

INSPECTION PROCEDURE 25: 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 System –Evaporative Emission Purge Solenoid Check [P.17-102](#).

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 System –Evaporative Emission Ventilation Solenoid Check [P.17-103](#).

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.

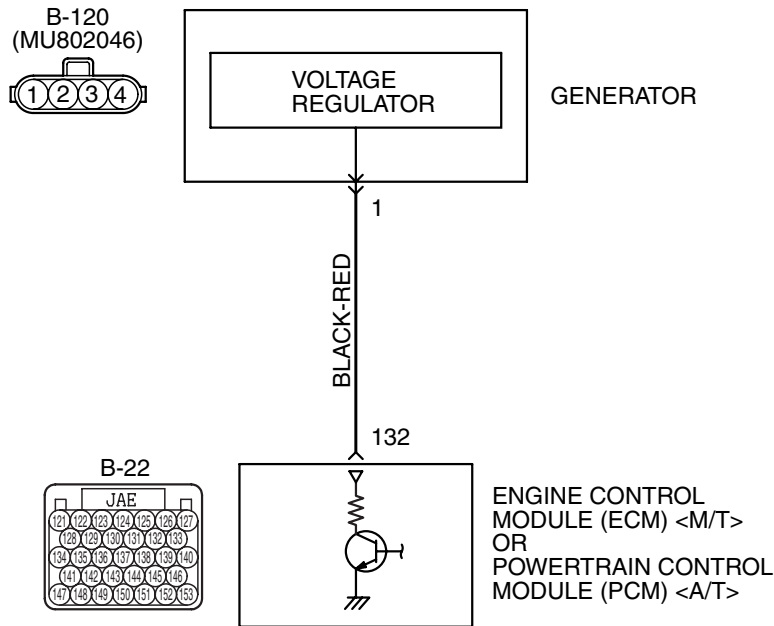
b. Check for leaks from the fuel tank.

Then confirm that the malfunction symptom is eliminated.

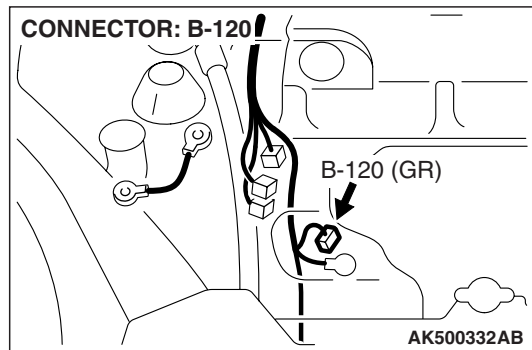
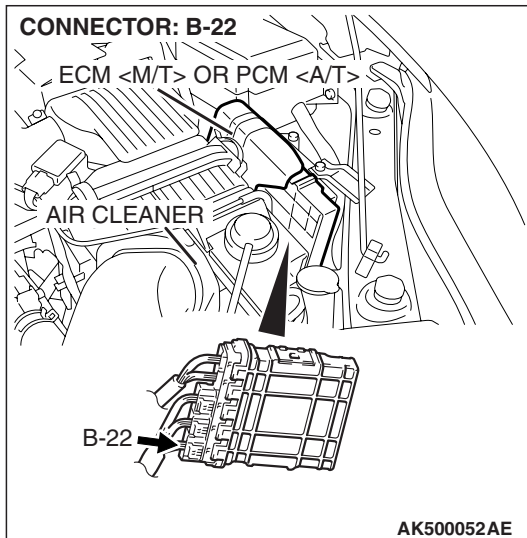
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 26: Generator output voltage is low (approximately 12.3 volts).

Generator Circuit



AK403709



CIRCUIT OPERATION

- The ECM <M/T> or the PCM <A/T> controls generator output current by duty-controlling continuity between the generator G terminal (terminal No. 1) and ground.

TROUBLESHOOTING HINTS (The most likely causes for this charging system:)

- Malfunction of the charging system.
- Short circuit in harness between generator G terminal and ECM <M/T> or PCM <A/T>.
- ECM failed. <M/T>
- PCM failed. <A/T>

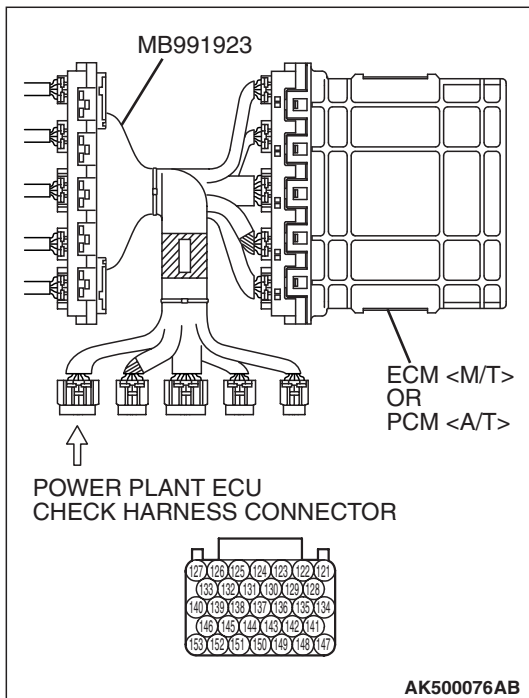
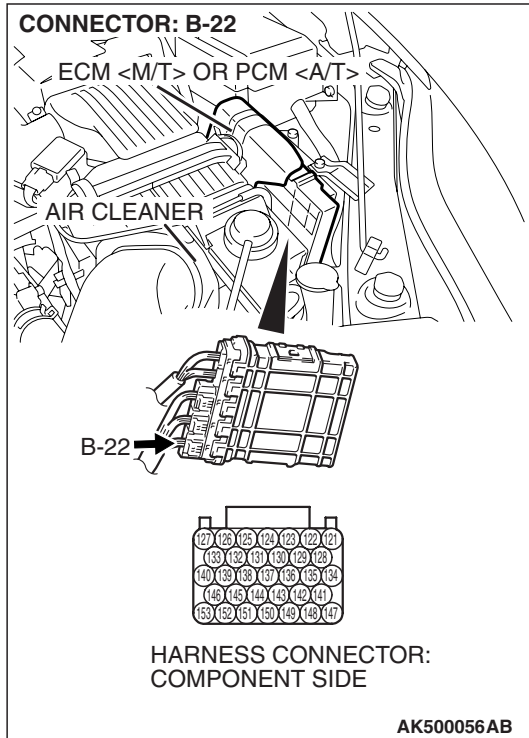
DIAGNOSIS

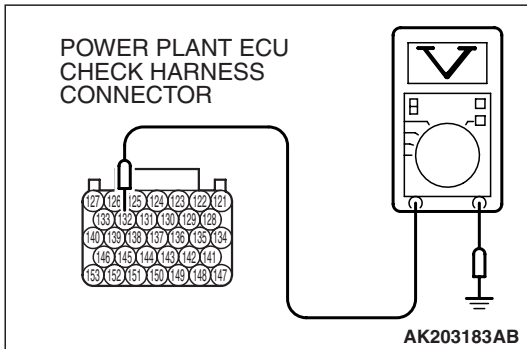
Required Special Tool:

- MB991923: Power Train ECU Check Harness

STEP 1. Measure the voltage at ECM <M/T> or PCM <A/T> connector B-22 by using check harness special tool MB991923.

- (1) Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool MB991923 between the separated connectors.
- (2) Start the engine and run at idle.





- (3) Measure the voltage between terminal No. 132 and ground.
NOTE: Vehicle for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.
- Engine: warming up
 - Radiator fan: stopped
 - Headlight switch: OFF to ON
 - Rear defogger switch: OFF to ON
 - Stoplight switch: OFF to ON
 - Voltage rises.

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

Q: Is the measured voltage within the specified range?

YES : Go to Step 2.

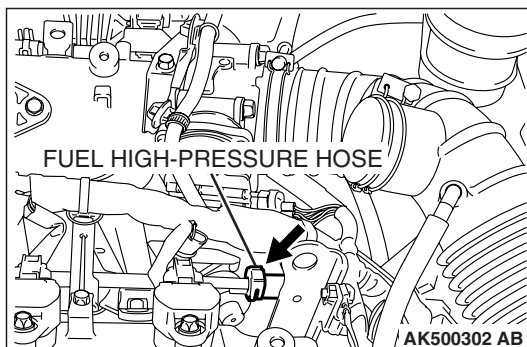
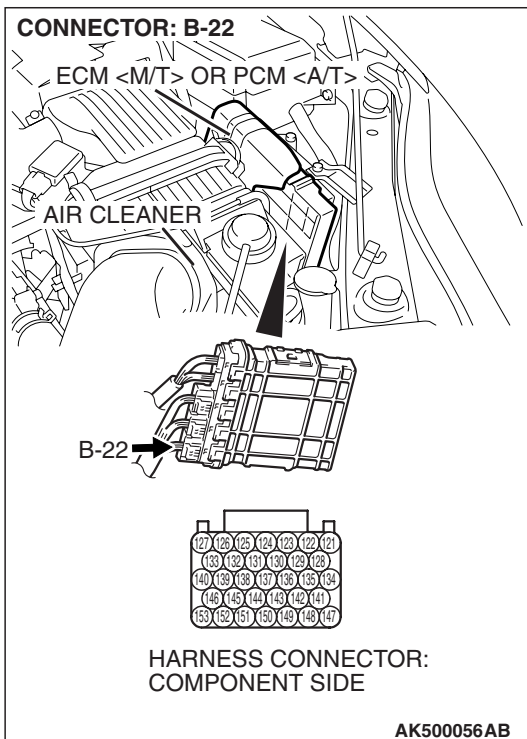
NO : Replace the generator. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-22 at ECM <M/T> or PCM <A/T> connector and harness connector B-120 at generator connector 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.

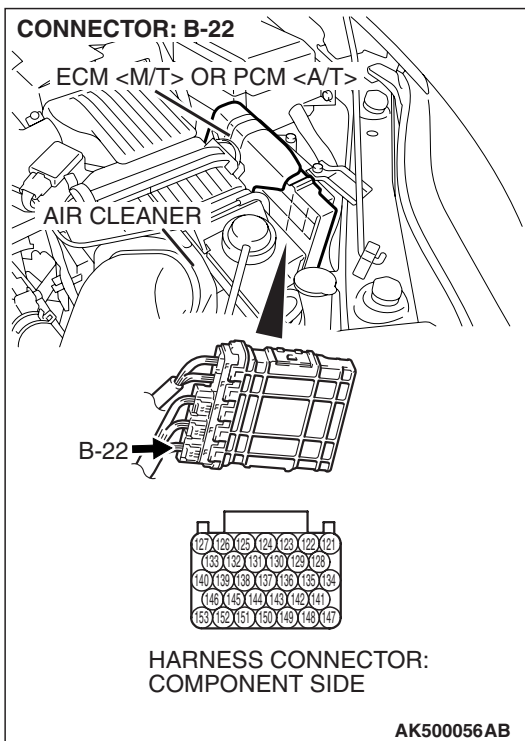
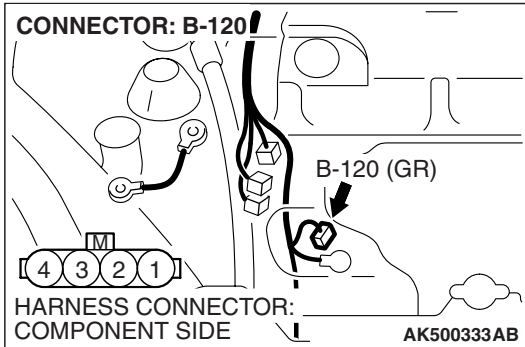


STEP 3. Check for open circuit and short circuit to ground and harness damage between generator connector B-120 (terminal No. 1) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 132).

Q: Is the harness wire in good condition?

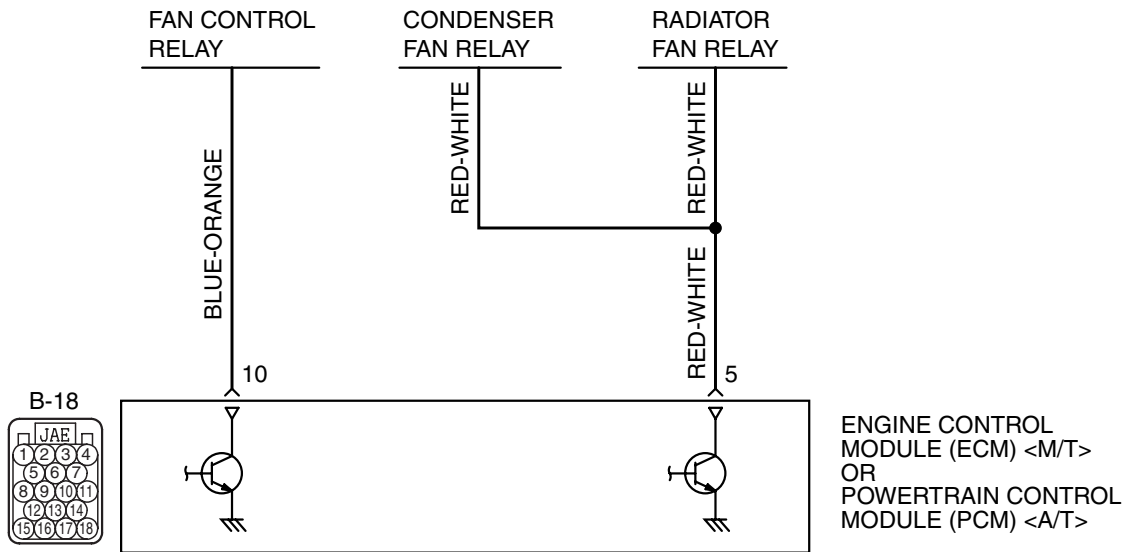
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then confirm that the malfunction symptom is eliminated.

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

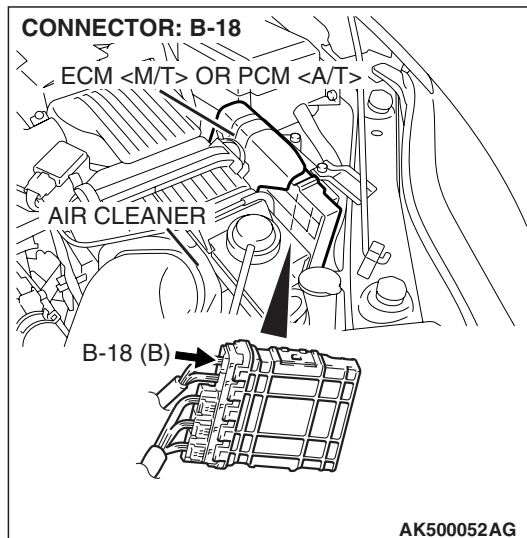


INSPECTION PROCEDURE 27: Fans (radiator fan, A/C condenser fan) are inoperative

Radiator Fan, A/C Condenser Fan Circuit



AK403710



COMMENT

- The fan control relay is controlled by the power transistor inside the ECM <M/T> or the PCM <A/T> turning "ON" and "OFF".

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

- Malfunction of the fan control relay.
- Malfunction of the condenser fan relay.
- Malfunction of the radiator fan relay.
- Malfunction of the condenser fan motor.
- Malfunction of the radiator fan motor.
- Improper connector contact, open or shorted harness wire.
- ECM failed. <M/T>
- PCM failed. <A/T>

DIAGNOSIS**Required Special Tools:**

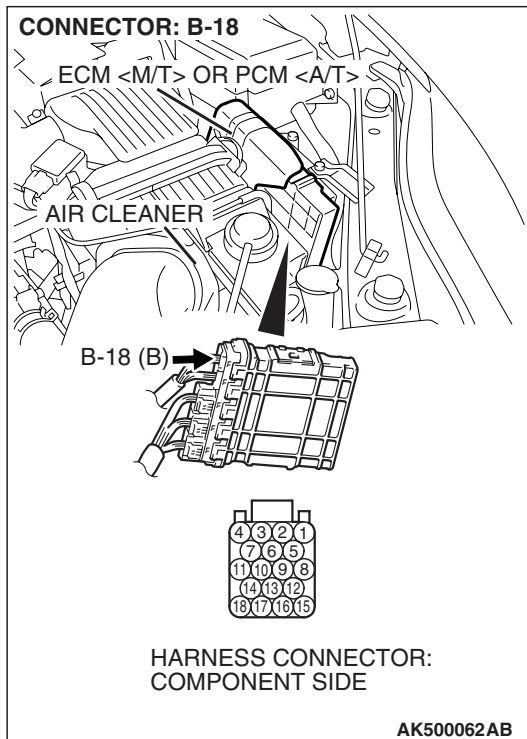
- MB991958: Scan tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A

STEP 1. Check harness connector B-18 at ECM <M/T> or PCM <A/T> for damage.

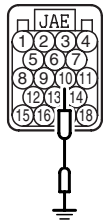
Q: Is the harness connector in good condition?

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.

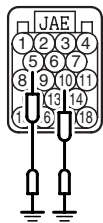


B-18 HARNESS CONNECTOR:
COMPONENT SIDE



AK303257AC

B-18 HARNESS CONNECTOR:
COMPONENT SIDE



AK303259AC

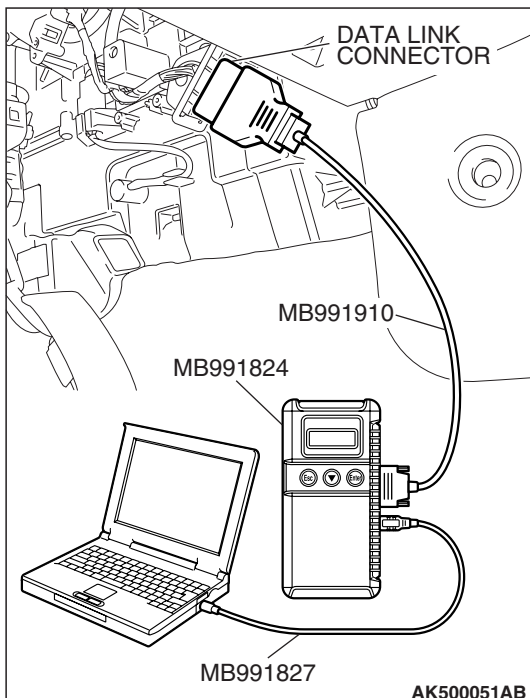
STEP 2. Check the fan condition.

- (1) Disconnect the B-18 at ECM <M/T> or PCM <A/T> connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the fan condition.
 - When the terminal No.10 is grounded by the jumper cable, the radiator and condenser fans should run.
 - When the terminal No.10 is grounded first and then both of the terminal No.10 and No.5 are grounded next, check that the rotation speed of fan is higher than the rotation speed when the terminal No.10 is grounded.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fan condition normal?

YES : Go to Step 3.

NO : Refer to GROUP 14, Symptom Chart [P.14-4](#).



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

CAUTION

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Check the following items in the data list. Refer to Data List Reference Table [P.13A-1147](#).
 - a. Item 6: Engine Coolant Temperature Sensor.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

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

STEP 4. Check the cooling system.

Refer to GROUP 14, Engine Cooling Diagnosis [P.14-4](#).

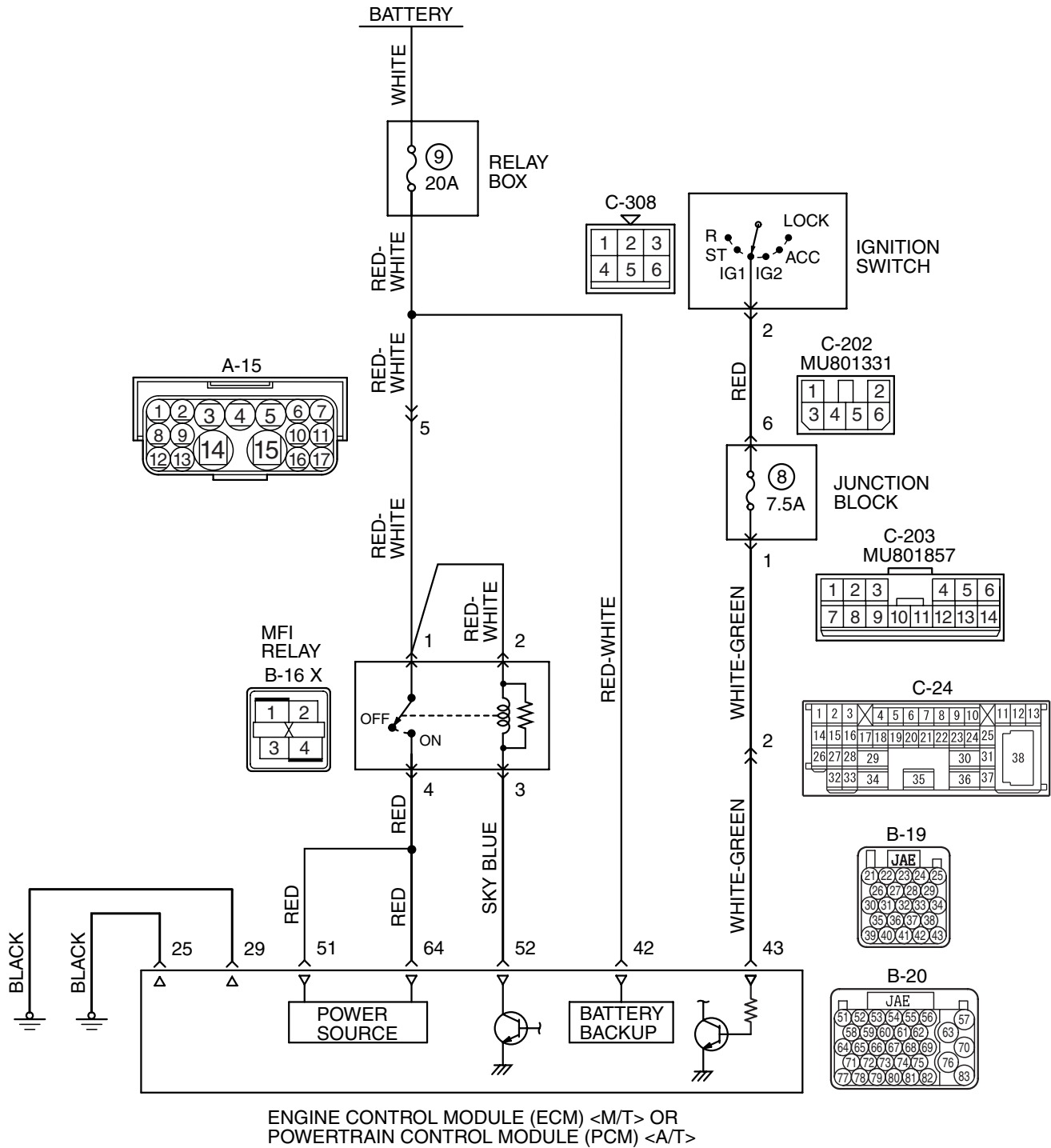
Q: Is the cooling system normal?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table [P.54A-13](#).

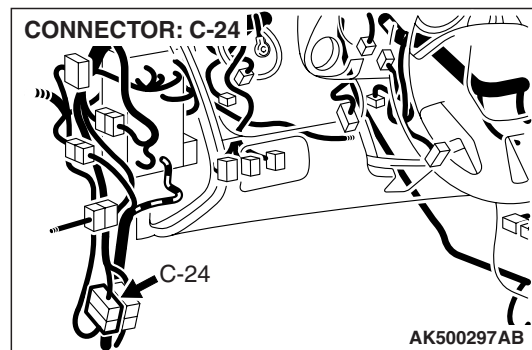
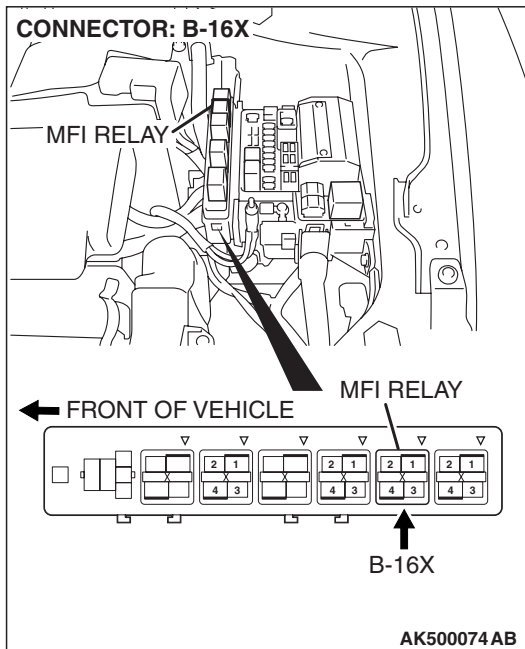
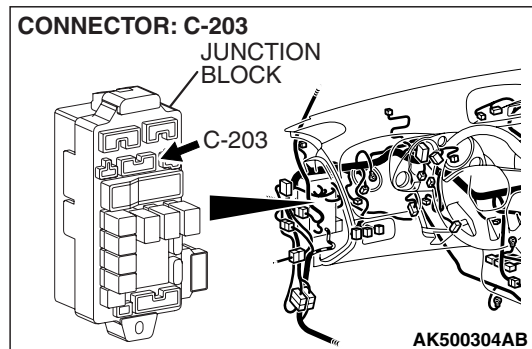
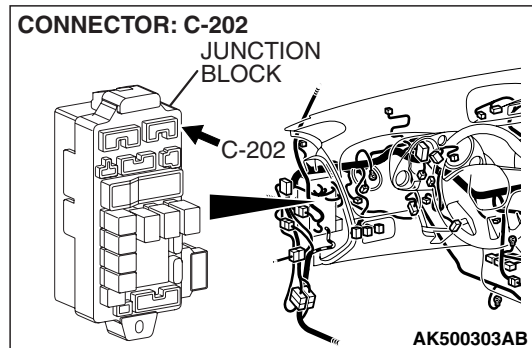
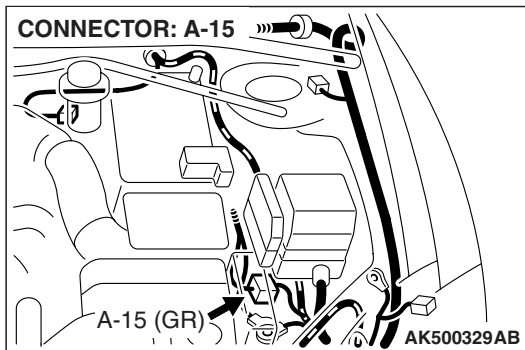
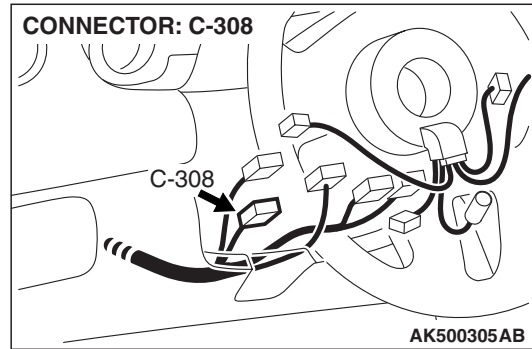
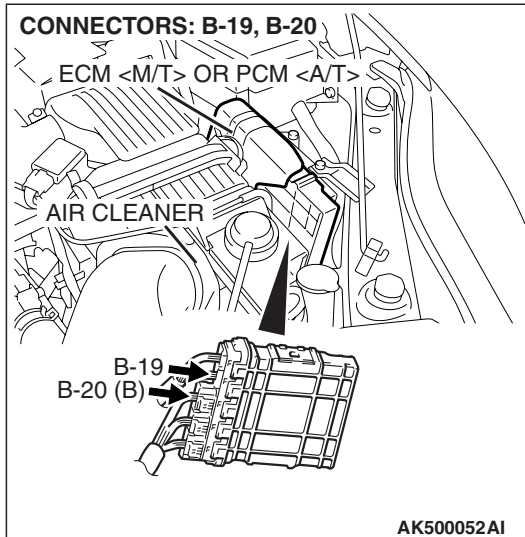
NO : Replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 28: Power supply system and ignition switch-IG system.

Power Supply and Ignition Switch-IG Circuit



AK403711



CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals No. 1, No. 2).
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the ECM <M/T> or the PCM <A/T> (terminal No. 43). When the battery positive voltage is applied, the ECM <M/T> or the PCM <A/T> turns the power transistor in the ECM <M/T> or the PCM <A/T> "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" and the battery positive voltage is supplied to the ECM <M/T> or the PCM <A/T> (terminals No. 51, No. 64) from the MFI relay (terminal No. 4).
- A battery positive voltage is constantly supplied to the ECM <M/T> or the PCM <A/T> (terminal No. 42) as the backup power.
- The ECM <M/T> or the PCM <A/T> (terminals No. 25, No. 29) is grounded to the vehicle body.

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 or shorted harness wire.
- Disconnected ECM <M/T> or PCM <A/T> ground wire.
- Malfunction of the ECM <M/T> or the PCM <A/T>.

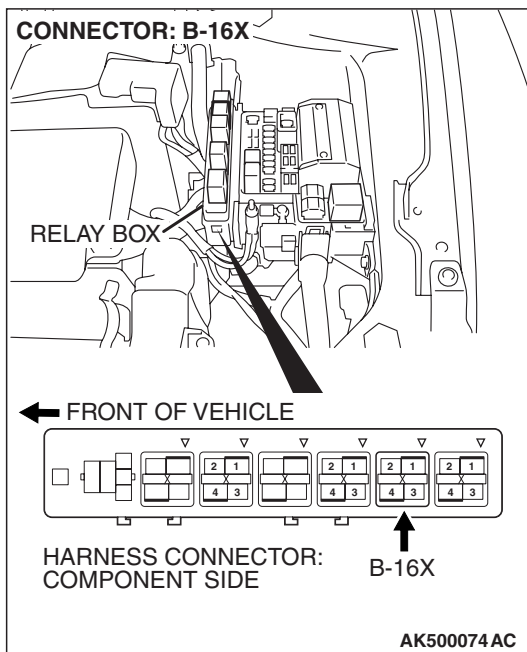
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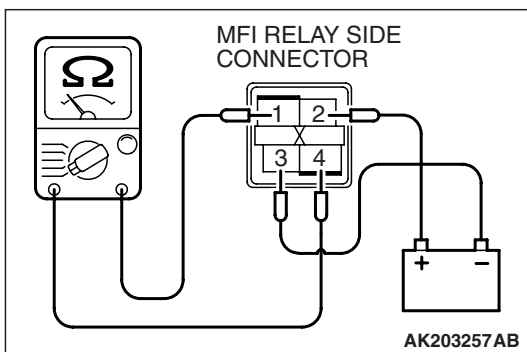
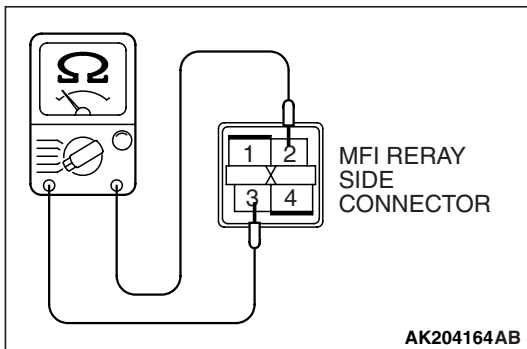
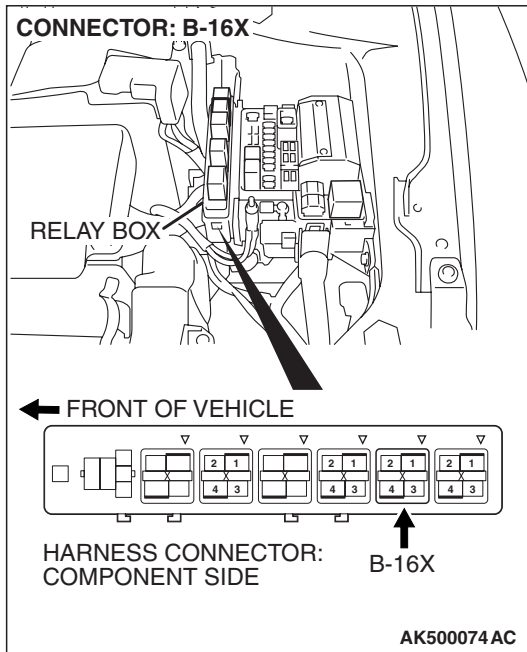
STEP 1. Check harness connector B-16X at MFI relay for damage.

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 MFI relay.****⚠ CAUTION**

Because it is not possible to distinguish the top and the bottom of the MFI relay, inspect it with the triangle mark printed on the relay facing upward.

(1) Remove the MFI relay.

(2) Check for continuity between the MFI relay terminals No. 2 and No. 3.

- There should be continuity. (approximately 70 ohms)

(3) Use jumper wires to connect MFI relay terminal No. 2 to the positive battery terminal and terminal No. 3 to the negative battery terminal.

(4) Check for continuity between the MFI relay terminals No. 1 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.

