

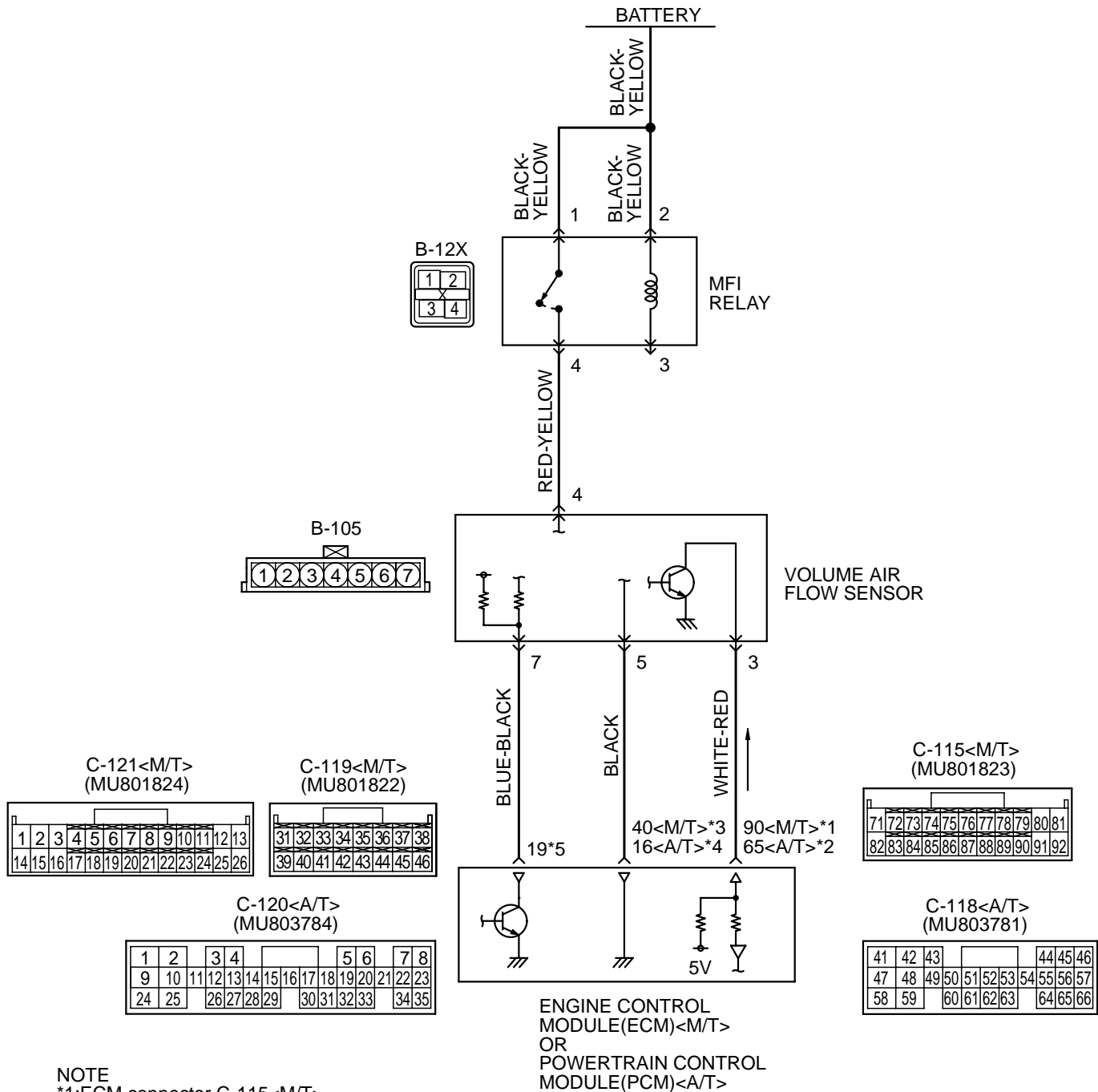
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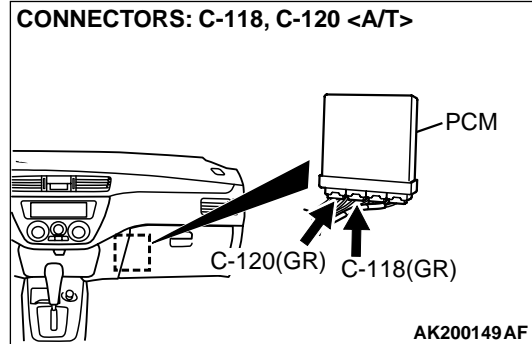
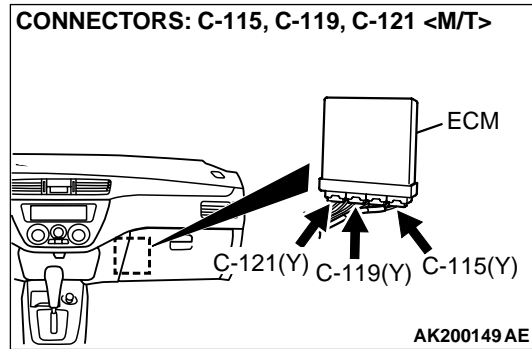
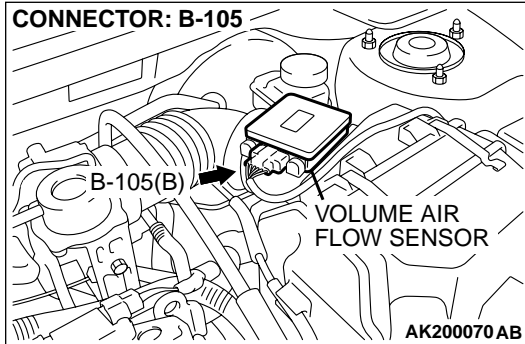
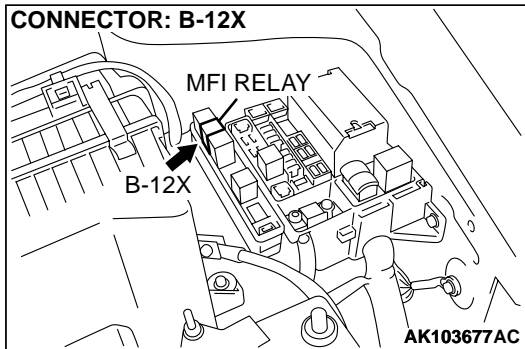
GROUP 13Ac

**DIAGNOSTIC  
TROUBLE CODE  
PROCEDURES**

## DTC P0101: Volume Air Flow Circuit Range/Performance Problem

## Volume Air Flow Sensor Circuit





## CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal No. 3) from the ECM (terminal No. 90) <M/T> or PCM (terminal No. 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

## TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.
- When the throttle position sensor output voltage is low, the ECM <M/T> or PCM <A/T> causes the power transistor to be "ON" to send an air flow sensor reset signal to the air flow sensor. In response to the reset signal, the air flow sensor resets the filter circuit and improves the ability of the air flow sensor to measure the amount of air in a small air intake region.

## DTC SET CONDITIONS

### Check Conditions

- Throttle position sensor output voltage is 1.5 volts or higher.
- Engine speed is higher than 2,000 r/min.

### Judgement Criteria

- Volume air flow sensor output frequency has continued to be 60 Hz or lower for 2 seconds.

### Check Conditions

- Throttle position sensor output voltage is 2 volts or lower.
- Engine speed is lower than 2,000 r/min.

### Judgement Criteria

- Volume air flow sensor output frequency has continued to be 800 Hz or higher for 2 seconds.

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

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
- (4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - The standard value during idling should be 10 Hz or more.
  - When the engine is revved, the frequency should increase according to the increase in engine speed.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

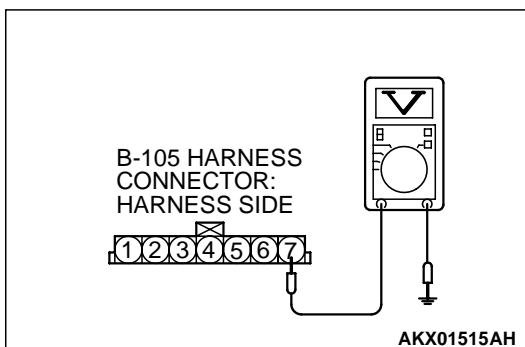
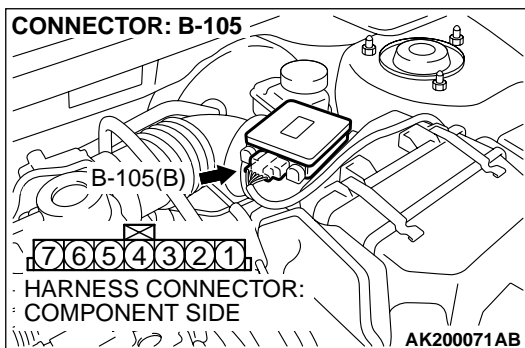
**Q: Is the sensor operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Measure the reset signal voltage at volume air flow sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.



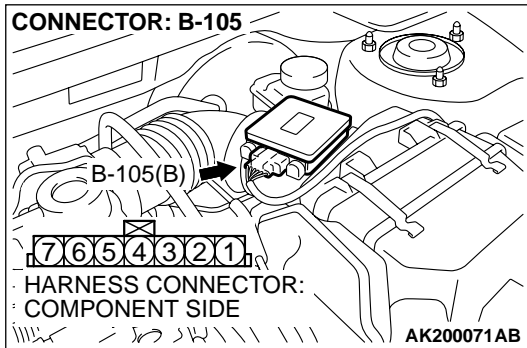
- (3) Measure the voltage between terminal No. 7 and ground by backprobing.
  - Voltage should measure between 6.0 and 9.0 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 6.0 and 9.0 volts?**

**YES :** Go to Step 5.

**NO :** Go to Step 3.



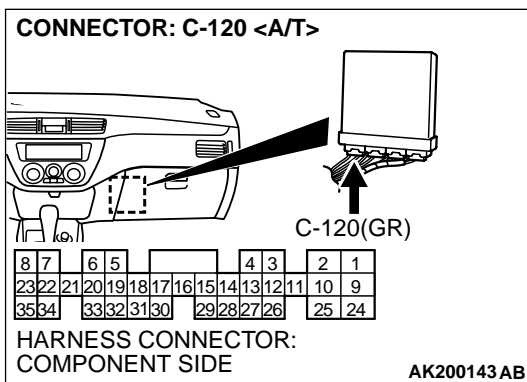
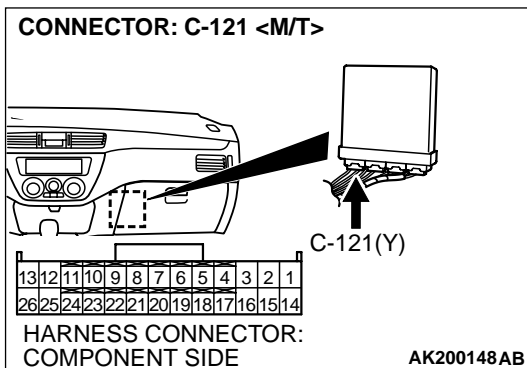


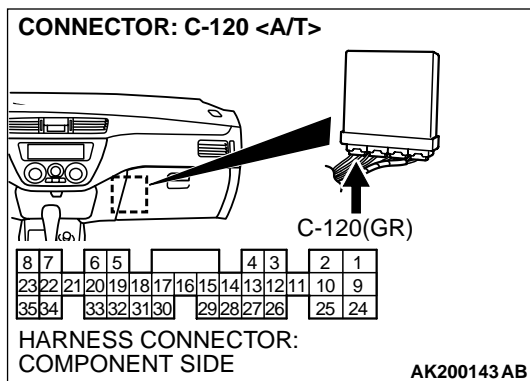
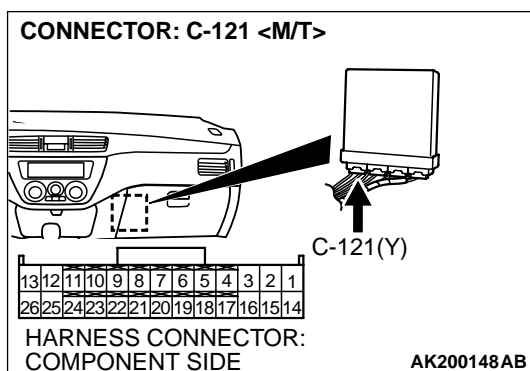
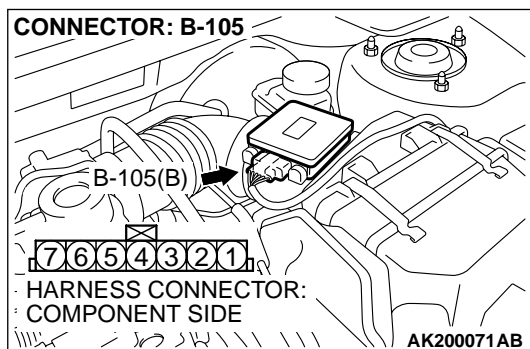
**STEP 3.** Check connector B-105 at volume air flow sensor and connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.



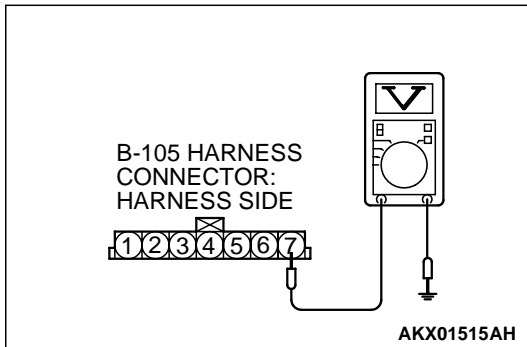
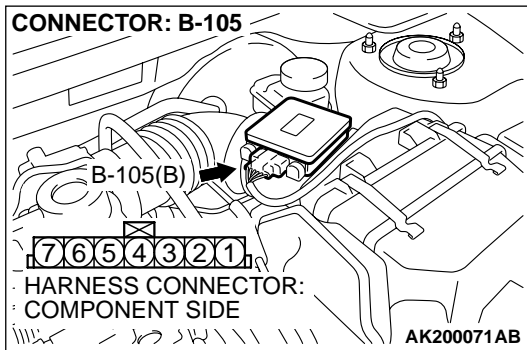


**STEP 4.** Check for short circuit to ground between volume air flow sensor connector B-105 (terminal No. 7) and ECM connector C-121 (terminal No. 19) <M/T> or PCM connector C-120 (terminal No. 19) <A/T>.

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

**YES :** Replace the volume air flow sensor. Then go to Step 9.

**NO :** Repair it. Then go to Step 9.



**STEP 5. Measure the reset signal voltage at volume air flow sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 7 and ground by backprobing.

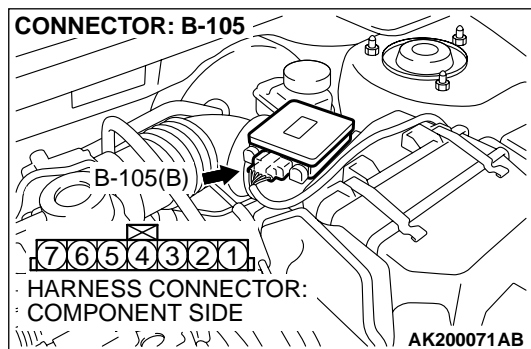
- When the engine idling, voltage should measure 1.0 volt or less.
- When the engine speed is 3,000 r/min, voltage should measure between 6.0 and 9.0 volts.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 8.

**NO :** Go to Step 6.

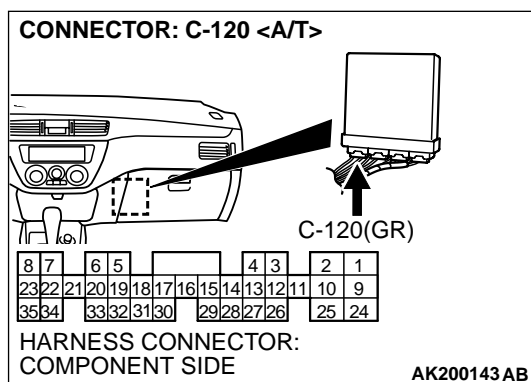
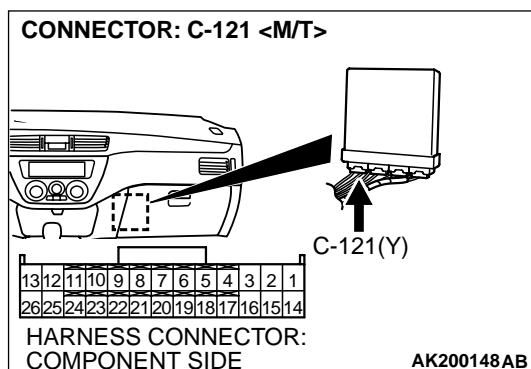


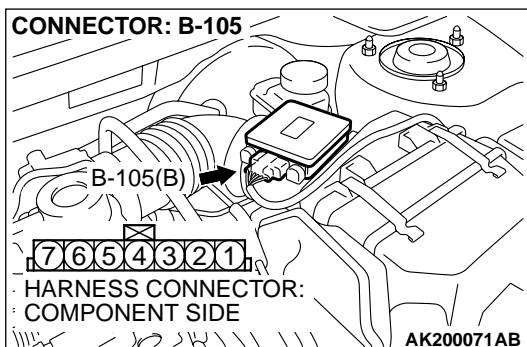
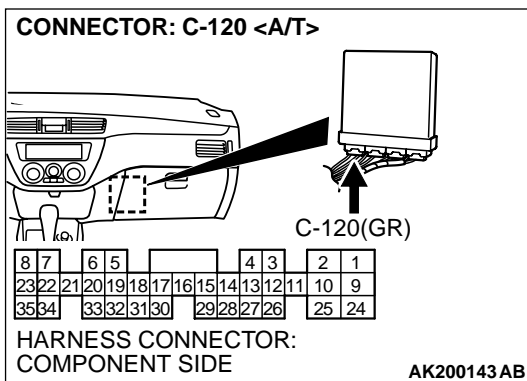
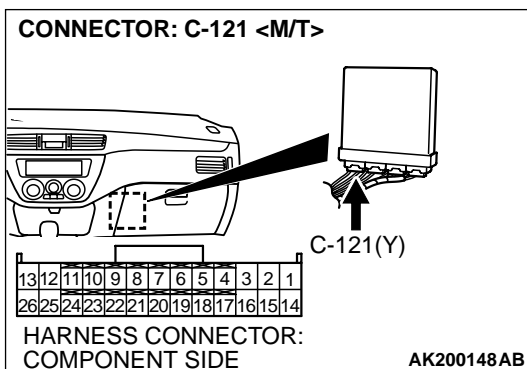
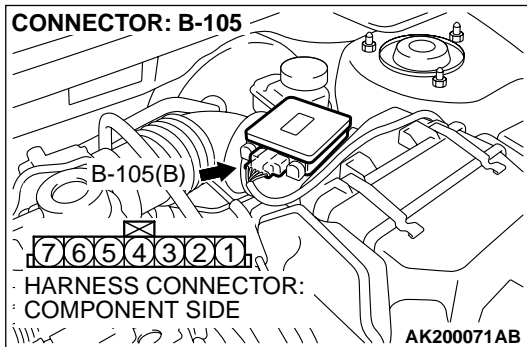
**STEP 6.** Check connector B-105 at volume air flow sensor and connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

**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 go to Step 9.





**STEP 7. Check for open circuit and harness damage between volume air flow sensor connector B-105 (terminal No. 7) and ECM connector C-121 (terminal No. 19) <M/T> or PCM connector C-120 (terminal No. 19) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** Repair it. Then go to Step 9.

**STEP 8. Replace the volume air flow sensor.**

- (1) Replace the volume air flow sensor.
- (2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0101 set?**

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** The procedure is complete.

**STEP 9. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

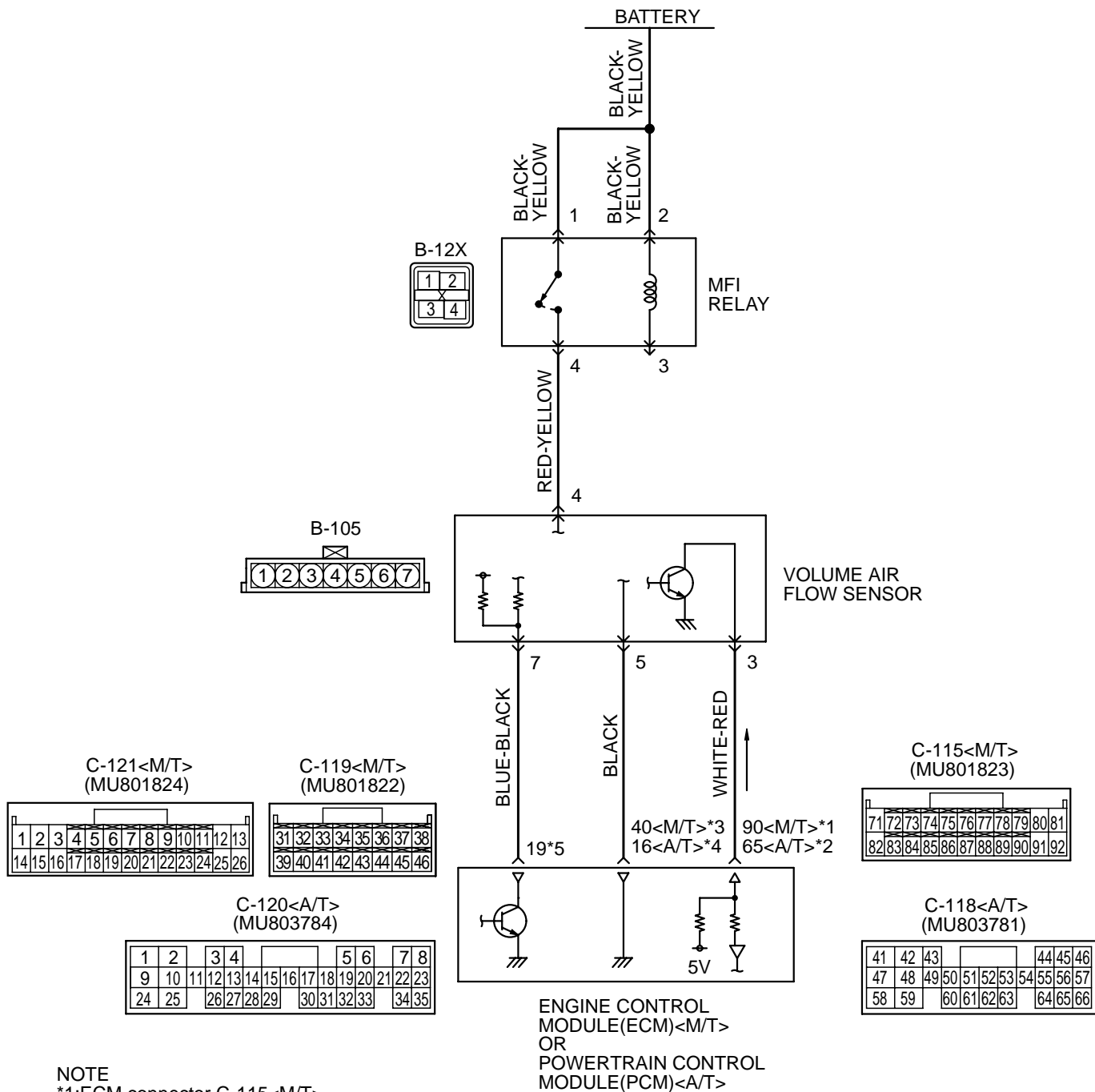
**Q: Is DTC P0101 set?**

**YES** : Repeat the troubleshooting.

**NO** : The procedure is complete.

## DTC P0102: Volume Air Flow Circuit Low Input

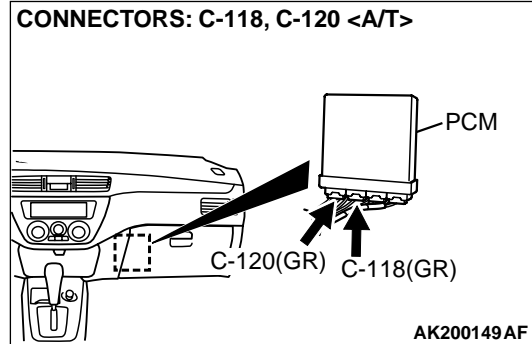
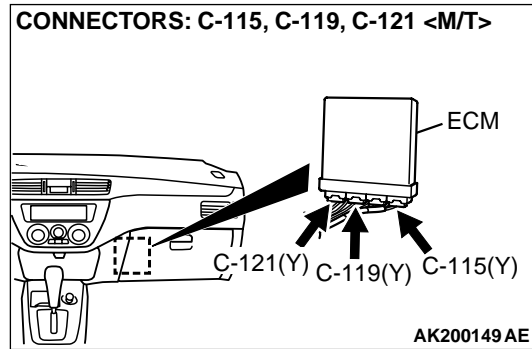
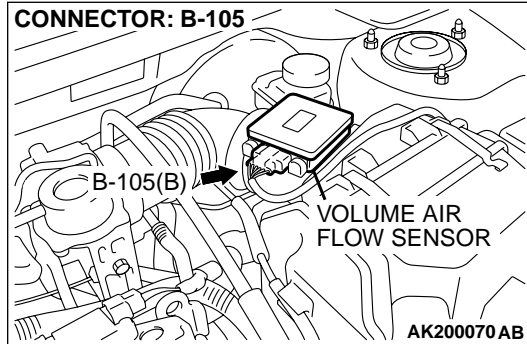
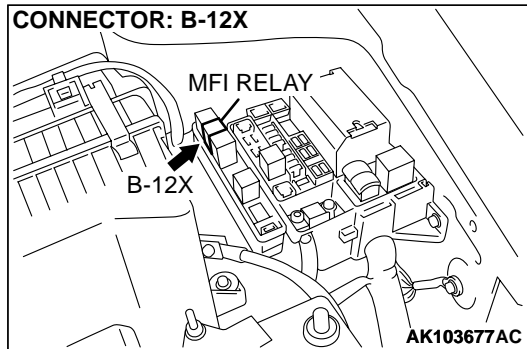
## Volume Air Flow Sensor Circuit



## NOTE

- \*1:ECM connector C-115<M/T>
- \*2:PCM connector C-118<A/T>
- \*3:ECM connector C-119<M/T>
- \*4:PCM connector C-120<A/T>
- \*5:ECM connector C-121<M/T> or PCM connector C-120<A/T>

AK101118



### CIRCUIT OPERATION

- The volume air flow sensor power is supplied from the MFI relay (terminal No. 4), and the ground is provided on the ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- 5-volt power is applied to the volume air flow sensor output terminal (terminal No. 3) from the ECM (terminal No. 90) <M/T> or PCM (terminal No. 65) <A/T>. The volume air flow sensor generates a pulse signal when the output terminal and ground are opened/closed (opened/short).

### TECHNICAL DESCRIPTION

- While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow.
- The ECM <M/T> or PCM <A/T> checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value.

### DTC SET CONDITIONS

#### Check Conditions

- Engine speed is higher than 500 r/min.

#### Judgement Criteria

- Volume air flow sensor output frequency has continued to be 3.3 Hz or lower for 2 seconds.

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

- Volume air flow sensor failed.
- Open or shorted volume air flow sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>
- Air leak between volume air flow sensor and throttle body.



**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
- (4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - The standard value during idling should be 10 Hz or more.
  - When the engine is revved, the frequency should increase according to the increase in engine speed.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

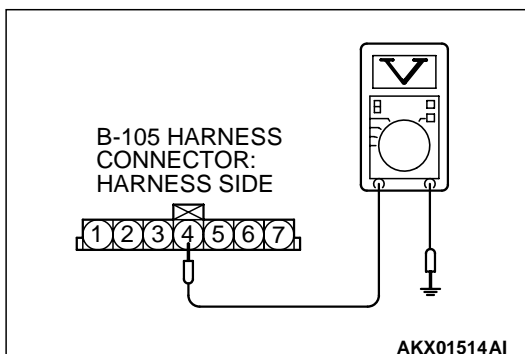
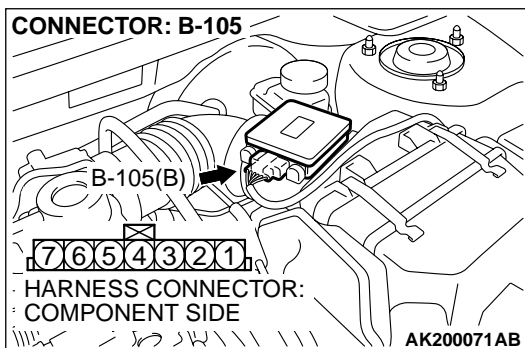
**Q: Is the sensor operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Measure the power supply voltage at volume air flow sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.

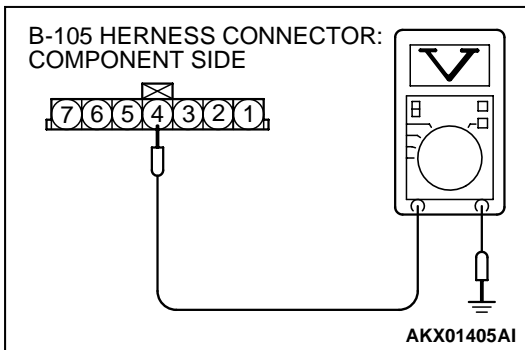
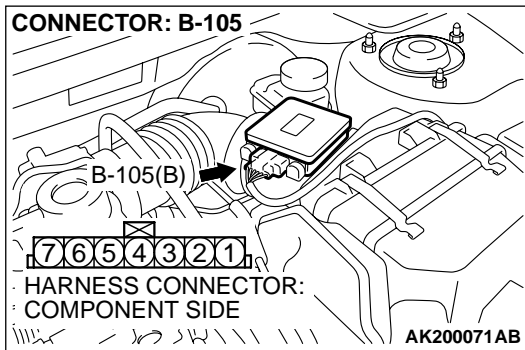


- (3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Voltage should measure battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 5.

**NO :** Go to Step 3.



**STEP 3. Measure the power supply voltage at volume air flow sensor harness side connector B-105.**

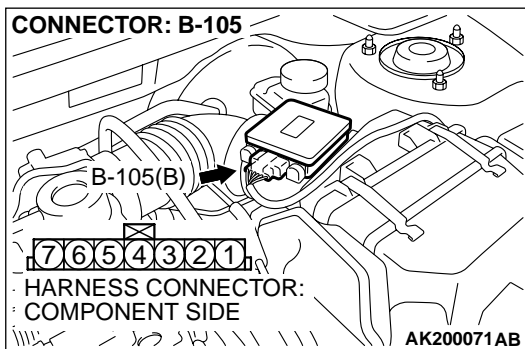
- (1) Disconnect connector B-105 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

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

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

**YES :** Go to Step 4.

**NO :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and volume air flow sensor connector B-105 (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 13.

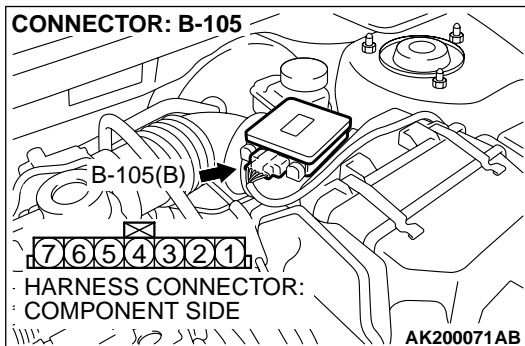


**STEP 4. Check connector B-105 at the volume air flow sensor for damage.**

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

**YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and volume air flow sensor connector B-105 (terminal No. 4) because of harness damage. Then go to Step 13.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

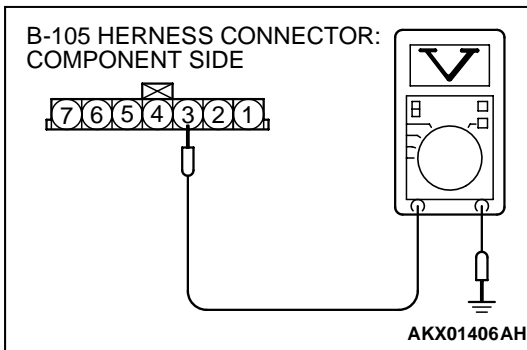
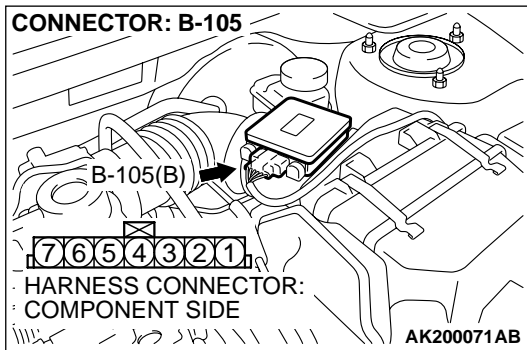


**STEP 5. Check connector B-105 at volume air flow sensor for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



**STEP 6. Measure the sensor supply voltage at volume air flow sensor harness side connector B-105.**

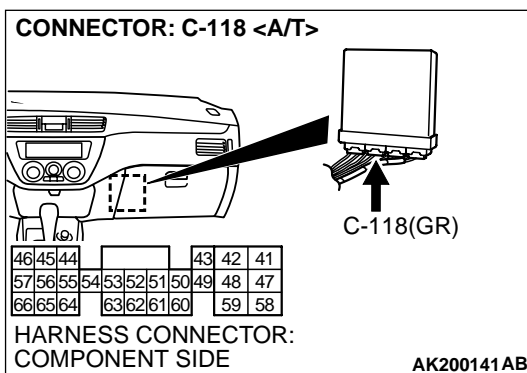
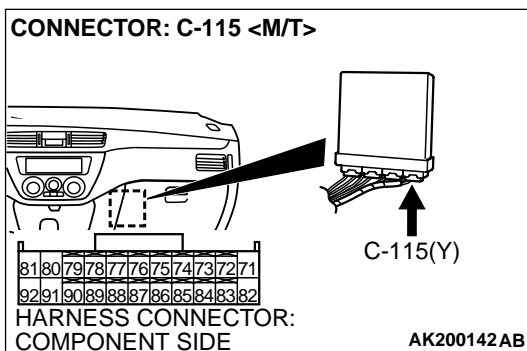
- (1) Disconnect connector B-105 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.8 and 5.2 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 9.

**NO :** Go to Step 7.



**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

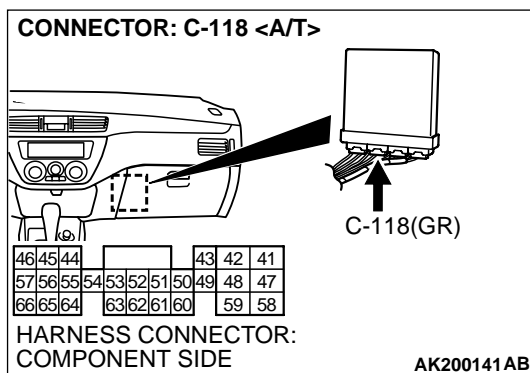
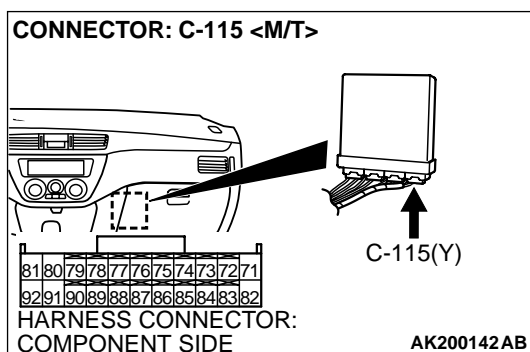
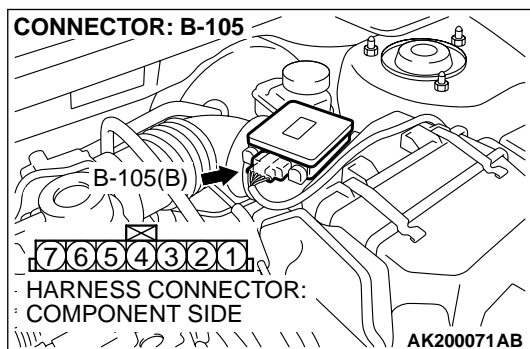
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 13.

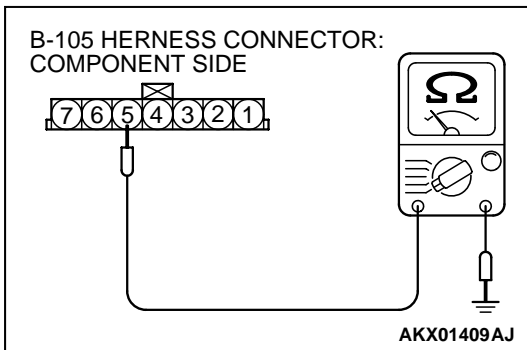
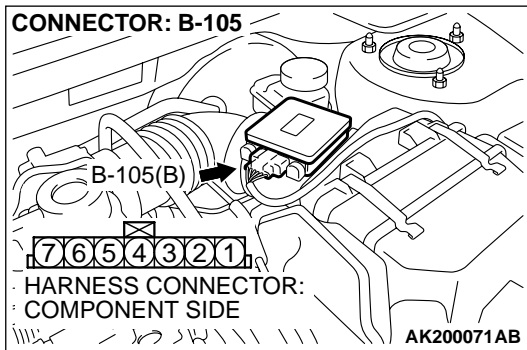
**STEP 8.** Check for short circuit to ground between volume air flow sensor connector B-105 (terminal No. 3) and ECM connector C-115 (terminal No. 90) <M/T> or PCM connector C-118 (terminal No. 65) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 13.

**NO :** Repair it. Then go to Step 13.





**STEP 9. Check for continuity at volume air flow sensor harness side connector B-105.**

(1) Disconnect connector B-105 and measure at the harness side.

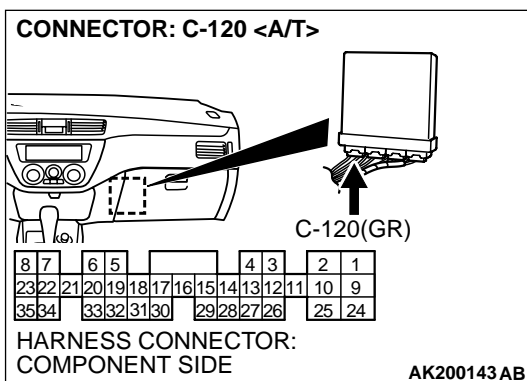
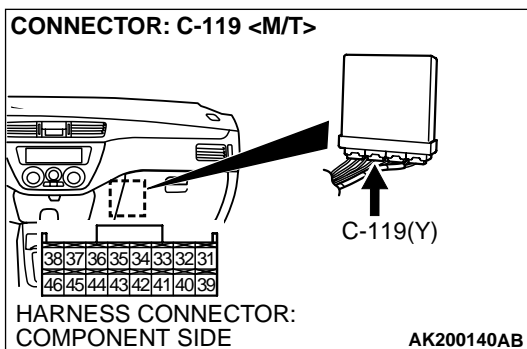
(2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 12.

**NO :** Go to Step 10.



**STEP 10. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 11.

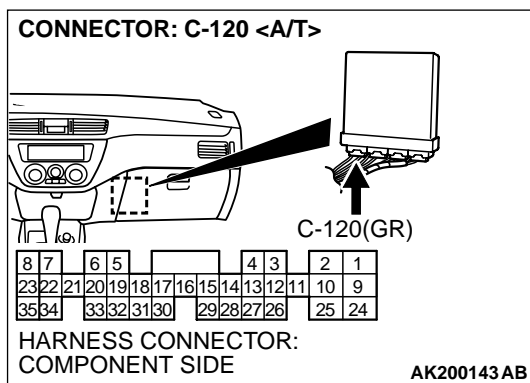
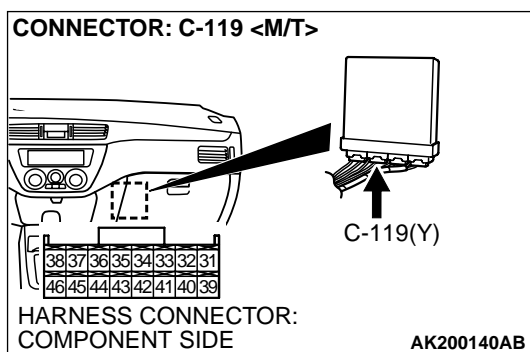
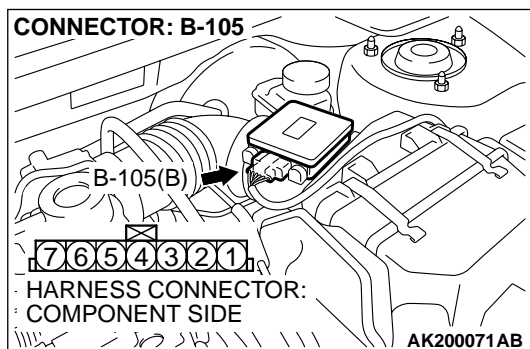
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 13.

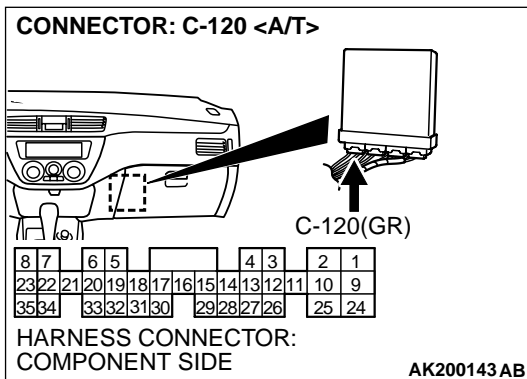
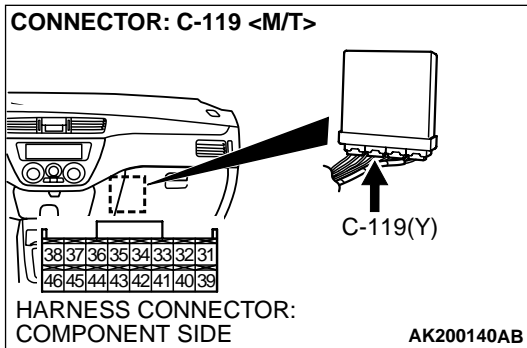
**STEP 11. Check for open circuit and harness damage between volume air flow sensor connector B-105 (terminal No. 5) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 13.

**NO :** Repair it. Then go to Step 13.





**STEP 12. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Replace the volume air flow sensor. Then go to Step 13.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 13.

**STEP 13. Perform the OBD-II drive cycle.**

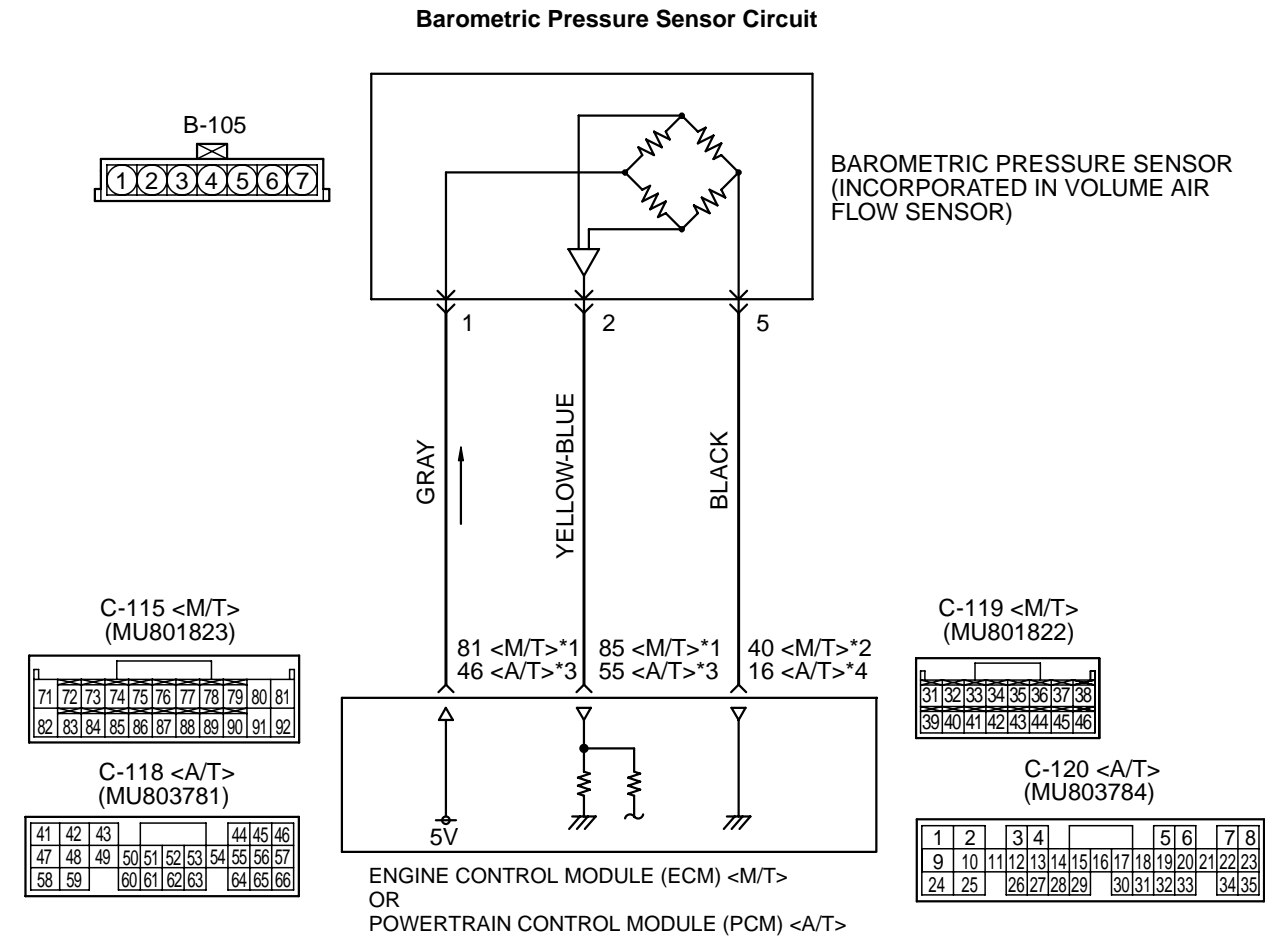
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0102 set?**

**YES :** Repeat the troubleshooting.

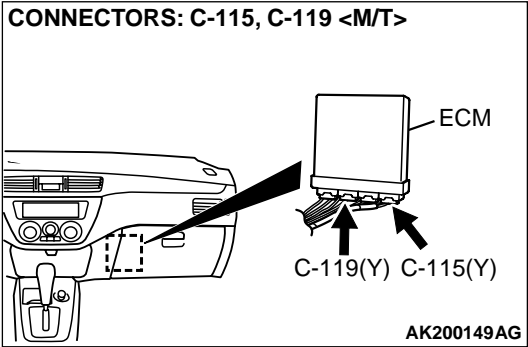
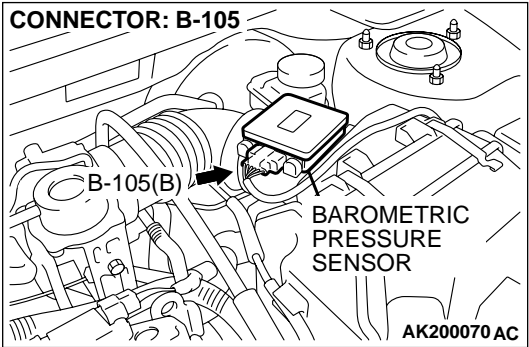
**NO :** The procedure is complete.

DTC P0106: Barometric Pressure Circuit Range/Performance Problem

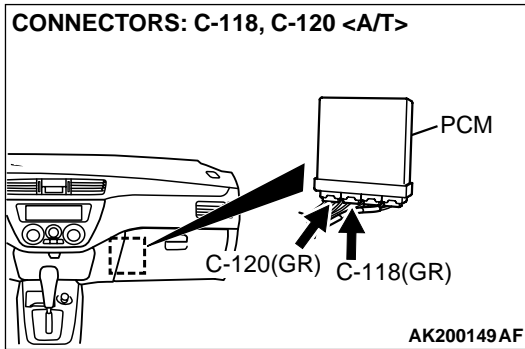


- NOTE
- \*1: ECM connector C-115 <M/T>
  - \*2: ECM connector C-119 <M/T>
  - \*3: PCM connector C-118 <A/T>
  - \*4: PCM connector C-120 <A/T>

AK000862







### CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>. The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal No. 85) <M/T> or PCM (terminal No. 55) <A/T> from the barometric pressure sensor output terminal (terminal No. 2).

### TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

- Barometric pressure is lower than 76 kPa (11 psi).

#### Judgement Criteria

- During 15 times of driving, the changes in the sensor output voltage should measure 0.015 volt [equivalent to 0.4 kPa (0.06 psi)] or less.
- Make sure that the engine coolant temperature is 72°C (160°F) or higher during each of the 15 times of driving. Also, during each of the 15 times of driving, make sure that after the engine has been started, the engine coolant temperature has increased for 23°C (40°F) or higher.

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

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1.** Using scan tool MB991502, read the diagnostic trouble code (DTC).

### ⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is DTC P0107 set?

**YES** : Refer to, DTC P0107 – Barometric Pressure Circuit Low Input [P.13Ac-27](#).

**NO** : Go to Step 2.

**STEP 2.** Check connector B-105 at the barometric pressure sensor for damage.

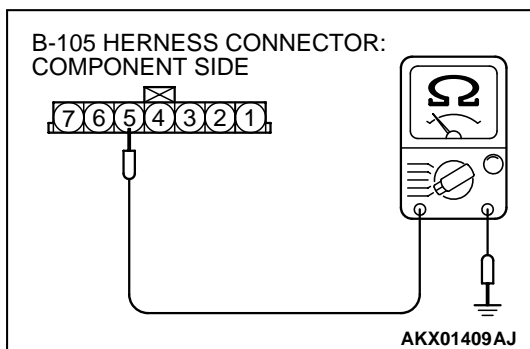
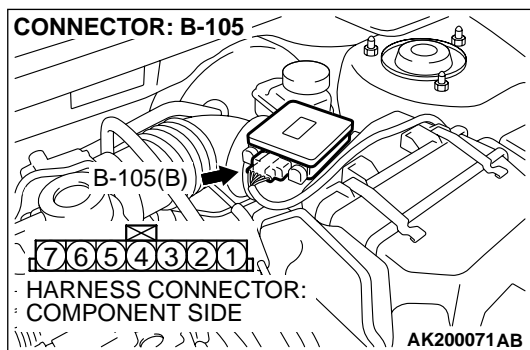
### Q: Is the connector in good condition?

**YES** : Go to Step 3.

**NO** : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.

**STEP 3.** Check for continuity at barometric pressure sensor harness side connector B-105.

- (1) Disconnect connector B-105 and measure at the harness side.



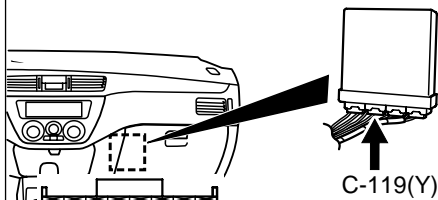
- (2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

### Q: Does continuity exist?

**YES** : Go to Step 6.

**NO** : Go to Step 4.

**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

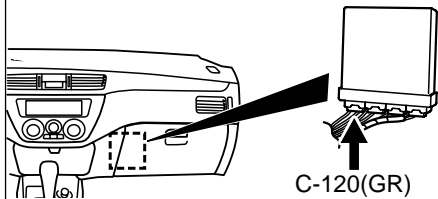
AK200140AB

**STEP 4. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> 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 go to Step 9.

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

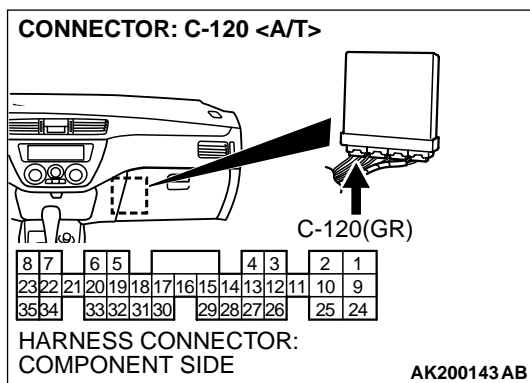
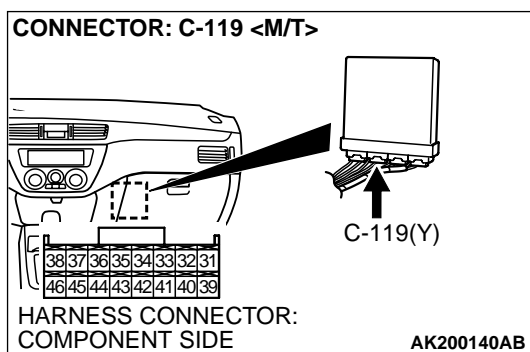
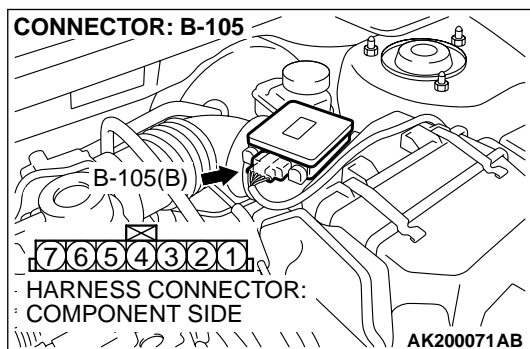
AK200143AB

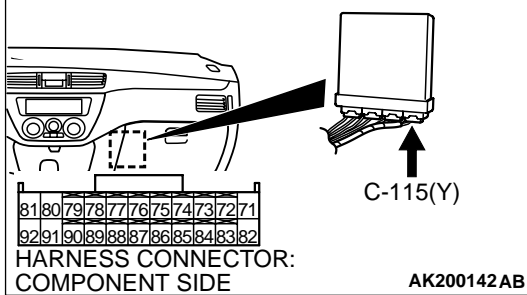
**STEP 5. Check for open circuit and harness damage between barometric pressure sensor connector B-105 (terminal No. 5) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** Repair it. Then go to Step 9.