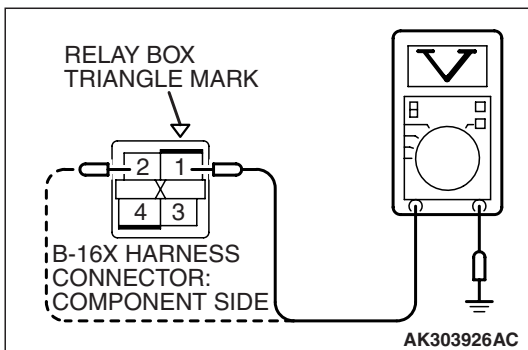
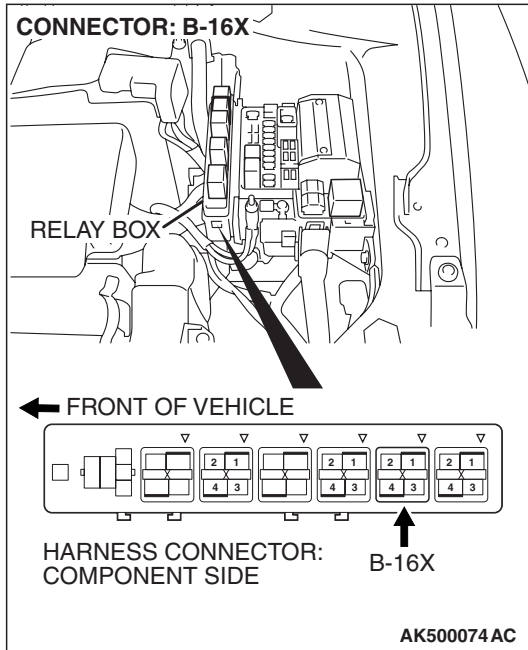
NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.

STEP 3. Measure the power supply voltage at MFI relay harness side connector B-16X.

⚠ CAUTION

Because it is difficult to distinguish the top and bottom of the MFI relay connector at the wiring harness, inspect it by using triangle mark on the junction block as a reference.

(1) Disconnect the connector B-16X and measure at the harness side.



(2) Measure the voltage between terminals No. 1, No. 2 and ground.
 • Voltage should be battery positive voltage.

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

YES : Go to Step 4.

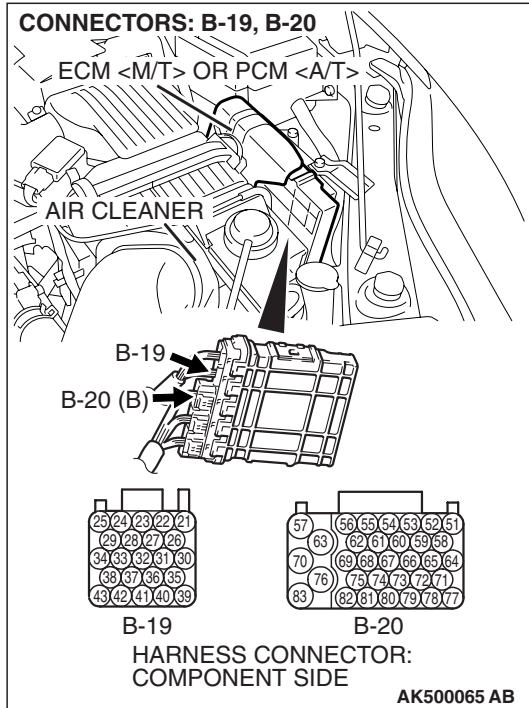
NO : Check harness connector A-15 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between fusible link (9) and MFI relay connector B-16X (terminals No. 1, No. 2) because of open circuit. Then confirm that the malfunction symptom is eliminated.

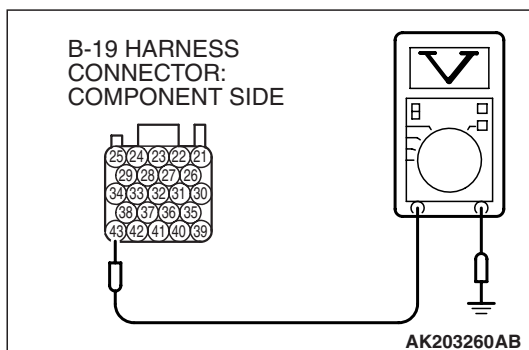
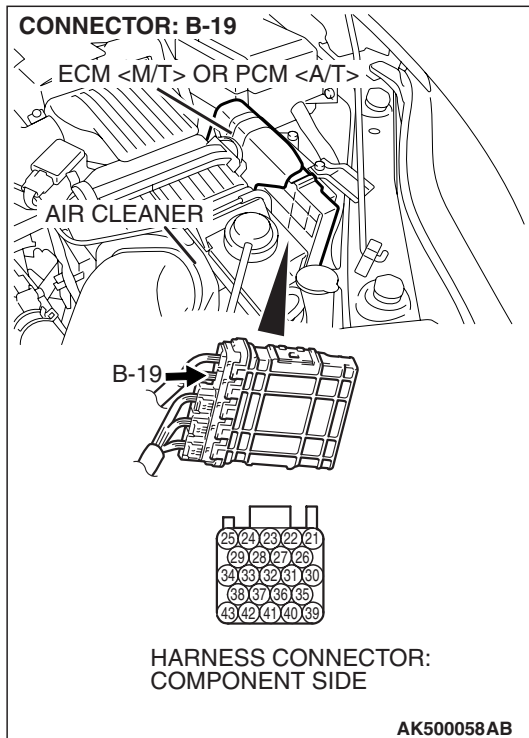
STEP 4. Check harness connector B-19 and B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

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





STEP 5. Measure the ignition switch-IG signal voltage at ECM <M/T> or PCM <A/T> harness side connector B-19.

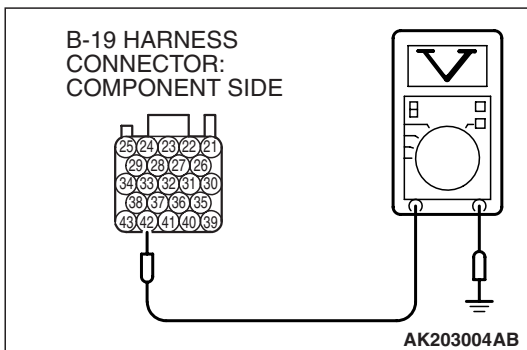
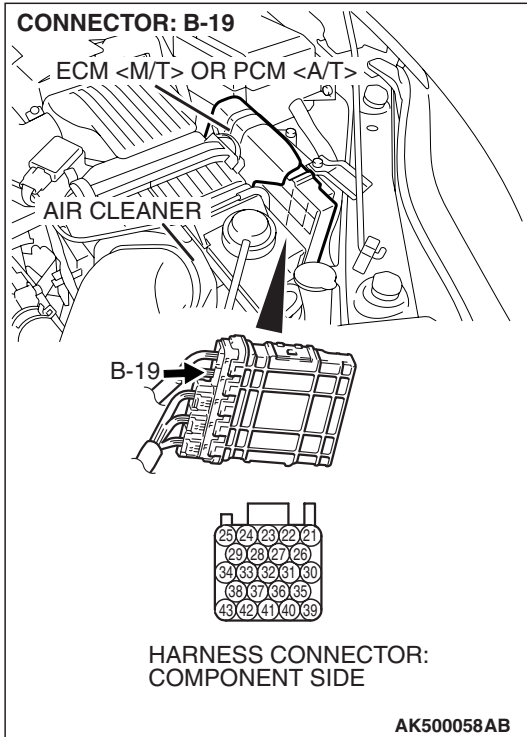
- (1) Disconnect the connector B-19 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 43 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 : Check harness connector C-24, C-203 and C-202 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-308 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 43) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 6. Measure the backup power supply voltage at ECM <M/T> or PCM <A/T> harness side connector B-19.

(1) Disconnect the connector B-19 and measure at the harness side.

(2) Measure the voltage between terminal No. 42 and ground.

- Voltage should be battery positive voltage.

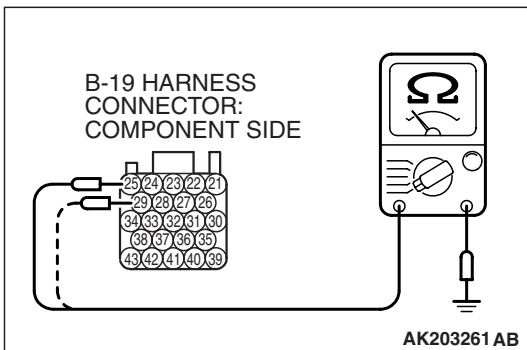
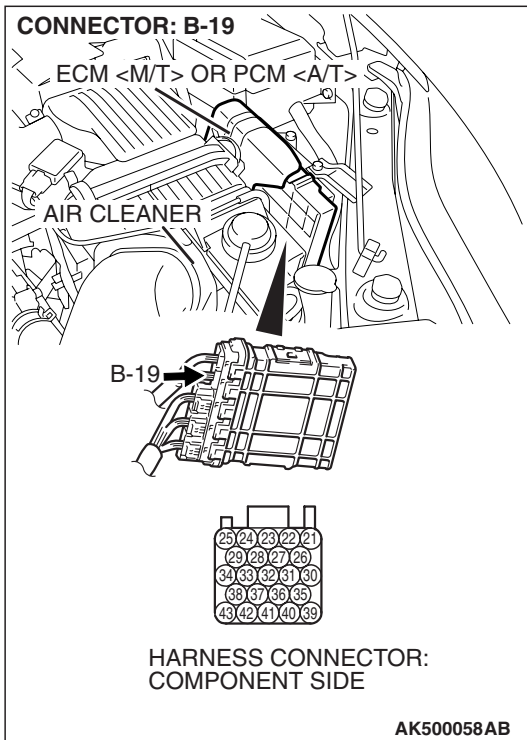
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

NO : Repair harness wire between fusible link (9) and ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 42) because of short circuit. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check for continuity at ECM <M/T> or PCM <A/T> harness side connector B-19.

(1) Disconnect the connector B-19 and measure at the harness side.



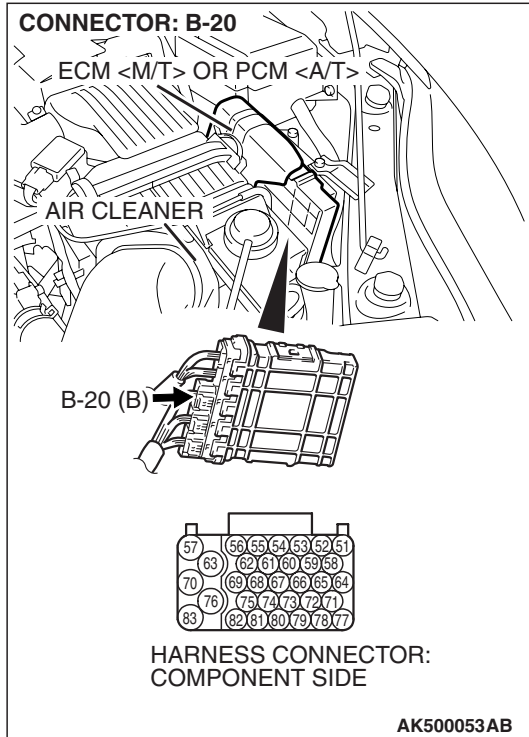
(2) Check for the continuity between terminals (No. 25, No. 29) and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

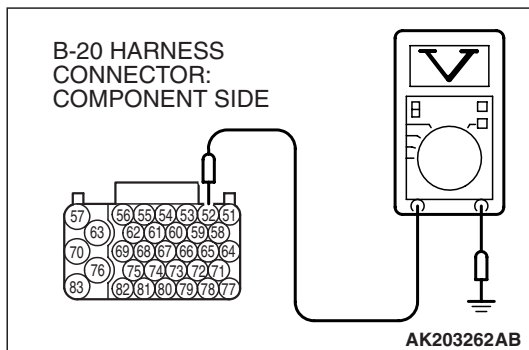
YES : Go to Step 8.

NO : Repair harness wire between ECM <M/T> or PCM <A/T> connector B-19 (terminal No. 25, No. 29) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Measure the power supply voltage at ECM <M/T> or PCM <A/T> harness side connector B-20.

(1) Disconnect the connector B-20 and measure at the harness side.



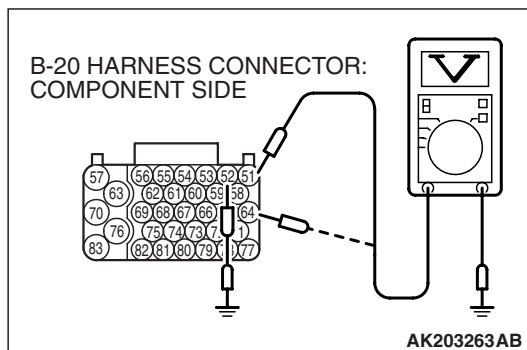
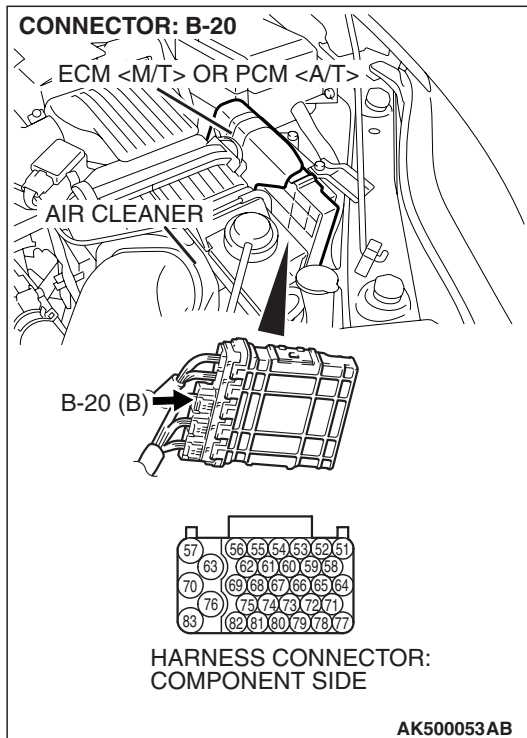
(2) Measure the voltage between terminal No. 52 and ground.

- Voltage should be battery positive voltage.

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

YES : Go to Step 9.

NO : Repair harness wire between MFI relay connector B-16X (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-20 (terminal No. 52) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Measure the power supply voltage at ECM <M/T> or PCM <A/T> harness side connector B-20.

- (1) Disconnect the connector B-20 and measure at the harness side.
- (2) Using a jumper wire, connect terminal No. 52 to ground.

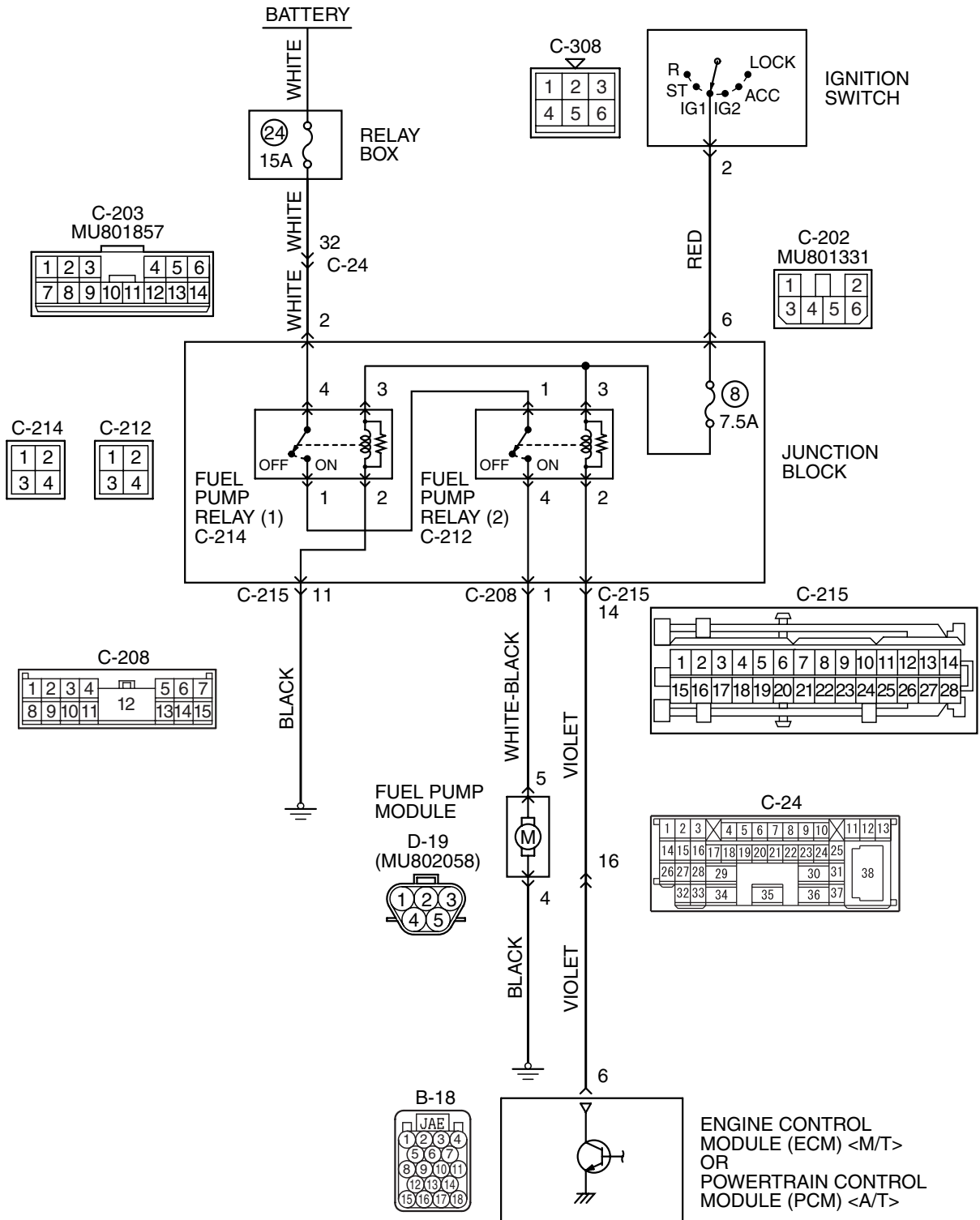
- (3) Measure the voltage between terminals (No. 51, No. 64) and ground.
 - Voltage should be battery positive voltage.

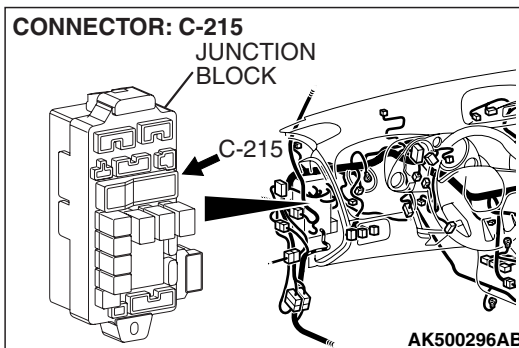
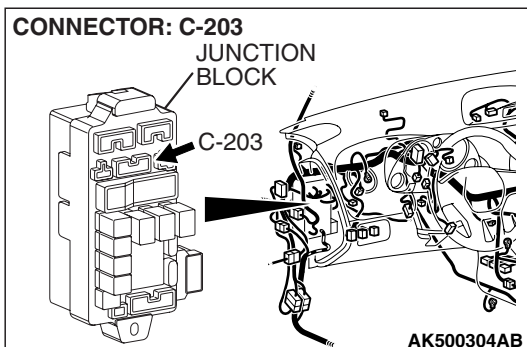
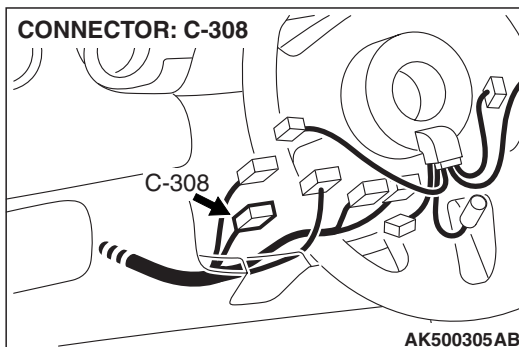
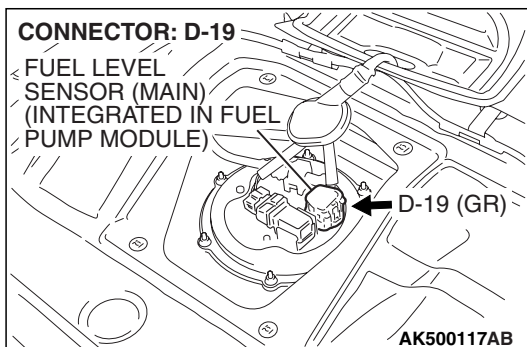
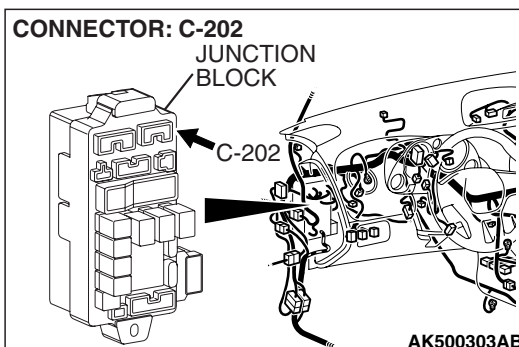
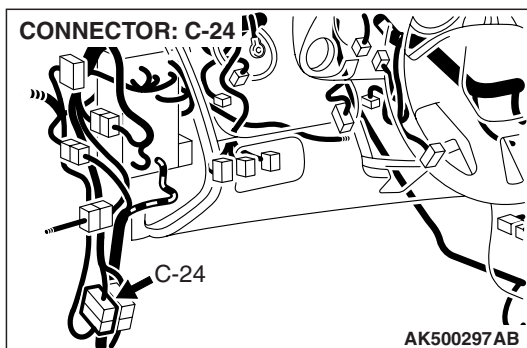
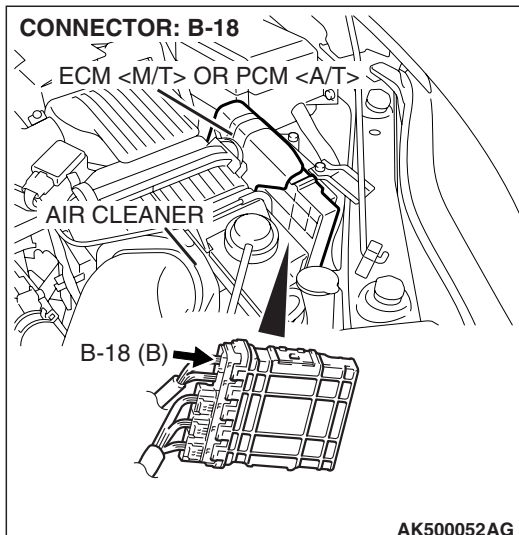
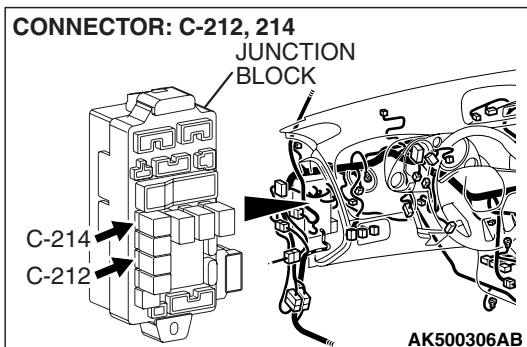
Q: Is battery positive voltage (approximately 12 volts) present?

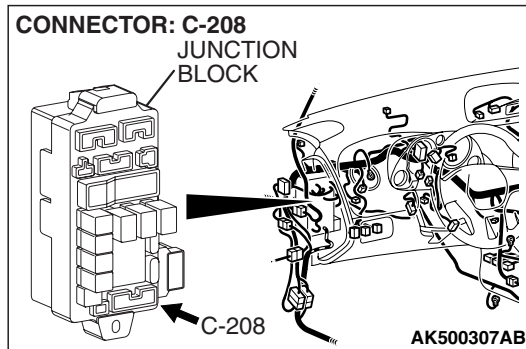
- YES :** Replace the ECM or the PCM. Then confirm that the malfunction symptom is eliminated.
- NO :** Repair harness wire between MFI relay connector B-16X (terminal No. 4) and ECM <M/T> or PCM <A/T> connector B-20 (terminals No. 51, No. 64) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 29: Fuel pump system

Fuel Pump Circuit







CIRCUIT OPERATION

- Battery positive voltage is applied to the fuel pump relay 1 (terminal No. 3) from the ignition switch-IG.
Ground is provided through terminal No. 2 to chassis ground.
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the fuel pump relay 2 (terminal No. 1) from the fuel pump relay 1 (terminal No. 1).
- Battery positive voltage is applied to the fuel pump relay 2 (terminal No. 3) from the ignition switch-IG.

- During cranking and while the engine is running, the ECM <M/T> or the PCM <A/T> turns the power transistor in the ECM <M/T> or the PCM <A/T> ON to ground the fuel pump relay 2 coil. With this, the fuel pump relay turns ON, and the battery positive voltage is supplied to the fuel pump from the fuel pump relay 2 (terminal No. 4).

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-circu-
lated harness wire.
- Malfunction of the ECM <M/T> or the PCM
<A/T>.

DIAGNOSIS

Required Special Tools:

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

STEP 1. Using scan tool MB991958, check actuator test item 9: Fuel Pump.

⚠ CAUTION

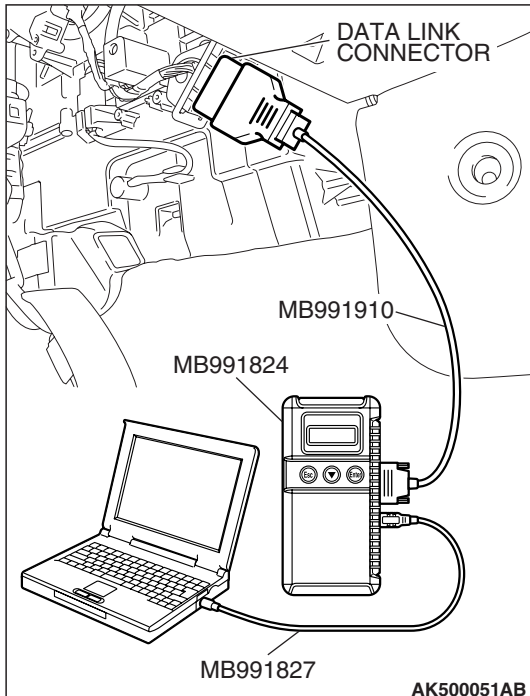
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991958 to the actuator test mode for item 9, Fuel Pump.
 - An operation sound of the fuel pump should be heard.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fuel pump operating properly?

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

NO : Go to Step 2.

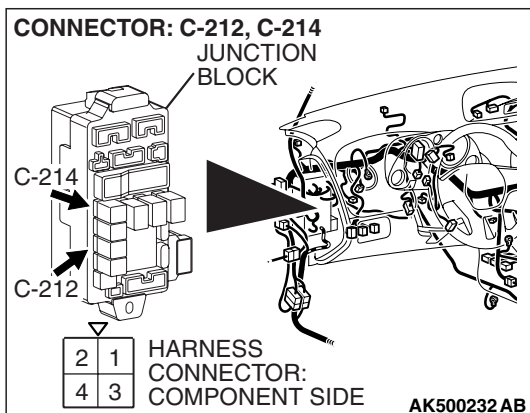


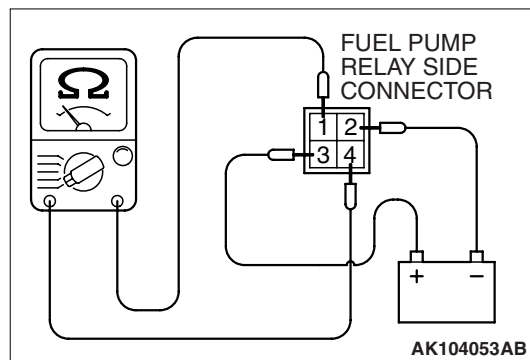
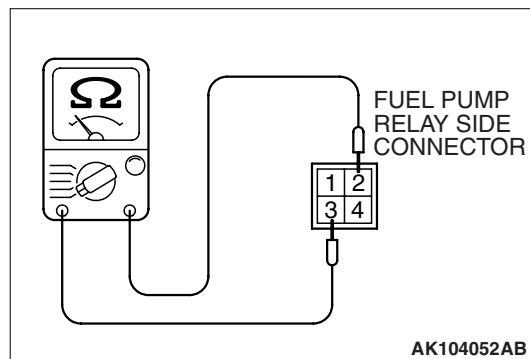
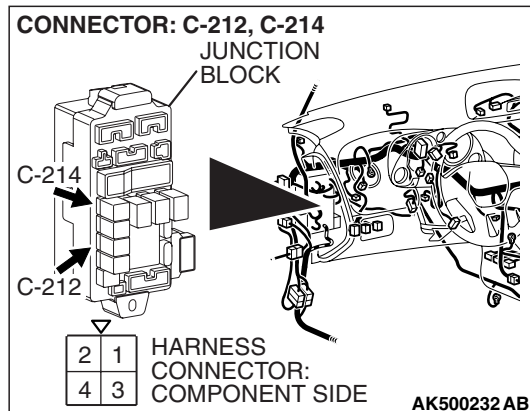
STEP 2. Check harness connector C-214 at fuel pump relay 1 and harness connector C-212 at fuel pump relay 2 for damage.

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 fuel pump relay 1 and 2.****⚠ CAUTION**

Because it is not possible to distinguish the top and the bottom of the fuel pump relay, inspect it with the triangle mark printed on the relay facing upward.

(1) Remove the fuel pump relay 1 and 2.

(2) Check for continuity between the each fuel pump relay terminals No. 2 and No. 3.

- There should be continuity. (approximately 70 ohms)

(3) Use jumper wires to connect each fuel pump relay terminal No. 3 to the positive battery terminal and terminal No. 2 to the negative battery terminal.

(4) Check for continuity between the each fuel pump relay terminals No. 1 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

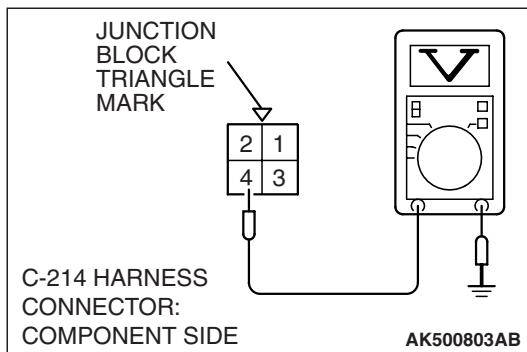
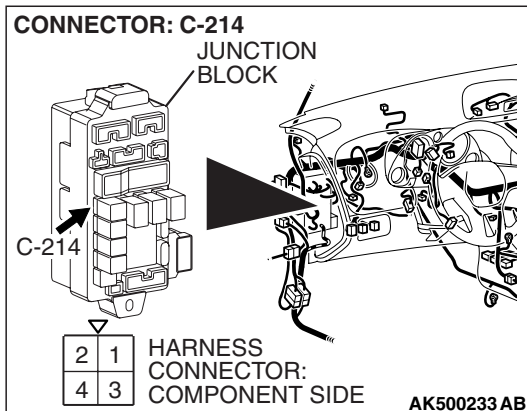
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the fuel pump relay 1 and 2.

Q: Is the measured resistance normal?

YES : Go to Step 4.

NO : Replace the fuel pump relay 1 and/or 2. Then confirm that the malfunction symptom is eliminated.



STEP 4. Measure the power supply voltage at fuel pump relay 1 harness side connector C-214.

CAUTION

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

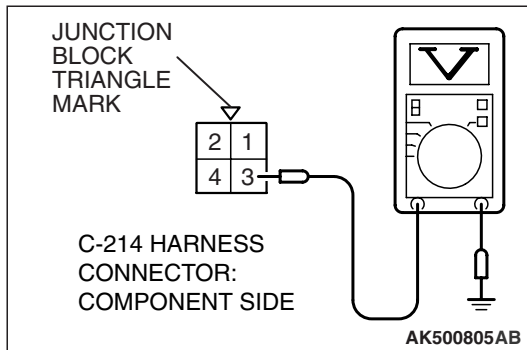
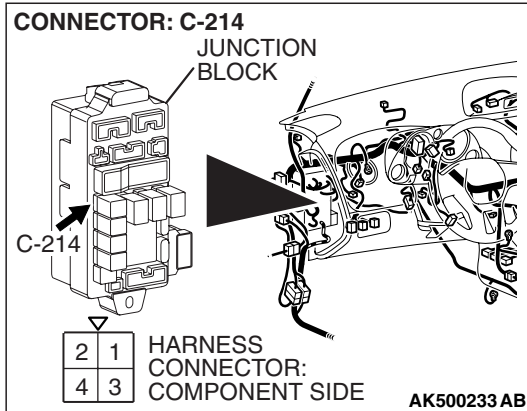
(1) Disconnect the connector C-214 and measure at the harness side.

(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 : Check harness connector C-203 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 relay box and fuel pump relay 1 connector C-214 (terminal No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 5. Measure the power supply voltage at fuel pump relay 1 harness side connector C-214.

⚠ CAUTION

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-214 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

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

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

YES : Go to Step 6.

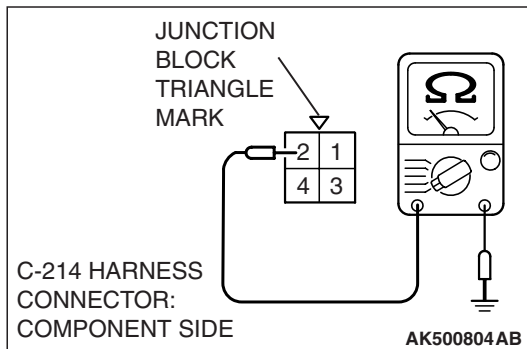
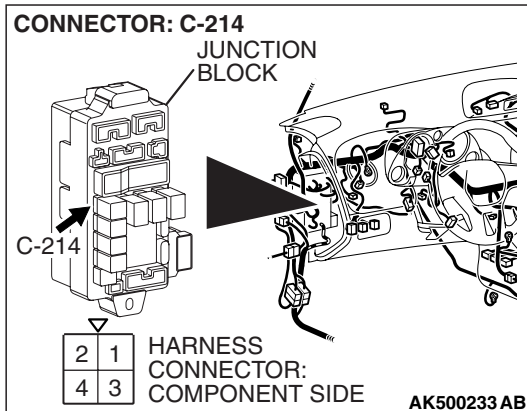
NO : Check harness connector C-202 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel pump relay 1 connector C-214 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for continuity at fuel pump relay 1 harness side connector C-214.