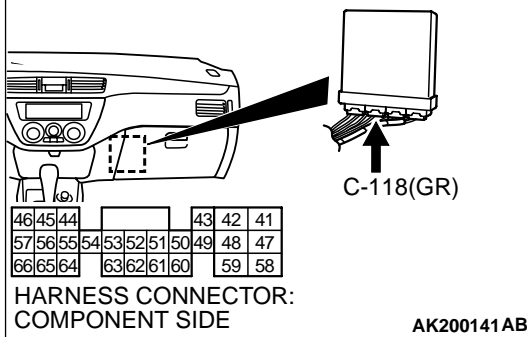
**CONNECTOR: C-115 <M/T>**

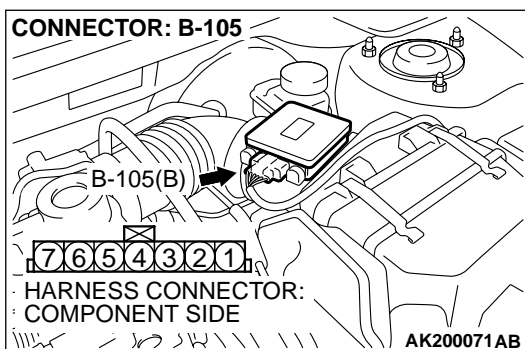
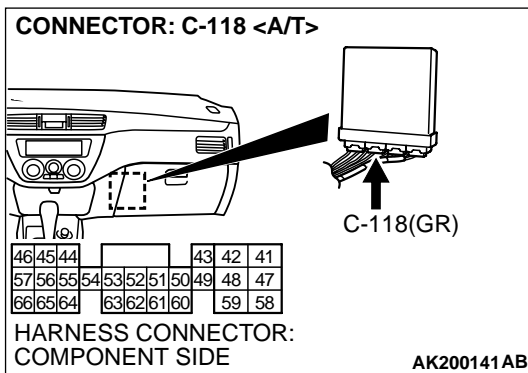
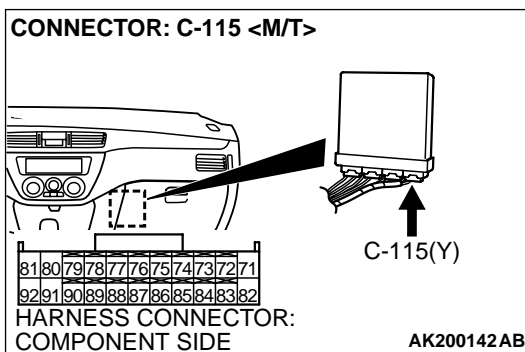
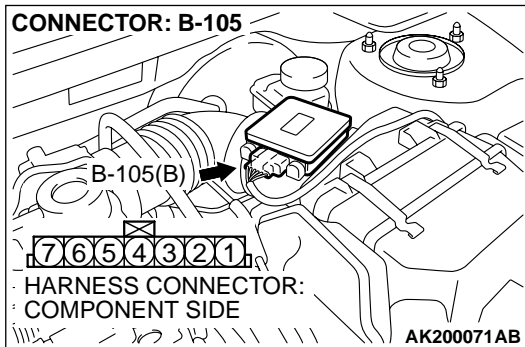
**STEP 6. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

**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 go to Step 9.

**CONNECTOR: C-118 <A/T>**



**STEP 7. Check for open circuit and harness damage between barometric pressure sensor connector B-105 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.**

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

**YES :** Go to Step 8.

**NO :** Repair it. Then go to Step 9.

**STEP 8. Replace the barometric pressure sensor.**

- (1) Replace the barometric pressure sensor.
- (2) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 6 – Other Monitor [P.13Ab-2](#).
- (3) Check the diagnostic trouble code (DTC).

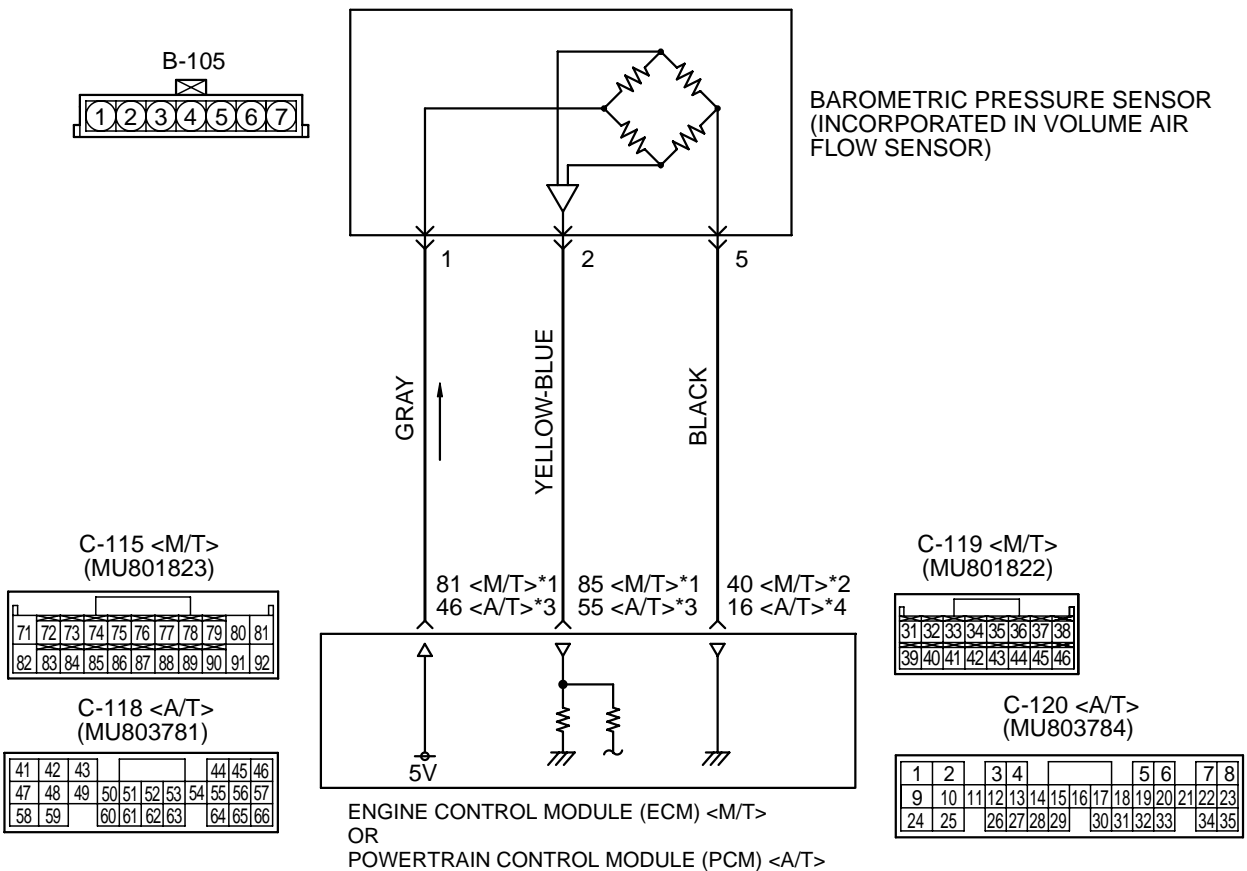
**Q: Is DTC P0106 set?**

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** The procedure is complete.

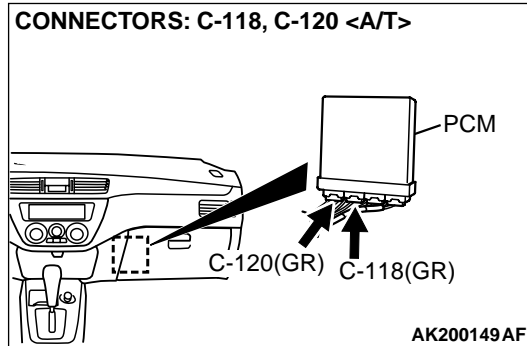
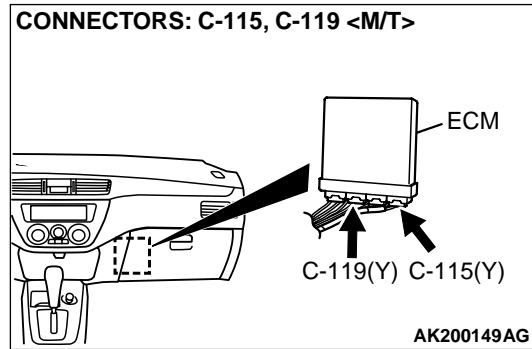
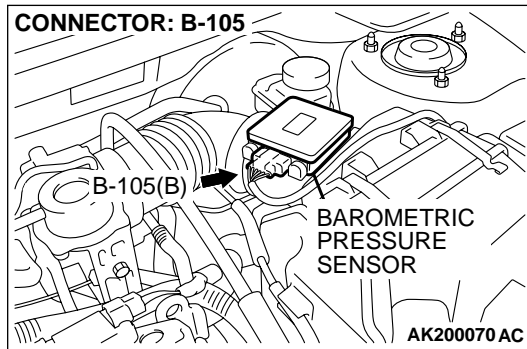
**STEP 9. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0106 set?****YES :** Repeat the troubleshooting.**NO :** The procedure is complete.**DTC P0107: Barometric Pressure Circuit Low Input****Barometric Pressure Sensor Circuit****NOTE**

- \*1: ECM connector C-115 <M/T>
- \*2: ECM connector C-119 <M/T>
- \*3: PCM connector C-118 <A/T>
- \*4: PCM connector C-120 <A/T>

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### CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>. The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal No. 85) <M/T> or PCM (terminal No. 55) <A/T> from the barometric pressure sensor output terminal (terminal No. 2).

### TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

#### Judgement Criteria

- Barometric pressure sensor output signal has continued to be approximately 49 kPa (7.2 psi) or lower (approximately 15,000 ft above sea level) for 10 seconds.

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

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>



**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

**⚠ CAUTION**

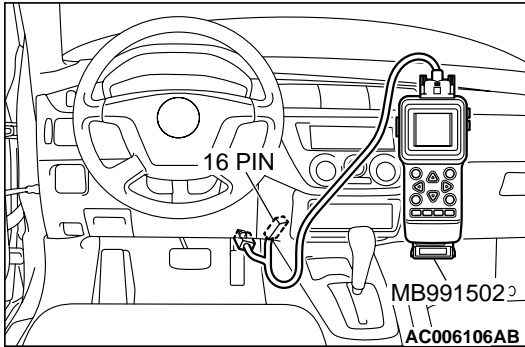
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

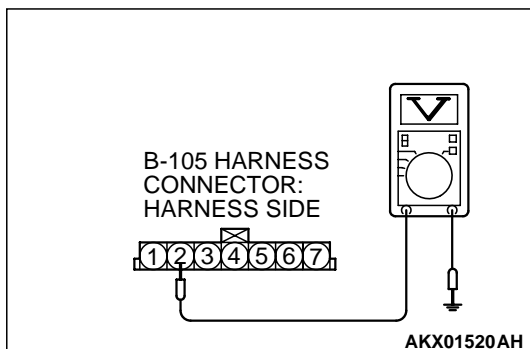
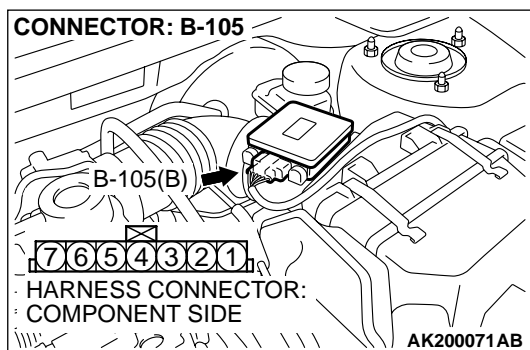
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent.  
Refer to GROUP 00, How to Use Troubleshooting/  
Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Measure the sensor output voltage at barometric pressure sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.

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

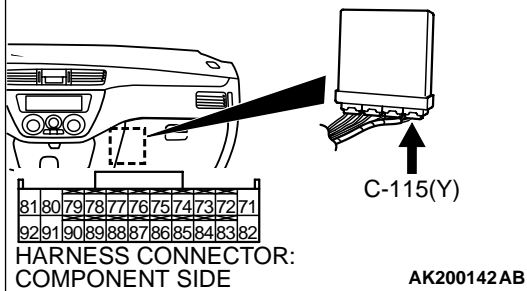
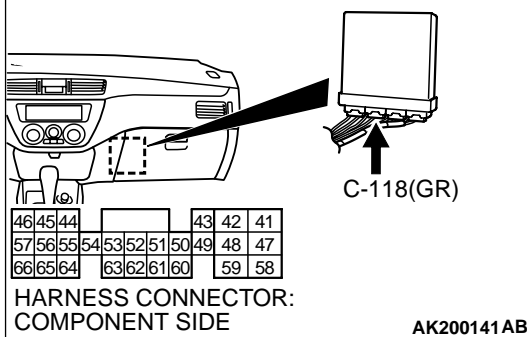
- When altitude is 0 m (0 foot), voltage should measure 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should measure 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should measure 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should measure 2.9 and 3.5 volts.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

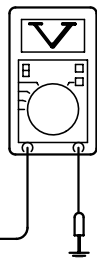
**NO :** Go to Step 7.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

&lt;M/T&gt;

C-115 HARNESS  
CONNECTOR:  
HARNESS SIDE

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92

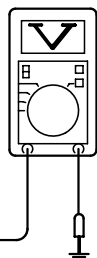


AK000281 AG

&lt;A/T&gt;

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

41	42	43					44	45	46	
47	48	49	50	51	52	53	54	55	56	57
58	59		60	61	62	63	64	65	66	



AK000282 AK

**STEP 3. Measure the sensor output voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect connector C-115 <M/T> or C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 85 <M/T> or terminal No. 55 <A/T> and ground by backprobing.

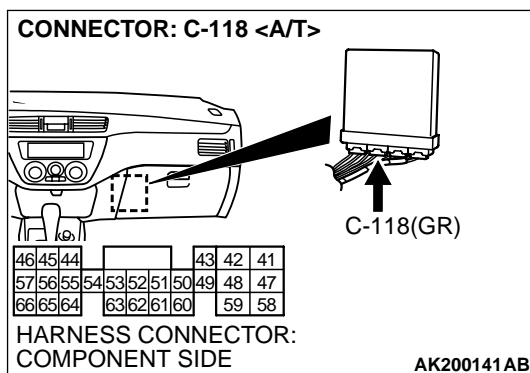
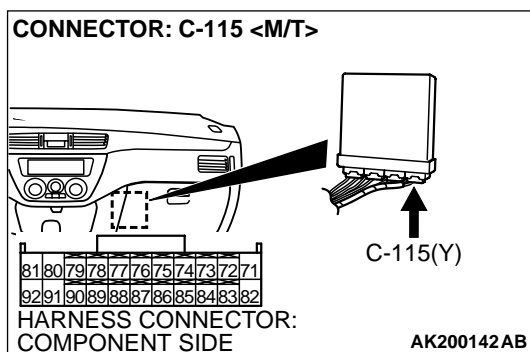
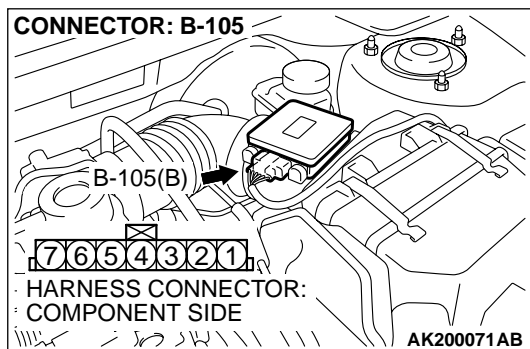
- When altitude is 0 m (0 foot), voltage should measure 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should measure 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should measure 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should measure 2.9 and 3.5 volts.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 4.

**NO :** Go to Step 6.

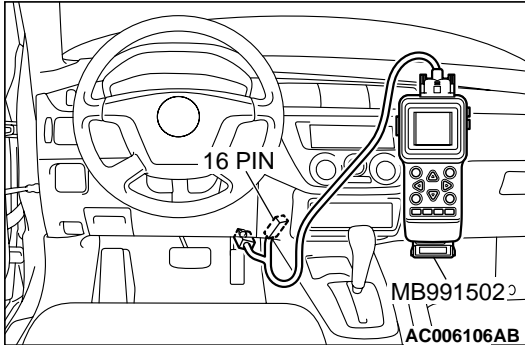


**STEP 4.** Check connector B-105 at the barometric pressure sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

**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 go to Step 18.



**STEP 5. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

**⚠ CAUTION**

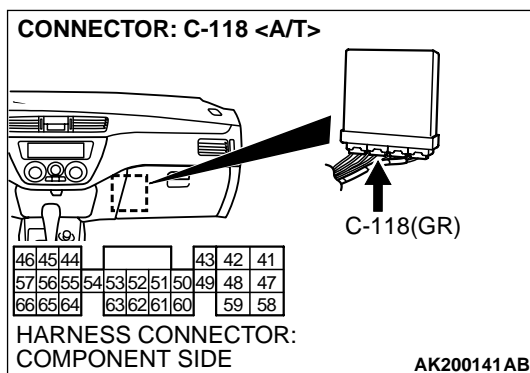
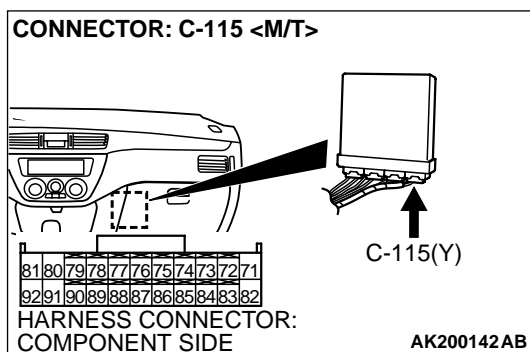
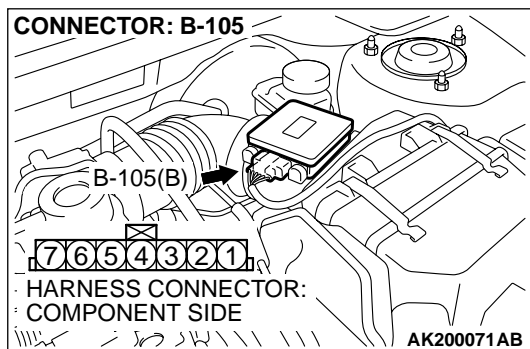
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent.  
Refer to GROUP 00, How to Use Troubleshooting/  
Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 18.

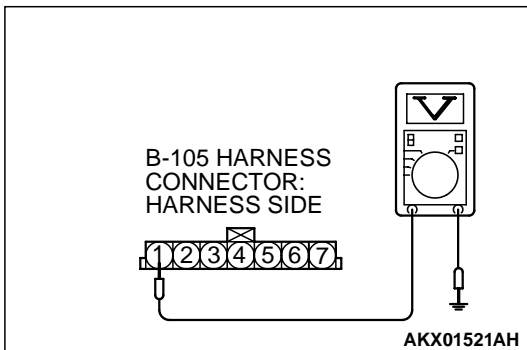
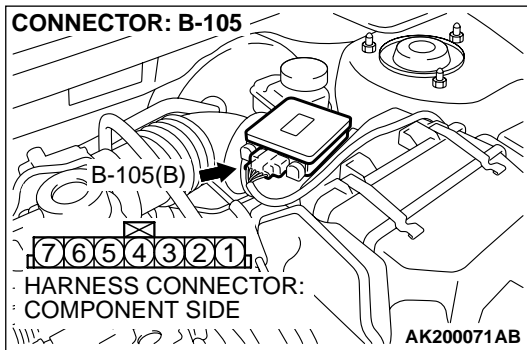


**STEP 6. Check connector B-105 at the barometric pressure sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between barometric pressure sensor connector B-105 (terminal No. 2) and ECM connector C-115 (terminal No. 85) <M/T> or PCM connector C-118 (terminal No. 55) <A/T> because of open circuit or harness damage. Then go to Step 18.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 18.



**STEP 7. Measure the sensor supply voltage at barometric pressure sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground by backprobing.

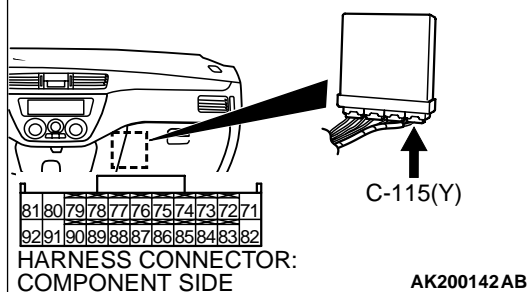
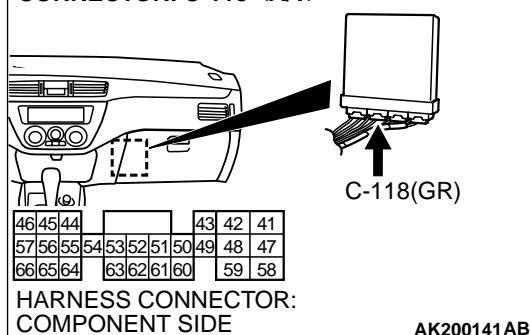
- Voltage should measure between 4.8 and 5.2 volts.

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

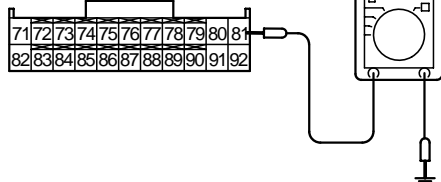
**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 12.

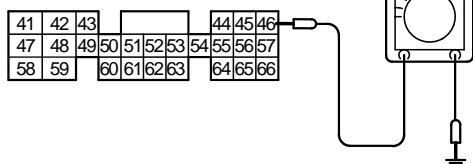
**NO :** Go to Step 8.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

&lt;M/T&gt;

C-115 HARNESS  
CONNECTOR:  
HARNESS SIDE

&lt;A/T&gt;

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

**STEP 8. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect connector C-115 <M/T> or C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 81 <M/T> or No. 46 <A/T> and ground by backprobing.

- Voltage should measure between 4.8 and 5.2 volts.

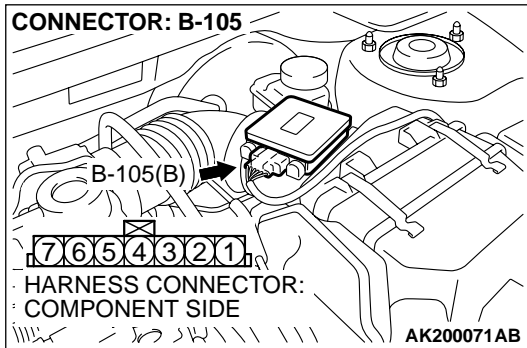
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 9.

**NO :** Go to Step 10.



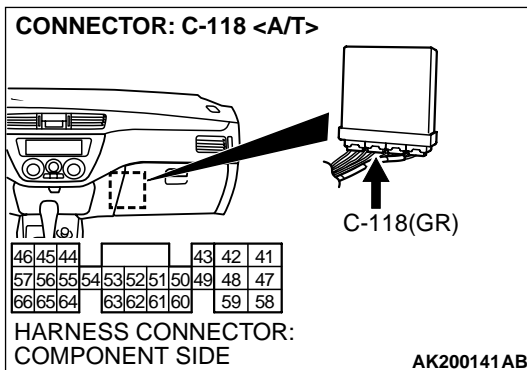
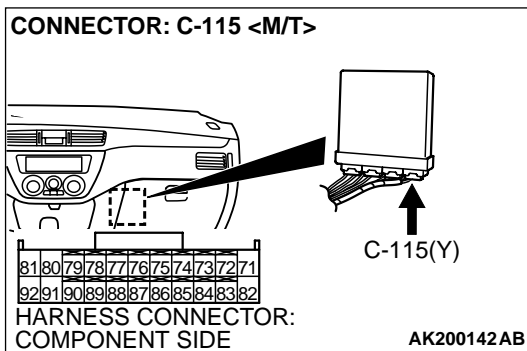


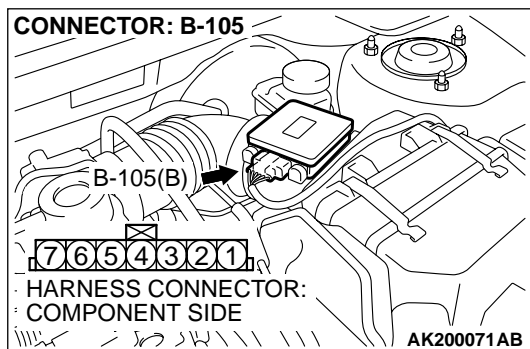
**STEP 9.** Check connector B-105 at the barometric pressure sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

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

**YES :** Repair harness wire between barometric pressure sensor connector B-105 (terminal No. 1) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T> because of open circuit or harness damage. Then go to Step 18.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 18.



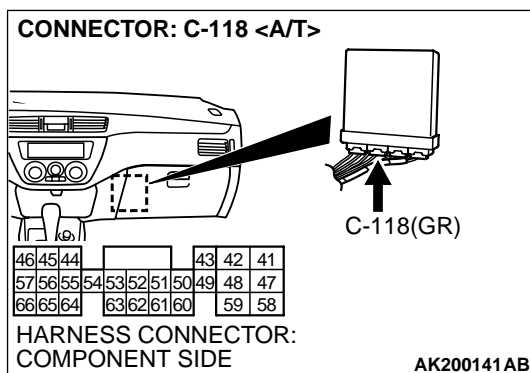
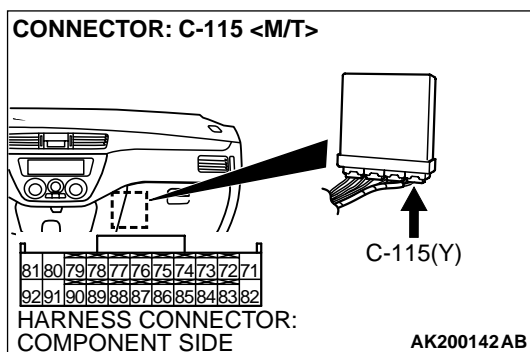


**STEP 10.** Check connector B-105 at the barometric pressure sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

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

**YES :** Go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 18.

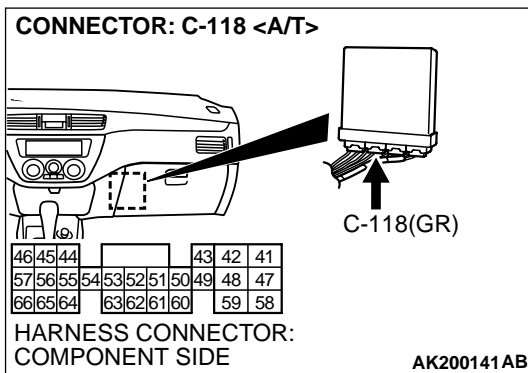
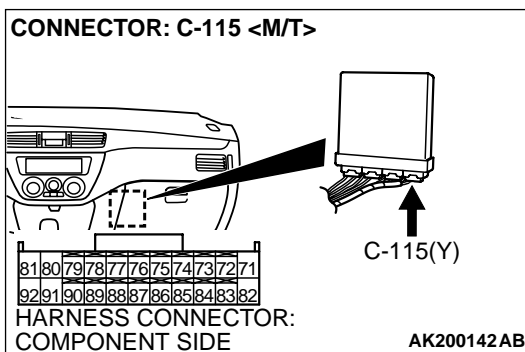
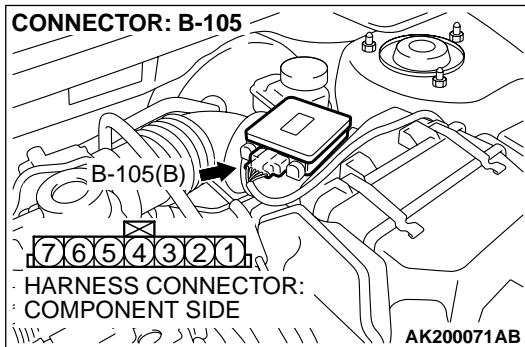


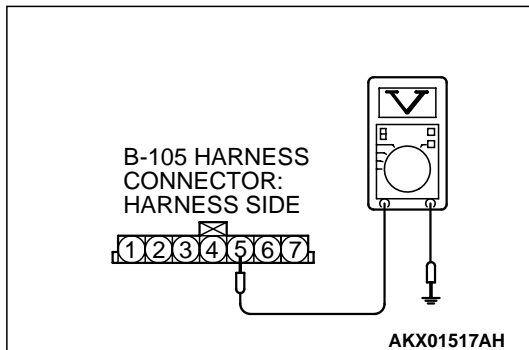
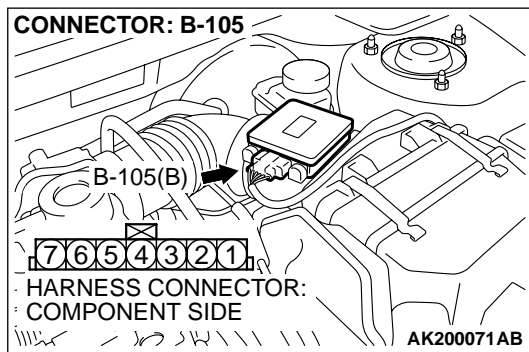
**STEP 11.** Check for short circuit to ground between barometric pressure sensor connector B-105 (terminal No. 1) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 18.

**NO :** Repair it. Then go to Step 18.





**STEP 12. Measure the ground voltage at barometric pressure sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.

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

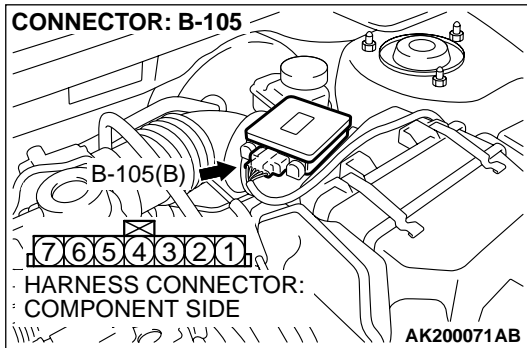
- Voltage should measure 0.5 volt or less.

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

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

**YES :** Go to Step 15.

**NO :** Go to Step 13.

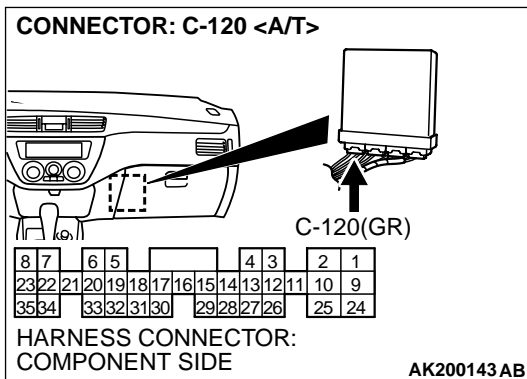
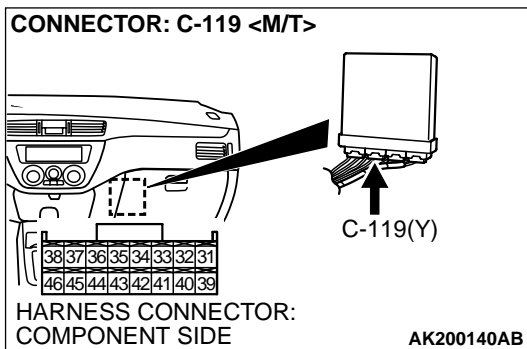


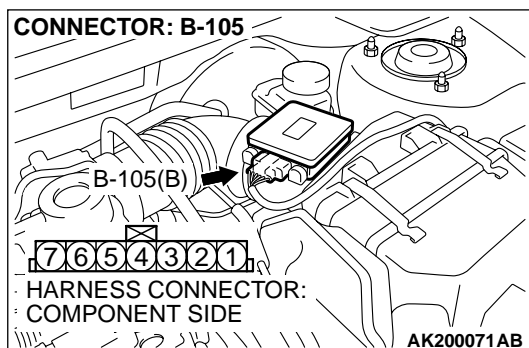
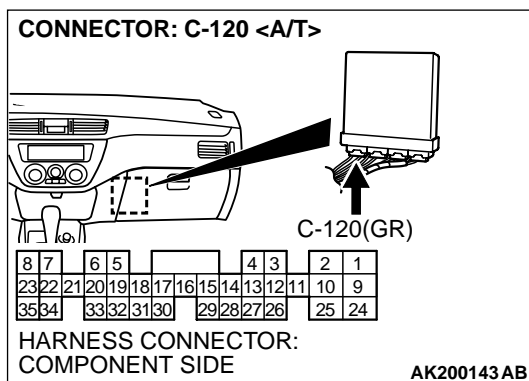
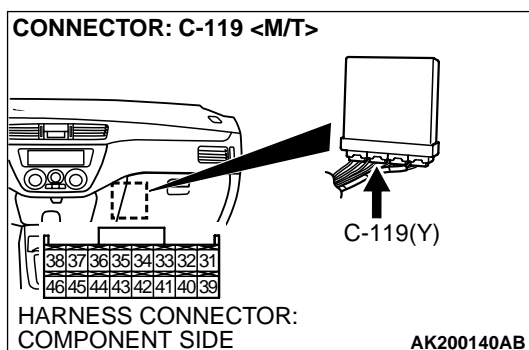
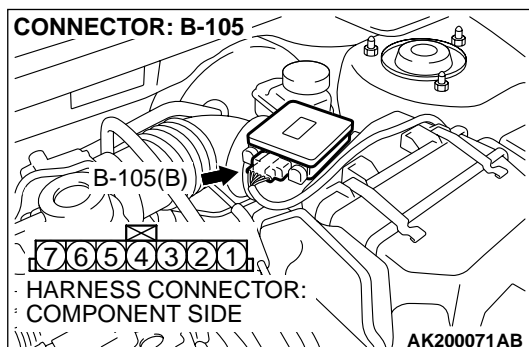
**STEP 13.** Check connector B-105 at the barometric pressure sensor and connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

**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 go to Step 18.





**STEP 14. Check for harness damage between barometric pressure sensor connector B-105 (terminal No. 5) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 18.

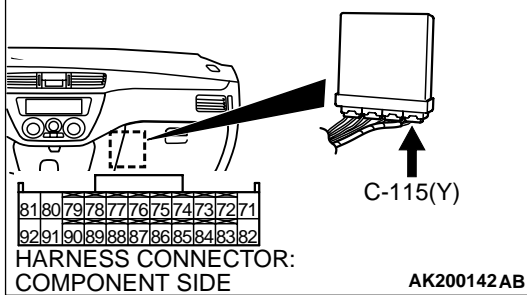
**NO :** Repair it. Then go to Step 18.

**STEP 15. Check connector B-105 at barometric pressure sensor for damage.**

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

**YES :** Go to Step 16.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 18.

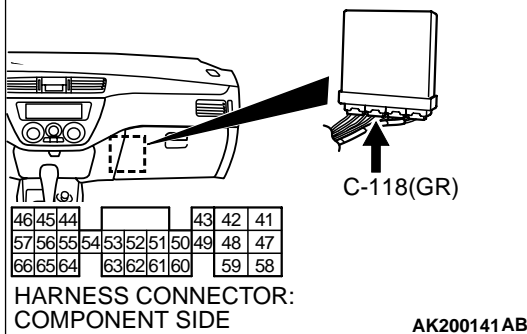
**CONNECTOR: C-115 <M/T>**

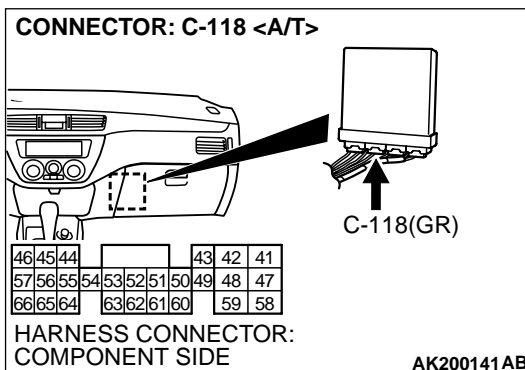
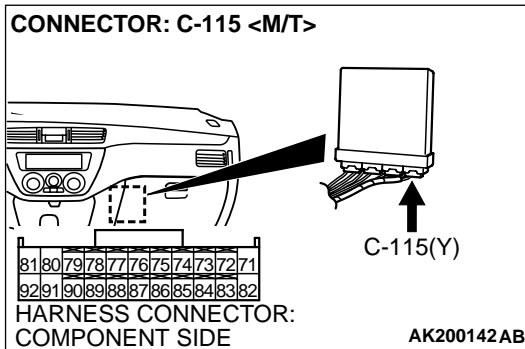
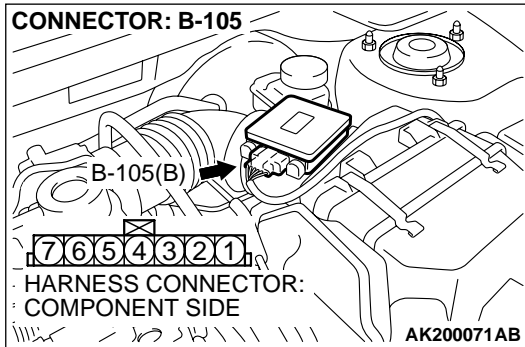
**STEP 16. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 17.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 18.

**CONNECTOR: C-118 <A/T>**



**STEP 17. Check for short circuit to ground and harness damage between barometric pressure sensor connector B-105 (terminal No. 2) and ECM connector C-115 (terminal No. 85) <M/T> or PCM connector C-118 (terminal No. 55) <A/T>.**

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

**YES :** Replace the volume air flow sensor. Then go to Step 18.

**NO :** Repair it. Then go to Step 18.

**STEP 18. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

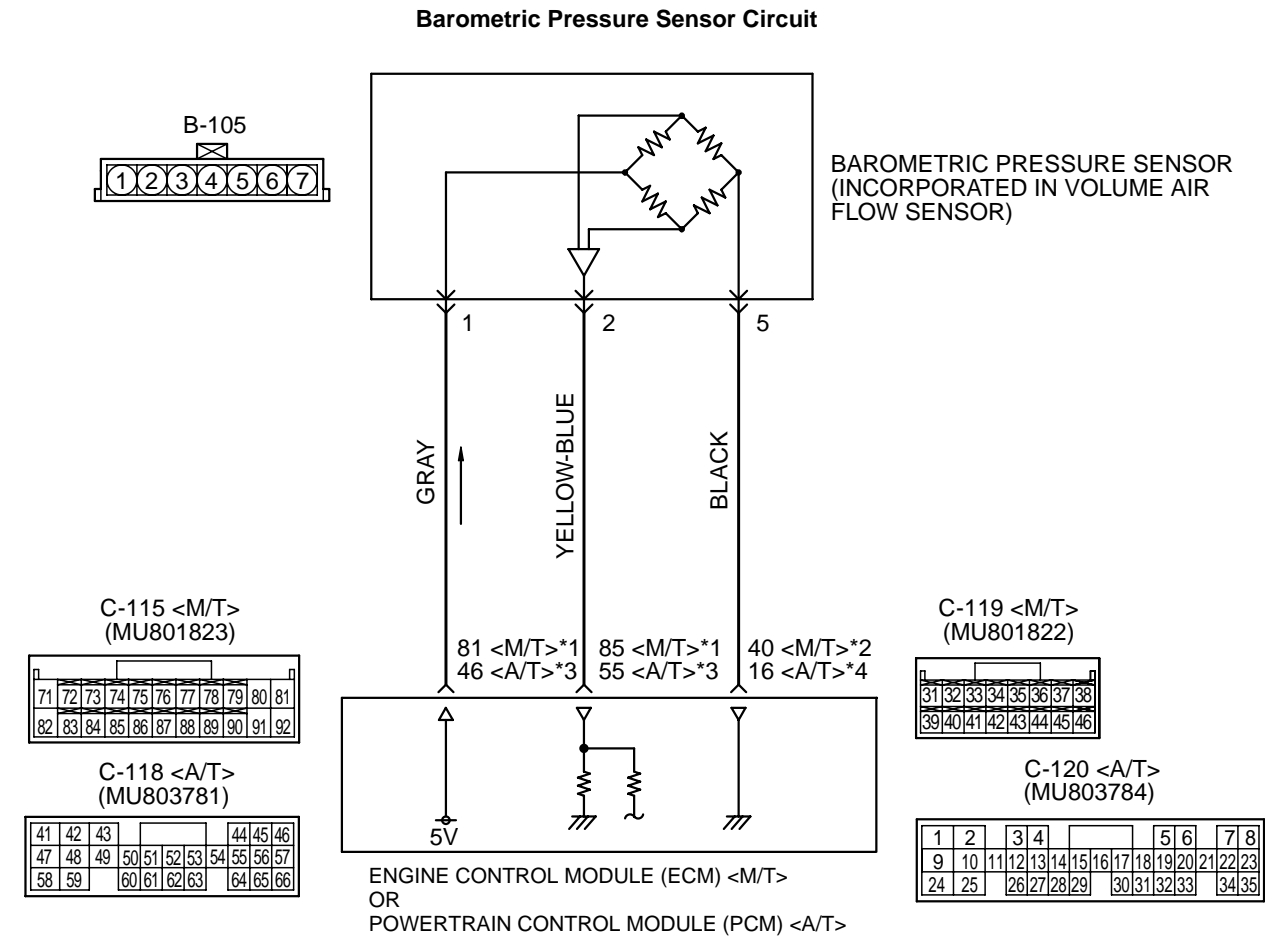
**Q: Is DTC P0107 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

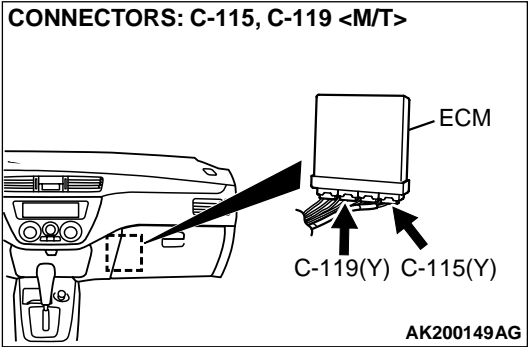
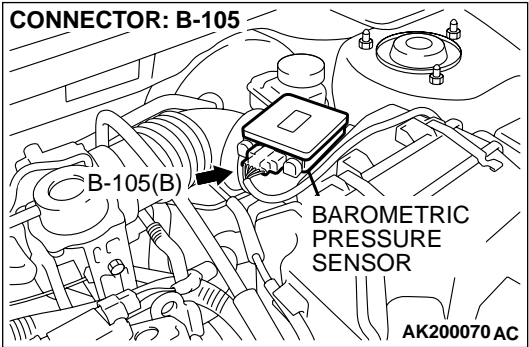


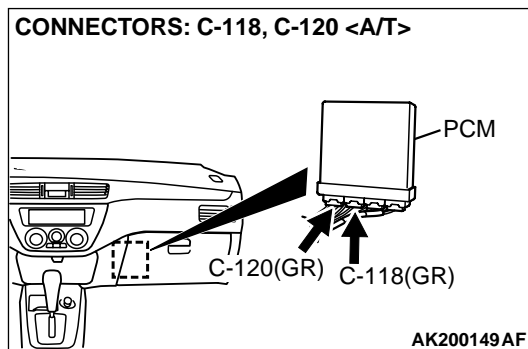
DTC P0108: Barometric Pressure Circuit High Input



- NOTE
- \*1: ECM connector C-115 <M/T>
  - \*2: ECM connector C-119 <M/T>
  - \*3: PCM connector C-118 <A/T>
  - \*4: PCM connector C-120 <A/T>

AK000862





### CIRCUIT OPERATION

- A 5-volt voltage is supplied to the barometric pressure sensor power terminal (terminal No. 1) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>. The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- A voltage that is proportional to the atmospheric pressure is sent to the ECM (terminal No. 85) <M/T> or PCM (terminal No. 55) <A/T> from the barometric pressure sensor output terminal (terminal No. 2).

### TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

#### Judgement Criteria

- Barometric pressure sensor output signal has continued to be approximately 113 kPa (16 psi) or higher (approximately 4,000 ft below sea level) for 10 seconds.

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

- Barometric pressure sensor failed.
- Open or shorted barometric pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

**⚠ CAUTION**

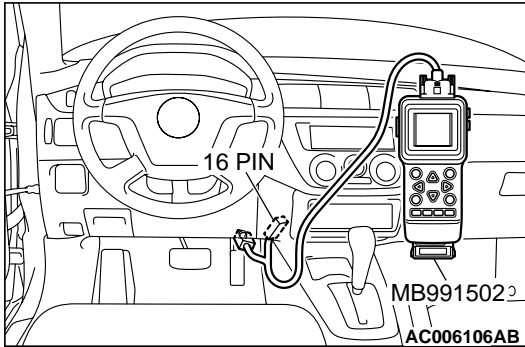
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

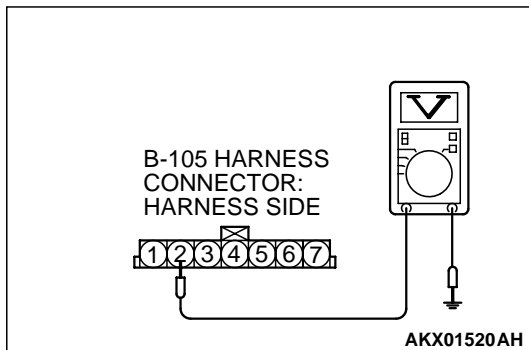
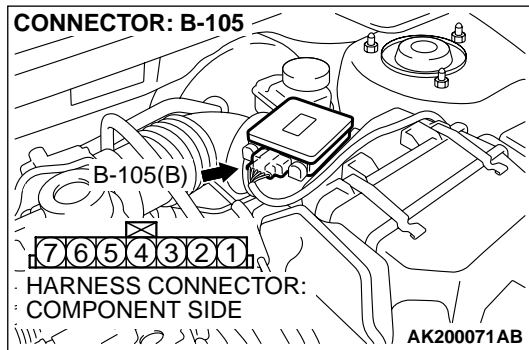
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent.  
Refer to GROUP 00, How to Use Troubleshooting/  
Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Measure the sensor output voltage at barometric pressure sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.

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

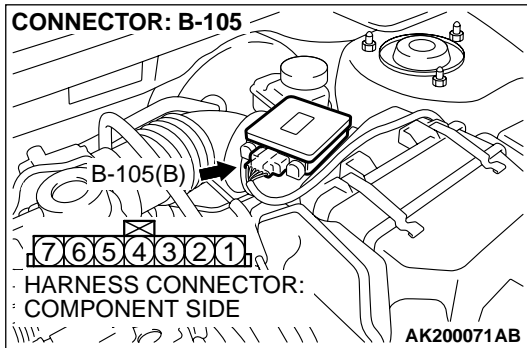
- When altitude is 0 m (0 foot), voltage should measure 3.7 and 4.3 volts.
- When altitude is 600 m (1,969 feet), voltage should measure 3.4 and 4.0 volts.
- When altitude is 1,200 m (3,937 feet), voltage should measure 3.2 and 3.8 volts.
- When altitude is 1,800 m (5,906 feet), voltage should measure 2.9 and 3.5 volts.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

**NO :** Go to Step 5.

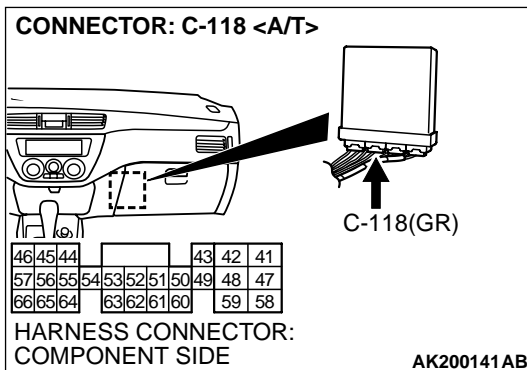
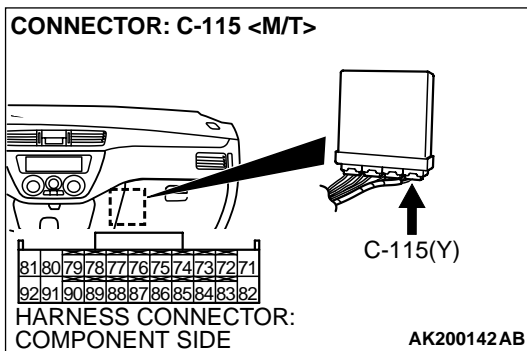


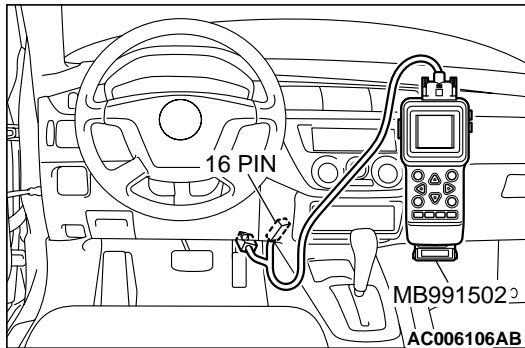
**STEP 3.** Check connector B-105 at the barometric pressure sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

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

**YES :** Go to Step 4.

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





**STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

**⚠ CAUTION**

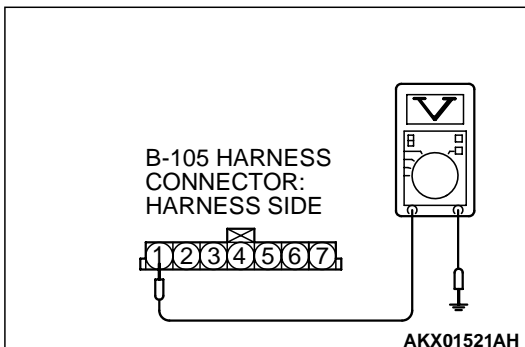
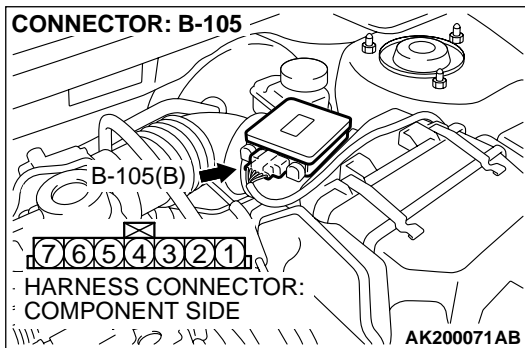
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 12.



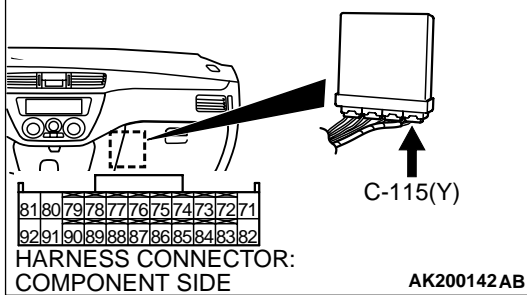
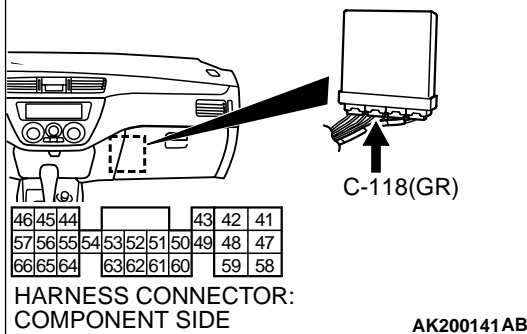
**STEP 5. Measure the sensor supply voltage at barometric pressure sensor connector B-105 by backprobing.**

- (1) Do not disconnect connector B-105.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal No. 1 and ground by backprobing.
  - Voltage should measure between 4.8 and 5.2 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 7.

**NO :** Go to Step 6.

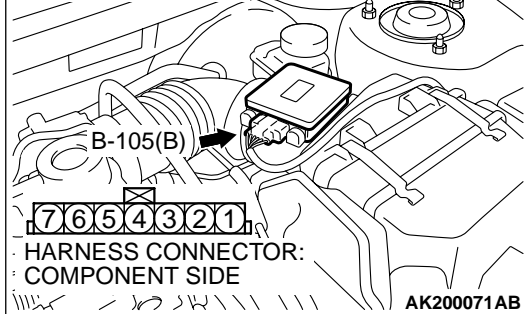
**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 6. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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

**CONNECTOR: B-105**

**STEP 7. Measure the ground voltage at barometric pressure sensor connector B-105 by backprobing.**

(1) Do not disconnect connector B-105.

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

(3) Measure the voltage between terminal No. 5 and ground by backprobing.

- Voltage should measure 0.5 volt or less.

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

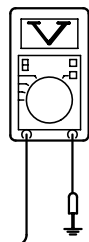
**Q: Is the measured voltage 0.5 volt or less?**

**YES :** Go to Step 10.

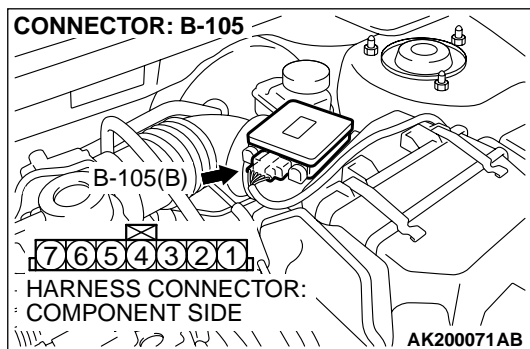
**NO :** Go to Step 8.

B-105 HARNESS  
CONNECTOR:  
HARNESS SIDE

1	2	3	4	5	6	7
---	---	---	---	---	---	---



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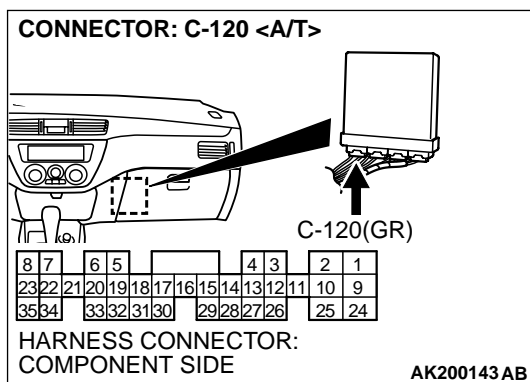
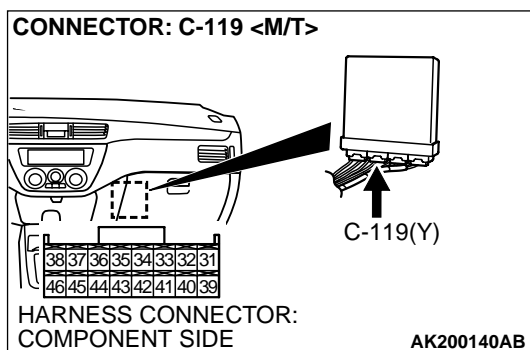


**STEP 8.** Check connector B-105 at the barometric pressure sensor and connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

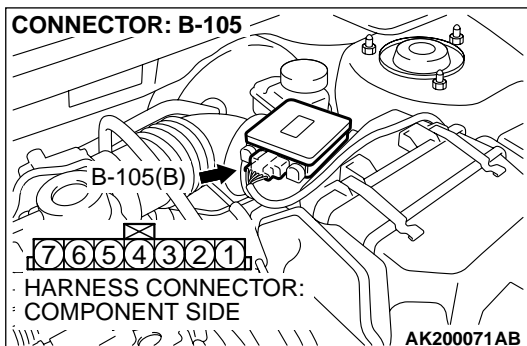
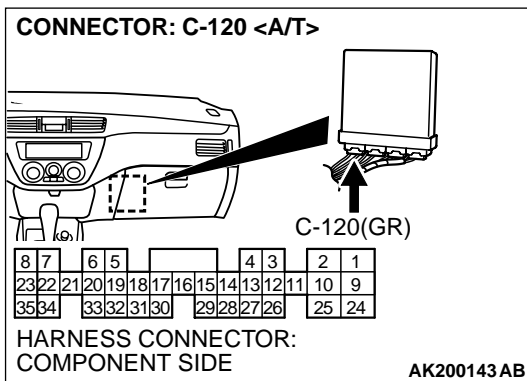
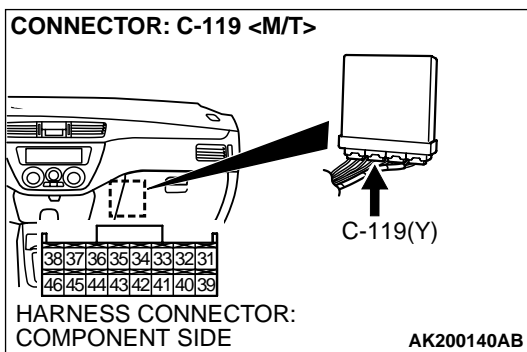
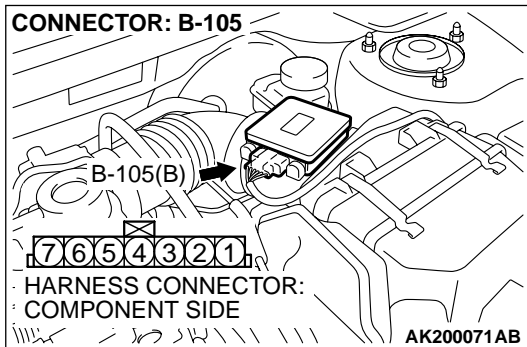
**Q:** Is the connector in good condition?

**YES :** Go to Step 9.

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







**STEP 9.** Check for open circuit between barometric pressure sensor connector B-105 (terminal No. 5) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

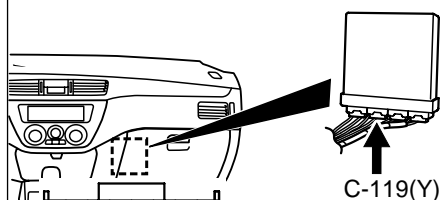
**NO :** Repair it. Then go to Step 12.

**STEP 10.** Check connector B-105 at barometric pressure sensor for damage.

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

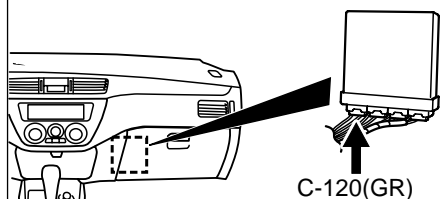
**YES :** Go to Step 11.

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

**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200140AB

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB

**STEP 11. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Replace the volume air flow sensor. Then go to Step 12.

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

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

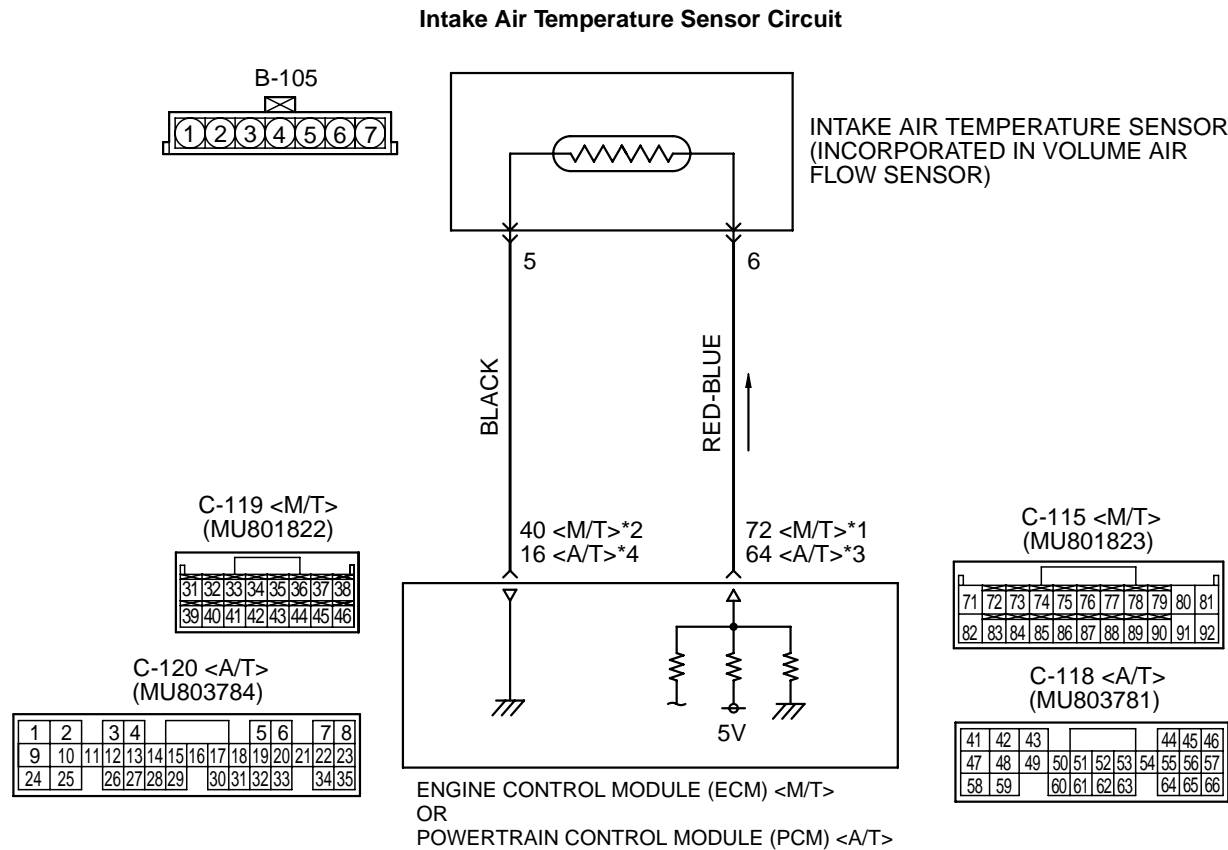
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0108 set?**

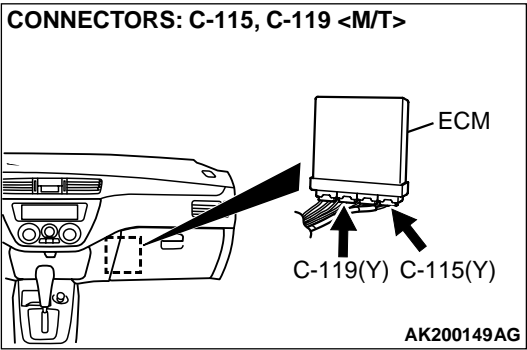
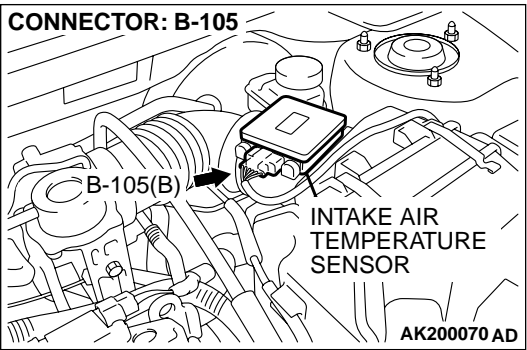
**YES :** Repeat the troubleshooting.

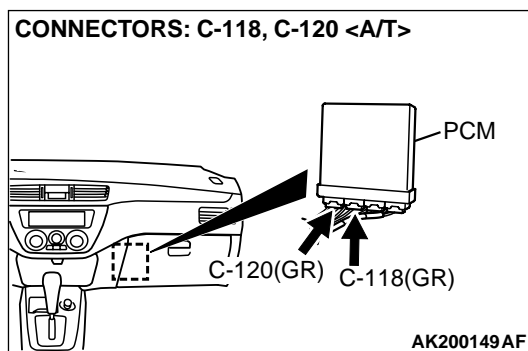
**NO :** The procedure is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem



AK000863





### CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the ECM (terminal No. 72) <M/T> or PCM (terminal No. 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

### TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- Repeat 5 or more times: drive<sup>\*1</sup>, stop<sup>\*2</sup>.  
Drive<sup>\*1</sup>: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.  
Stop<sup>\*2</sup>: vehicle speed lower than 1.5 km/h (0.9 mph) lasting more than 30 seconds.

#### Judgement Criteria

- Changes in the intake air temperature is lower than 1°C (1.8°F).

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

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

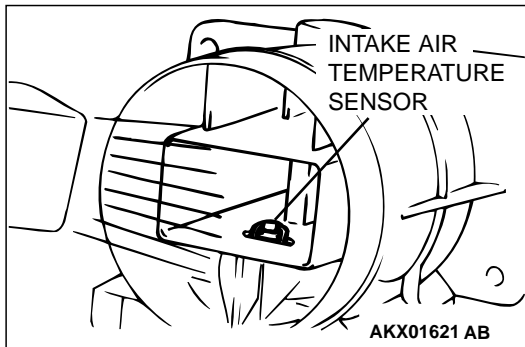
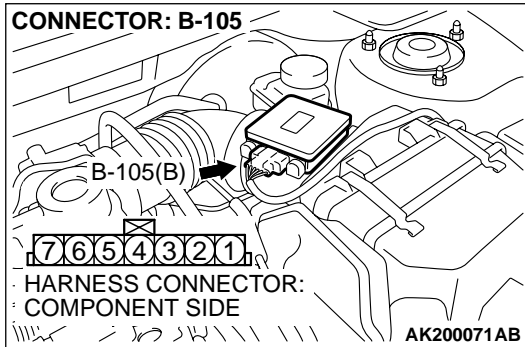
- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Remove the air intake hose from the volume air flow sensor.
- (3) Turn the ignition switch to the "ON" position.
- (4) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.



- (5) Heating the sensor using a hair drier.

- The indicated temperature increases.

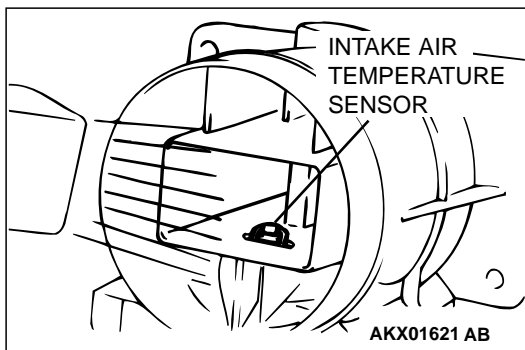
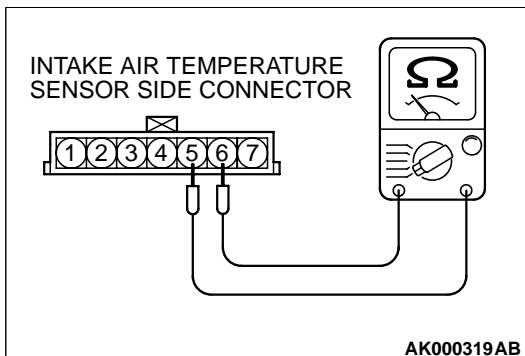
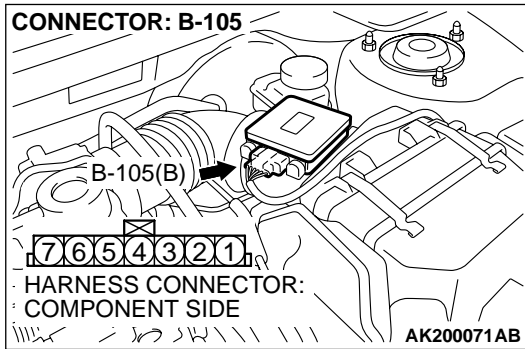
*NOTE: Do not allow it to increase over 80°C (176°F).*

- (6) Turn the ignition switch to the "LOCK" (OFF) position.
- (7) Attach the air intake hose.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Check the intake air temperature sensor.**

(1) Disconnect the intake air temperature sensor connector B-105.

(2) Measure the resistance between intake air temperature sensor side connector terminals No. 5 and No. 6.

(3) Measure resistance while heating the sensor using a hair drier.

**Standard value:**

- 13 – 17 kilohms [at -20°C (-4°F)]
- 5.3 – 6.7 kilohms [at 0°C (32°F)]
- 2.3 – 3.0 kilohms [at 20°C (68°F)]
- 1.0 – 1.5 kilohms [at 40°C (104°F)]
- 0.56 – 0.76 kilohm [at 60°C (140°F)]
- 0.30 – 0.42 kilohm [at 80°C (176°F)]

**Q: Is the resistance at the standard value?**

**YES :** Go to Step 3.

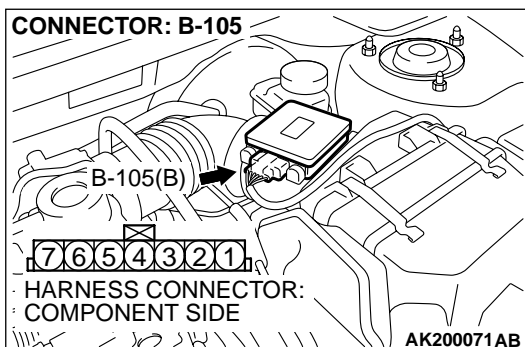
**NO :** Replace the volume air flow sensor. Then go to Step 9.

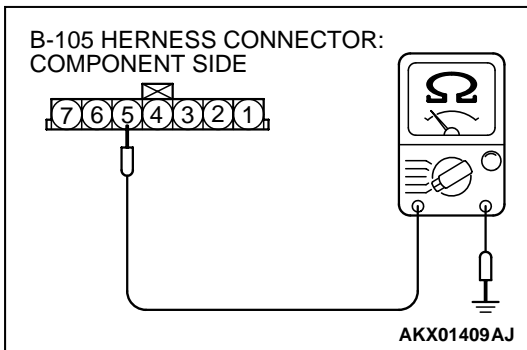
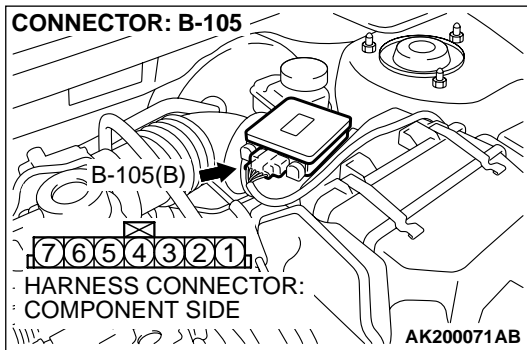
**STEP 3. Check connector B-105 at the intake air temperature sensor for damage.**

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.





**STEP 4. Check for continuity at intake air temperature sensor harness side connector B-105.**

(1) Disconnect connector B-105 and measure at the harness side.

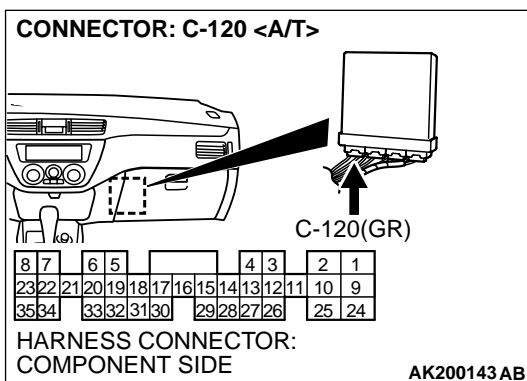
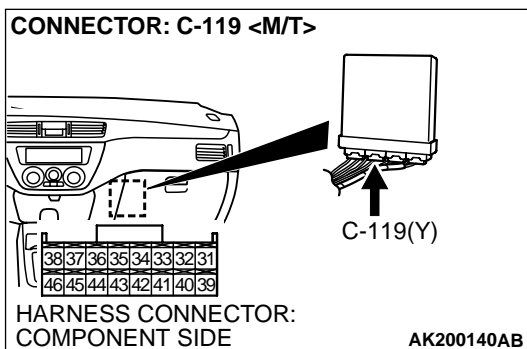
(2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 7.

**NO :** Go to Step 5.



**STEP 5. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 6.

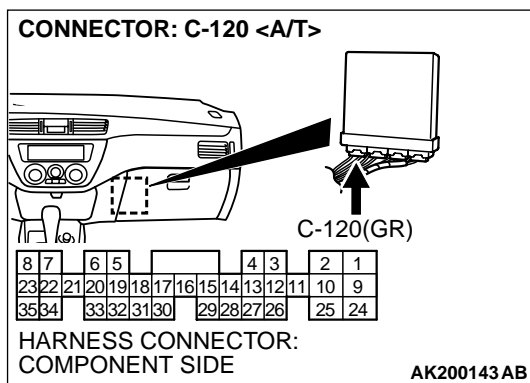
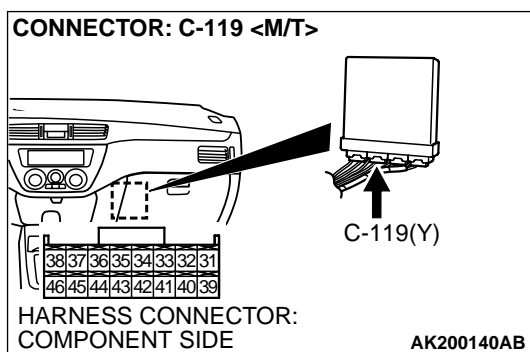
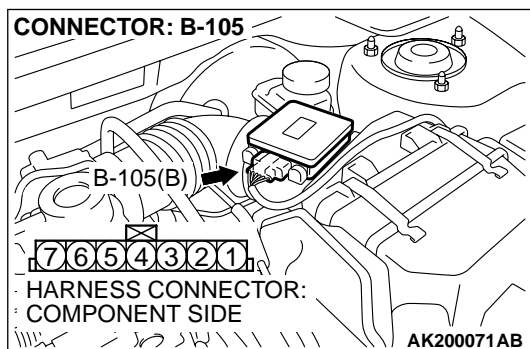
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.

**STEP 6. Check for open circuit and harness damage between intake air temperature sensor connector B-105 and ECM connector C-119 <M/T> or PCM connector C-120 <A/T>.**

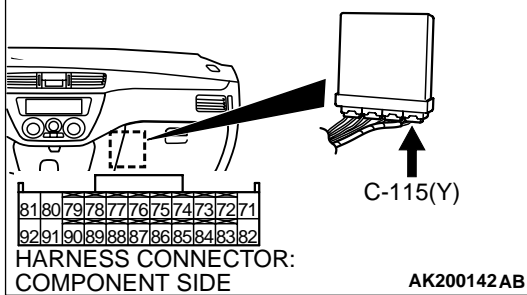
**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** Repair it. Then go to Step 9.





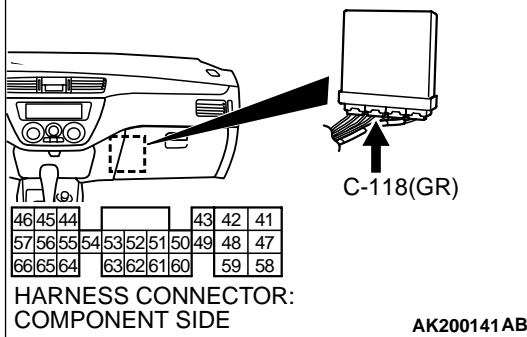
**CONNECTOR: C-115 <M/T>**

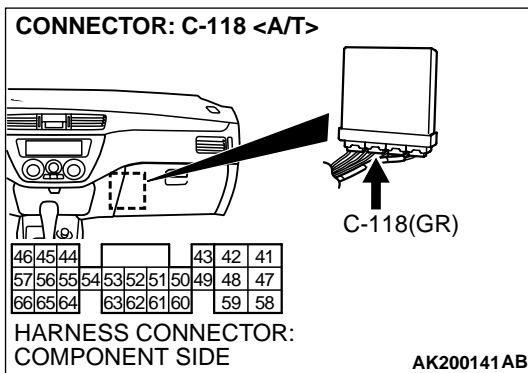
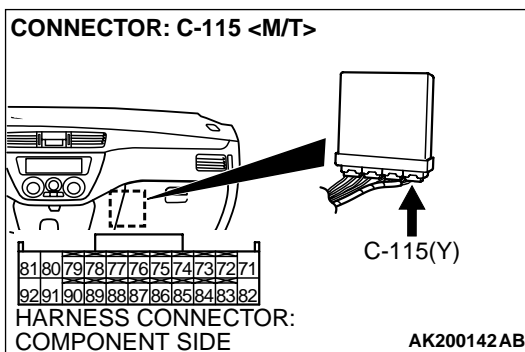
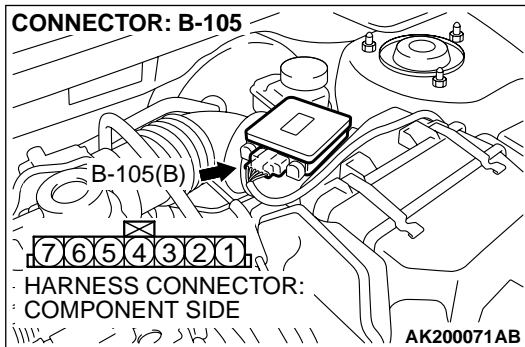
**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9

**CONNECTOR: C-118 <A/T>**



**STEP 8. Check for open circuit and harness damage between intake air temperature sensor connector B-105 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** Repair it. Then go to Step 9.

**STEP 9. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

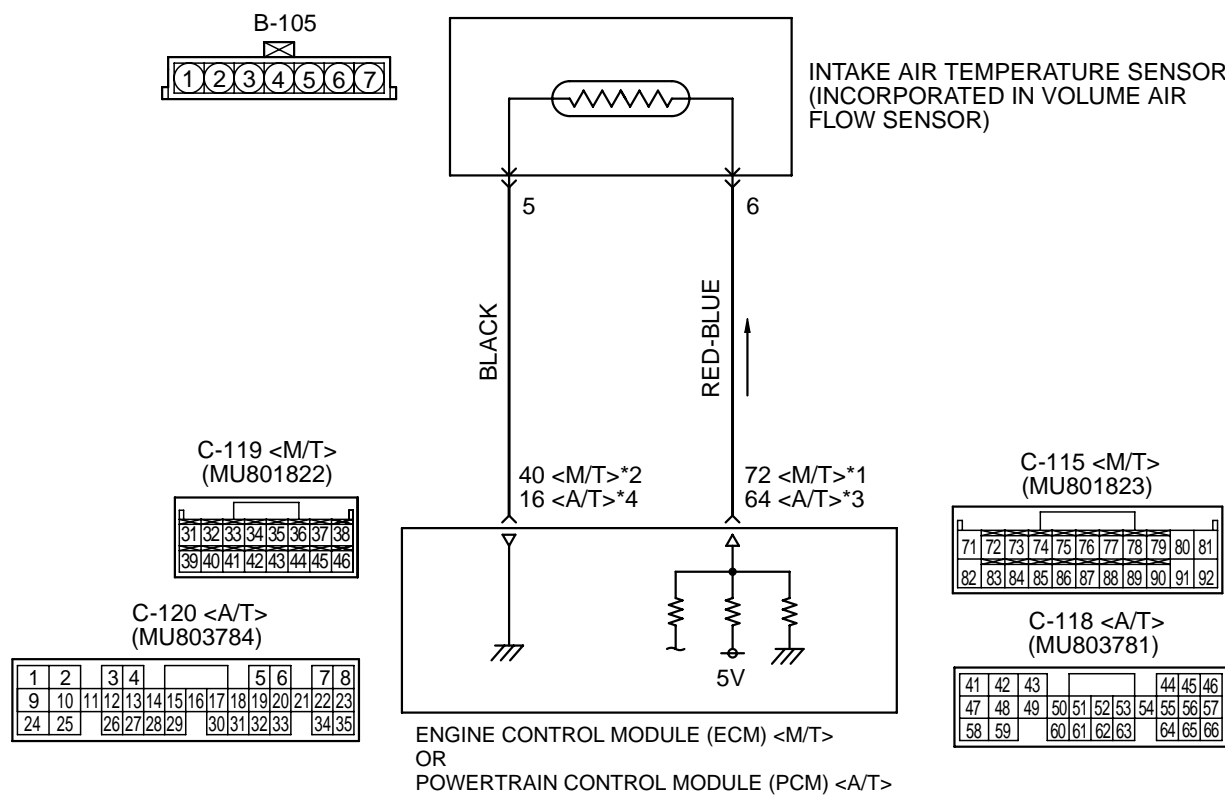
**Q: Is DTC P0111 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

DTC P0112: Intake air temperature Circuit Low Input

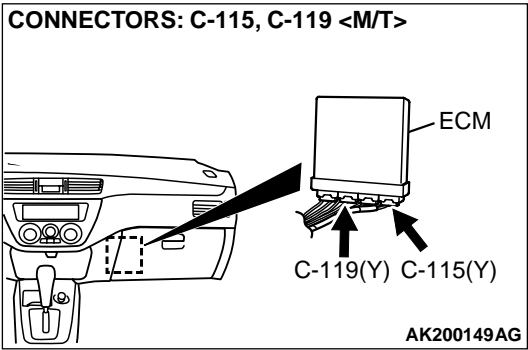
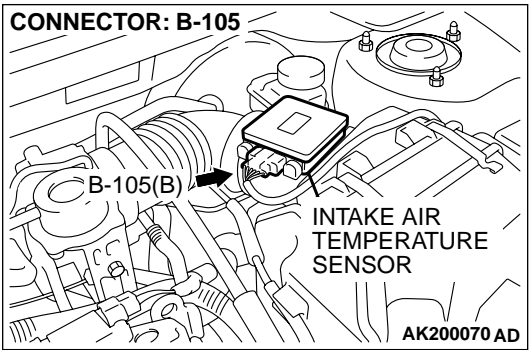
Intake Air Temperature Sensor Circuit

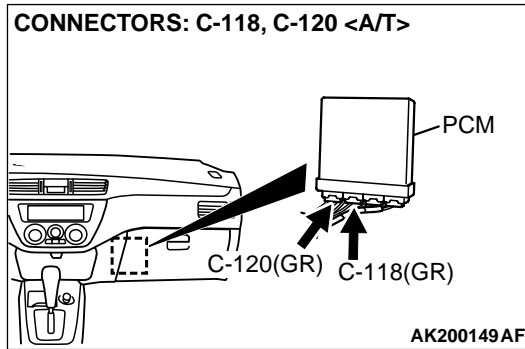


NOTE

- \*1: ECM connector C-115 <M/T>
- \*2: ECM connector C-119 <M/T>
- \*3: PCM connector C-118 <A/T>
- \*4: PCM connector C-120 <A/T>

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### CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the ECM (terminal No. 72) <M/T> or PCM (terminal No. 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

### TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.

- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

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

#### Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an air intake temperature of 115°C (239°F) or higher] for 2 seconds.

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

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

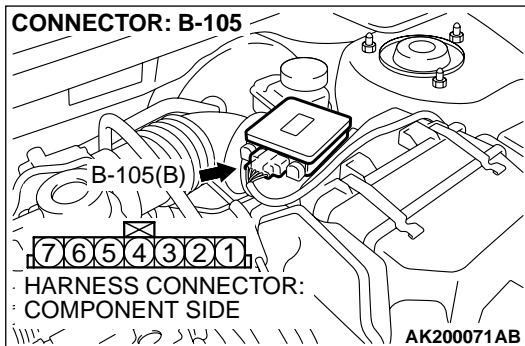
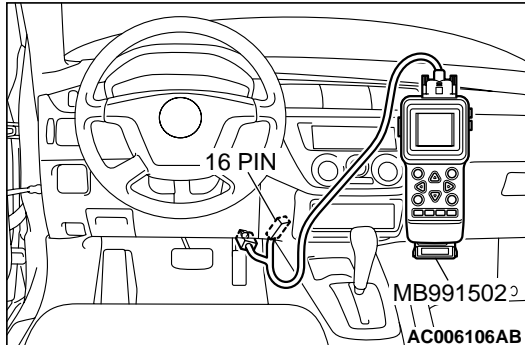
**NO :** Go to Step 2.

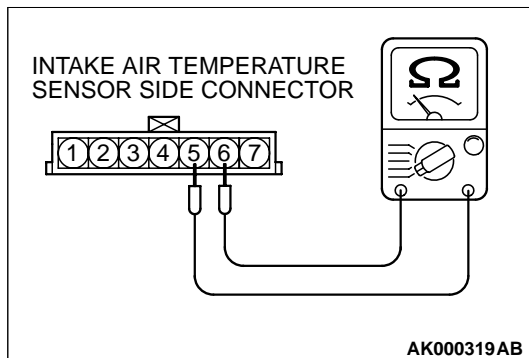
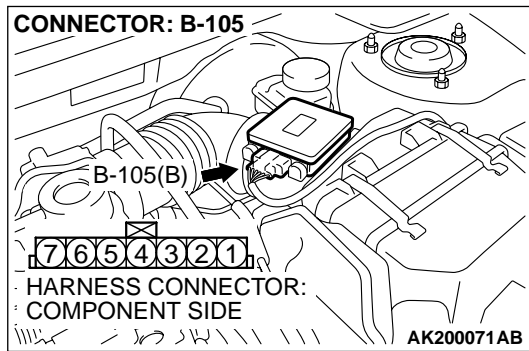
**STEP 2. Check connector B-105 at the intake air temperature sensor for damage.**

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

**YES :** Go to Step 3.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.



**STEP 3. Check the intake air temperature sensor.**

(1) Disconnect the intake air temperature sensor connector B-105.

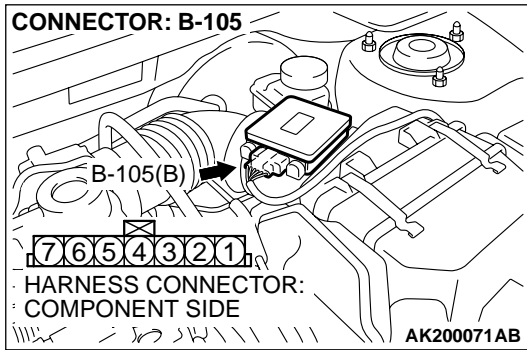
(2) Measure the resistance between intake air temperature sensor side connector terminal No. 5 and No. 6.

- There should be continuity. (0.30 – 1.0 kilohm)

**Q: Is the measured resistance between 0.30 and 1.0 kilohm?**

**YES :** Go to Step 4.

**NO :** Replace the volume air flow sensor. Then go to Step 6.

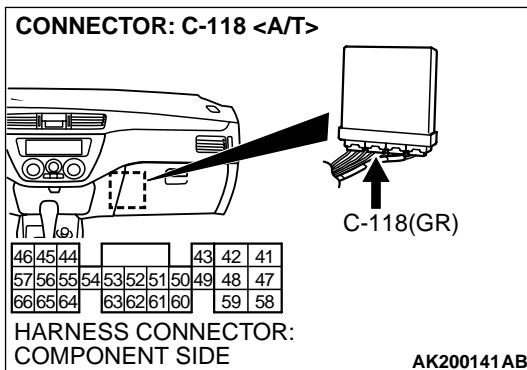
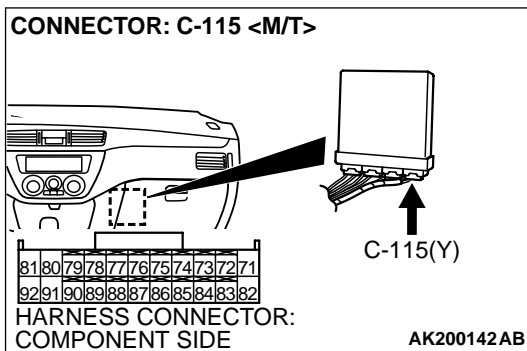


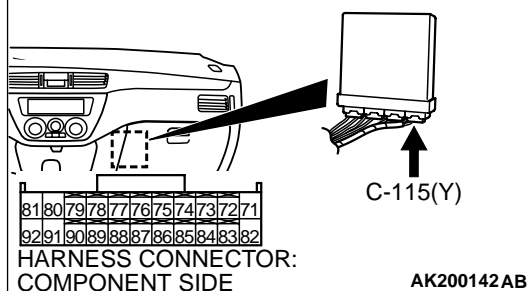
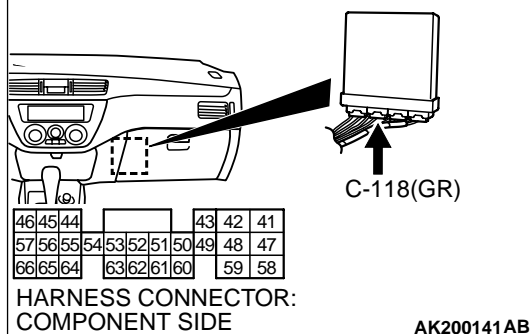
**STEP 4.** Check for short circuit to ground between intake air temperature sensor connector B-105 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.

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

**YES :** Go to Step 5.

**NO :** Repair it. Then go to Step 6.



**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 5. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

**STEP 6. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

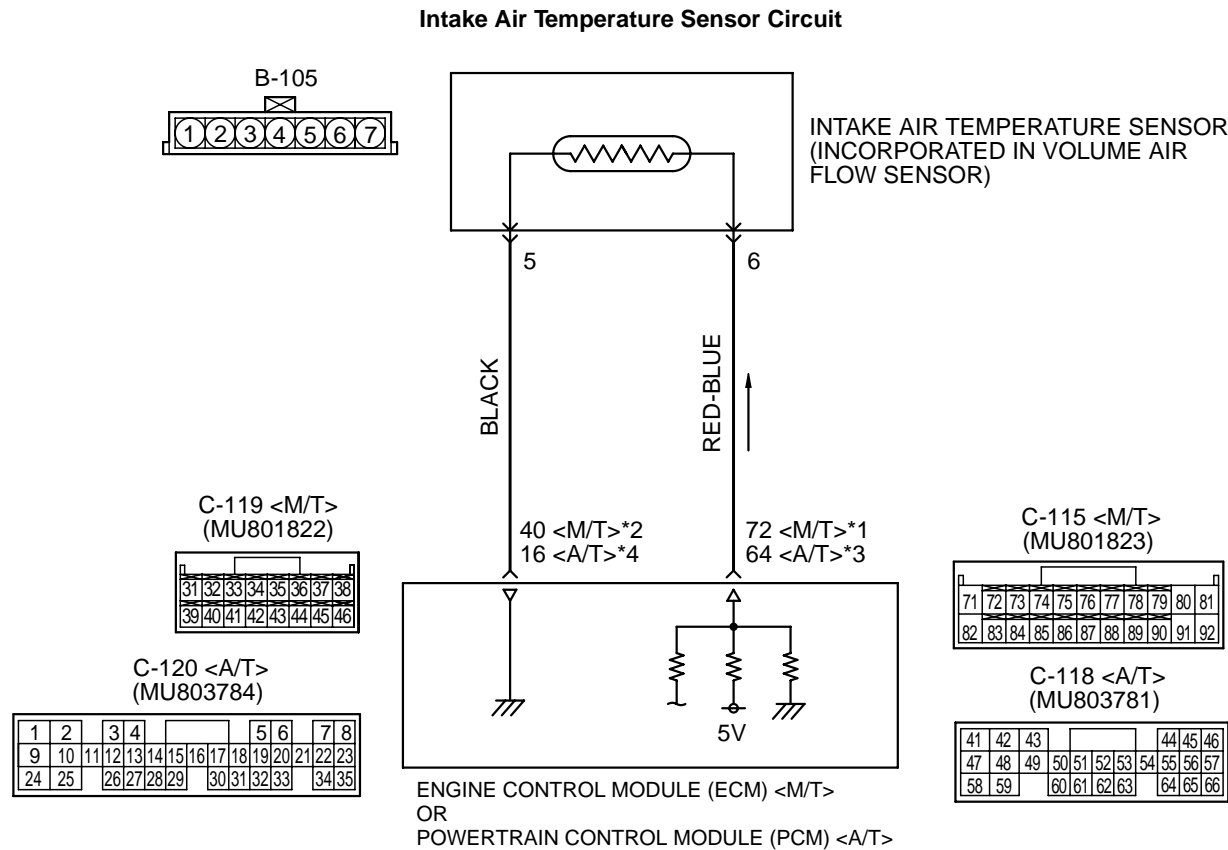
**Q: Is DTC P0112 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.



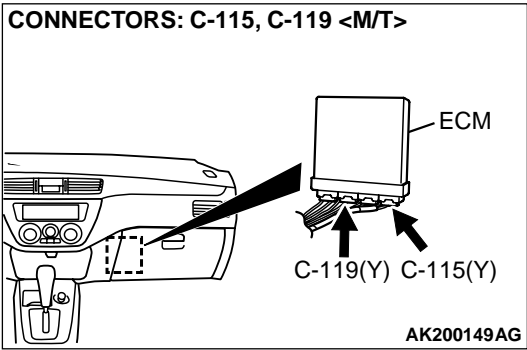
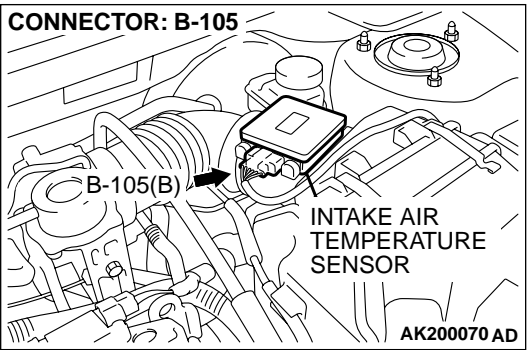
DTC P0113: Intake air temperature Circuit High Input

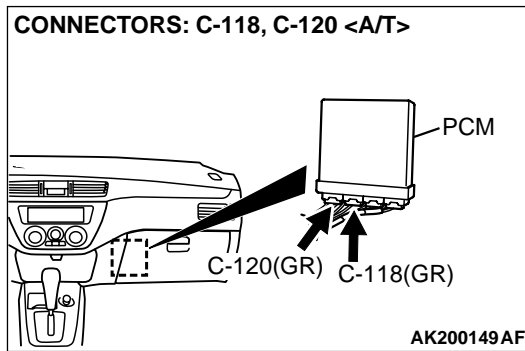


**NOTE**

- \*1: ECM connector C-115 <M/T>
- \*2: ECM connector C-119 <M/T>
- \*3: PCM connector C-118 <A/T>
- \*4: PCM connector C-120 <A/T>

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### CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 6) from the ECM (terminal No. 72) <M/T> or PCM (terminal No. 64) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

### TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.

- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

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

#### Judgement Criteria

- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an air intake temperature of  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) or lower] for 2 seconds.

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

- Intake air temperature sensor failed.
- Open or shorted intake air temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

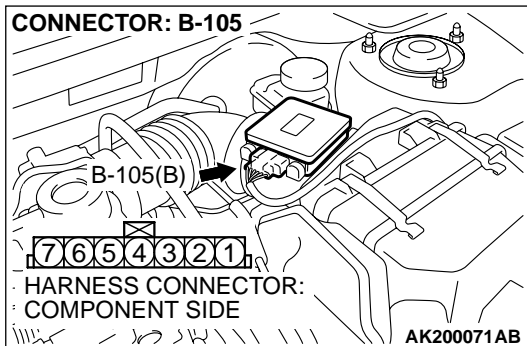
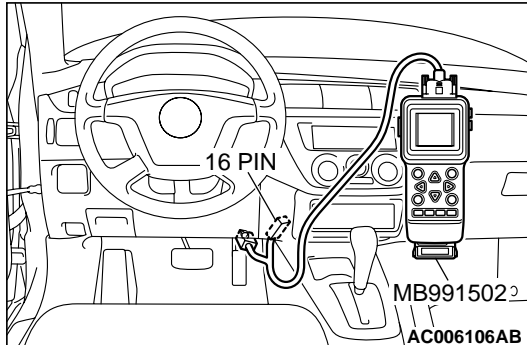
**NO :** Go to Step 2.

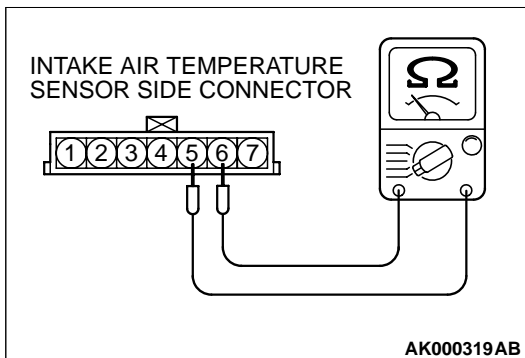
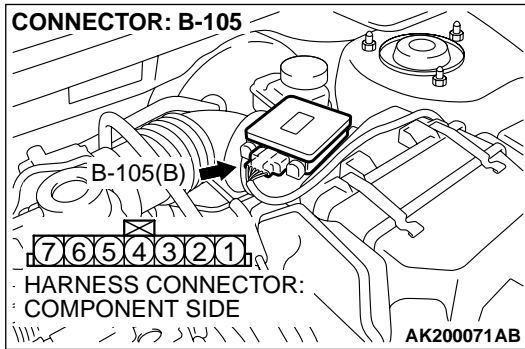
**STEP 2. Check connector B-105 at the intake air temperature sensor for damage.**

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

**YES :** Go to Step 3.

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



**STEP 3. Check the intake air temperature sensor.**

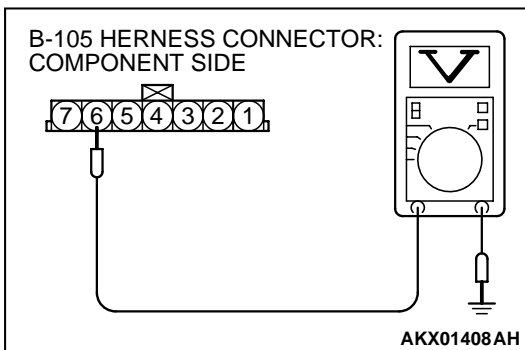
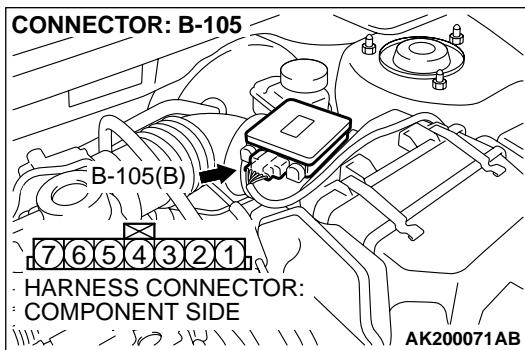
- (1) Disconnect the intake air temperature sensor connector B-105.

- (2) Measure the resistance between intake air temperature sensor side connector terminal No. 5 and No. 6.
- There should be continuity. (0.30 – 1.0 kilohm)

**Q: Is the measured resistance between 0.3 and 1.0 kilohm?**

**YES :** Go to Step 4.

**NO :** Replace the volume air flow sensor. Then go to Step 11.

**STEP 4. Measure the sensor supply voltage at intake air temperature sensor harness side connector B-105.**

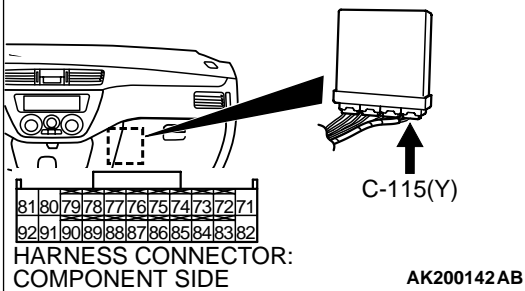
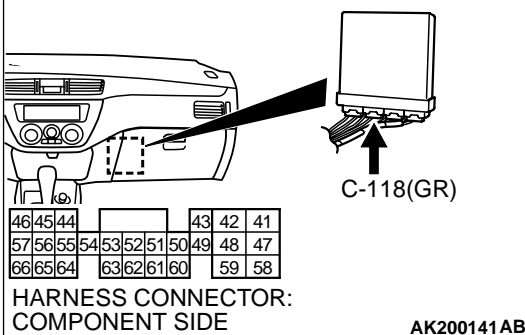
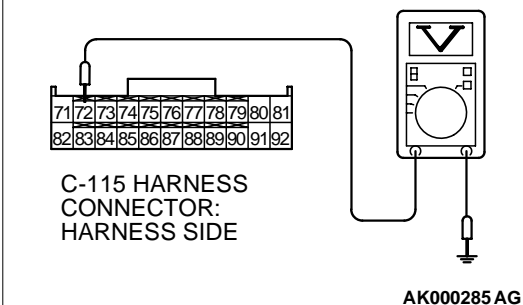
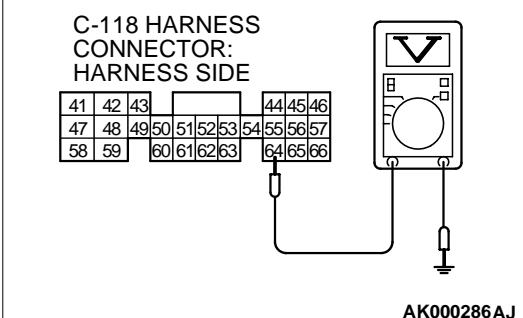
- (1) Disconnect connector B-105 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 6 and ground.
- Voltage should measure between 4.5 and 4.9 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Go to Step 5.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>****<M/T>****<A/T>**

**STEP 5. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the intake air temperature sensor connector B-105.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 72 <M/T> or No. 64 <A/T> and ground by backprobing.

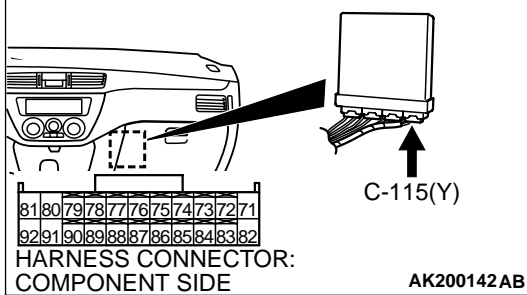
- Voltage should measure between 4.5 and 4.9 volts.

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

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

**YES :** Go to Step 6.

**NO :** Go to Step 7.

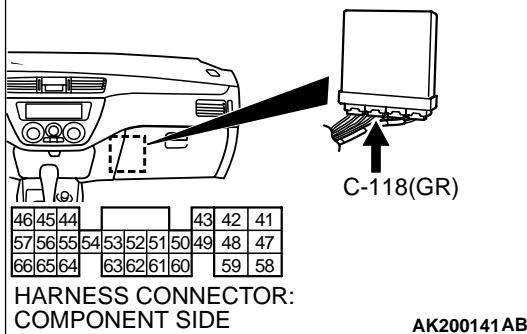
**CONNECTOR: C-115 <M/T>**

**STEP 6. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between intake air temperature sensor connector B-105 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> because of open circuit. Then go to Step 11.

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

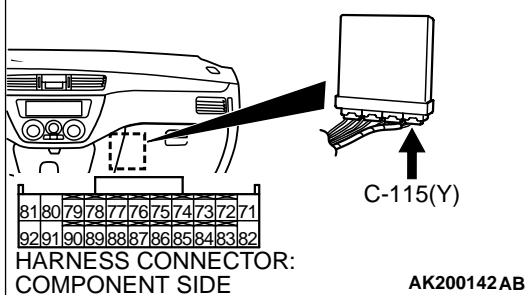
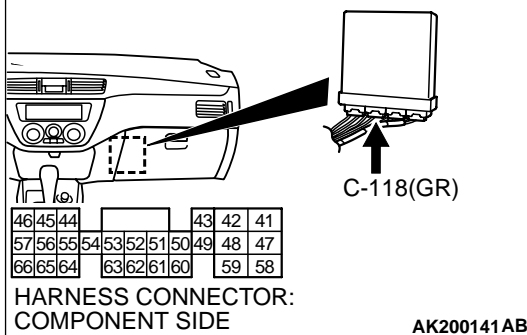
**CONNECTOR: C-118 <A/T>**

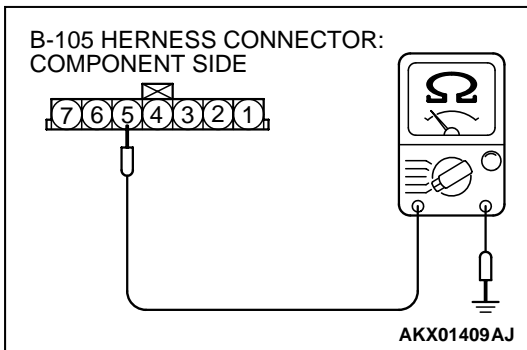
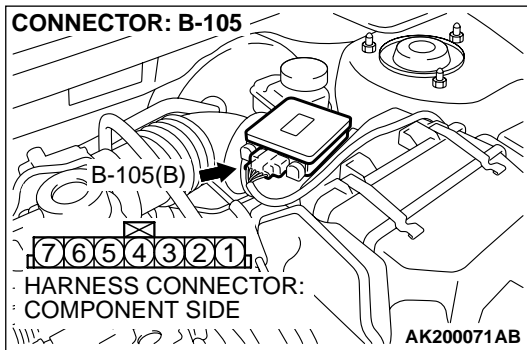
**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**



**STEP 8. Check for continuity at intake air temperature sensor harness side connector B-105.**

(1) Disconnect connector B-105 and measure at the harness side.

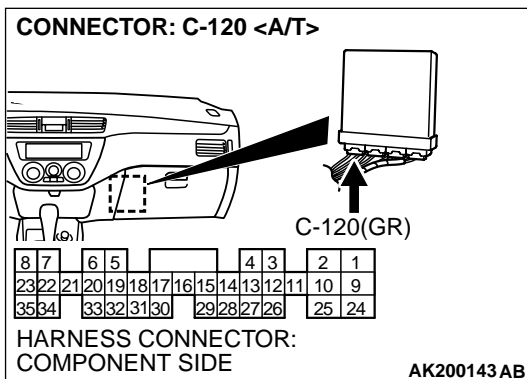
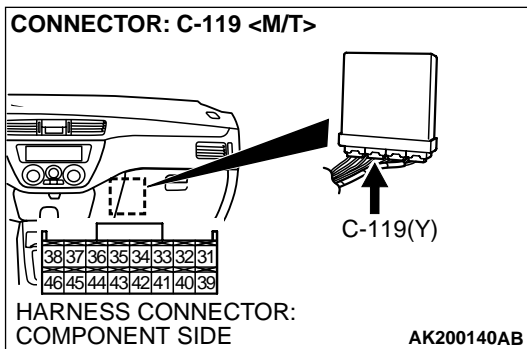
(2) Check for the continuity between terminal No. 5 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Replace the ECM or PCM. Then go to Step 11.