⚠ CAUTION

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

(1) Disconnect the connector C-214 and measure at the harness side.



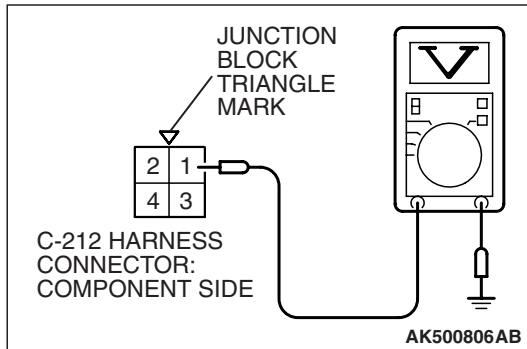
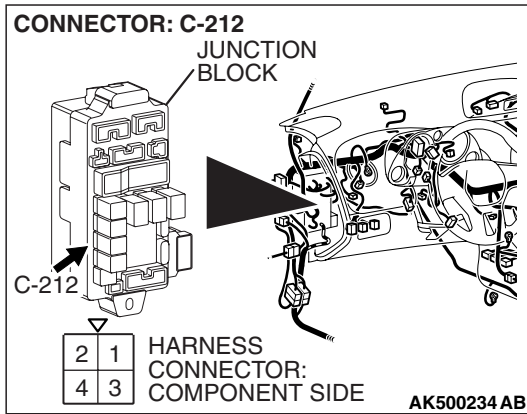
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.

NO : Check connector C-215 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between fuel pump relay 1 connector C-214 (terminal No. 2) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 7. Measure the power supply voltage at fuel pump relay 2 harness side connector C-212.

⚠ CAUTION

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-212 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

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

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

YES : Go to Step 8.

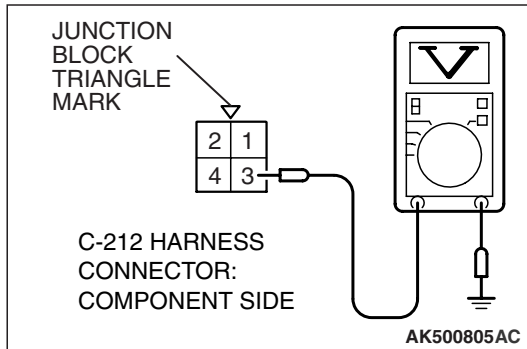
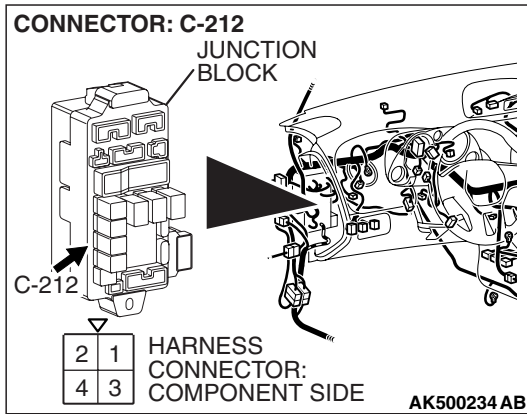
NO : Repair harness wire between fuel pump relay 1 connector C-214 (terminal No. 1) and fuel pump relay 2 connector C-212 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 8. Measure the power supply voltage at fuel pump relay 2 harness side connector C-212.

⚠ CAUTION

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-212 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.



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

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

YES : Go to Step 9.

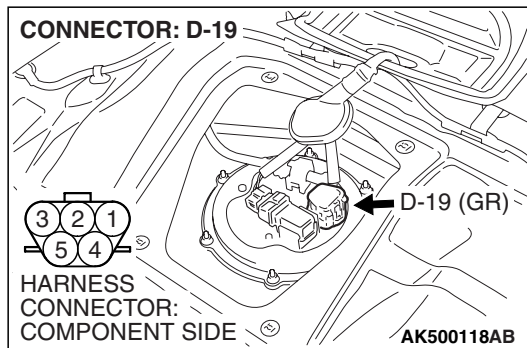
NO : Check harness connector C-202 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel pump relay 2 connector C-212 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

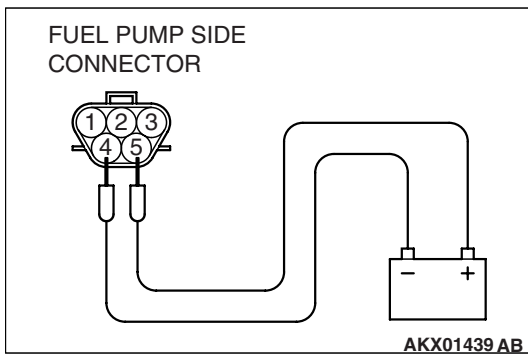
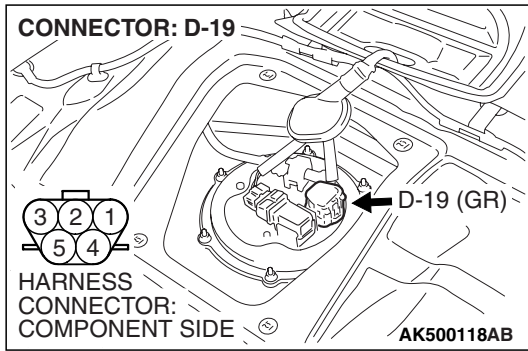
STEP 9. Check connector D-19 at fuel pump for damage.

Q: Is the connector in good condition?

YES : Go to Step 10.

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





STEP 10. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-19.

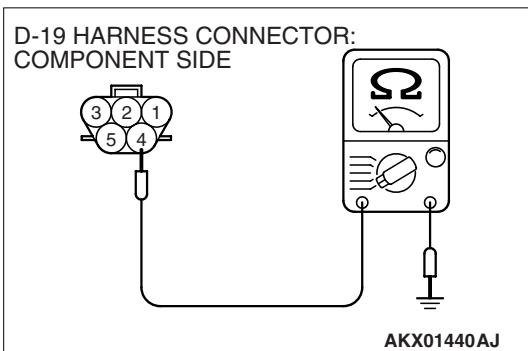
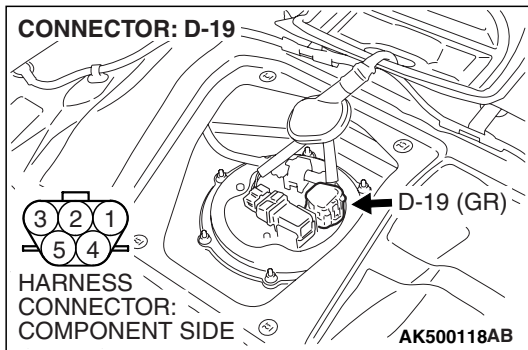
(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.

- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 11.

NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.



STEP 11. Check for continuity at fuel pump harness side connector D-19.

(1) Disconnect the connector D-19 and measure at the harness side.

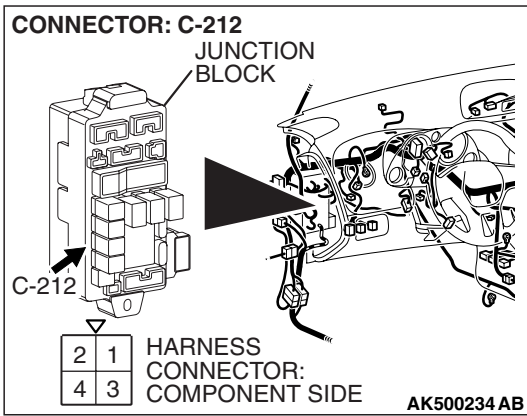
(2) Check for the continuity between terminal No. 4 and ground.

- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 12.

NO : Repair harness wire between fuel pump connector D-19 (terminal No. 4) and ground because of open circuit. or harness damage. Then confirm that the malfunction symptom is eliminated.



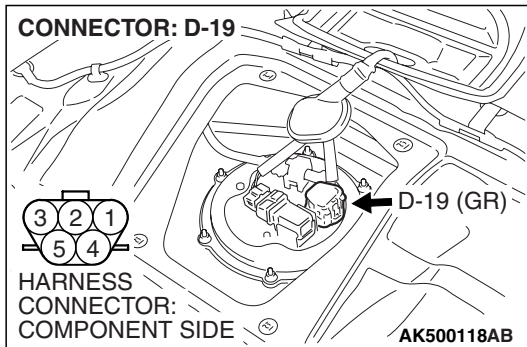
STEP 12. Check for open circuit and short circuit to ground and harness damage between fuel pump relay 2 connector C-212 (terminal No. 4) and fuel pump connector D-19 (terminal No. 5).

NOTE: Check harness after checking intermediate connector C-208. If intermediate connector is damaged, repair or replace it. After to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

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

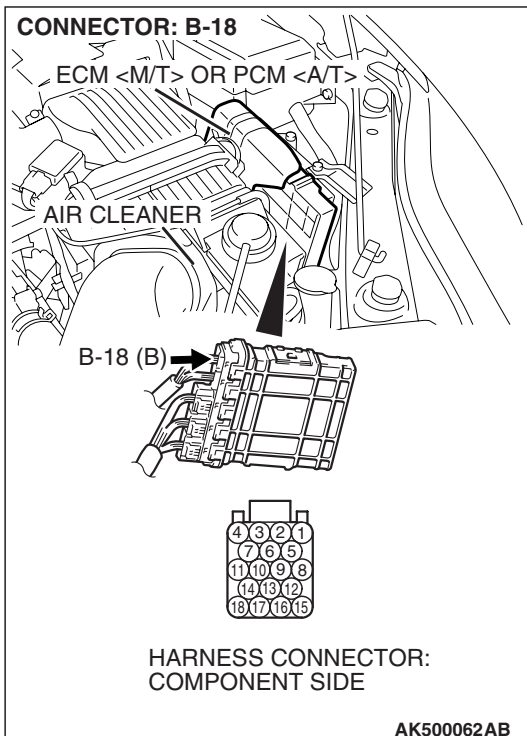


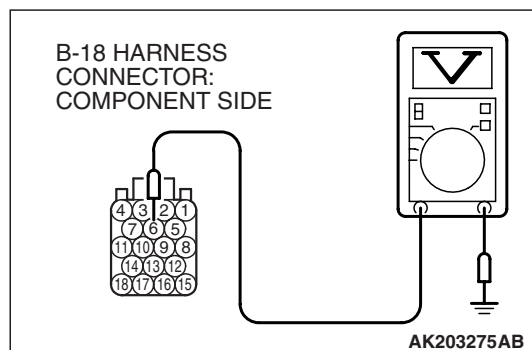
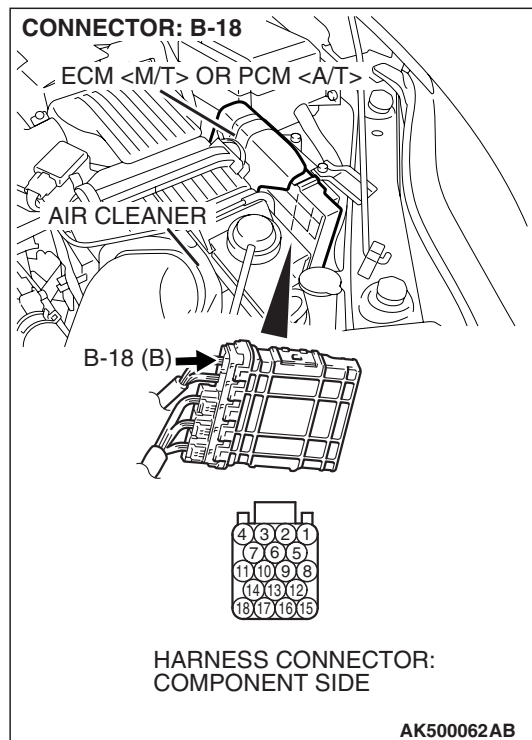
STEP 13. Check connector B-18 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the connector in good condition?

YES : Go to Step 14.

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





STEP 14. Measure the power supply voltage at ECM <M/T> or PCM <A/T> connector B-18.

- (1) Disconnect the connector B-18 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 6 and ground.
 - Voltage should be battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

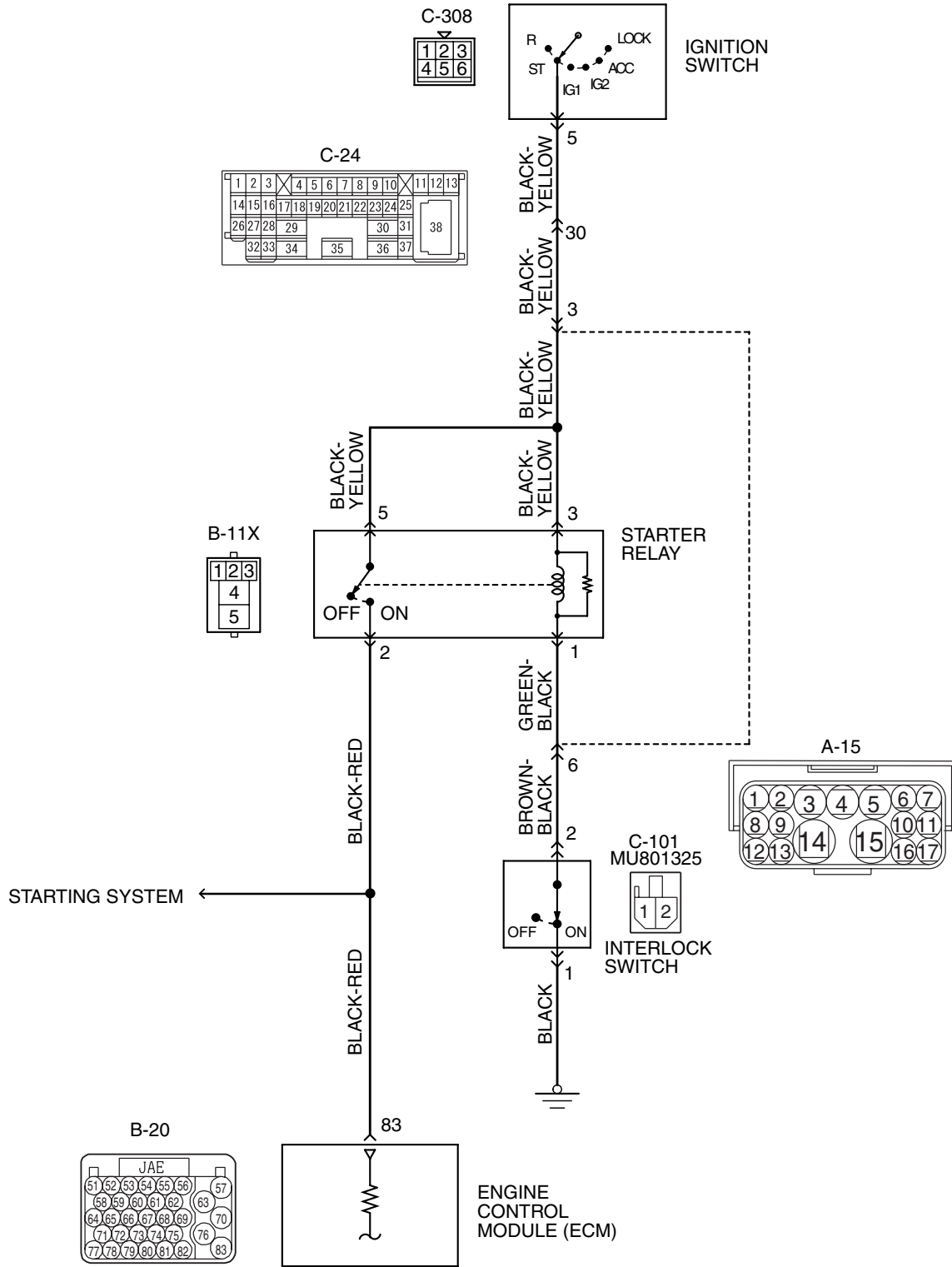
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table [P.54A-13](#). Then confirm that the malfunction symptom is eliminated.

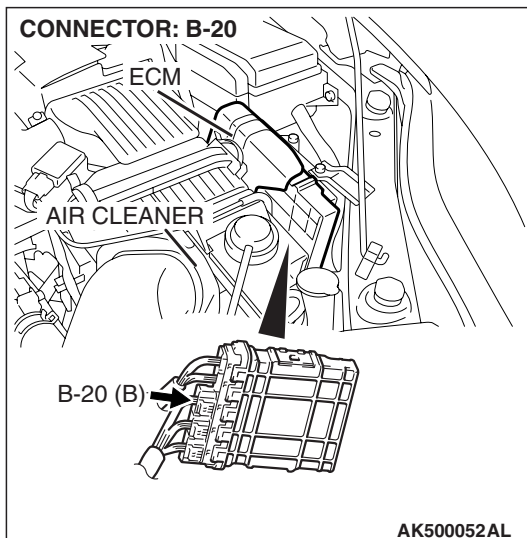
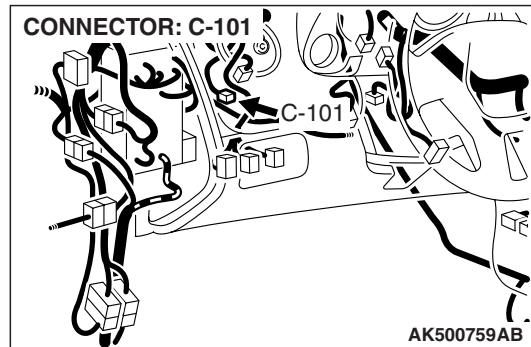
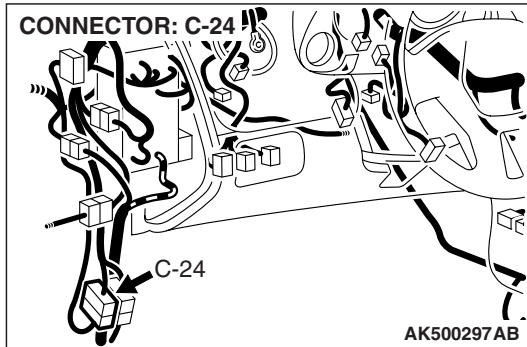
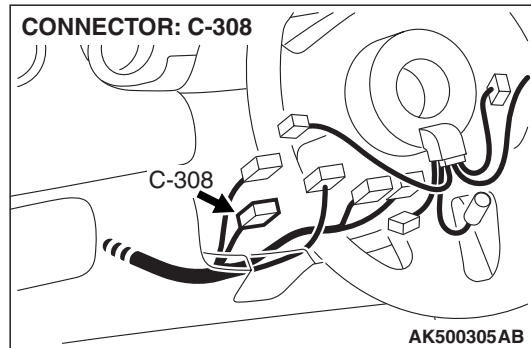
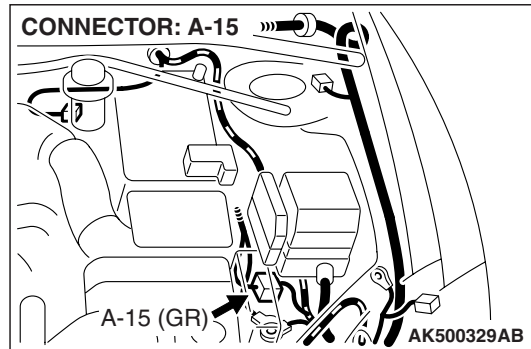
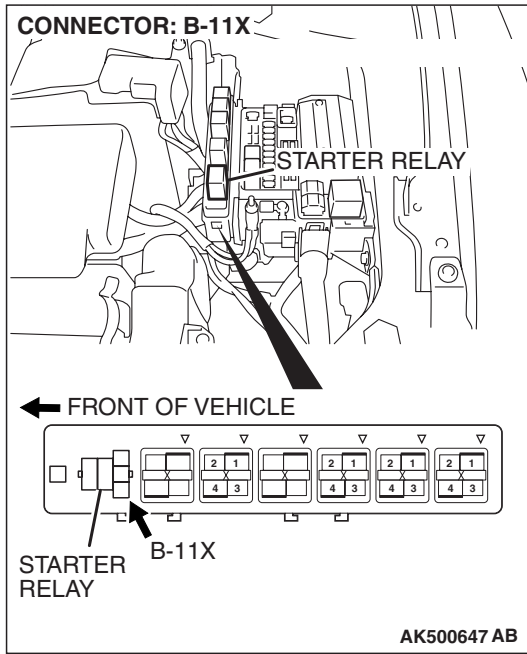
NO : Check harness connectors C-24 and C-215 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-212 (terminal No. 2) and ECM <M/T> or PCM <A/T> connector B-18 (terminal No. 6) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 30: Ignition Switch-ST System. <M/T>

Ignition Switch-ST Circuit



AK500643



CIRCUIT OPERATION

- The battery positive voltage is supplied to the ECM (terminal No. 83) via the starter relay during engine cranking. With this, the ECM detects that the engine is being cranked.

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

- Malfunction of the ignition switch.
- Malfunction of the starter relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

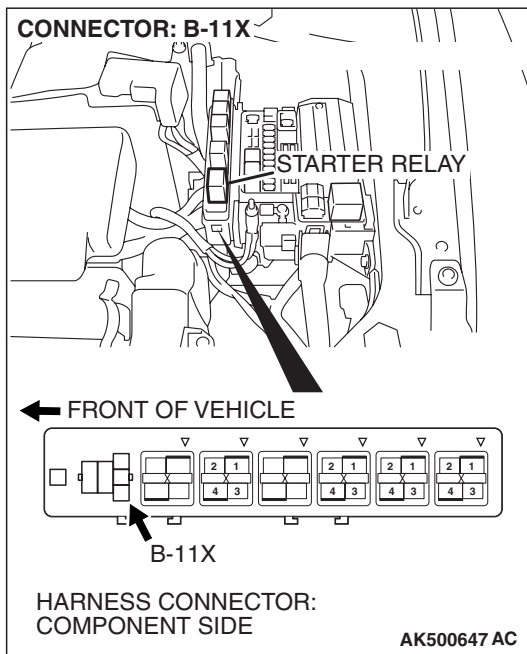
DIAGNOSIS

STEP 1. Check connector B-11X at starter 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.



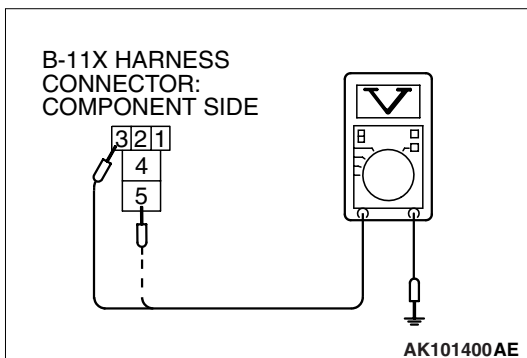
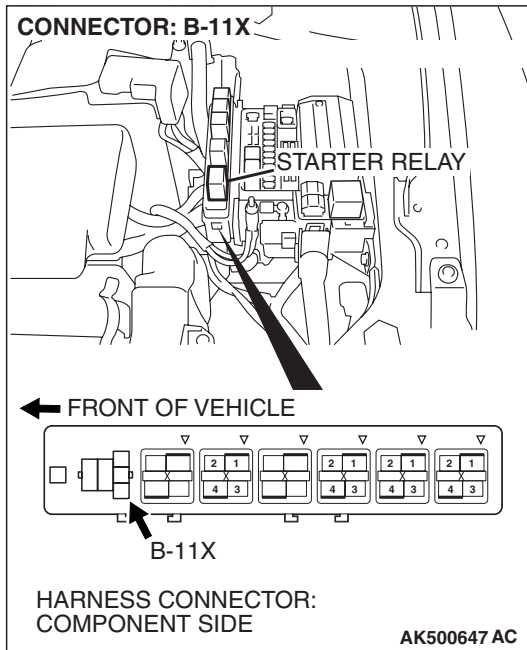
STEP 2. Check the starter relay.

Refer to GROUP 16, Starting system –On-vehicle Service – Starter relay check [P.16-26](#).

Q: Are there any abnormalities?

YES : Go to Step 3.

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



STEP 3. Measure the power supply voltage at starter relay connector B-11X.

- (1) Disconnect the connector B-11X and measure at the harness side.
- (2) Turn the ignition switch to the "START" position.

- (3) Measure the voltage between terminal No. 3, No. 5 and ground.

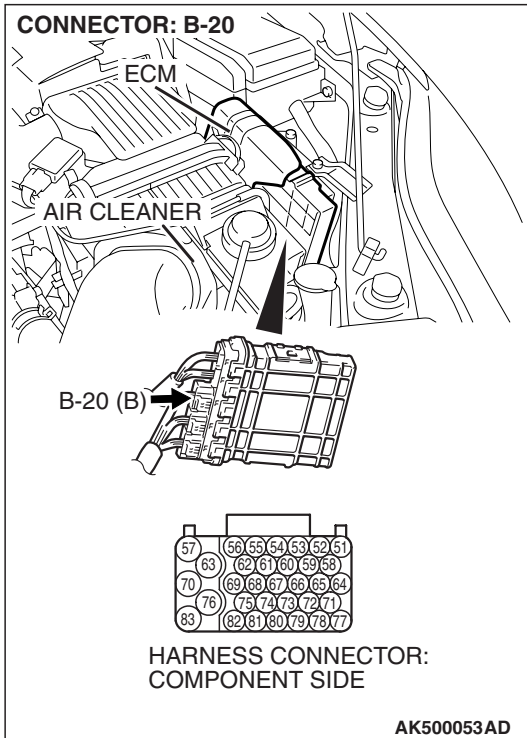
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 4.

NO : Check connectors A-15 and C-24 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 switch connector C-308 (terminal No. 5) and starter relay connector B-11X (terminal No. 3, No. 5) because of open circuit. Then confirm that the malfunction symptom is eliminated.

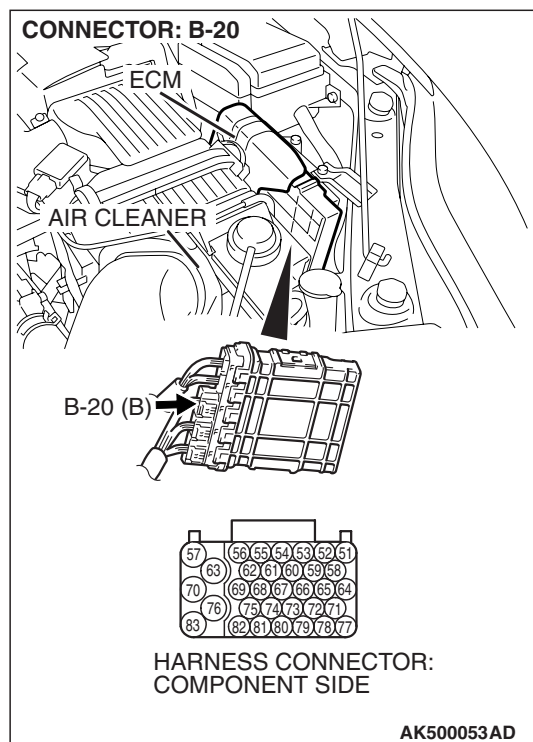


STEP 4. Check connector B-20 at ECM for damage.

Q: Is the connector in good condition?

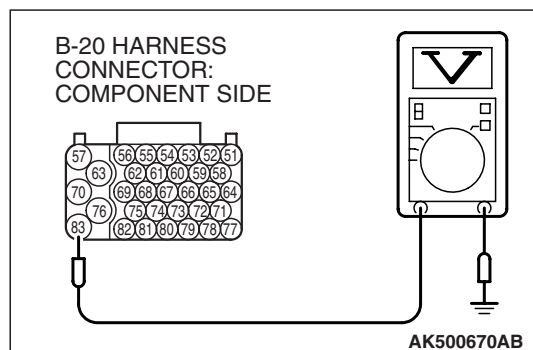
YES : Go to Step 5.

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. Measure the power supply voltage at ECM connector B-20.

- (1) Disconnect the connector B-20 and measure at the harness side.
- (2) Turn the ignition switch to the "START" position.

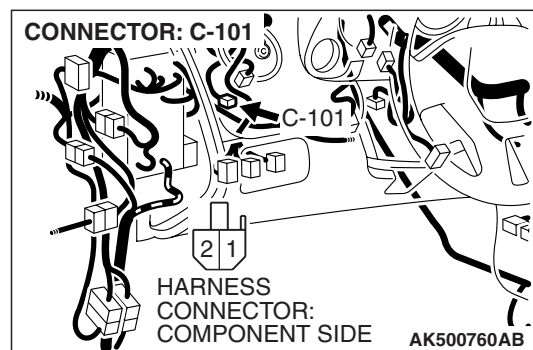


- (3) Measure the voltage between terminal No. 83 and ground.
 - Voltage should be battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 6.

NO : Repair harness wire between starter relay connector B-11X (terminal No. 2) and ECM connector B-20 (terminal No. 83) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check connector C-101 at interlock switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 7.

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

STEP 7. Check the interlock switch.

Refer to GROUP 21A, On-vehicle Service –Interlock switch check and adjustment [P.21A-11](#).

Q: Are there any abnormalities?

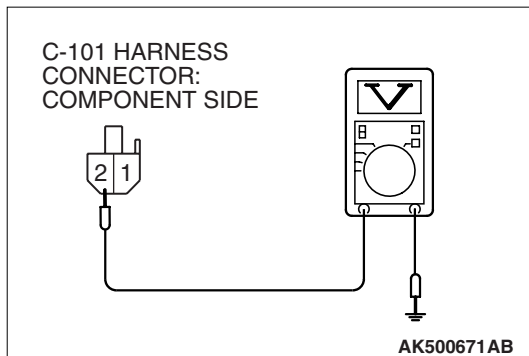
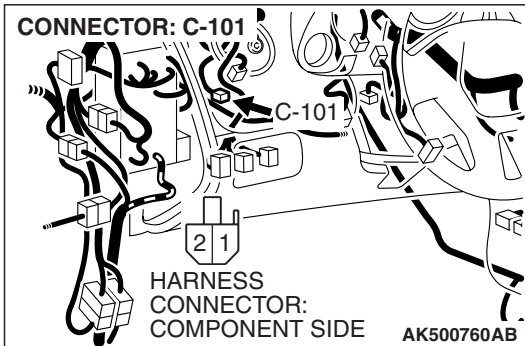
YES : Go to Step 8.

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

STEP 8. Measure the power supply voltage at interlock switch connector C-101.

(1) Disconnect the connector C-101 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 2 and ground.

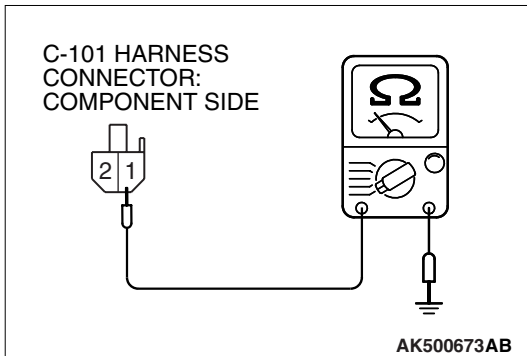
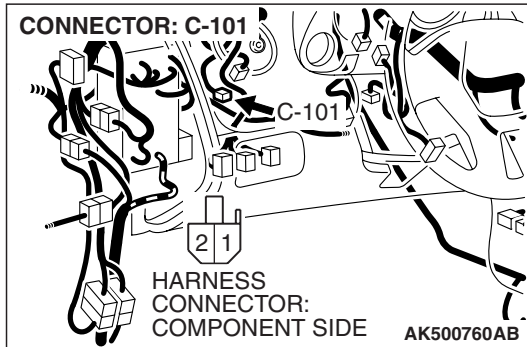
- Voltage should be battery positive voltage.

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

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

YES : Go to Step 9.

NO : Check connector A-15 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connectors is in good condition, repair harness wire between starter relay connector B-11X (terminal No. 1) and interlock switch connector C-101 (terminal No. 2) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check the continuity at interlock switch harness side connector C-101.

(1) Disconnect the connector C-101 and measure at the harness side.

(2) Check for the continuity between terminal No. 1 and ground.

- Should be less than 2 ohms.

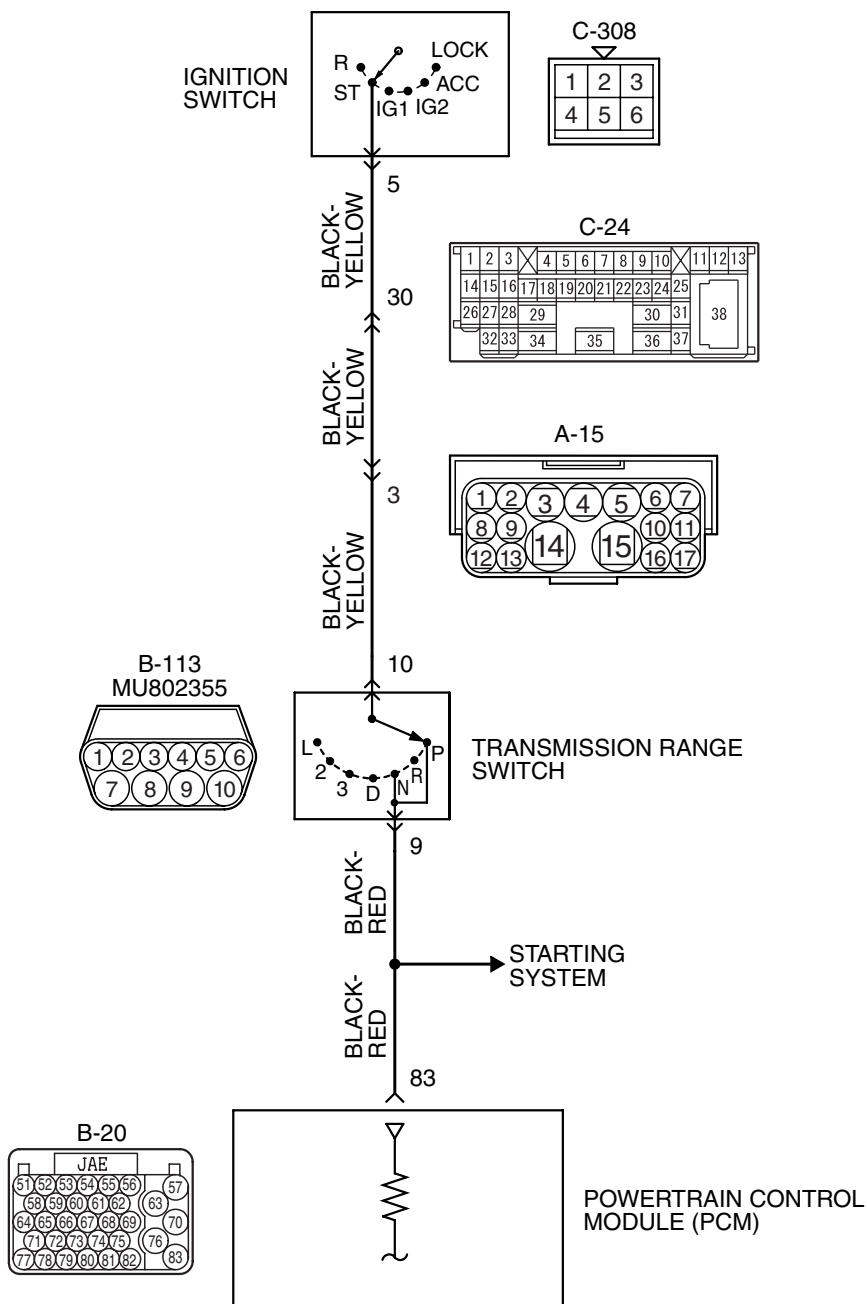
Q: Is the continuity normal?

YES : Replace the ECM. When the ECM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table [P.54A-13](#). Then confirm that the malfunction symptom is eliminated.

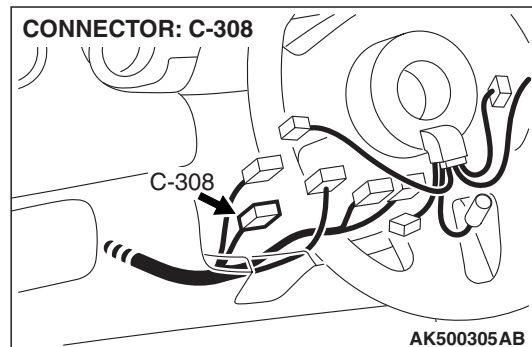
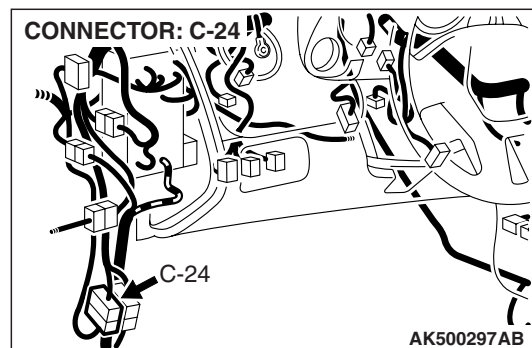
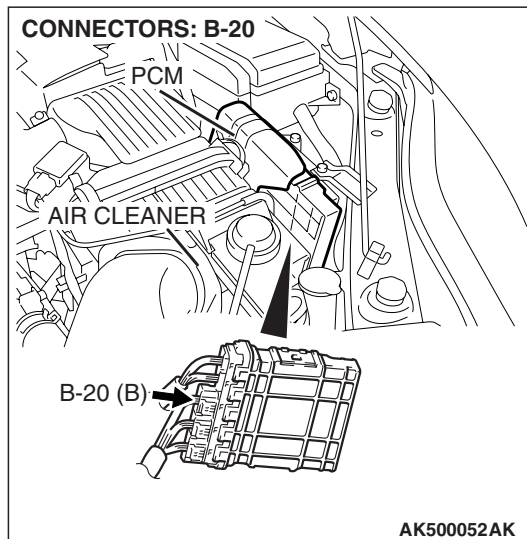
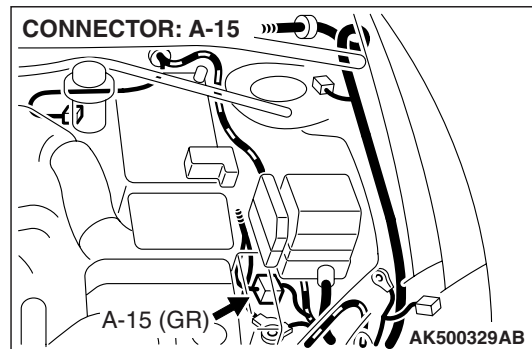
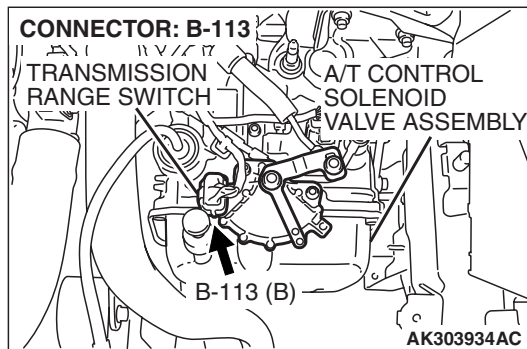
NO : Repair harness wire between interlock switch connector C-101 (terminal No. 1) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 31: Ignition Switch-ST System and Transmission Range Switch System
 <A/T>

Ignition Switch-ST and Transmission Range Switch Circuit



AK403713

**COMMENT**

- 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 PCM (terminal No. 83) through the ignition switch and transmission range switch. Because of this, the PCM detects that the engine is cranking.
- The transmission range switch detects the transmission range (P, N or other ranges) and converts it to a voltage signal (high or low). Then the transmission range switch sends that signal to the PCM.

If the selector lever is moved to "P" or "N" range with the ignition switch turned on (except "START" position), continuity will exist between the PCM and ground through the transmission range switch and starter motor. The terminal voltage of the PCM will become low. If the selector lever is moved to the other ranges, continuity will be lost between the PCM and ground. The terminal voltage of the PCM will become high.

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

- Malfunction of the ignition switch.
- Malfunction of the transmission range switch.
- Improper connector contact, open circuit or short-circuit in the harness wire.
- Malfunction of the PCM.

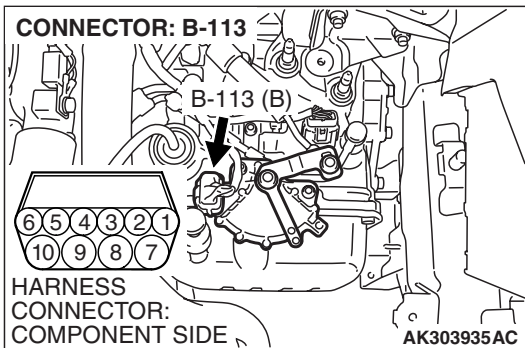
DIAGNOSIS

STEP 1. Check connector B-113 at transmission range switch 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 transmission range switch.

Refer to GROUP 23A, On-vehicle Service –Essential Service – Transmission Range Switch Continuity Check [P.23A-387](#).

Q: Are there any abnormalities?

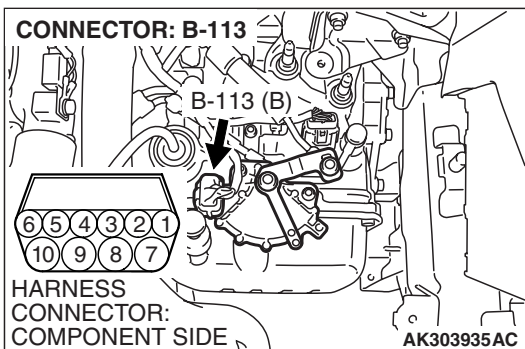
YES : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 3.

STEP 3. Measure the power supply voltage at transmission range switch connector B-113.

(1) Disconnect the connector B-113 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 10 and ground.

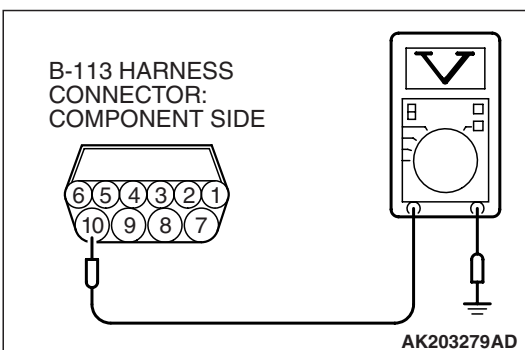
- Voltage should be battery positive voltage.

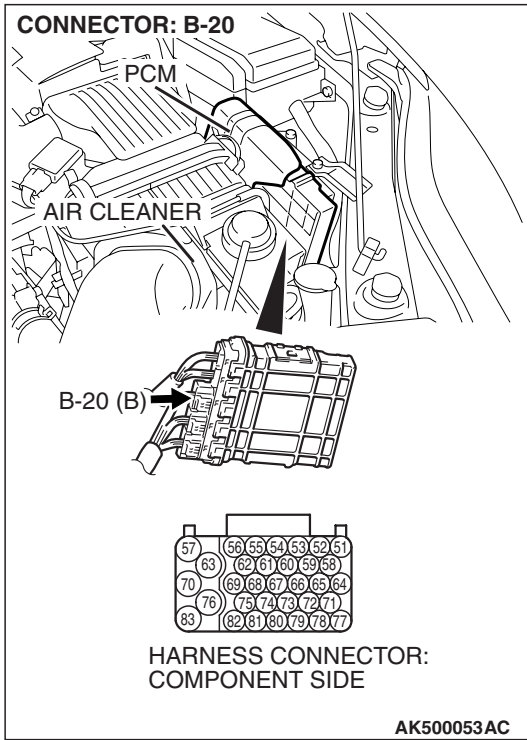
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 4.

NO : Check connector A-15 and C-24 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector are in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 5) and transmission range switch connector B-113 (terminal No. 10) because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 4. Check connector B-20 at PCM for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

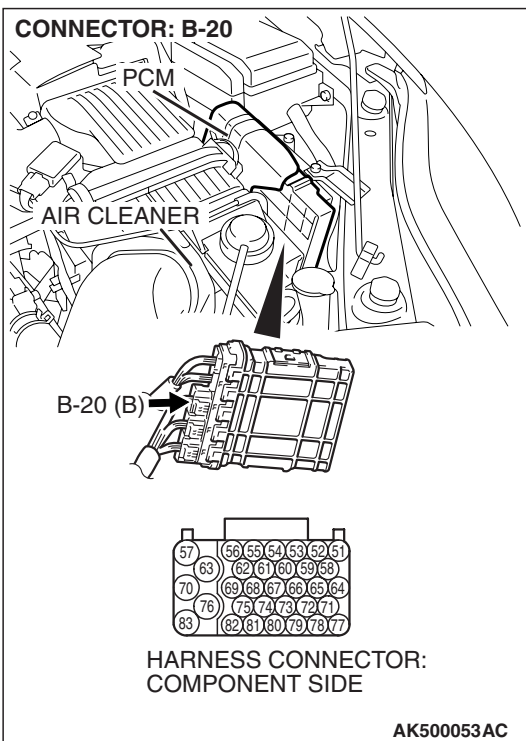
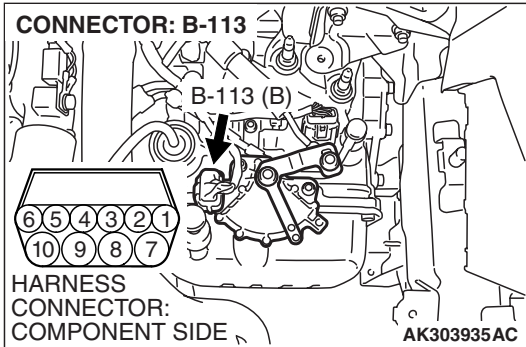
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then confirm that the malfunction symptom is eliminated.

STEP 5. Check for open circuit and short circuit to ground and harness damage between transmission range switch connector B-113 (terminal No. 9) and PCM connector B-20 (terminal No. 83).

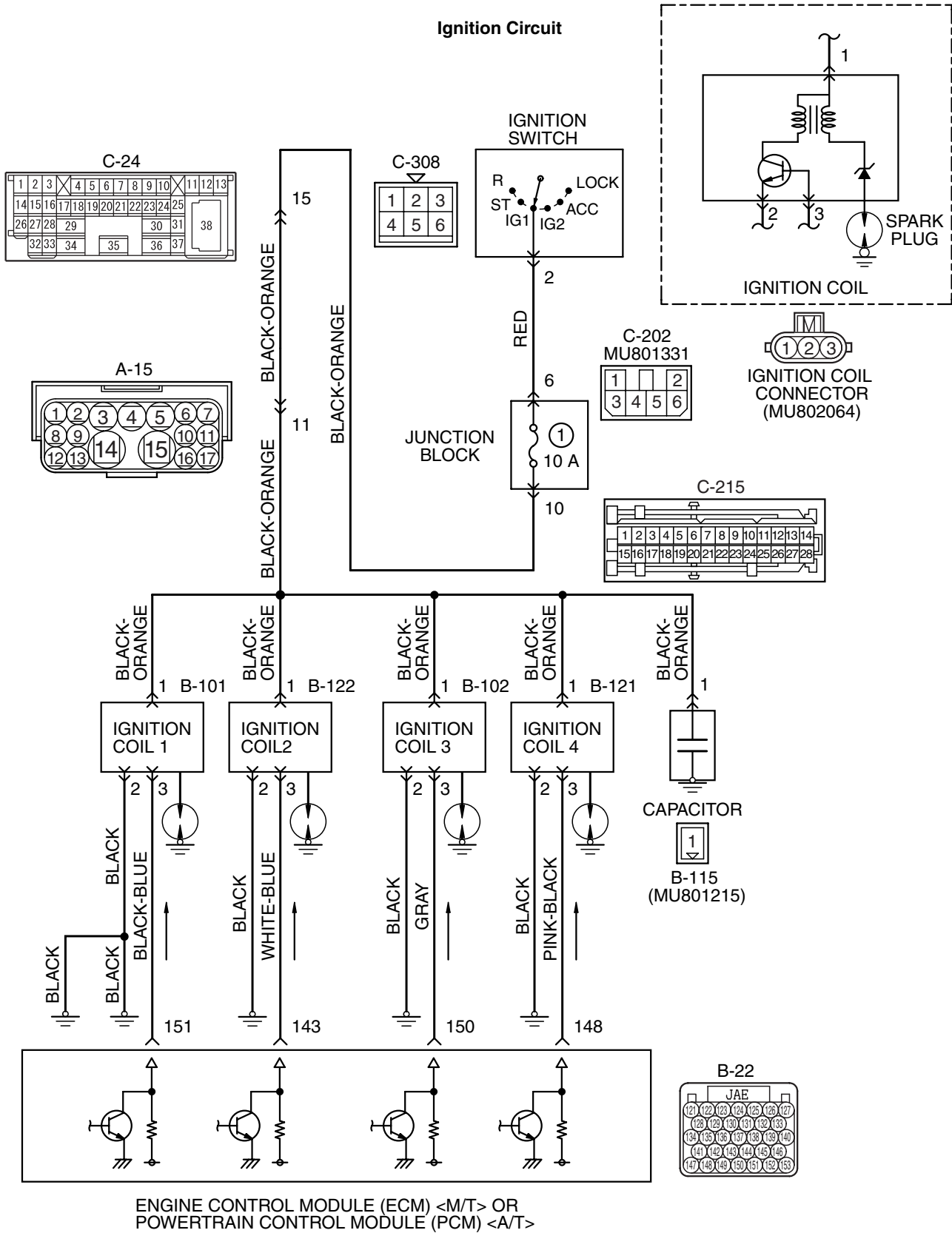
Q: Is the harness wire in good condition?

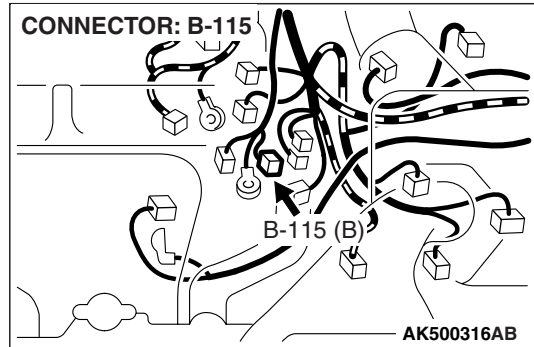
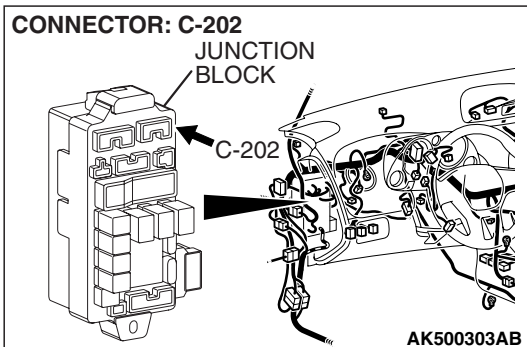
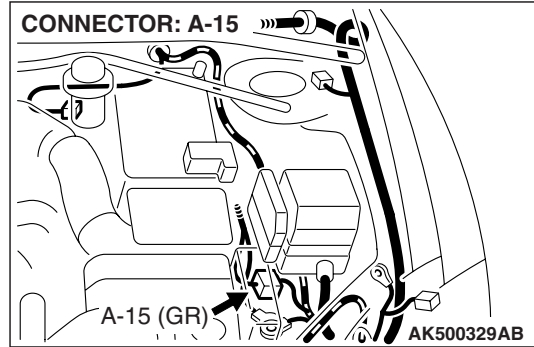
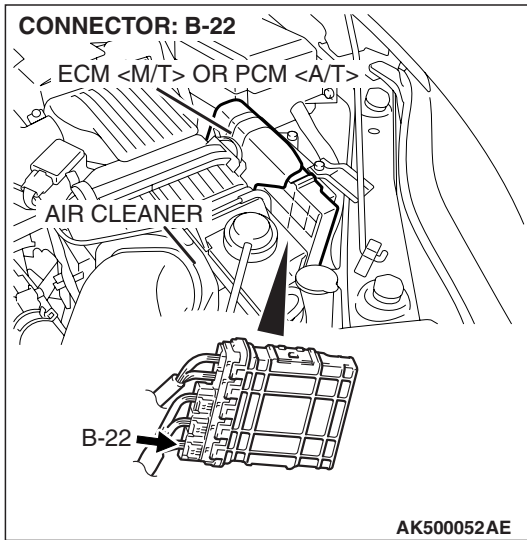
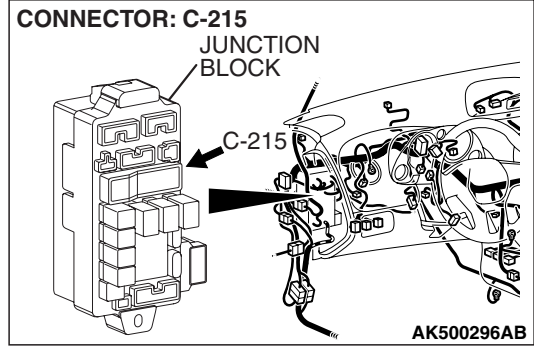
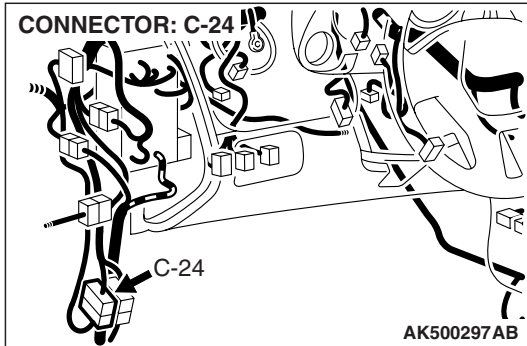
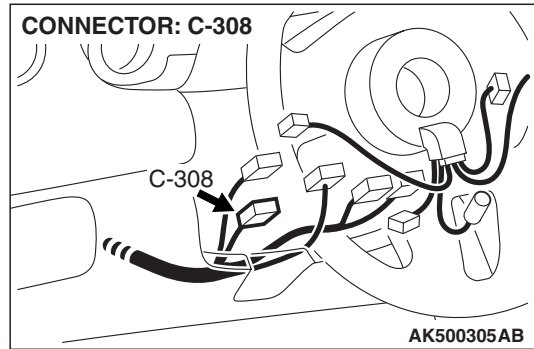
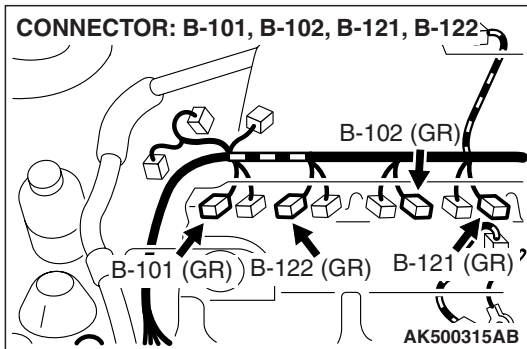
YES : Replace the PCM. When the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table [P.54A-13](#). Then confirm that the malfunction symptom is eliminated.

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



INSPECTION PROCEDURE 32: Ignition Circuit System





CIRCUIT OPERATION

- The ignition coil is energized by battery positive voltage from the ignition switch.
- When the ECM <M/T> or the PCM <A/T> turns off its internal power transistor, battery positive voltage is applied to the ignition power transistor (terminal No. 3) inside the ignition coil, causing the ignition power transistor to be turned on.
- If the ignition power transistor is turned on, the primary circuit of the ignition coil is energized by grounding the ignition coil through terminal No. 2, causing the primary current to flow to the ignition coil.

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

- Malfunction of the ignition coil.
- Malfunction of the ignition power transistor.
- Improper connector contact, open circuit or shorted harness wire.
- Malfunction of the ECM <M/T> or the PCM <A/T>.

DIAGNOSIS**STEP 1. Check the ignition coil.**

Refer to GROUP 16, Ignition System –On-vehicle service –Ignition Coil Check [P.16-40](#).

Q: Are there any abnormalities?

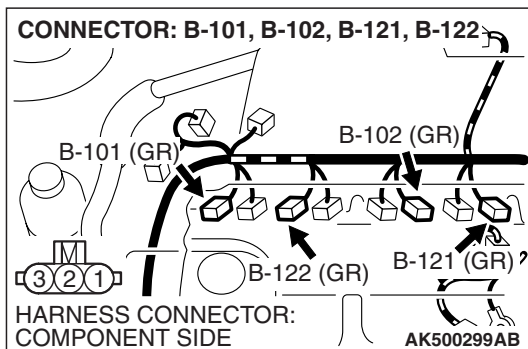
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

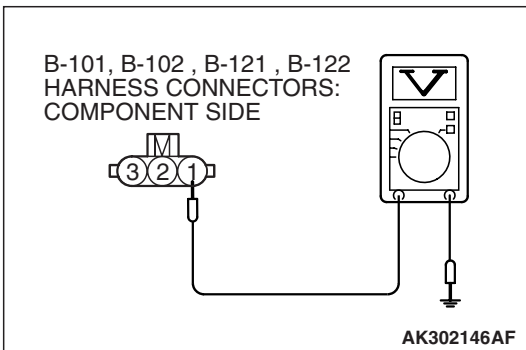
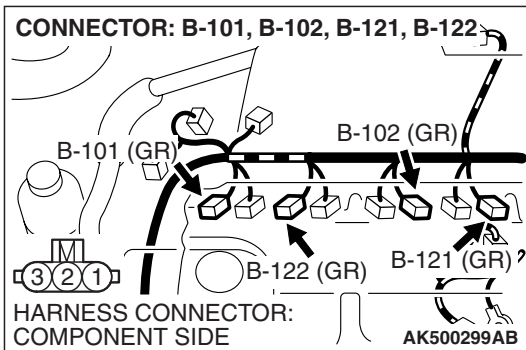
NO : Go to Step 2.

STEP 2. Check harness connector B-101, B-102, B-121 and B-122 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. Measure the power supply voltage at ignition coil connectors B-101, B-102, B-121 and B-122.

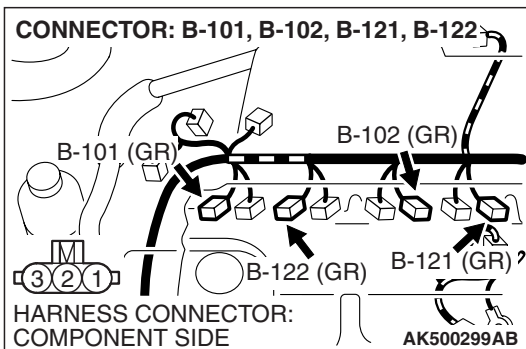
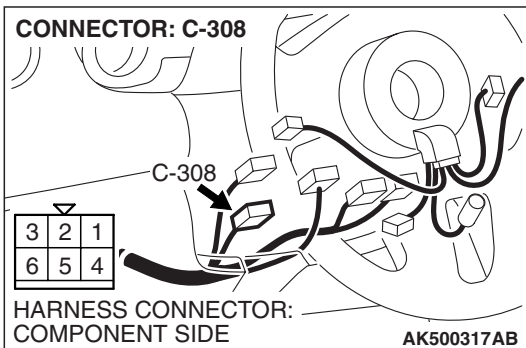
- (1) Disconnect the connector B-101, B-102, B-121 and B-122 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (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 5.
NO : Go to Step 4.

STEP 4. Check for open circuit between ignition switch connector C-308 (terminal No. 2) and ignition coil connectors B-101, B-102, B-121 and B-122 (terminal No. 1).



NOTE: Check harness after checking intermediate connectors A-15, C-24, C-215, and C-202. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

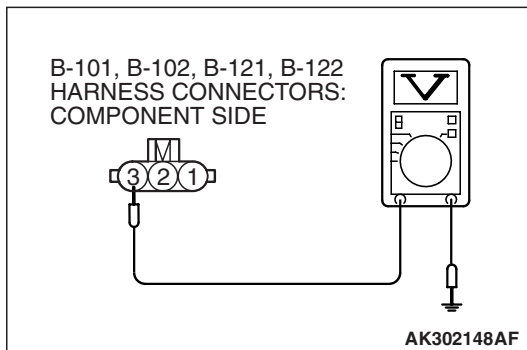
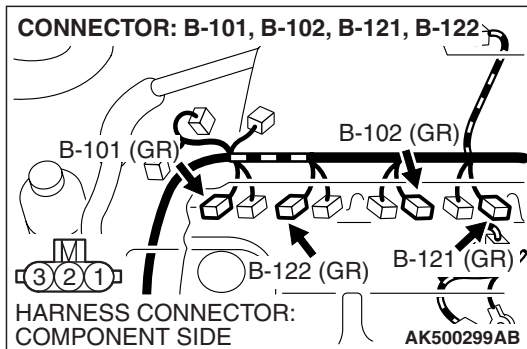
Q: Is the harness wire in good condition?

YES : Repair harness wire between ignition switch connector C-308 (terminal No. 2) and capacitor connector B-115 (terminal No. 1) because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

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

STEP 5. Check the circuit at ignition coil harness side connector B-101, B-102, B-121 and B-122.

- (1) Disconnect the connectors B-101, B-102, B-121 and B-122 and measure at the harness side.
- (2) Crank the engine.

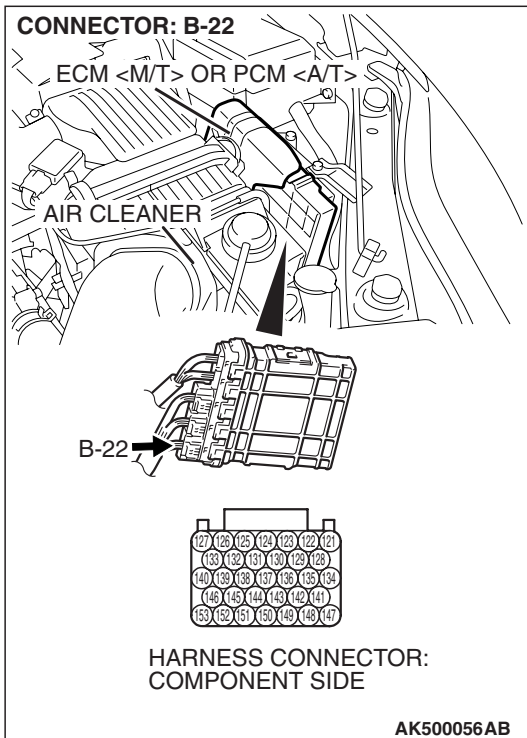


- (3) Measure the voltage between terminal No. 3 and ground.
 - Voltage should be 0.3 and 3.0 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.3 and 3.0 volts?

YES : Go to Step 8.

NO : Go to Step 6.

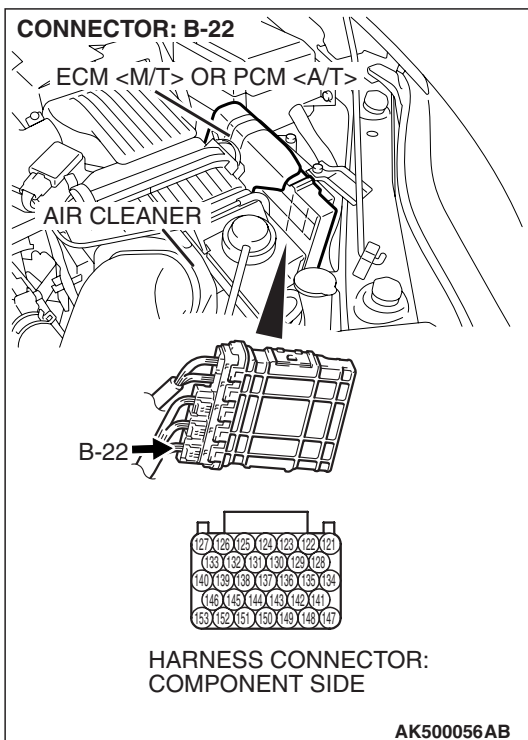
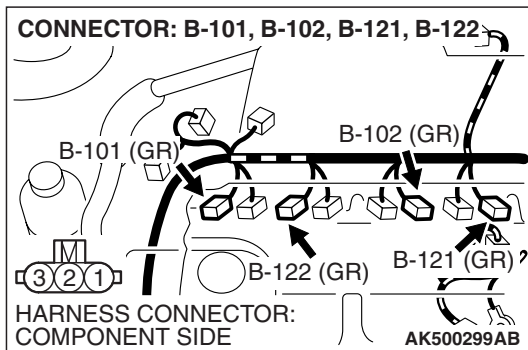


STEP 6. Check harness connector B-22 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

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

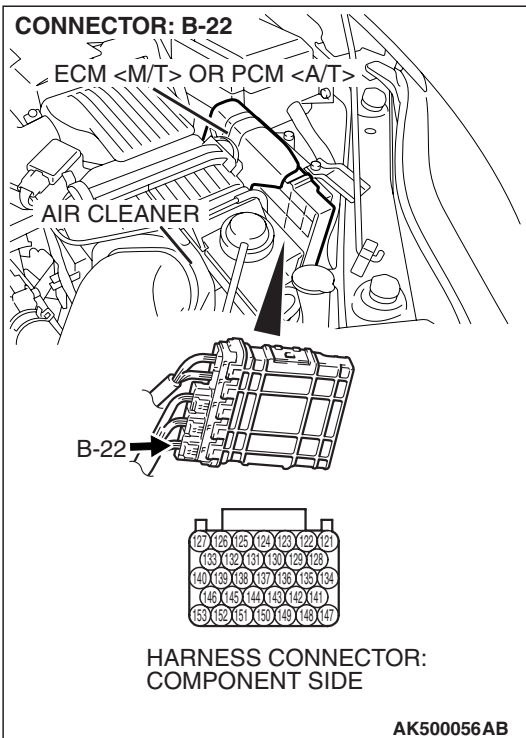
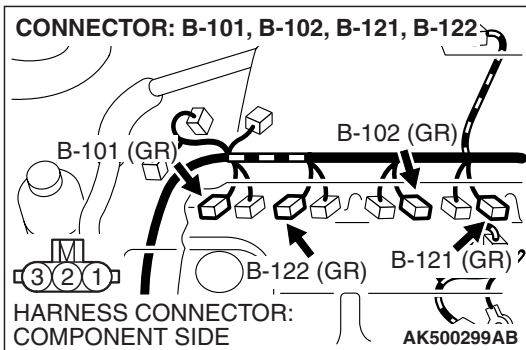


STEP 7. Check for open circuit and short circuit to ground between ignition coil connector and ECM <M/T> or PCM <A/T> connector.

- Check the harness wire between ignition coil connector B-101 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 151) at ignition coil 1.
- Check the harness wire between ignition coil connector B-122 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 143) at ignition coil 2.
- Check the harness wire between ignition coil connector B-102 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 150) at ignition coil 3.
- Check the harness wire between ignition coil connector B-121 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 148) at ignition coil 4.

Q: Is the harness wire in good condition?