**NO :** Go to Step 9.

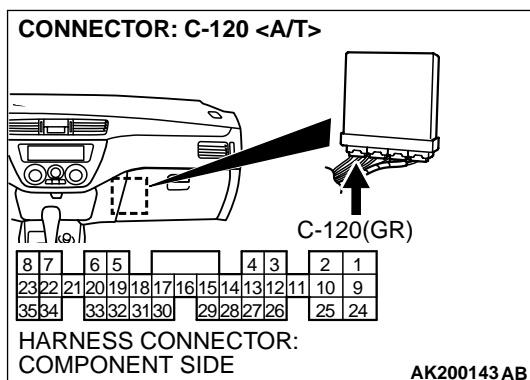
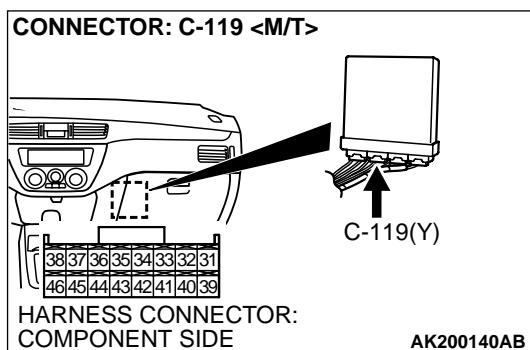
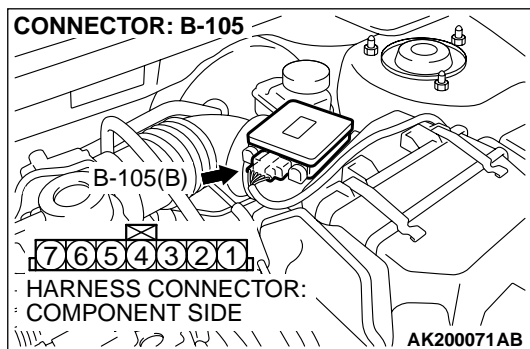


**STEP 9. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

**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 go to Step 11.



**STEP 10. Check for open circuit between intake air temperature sensor connector B-105 and ECM connector C-119 <M/T> or PCM connector C-120 <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0113 set?**

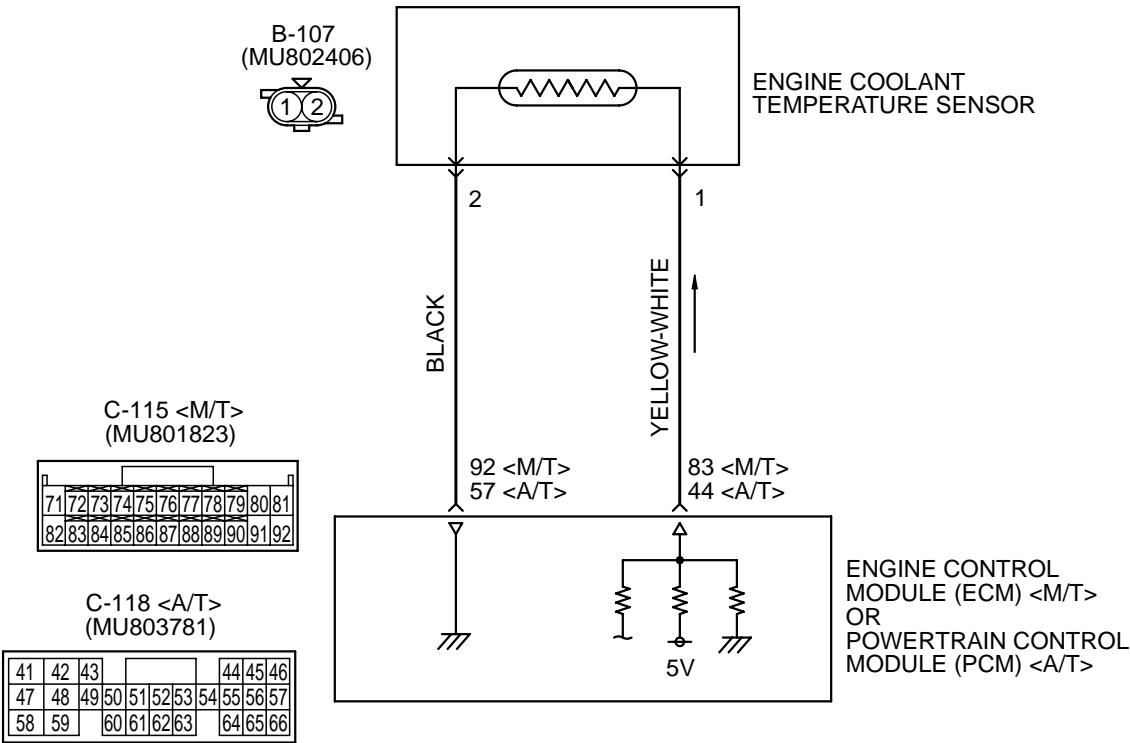
**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

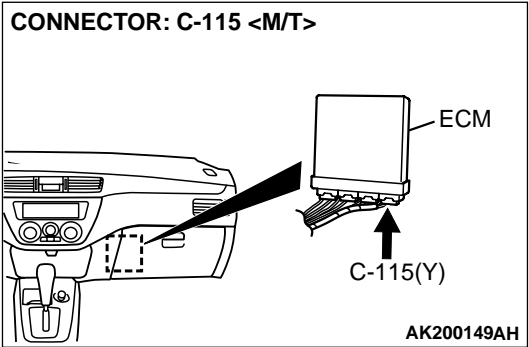
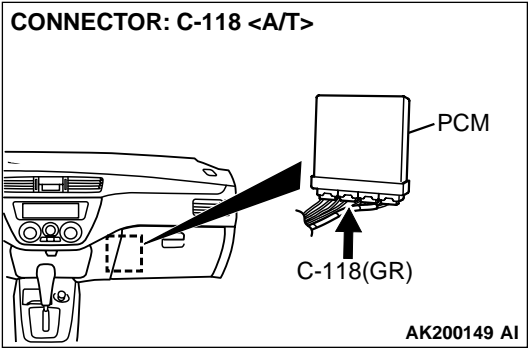
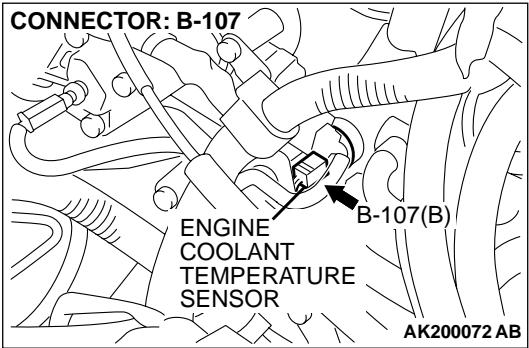


DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

Enging Coolant Temperature Sensor Circuit



AK000864



**CIRCUIT OPERATION**

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 83) <M/T> or PCM (terminal No. 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or (terminal No. 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

**TECHNICAL DESCRIPTION**

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

- Engine coolant temperature was 7°C (44.6°F) or more immediately before the engine was stopped at the last drive.

- Engine coolant temperature was 7°C (44.6°F) or more when the engine started.

**Judgement Criteria**

- Engine coolant temperature fluctuates within 1°C (1.8°F) after five minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60°C (140°F) or more.
  2. Volume air flow sensor output frequency is 70 Hz or less.
  3. During fuel shut-off operation.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.****⚠ CAUTION**

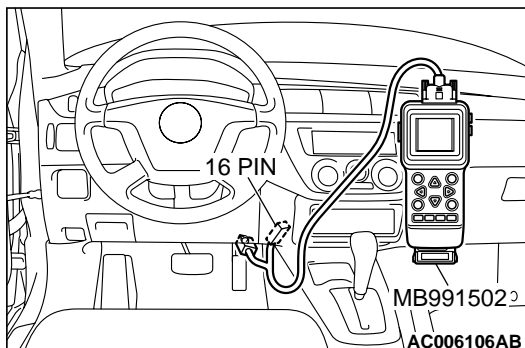
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

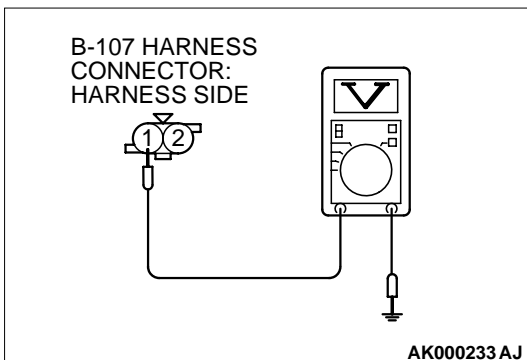
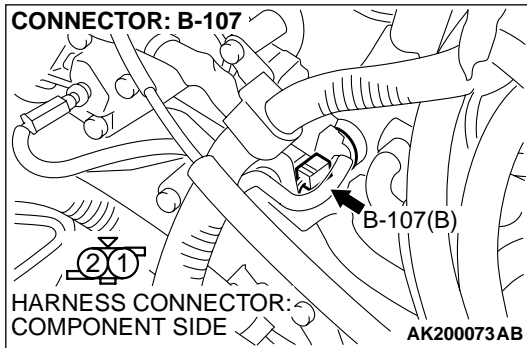
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-107 by backprobing.**

- (1) Do not disconnect connector B-107.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground by backprobing.

- When engine coolant temperature is  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ), voltage should measure 3.9 and 4.5 volts.
- When engine coolant temperature is  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ), voltage should measure 3.2 and 3.8 volts.
- When engine coolant temperature is  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ), voltage should measure 2.3 and 2.9 volts.
- When engine coolant temperature is  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ), voltage should measure 1.3 and 1.9 volts.
- When engine coolant temperature is  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ), voltage should measure 0.7 and 1.3 volts.
- When engine coolant temperature is  $80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ ), voltage should measure 0.3 and 0.9 volt.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

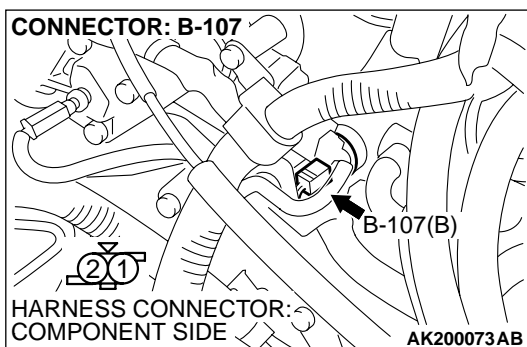
**NO :** Go to Step 5.

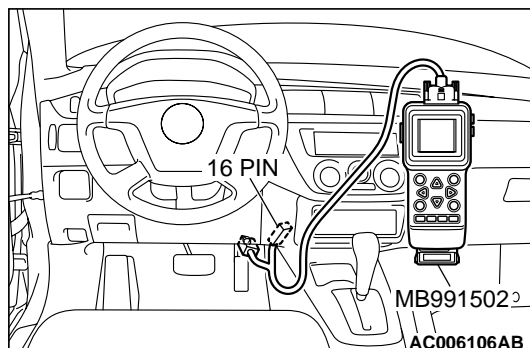
**STEP 3. Check connector B-107 at the engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

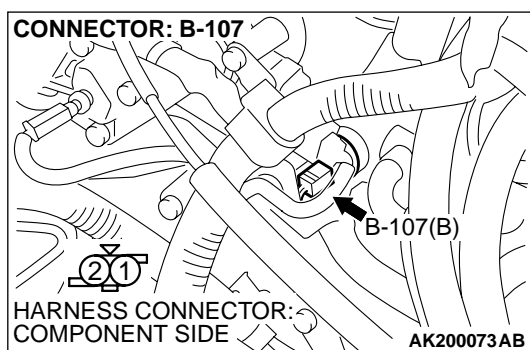
**NO :** Replace the ECM or PCM. Then go to Step 14.

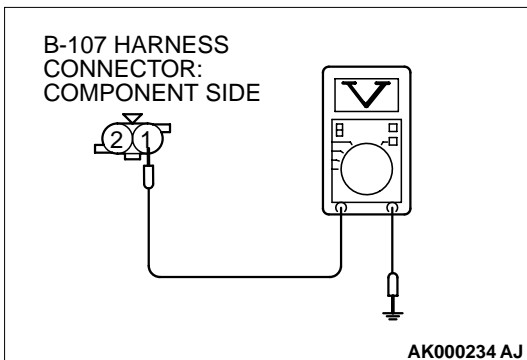
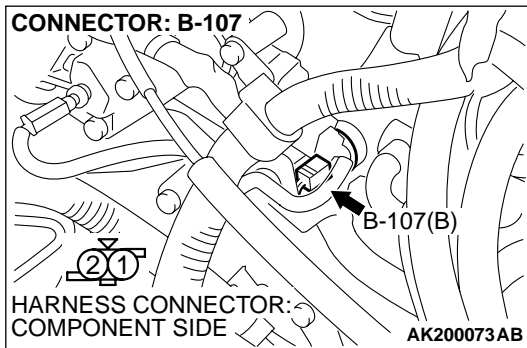
**STEP 5. Check connector B-107 at engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-107.**

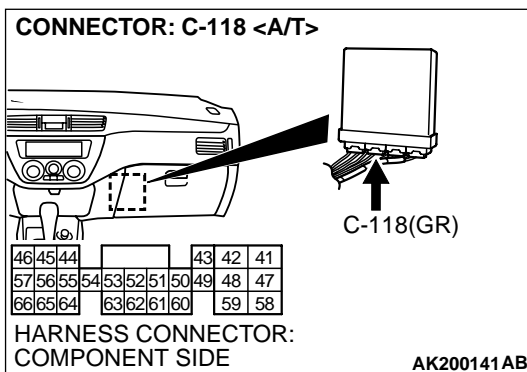
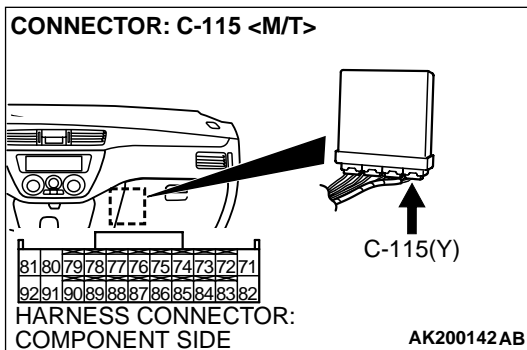
- (1) Disconnect connector B-107 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should measure between 4.5 and 4.9 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Go to Step 7.

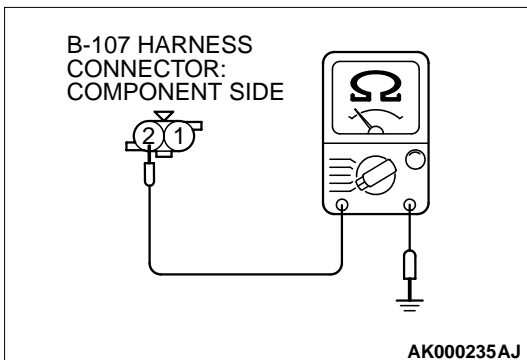
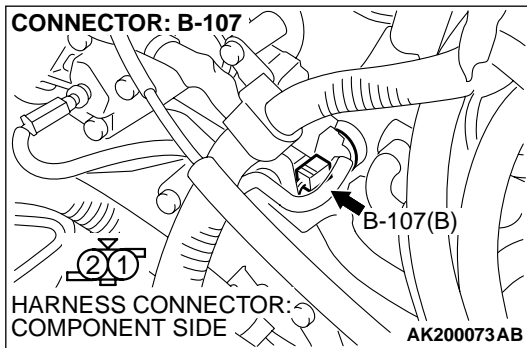


**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 8. Check for continuity at engine coolant temperature sensor harness side connector B-107.**

(1) Disconnect connector B-107 and measure at the harness side.

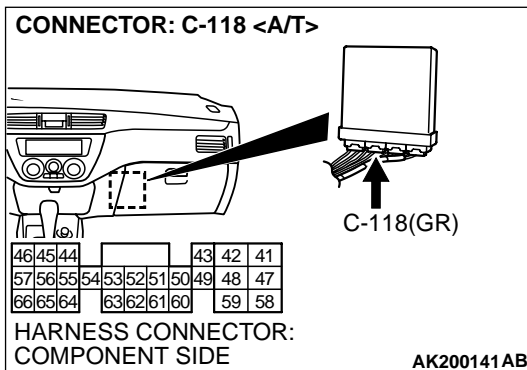
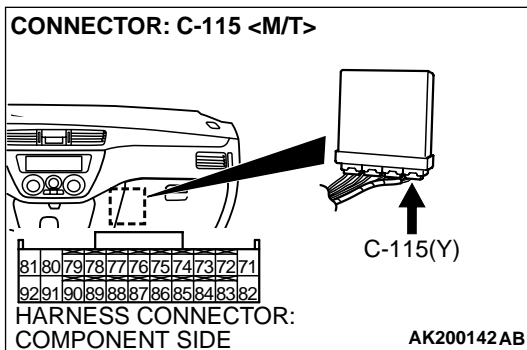
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 11.

**NO :** Go to Step 9.



**STEP 9. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 10.

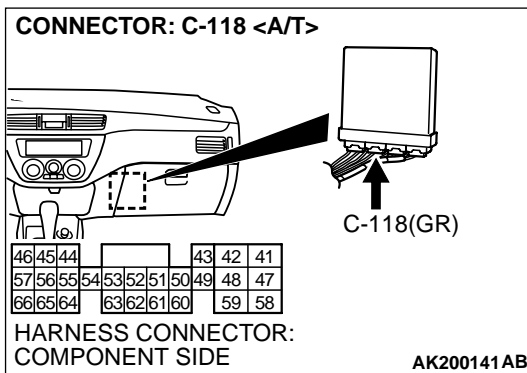
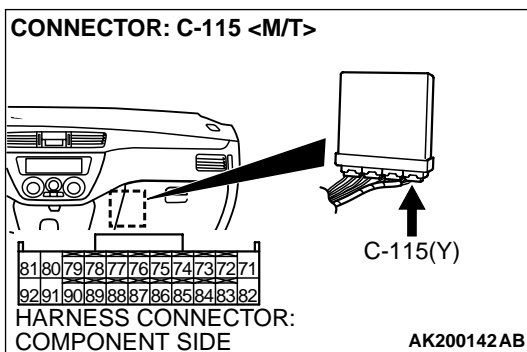
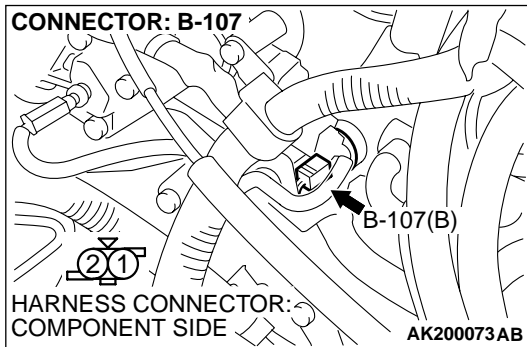
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

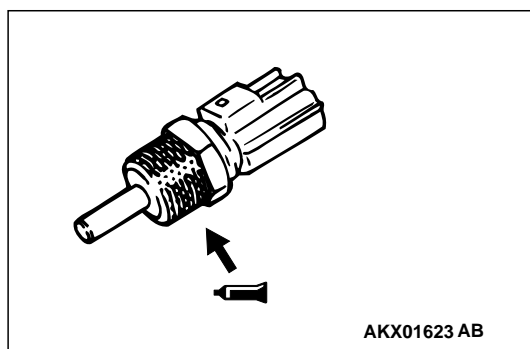
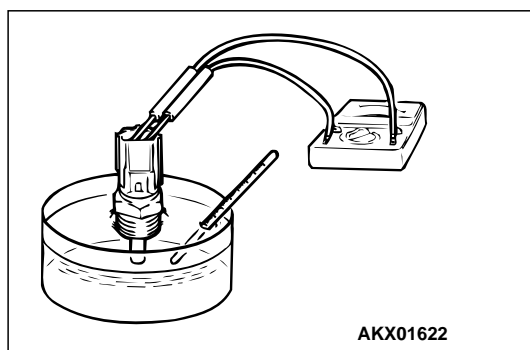
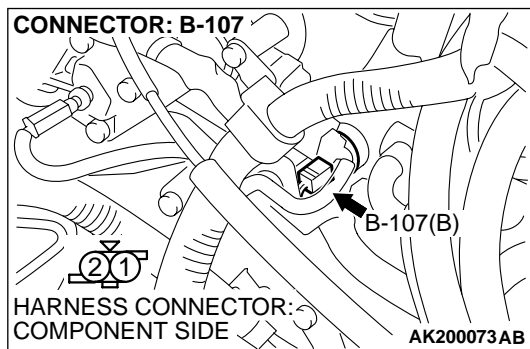
**STEP 10.** Check for harness damage between engine coolant temperature sensor connector B-107 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.



**STEP 11. Check the engine coolant temperature sensor.**

- (1) Disconnect the engine coolant temperature sensor connector B-107.
- (2) Remove the engine coolant temperature sensor.

- (3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

**Standard value:**

- 14 – 17 kilohms [at  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ )]
- 5.1 – 6.5 kilohms [at  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ )]
- 2.1 – 2.7 kilohms [at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ )]
- 0.9 – 1.3 kilohms [at  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ )]
- 0.48 – 0.68 kilohm [at  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ )]
- 0.26 – 0.36 kilohm [at  $80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ )]

- (4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
- (5) Install the engine coolant temperature sensor, and tighten to the specified torque.

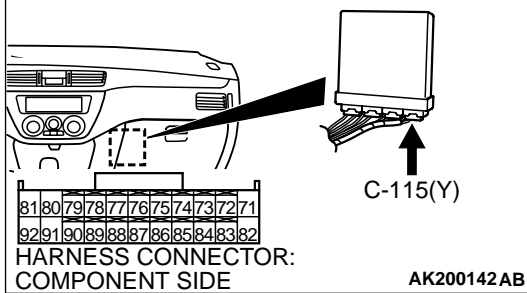
**Tightening torque:  $29 \pm 10 \text{ N}\cdot\text{m}$  ( $22 \pm 7 \text{ ft}\cdot\text{lb}$ )**

**Q: Is the resistance at the standard value?**

**YES :** Go to Step 12.

**NO :** Replace the engine coolant temperature sensor. Then go to Step 14.



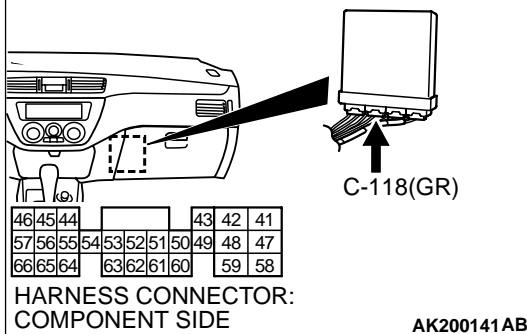
**CONNECTOR: C-115 <M/T>**

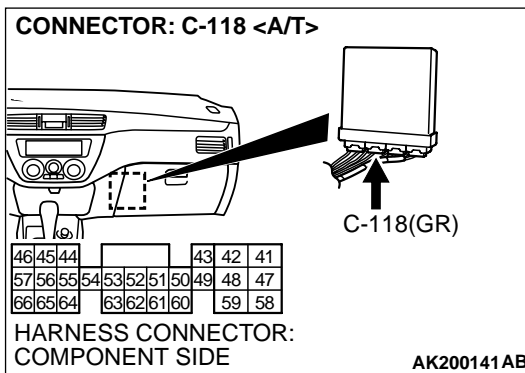
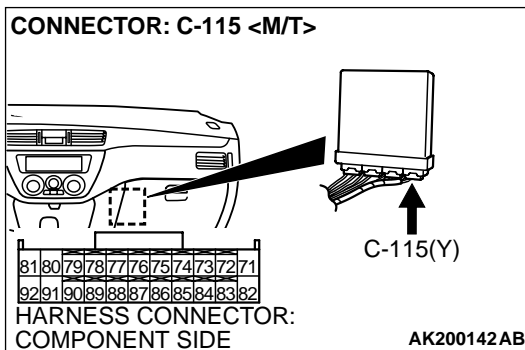
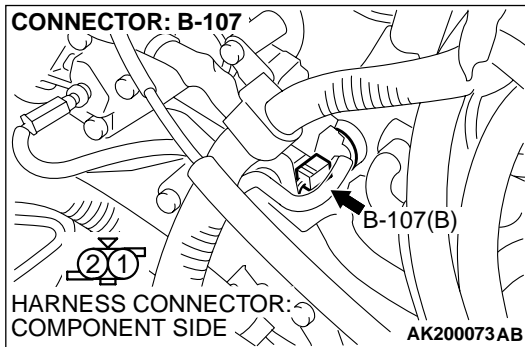
**STEP 12. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 13.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**CONNECTOR: C-118 <A/T>**



**STEP 13. Check for harness damage between engine coolant temperature sensor connector B-107 (terminal No. 1) and ECM connector C-115 (terminal No. 83) <M/T> or PCM connector C-118 (terminal No. 44) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

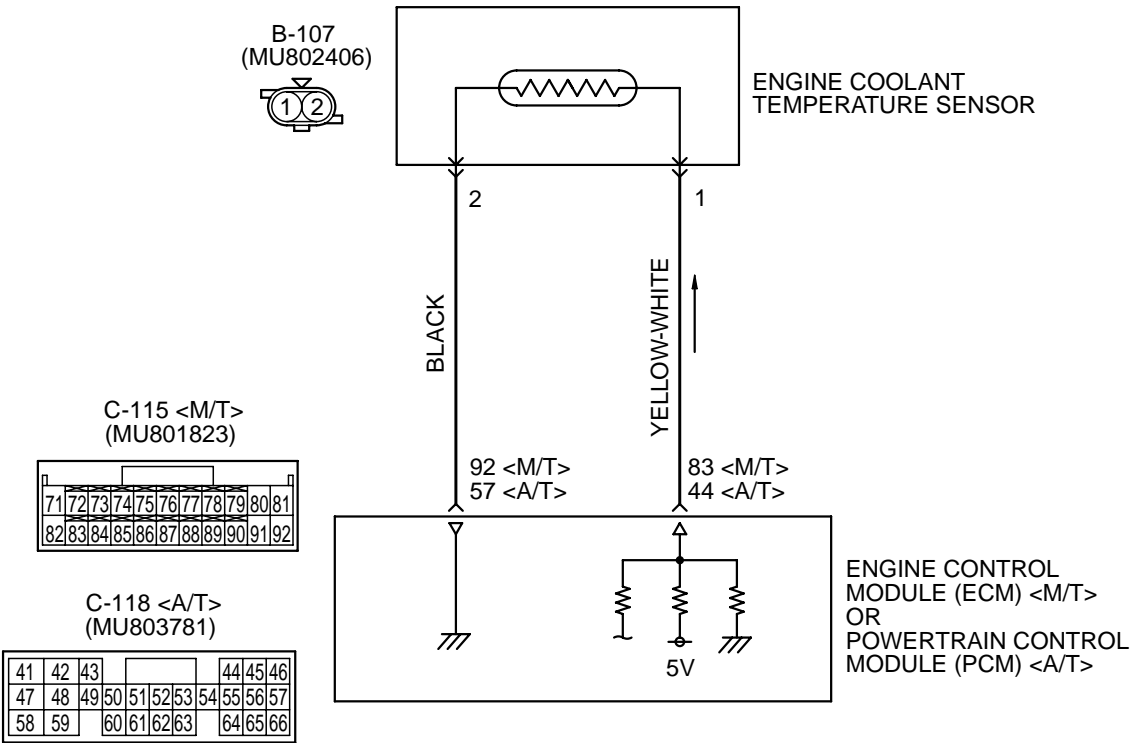
**Q: Is DTC P0116 set?**

**YES :** Repeat the troubleshooting.

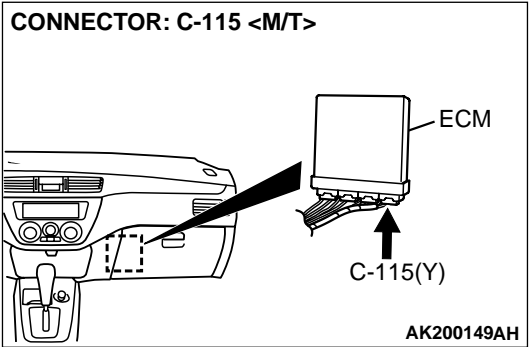
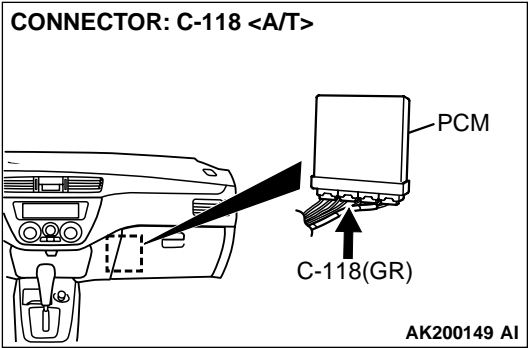
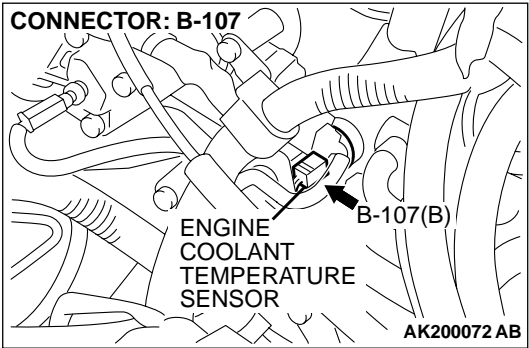
**NO :** The procedure is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

Enging Coolant Temperature Sensor Circuit



AK000864



**CIRCUIT OPERATION**

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 83) <M/T> or PCM (terminal No. 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or (terminal No. 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

**TECHNICAL DESCRIPTION**

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.

- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

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

**Judgement Criteria**

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 seconds.

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

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.****⚠ CAUTION**

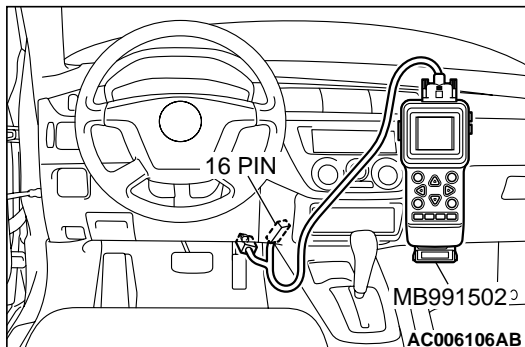
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

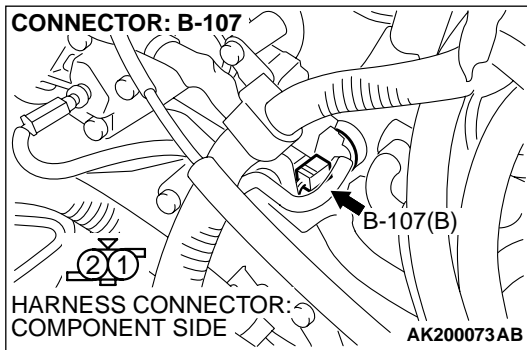
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.



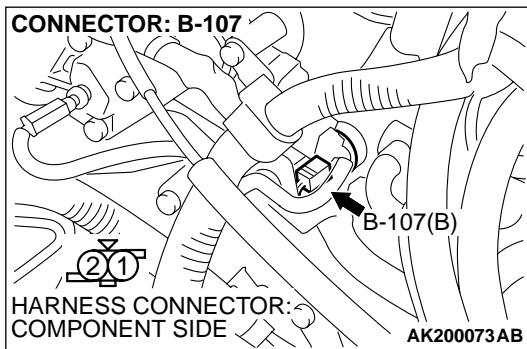


**STEP 2. Check connector B-107 at the engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 3.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

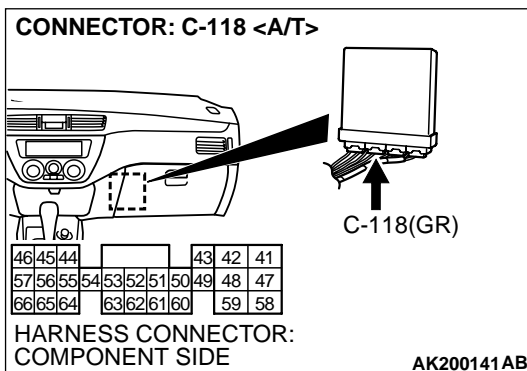
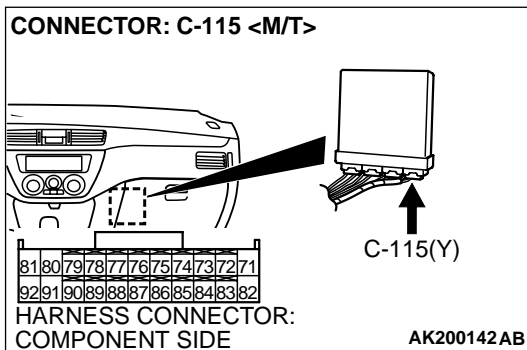


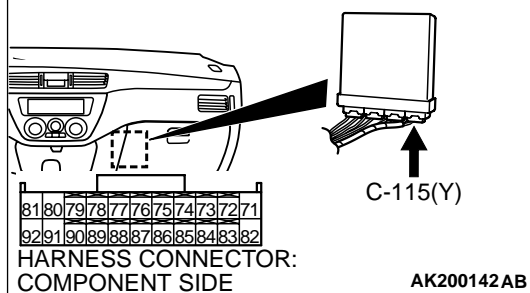
**STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-107 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.**

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

**YES :** Go to Step 4.

**NO :** Repair it. Then go to Step 6.



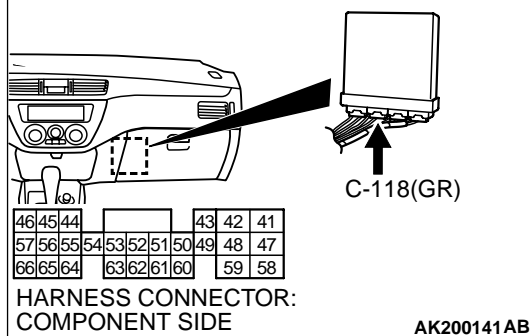
**CONNECTOR: C-115 <M/T>**

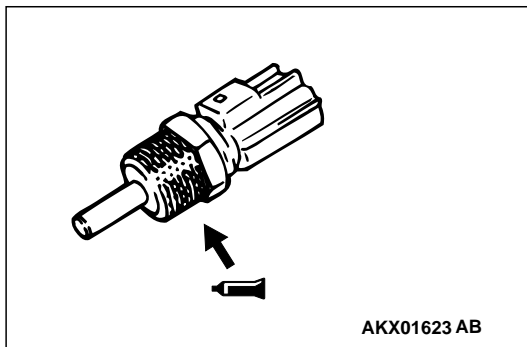
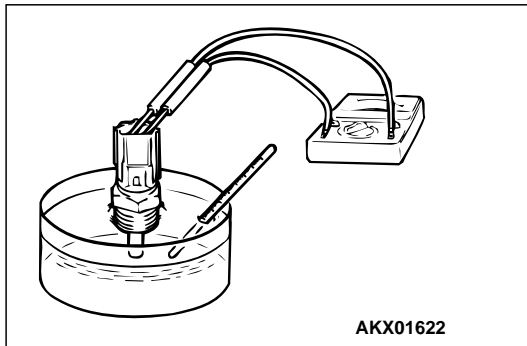
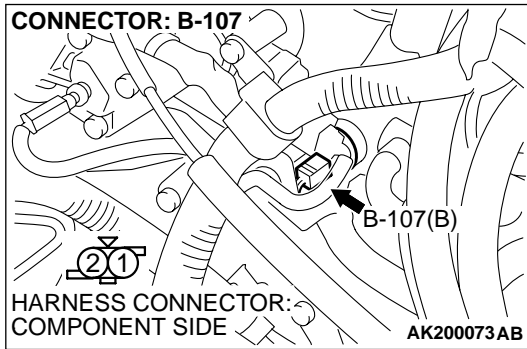
**STEP 4. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

**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 go to Step 6.

**CONNECTOR: C-118 <A/T>**

**STEP 5. Check the engine coolant temperature sensor.**

- (1) Disconnect the engine coolant temperature sensor connector B-107.
- (2) Remove the engine coolant temperature sensor.

- (3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

**Standard value:**

- 14 – 17 kilohms [at –20°C (–4°F)]
- 5.1 – 6.5 kilohms [at 0°C (32°F)]
- 2.1 – 2.7 kilohms [at 20°C (68°F)]
- 0.9 – 1.3 kilohms [at 40°C (104°F)]
- 0.48 – 0.68 kilohm [at 60°C (140°F)]
- 0.26 – 0.36 kilohm [at 80°C (176°F)]

- (4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
- (5) Install the engine coolant temperature sensor, and tighten to the specified torque.

**Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)**

**Q: Is the resistance at the standard value?**

**YES :** Replace the ECU or PCM. Then go to Step 6.

**NO :** Replace the engine coolant temperature sensor. Then go to Step 6.

**STEP 6. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

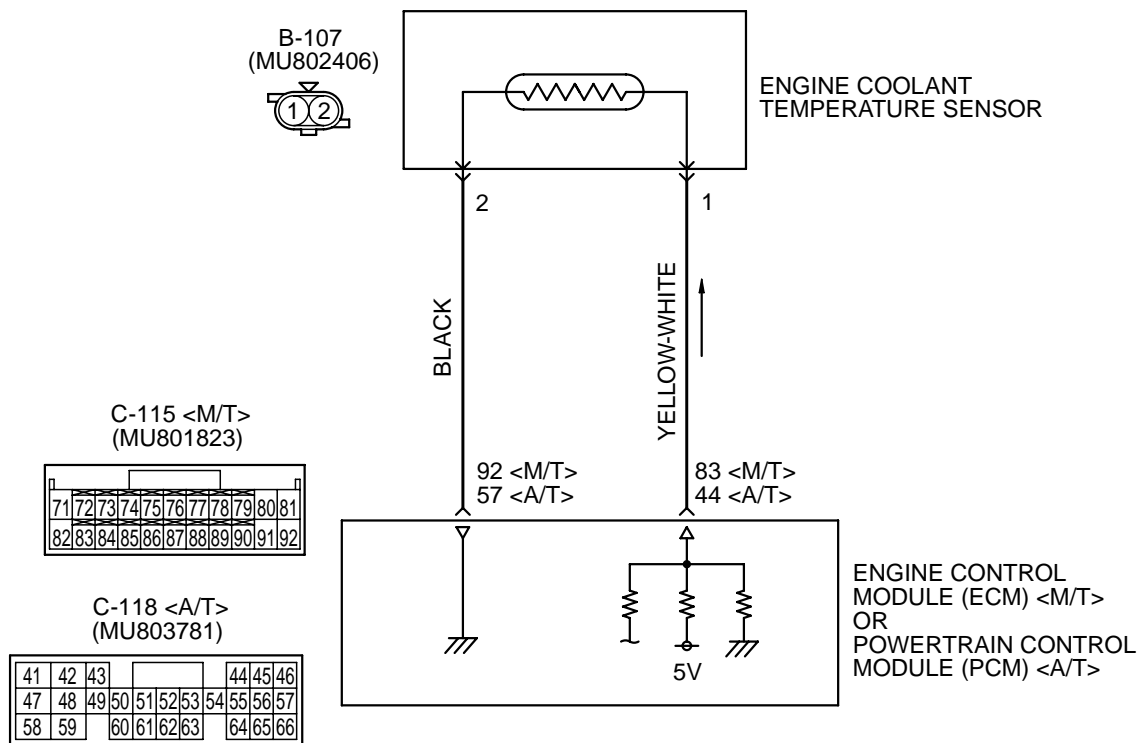
**Q: Is DTC P0117 set?**

**YES :** Repeat the troubleshooting.

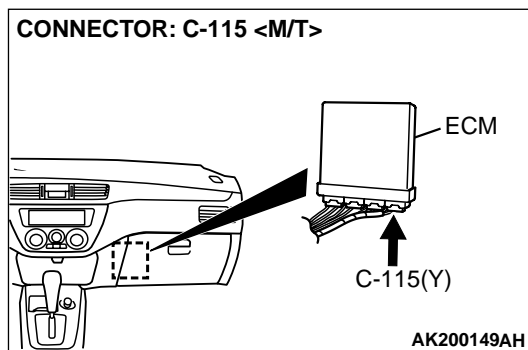
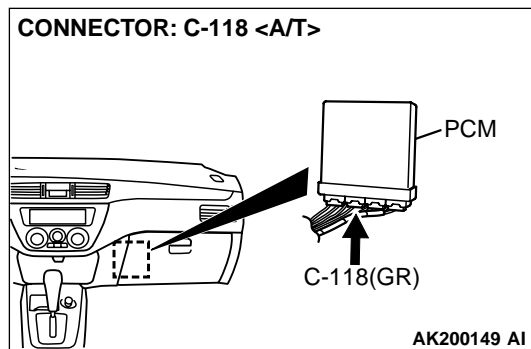
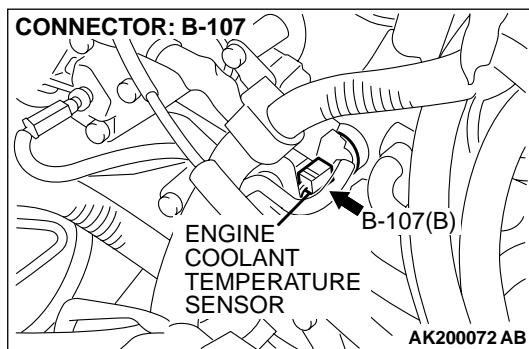
**NO :** The procedure is complete.

## DTC P0118: Engine Coolant Temperature Circuit High Input

## Enging Coolant Temperature Sensor Circuit



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**CIRCUIT OPERATION**

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 83) <M/T> or PCM (terminal No. 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or (terminal No. 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

**TECHNICAL DESCRIPTION**

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.

- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

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

**Judgement Criteria**

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to a coolant temperature of  $-45^{\circ}\text{C}$  ( $-49^{\circ}\text{F}$ ) or lower] for 2 seconds.

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

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.****⚠ CAUTION**

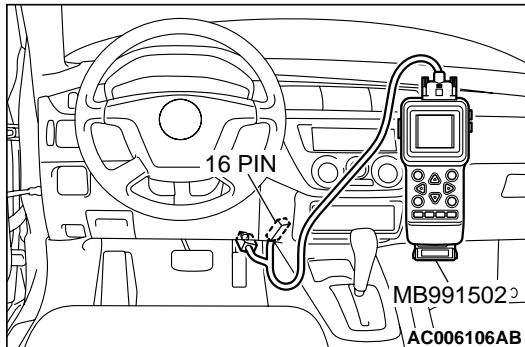
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

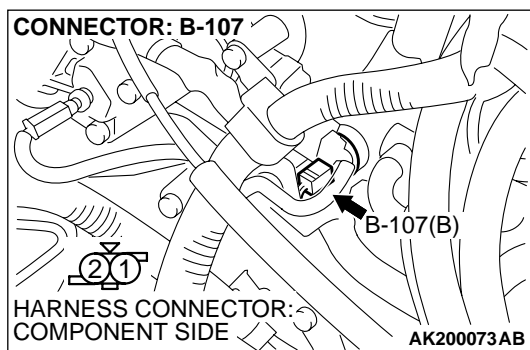
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.



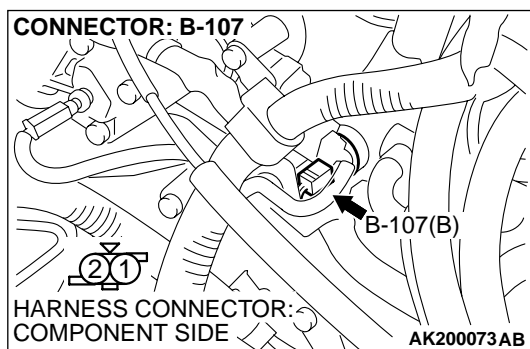


**STEP 2. Check connector B-107 at the engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 3.

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



**STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-107.**

(1) Disconnect connector B-107 and measure at the harness side.

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

(3) Measure the voltage between terminal No. 1 and ground.

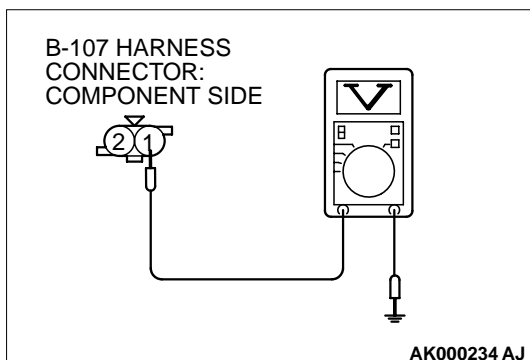
- Voltage should measure between 4.5 and 4.9 volts.

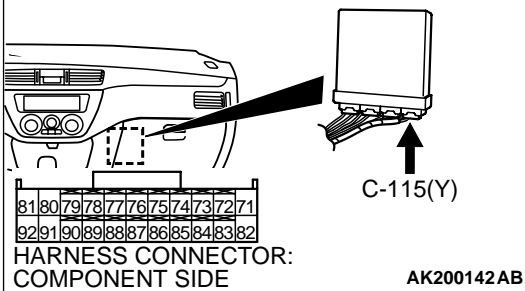
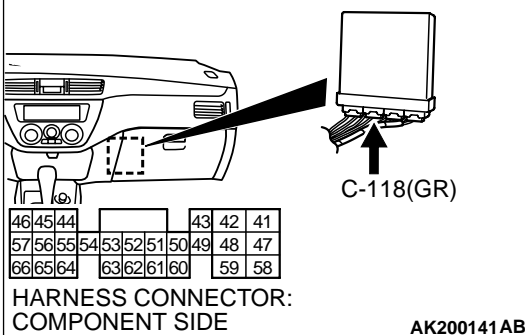
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 7.

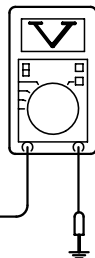
**NO :** Go to Step 4.



**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>****<M/T>**

C-115 HARNESS  
CONNECTOR:  
HARNESS SIDE

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92

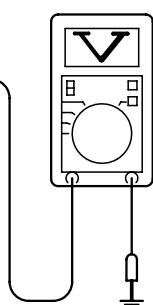


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**<A/T>**

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

41	42	43		44	45	46
47	48	49	50	51	52	53
54	55	56	57	58	59	60
61	62	63	64	65	66	



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**STEP 4. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

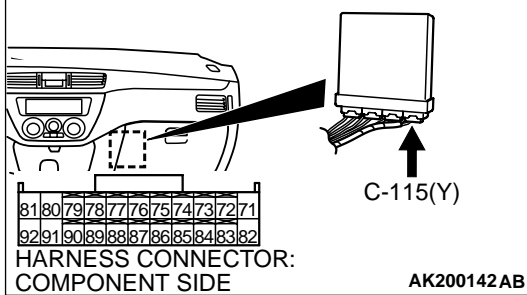
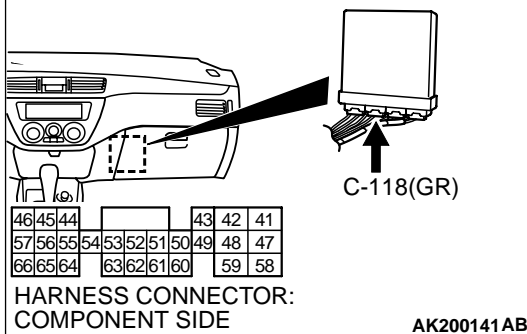
- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the engine coolant temperature sensor connector B-107.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 83 <M/T> or No. 44 <A/T> and ground by backprobing.
  - Voltage should measure between 4.5 and 4.9 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 5.

**NO :** Go to Step 6.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 5. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between engine coolant temperature sensor connector B-107 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> because of open circuit. Then go to Step 11.

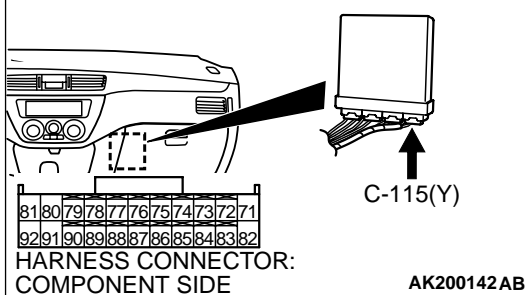
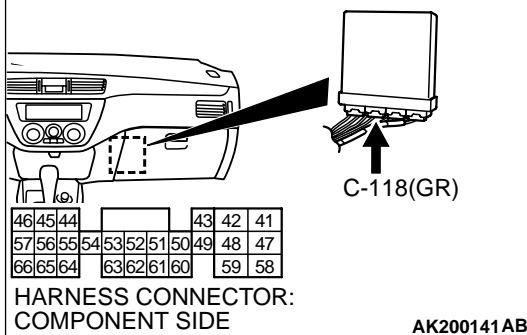
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

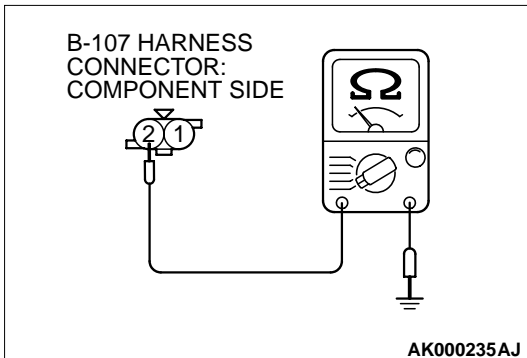
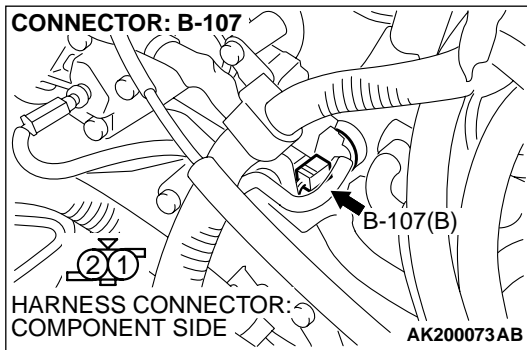
**STEP 6. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**



**STEP 7. Check for continuity at engine coolant temperature sensor harness side connector B-107.**

(1) Disconnect connector B-107 and measure at the harness side.

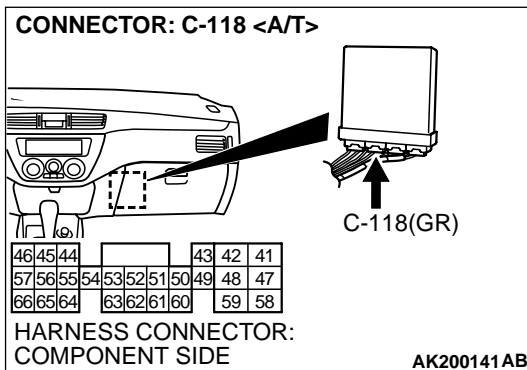
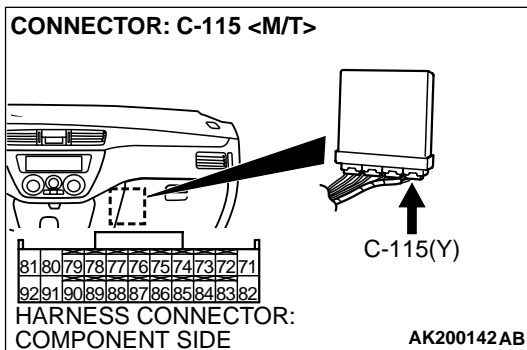
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 10.

**NO :** Go to Step 8.



**STEP 8. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

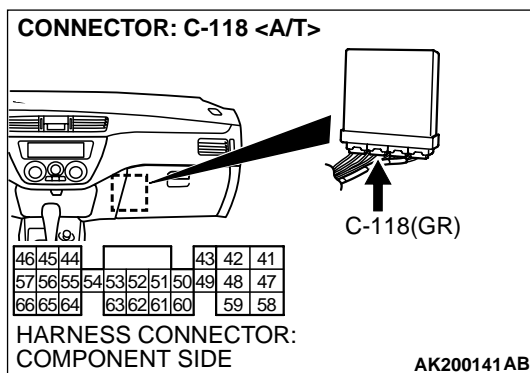
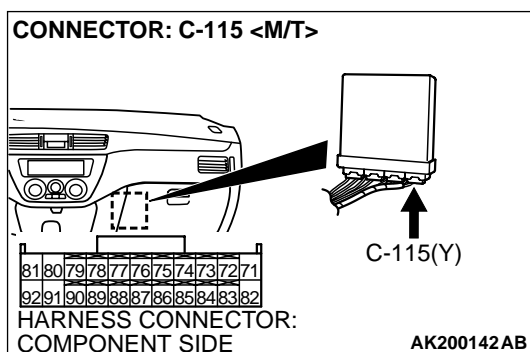
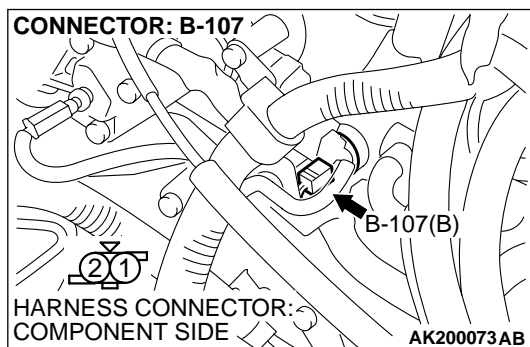
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

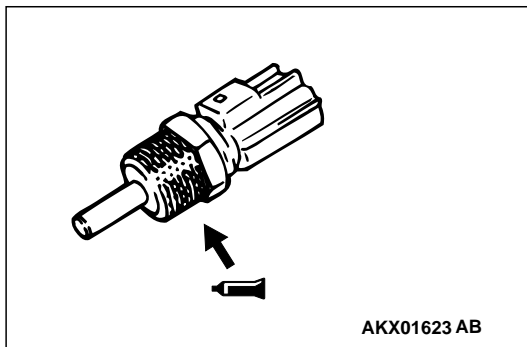
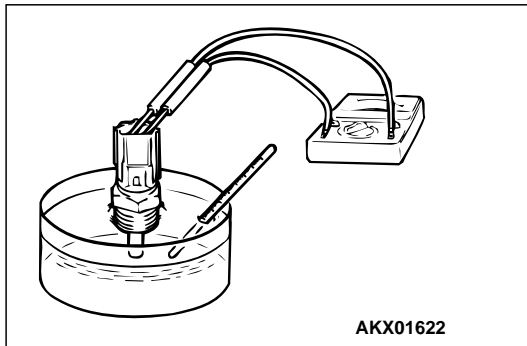
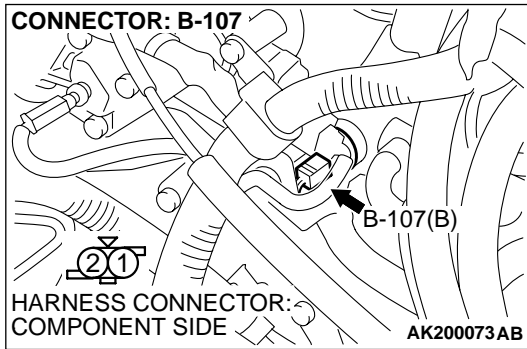
**STEP 9.** Check for open circuit between engine coolant sensor connector B-107 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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



**STEP 10. Check the engine coolant temperature sensor.**

- (1) Disconnect the engine coolant temperature sensor connector B-107.
- (2) Remove the engine coolant temperature sensor.