- YES :** Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then confirm that the malfunction symptom is eliminated.
- NO :** Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for harness damage between ignition coil connector and ECM <M/T> or PCM <A/T> connector.

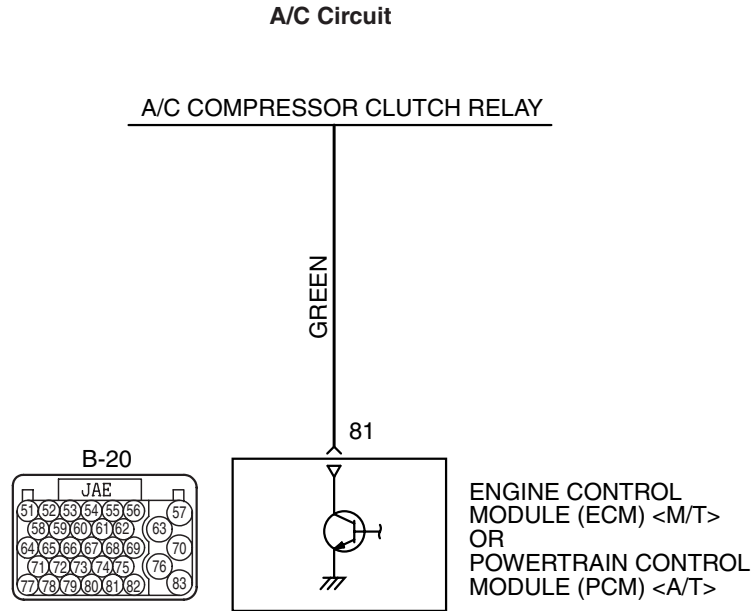
- Check the harness wire between ignition coil connector B-101 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 151) at ignition coil 1.
- Check the harness wire between ignition coil connector B-122 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 143) at ignition coil 2.
- Check the harness wire between ignition coil connector B-102 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 150) at ignition coil 3.
- Check the harness wire between ignition coil connector B-121 (terminal No. 3) and ECM <M/T> or PCM <A/T> connector B-22 (terminal No. 148) at ignition coil 4.

Q: Is the harness wire in good condition?

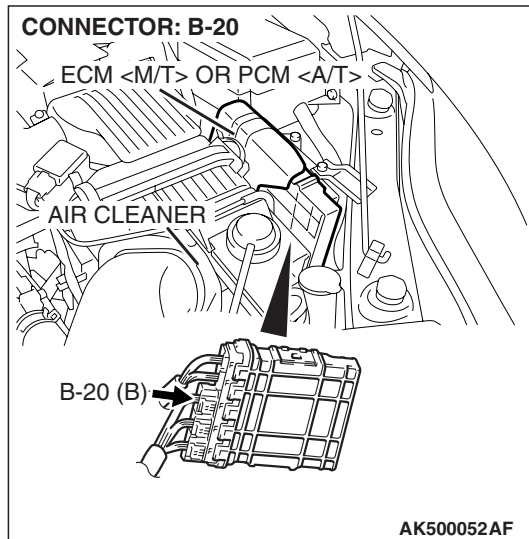
YES : Replace the ECM or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13. Then confirm that the malfunction symptom is eliminated.

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

INSPECTION PROCEDURE 33: A/C system.



AK403715



COMMENT

- When the A/C is "ON" the ECM <M/T> or the PCM <A/T> turns "ON" the power transistor in the ECM <M/T> or the PCM <A/T>. The ECM <M/T> or the PCM <A/T> 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 shorted harness wire.
- Malfunction of the ECM <M/T> or the PCM <A/T>.

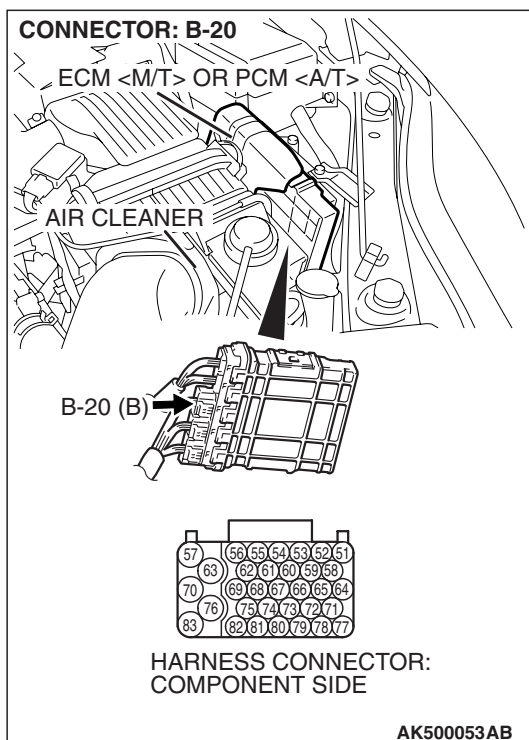
DIAGNOSIS

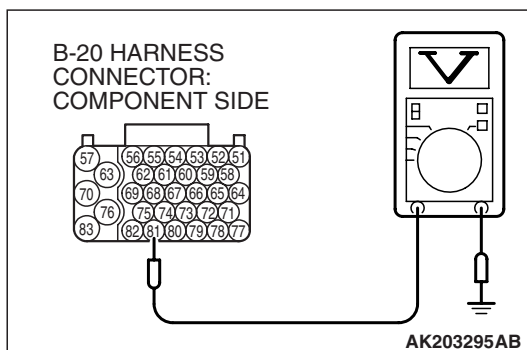
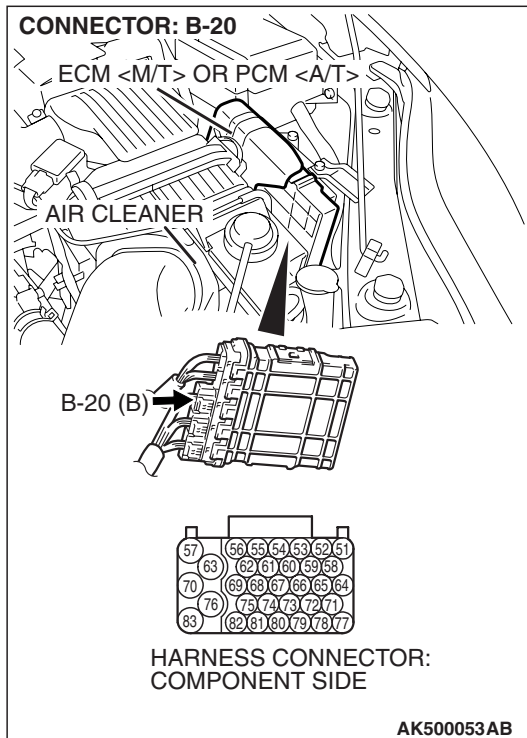
STEP 1. Check harness connector B-20 at ECM <M/T> or PCM <A/T> for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 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 circuit at ECM <M/T> or PCM <A/T> connector B-20.

- (1) Disconnect the connectors B-20 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 81 and ground.
 - Voltage should be battery positive voltage.
- (4) Using a jumper wire, connect terminal No. 81 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 or the PCM. When the ECM or the PCM is replaced, register the encrypted code. Refer to GROUP 54A, Encrypted Code Registration Criteria Table [P.54A-13](#). Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55A, Manual A/C Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis [P.55A-6](#) <Manual A/C>, 55B, Automatic A/C Diagnosis –Introduction To Heater, Air Conditioning And Ventilation Diagnosis [P.55B-5](#) <Automatic A/C>. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

⚠ 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.

NOTE: *⁵Not applied to 2.4L engines.

MUT-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 relay	<ul style="list-style-type: none"> • Engine: warming up, idling • A/C switch: "OFF" 	OFF	Procedure No. 33	P.13A-1144	
			<ul style="list-style-type: none"> • Engine: warming up, idling • A/C switch: "ON" 	A/C compressor clutch is not operating			OFF
				A/C compressor clutch is operating			ON
A/C SW1	76	A/C switch	<ul style="list-style-type: none"> • Engine: warming up, idling • A/C switch: "OFF" 	OFF	Procedure No. 33	P.13A-1144	
			<ul style="list-style-type: none"> • 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 idling	10 – 20%	–	–
				2,500 r/min	10 – 20%		
				Revving engine	Load value increases according to amount of revving.		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Airflow sensor	10	Mass airflow sensor*1	<ul style="list-style-type: none"> Engine coolant temperature : 80 – 95° C (176 – 203° F) Lights, electric cooling fan and all accessories : "OFF"*4 Transaxle: neutral (A/T: "P" range) 	Engine is idling	1,300 – 1,620 mV	–	–
		2,500 r/min		1,600 – 1,970 mV			
		Engine is revved		Increase in response to revving			
APP sensor (main)	11	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	800 – 1,200 mV	Code No. P2122, P2123	P.13A-921 , P.13A-931
				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 (sub)	12	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	400 – 1,000 mV	Code No. P2127, P2128	P.13A-981 , P.13A-983
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	3,600 mV or more		
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: idling	10% – 20%	–	–
				2,500 r/min	10% – 20%		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Closed throttle position switch	84	Closed throttle position switch	Ignition switch: "ON"	Depress the accelerator pedal fully	ON	-	-
				Release the accelerator pedal	OFF		
Cranking signal	79	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 30, No. 31	P.13A-1123 <M/T>, P.13A-1131 <A/T>
				Engine: cranking	ON		
Crankshaft position sensor	2	Crankshaft position sensor	<ul style="list-style-type: none"> Engine: cranking Tachometer: connected 		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P.13A-559
			Engine: idling	Engine coolant temperature is - 20° C (- 40° F)	1,275 – 1,475 r/min		
				Engine coolant temperature is 0° C (32° F)	1,250 – 1,450 r/min		
				Engine coolant temperature is 20° C (68° F)	1,250 – 1,450 r/min		
				Engine coolant temperature is 40° C (104° F)	1,140 – 1,340 r/min		
				Engine coolant temperature is 80° C (176° F)	600 – 800 r/min		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE		
ECT sensor	6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is – 20° C (– 40° F)	– 20° C (– 4° F)	Code No. P0116, P0117, P0118	P.13A-219 , P.13A-228 , P.13A-235	
				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)
EGR step motor	31	EGR valva (stepper motor)	<ul style="list-style-type: none"> Engine coolant temperature : 80 – 95° C (176 – 203° F) Lights, electric cooling fan and all accessories : "OFF"*4 Transaxle: neutral (A/T: "P" range) 	Engine is idling 2,500 r/min	2 – 8 Step 2 – 8 Step	Code No. P0403	P.13A-599	
Engine control realy	95	Engine control realy	Ignition switch: "ON"	ON	–	–		
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*5	–	–	–	–		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Fuel level gage	51	Fuel level gage	Ignition switch: "ON" <ul style="list-style-type: none"> The residual fuel amount in the tank is shown. "0%" means "Empty" and "100%" means "Full". 	0 – 100% (Display range)	–	–
			Engine:cranking	ON	–	–
Fuel pump relay	97	Fuel pump relay	Ignition switch: "ON"	OFF	–	–
			Engine:cranking	ON	–	–
Fuel system status (bank 1)	105	Cylinder 1, 4 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	Cylinder 2, 3 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	<ul style="list-style-type: none"> Ignition switch: "ON" Fuel cap removal 	1,200 – 3,800 mV	–	–
Fuel tank temperature sensor	53	Fuel tank temperature sensor	<ul style="list-style-type: none"> In cooled state Ignition switch: "ON" 	Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-439 , P.13A-451 , P.13A-457
Ignition switch	85	Ignition switch (IG1)	Ignition switch: "ON"	ON	–	–

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Injectors	17	Injectors*2	Engine: cranking	When engine coolant temperature is 0° C (32° F)	74 – 94 ms	-	-
				When engine coolant temperature is 20° C (68° F)	26.9 – 46.9 ms		
				When engine coolant temperature is 80° C (176° F)	7 – 13 ms		
		Injectors*3	<ul style="list-style-type: none"> • Engine coolant temperature : 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : "OFF" • Transaxle: neutral (A/T "P" range) 	Engine is idling	1.3 – 3.3 ms		
				2,500 r/min	1.0 – 3.0 ms		
				When engine is suddenly revved	Increases		
Intake air temperature sensor	5	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20° C (- 40° F)	-20° C (- 40° F)	Code No. P0111, P0112, P0113	P.13A-193, P.13A-202, P.13A-209
				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)		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ISC learned value (A/C OFF)	19	Idle speed control learned value (at A/C OFF)	Ignition switch: "ON" <ul style="list-style-type: none"> The learning value is shown, which compensates the idle speed control throttle opening degree (the throttle valve opening degree). " -128 Step" means "the fully closed side" and "128 Step" means "the fully open side". 	-128 -128 Step (Display range)	-	-
ISC learned value (A/C ON)	20	Idle speed control learned value (at A/C ON)	Ignition switch: "ON" <ul style="list-style-type: none"> When A/C is in "ON" position, the learning value is shown, which compensates the idle speed control throttle opening degree (the throttle valve opening degree). " -128 Step" means "the fully closed side" and "128 Step" means "the fully open side". 	-128 -128 Step (Display range)	-	-
Knock retard	32	Knock retard	Engine: warming up, sudden racing	According to acceleration, knock retard is increased.	-	-
Learned knock retard	33	Knock control learned value	Ignition switch: "ON" <ul style="list-style-type: none"> 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	Cylinder 1, 4 long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)	-12.5 to 12.5%	Code No. P0171, P0172	P.13A-412 , P.13A-420
Long term fuel trim (bank 2)	27	Cylinder 2, 3 long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)	-12.5 to 12.5%	Code No. P0174, P0175	P.13A-425 , P.13A-433

MUT-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.13A-158, P.13A-172, P.13A-184
				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		
Normally closed brake switch	89	Normally closed brake switch	Ignition switch: "ON"	Depress the brake pedal	OFF	–	–
				Release the brake pedal	ON		
Oil control valve (bank 1)	98	Engine oil control valve	Engine: warming up	Engine is idling	OFF	–	–
				4,500 r/min	ON		
Oil control valve (bank 2)	99	Engine oil control valve (bank 2) *5	–		–	–	–
Power steering switch	83	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No.P0551	P.13A-816
				Steering wheel turning	ON		
Power supply voltage	1	Power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 28	P.13A-1099
Radiator fan control relay (high)	100	Radiator fan relay, condenser fan relay	Ignition switch: "ON"		OFF	–	–
			Carry out the actuator test to revolve the fan at high speed.		ON		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Radiator fan control relay (low)	101	Fan control relay	Ignition switch: "ON"		OFF	-	-
			Carry out the actuator test to revolve the fan at low speed.		ON		
Short term fuel trim (bank 1)	28	Cylinder 1, 4 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		-25 to 25%	Code No. P0171, P0172	P.13A-412 , P.13A-420
Short term fuel trim (bank 2)	29	Cylinder 2, 3 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		-25 to 25%	Code No. P0174, P0175	P.13A-425 , P.13A-433
Spark advance	16	Ignition timing advance	<ul style="list-style-type: none"> Engine: warming up Timing light is set (to check actual ignition timing) 	Engine is idling	2 – 18 CA	-	-
				2,500 r/min	28 – 48 CA		
Starter relay	102	Starter relay <M/T>	Ignition switch: "ON"	Engine: stopped	OFF	-	-
				Engine: cranking	ON		
Target ETV value	59	Throttle actuator control motor target value	Engine: warming up <ul style="list-style-type: none"> 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)	-	-
Target idle speed	3	Target idle speed	Engine: idling	Engine coolant temperature is -20° C (-4° F)	1,275 – 1,475 r/min	-	-
				Engine coolant temperature is 0° C (32° F)	1,250 – 1,450 r/min		
				Engine coolant temperature is 20° C (68° F)	1,200 – 1,400 r/min		
				Engine coolant temperature is 40° C (104° F)	1,140 – 1,340 r/min		
				Engine coolant temperature is 80° C (176° F)	600 – 800 r/min		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE		
Throttle actuator	58	Throttle actuator control motor	Engine: warming up <ul style="list-style-type: none"> 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)	–	–		
TP sensor (main)	13	Throttle position sensor (main)	<ul style="list-style-type: none"> 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	300 – 700 mV	Code No. P0122, P0123	P.13A-246, P.13A-257	
				Fully open the throttle valve with your finger	4,000 mV or more			
				Engine: warming up, idling	No load			500 – 630 mV
					A/C switch: "OFF" → "ON"			Voltage varies
	Shift lever: "N" → "D"							
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.		–	–		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
TP sensor (sub)	15	Throttle position sensor (sub)	<ul style="list-style-type: none"> • 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" 	<p>Fully close the throttle valve with your finger</p> <p>Fully open the throttle valve with your finger</p>	<p>2,200 – 2,800 mV</p> <p>4,000 mV or more</p>	Code No. P0222, P0223	P.13A-512 , P.13A-523
Variable intake solenoid	103	Variable intake air solenoid*5	–	–	–	–	
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

M113115600016

The purpose of this service of to allow access to current emission-related data values, including analogue inputs and outputs, digital inputs and outputs, and system status information.

The request for information includes a parameter identification (PID) value that indicates to the on-board system the specific information requested.

The ECM <M/T> or the PCM <A/T> 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:	-	
	Number of DTCs stored in this ECU	DTC_CNT: xxxd		
	Malfunction Indicator Lamp (MIL) status	MIL: OFF or ON		
	Supported tests which are continuous	Support status of continuous monitors:		
	Misfire monitoring	MIS_SUP: YES		
	Fuel system monitoring	FUEL_SUP: YES		
	Comprehensive component monitoring	CCM_SUP: YES		
	Status of continuous monitoring tests since DTC cleared	Completion status of continuous monitors since DTC cleared:		
	Misfire monitoring	MIS_RDY: YES or NO		
	Fuel system monitoring	FUEL_RDY: YES or NO		
Comprehensive component monitoring	CCM_RDY: YES or NO			

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	Supported tests run at least once per trip	Support status of non-continuous monitors:	-	
	Catalyst monitoring	CAT_SUP: YES		
	Heated catalyst monitoring	HCAT_SUP: NO		
	Evaporative system monitoring	EVAP_SUP: YES		
	Secondary air system monitoring	AIR_SUP: NO		
	A/C system refrigerant monitoring	ACRF_SUP: NO		
	Oxygen sensor monitoring	O2S_SUP: YES		
	Oxygen sensor heater monitoring	HTR_SUP: YES		
	EGR system monitoring	EGR_SUP: YES		
	Status of tests run at least once per trip	Completion status of non-continuous monitors since DTC cleared:		
	Catalyst monitoring	CAT_RDY: YES or NO		
	Heated catalyst monitoring	HCAT_RDY: YES		
	Evaporative system monitoring	EVAP_RDY: YES or NO		
	Secondary air system monitoring	AIR_RDY: YES		
	A/C system refrigerant monitoring	ACRF_RDY: YES		
	Oxygen sensor monitoring	O2S_RDY: YES or NO		
Oxygen sensor heater monitoring	HTR_RDY: YES or NO			
EGR system monitoring	EGR_RDY: YES or NO			
03	Fuel system 1 status	FUELSYS1: OL/CL/OL-Drive/OL-Fault/CL-Fault	See MUT-III item No. 105.	
	Fuel system 2 status	FUELSYS2: OL/CL/OL-Drive/OL-Fault/CL-Fault	See MUT-III item No. 106.	
04	Calculated LOAD Value	LOAD_PCT: xxx.x%	See MUT-III item No. 73.	
05	Engine Coolant Temperature	ECT: xxx° C (xxx° F)	See MUT-III item No. 6.	
06	Short Term Fuel Trim–Bank 1	SHRTFT1: xxx.x%	See MUT-III item No. 28.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION						
07	Long Term Fuel Trim–Bank 1	LONGFT1: xxx.x%	See MUT-III item No. 26.							
08	Short Term Fuel Trim–Bank 2	SHRTFT2: xxx.x%	See MUT-III item No. 29.							
09	Long Term Fuel Trim–Bank 2	LONGFT2: xxx.x%	See MUT-III item No. 27.							
0B	Intake Manifold Absolute Pressure	MAP: xxx kPa (xx.x inHg)	See MUT-III item No. 8.							
0C	Engine RPM	RPM: xxxxx min ⁻¹	See MUT-III item No. 2.							
0D	Vehicle Speed Sensor	VSS: xxx km/h (xxx mph)	See MUT-III item No. 4.							
0E	Ignition Timing Advance for #1 Cylinder	SPARKADV: xx°	See MUT-III item No. 16.							
0F	Intake Air Temperature	IAT: xxx° C (xxx° F)	See MUT-III item No. 5.							
10	Air Flow Rate from Mass Air Flow Sensor	MAF: xxx.xx g/s (xxxx.x lb/min)	<ul style="list-style-type: none"> • Engine coolant temperature : 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : "OFF"*5 • Transaxle: "P" range 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Engine is idling</td> <td style="width: 20%;">1.3 – 5.3 g/s (0.2 – 0.7 lb/min)</td> </tr> <tr> <td>2,500 r/min</td> <td>5.0 – 13.0 g/s (0.7 – 1.7 lb/min)</td> </tr> <tr> <td>Engine is revved</td> <td>Increase in response to revving</td> </tr> </table>	Engine is idling	1.3 – 5.3 g/s (0.2 – 0.7 lb/min)	2,500 r/min	5.0 – 13.0 g/s (0.7 – 1.7 lb/min)	Engine is revved	Increase in response to revving
Engine is idling	1.3 – 5.3 g/s (0.2 – 0.7 lb/min)									
2,500 r/min	5.0 – 13.0 g/s (0.7 – 1.7 lb/min)									
Engine is revved	Increase in response to revving									

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION		NORMAL CONDITION
11	Absolute Throttle Position	TP: xxx.x%	<ul style="list-style-type: none"> 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
13	Location of Oxygen Sensor	O2SLOC: OxSxx	• Ignition switch: "ON"		O2S11/ O2S12/ O2S21/ O2S22
14	Bank 1 – Sensor 1	O2S11: x.xxx V	Engine: Warming up, 2,500 r/min	Voltage changes repeatedly between 0.5 V and 1.4 V.	
		SHRTFT11: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
15	Bank 1 –Sensor 2	O2S12: x.xxx V	<ul style="list-style-type: none"> • Transaxle: 2nd speed (A/T: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more 	1.0 – 1.5 V
		SHRTFT12: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
18	Bank 2 –Sensor 1	O2S21: x.xxx V	Engine: Warming up, 2,500 r/min	Voltage changes repeatedly between 0.5 V and 1.4 V.
		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	<ul style="list-style-type: none"> • Transaxle: 2nd speed (A/T: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more 	1.0 – 1.5 V
		SHRTFT22: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
1C	OBD requirements to which vehicle is designed	OBDSUP: OBD II	Ignition switch: "ON"	OBD II
1F	Time Since Engine Start	RUNTM: xxxxx sec.	–	
21	Distance Travelled While MIL is Active	MIL DIST: xxxxx km (xxxxx miles)	–	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
2C	Commanded EGR	EGR_PCT: xxx.x%	Engine: warming up <ul style="list-style-type: none"> • The 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)
2E	Commanded Evaporative Purge	EVAP_PCT: xxx.x%	See MUT-III item No. 49.	
2F	Fuel Level Input	FLI: xxx.x%	See MUT-III item No. 51.	
30	Number of warm-ups since diagnostic trouble codes cleared	WARM_UPS: xxx	–	
31	Distance since diagnostic trouble codes cleared	CLR_DIST: xxxxx km (xxxxx miles)	–	
32	Evap System Vapor Pressure	EVAP_VP: xxxx.xx Pa (xx.xxx in H2O)	<ul style="list-style-type: none"> • Ignition switch: "ON" • Fuel cap removal 	–3.3 to 3.3 kPa (–13.3 to 13.3 in.H2O)

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION		NORMAL CONDITION
33	Barometric Pressure	BARO: xxx kPa (xx.x inHg)	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)
				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)

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
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	MIS_ENA: NO or YES		
	Fuel system monitoring	FUEL_ENA: NO or YES		
	Comprehensive component monitoring	CCM_ENA: YES		
	Completion status of continuous monitors this monitoring cycle:	Completion status of continuous monitors this monitoring cycle:		
	Misfire monitoring	MIS_CMPL: YES or NO		
	Fuel system monitoring	FUEL_CMPL: YES or NO		
	Comprehensive component monitoring	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 or NO		
	Heated catalyst monitoring	HCAT_ENA: NO		
	Evaporative system status	EVAP_ENA: YES or NO		
	Secondary air system monitoring	AIR_ENA: YES or NO		
	A/C system refrigerant monitoring	ACRF_ENA: YES or NO		
	Oxygen sensor monitoring	O2S_ENA: YES or NO		
	Oxygen sensor heater monitoring	HTR_ENA: YES or NO		
	EGR system monitoring	EGR_ENA: YES or NO		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Completion status of non-continuous monitors this monitoring cycle:	Completion status of non-continuous monitors this monitoring cycle:	-	
	Catalyst monitoring	CAT_CMPL: YES or NO		
	Evaporative system status	EVAP_CMPL: YES or NO		
	Oxygen sensor monitoring	O2S_CMPL: YES or NO		
	Oxygen sensor heater monitoring	HTR_CMPL: YES or NO		
	EGR system monitoring	EGR_CMPL: YES or NO		
42	Control module voltage	VPWR: xx.xxx V	See MUT-III item No.1.	
43	Absolute Load Value	LOAD_ABS: xxx.x%	See MUT-III item No.72.	
44	Commanded Equivalence Ratio	EQ_RAT: x.xxx	Engine: running <ul style="list-style-type: none"> • "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)

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION		NORMAL CONDITION
45	Relative Throttle Position	TP_R: xxx.x%	<ul style="list-style-type: none"> 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
46	Ambient air temperature	AAT: xxx°C (xxx°F)	–		
47	Absolute Throttle Position B	TP_B: xxx.x%	<ul style="list-style-type: none"> 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

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION	
49	Accelerator Pedal Position D	APP_D: xxx.x%	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	88% or more
4A	Accelerator Pedal Position E	APP_E: xxx.x%	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	88% or more
4C	Commanded Throttle Actuator Control	TAC_PCT: xxx.x%	See MUT-III item No.58.		

ACTUATOR TEST REFERENCE TABLE

M1131152501197

NOTE: *1: Continues for 27 minutes. Can be released by pressing the CLEAR key.

NOTE: *2: Not applied to 2.4L engines.

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	PEFERECE 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. 33	P.13A-1144
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.13A-634
EVAP. emission ventilation SOL. Valve	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.13A-646
FUEL PUMP	9	Fuel pump	Fuel pump operate and fuel is recirculated	Ignition switch: "ON"	Listen near the fuel tank for the sound of fuel pump operati on	Sound of operation is heard	Procedure No. 29	P.13A-1110
Ignition timing 5 BTDC	11	Basic ignition timing	Set to ignition timing adjustment mode	<ul style="list-style-type: none"> • Engine: idling • Connect timing light 		5° BTDC	—	—

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	PEFERECE PAGE	
No. 1 injector	1	Injectors	Cut fuel to No. 1 injector	Engine: warm up, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling becomes unstable	Code No. P0201	P.13A-468	
No. 2 injector	2		Cut fuel to No. 2 injector			Code No. P0202	P.13A-479	
No. 3 injector	3		Cut fuel to No. 3 injector			Code No. P0203	P.13A-490	
No. 4 injector	4		Cut fuel to No. 4 injector			Code No. P0204	P.13A-501	
No. 5 injector	5*2		–					
No. 6 injector	6*2		–					
PWM Radiator fan	14*2	Radiator fan, A/C condenser fan	–					
Radiator fan (high)	12	Radiator fan, A/C condenser fan	Drive the fan motor	Ignition switch: "ON"	Radiator fan and A/C condenser fan rotate at high speed.	Procedure No. 27	P.13A-1095	
Radiator fan (low)	13							Radiator fan and A/C condenser fan rotate.
Variable intake solenoid	21*2	Variable intake air solenoid	–					
VVT oil control valve	17	Engine oil control valve	Engine oil control valve turns from OFF to ON	Engine: warming up, 2,000 r/min	The engine speed is changed.	Code No. P1021	P.13A-881	

CHECK AT THE ENGINE CONTROL MODULE (ECU) <M/T> OR THE POWERTRAIN CONTROL MODULE (PCM) <A/T>

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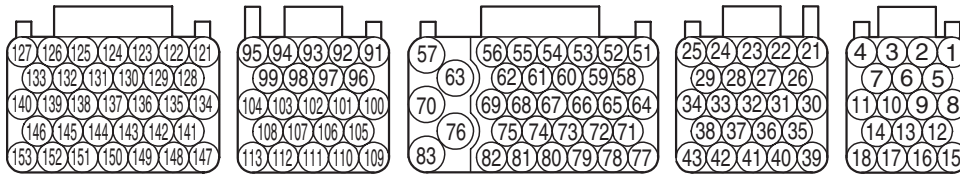
1. Disconnect the ECM <M/T> or the PCM <A/T> connectors B-18, B-19, B-20, B-21 and B-22, and connect check harness special tool MB991923 between the ECM <M/T> connectors or the PCM <A/T> connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground 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 is too stable to be 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 this is no problem for checks.*

Check Harness Special Tool MB991923 Connector Terminal Arrangement



AK203309AB

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
2	2	Evaporative emission ventilation solenoid	Ignition switch: "ON"	B+
			Carry out the actuator test to drive the solenoid valve.	For approximately 6 seconds 1 V or less
5	5	Fan control relay (high)	Ignition switch: "ON"	B+
			Carry out the actuator test to revolve the fan at high speed.	1 V or less
6	6	Fuel pump relay	Ignition switch: "ON"	B+
			Engine: idling	1 V or less
10	10	Fan control relay (low)	Ignition switch: "ON"	B+
			Carry out the actuator test to revolve the fan at low speed.	1 V or less
14	–	Vehicle speed sensor	<ul style="list-style-type: none"> • Ignition switch: "ON" • Move the vehicle slowly forward 	0 ↔ 8 – 12 V*1 (changes repeatedly)
21	21	Sensor supplied voltage	Ignition switch: "ON"	4.9 – 5.1 V
68	68			
23	23	Fuel tank differential pressure sensor	<ul style="list-style-type: none"> • Ignition switch: "ON" • Fuel cap removal 	1.2 – 3.8 V

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
26	26	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.8 – 1.2 V
				Depress the accelerator pedal fully	4.0 V or more
27	27	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.4 – 1.0 V
				Depress the accelerator pedal fully	3.6 V or more
30	30	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: "ON"		4.9 – 5.1 V
41	41	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
42	42	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
43	43	Ignition switch-IG	Ignition switch: "ON"		B+
51	51	Power supply	Ignition switch: "ON"		B+
64	64				
52	52	MFI relay (power supply)	Ignition switch: "LOCK" (OFF)		B+
			Ignition switch: "ON"		1 V or less
78	78	Power steering pressure switch	Engine: warming up, idling	When steering wheel is not turned	B+
				When steering wheel is turned	1 V or less
79	79	Cylinder 2, 3 heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
80	80	Cylinder 1, 4 heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
81	81	A/C compressor clutch relay	<ul style="list-style-type: none"> • Engine: idling • A/C switch: OFF → ON (A/C compressor is operating) 		B+ → 1 V or less as A/C clutch cycles
83	83	Ignition switch-ST	Engine: cranking		8 V or more
91	91	Cylinder 2, 3 heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ↔ 1.4 V (changes repeatedly)
92	92	Cylinder 1, 4 heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ↔ 1.4 V (changes repeatedly)
93	93	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
94	94	Power supply voltage applied to throttle position sensor	Ignition switch: "ON"		4.9 – 5.1 V
96	96	Cylinder 2, 3 heated oxygen sensor (rear)	<ul style="list-style-type: none"> • Transaxle: 2nd speed (A/T: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more 		0 and 1.0 – 1.5 V alternates
97	97	Cylinder 1, 4 heated oxygen sensor (rear)	<ul style="list-style-type: none"> • Transaxle: 2nd speed (A/T: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more 		0 and 1.0 – 1.5 V alternates

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
98	98	Throttle position sensor (sub)	<ul style="list-style-type: none"> • 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	2.2 – 2.8 V
				Fully open the throttle valve with your finger	4.0 V or more
99	99	Throttle position sensor (main)	<ul style="list-style-type: none"> • 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

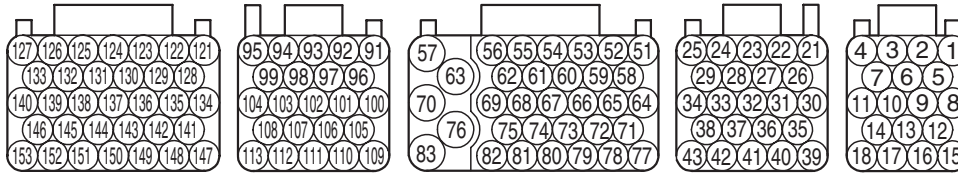
TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
102	102	Manifold absolute pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft.)	3.8 – 4.2 V
				At altitude of 600 m (1,969 ft.)	3.5 – 3.9 V
				At altitude of 1,200 m (3,937 ft.)	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
103	103	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V* ¹
			Engine: idling		2.0 – 3.0 V* ¹
104	104	Camshaft position sensor	Engine: cranking		2.0 – 4.8 V* ¹
			Engine: idling		3.0 – 4.0 V* ¹
105	105	Cylinder 2, 3 heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
106	106	Cylinder 1, 4 heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 – 0.6 V
107	107	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
108	108	Mass airflow sensor	Engine: revving		Voltage increase in response to revving