- (3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

**Standard value:**

- 14 – 17 kilohms [at –20°C (–4°F)]
- 5.1 – 6.5 kilohms [at 0°C (32°F)]
- 2.1 – 2.7 kilohms [at 20°C (68°F)]
- 0.9 – 1.3 kilohms [at 40°C (104°F)]
- 0.48 – 0.68 kilohm [at 60°C (140°F)]
- 0.26 – 0.36 kilohm [at 80°C (176°F)]

- (4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
- (5) Install the engine coolant temperature sensor, and tighten to the specified torque.

**Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)**

**Q: Is the resistance at the standard value?**

**YES :** Replace the ECU or PCM. Then go to Step 11.

**NO :** Replace the engine coolant temperature sensor. Then go to Step 11.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

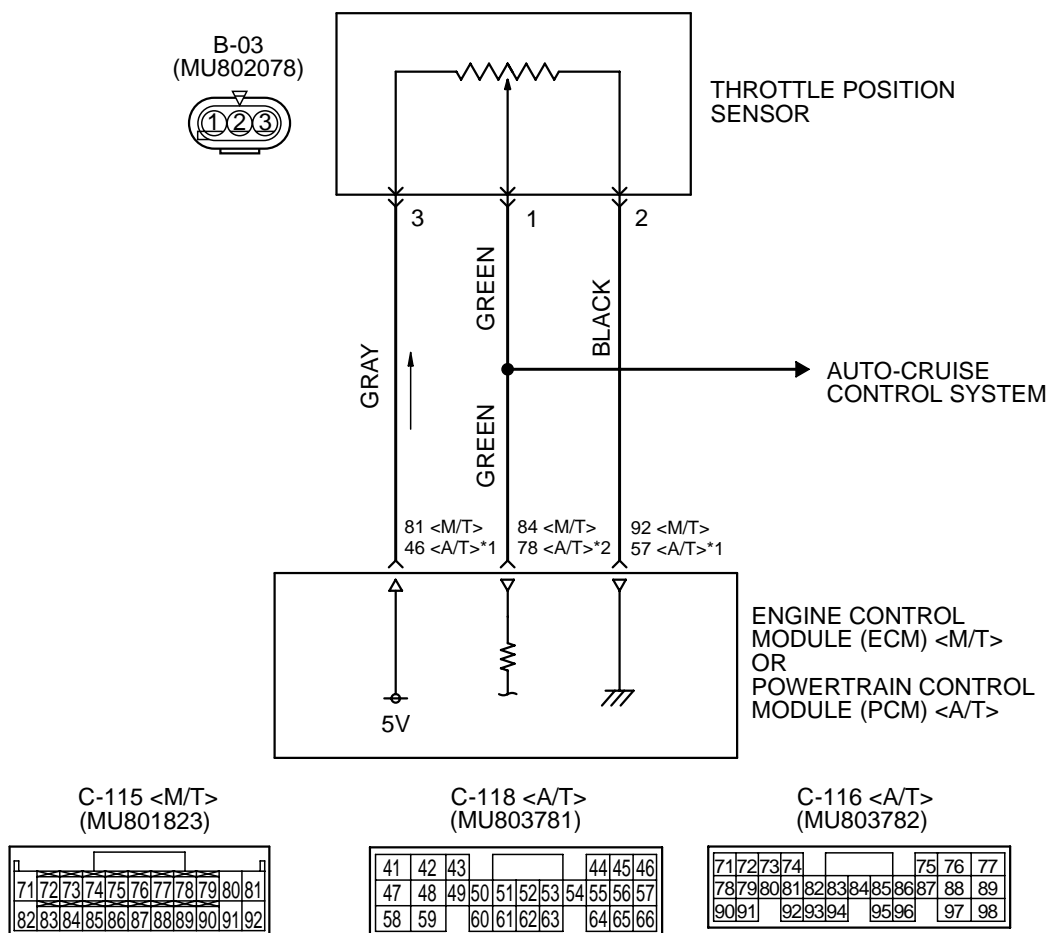
**Q: Is DTC P0118 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

## DTC P0121: Throttle Position Sensor Circuit Range/Performance Problem

## Throttle Position Sensor (TPS) Circuit

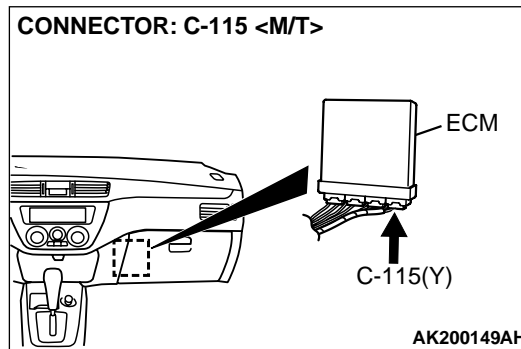
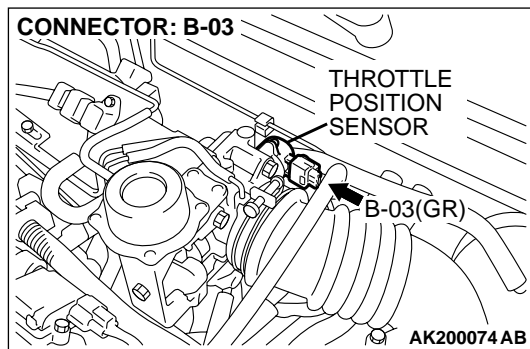


## NOTE

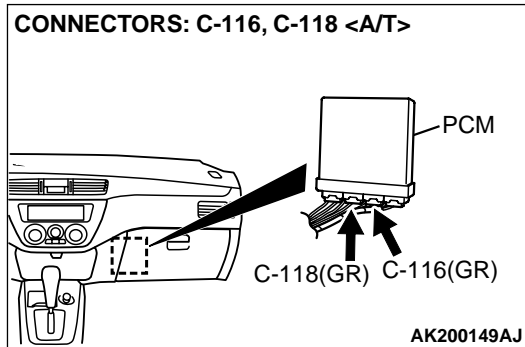
\*1: PCM connector C-118 &lt;A/T&gt;

\*2: PCM connector C-116 &lt;A/T&gt;

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### CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal No. 3) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>.
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal No. 1) and ground terminal will increase according to the rotation.

### TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions

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

- Engine speed is higher than 2,000 r/min.
- Volumetric efficiency is higher than 60 percent.

#### Judgement Criteria

- Throttle position sensor output voltage has continued to be 0.8 volt or lower for 2 seconds.

#### Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is lower than 3,000 r/min.
- Volumetric efficiency is lower than 30 percent.

#### Judgement Criteria

- Throttle position sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

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

- Throttle position sensor failed or incorrectly adjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.**

### CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
  - With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is the sensor operating properly?

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

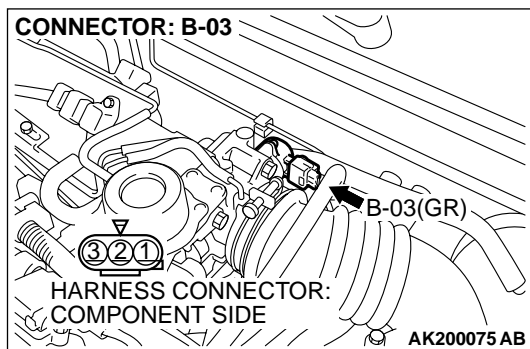
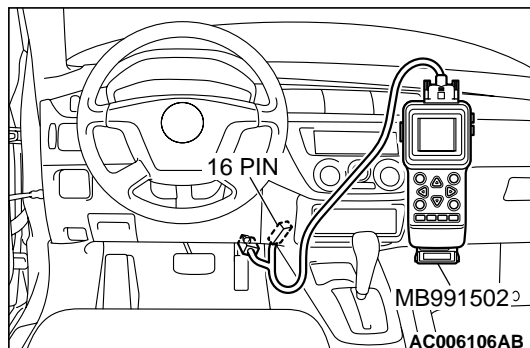
**NO :** Go to Step 2.

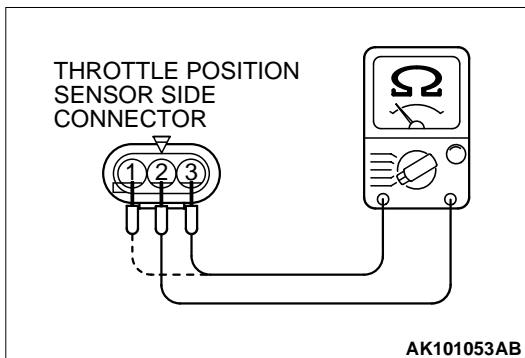
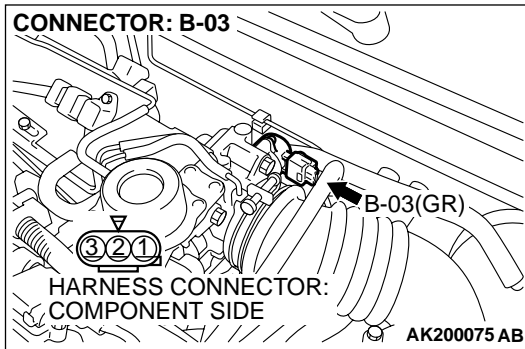
**STEP 2. Check connector B-03 at throttle position sensor for damage.**

### Q: Is the connector in good condition?

**YES :** Go to Step 3.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP3. Check the throttle position sensor.**

(1) Disconnect connector B-03.

(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 3.

**Standard value: 2.0 – 4.0 kilohms**

(3) Measure resistance between the throttle position sensor side connector terminal No. 1 and No. 2.

(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

**Q: Is the resistance normal?**

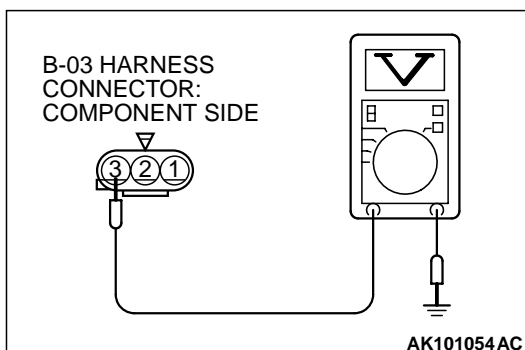
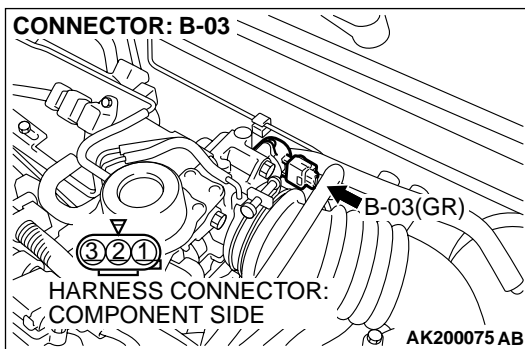
**YES :** Go to Step 4.

**NO :** Replace the throttle position sensor. Refer to GROUP 13A, Throttle Body Assembly – Disassembly and Assembly [P.13Aa-30](#). Then go to Step 14.

**STEP 4. Measure the sensor supply voltage at throttle position sensor harness side connector B-03.**

(1) Disconnect connector B-03 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.

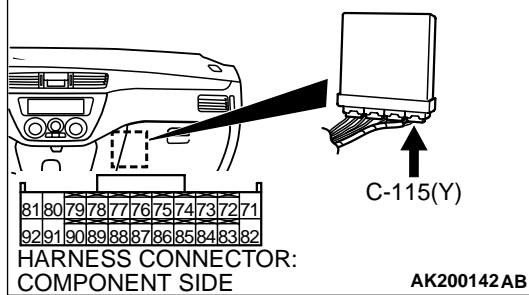
- Voltage should measure between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 7.

**NO :** Go to Step 5.

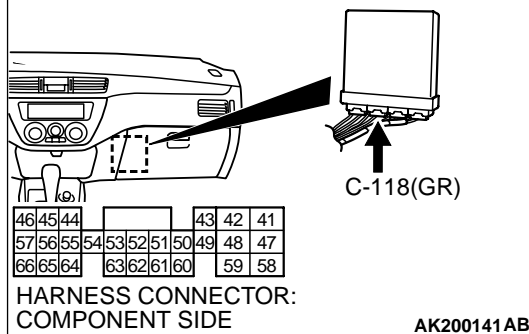
**CONNECTOR: C-115 <M/T>**

**STEP 5. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

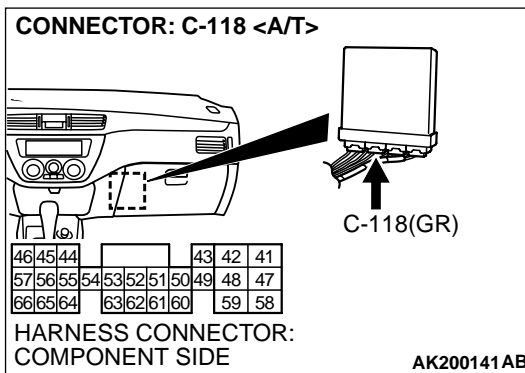
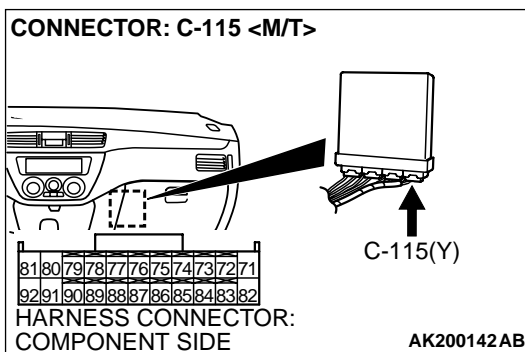
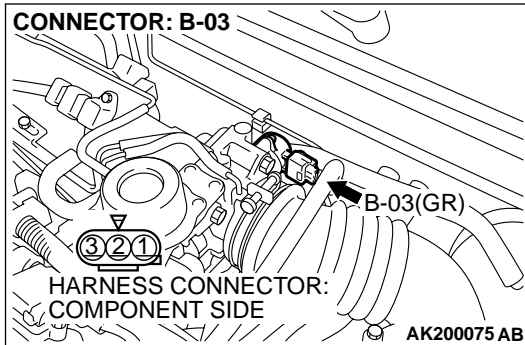
**CONNECTOR: C-118 <A/T>**

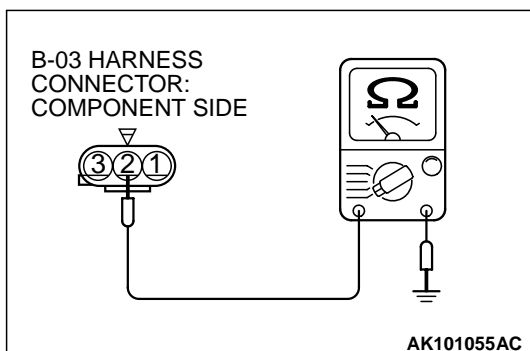
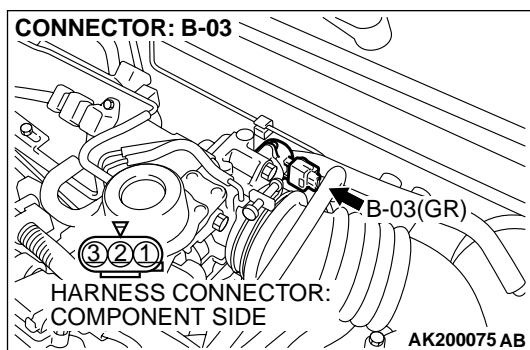
**STEP 6.** Check for harness damage between throttle position sensor connector B-03 (terminal No. 3) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.





**STEP 7. Check for continuity at throttle position sensor harness side connector B-03.**

(1) Disconnect connector B-03 and measure at the harness side.

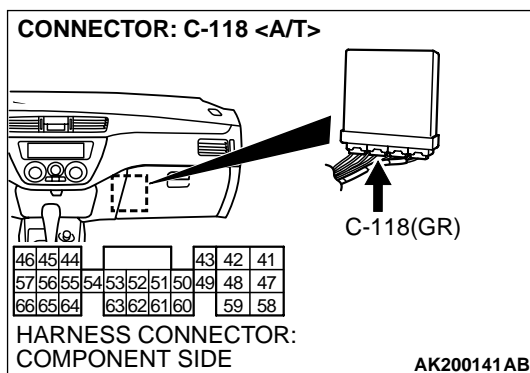
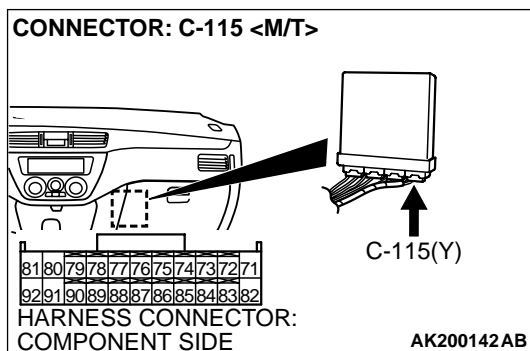
(2) Measure the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 10.

**NO :** Go to Step 8.



**STEP 8. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

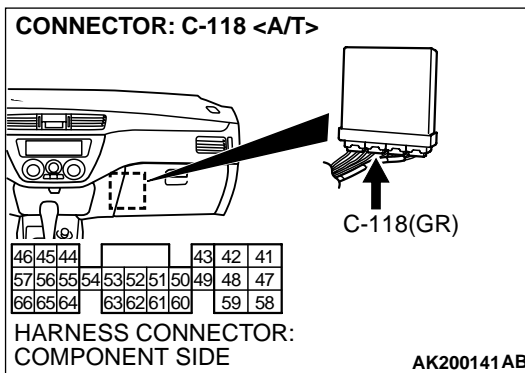
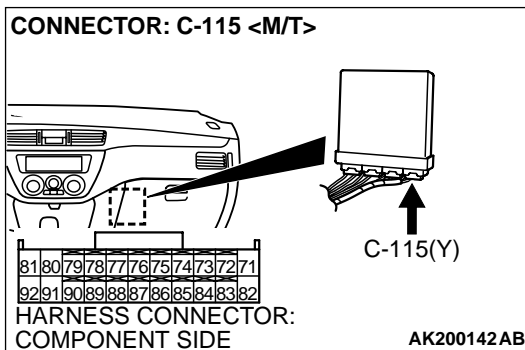
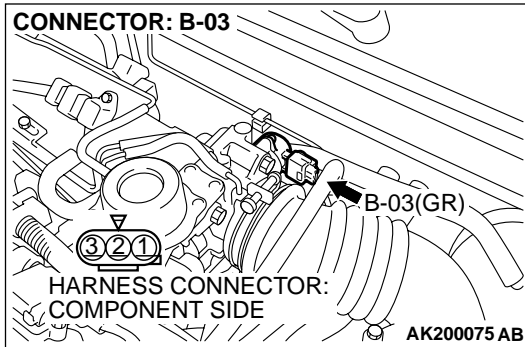
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

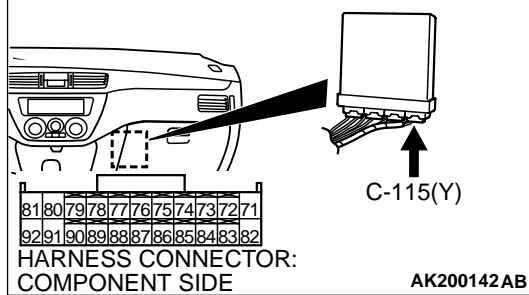
**STEP 9. Check for open circuit and harness damage between throttle position sensor connector B-03 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

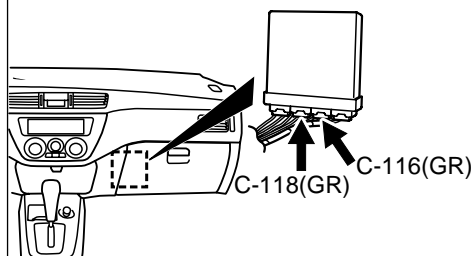


**CONNECTOR: C-115 <M/T>**

**STEP 10. Check connector C-115 at ECM <M/T> or connectors C-116, C-118 at PCM <A/T> for damage.**  
**Q: Is the connector in good condition?**

**YES :** Go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**CONNECTORS: C-116, C-118 <A/T>**

C-116 HARNESS CONNECTOR:  
COMPONENT SIDE

46	45	44						43	42	41
57	56	55	54	53	52	51	50	49	48	47
66	65	64		63	62	61	60		59	58

C-118 HARNESS CONNECTOR:  
COMPONENT SIDE

AK200139 AB

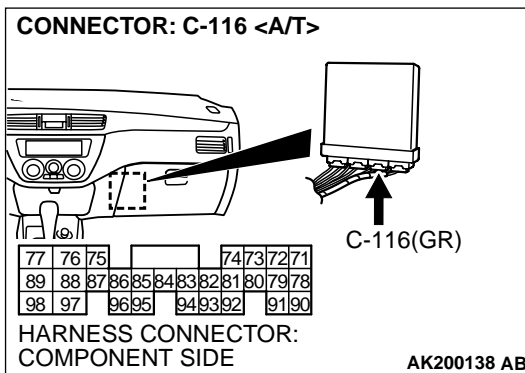
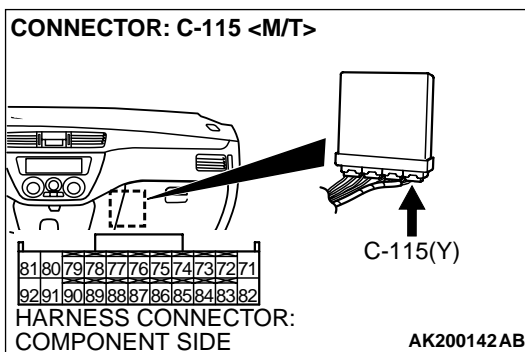
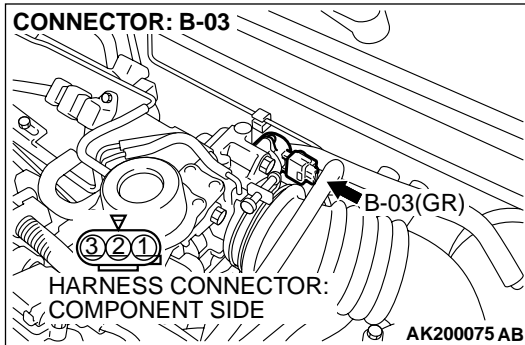


**STEP 11. Check for harness damage between throttle position sensor connector B-03 (terminal No. 1) and ECM connector C-115 (terminal No. 84) <M/T> or PCM connector C-116 (terminal No. 78) <A/T>.**

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

**YES :** Go to Step 12.

**NO :** Repair it. Then go to Step 14.



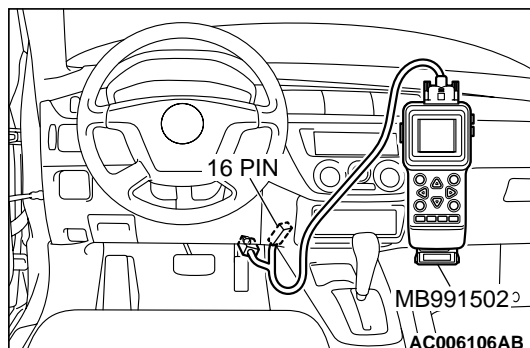
**STEP 12. Check the incorrectly adjusted throttle position sensor.**

Refer to GROUP 13A, Throttle Position Sensor Adjustment [P.13Aa-12](#).

**Q: Is the output voltage normal?**

**YES :** Go to Step 13.

**NO :** Adjust it. Then go to Step 14.



**STEP 13. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
  - With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 14.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

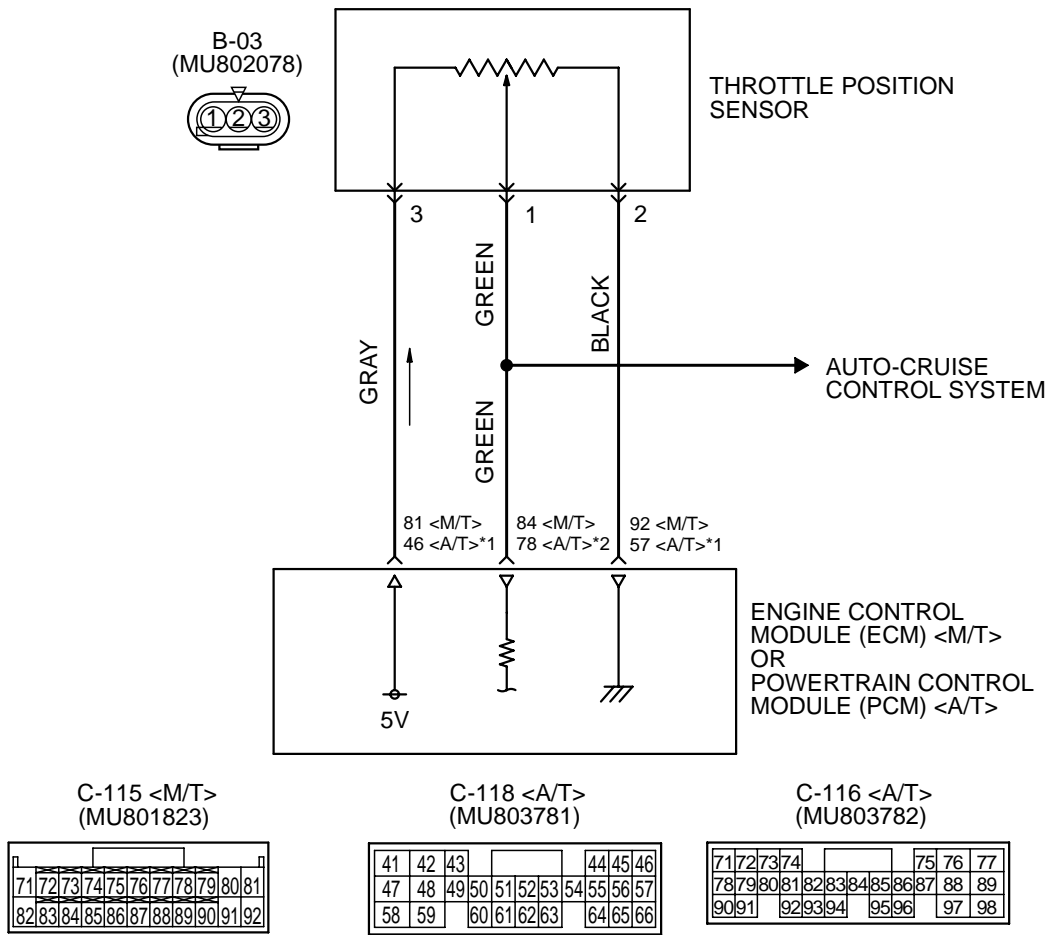
**Q: Is DTC P0121 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

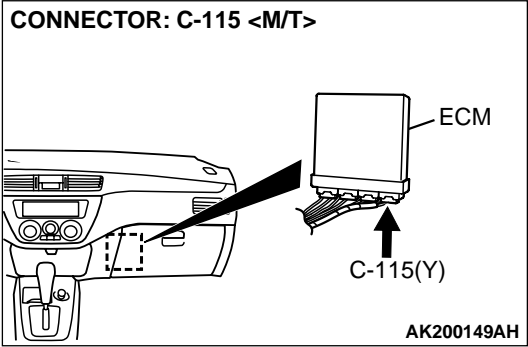
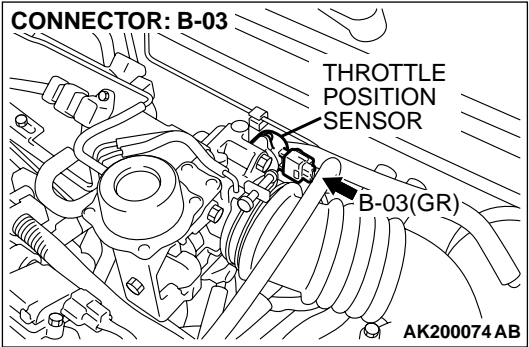
DTC P0122: Throttle Position Sensor Circuit Low Input

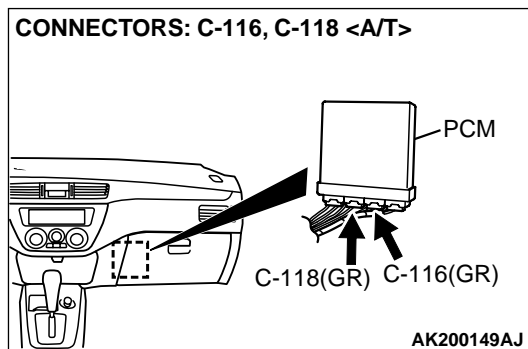
Throttle Position Sensor (TPS) Circuit



NOTE  
\*1: PCM connector C-118 <A/T>  
\*2: PCM connector C-116 <A/T>

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### CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal No. 3) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>.
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal No. 1) and ground terminal will increase according to the rotation.

### TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

### DTC SET CONDITIONS

#### Check Conditions

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

#### Judgement Criteria

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

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

- Throttle position sensor failed or incorrectly adjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
  - With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

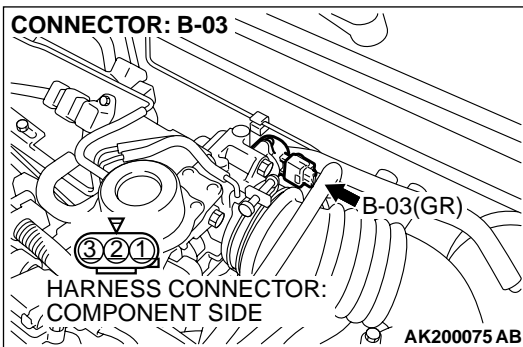
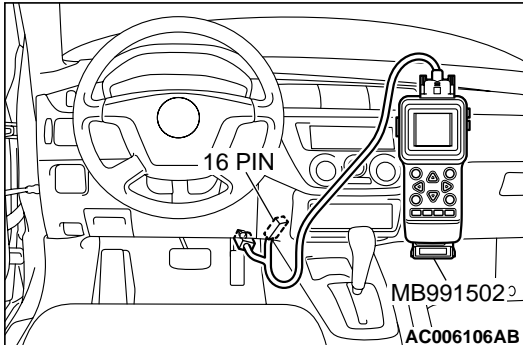
**NO :** Go to Step 2.

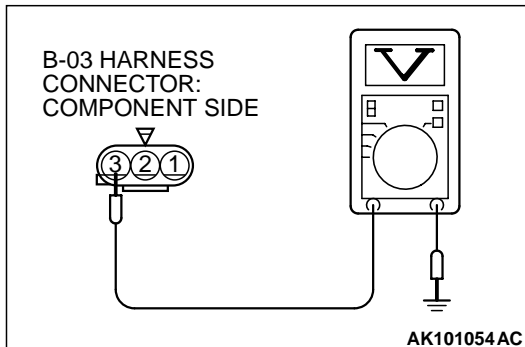
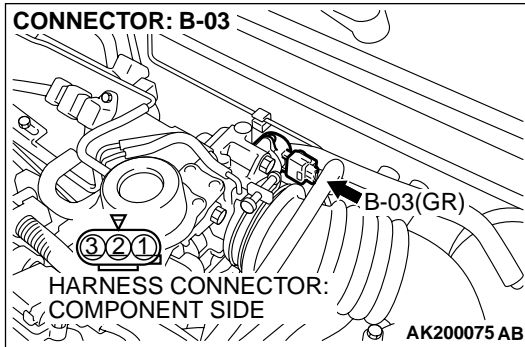
**STEP 2. Check connector B-03 at throttle position sensor for damage.**

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

**YES :** Go to Step 3.

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





**STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-03.**

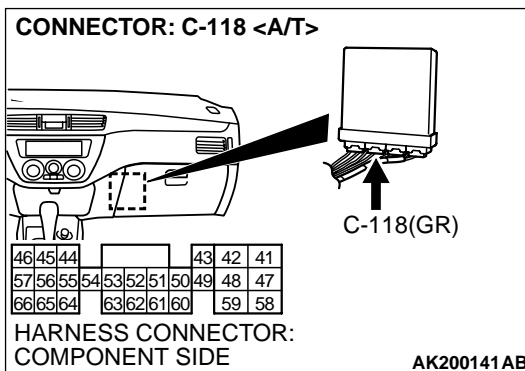
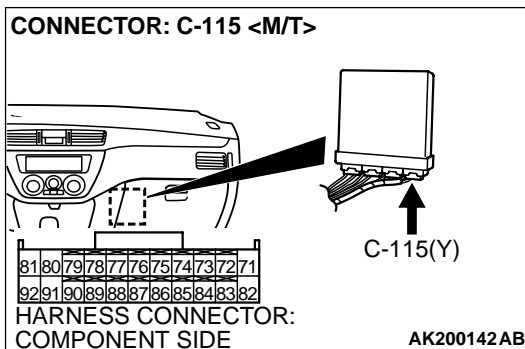
- (1) Disconnect connector B-03 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.8 and 5.2 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 6.

**NO :** Go to Step 4.



**STEP 4. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 5.

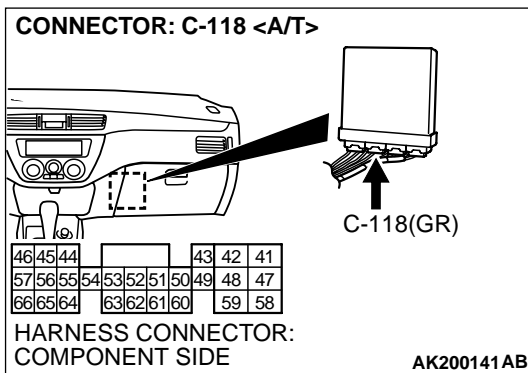
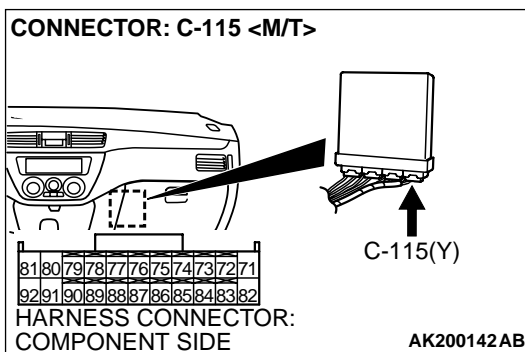
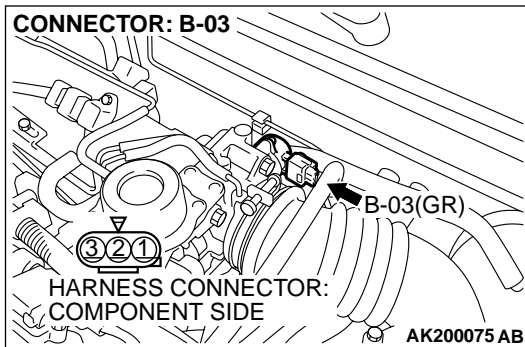
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

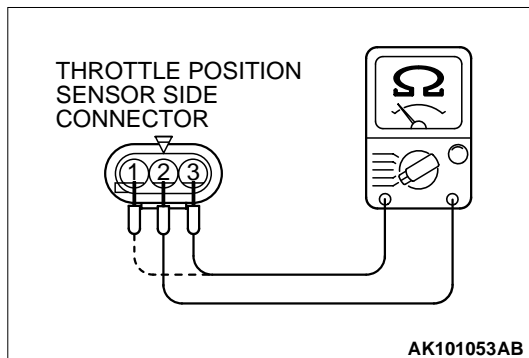
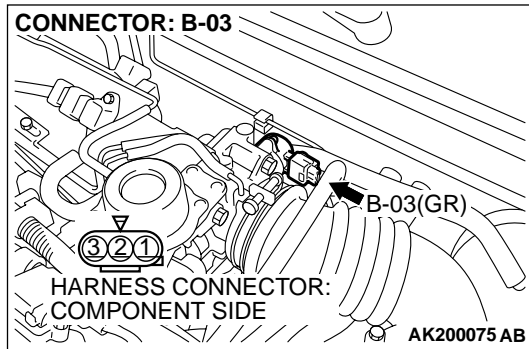
**STEP 5.** Check for open circuit and short circuit to ground between throttle position sensor connector B-03 (terminal No. 3) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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



**STEP 6. Check the throttle position sensor.**

(1) Disconnect connector B-03.

(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 3.

**Standard value: 2.0 – 4.0 kilohms**

(3) Measure resistance between the throttle position sensor side connector terminal No. 1 and No. 2.

(4) Move the throttle valve from the idle position to the full-open position.

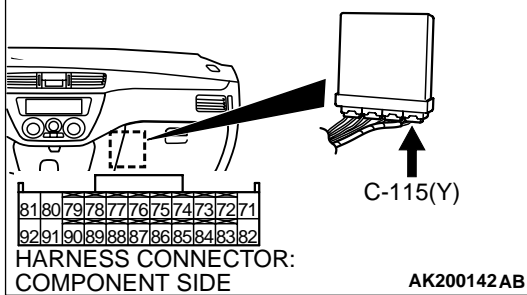
- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

**Q: Is the resistance normal?**

**YES :** Go to Step 7.

**NO :** Replace the throttle position sensor. Refer to GROUP 13A, Throttle Body Assembly – Disassembly and Assembly [P.13Aa-30](#). Then go to Step 11.



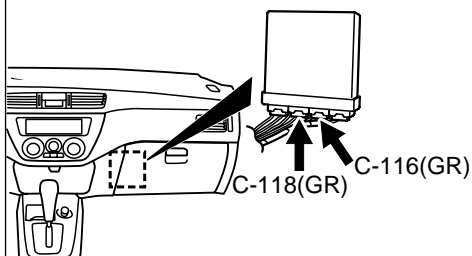
**CONNECTOR: C-115 <M/T>**

**STEP 7. Check connector C-115 at ECM <M/T> or connectors C-118, C-116 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

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

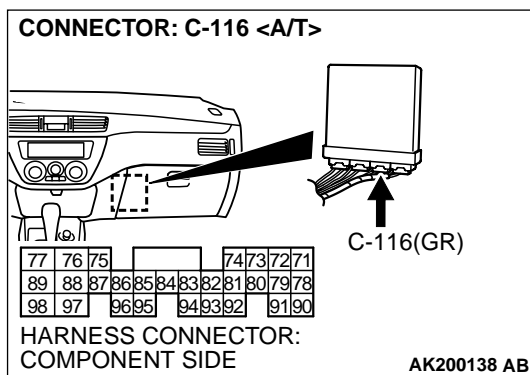
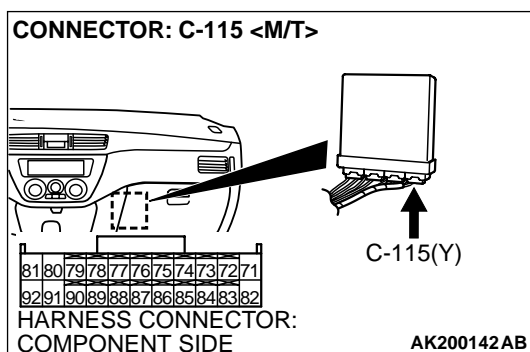
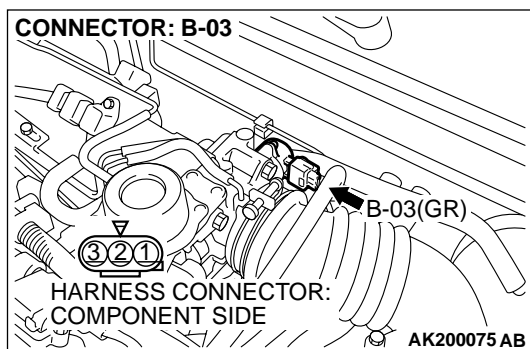
**CONNECTORS: C-116, C-118 <A/T>**

C-116 HARNESS CONNECTOR:  
COMPONENT SIDE

46	45	44				43	42	41
57	56	55	54	53	52	51	50	49
66	65	64	63	62	61	60	59	58

C-118 HARNESS CONNECTOR:  
COMPONENT SIDE

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**STEP 8. Check for open circuit and short circuit to ground between throttle position sensor connector B-03 (terminal No. 1) and ECM connector C-115 (terminal No. 84) <M/T> or PCM connector C-116 (terminal No. 78) <A/T>.**

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

**YES :** Go to Step 9.

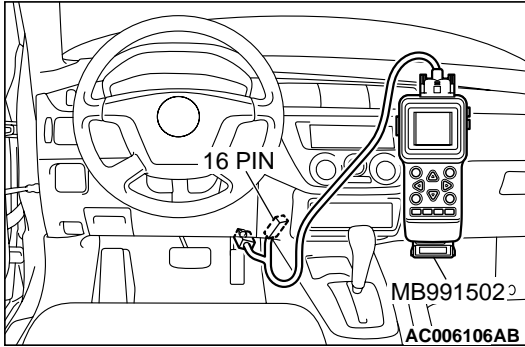
**NO :** Repair it. Then go to Step 11.

**STEP 9. Check for short circuit to ground between throttle position sensor connector and auto-cruise control-ECU. Refer to GROUP 17, Auto Cruise Control System – Diagnostic Trouble Code Chart P.17-11.**

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

**YES :** Go to Step 10.

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



**STEP 10. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
  - With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 11.

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

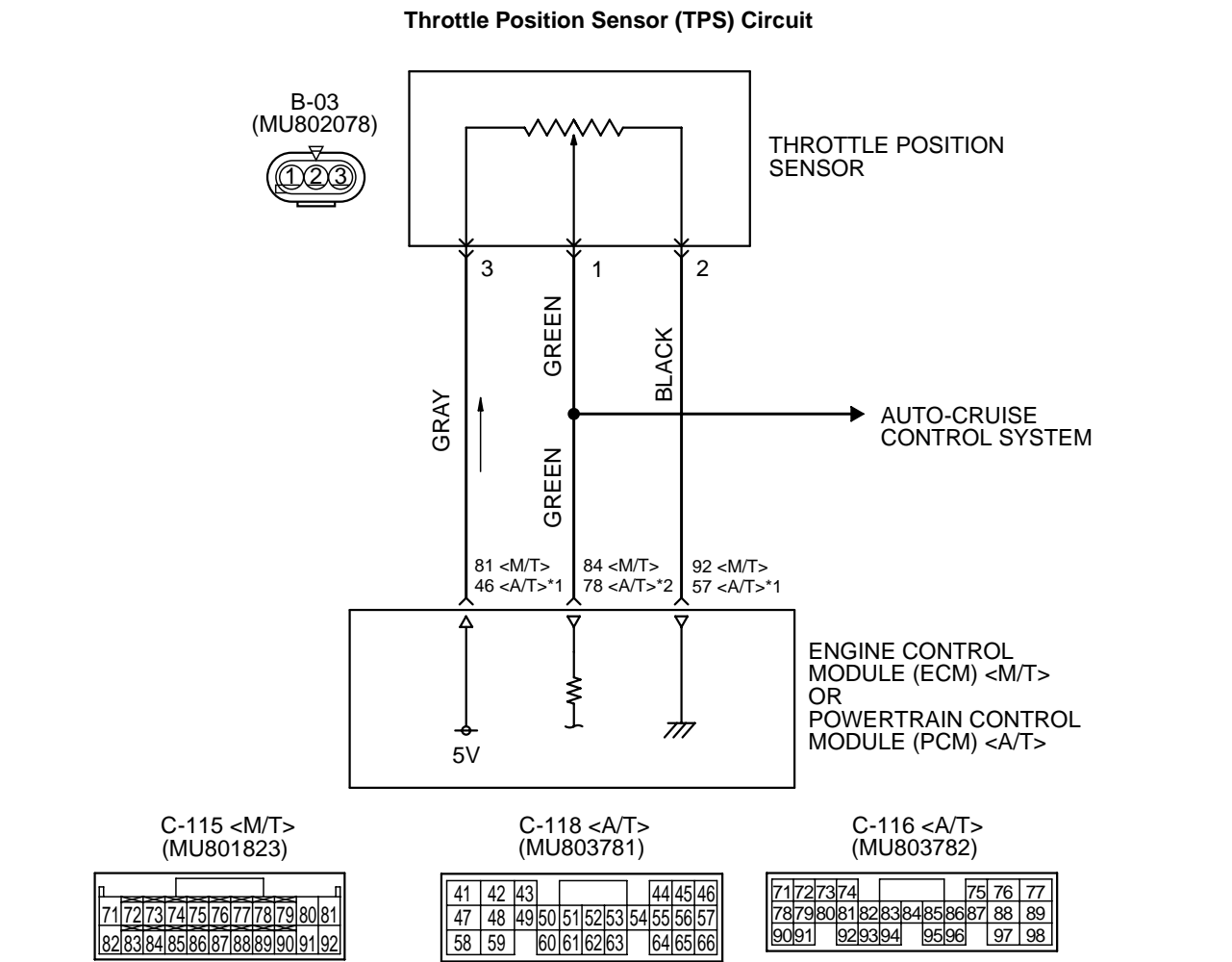
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0122 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

DTC P0123: Throttle Position Sensor Circuit High Input

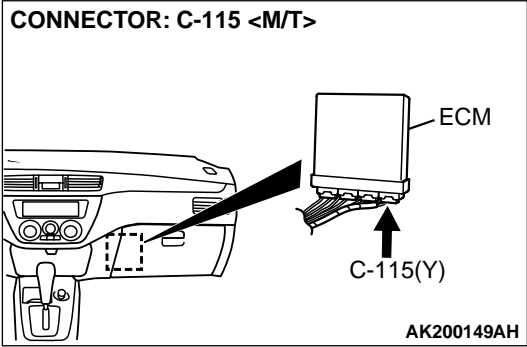
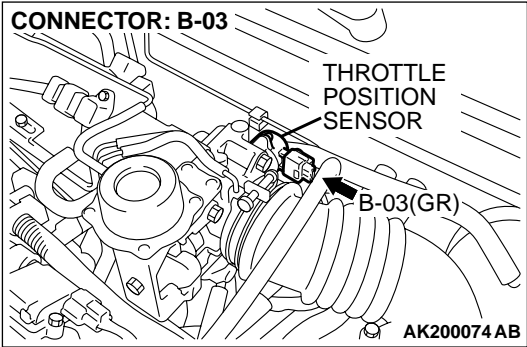


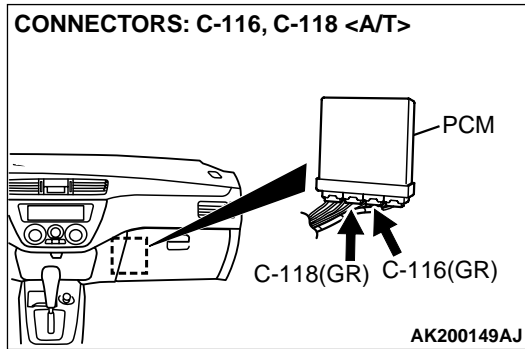
NOTE

\*1: PCM connector C-118 <A/T>

\*2: PCM connector C-116 <A/T>

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### CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor power terminal (terminal No. 3) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.
- When the throttle valve shaft is turned from the idle position to the fully opened position, the resistor between the throttle position sensor output terminal (terminal No. 1) and ground terminal will increase according to the rotation.

### TECHNICAL DESCRIPTION

- The throttle position sensor outputs voltage which corresponds to the throttle valve opening angle.
- The ECM <M/T> or PCM <A/T> checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too high while the engine is at idle.

### DTC SET CONDITIONS

#### Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- Engine speed is lower than 1,000 r/min.
- Volumetric efficiency is lower than 60 percent.

#### Judgement Criteria

- Throttle position sensor output voltage has continued to be 2 volts or higher for 2 seconds.

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

- Throttle position sensor failed or incorrectly adjusted.
- Open or shorted throttle position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.**

### **⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.
  - With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
  - With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

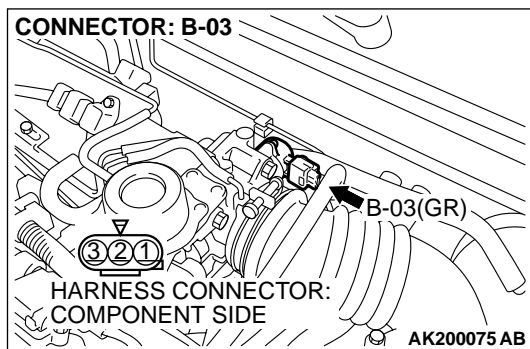
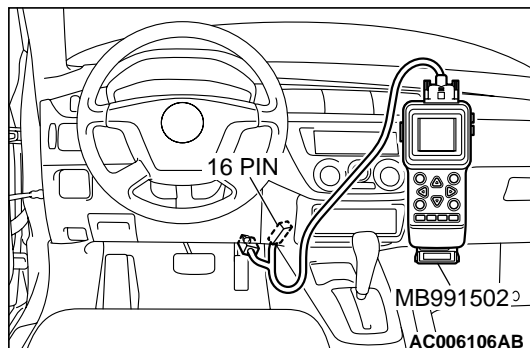
**NO :** Go to Step 2.

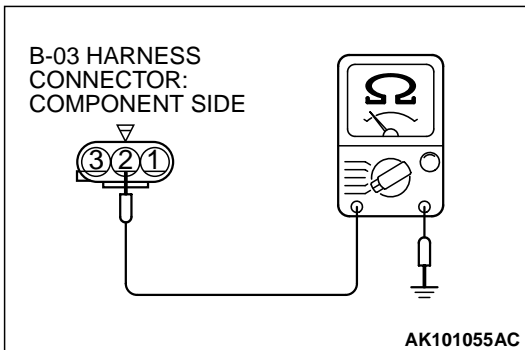
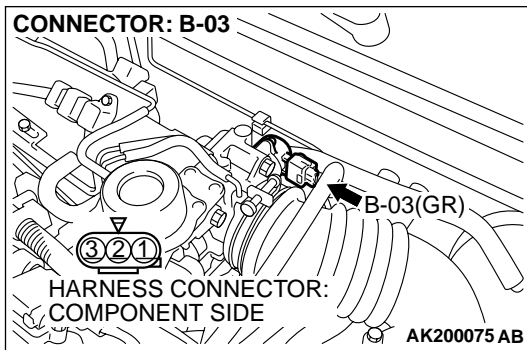
**STEP 2. Check connector B-03 at throttle position sensor for damage.**

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

**YES :** Go to Step 3.

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





**STEP 3. Check for continuity at throttle position sensor harness side connector B-03.**

(1) Disconnect connector B-03 and measure at the harness side.

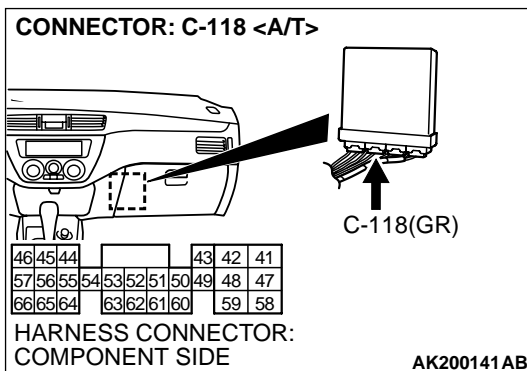
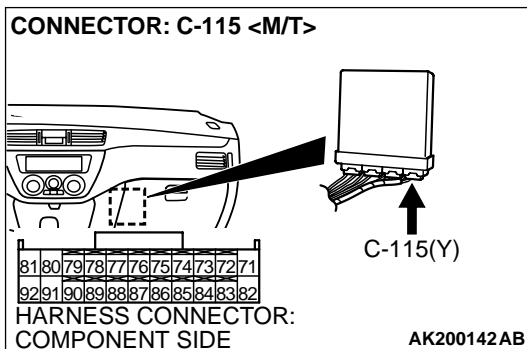
(2) Measure the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 6.