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
110	110	Engine oil pressure switch	Engine: warming up, idling	1 V or less
			Engine: 4,500 r/min	B+
122	122	Power supply voltage applied to throttle actuator control motor	Ignition switch: "ON"	B+
123	123	Throttle actuator control motor relay	Ignition switch: "ON" → "LOCK" (OFF)	1 V or less → B+ → 1 V or less
125	125	Cylinder 2, 3 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)
126	126	Cylinder 1, 4 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)
128	128	Engine oil control valve	Engine: warming up, idling	B+
			Engine: 4,500 r/min	1 V or less → 4.0 – 10 V* ¹ (After a few seconds pass)
131	131	Generator FR terminal	<ul style="list-style-type: none"> • Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON*² • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON 	Voltage drops
132	132	Generator G terminal	<ul style="list-style-type: none"> • Engine: warming up, idling (radiator fan: stopped) • Headlight: OFF to ON*² • Rear defogger switch: OFF to ON • Stop light switch: OFF to ON 	Voltage rises
137	137	Cylinder 2, 3 heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less
			Engine: revving	B+
138	138	Cylinder 1, 4 heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less
			Engine: revving	B+

TERMINAL NO. <M/T>	TERMINAL NO. <A/T>	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
141	141	Throttle actuator control motor (-)	<ul style="list-style-type: none"> Ignition switch: "ON" Accelerator pedal: fully closed → fully opened 	Decreases slightly (approximately 2 V) from battery voltage.
147	147	Throttle actuator control motor (+)	<ul style="list-style-type: none"> Ignition switch: "ON" Accelerator pedal: fully opened → fully closed 	Decreases slightly (approximately 2 V) from battery voltage.
142	142	EGR valve (Stepper motor coil <A1>)	Ignition switch: "LOCK" (OFF) → "ON"	5 – 8 V* ¹ (changes about three seconds repeatedly)
136	136	EGR valve (Stepper motor coil <A2>)		
130	130	EGR valve (Stepper motor coil <B1>)		
124	124	EGR valve (Stepper motor coil <B2>)		
149	149	Evaporative emission purge solenoid	Ignition switch: "ON"	B+
			Engine: warm up, 3,000 r/min (within 3 minutes after the engine starting sequence is completed)	Voltage drops
151	151	Ignition coil –No. 1 (ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V* ¹
143	143	Ignition coil –No. 2 (ignition power transistor)		
150	150	Ignition coil –No. 3 (ignition power transistor)		
148	148	Ignition coil –No. 4 (ignition power transistor)		
153	153	No. 1 injector	<ul style="list-style-type: none"> Engine: warming up, idling Suddenly depress the accelerator pedal 	From 9 – 13 V* ¹ momentarily drops slightly
146	146	No. 2 injector		
140	140	No. 3 injector		
139	139	No. 4 injector		

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM <M/T> or PCM <A/T> Harness Side Connector Terminal Arrangement



AK203310AC

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
25 – Body ground	ECM <M/T> or PCM <A/T> ground	Continuity (2 Ω or less)
29 – Body ground	ECM <M/T> or PCM <A/T> ground	
34 – Body ground	ECM <M/T> or PCM <A/T> ground	
38 – Body ground	ECM <M/T> or PCM <A/T> ground	
2 – 51	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20° C (68° F)]
69 – 93	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)]
69 – 107	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)]
51 – 125	Cylinder 2, 3 heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20° C (68° F)]

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
51 – 126	Cylinder 1, 4 heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20° C (68° F)]
51 – 128	Engine oil control valve	6.9 – 7.9 Ω [at 20° C (68° F)]
51 – 137	Cylinder 2, 3 heated oxygen sensor heater (rear)	11 – 18 Ω [at 20° C (68° F)]
51 – 138	Cylinder 1, 4 heated oxygen sensor heater (rear)	11 – 18 Ω [at 20° C (68° F)]
141 – 147	Throttle actuator control motor	0.3 – 80 Ω [at 20° C (68° F)]
51 – 142	Stepper motor coil (A1)	20 – 24 Ω [at 20° C (68° F)]
51 – 136	Stepper motor coil (A2)	
51 – 130	Stepper motor coil (B1)	
51 – 124	Stepper motor coil (B2)	
51 – 149	Evaporative emission purge solenoid	30 – 34 Ω [at 20° C (68° F)]
51 – 153	No. 1 injector	10.5 – 13.5 Ω [at 20° C (68° F)]
51 – 146	No. 2 injector	
51 – 140	No. 3 injector	
51 – 139	No. 4 injector	

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

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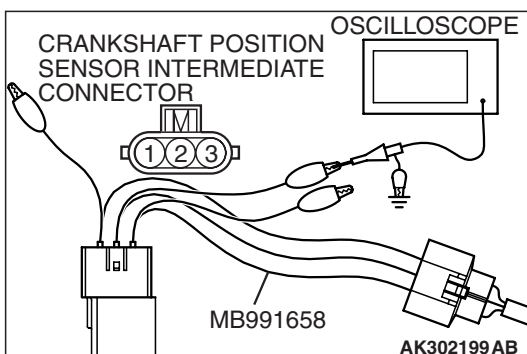
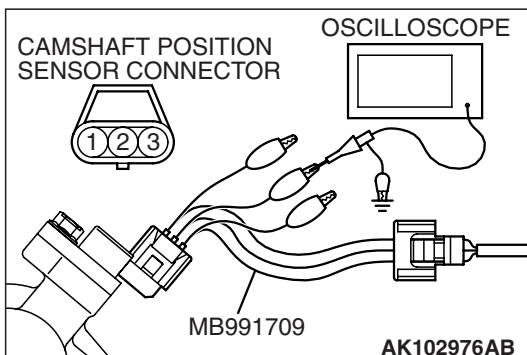
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Required Special Tools:

- MB991709: Test Harness
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

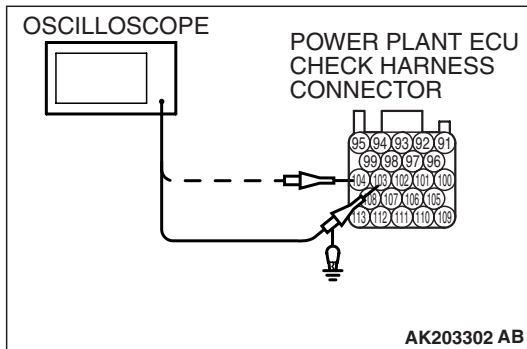
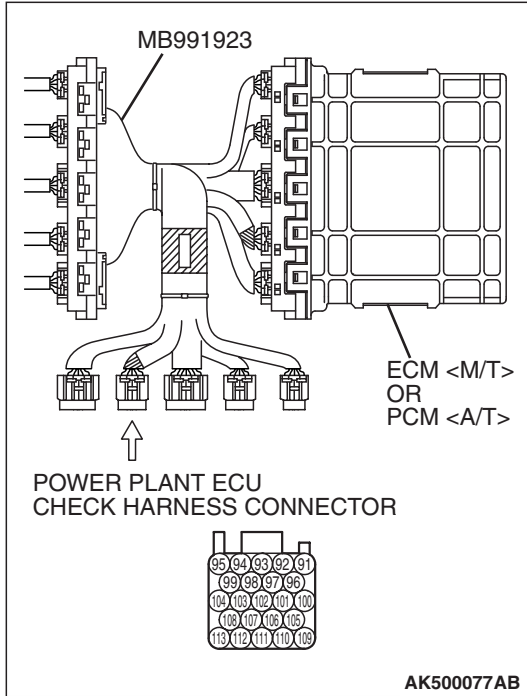
Measurement Method

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. 2.
3. Disconnect the crankshaft position sensor intermediate connector, and connect the test harness special tool (MB991658) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor intermediate connector terminal No. 2.



Alternate method

1. Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors.

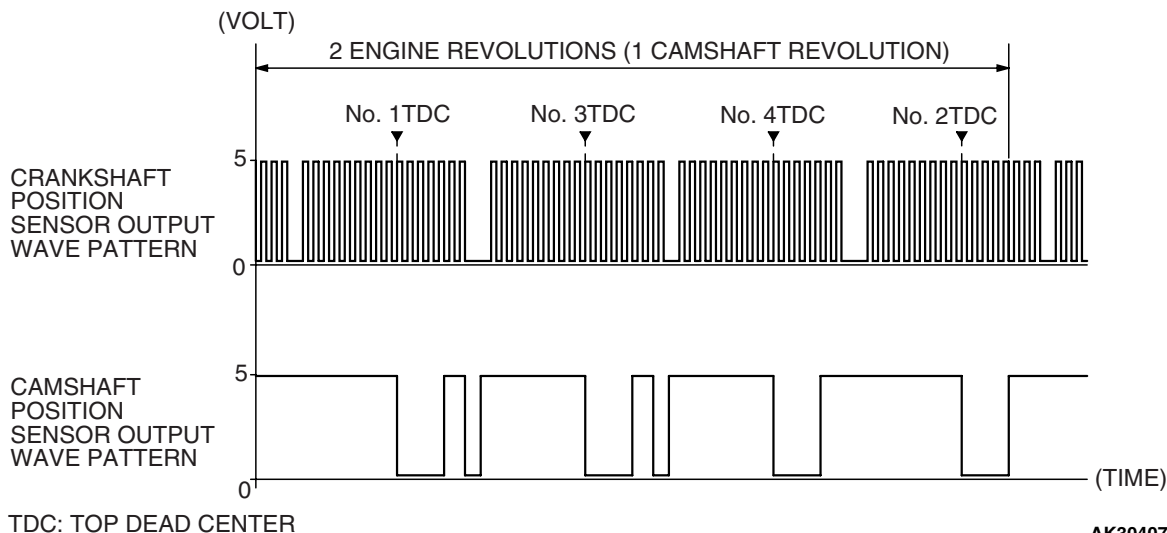


2. Connect the oscilloscope to check harness terminal No. 104. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 103. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation condition	
Function	Special pattern
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

1. Check that cycle time becomes shorter when the engine speed increased.

Examples of Abnormal Wave Patterns

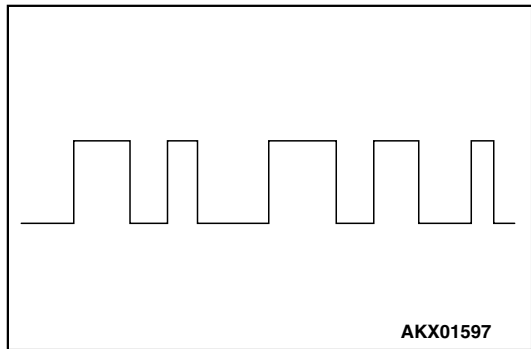
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.



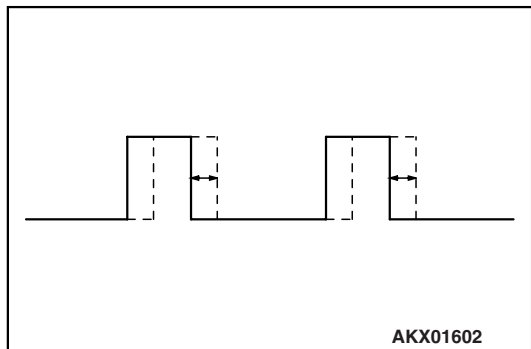
Example 2

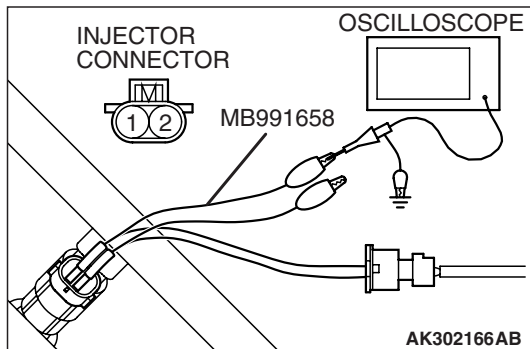
Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.





INJECTOR

Required Special Tools:

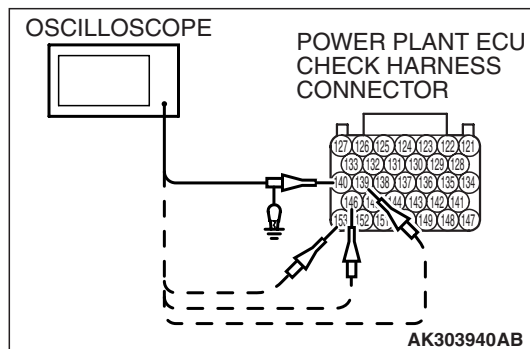
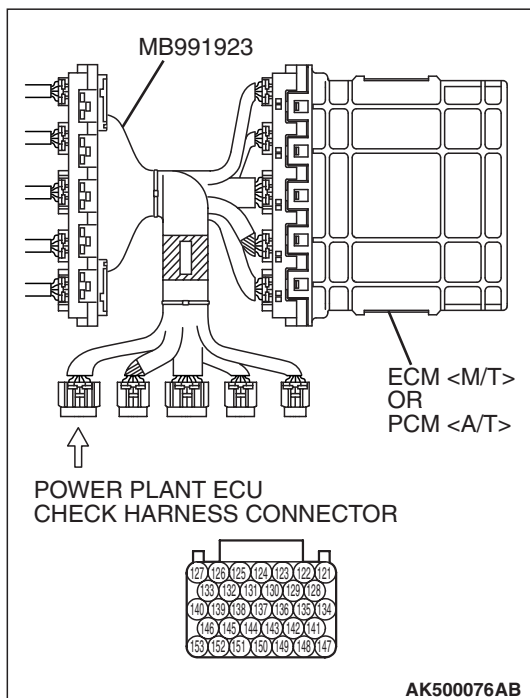
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

Measurement Method

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 <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors.

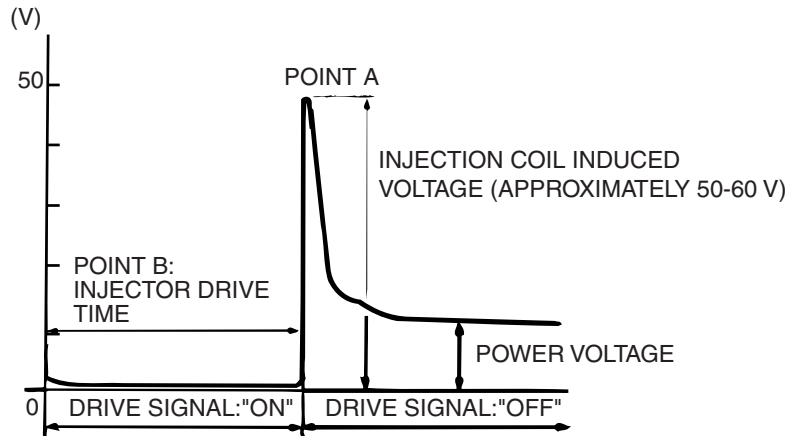


2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
 - Terminal No. 153 for the number 1 cylinder.
 - Terminal No. 146 for the number 2 cylinder.
 - Terminal No. 140 for the number 3 cylinder.
 - Terminal No. 139 for the number 4 cylinder.

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

Standard wave pattern



AKX01604 AB

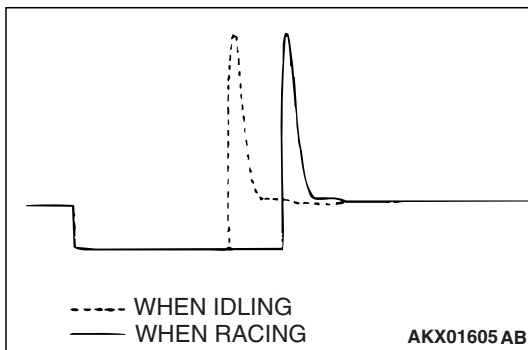
Wave Pattern Observation Points

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

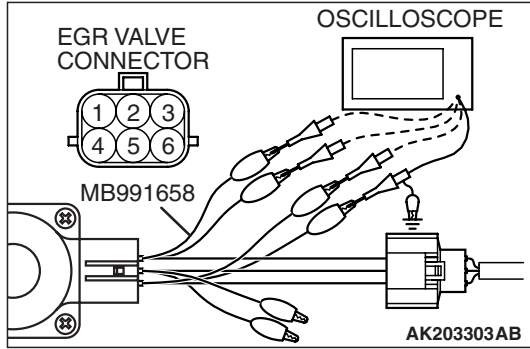
1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.



EGR VALVE (STEPPER MOTOR)

Required Special Tools:

- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

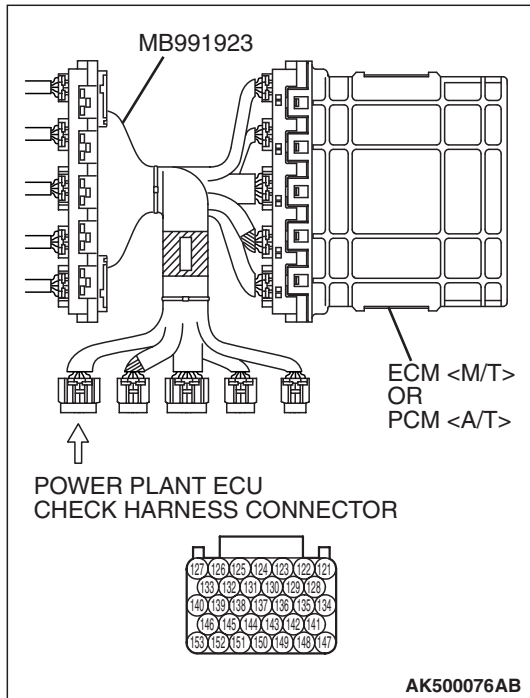


Measurement Method

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

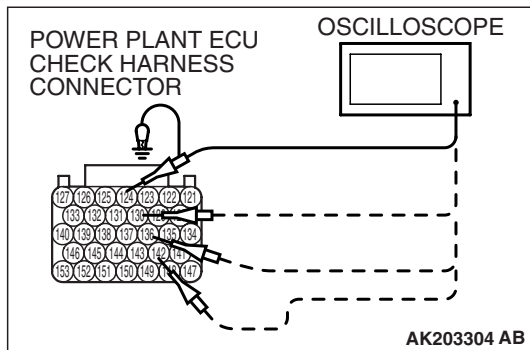
1. Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors.



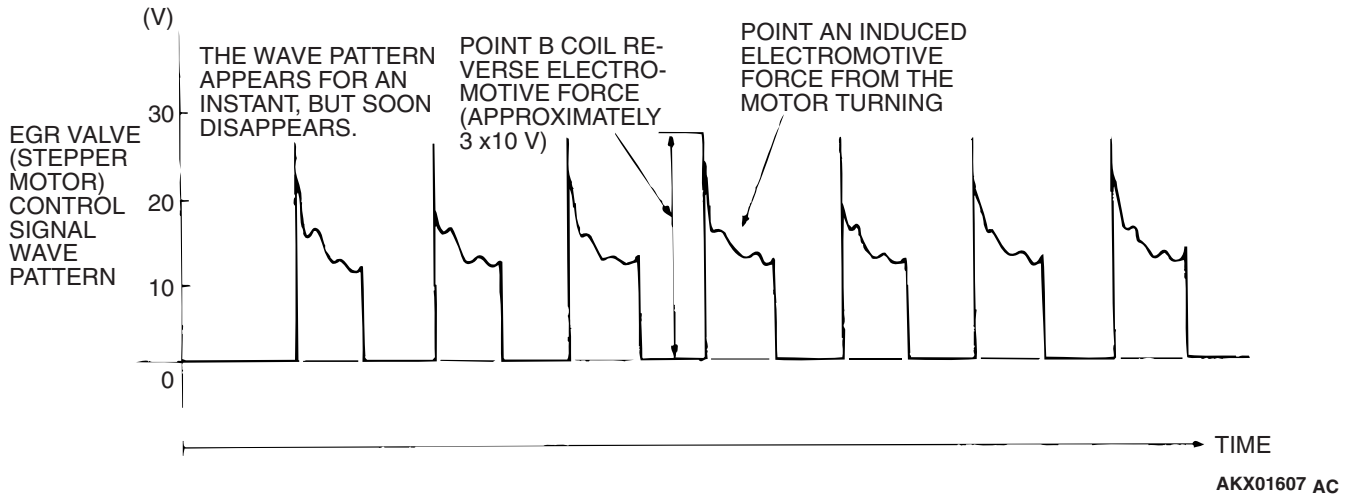
2. Connect the oscilloscope probe to check harness terminal No. 124, No. 130, No. 136 and No. 142.

Standard Wave Pattern

Observation condition	
Function	Special pattern
Pattern height	High
Pattern selector	Display
Engine condition	Revving



Standard wave pattern



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

Examples of Abnormal Wave Patterns

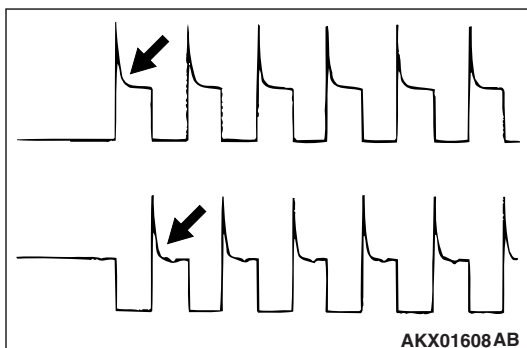
Example 1

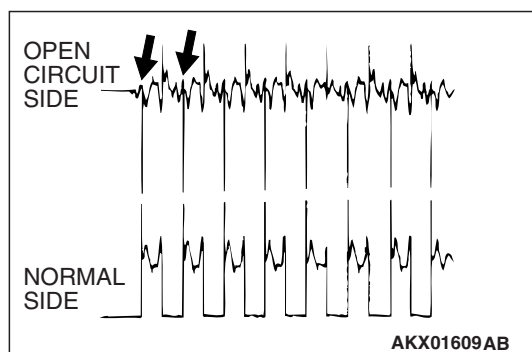
Cause of problem

- 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 <M/T> or the PCM <A/T>.

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.

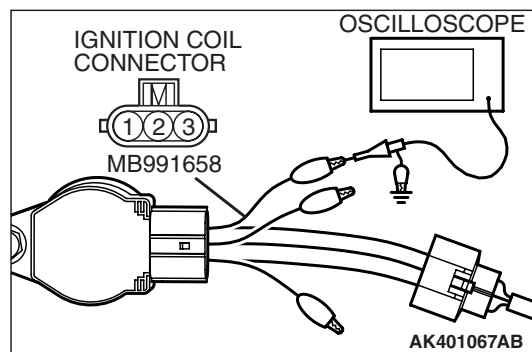
IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tools:

- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

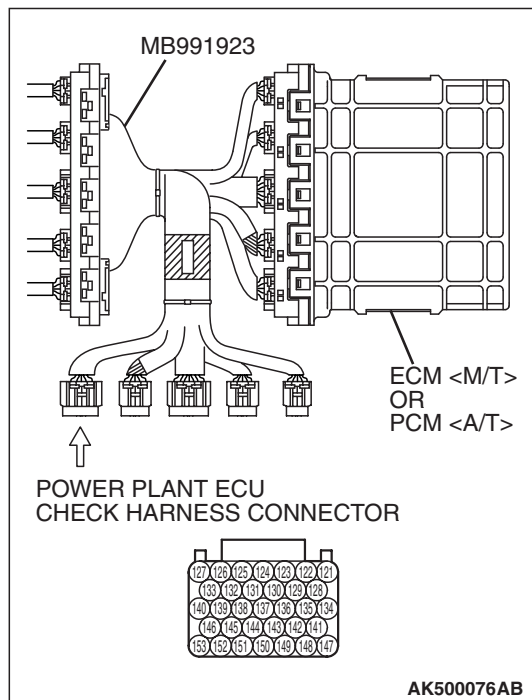
Measurement Method

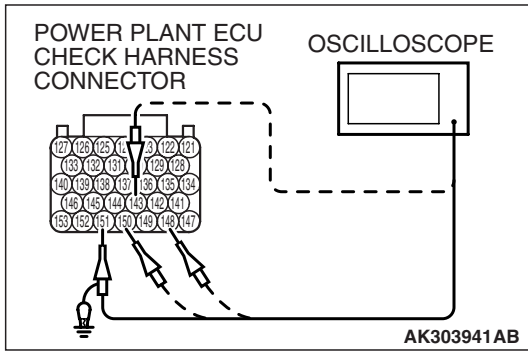
1. Disconnect the ignition coil connector, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to ignition coil connector terminal No. 3.



Alternate method

1. Disconnect all ECM <M/T> connectors or PCM <A/T> connectors. Connect the check harness special tool (MB991923) between the separated connectors.





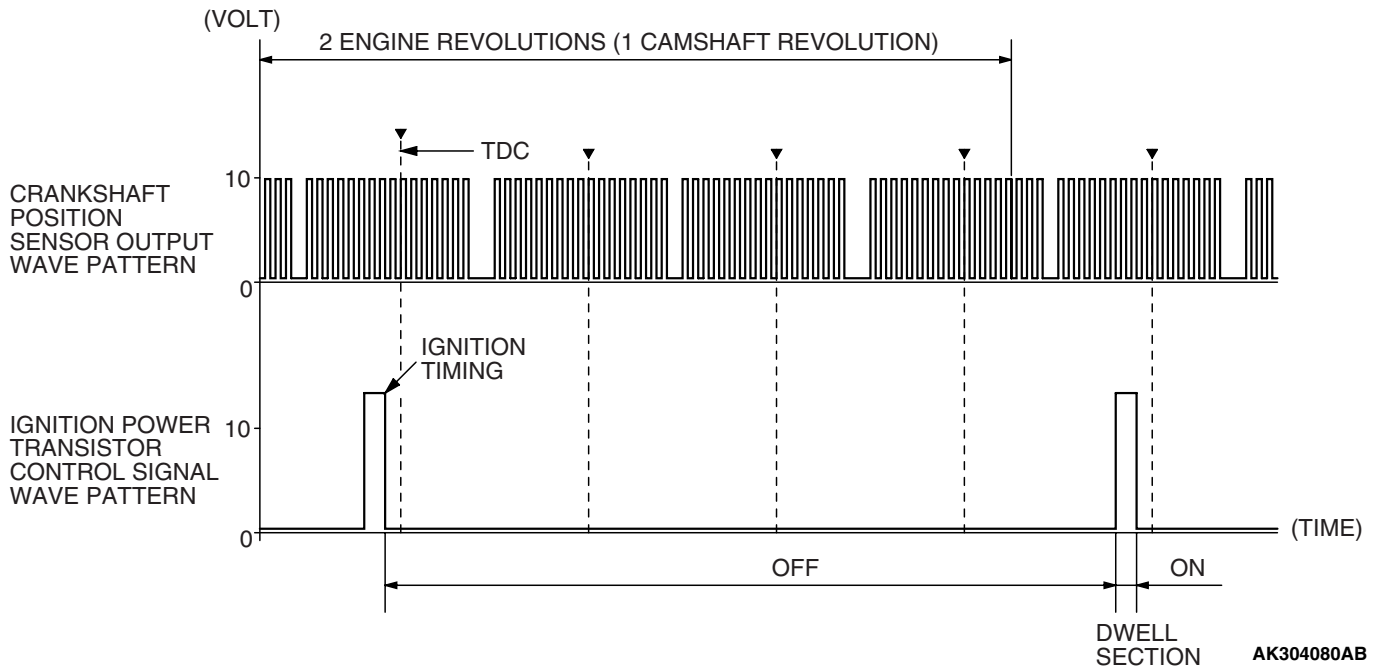
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:

- Terminal No. 151 for the number 1 cylinder.
- Terminal No. 143 for the number 2 cylinder.
- Terminal No. 150 for the number 3 cylinder.
- Terminal No. 148 for the number 4 cylinder.

Standard Wave Pattern

Observation condition	
Function	Special pattern
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



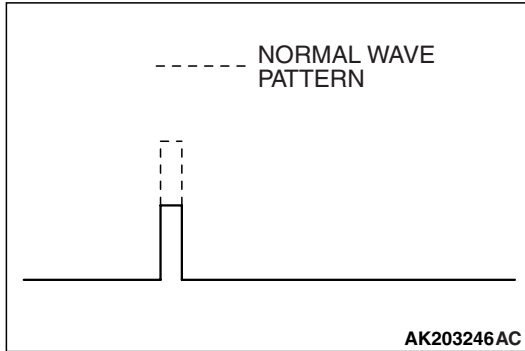
Wave Pattern Observation Points

Point: The power transistor control signal (ignition timing) is advanced when the engine speed is increased.

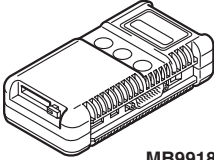
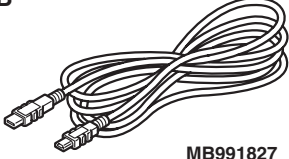
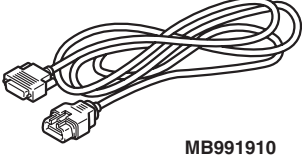
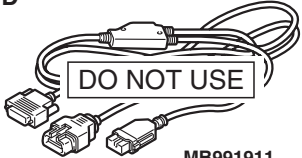
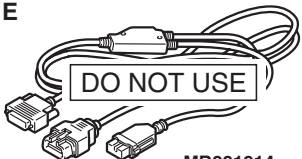
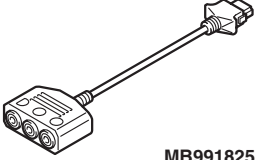
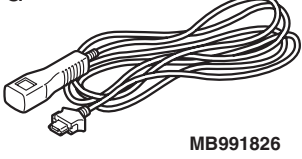
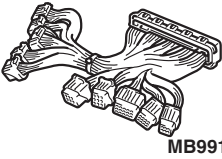
CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Voltage value is too low	Open-circuit in ignition primary circuit


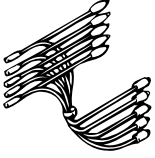


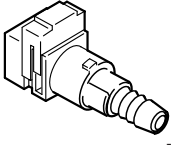
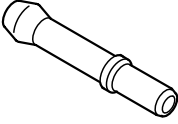

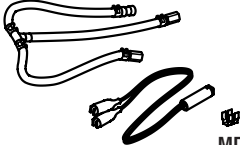
Examples of Abnormal Wave Patterns**Example 1 (Wave pattern during engine cranking)**

- Cause of problem
Open-circuit in ignition primary circuit
- Wave pattern characteristics
Voltage value is too low.