**NO :** Go to Step 4.



**STEP 4. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 5.

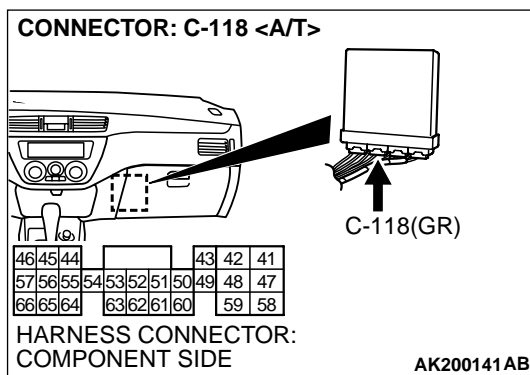
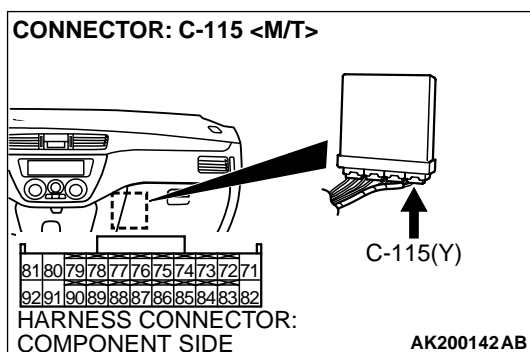
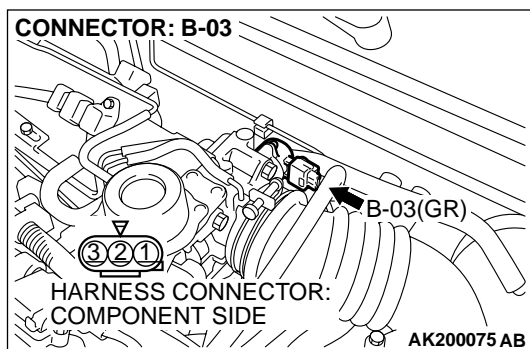
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 8.

**STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-03 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

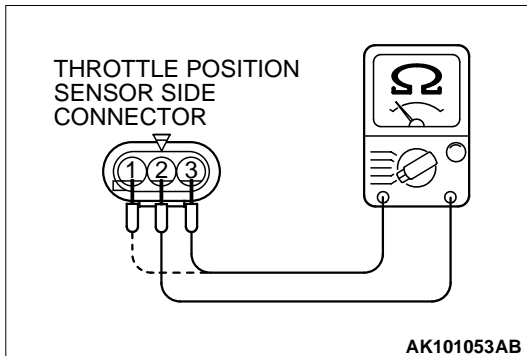
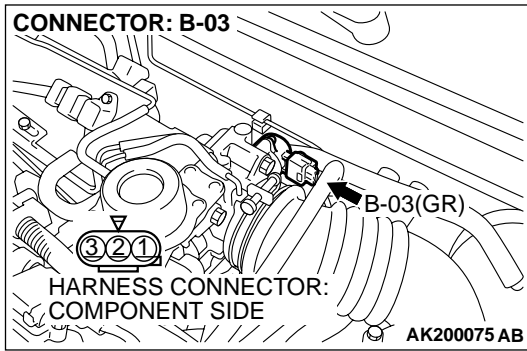
**Q: Is the harness wire in good condition?**

**YES :** Replace the ECM or PCM. Then go to Step 8.

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





**STEP 6. Check the throttle position sensor.**

(1) Disconnect connector B-03.

(2) Measure the resistance between throttle position sensor side connector terminal No. 2 and No. 3.

**Standard value: 2.0 – 4.0 kilohms**

(3) Measure resistance between the throttle position sensor side connector terminal No. 1 and No. 2.

(4) Move the throttle valve from the idle position to the full-open position.

- Resistance should change smoothly in proportion to the opening angle of the throttle valve.

**Q: Is the resistance normal?**

**YES :** Go to Step 7.

**NO :** Replace the throttle position sensor. Refer to GROUP 13A, Throttle Body Assembly – Disassembly and Assembly [P.13Aa-30](#), Throttle Body. Then go to Step 8.

**STEP 7. Using scan tool MB991502, check data list item 14: Throttle Position Sensor.****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.

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

(3) Set scan tool MB991502 to the data reading mode for item 14, Throttle Position Sensor.

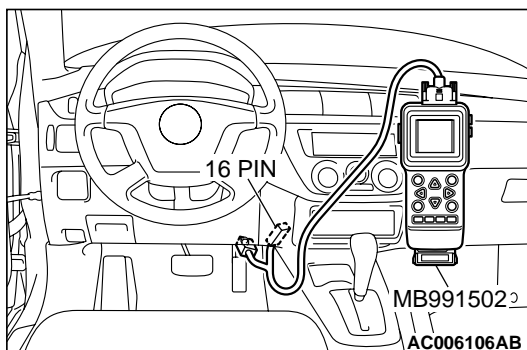
- With the throttle valve in the idle position, voltage should measure between 0.335 and 0.935 volt.
- With the throttle valve in the full-open position, voltage should measure between 4.39 and 5.29 volts.

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

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

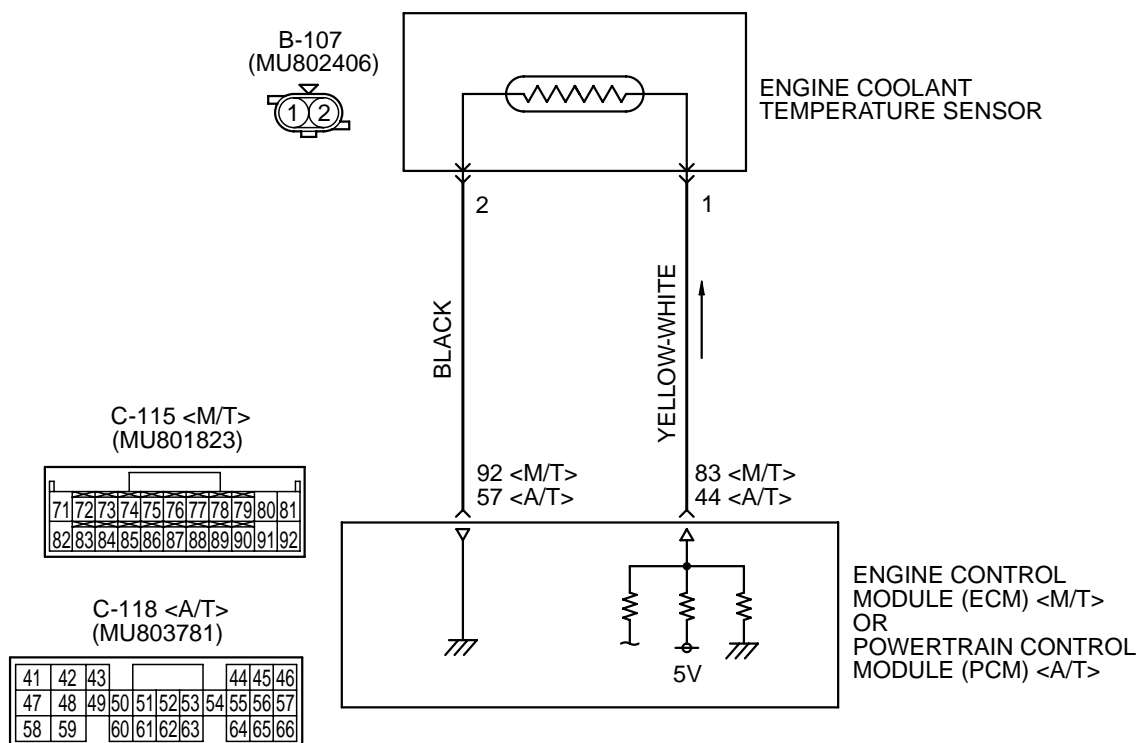
**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 8.

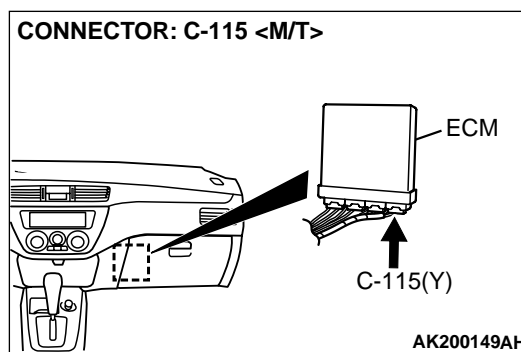
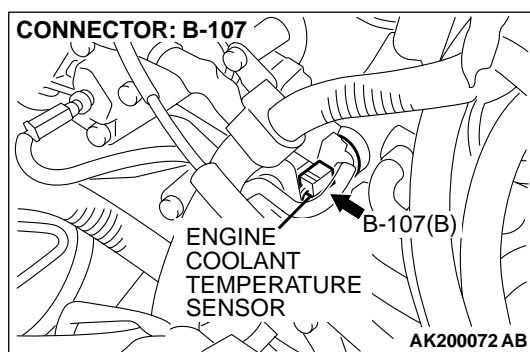


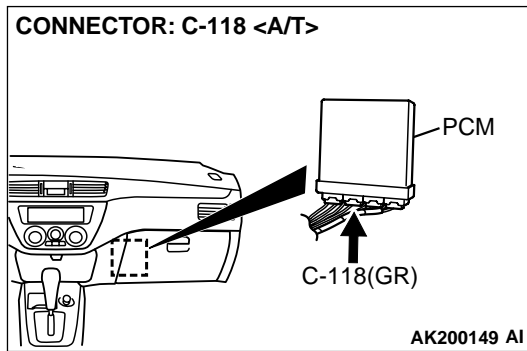
**STEP 8. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0123 set?****YES :** Repeat the troubleshooting.**NO :** The procedure is complete.**DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control****Enging Coolant Temperature Sensor Circuit**

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### CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 83) <M/T> or PCM (terminal No. 44) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 92) <M/T> or (terminal No. 57) <A/T>.
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistor decreases.
- The engine coolant temperature sensor output voltage increases when the resistor increases and decreases when the resistor decreases.

### TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and output it.
- The ECM <M/T> or PCM <A/T> checks whether this voltage is within a specified range.

### DTC SET CONDITIONS

#### Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40°C (104°F) to lower than 40°C (104°F).
- Then the engine coolant temperature has continued to be 40°C (104°F) or lower for five minutes.

#### Check Conditions, Judgement Criteria

- About 60 – 300 seconds have passed for the engine coolant temperature to rise to about 7°C (44.6°F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

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

- Engine coolant temperature sensor failed.
- Open or shorted engine coolant temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.**

**⚠ CAUTION**

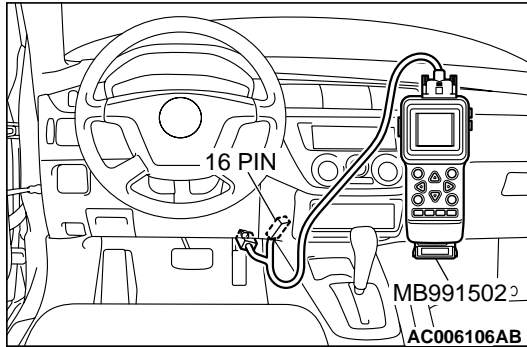
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

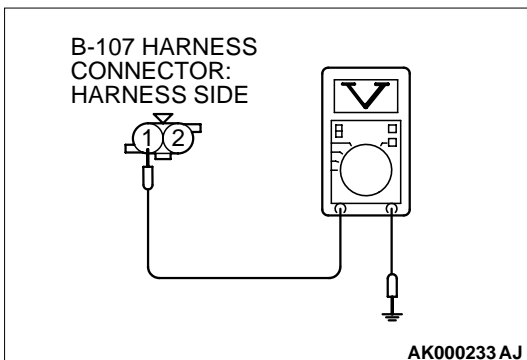
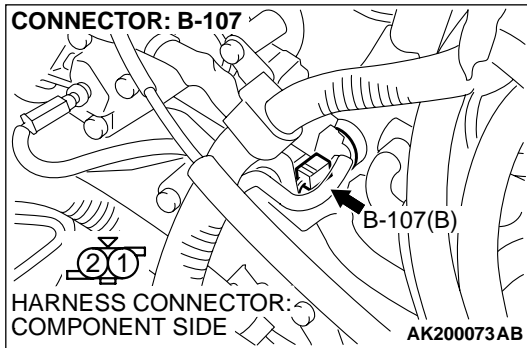
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent.  
Refer to GROUP 00, How to Use Troubleshooting/  
Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-107 by backprobing.**

- (1) Do not disconnect connector B-107.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground by backprobing.

- When engine coolant temperature is  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ), voltage should measure 3.9 and 4.5 volts.
- When engine coolant temperature is  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ), voltage should measure 3.2 and 3.8 volts.
- When engine coolant temperature is  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ), voltage should measure 2.3 and 2.9 volts.
- When engine coolant temperature is  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ), voltage should measure 1.3 and 1.9 volts.
- When engine coolant temperature is  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ), voltage should measure 0.7 and 1.3 volts.
- When engine coolant temperature is  $80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ ), voltage should measure 0.3 and 0.9 volt.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

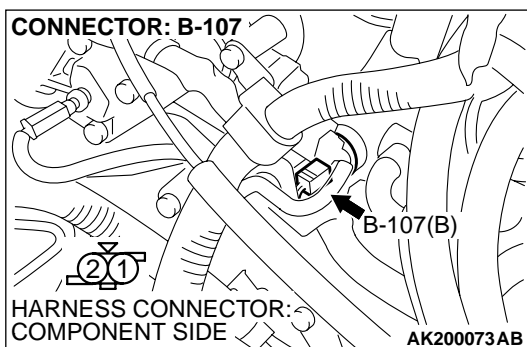
**NO :** Go to Step 5.

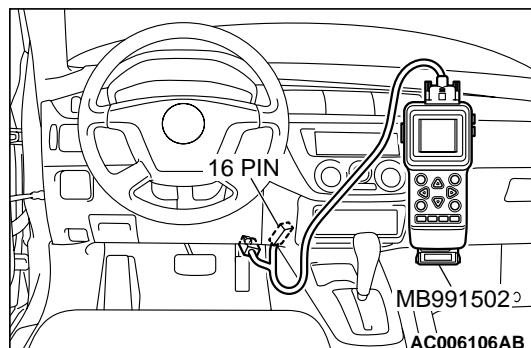
**STEP 3. Check connector B-107 at the engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 4. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

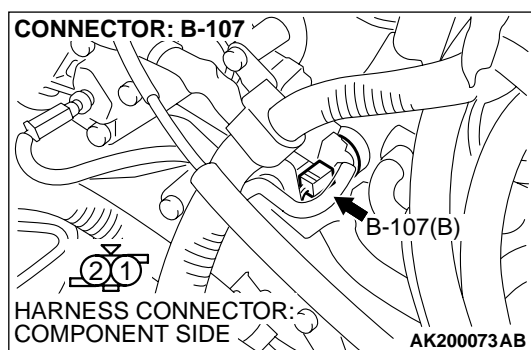
**NO :** Replace the ECM or PCM. Then go to Step 14.

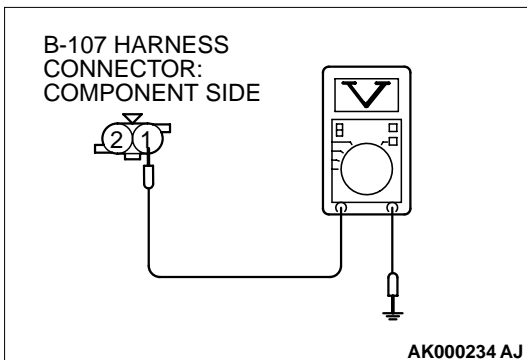
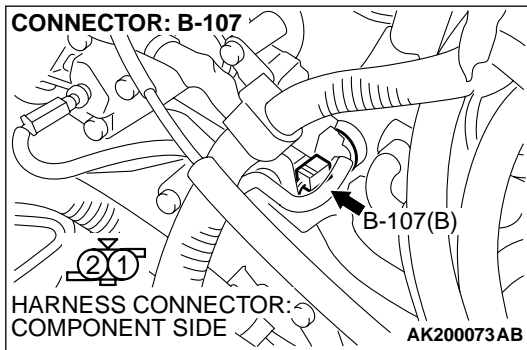
**STEP 5. Check connector B-107 at engine coolant temperature sensor for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-107.**

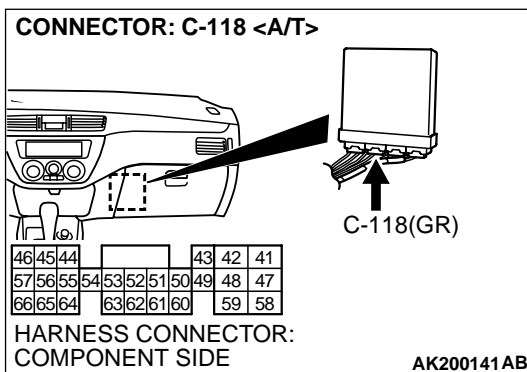
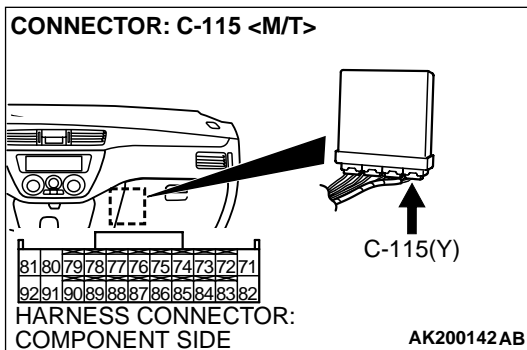
- (1) Disconnect connector B-107 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should measure between 4.5 and 4.9 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Go to Step 7.

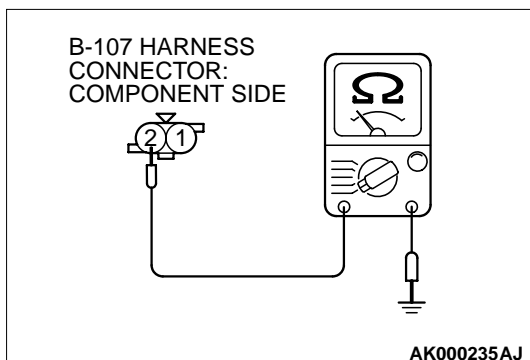
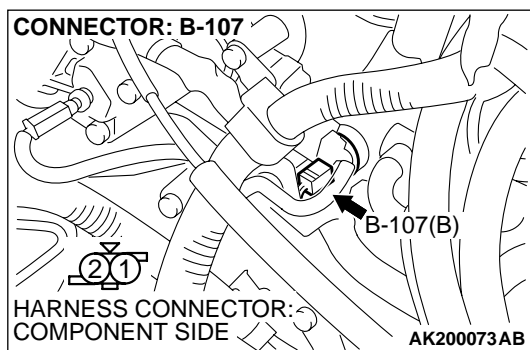


**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 8. Check for continuity at engine coolant temperature sensor harness side connector B-107.**

(1) Disconnect connector B-107 and measure at the harness side.

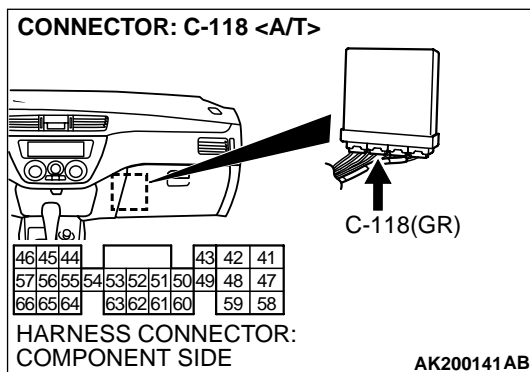
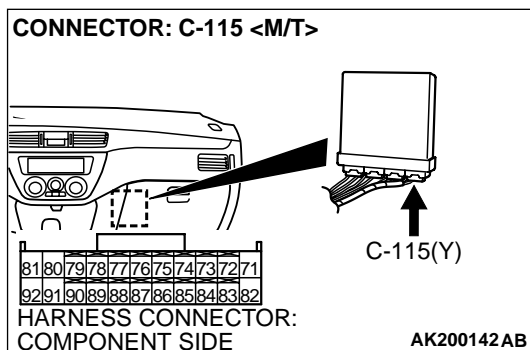
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 11.

**NO :** Go to Step 9.



**STEP 9. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> 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 go to Step 14.

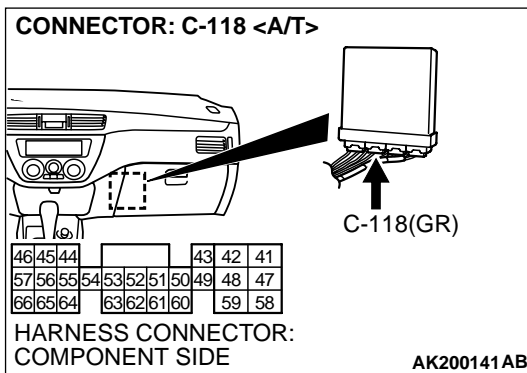
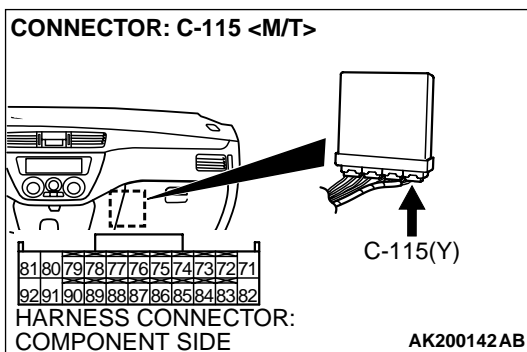
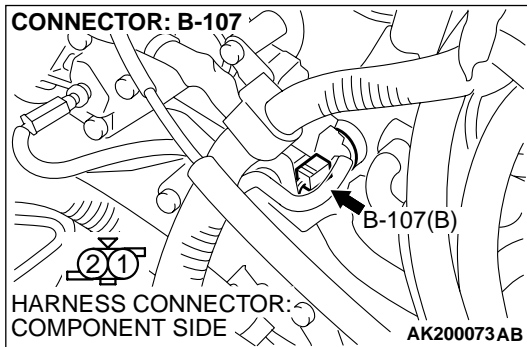


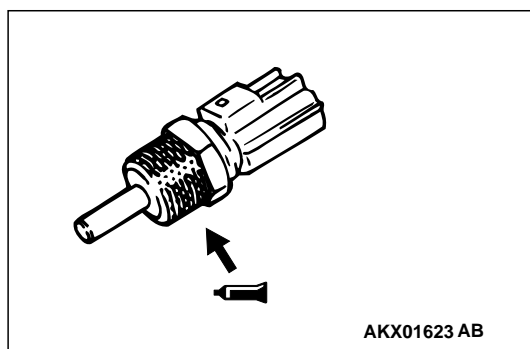
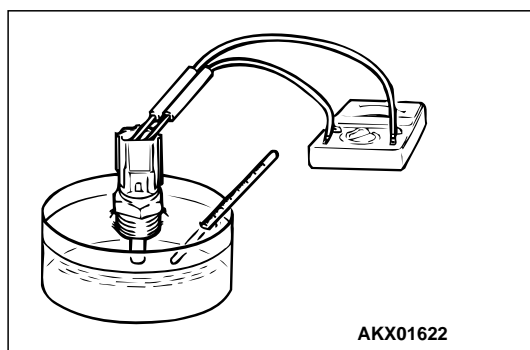
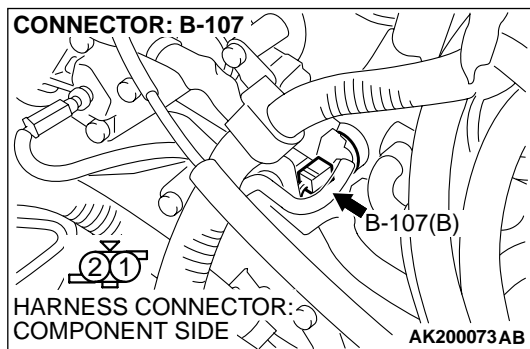
**STEP 10.** Check for harness damage between engine coolant temperature sensor connector B-107 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.



**STEP 11. Check the engine coolant temperature sensor.**

- (1) Disconnect the engine coolant temperature sensor connector B-107.
- (2) Remove the engine coolant temperature sensor.

- (3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

**Standard value:**

- 14 – 17 kilohms [at  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ )]
- 5.1 – 6.5 kilohms [at  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ )]
- 2.1 – 2.7 kilohms [at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ )]
- 0.9 – 1.3 kilohms [at  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ )]
- 0.48 – 0.68 kilohm [at  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ )]
- 0.26 – 0.36 kilohm [at  $80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ )]

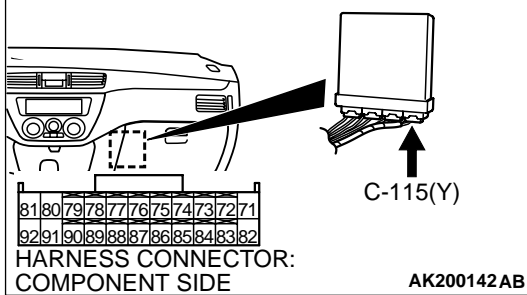
- (4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
- (5) Install the engine coolant temperature sensor, and tighten to the specified torque.

**Tightening torque:  $29 \pm 10 \text{ N}\cdot\text{m}$  ( $22 \pm 7 \text{ ft}\cdot\text{lb}$ )**

**Q: Is the resistance at the standard value?**

**YES :** Go to Step 12.

**NO :** Replace the engine coolant temperature sensor. Then go to Step 14.

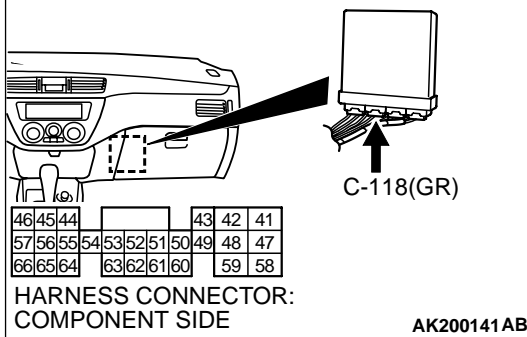
**CONNECTOR: C-115 <M/T>**

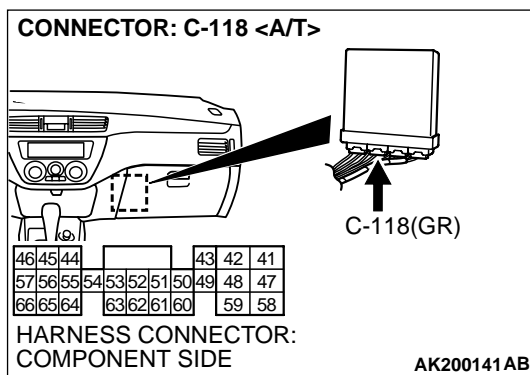
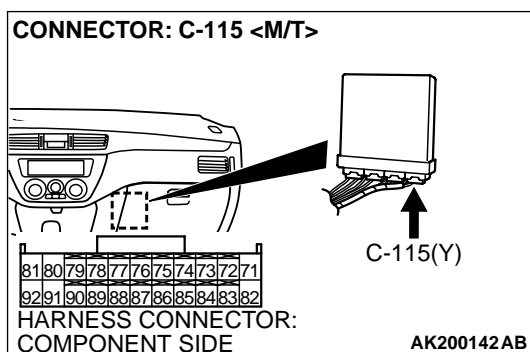
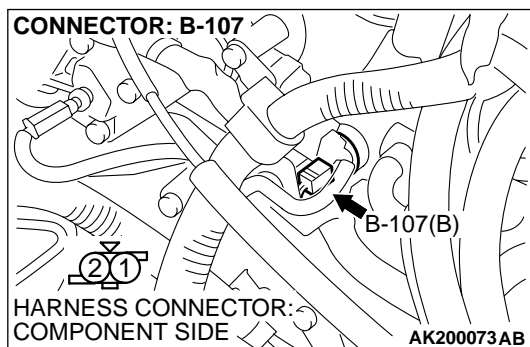
**STEP 12. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 13.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**CONNECTOR: C-118 <A/T>**



**STEP 13. Check for harness damage between engine coolant temperature sensor connector B-107 (terminal No. 1) and ECM connector C-115 (terminal No. 83) <M/T> or PCM connector C-118 (terminal No. 44) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0125 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

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**DTC P0128 : Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)**

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**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> checks the time for the engine coolant temperature to reach the judgment temperature.

**DTC SET CONDITIONS****Check Conditions**

- Engine coolant temperature is between –10°C (14°F) and 77°C (171°F) when the engine is started.
- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The intake air temperature when the engine is started – intake air temperature is 5°C (9°F) or less.

- The volume air flow sensors output frequency is in the low frequency (50 – 100 Hz or less) state for 490 seconds or less.

**Judgment Criteria**

- The time for the engine coolant temperature to rise to 77°C (171°F) takes longer than approximately 10 to 32 minutes.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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

- The thermostat is faulty
- ECM <M/T> failed.
- PCM <A/T> failed.

**DIAGNOSIS**

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**STEP 1. Check the cooling system.**

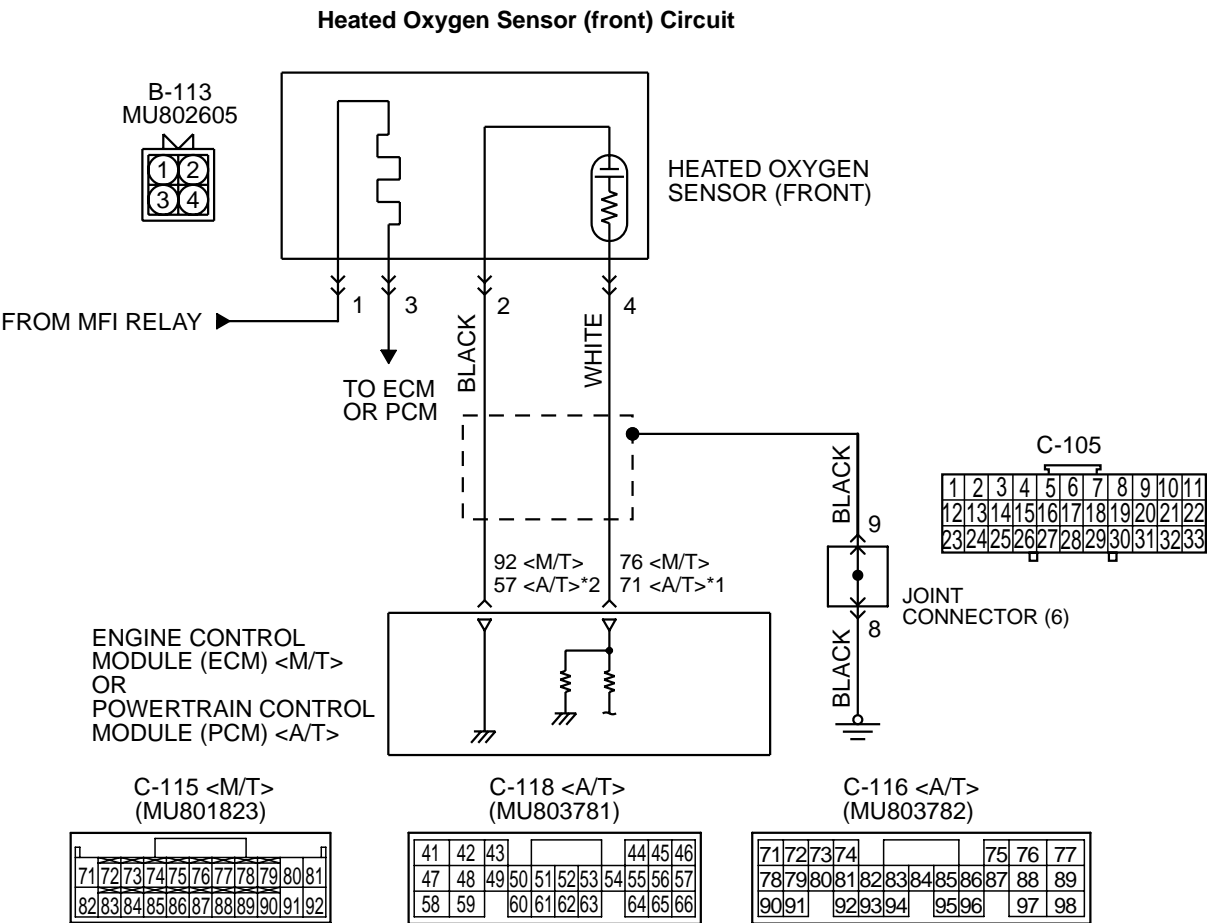
Refer to GROUP 14, Engine Cooling Diagnosis [P.14-3](#).

**Q: Is the cooling system normal?**

**YES :** Replace the ECM <M/T> or PCM<A/T>. Then check that the DTC P0128 does not reset.

**NO :** Repair it. Then check that the DTC P0128 does not reset.

DTC P0130: Heated Oxygen Sensor Circuit (sensor 1)

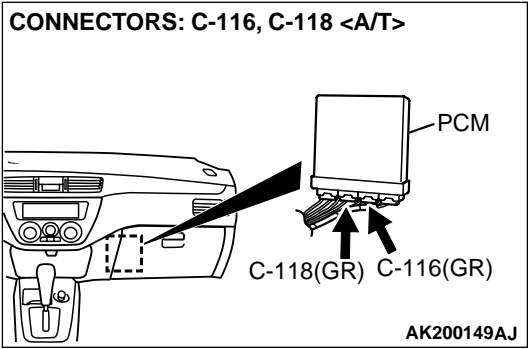
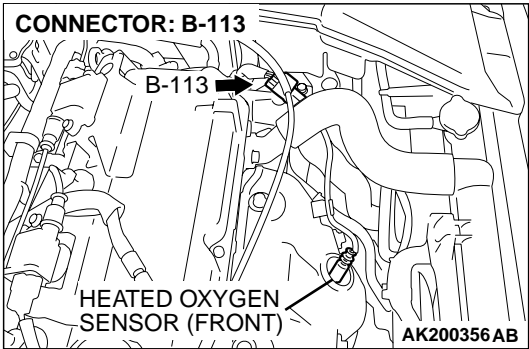


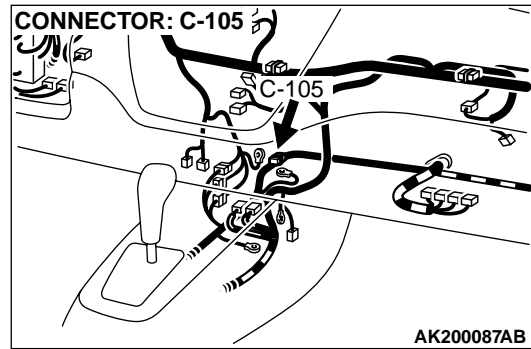
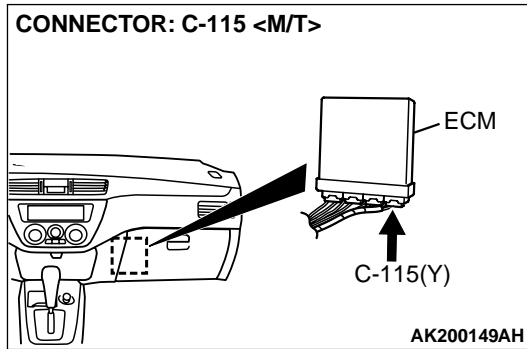
NOTE

\*1: PCM connector C-116 <A/T>

\*2: PCM connector C-118 <A/T>

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## CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 76) <M/T> or PCM (terminal No. 71) <A/T> from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

## TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

## DTC SET CONDITIONS

### Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

### Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (front) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness

**STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

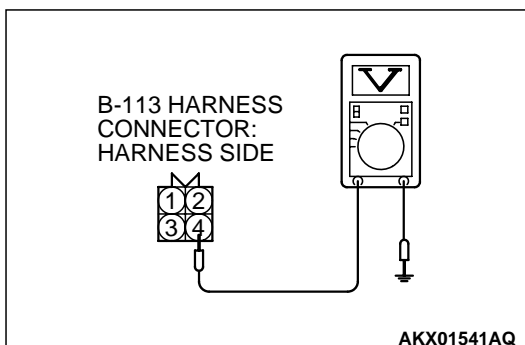
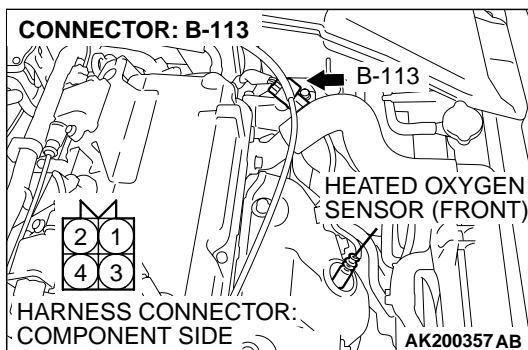
**Q: Is the sensor operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Measure the sensor output voltage at heated oxygen sensor (front) connector B-113 by backprobing.**

- (1) Do not disconnect connector B-113.
- (2) Start the engine and run at idle.



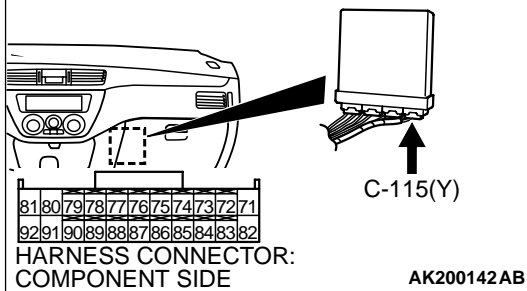
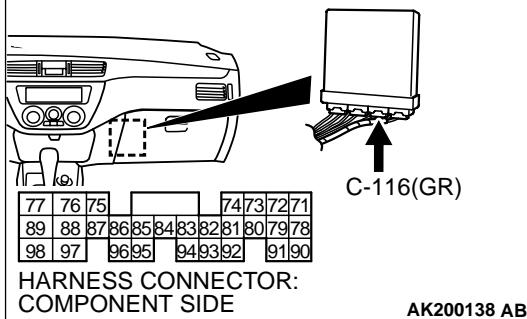
- (3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage within the specified range?**

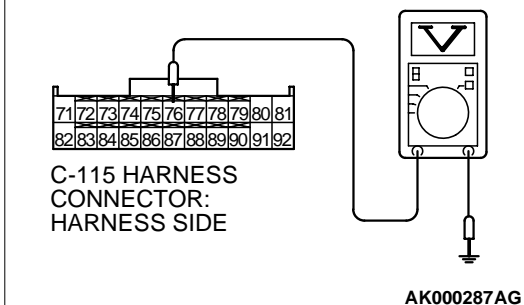
**YES :** Go to Step 3.

**NO :** Go to Step 7.

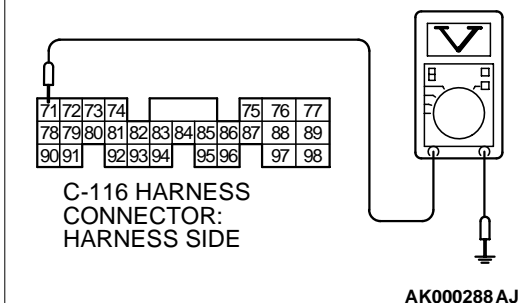


**CONNECTOR: C-115 <M/T>****CONNECTOR: C-116 <A/T>**

&lt;M/T&gt;



&lt;A/T&gt;



**STEP 3. Measure the sensor output voltage at ECM connector C-115 <M/T> or PCM connector C-116 <A/T> by backprobing.**

- (1) Do not disconnect connector C-115 <M/T> or C-116 <A/T>.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 76 <M/T> or No. 71 <A/T> and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 to 0.8 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 4.

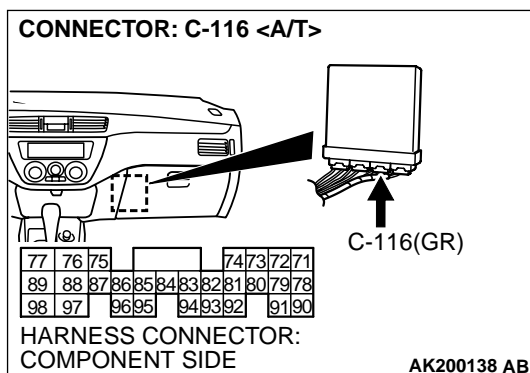
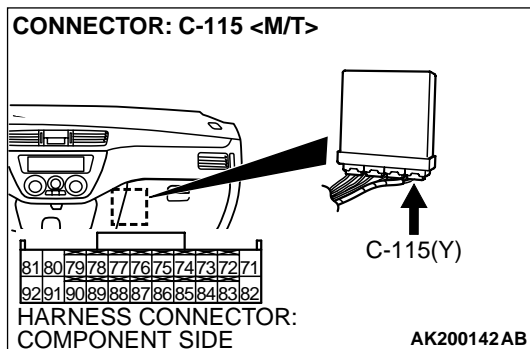
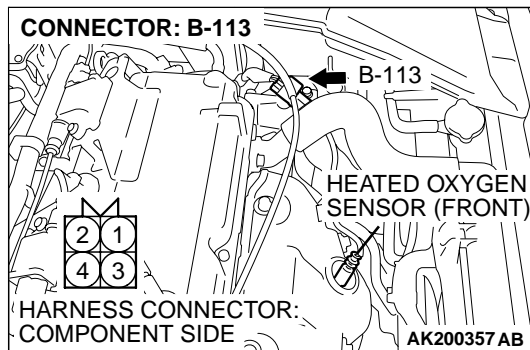
**NO :** Go to Step 6.

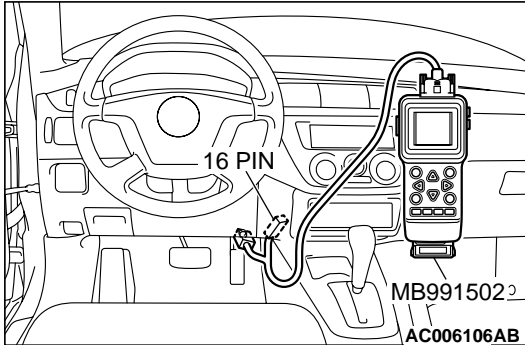
**STEP 4.** Check connector B-113 at heated oxygen sensor (front) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.

**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 go to Step 15.





**STEP 5. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

**⚠ CAUTION**

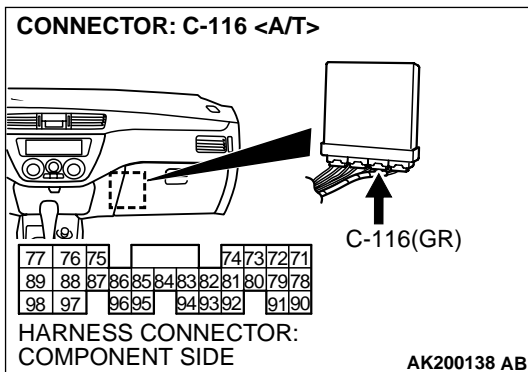
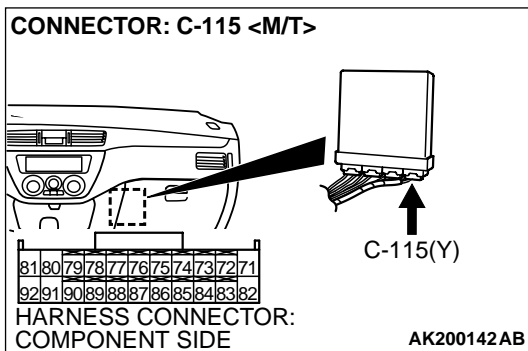
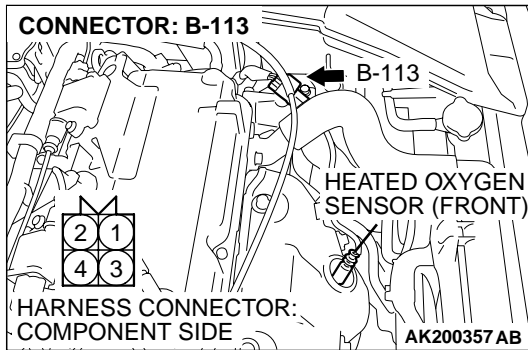
**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 15.

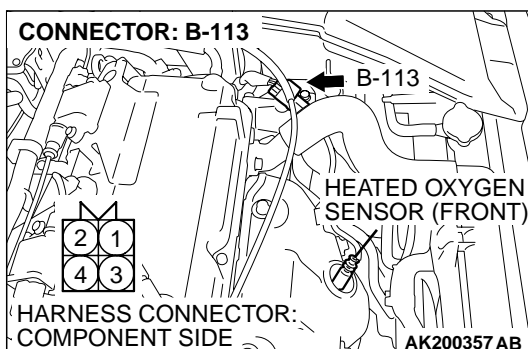


**STEP 6. Check connector B-113 at heated oxygen sensor (front) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between heated oxygen sensor (front) connector B-113 (terminal No. 4) and ECM connector C-115 (terminal No. 76) <M/T> or PCM connector C-116 (terminal No. 71) <A/T> because of open circuit or harness damage. Then go to Step 15.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 15.

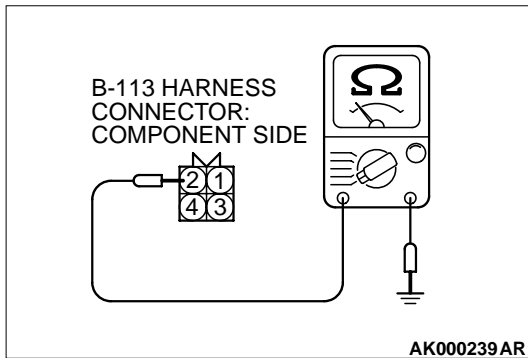
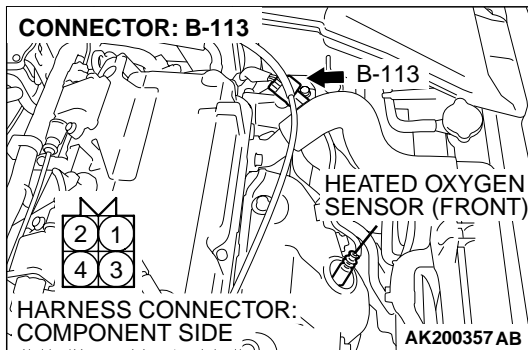


**STEP 7. Check connector B-113 at heated oxygen sensor (front) for damage.**

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

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 15.



**STEP 8. Check for continuity at heated oxygen sensor (front) harness side connector B-113.**

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

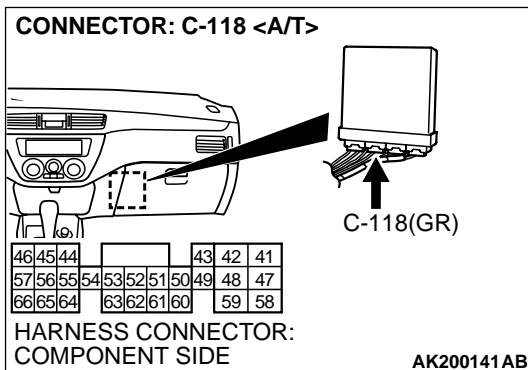
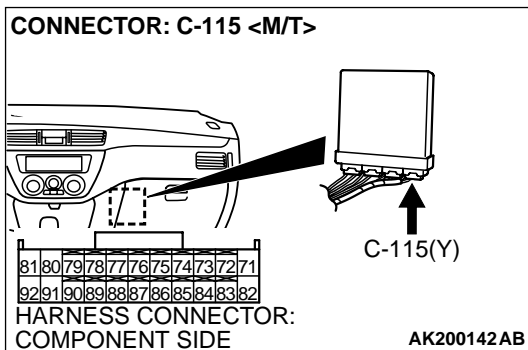
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 11.

**NO :** Go to Step 9.



**STEP 9. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 10.

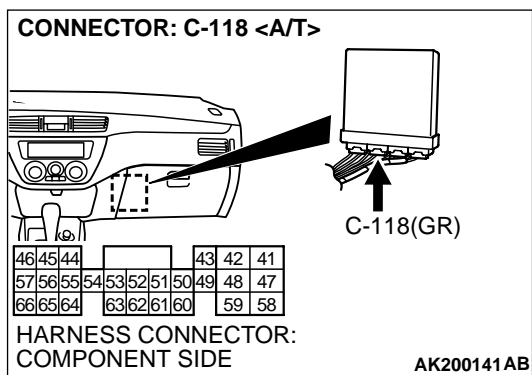
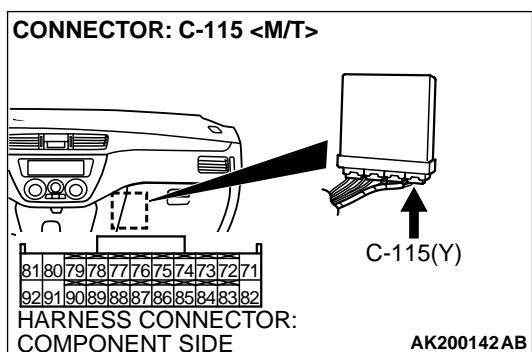
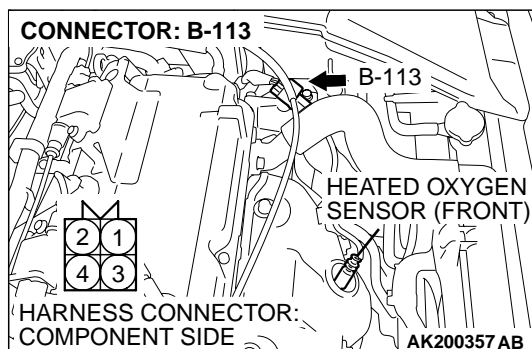
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 15.

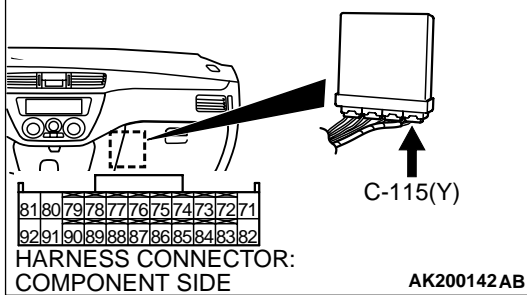
**STEP 10. Check for open circuit and harness damage between heated oxygen sensor (front) connector B-113 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 15.

**NO :** Repair it. Then go to Step 15.



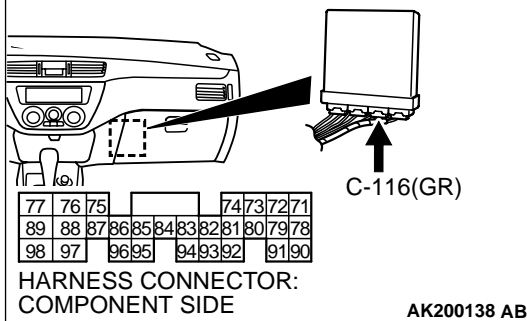
**CONNECTOR: C-115 <M/T>**

**STEP 11. Check connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.**

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

**YES :** Go to Step 12.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 15.

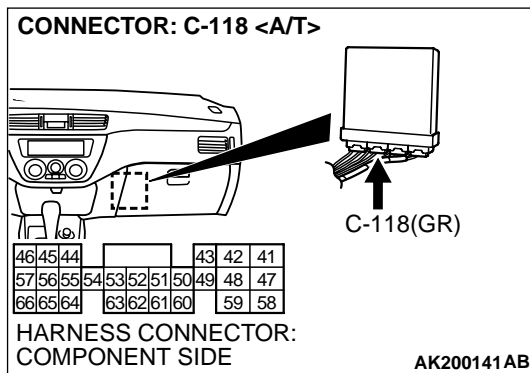
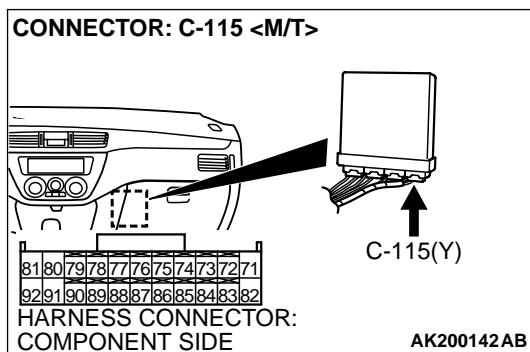
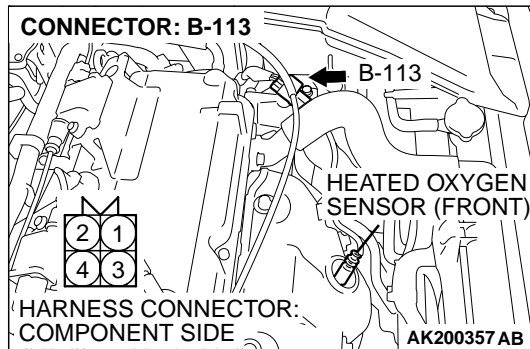
**CONNECTOR: C-116 <A/T>**

**STEP 12. Check for harness damage between heated oxygen sensor (front) connector B-113 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Go to Step 13.

**NO :** Repair it. Then go to Step 15.



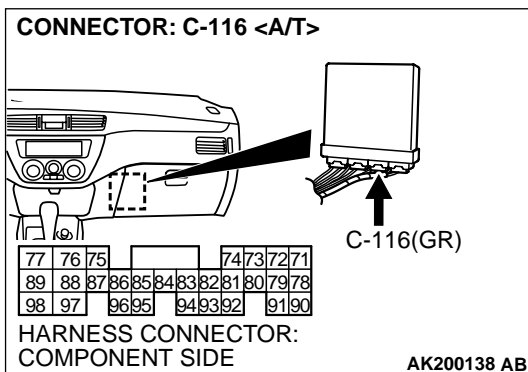
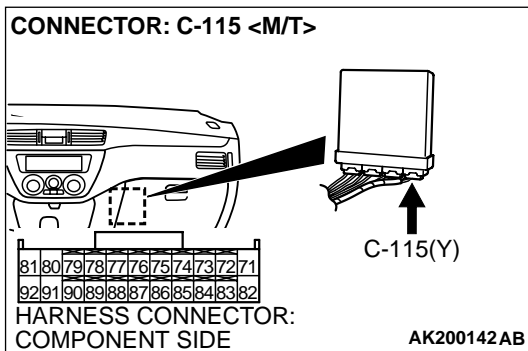
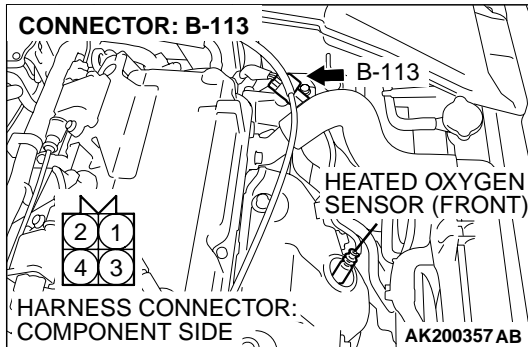


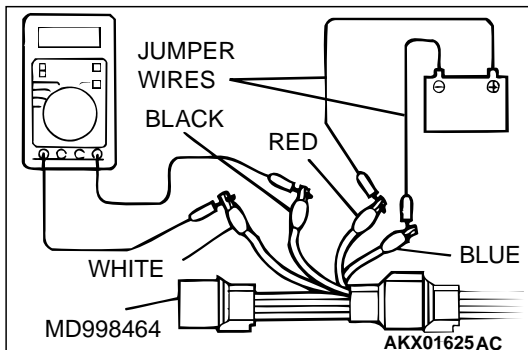
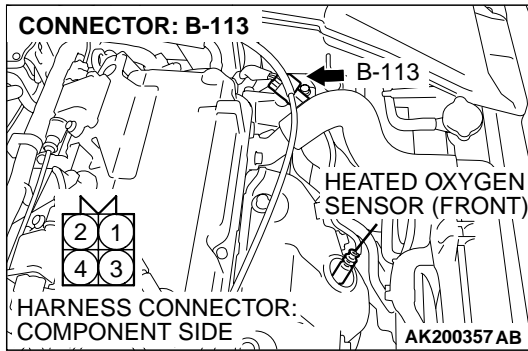
**STEP 13.** Check for short circuit to ground and harness damage between heated oxygen sensor (front) connector B-113 (terminal No. 4) and ECM connector C-115 (terminal No. 76) <M/T> or PCM connector C-116 (terminal No. 71) <A/T>.

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

**YES :** Go to Step 14.

**NO :** Repair it. Then go to Step 15.



**STEP 14. Check the heated oxygen sensor (front).**

- (1) Disconnect the heated oxygen sensor (front) connector B-113 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.
- (2) Warm up the engine until engine coolant 80°C (176°F) or higher.

**CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

- (3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
- (4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
- (5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

**Standard value: 0.6 – 1.0 volt**

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

**YES :** Replace the ECM or PCM. Then go to Step 15.

**NO :** Replace the heated oxygen sensor (front). Then go to Step 15.

**STEP 15. Perform the OBD-II drive cycle.**

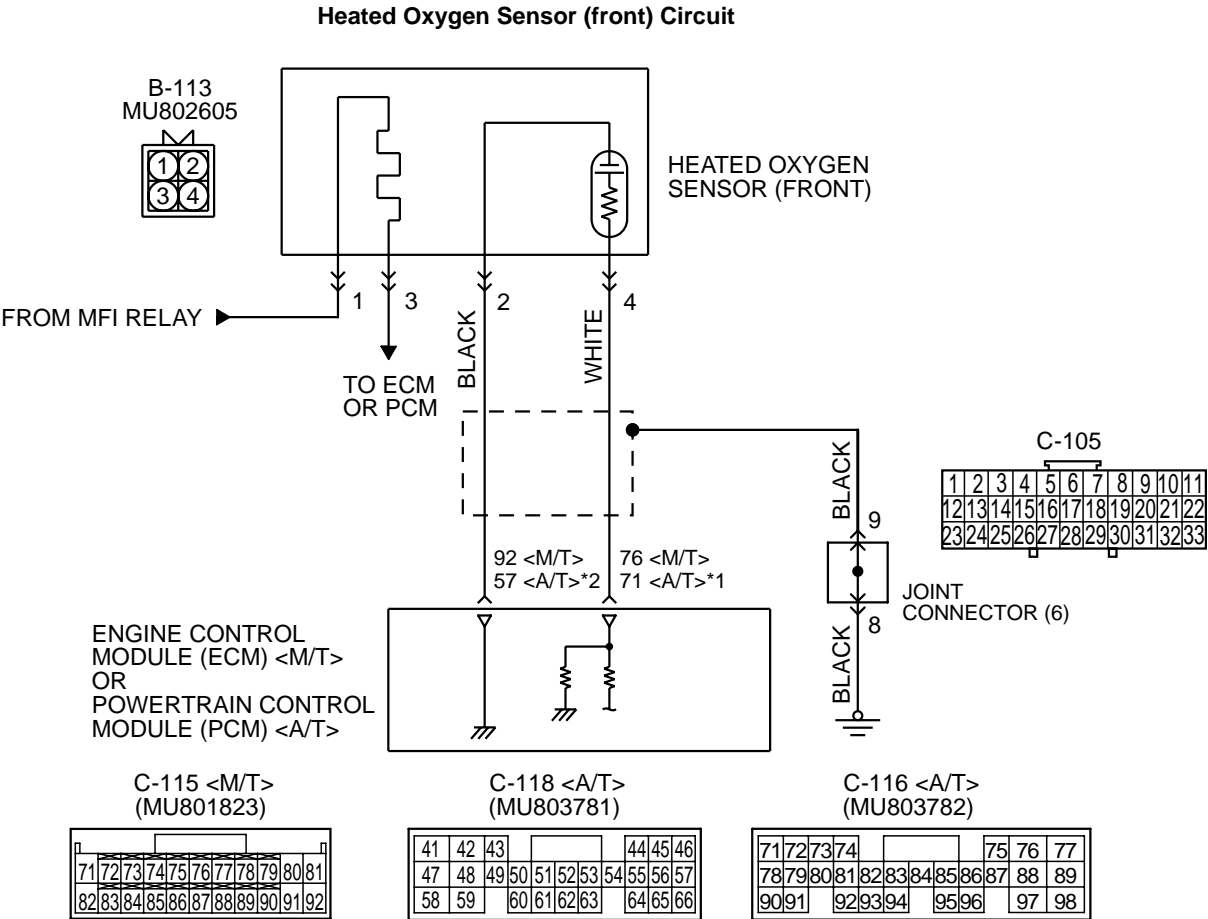
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0130 set?**

**YES :** Repeat the troubleshooting.

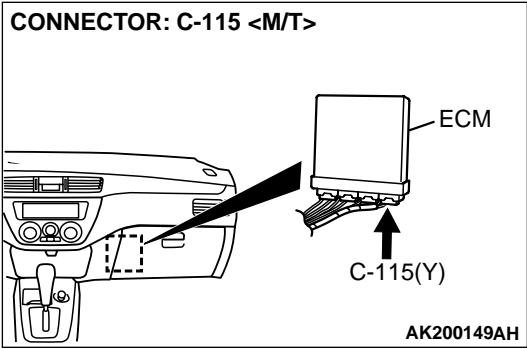
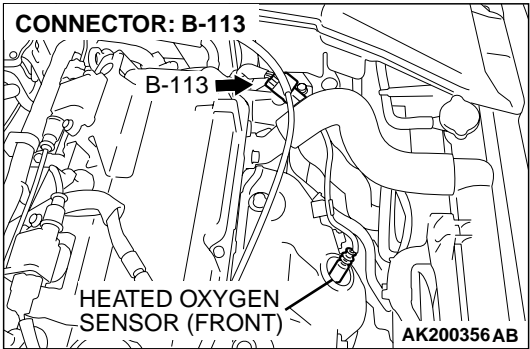
**NO :** The procedure is complete.

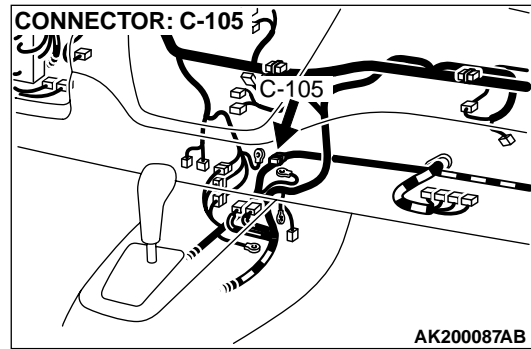
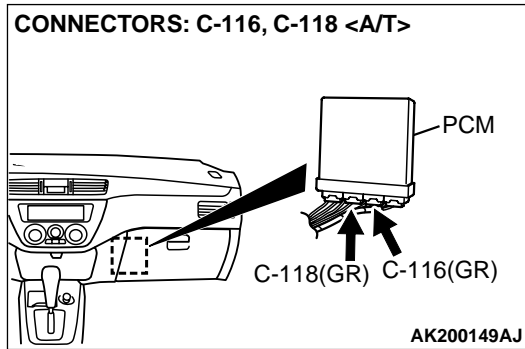
DTC P0131: Heated Oxygen Sensor Circuit Low Voltage (sensor 1)



NOTE  
\*1: PCM connector C-116 <A/T>  
\*2: PCM connector C-118 <A/T>

AK000866





### CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 76) <M/T> or PCM (terminal No. 71) <A/T> from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

### TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

### DTC SET CONDITIONS

#### Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.

- Heated oxygen sensor (front) signal voltage has continued to be 0.2 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 81 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- After the ignition switch is turned ON, the changes in the output voltage of the heated oxygen sensor (front) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

### Judgement Criteria

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (front) output voltage beyond 0.2 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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

- Heated oxygen sensor (front) deteriorated.
- Short circuit in heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness

**STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

#### **⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is the sensor operating properly?

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Check the heated oxygen sensor (front).**

- (1) Disconnect the heated oxygen sensor (front) connector B-113 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.
- (2) Warm up the engine until engine coolant 80°C (176°F) or higher.

#### **⚠ CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

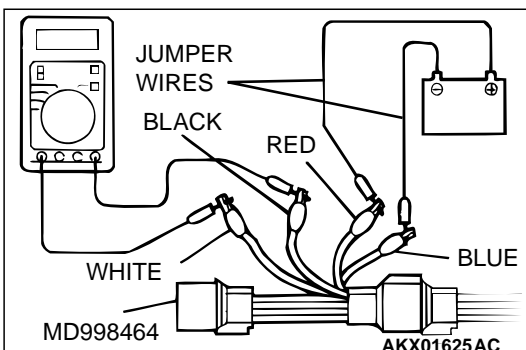
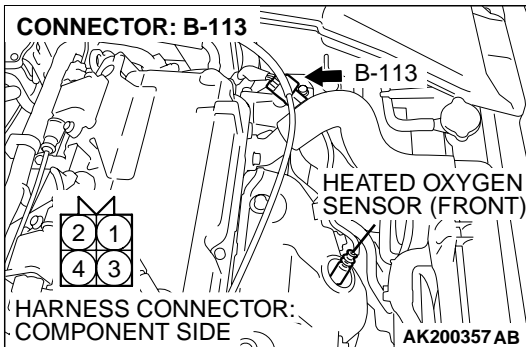
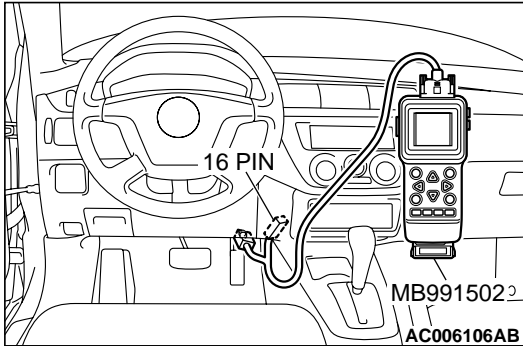
- (3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
- (4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
- (5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

**Standard value: 0.6 – 1.0 volt**

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

**YES :** Go to Step 3.

**NO :** Replace the heated oxygen sensor (front). Then go to Step 5.

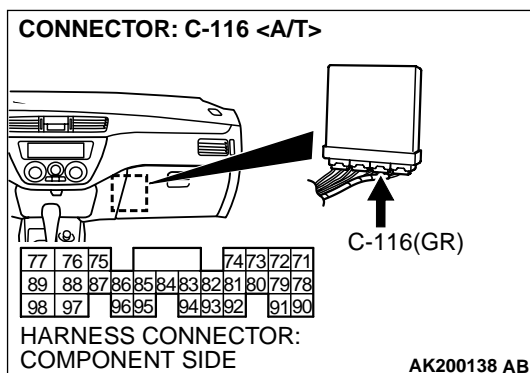
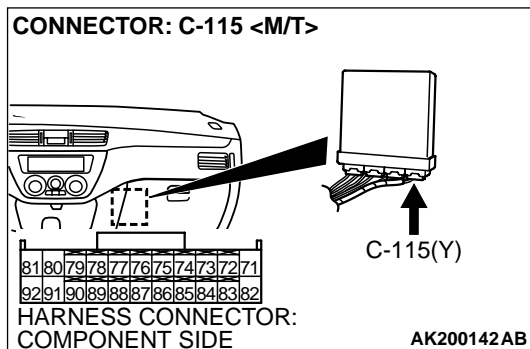
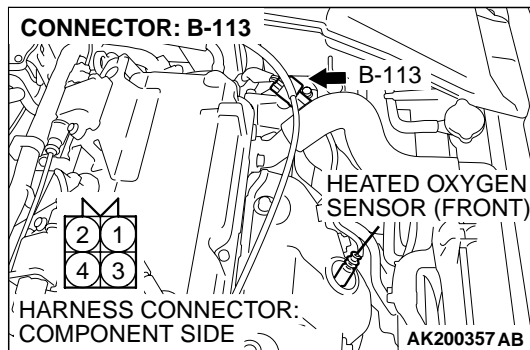


**STEP 3.** Check connector B-113 at heated oxygen sensor (front) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.

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

**YES :** Go to Step 4.

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

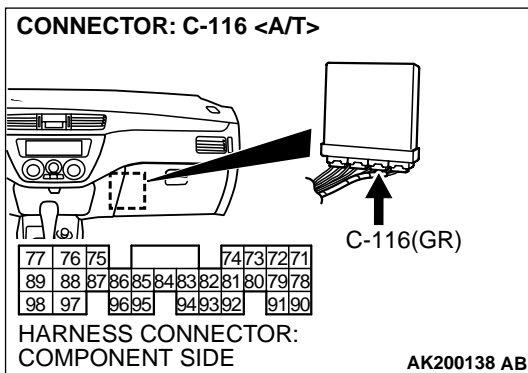
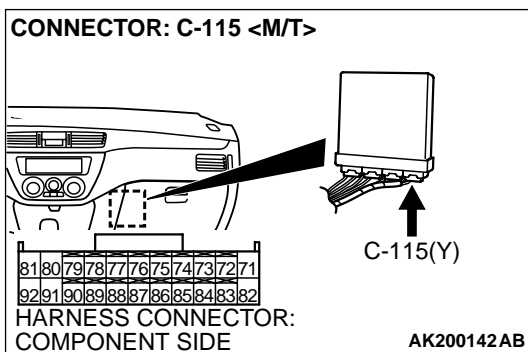
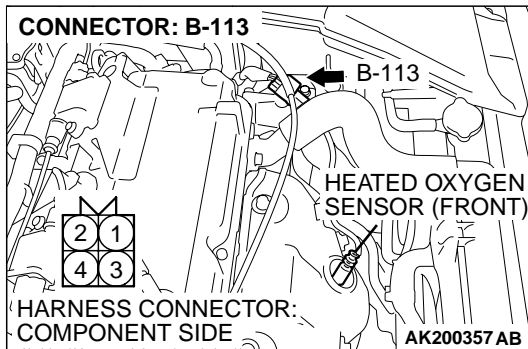


**STEP 4. Check for short circuit to ground between heated oxygen sensor (front) connector B-113 (terminal No. 4) and ECM connector C-115 (terminal No. 76) <M/T> or PCM connector C-116 (terminal No. 71) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 5.

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



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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

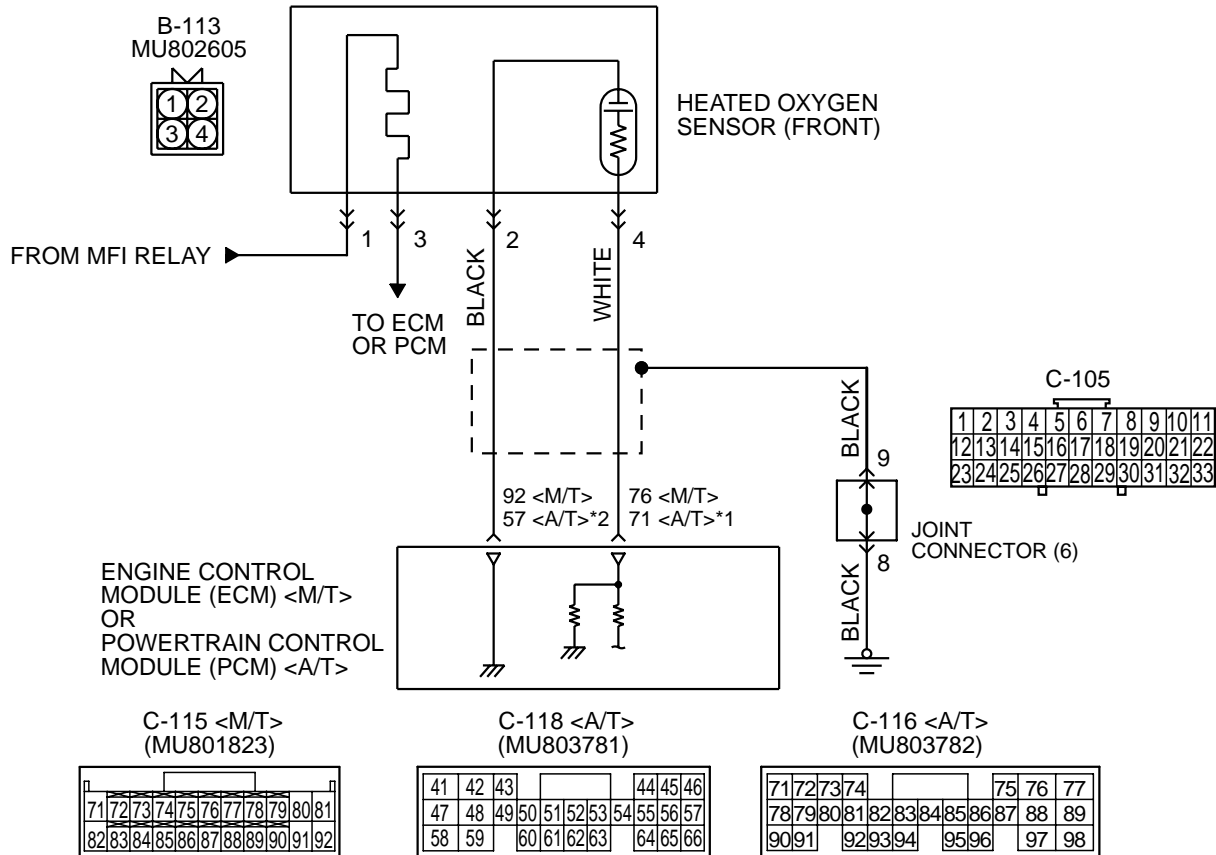
**Q: Is DTC P0131 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

## DTC P0132: Heated Oxygen Sensor Circuit High Voltage (sensor 1)

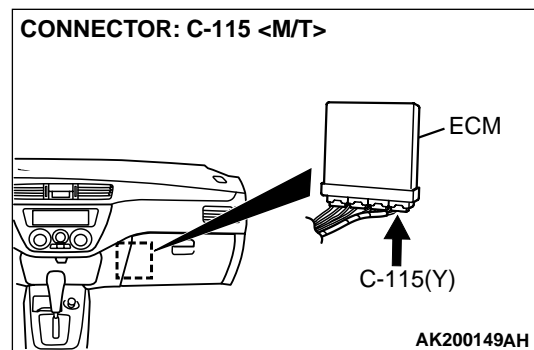
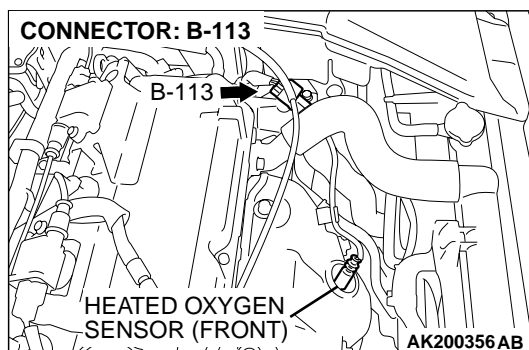
### Heated Oxygen Sensor (front) Circuit



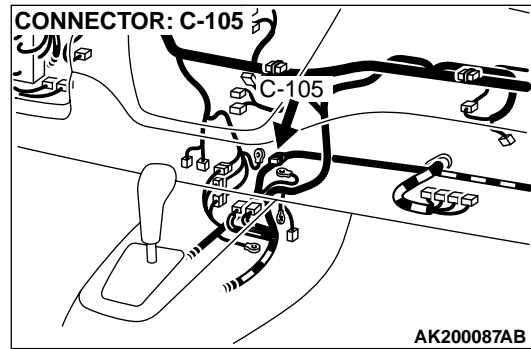
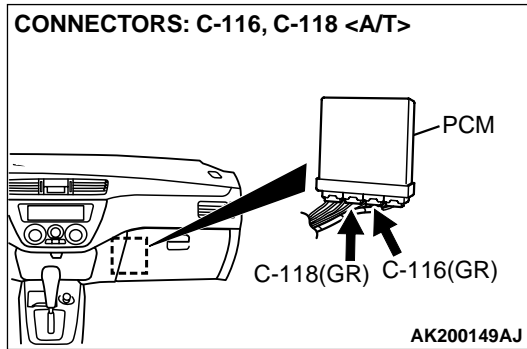
NOTE

\*1: PCM connector C-116 <A/T>  
\*2: PCM connector C-118 <A/T>

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### CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 76) <M/T> or PCM (terminal No. 71) <A/T> from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

### TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.

- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

### DTC SET CONDITIONS

#### Check Conditions

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

#### Judgment Criteria

- Heated oxygen sensor (front) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Heated oxygen sensor (front) deteriorated.
- Short circuit in heated oxygen sensor (front) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

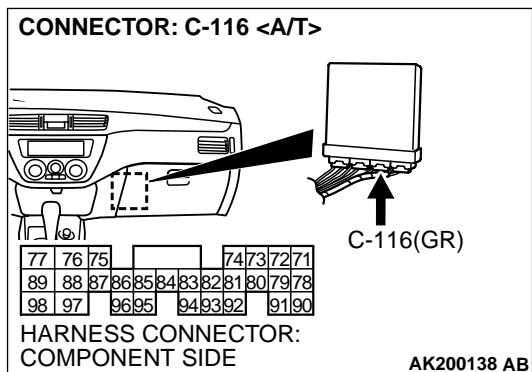
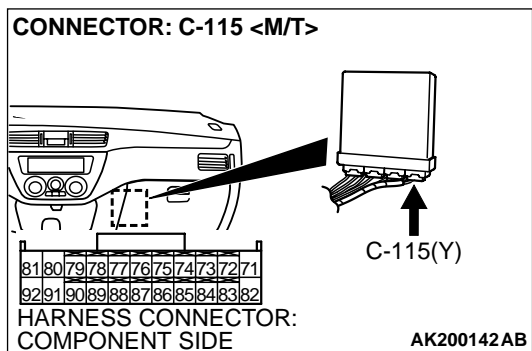
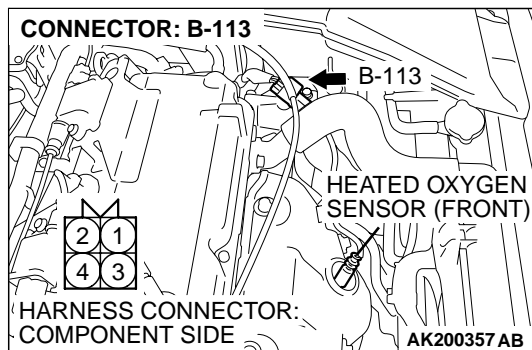
- MB991502: Scan Tool (MUT-II)

**STEP 1.** Check connector B-113 at heated oxygen sensor (front) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> 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 go to Step 3.

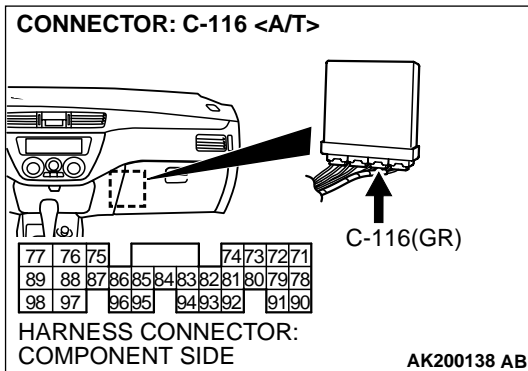
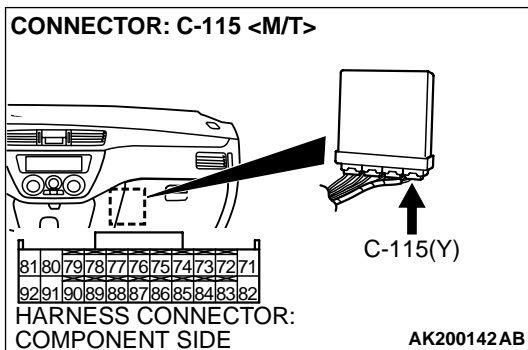
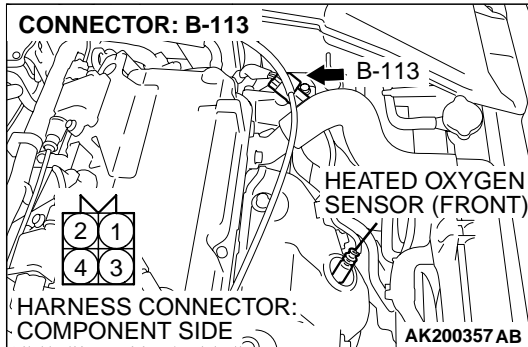


**STEP 2. Check for short circuit to power supply between heated oxygen sensor (front) connector B-113 (terminal No. 4) and ECM connector C-115 (terminal No. 76) <M/T> or PCM connector C-116 (terminal No. 71) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 3.

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



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

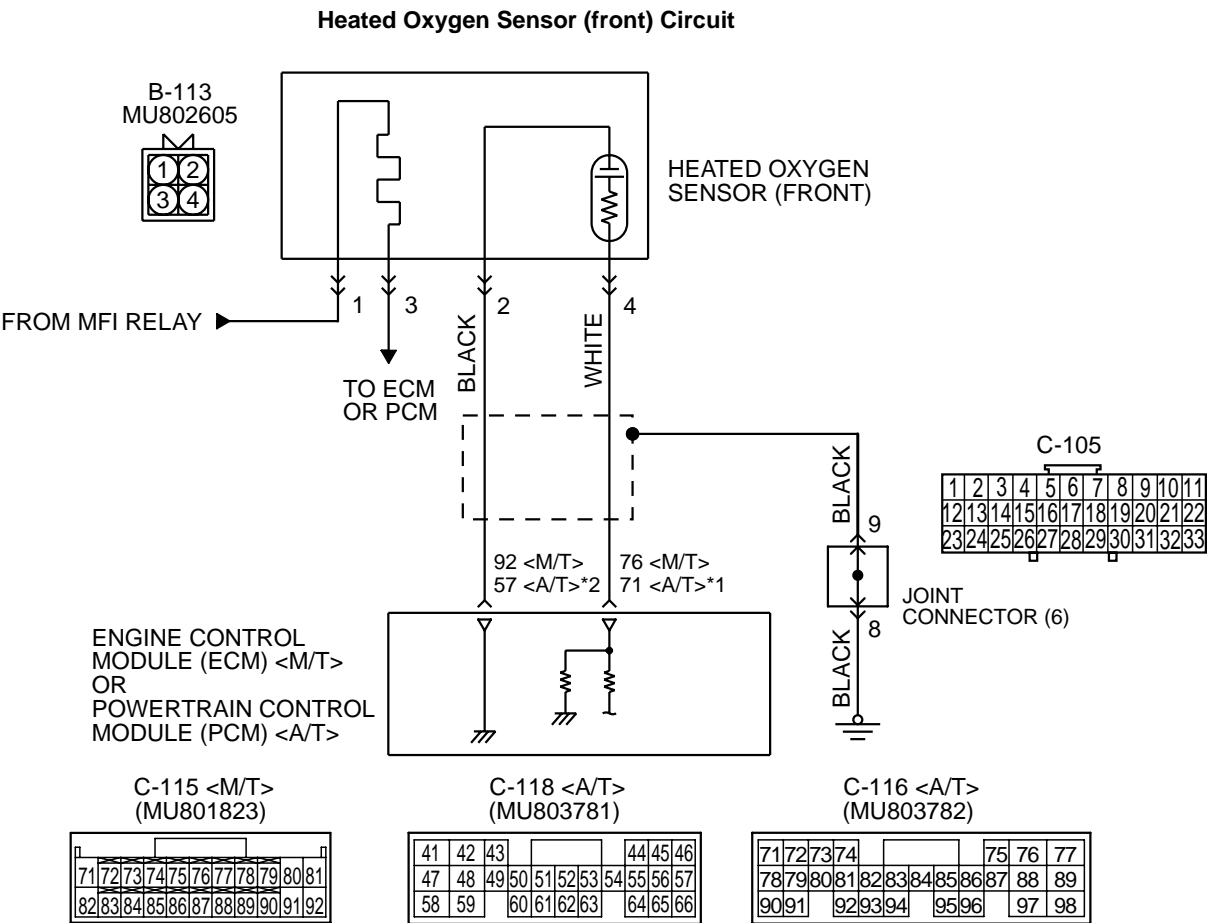
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0132 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

DTC P0133: Heated Oxygen Sensor Circuit Slow Response (sensor 1)

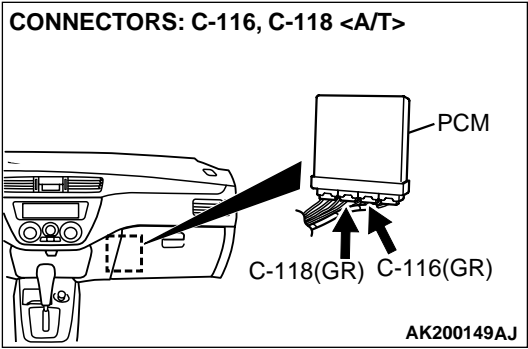
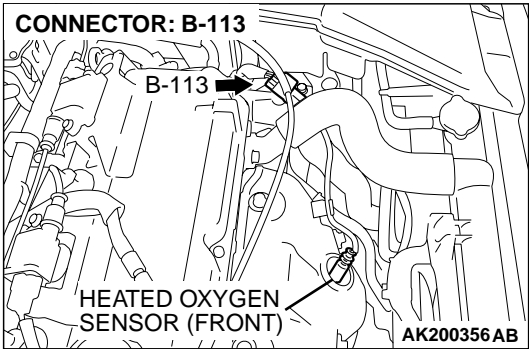


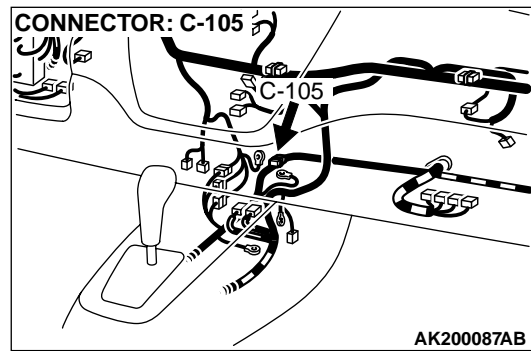
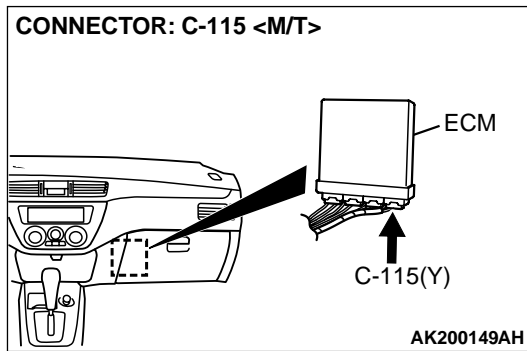
NOTE

\*1: PCM connector C-116 <A/T>

\*2: PCM connector C-118 <A/T>

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### CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 76) <M/T> or PCM (terminal No. 71) <A/T> from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

### TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM <M/T> or PCM <A/T>.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM <M/T> or PCM <A/T> forcibly varies the air/fuel mixture to make it leaner and richer, and checks the response speed of the heated oxygen sensor (front). In addition, the ECM <M/T> or PCM <A/T> also checks for an open circuit in the heated oxygen sensor (front) output line.

### DTC SET CONDITIONS

#### Check Conditions

- Engine coolant temperature is higher than 50°C (122°F).
- Engine speed is at between 1,200 and 3,000 r/min.

- Volumetric efficiency is at between 20 and 60 percent.
- Under the closed loop air/fuel control.
- Short-term fuel trim is at between -25 percent and +25 percent.
- The throttle valve is open.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 5 cycles of 10 seconds each during the drive cycle.

### Judgment Criteria

- The heated oxygen sensor (front) sends "lean" and "rich" signals alternately 10 times or less for 10 seconds.

*NOTE: If the sensor switching frequency is lower than the Judgment Criteria due to the MUT-II OBD-II test Mode – H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.*

*If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.*

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

- Heated oxygen sensor (front) deteriorated.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

### CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- (4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 – 1.0 volt 10 times or more within 10 seconds.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is the sensor operating properly?

**YES** : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

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

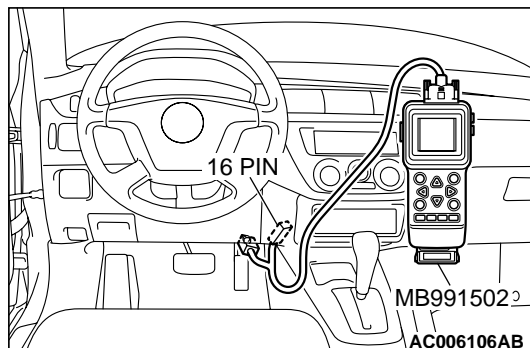
### STEP 2. Perform the OBD-II drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

### Q: Is DTC P0133 set?

**YES** : Repeat the troubleshooting.

**NO** : The procedure is complete.



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**DTC P0134: Heated Oxygen Sensor Circuit No Activity Detected (sensor 1)**

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**Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) Circuit**

- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit [P.13Ac-138](#).
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit [P.13Ac-254](#).

**CIRCUIT OPERATION**

- Refer to, DTC P0130 Heated Oxygen Sensor (front) Circuit [P.13Ac-138](#).
- Refer to, DTC P0201, P0202, P0203, P0204 – Injector Circuit [P.13Ac-254](#).

**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> effects air/fuel ratio feedback control in accordance with the signals from the heater oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

**DTC SET CONDITIONS****Check Conditions**

- Thirty seconds or more have passed since the starting sequence was completed.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is at between 30 and 100 percent.

- Throttle position sensor output voltage is lower than 3.6 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

**Judgment Criteria**

- Heated oxygen sensor (front) output voltage does not get across 0.5 volt within about 30 seconds.

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

- Heated oxygen sensor (front) deteriorated.
- Open circuit in heated oxygen sensor (front) output line.
- Open circuit in heated oxygen sensor (front) ground line.
- Heated oxygen sensor (rear) deteriorated.

*NOTE: When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the heated oxygen sensor (rear).*

*If the heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the heated oxygen sensor (front).*

*Thus, even when closed loop control is being effected, the fluctuation of the heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.*

- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MD998464: Test Harness

**STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 2.

**NO :** Refer to, DTC P0136 – Heated Oxygen Sensor Circuit (Sensor 2) [P.13Ac-179](#), DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) [P.13Ac-194](#), DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) [P.13Ac-200](#), DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) [P.13Ac-204](#),

**STEP 2. Check for exhaust leaks.**

**Q: Are there any abnormalities?**

**YES :** Repair it. Then go to Step 12.

**NO :** Go to Step 3.

**STEP 3. Check for intake system vacuum leaks.**

**Q: Are there any abnormalities?**

**YES :** Repair it. Then go to Step 12.

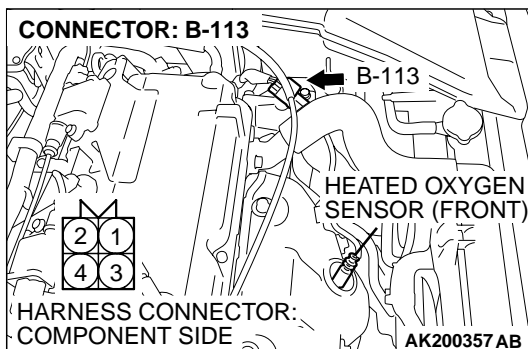
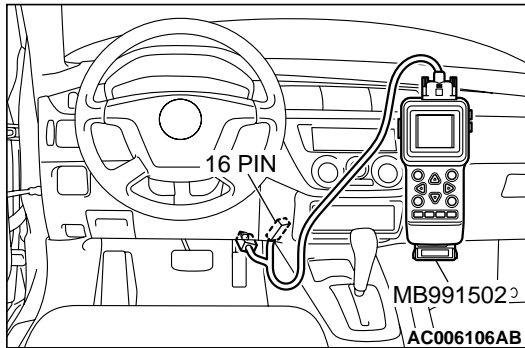
**NO :** Go to Step 4.

**STEP 4. Check connector B-113 at the heated oxygen sensor (front) for damage.**

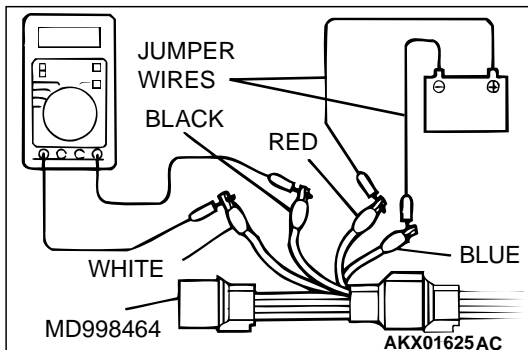
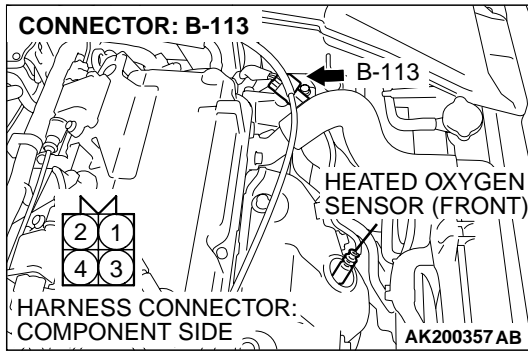
**Q: Is the connector in good condition?**

**YES :** Go to Step 5.

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





**STEP 5. Check the heated oxygen sensor (front).**

- (1) Disconnect the heated oxygen sensor (front) connector B-113 and connect test harness special tool, MD998464 to the connector on the heated oxygen sensor (front) side.
- (2) Warm up the engine until engine coolant 80°C (176°F) or higher.

**CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (front).

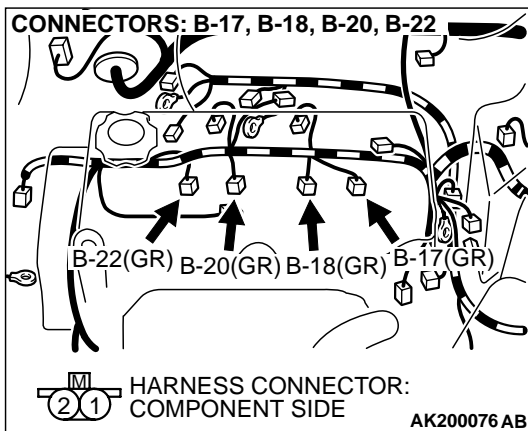
- (3) Use the jumper wires to connect terminal No. 1 (red clip) to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
- (4) Connect a digital volt meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
- (5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

**Standard value: 0.6 – 1.0 volt**

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

**YES :** Go to Step 6.

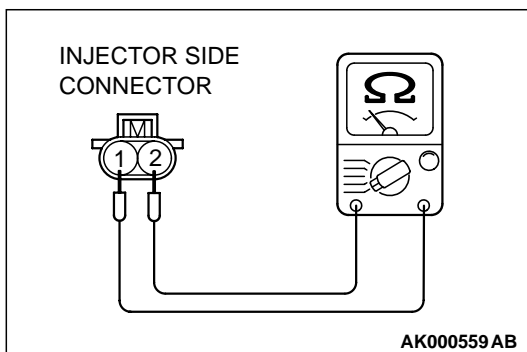
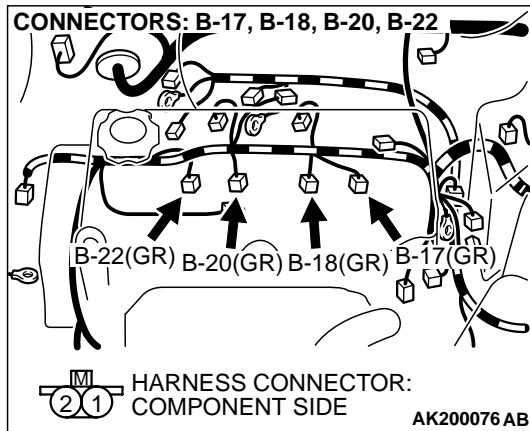
**NO :** Replace the heated oxygen sensor (front). Then go to Step 12.

**STEP 6. Check connectors B-17, B-18, B-20, B-22 at injector 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 go to Step 12.

**STEP 7. Check the injector.**

(1) Disconnect each injector connector.

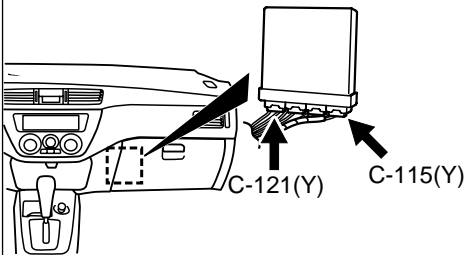
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 8.

**NO :** Replace the injector. Then go to Step 12.

**CONNECTORS: C-115, C-121 <M/T>**

81	80	79	78	77	76	75	74	73	72	71
92	91	90	89	88	87	86	85	84	83	82

**C-115 HARNESS CONNECTOR:  
COMPONENT SIDE**

13	12	11	10	9	8	7	6	5	4	3	2	1
26	25	24	23	22	21	20	19	18	17	16	15	14

**C-121 HARNESS CONNECTOR:  
COMPONENT SIDE**

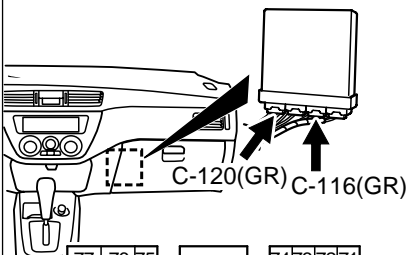
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**STEP 8. Check connectors C-115, C-121 at ECM <M/T> or connectors C-116, C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

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

**CONNECTORS: C-116, C-120 <A/T>**

77	76	75				74	73	72	71
89	88	87	86	85	84	83	82	81	80
98	97	96	95	94	93	92	91	90	

**C-116 HARNESS CONNECTOR:  
COMPONENT SIDE**

8	7	6	5			4	3	2	1
23	22	21	20	19	18	17	16	15	14
35	34	33	32	31	30	29	28	27	26

**C-120 HARNESS CONNECTOR:  
COMPONENT SIDE**

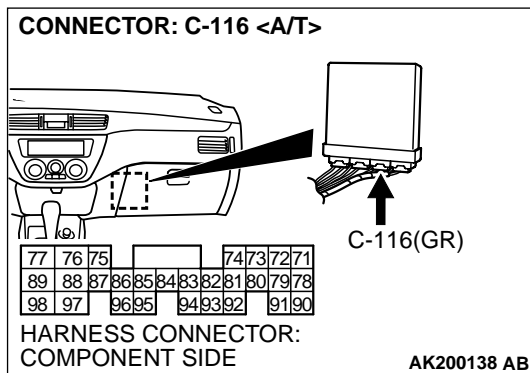
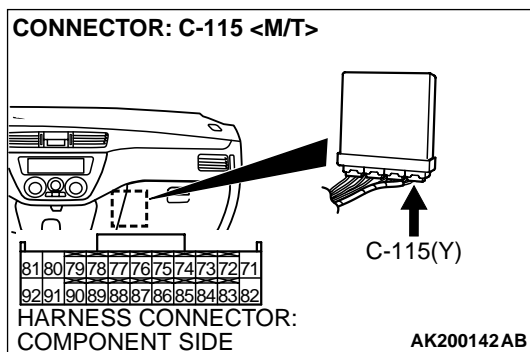
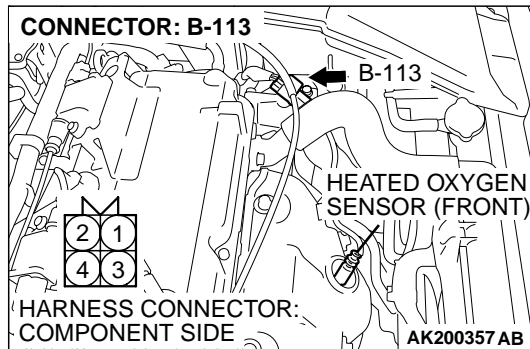
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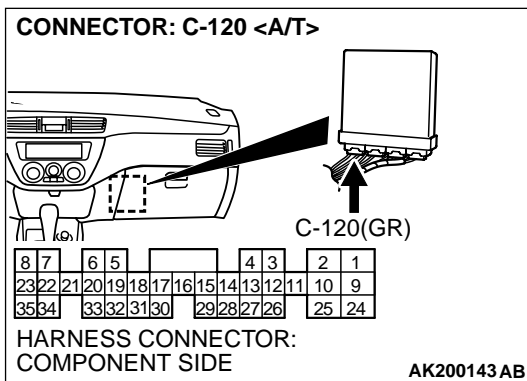
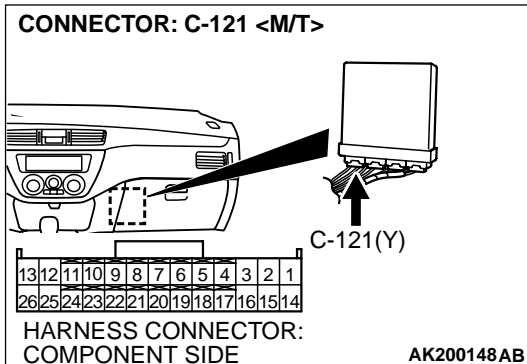
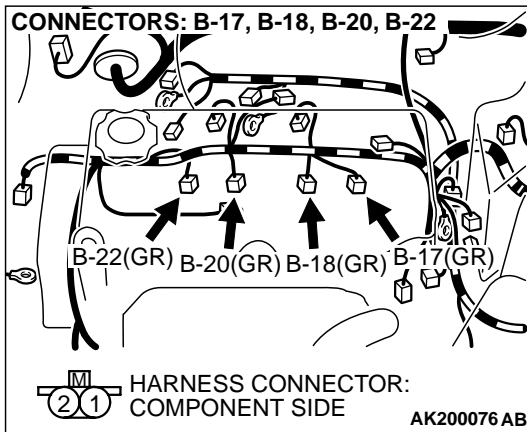
**STEP 9.** Check for harness damage between heated oxygen sensor (front) connector B-113 (terminal No. 4) and ECM connector C-115 (terminal No. 76) <M/T> or PCM connector C-116 (terminal No. 71) <A/T>.

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

**YES :** Go to Step 10.

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





**STEP 10. Check for harness damage between injector connectors B-17, B-18, B-20, B-22 and ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.**

- Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) <M/T> or PCM connector C-120 (terminal No. 1) <A/T> when checking No. 1 cylinder.
- Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) <M/T> or PCM connector C-120 (terminal No. 9) <A/T> when checking No. 2 cylinder.
- Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) <M/T> or PCM connector C-120 (terminal No. 24) <A/T> when checking No. 3 cylinder.
- Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) <M/T> or PCM connector C-120 (terminal No. 2) <A/T> when checking No. 4 cylinder.

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

**YES :** Go to Step 11.

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

**STEP 11. Check the fuel pressure.**

Refer to GROUP 13A, Oh-vehicle Service – Fuel Pressure Test [P.13Aa-14](#).

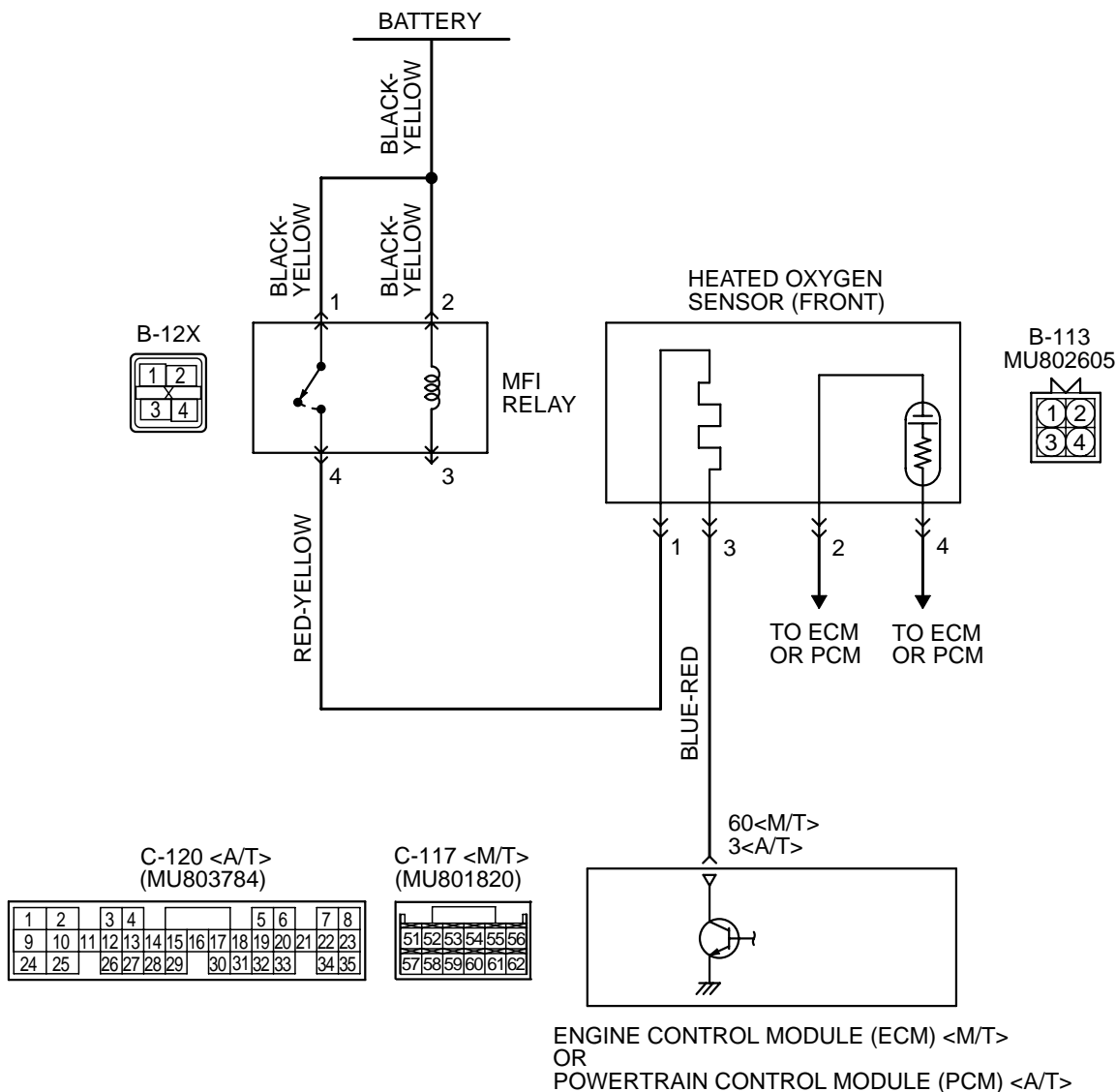
**Q: Is the fuel pressure normal?**

**YES :** Replace the ECM or PCM. Then go to Step 12.

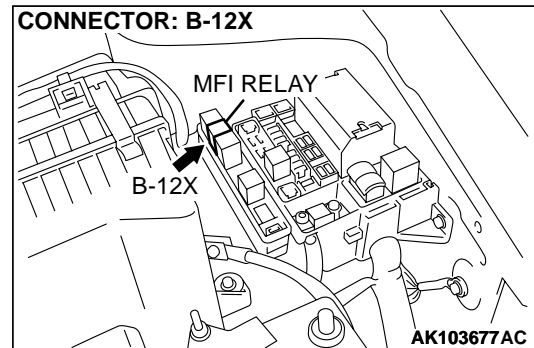
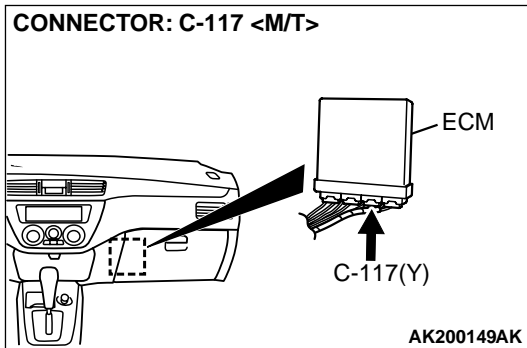
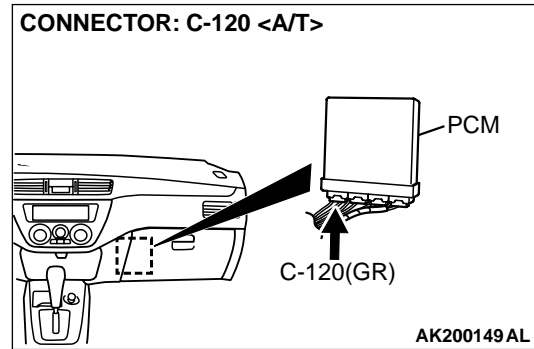
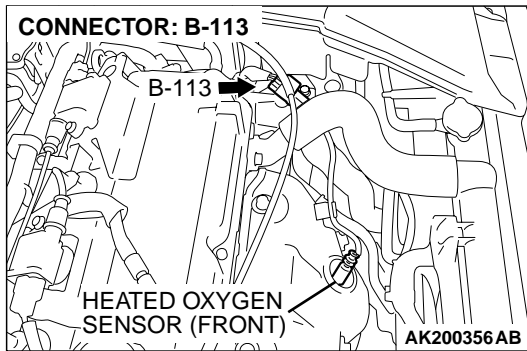
**NO :** Repair it. Then go to Step 12.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0134 set?****YES** : Repeat the troubleshooting.**NO** : The procedure is complete.**DTC P0135: Heated Oxygen Sensor Heater Circuit (sensor 1)****Heated Oxygen Sensor (front) Heater Circuit**

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### CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the heated oxygen sensor (front) heater.
- The ECM (terminal No. 60) <M/T> or PCM (terminal No. 3) <A/T> controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

### TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

### DTC SET CONDITIONS

#### Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.