SPECIAL TOOLS

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826 MB991958</p>	<p>MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826</p> <p>MUT-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: MUT-III USB Cable C: MUT-III Main Harness A (Vehicles with CAN communication system) D: MUT-III Main Harness B (Vehicles without CAN communication system) E: MUT-III Main Harness C (for Daimler Chrysler models only) F: MUT-III Measurement Adapter G: MUT-III Trigger Harness</p>	<p>MB991824-KIT <i>NOTE: G: MB991826 MUT-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.</i></p>	<ul style="list-style-type: none"> • Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure <p>CAUTION For vehicles with CAN communication, use MUT-III main harness A to send simulated vehicle speed. If you connect MUT-III main harness B instead, the CAN communication does not function correctly.</p>
 <p>MB991923</p>	<p>MB991923 Power plant ECU check harness</p>	<p>MD998478-01</p>	<ul style="list-style-type: none"> • Inspection using an oscilloscope • Inspection of the engine control module (ECM) <M/T> the powertrain control module (PCM) <A/T> terminal voltage check

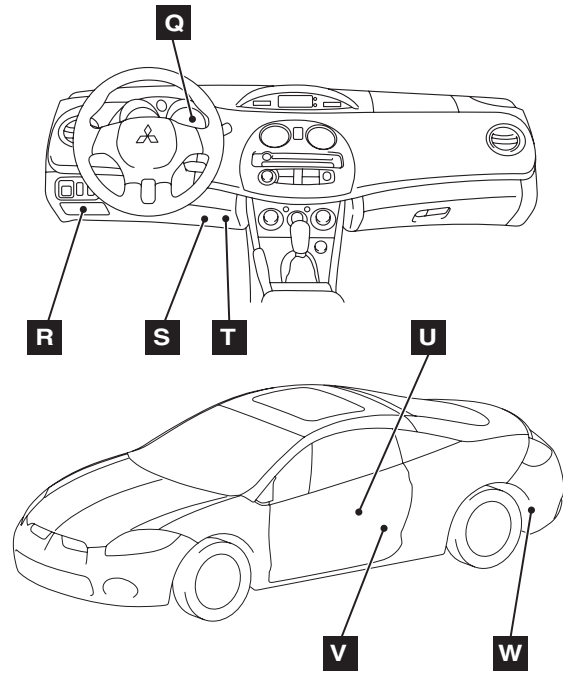
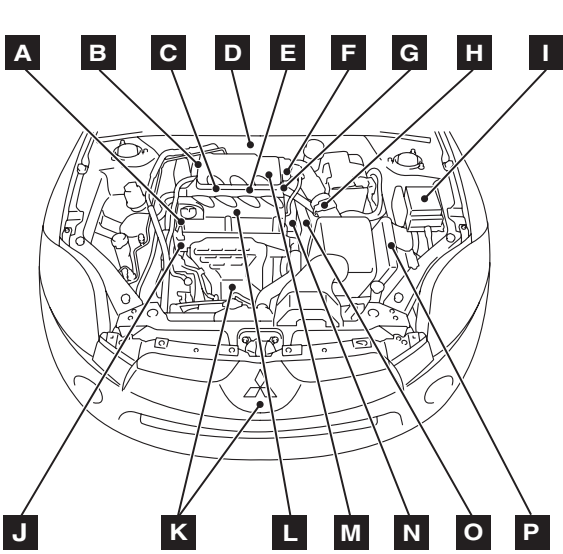
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991709 Test harness	MB991709-01	Inspection using an oscilloscope
 MB991658	MB991658 Test harness	Tool not available	Inspection using an oscilloscope
	MD998464 Test harness (4 pin, square)	MD998464-01	Inspection of heated oxygen sensor
	MB991316 Test harness (4 pin, square)	Tool not available	Inspection of heated oxygen sensor
 MB992049	MB992049	Quick connector	<ul style="list-style-type: none"> • Measurement of fuel pressure
 MB992001	MB992001	Hose adaptor	<ul style="list-style-type: none"> • Measurement of fuel pressure
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
 MD998707	MD998707	Injector test set	<ul style="list-style-type: none"> • Measurement of fuel pressure

ON-VEHICLE SERVICE

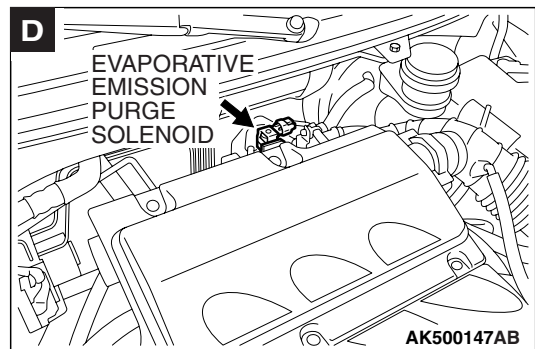
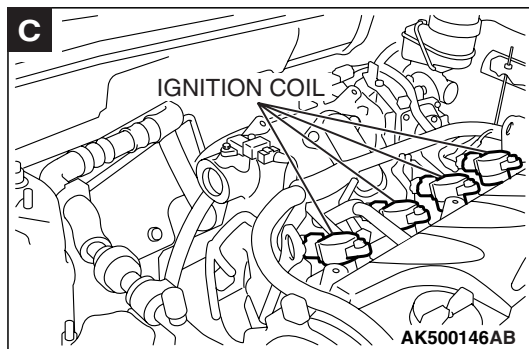
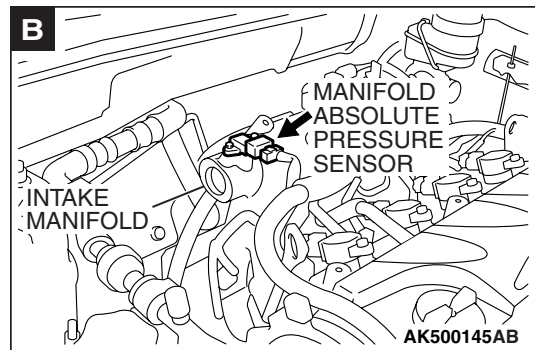
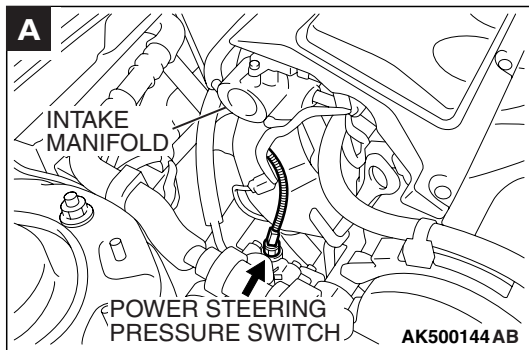
COMPONENT LOCATION

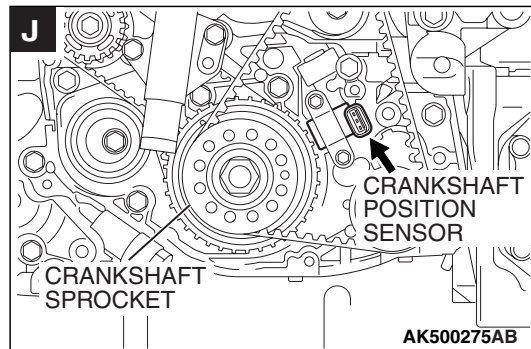
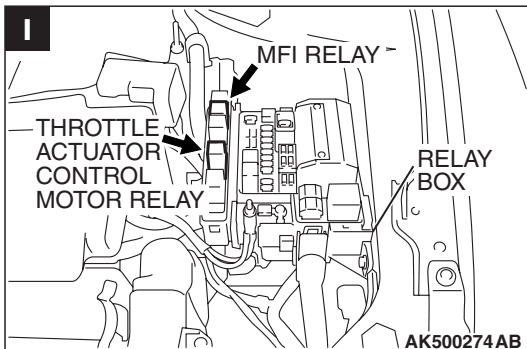
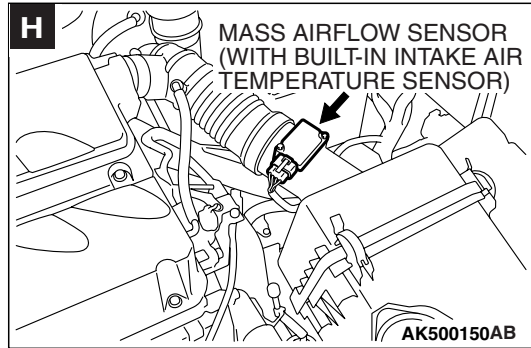
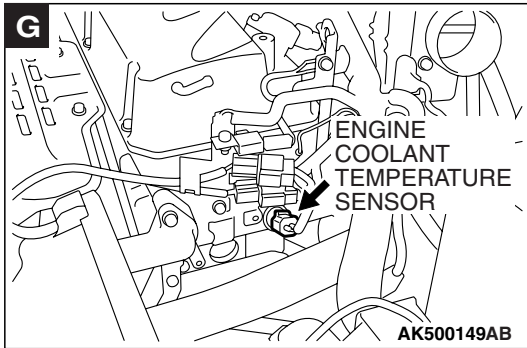
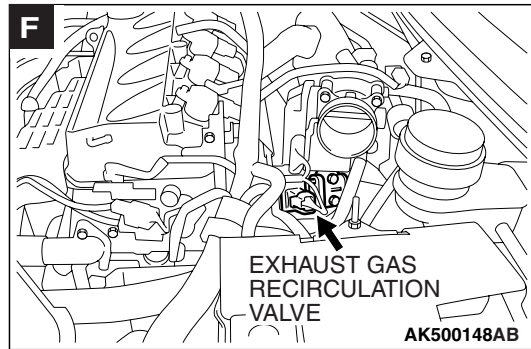
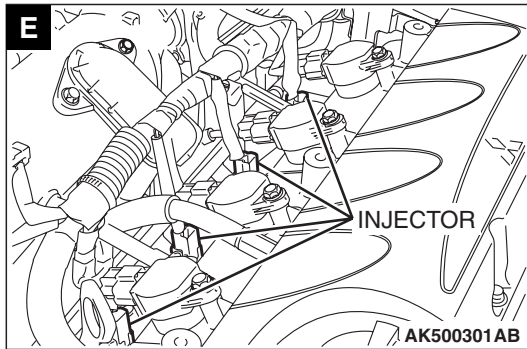
M1131002101443

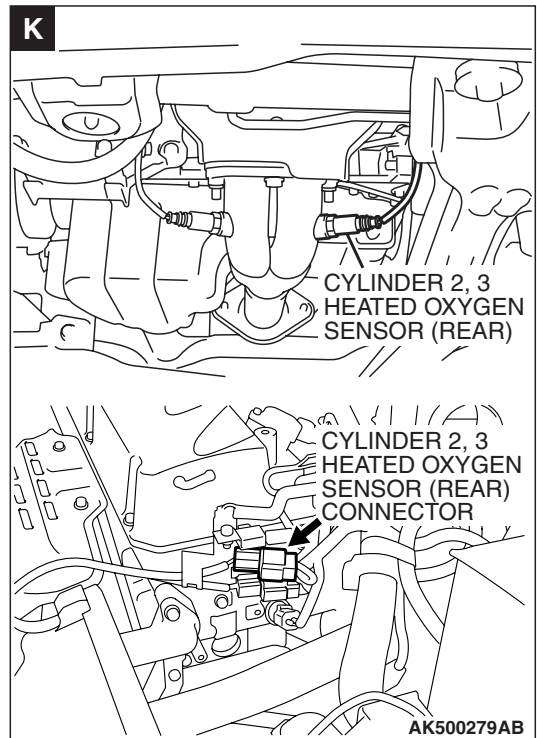
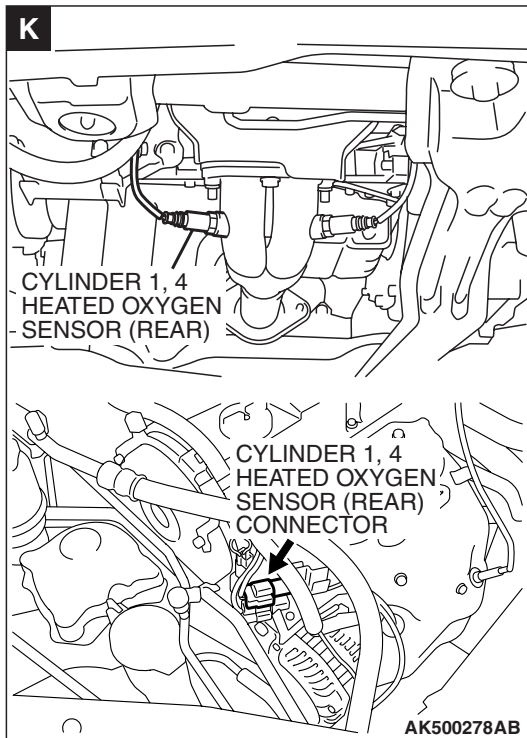
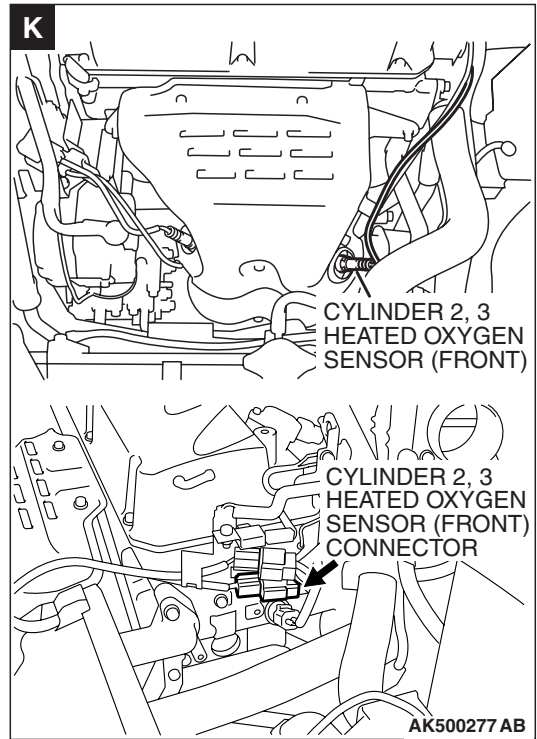
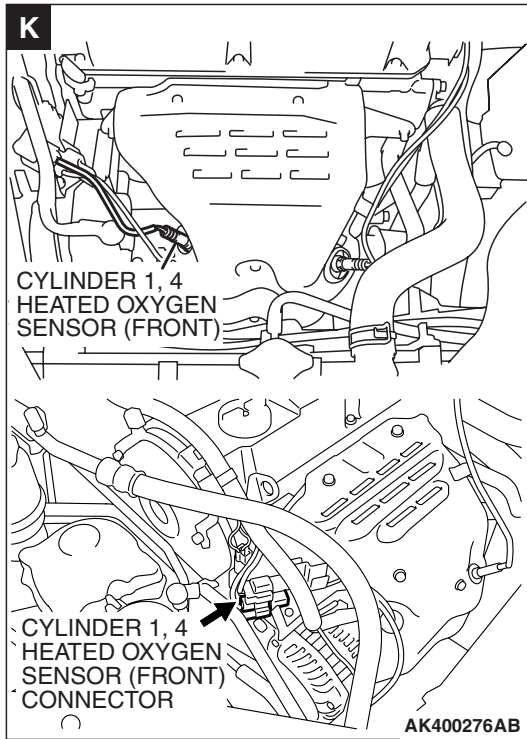
NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor	S	Fuel level sensor (sub)	U
Camshaft position sensor	O	Fuel pump relay	R
Crankshaft position sensor	J	Fuel tank differential pressure sensor	V
Cylinder 1, 4 heated oxygen sensor (front)	K	Fuel tank temperature sensor	V
Cylinder 1, 4 heated oxygen sensor (rear)	K	Ignition coil	C
Cylinder 2, 3 heated oxygen sensor (front)	K	Injector	E
Cylinder 2, 3 heated oxygen sensor (rear)	K	Knock sensor	L
Data link connector	T	Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)	Q
Engine control module (ECM)	P	Manifold absolute pressure sensor	B
Engine coolant temperature sensor	G	Mass airflow sensor (with built-in intake air temperature sensor)	H
Engine oil control valve	N	Multiport fuel injection (MFI) relay	I
Engine oil pressure switch	N	Powertrain control module (PCM)	P
Evaporative emission purge solenoid	D	Power steering pressure switch	A
Evaporative emission ventilation solenoid	W	Throttle actuator control motor	M
Exhaust gas recirculation (EGR) valve	F	Throttle actuator control motor relay	I
Fuel level sensor (main)	V	Throttle position sensor	M

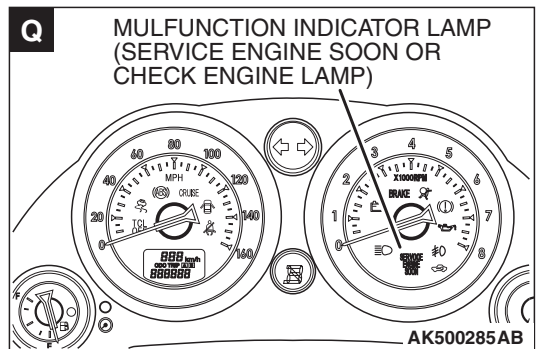
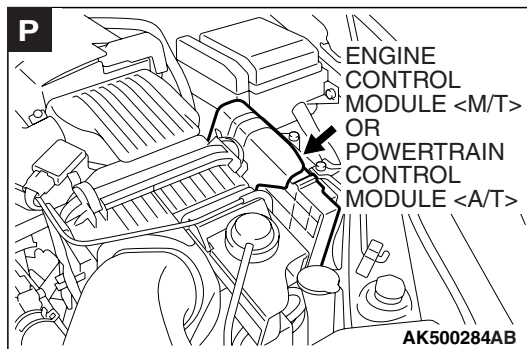
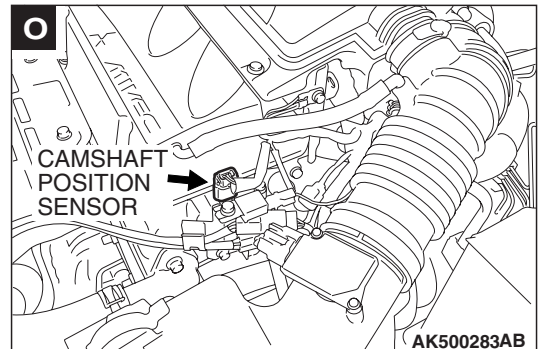
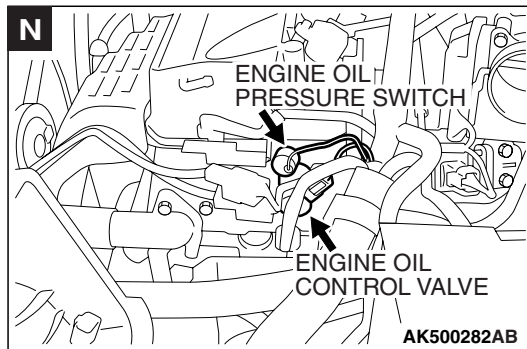
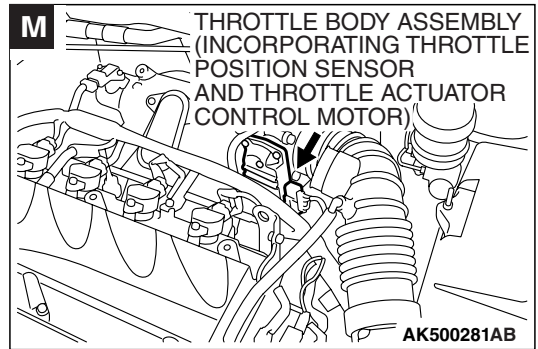
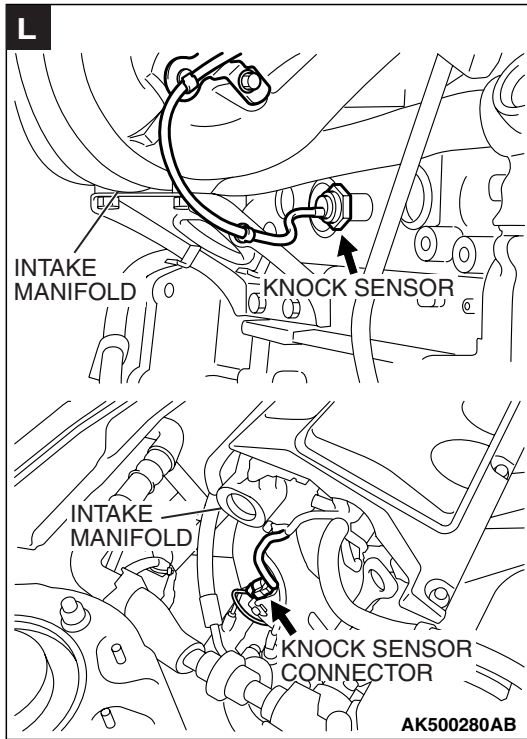


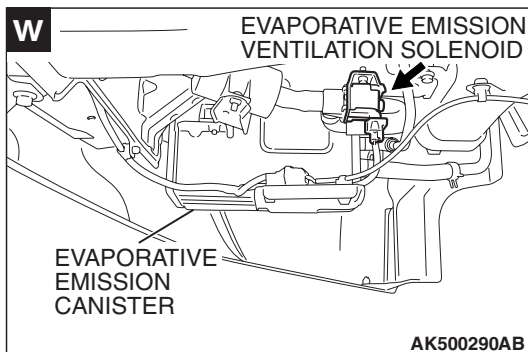
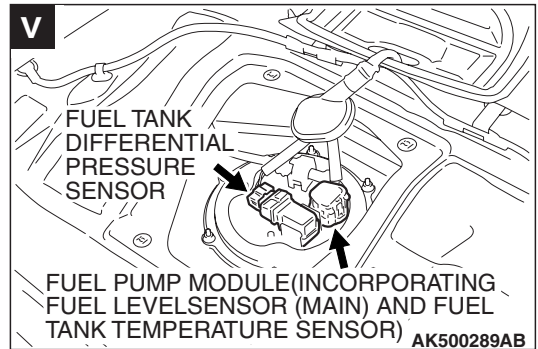
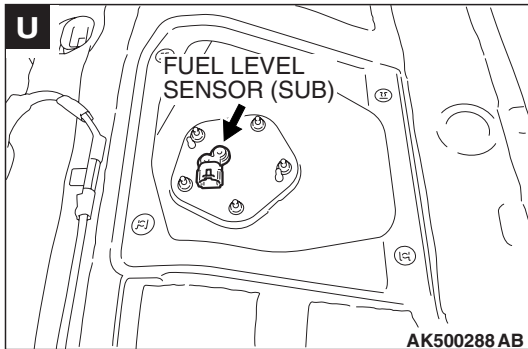
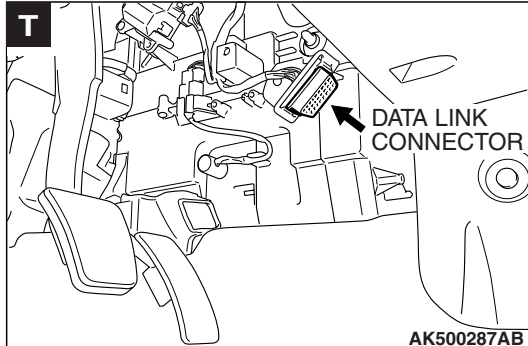
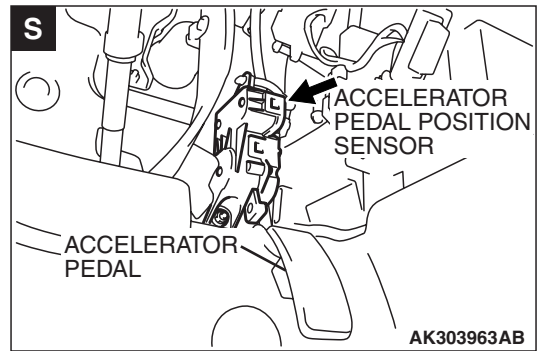
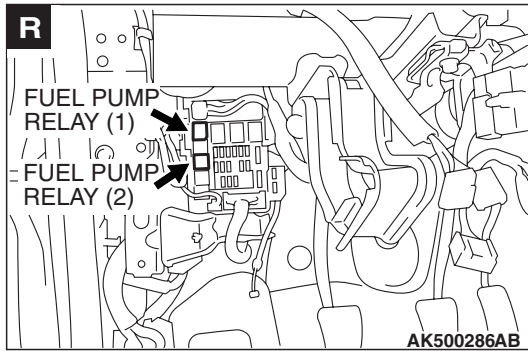
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THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000934

⚠ WARNING

If the throttle valve is operated in service, a finger might be injured as the result of being caught by the throttle valve. Make sure that the ignition switch is surely in "LOCK" (OFF) position before the service in order that the throttle valve cannot be operated.

1. Remove the throttle body.

⚠ CAUTION

- Do not spray the cleaning solvent directly to the throttle valve.
 - Make sure the cleaning solvent does not enter the motor and the sensor through the shaft.
2. Spray cleaning solvent on a clean cloth.
3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
4. Attach the air intake hose.

FUEL PRESSURE TEST

M1131001901167

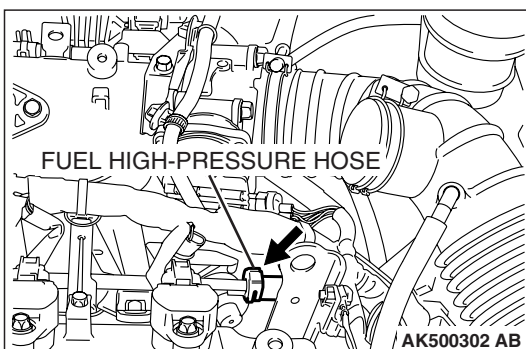
Required Special Tools:

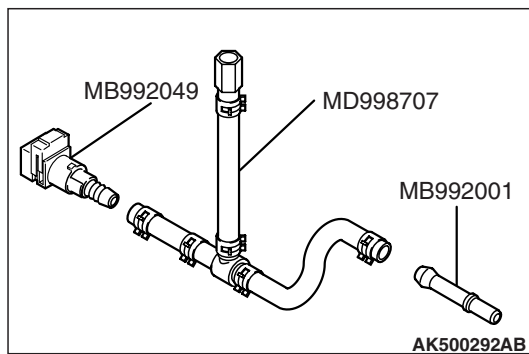
- MB991958: Scan tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: USB Cable
 - MB991910: Main Harness A
 - MB991637: Fuel Pressure Gauge Set
 - MB992001: Hose Adaptor
 - MB992049: Quick Connector
 - MD998707: Test Device
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to [P.13A-1200.](#))

⚠ WARNING

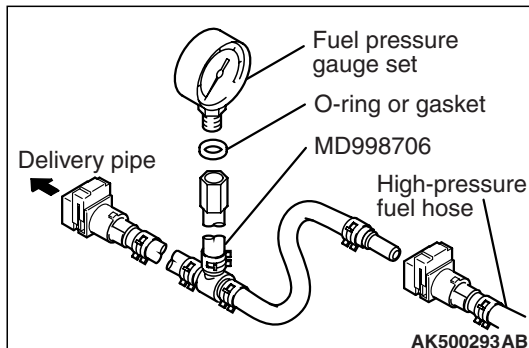
To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the fuel high-pressure hose at the fuel rail side.



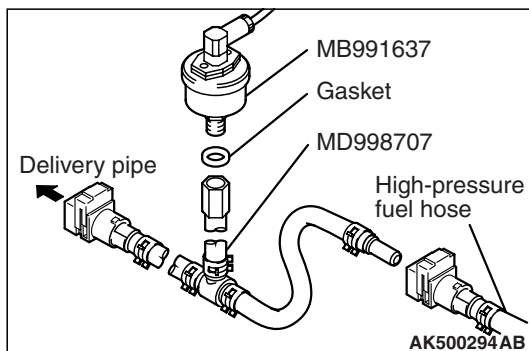


3. Assemble the special tool MD998707 of special tool as shown in figure.
4. Remove either the instillation adopter for the injector or another adopter.
5. Install the special tool MB992049 (quick connector) and the special tool MB992001 (hose adapter) to the hose without the adopter.
6. Assemble the fuel pressure measurement tools as follows.



<When using the fuel pressure gauge>

1. Via a suitable O-ring or gasket, install the fuel pressure gauge to the special tool that has already assembled as described.
2. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

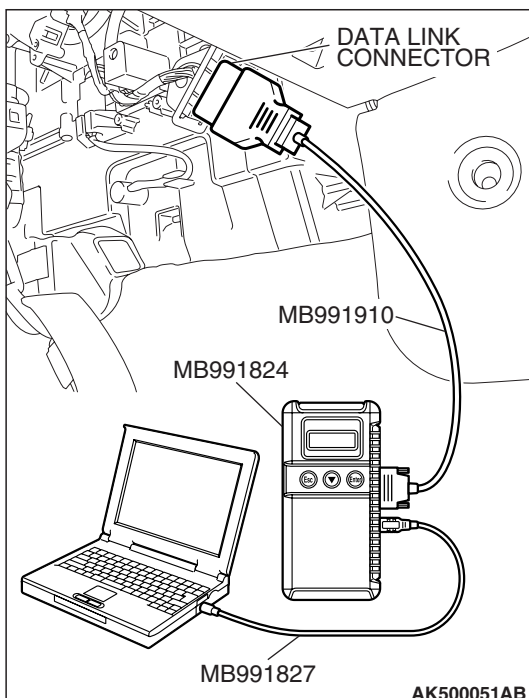


<When using special tool MB991637 (fuel pressure gauge set)>

1. Via a gasket, install the special tool MB991637 (fuel pressure gauge set) into the special tool that has already assembled as described.
2. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

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.



7. Connect scan tool MB991958 to the data link connector.
8. Use Actuator test 9 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
9. Stop the fuel pump.
10. Start the engine and run at idle.
11. Measure fuel pressure while the engine is running at idle.

Standard value: Approximately 324 kPa (47 psi) at curb idle

12. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
13. If any of fuel pressure measured in steps 11 to 12 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
<ul style="list-style-type: none"> • Fuel pressure too low • Fuel pressure drops after racing 	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

14. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two 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

15. Release residual pressure from the fuel pipe line. (Refer to [P.13A-1200.](#))

 WARNING

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.

16. Remove the fuel pressure gauge and special tool from the delivery rail.

17. Fit the fuel high-pressure hose to the delivery pipe.

18. 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.

19. Disconnect scan tool MB991958.

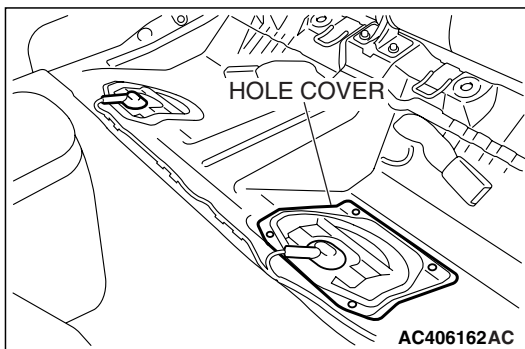
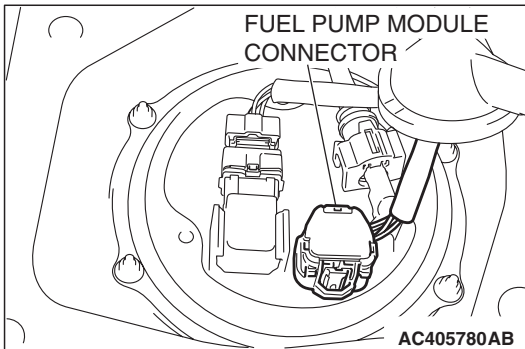
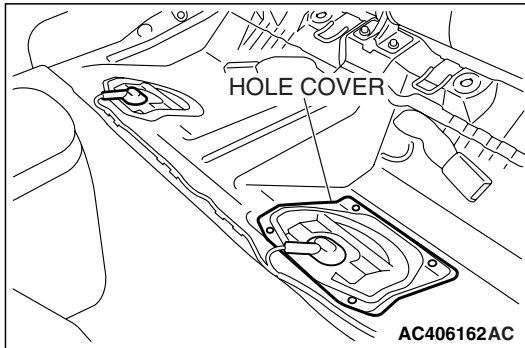
**FUEL PUMP CONNECTOR DISCONNECTION
(HOW TO REDUCE PRESSURIZED FUEL LINES)**

M1131000901045

⚠ WARNING

When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

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



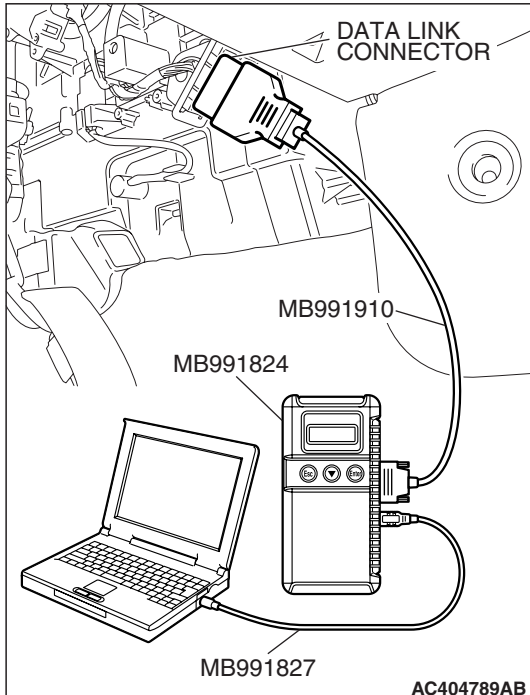
3. Disconnect the fuel pump module connector.
4. After starting the engine and letting it run until it stops naturally, turn the ignition switch to the "LOCK" (OFF) position.
5. Crank the engine for two seconds or more.
6. If the engine does not start, turn the ignition switch to "LOCK" (OFF) position.
7. If the engine starts, stop it naturally and turn the ignition switch to "LOCK" (OFF) position.
8. Connect the fuel pump module connector.
9. Install the hole cover.
10. Install the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat Assembly [P.52A-49](#)).

FUEL PUMP OPERATION CHECK

M1131002001145

Required Special Tool:

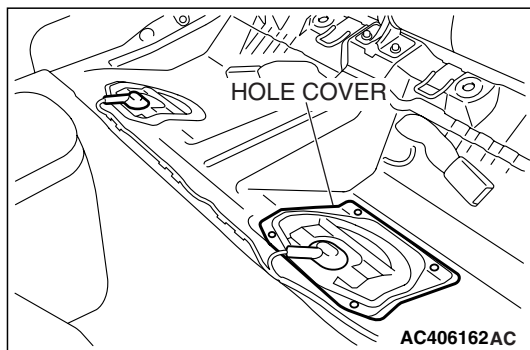
- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: MUT-III USB Cable
 - MB991910: MUT-III Main Harness A



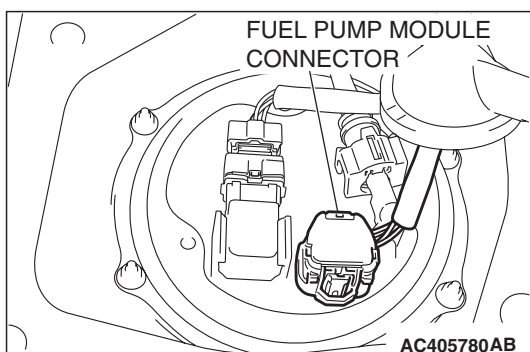
CAUTION

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

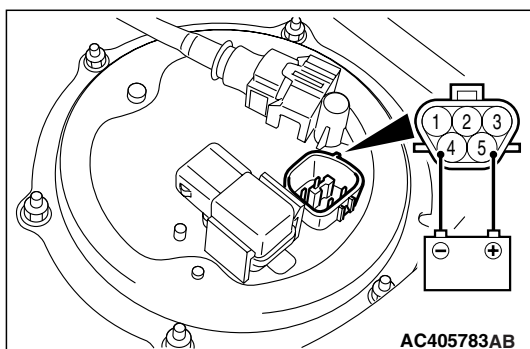
1. Check the operating of the fuel pump by using scan tool MB991958 to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
 - (1) Turn the ignition switch to the "LOCK" (OFF) position.
 - (2) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-49).



- (3) Remove the hole cover.



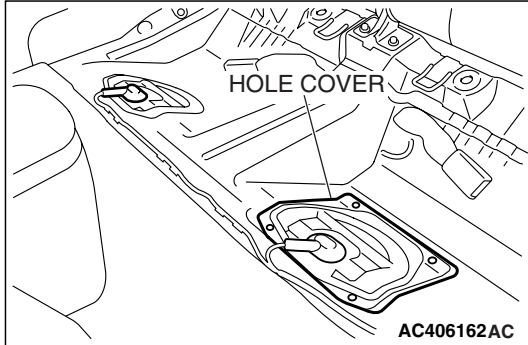
- (4) Disconnect the fuel pump module connector.



- (5) When the fuel pump drive connector is attached directly to the battery, check if the sound of the fuel pump operation can be heard. If no operating sound is heard, replace the fuel pump module (Refer to GROUP 13C, On-vehicle Service –Fuel Pump Module Replacement P.13C-6).

NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.

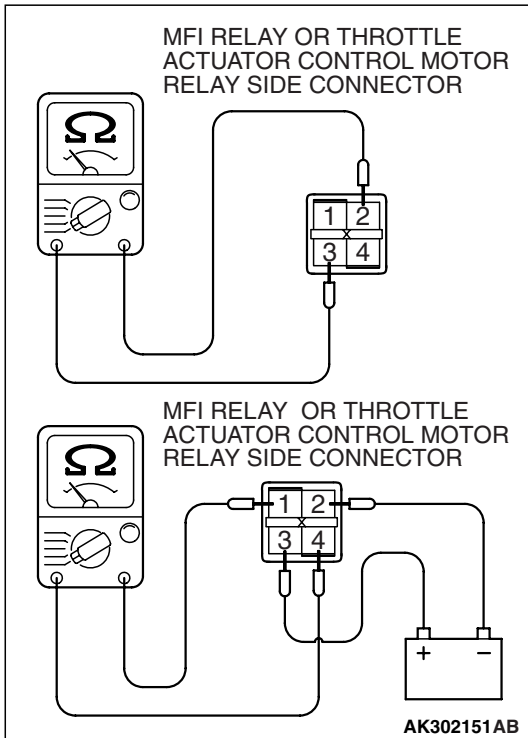
- (6) Check for fuel pressure by pinching the fuel hose with fingertips.
- (7) Connect the fuel pump module connector.
- (8) Install the hole cover.
- (9) Install the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat Assembly P.52A-49).



MULTIPOINT FUEL INJECTION (MFI) RELAY AND THROTTLE ACTUATOR CONTROL MOTOR RELAY CONTINUITY CHECK

M1131050000691

Inspect the MFI relay and throttle actuator control motor relay for continuity in accordance with the chart shown below.

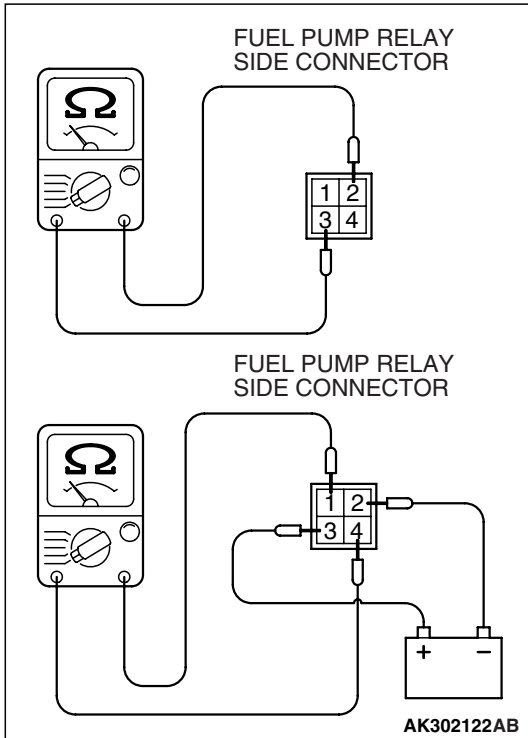


BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	-	2 - 3
Supplied	2 - 3	1 - 4

FUEL PUMP RELAY CONTINUITY CHECK

M1131033000698

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
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

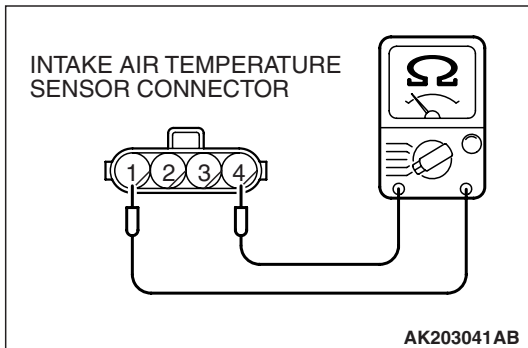
INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002801011

1. Disconnect the mass airflow sensor connector.
2. Measure resistance between terminal No. 1 and No. 4.

Standard value:

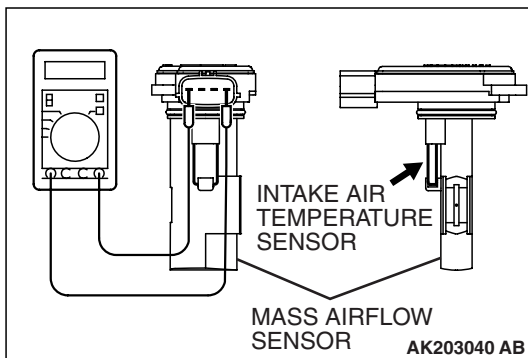
- 13 – 17 kΩ [at –20° C (– 4° F)]
- 5.3 – 6.7 kΩ [at 0° C (32° F)]
- 2.3 – 3.0 kΩ [at 20° C (68° F)]
- 1.0 – 1.5 kΩ [at 40° C (104° F)]
- 0.56 – 0.76 kΩ [at 60° C (140° F)]
- 0.30 – 0.45 kΩ [at 80° C (176° F)]



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**

M1131003100960

⚠ 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.
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)]

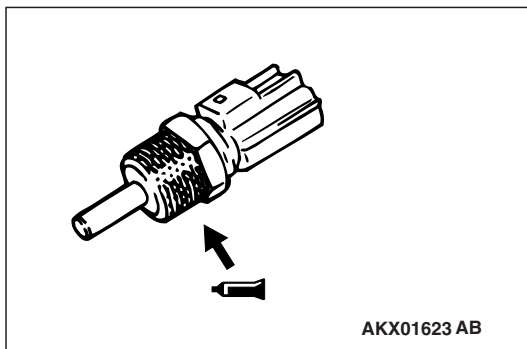
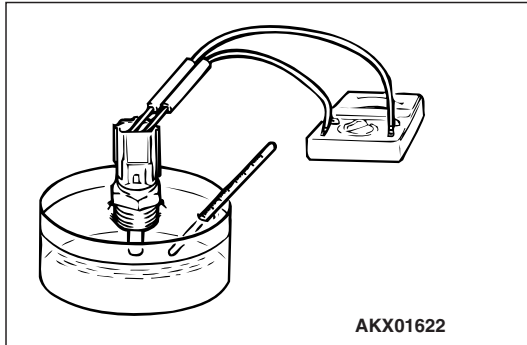
0.9 – 1.3 kΩ [at 40° C (104° F)]

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. Install the engine coolant temperature sensor and tighten it to the specified torque.

Tightening torque: 30 ± 9 N· m (22 ± 7 ft-lb)

**HEATED OXYGEN SENSOR CHECK**

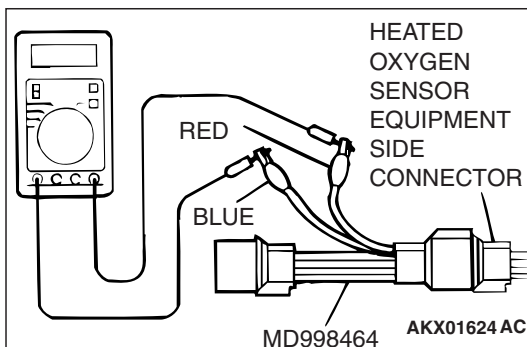
M1131005001296

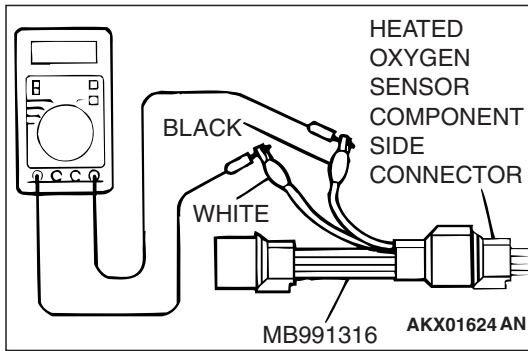
Required Special Tools:

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

<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. Make sure that there is continuity [11 – 18 ohms at 20° C (68° F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.
3. If there is no continuity, 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 (31mph) 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: 2nd speed (A/T: "L" range)
 - Drive with wide open throttle
 - Engine: 3,500 r/min or more

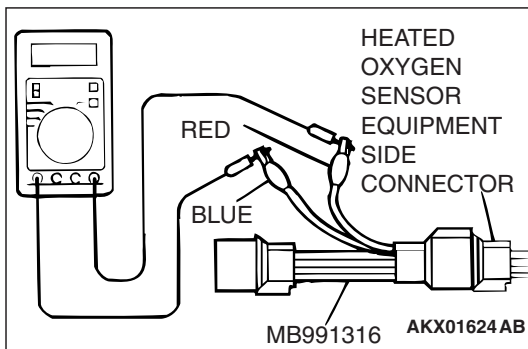
Standard value:

HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 – 1.0 volt	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 sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

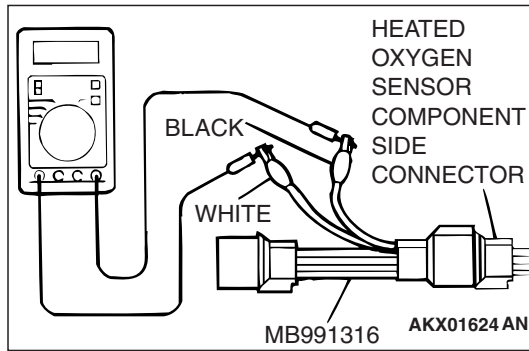
8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-23.



<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. Make sure that there is continuity [4.5 – 8.0 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.
3. If there is no continuity, 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 4,500 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 volt	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 volt.

⚠ CAUTION

- **Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use jumper wires to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with a (+) terminal and (–) terminal of 8 volts 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 Pipe and Main Muffler P.15-23.

INJECTOR CHECK

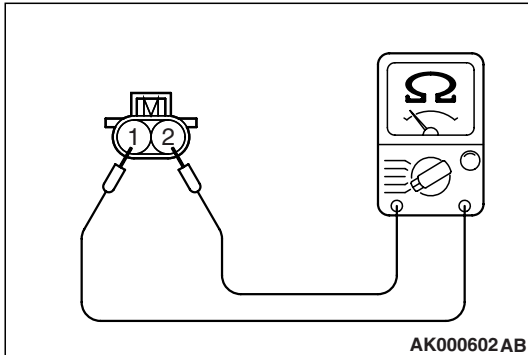
M1131005201115

Measurement of Resistance between Terminals

1. Disconnect the injector connector.
2. Measure resistance between terminals.

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

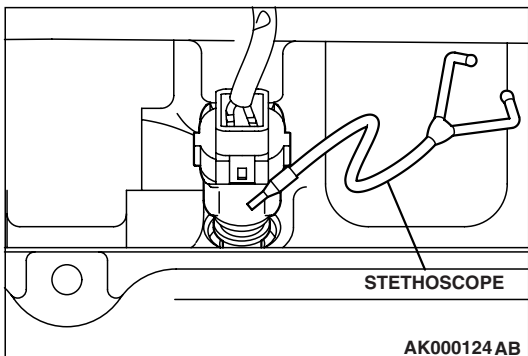
3. If not within specification, replace the injector.
4. Install the injector connector.



Checking operation sound

Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking. Check that as the engine speed increases, the frequency of the operating sound also increases.

1. If the injector you are checking is not operating, you may hear the operating sound of the other injectors.
2. If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or powertrain control module (PCM) is suspected.



THROTTLE ACTUATOR CONTROL MOTOR CHECK

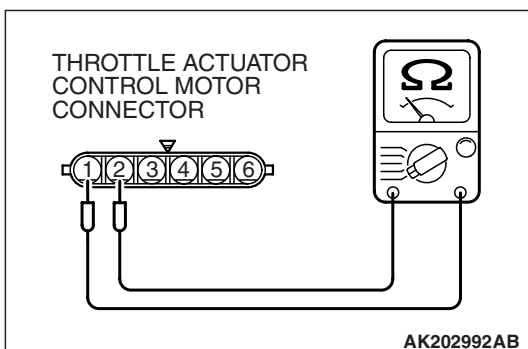
M1131051000371

<Operation Inspection>

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>

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminal No. 1 and No. 2.
Standard value: 0.3 – 80 ohms [at 20° C (68° F)]
3. If resistance is outside the standard value, replace the throttle body assembly.



ENGINE OIL CONTROL VALVE CHECK

M1131053200274

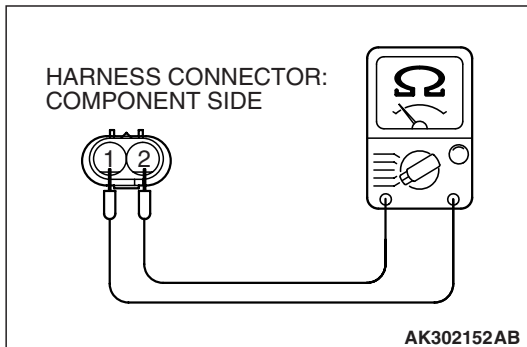
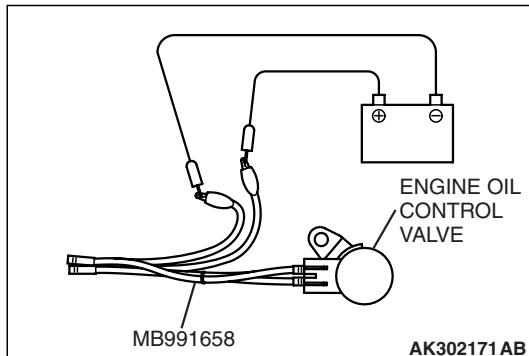
Checking the Operation Sound

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 jumper wires to connect terminal No. 2 of the engine oil control valve connector to the positive battery terminal and terminal No. 1 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 ohms [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

M1131005600392

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-102](#).

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1131012800310

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve Inspection [P.17-111](#).

EGR VALVE CHECK

M1131051500097

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Valve Check [P.17-105](#)

INJECTOR

REMOVAL AND INSTALLATION

M1131007101255

CAUTION

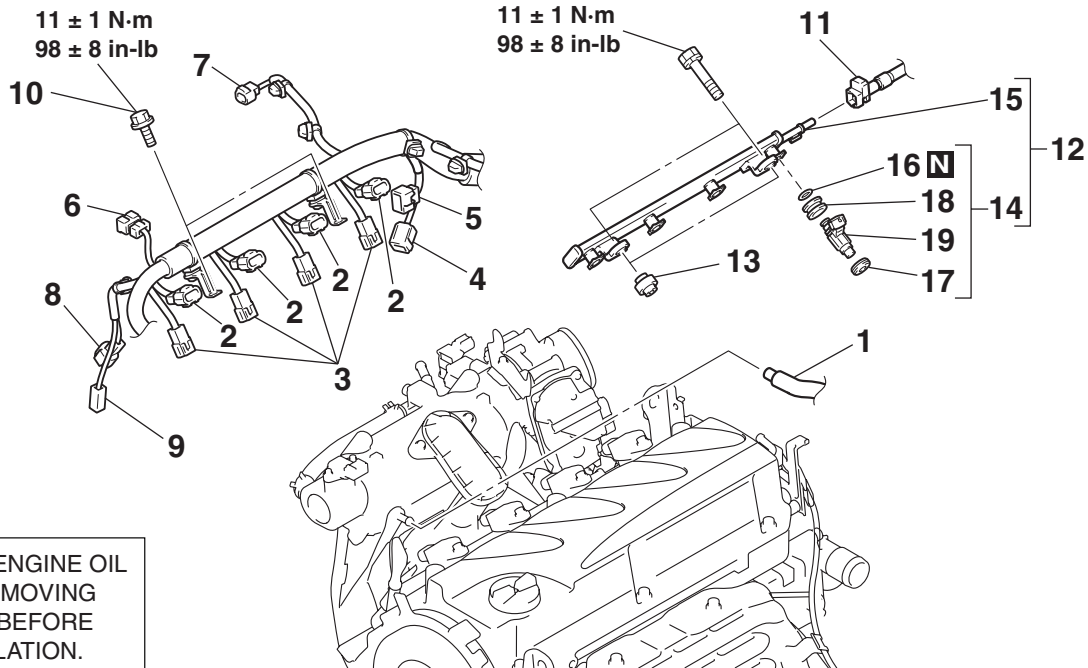
When the fuel injector replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-30).

Pre-removal Operation

- Fuel Discharge Prevention (Refer to P.13A-1200).
- Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-4).

Post-installation Operation

- Air Cleaner Cover and Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Fuel Leakage Inspection.



APPLY ENGINE OIL
TO ALL MOVING
PARTS BEFORE
INSTALLATION.

AC406968AB

REMOVAL STEPS

- PCV HOSE CONNECTION
- IGNITION COIL CONNECTORS
- FUEL INJECTOR CONNECTORS <<A>> >>B<<
- EGR VALVE CONNECTOR
- THROTTLE POSITION SENSOR CONNECTOR <>
- MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR
- EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
- KNOCK SENSOR CONNECTOR
- POWER STEERING PRESSURE SWITCH CONNECTOR

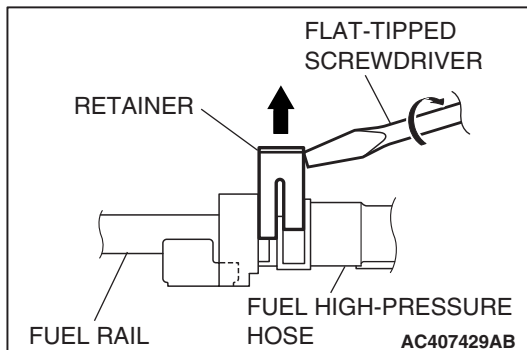
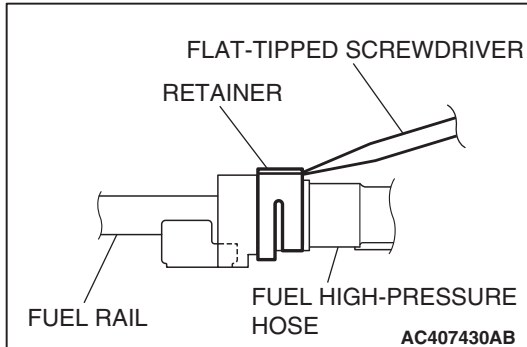
REMOVAL STEPS (Continued)

- ROCKER COVER BRACKET INSTALLATION BOLTS
- FUEL HIGH-PRESSURE HOSE CONNECTION
- FUEL RAIL AND FUEL INJECTOR ASSEMBLY
- INSULATORS
- FUEL INJECTOR ASSEMBLY >>A<<
- FUEL RAIL
- O-RING
- INSULATORS
- GROMMETS
- FUEL INJECTORS

REMOVAL SERVICE POINT**<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION****⚠ CAUTION**

Do not kink the fuel high-pressure hose as it is made of plastics and will become damaged.

1. Insert a flat-tipped screwdriver [width 6 mm (0.24 inch), thickness 1 mm (0.04 inch)] to the retainer.
2. Turn the flat-tipped screwdriver approximately 90° to the arrowed direction, and lift the retainer to unlock and disconnect the fuel high-pressure hose.

**<> FUEL RAIL AND FUEL INJECTOR ASSEMBLY REMOVAL****⚠ CAUTION**

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

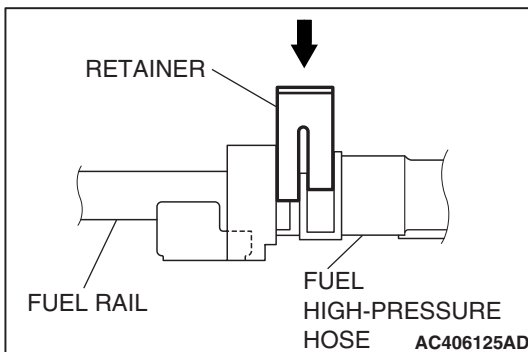
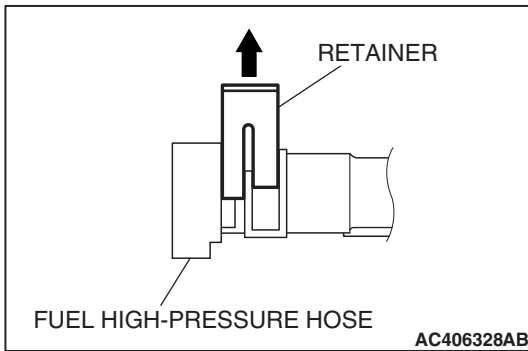
INSTALLATION SERVICE POINT**>>A<< FUEL INJECTOR ASSEMBLY INSTALLATION****⚠ CAUTION**

Do not let the engine oil get into the fuel rail.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector to the right and left to install to the fuel rail. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.

**>>B<< FUEL HIGH-PRESSURE HOSE
CONNECTION**

1. Pull up the retainer of fuel high-pressure hose to unlock before installing.



2. Install the fuel high-pressure hose to the fuel rail securely and push the retainer of fuel high-pressure hose downward and lock thoroughly.
3. After installing, slightly pull the fuel high-pressure hose and ensure that there is no disengaged fuel high-pressure hose. Also confirm that there is approximately 1 mm (0.04 inch) play at this time.

THROTTLE BODY ASSEMBLY

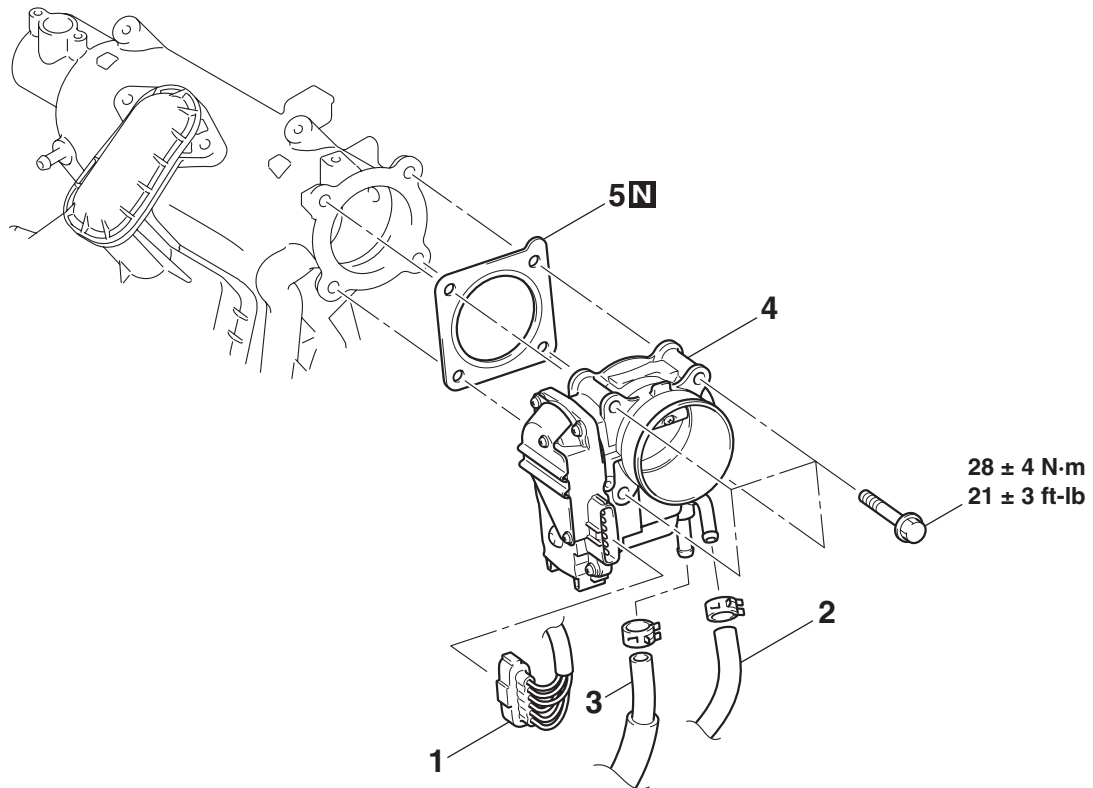
REMOVAL AND INSTALLATION

M1131007701075

CAUTION

- When the throttle body assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-30).
- Do not loosen the fixing screws for the resin cover of throttle body assembly. If the screws are loosened, the sensor incorporated in the resin cover becomes misaligned and the throttle body can not work normally.

<p>Pre-removal Operation</p> <ul style="list-style-type: none"> • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service –Engine Coolant (Change) P.00-63]. • Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-4). • Battery Removal 	<p>Post-installation Operation</p> <ul style="list-style-type: none"> • Battery Installation • Air Cleaner Cover and Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner P.15-4). • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service –Engine Coolant (Change) P.00-63].
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AC406351AB

- >>B<<
- REMOVAL STEPS**
- INITIALIZATION PROCEDURE (INSTALLATION ONLY)
1. THROTTLE POSITION SENSOR CONNECTOR
 2. WATER RETURN HOSE CONNECTION

- >>A<<
- REMOVAL STEPS (Continued)**
3. WATER FEED HOSE CONNECTION
 4. THROTTLE BODY ASSEMBLY
 5. THROTTLE BODY GASKET

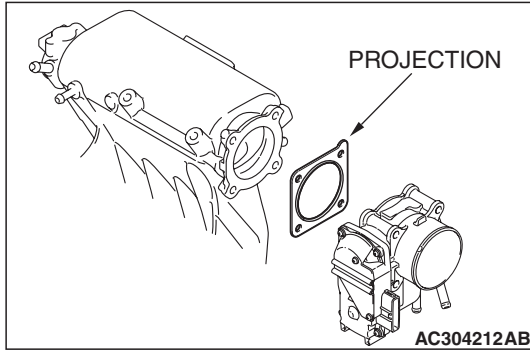
INSTALLATION SERVICE POINT

>>A<< THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

Poor idling etc. may result if the throttle body gasket is installed incorrectly.

Install the gasket as its protrusion is in the direction shown.



>>B<< INITIALIZATION PROCEDURE

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

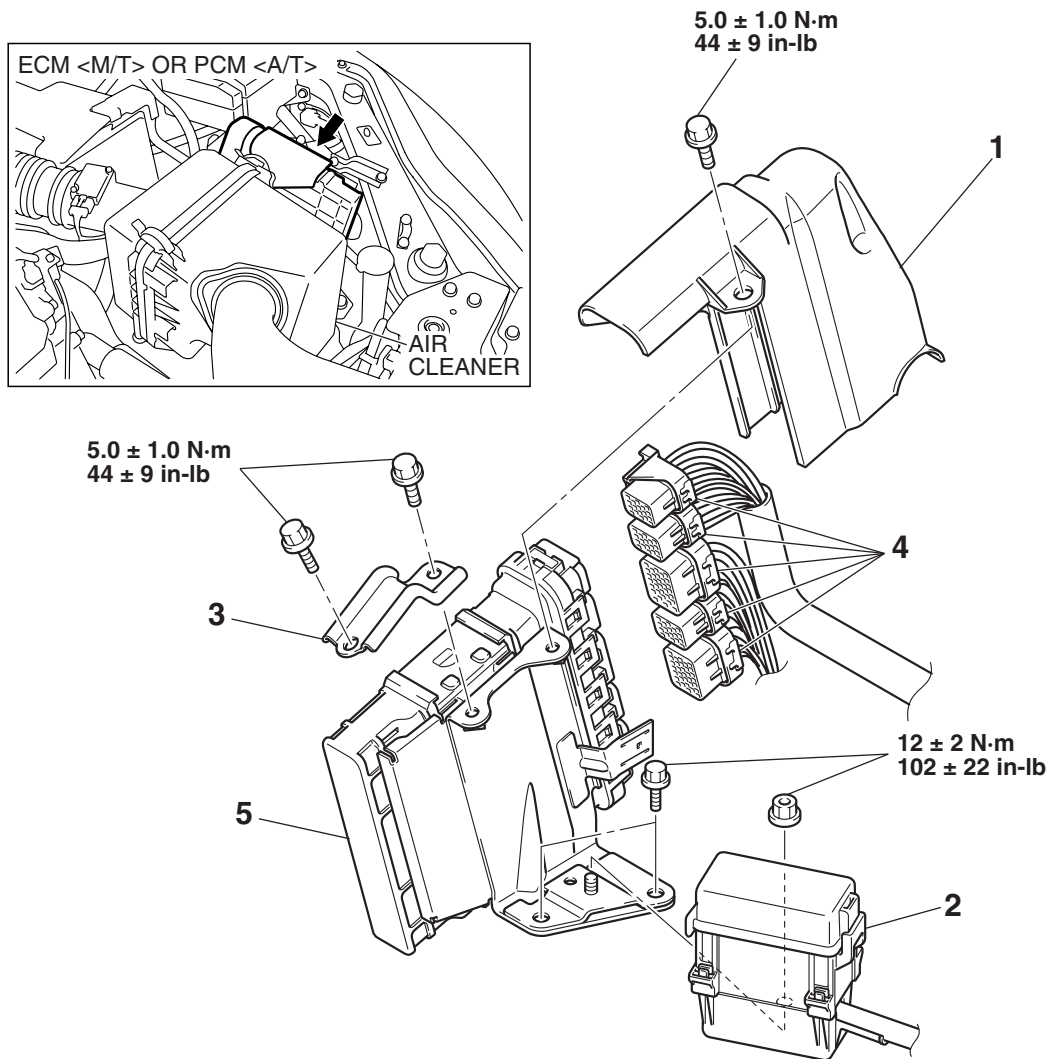
ENGINE CONTROL MODULE (ECM) AND POWERTRAIN CONTROL MODULE (PCM)

REMOVAL AND INSTALLATION

M1131034000044

⚠ CAUTION

Do not replace the ECM <M/T> or PCM <A/T> and the ETACS-ECU simultaneously. Always replace either one of the ECUs first, and register the encrypted code (Refer to GROUP 54A, Encrypted Code Registration Criteria Table P.54A-13). Then, replace the other ECU.



AC405798AB

- >>A<<
- **REMOVAL STEPS**
 - **INITIALIZATION PROCEDURE (INSTALLATION ONLY)**
 - 1. ECM <M/T> OR PCM <A/T> CONNECTOR COVER
 - 2. RELAY BOX

- REMOVAL STEPS (Continued)**
3. ECM <M/T> OR PCM <A/T> BRACKET
 4. ECM <M/T> OR PCM <A/T> CONNECTORS
 5. ECM <M/T> OR PCM <A/T>

INSTALLATION SERVICE POINT

>>A<< INITIALIZATION PROCEDURE

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

FASTENER TIGHTENING SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600636

ITEM	SPECIFICATION
ECM <M/T> or PCM <A/T> bracket bolts	5.0 ± 1.0 N· m (44 ± 9 in-lb)
ECM <M/T> or PCM <A/T> connector cover bolt	5.0 ± 1.0 N· m (44 ± 9 in-lb)
ECM <M/T> or PCM <A/T> mounting bolts	12 ± 2 N· m (102 ± 22 in-lb)
Fuel rail bolt	11 ± 1 N· m (98 ± 8 in-lb)
Relay box mounting nut	5.0 ± 1.0 N· m (44 ± 9 in-lb)
Rocker cover bracket installation bolts	11 ± 1 N· m (98 ± 8 in-lb)
Throttle body mounting bolt	28 ± 4 N· m (21 ± 3 ft-lb)

GENERAL SPECIFICATIONS

M1131000200894

ITEM	SPECIFICATION	
Throttle body	Throttle bore mm (in.)	60 (2.4)
	Throttle position sensor	Hall element type
	Throttle actuator control motor	DC motor type, having brushes
Engine control module (ECM) <M/T>	Identification model No.	E6T45273
Powertrain control module (PCM) <A/T>	Identification model No.	E6T45274
Sensors	Mass airflow sensor	Heat sensitizing type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Accelerator pedal position sensor	Hall element type
	Vehicle speed sensor <M/T>	Electromagnetic resistance element type
	Transmission range switch <A/T>	Contact switch type
	Camshaft position sensor	Magneto resistance element type
	Crankshaft position sensor	Magneto resistance element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold absolute pressure sensor	Semiconductor type
Engine oil pressure switch	Contact switch type	

ITEM		SPECIFICATION
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Throttle actuator control motor relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	IDH322S
	Engine oil control valve	Duty cycle type solenoid valve
	Exhaust gas recirculation (EGR) valve	Stepper motor type
	Evaporative emission purge solenoid	Duty cycle type solenoid valve

SERVICE SPECIFICATIONS

M1131000301322

ITEM		STANDARD VALUE
Fuel pressure kPa (psi)		Approximately 324 (47) at curb idle
Intake air temperature sensor resistance kΩ	- 20° C (- 4° F)	13 - 17
	0° C (32° F)	5.3 - 6.7
	20° C (86° F)	2.3 - 3.0
	40° C (104° F)	1.0 - 1.5
	60° C (140° F)	0.56 - 0.76
	80° C (176° F)	0.30 - 0.45
Engine coolant temperature sensor resistance kΩ	- 20° C (- 4° F)	14 - 17
	0° C (32° F)	5.1 - 6.5
	20° C (86° F)	2.1 - 2.7
	40° C (104° F)	0.9 - 1.3
	60° C (140° F)	0.48 - 0.68
	80° C (176° F)	0.26 - 0.36
Heated oxygen sensor output voltage V		0.6 - 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 - 8.0 [at 20° C (68° F)]
	<Rear>	11 - 18 [at 20° C (68° F)]
Injector coil resistance Ω		10.5 - 13.5 [at 20° C (68° F)]
Throttle actuator control motor coil resistance Ω		0.3 - 80 [at 20° C (68° F)]
Engine oil control valve coil resistance Ω		6.9 - 7.9 [at 20° C (68° F)]

SEALANT AND ADHESIVE

M1131000500914

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731 or equivalent

NOTES