- Engine coolant temperature is higher than 20°C (68°F).
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

### Judgment Criteria

- Heater current of the heated oxygen sensor (front) heater has continued to be lower than 0.16 ampere or higher than 7.5 ampere for 4 seconds.

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

- Open or shorted heated oxygen sensor (front) heater circuit.
- Open circuit in heated oxygen sensor (front) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

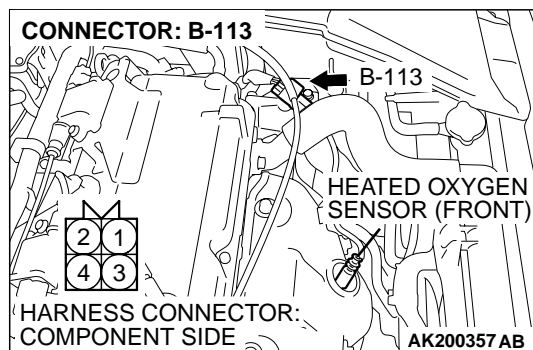
**DIAGNOSIS****Required Special Tool:**

- MD998464: Test Harness

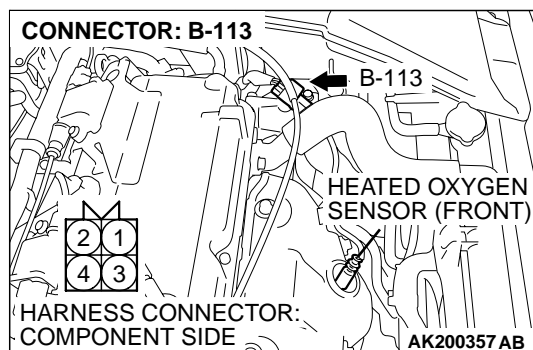
**STEP 1. Check connector B-113 at the heated oxygen sensor (front) for damage.****Q: Is the connector in good condition?**

**YES :** Go to Step 2.

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

**STEP 2. Check the heated oxygen sensor (front).**

- (1) Disconnect heated oxygen sensor (front) connector B-113 and connect test harness special tool, MD998464, to the connector on the heated oxygen (front) sensor side.



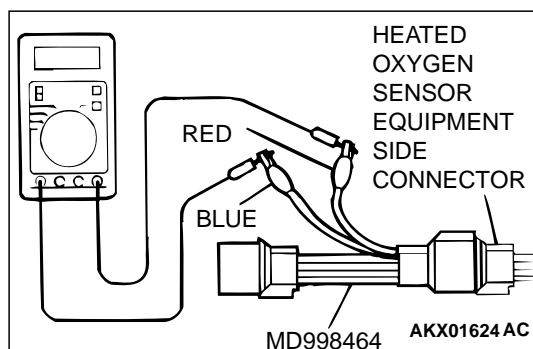
- (2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

**Standard value: 4.5 – 8.0 ohms [at 20°C (68°F)]**

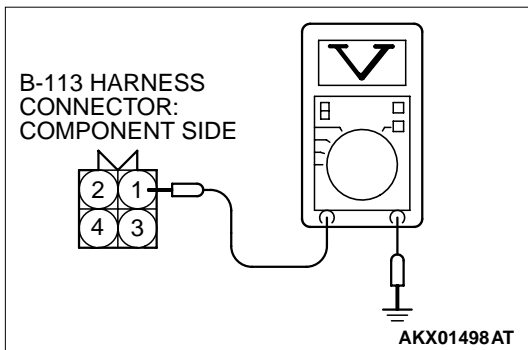
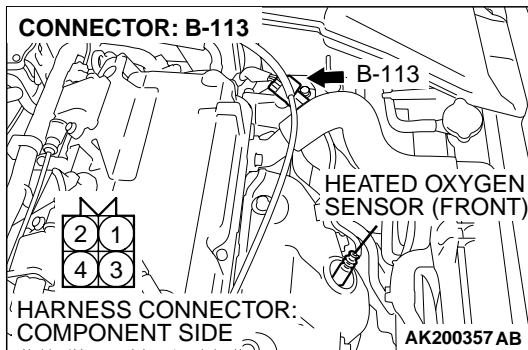
**Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 3.

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







**STEP 3. Measure the power supply voltage at heated oxygen sensor (front) harness side connector B-113.**

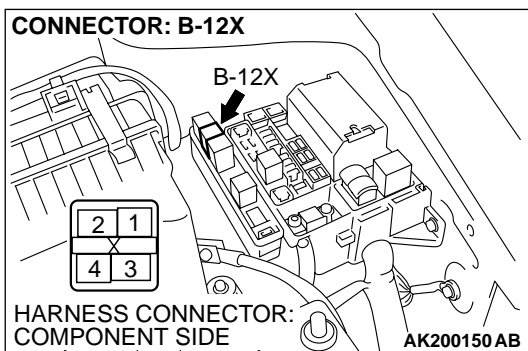
- (1) Disconnect connector B-113 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

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

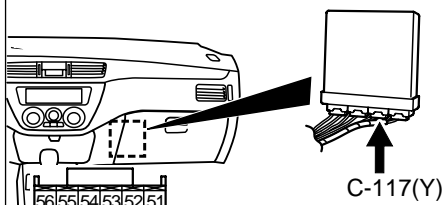


**STEP 4. Check connector B-12X at the MFI relay for damage.**

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

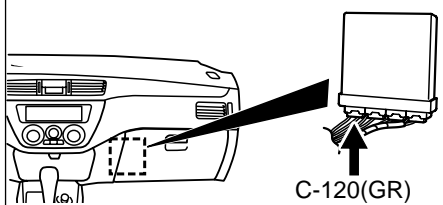
**YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and heated oxygen sensor (front) connector B-113 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

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

**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200137AB

**CONNECTOR: C-120 <A/T>**

8	7	6	5		4	3	2	1
23	22	21	20	19	18	17	16	15
14	13	12	11	10	9			
35	34	33	32	31	30	29	28	27
26	25	24						

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB

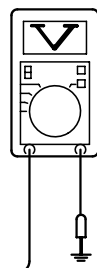
**STEP 5. Measure the power supply voltage at ECM connector C-117 <M/T> or PCM connector C-120 <A/T> by backprobing.**

- (1) Do not disconnect connector C-117 <M/T> or C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

&lt;M/T&gt;

C-117 HARNESS  
CONNECTOR:  
HARNESS SIDE

51	52	53	54	55	56
57	58	59	60	61	62



AK000289AG

- (3) Measure the voltage between terminal No. 60 <M/T> or No. 3 <A/T> and ground by backprobing.

- Voltage should measure battery positive voltage.

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

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

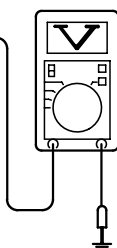
**YES :** Go to Step 8.

**NO :** Go to Step 6.

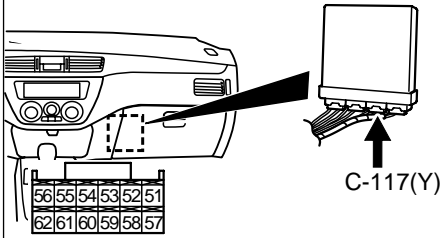
&lt;A/T&gt;

C-120 HARNESS  
CONNECTOR:  
HARNESS SIDE

1	2	3	4		5	6	7	8
9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			
24	25	26	27	28	29	30	31	32
33	34	35						



AK000290AI

**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

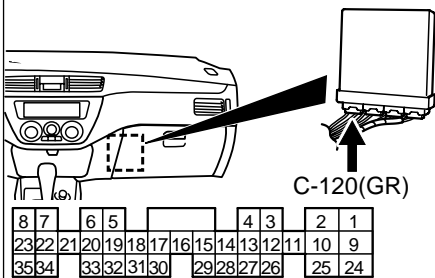
AK200137AB

**STEP 6.** Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> 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 go to Step 12.

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

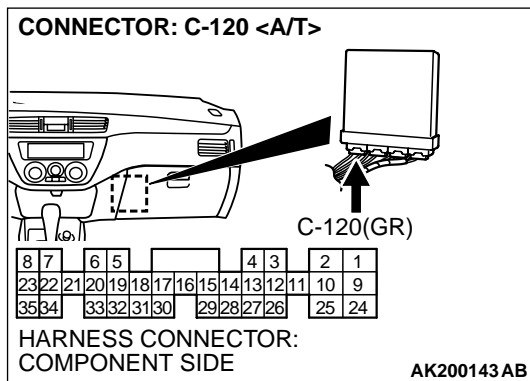
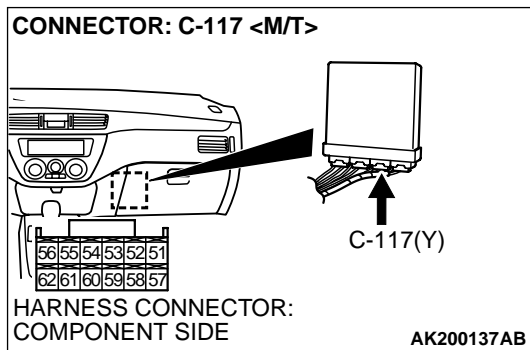
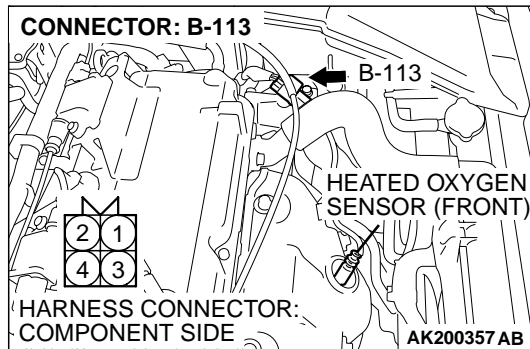
AK200143AB

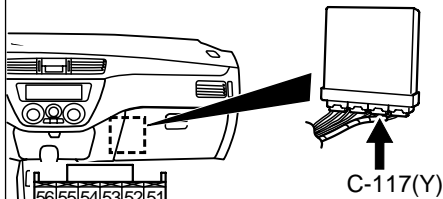
**STEP 7.** Check for open circuit and short circuit to ground between heated oxygen sensor (front) connector B-113 (terminal No. 3) and ECM connector C-117 (terminal No. 60) <M/T> or PCM connector C-120 (terminal No. 3) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

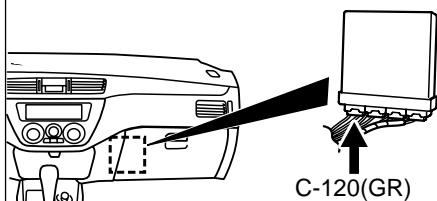
AK200137AB

**STEP 8.** Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

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

**YES :** Go to Step 9.

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

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

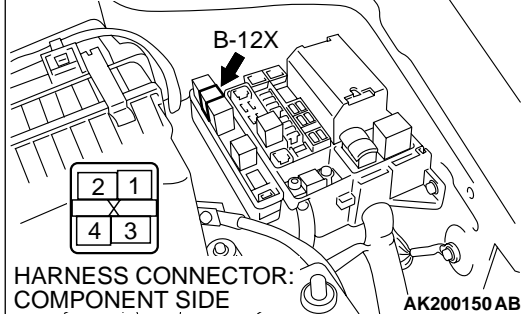
AK200143AB

**STEP 9.** Check for harness damage between MFI relay connector B-12X (terminal No. 4) and heated oxygen sensor (front) connector B-113 (terminal No. 1).

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

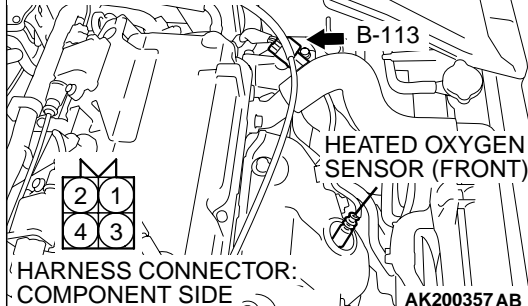
**YES :** Go to Step 10.

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

**CONNECTOR: B-12X**

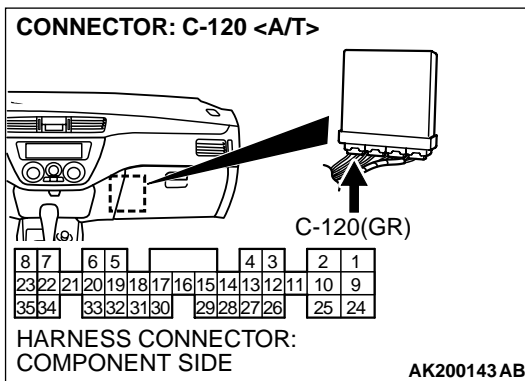
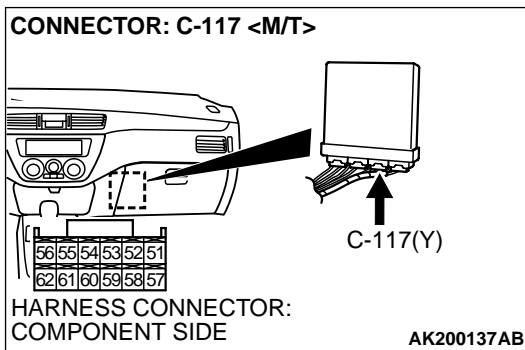
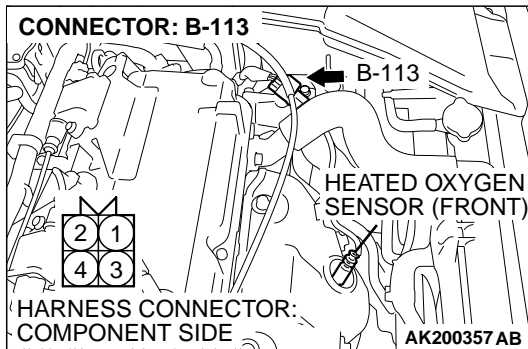
HARNESS CONNECTOR:  
COMPONENT SIDE

AK200150AB

**CONNECTOR: B-113**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200357AB



**STEP 10. Check for harness damage between heated oxygen sensor (front) connector B-113 (terminal No. 3) and ECM connector C-117 (terminal No. 60) <M/T> or PCM connector C-120 (terminal No. 3) <A/T>.**

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

**YES :** Go to Step 11.

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

**STEP 11. Retest the system.**

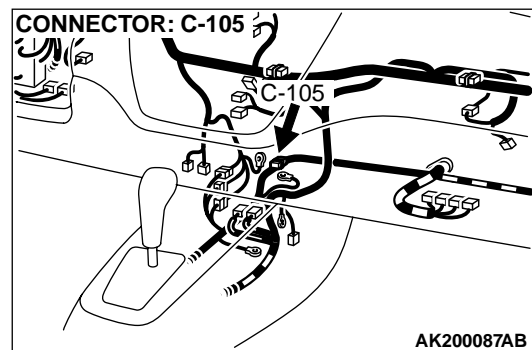
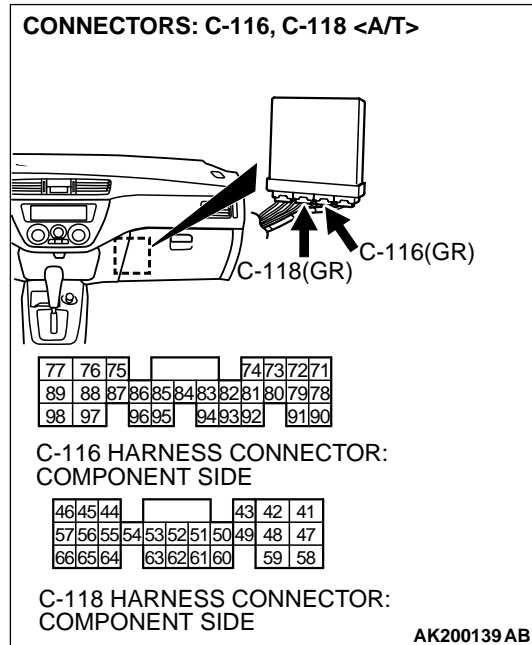
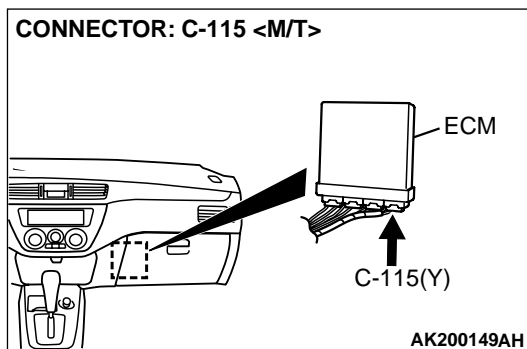
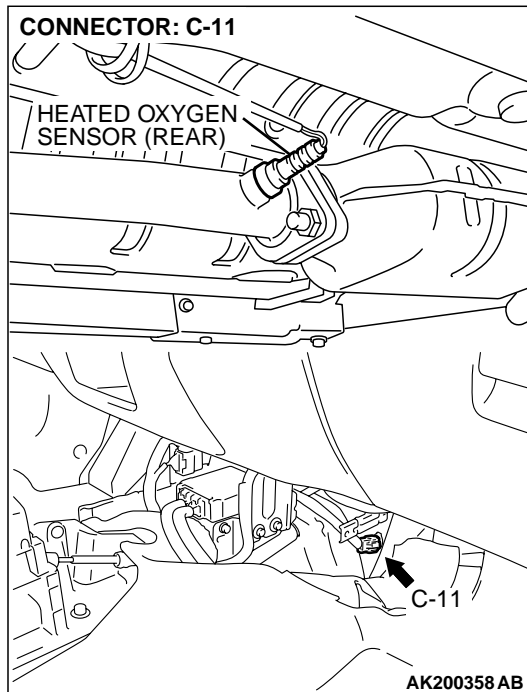
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0135 set?**

**YES :** Replace the ECM or PCM. Then go to Step 12.

**NO :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** The procedure is complete.



## CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 75) <M/T> or PCM (terminal No. 73) <A/T> from the output terminal (terminal No. 1) of the heated oxygen sensor (rear).
- Terminal No. 2 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

## TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

## DTC SET CONDITIONS

### Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Monitoring time: 7 seconds.

### Judgment Criteria

- Input voltage supplied to the ECM <M/T> or PCM <A/T> interface circuit is higher than 4.5 volts when 5 volts is applied to the heated oxygen sensor (rear) output line via a resistor.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.



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

- Heated oxygen sensor (rear) failed.
- Open circuit in heated oxygen sensor (rear) output line.
- Open circuit in heated oxygen sensor (rear) ground line.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MB991223: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).****⚠ CAUTION**

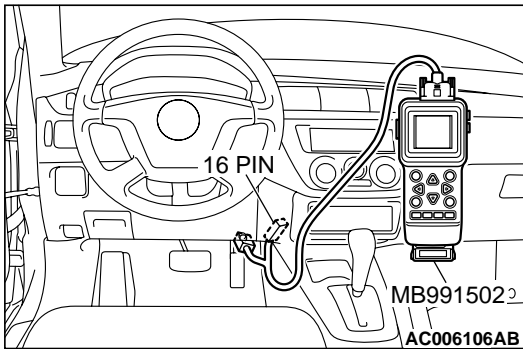
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

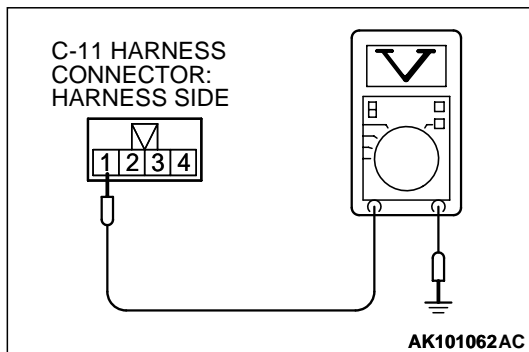
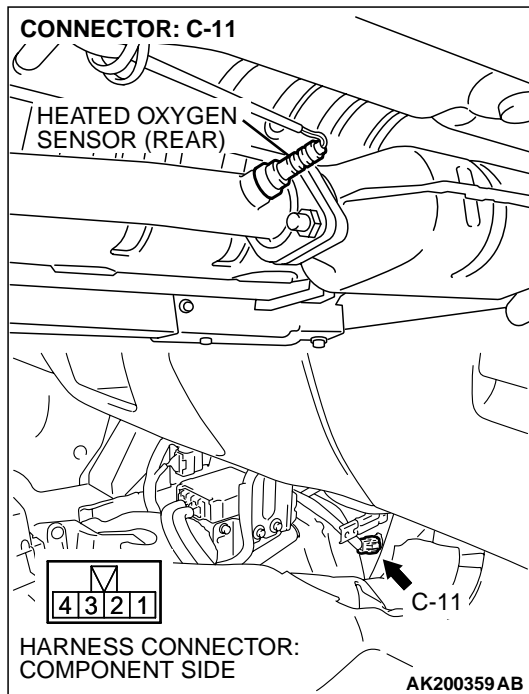
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.



**STEP 2. Measure the sensor output voltage at heated oxygen sensor (rear) connector C-11 by backprobing.**

- (1) Do not disconnect connector C-11.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 1 and ground by backprobing.

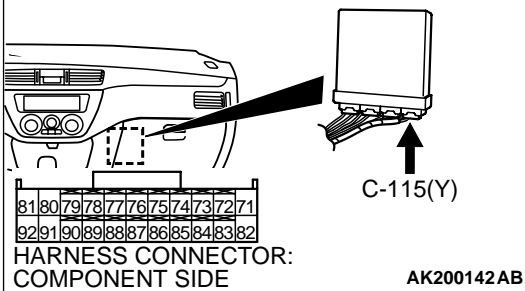
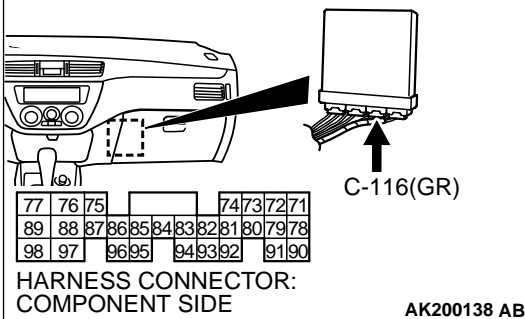
- Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

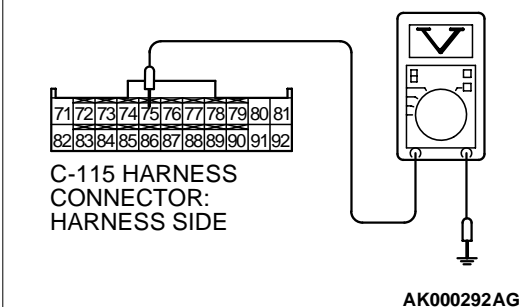
**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

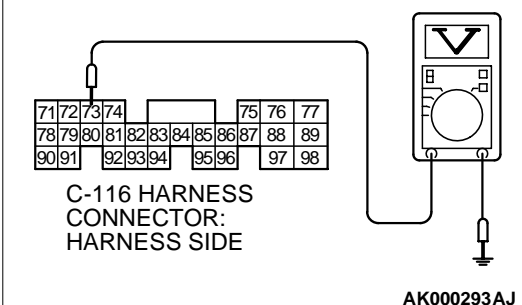
**NO :** Go to Step 7.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-116 <A/T>**

&lt;M/T&gt;



&lt;A/T&gt;



**STEP 3. Measure the sensor output voltage at ECM connector C-115 <M/T> or PCM connector C-116 <A/T> by backprobing.**

- (1) Do not disconnect connector C-115 <M/T> or C-116 <A/T>.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 75 <M/T> or No. 73 <A/T> and ground by backprobing.

- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 4.

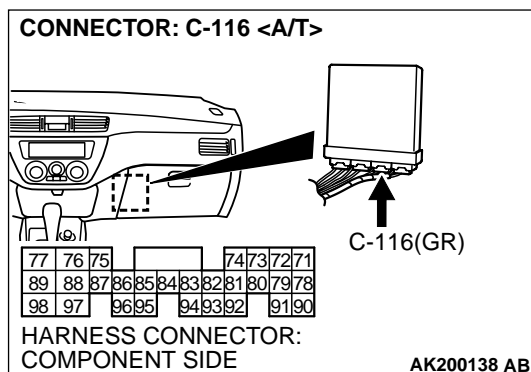
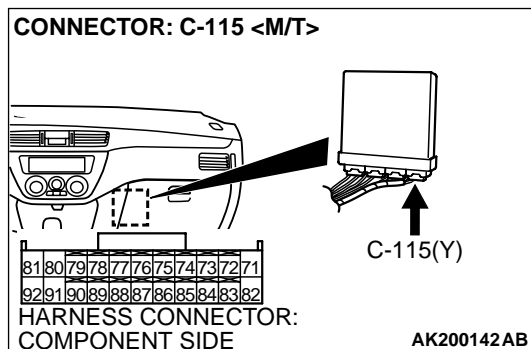
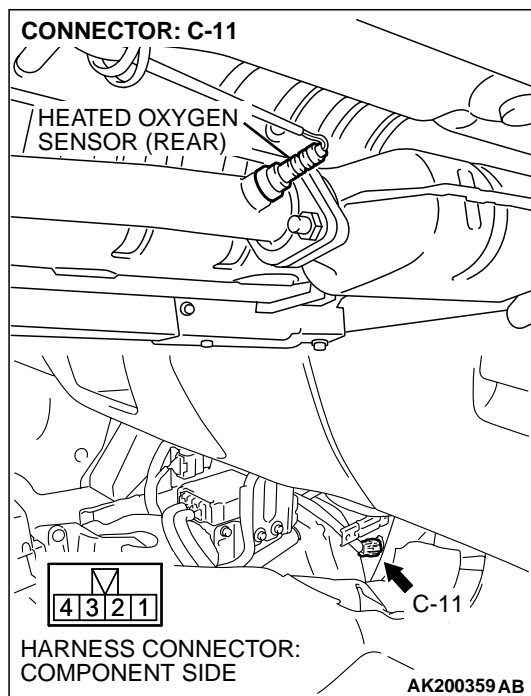
**NO :** Go to Step 6.

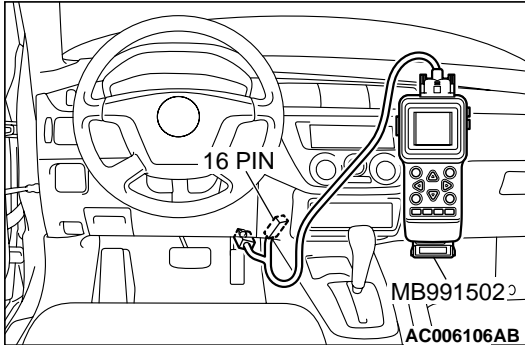
**STEP 4.** Check connector C-11 at heated oxygen sensor (rear) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.

**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 go to Step 14.





**STEP 5. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).**

**⚠ CAUTION**

**To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

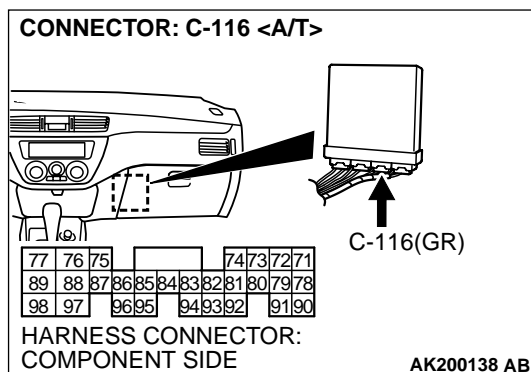
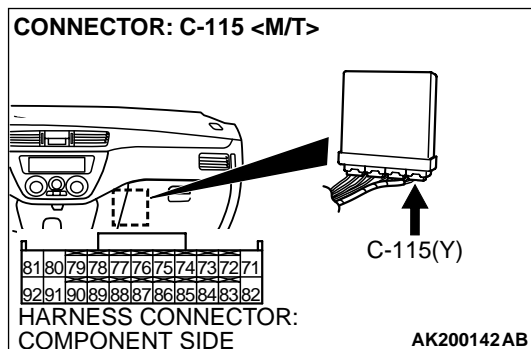
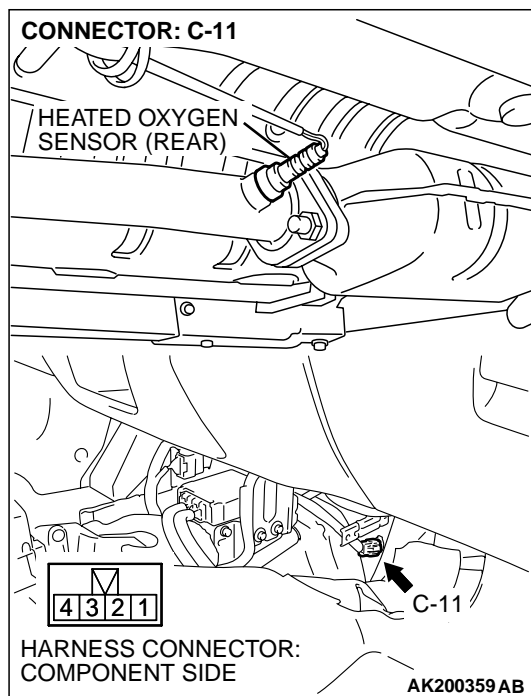
**NO :** Replace the ECM or PCM. Then go to Step 14.

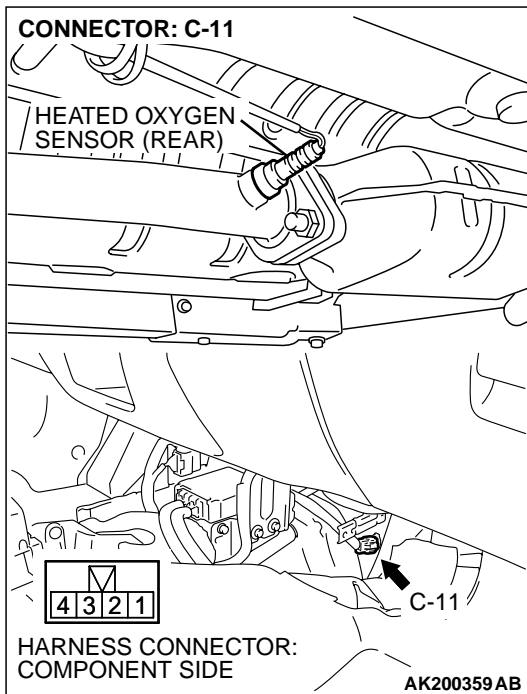
**STEP 6.** Check connector C-11 at heated oxygen sensor (rear) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.

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

**YES :** Repair harness wire between heated oxygen sensor (rear) connector C-11 (terminal No. 1) and ECM connector C-115 (terminal No. 75) <M/T> or PCM connector C-116 (terminal No. 73) <A/T> because of open circuit or harness damage. Then go to Step 14.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



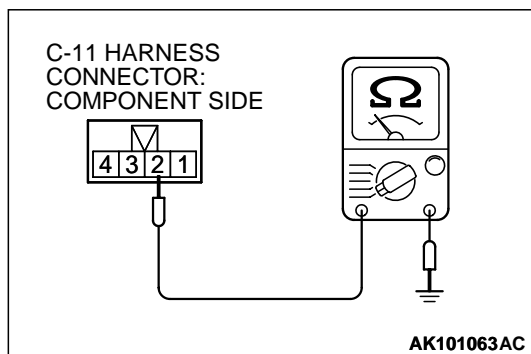
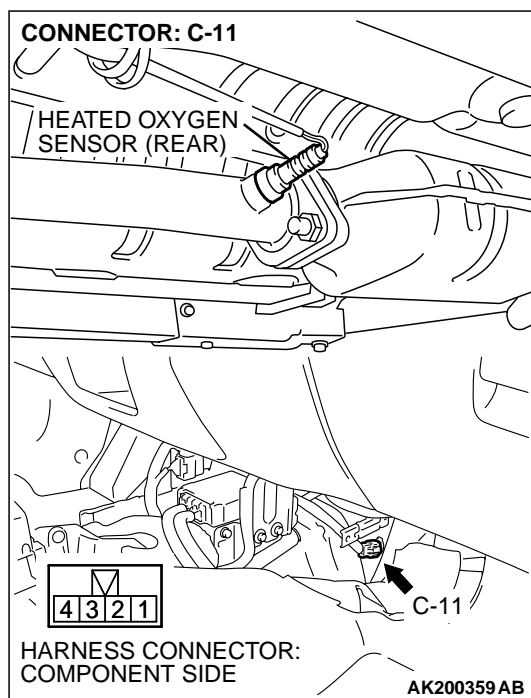


**STEP 7. Check connector C-11 at heated oxygen sensor (rear) for damage.**

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

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 8. Check for continuity at heated oxygen sensor (rear) harness side connector C-11.**

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

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

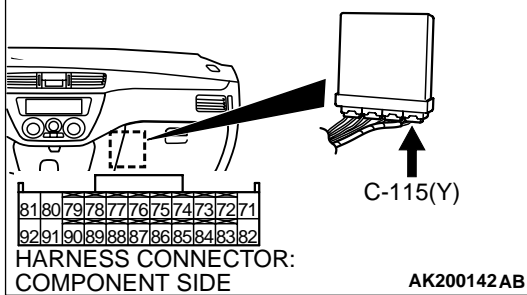
- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 11.

**NO :** Go to Step 9.



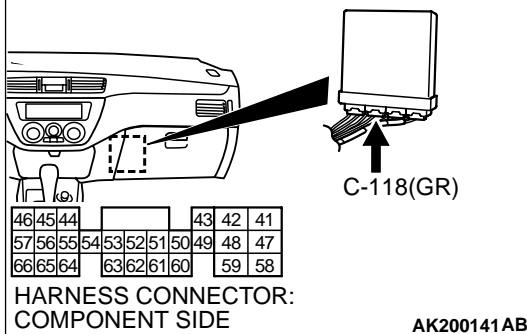
**CONNECTOR: C-115 <M/T>**

**STEP 9.** Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> 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 go to Step 14.

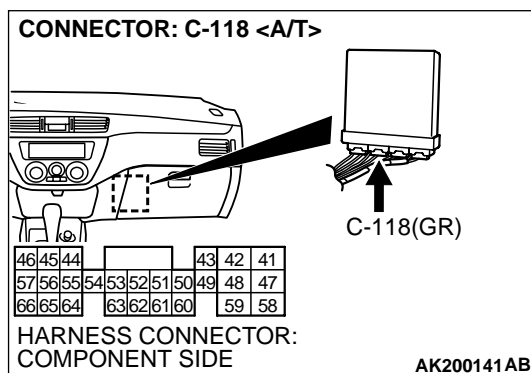
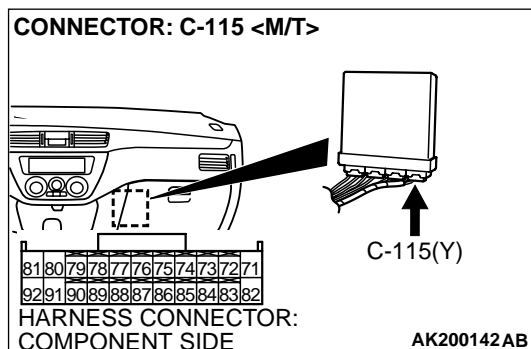
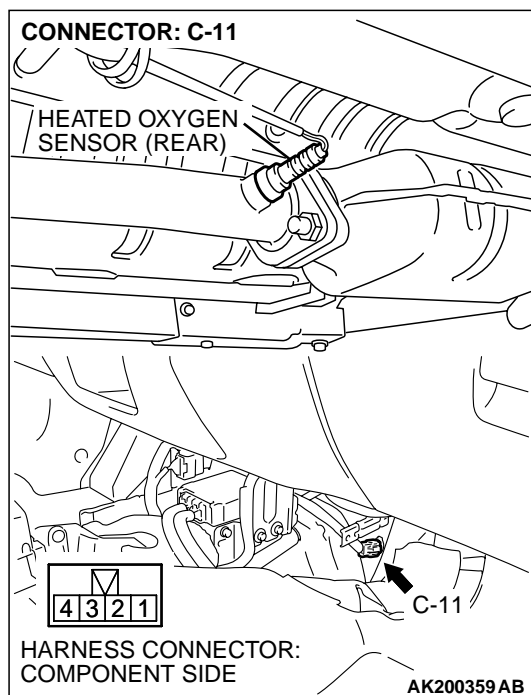
**CONNECTOR: C-118 <A/T>**

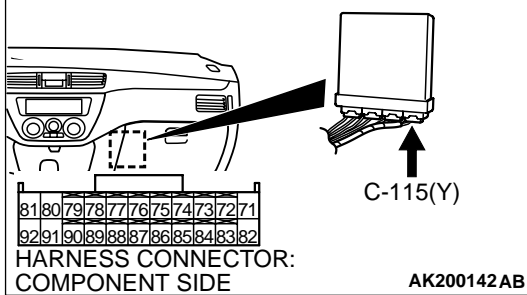
**STEP 10. Check for open circuit and harness damage between heated oxygen sensor (rear) connector C-11 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.



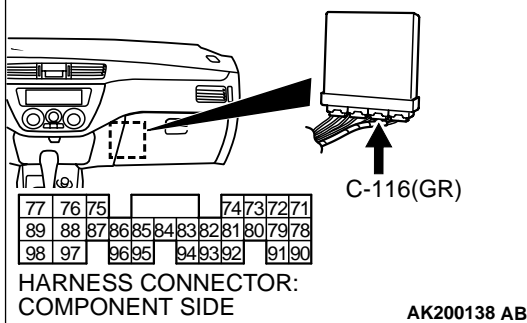
**CONNECTOR: C-115 <M/T>**

**STEP 11. Check connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.**

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

**YES :** Go to Step 12.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

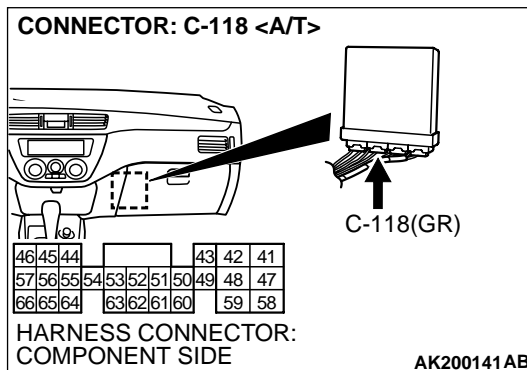
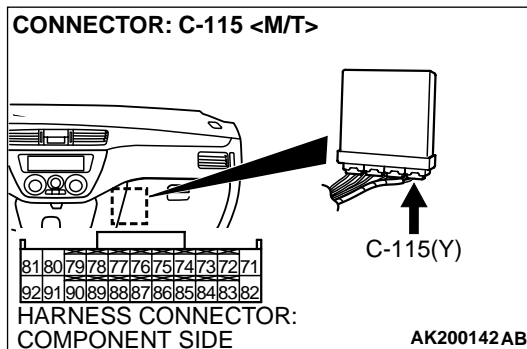
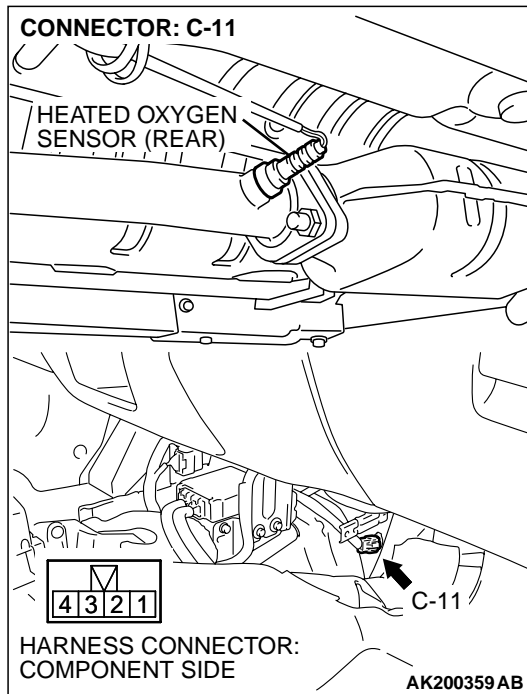
**CONNECTOR: C-116 <A/T>**

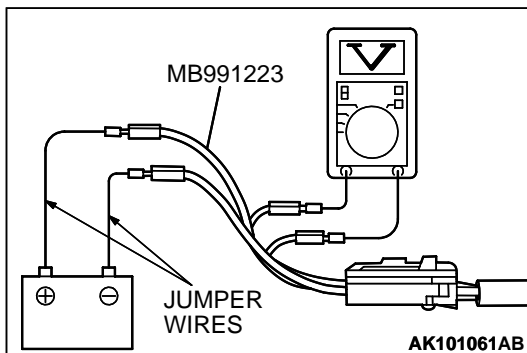
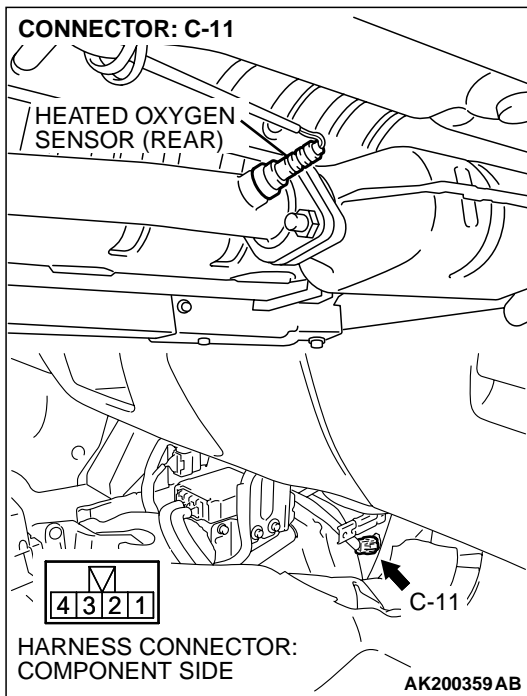
**STEP 12. Check for harness damage between heated oxygen sensor (rear) connector C-11 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Go to Step 13.

**NO :** Repair it. Then go to Step 14.



**STEP 13. Check the heated oxygen sensor (rear).**

- (1) Disconnect the heated oxygen sensor (rear) connector C-11 and connect test harness special tool, MB991223, to the connector on the heated oxygen sensor (front) side.
- (2) Warm up the engine until engine coolant 80°C (176°F) or higher.

**CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor (rear).

- (3) Use the jumper wires to connect terminal No. 3 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- (4) Connect a digital volt meter between terminal No. 1 and terminal No. 2.
- (5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

**Standard value: 0.6 – 1.0 volt**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Replace the heated oxygen sensor (rear). Then go to Step 14.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

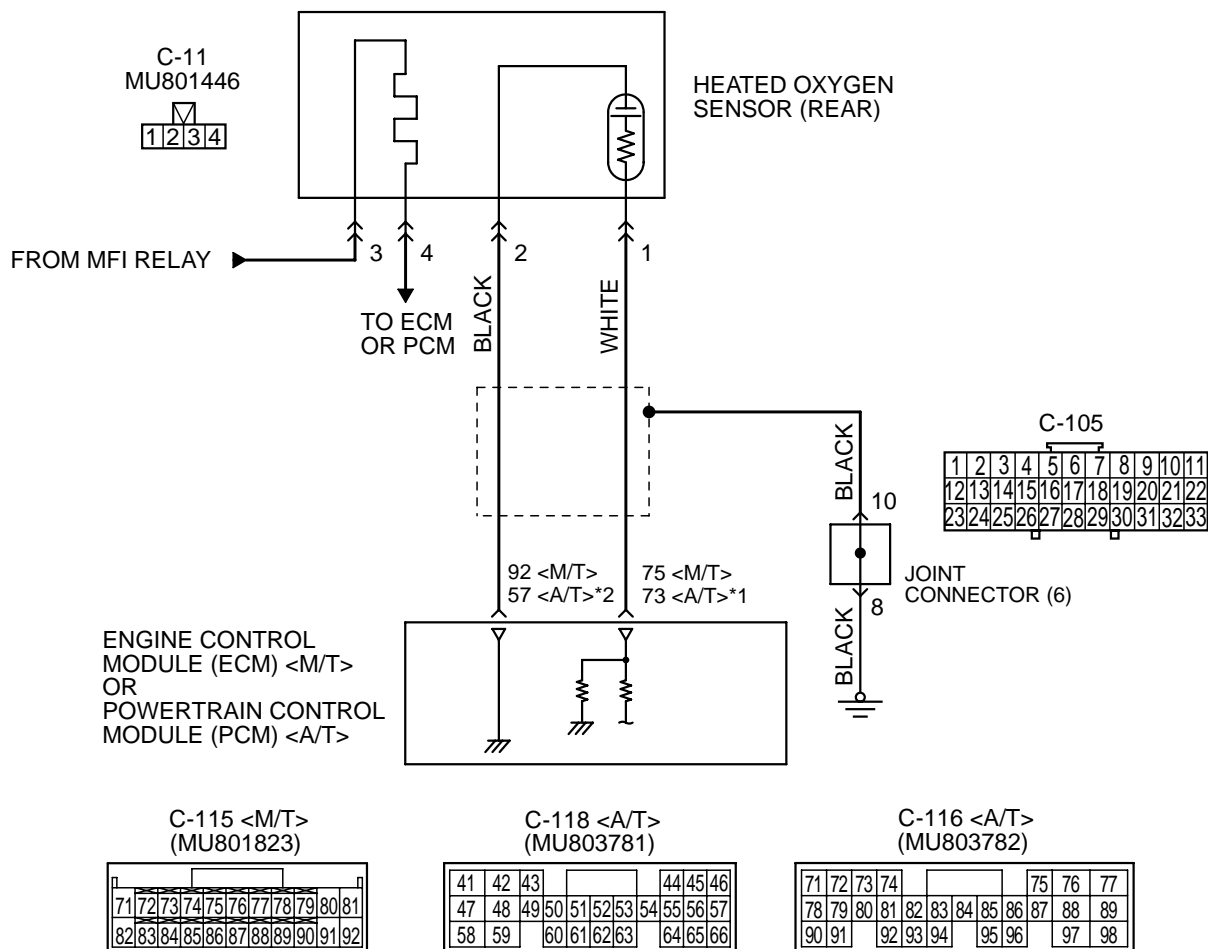
**Q: Is DTC P0136 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

## DTC P0137: Heated Oxygen Sensor Circuit Low Voltage (sensor 2)

Heated Oxygen Sensor (rear) Circuit

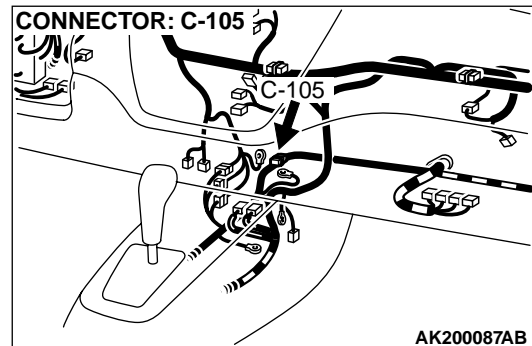
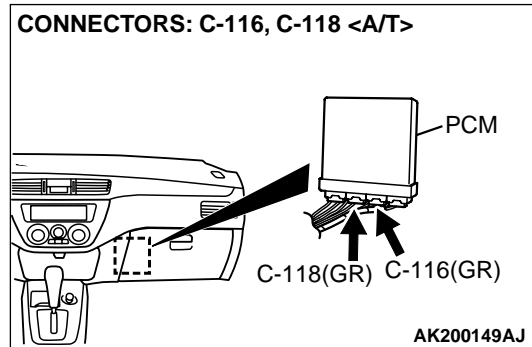
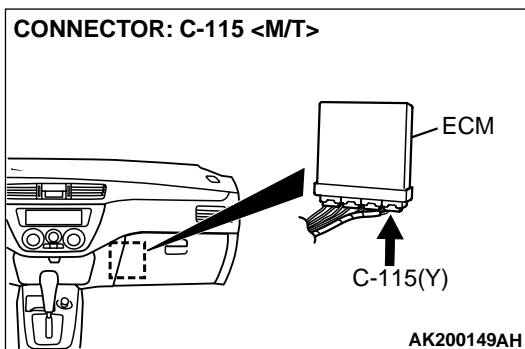
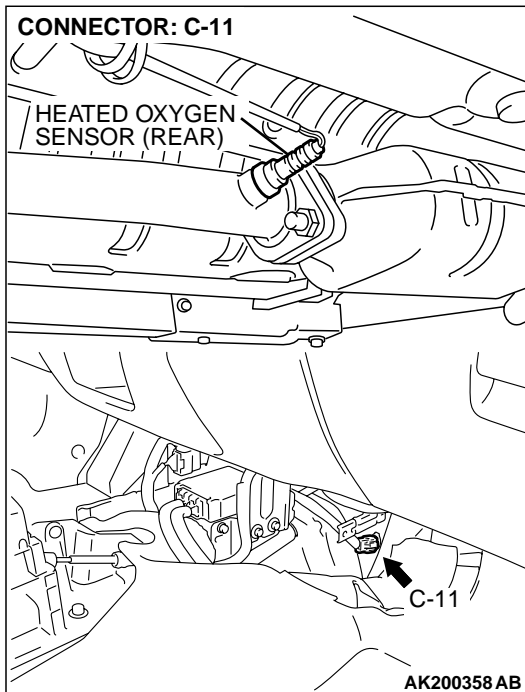


## NOTE

\*1: PCM connector C-116 &lt;A/T&gt;

\*2: PCM connector C-118 &lt;A/T&gt;

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## CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 75) <M/T> or PCM (terminal No. 73) <A/T> from the output terminal (terminal No. 1) of the heated oxygen sensor (rear).
- Terminal No. 2 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

## TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

## DTC SET CONDITIONS

### Check Conditions

- 3 minutes or more have passed since the starting sequence was completed.
- Heated oxygen sensor (rear) signal voltage has continued to be 0.15 volt or lower.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is higher than 1,200 r/min.
- Volumetric efficiency is higher than 25 percent.
- Volume air flow sensor output frequency is 81 Hz or more.
- At least 20 seconds have passed since fuel shut off control was canceled.
- The heated oxygen sensor (front) outputs 0.5 volt or more.
- After the ignition switch is turned ON, the changes in the output voltage of the heated oxygen sensor (rear) is lower than 0.078 volt.
- Monitoring time: 10 seconds.

**Judgement Criteria**

- Making the air/fuel ratio 15 percent for 10 seconds richer does not result in raising the heated oxygen sensor (rear) output voltage beyond 0.15 volt.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

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

- Heated oxygen sensor (rear) failed.
- Short circuit in heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MB991223: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).**

**⚠ CAUTION**

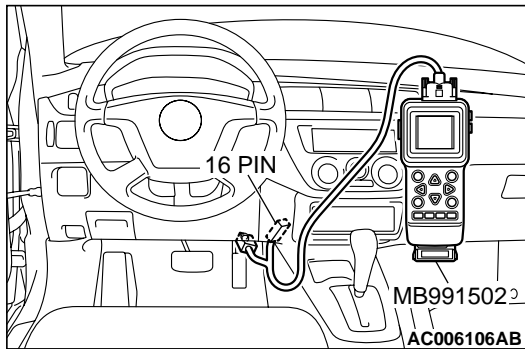
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

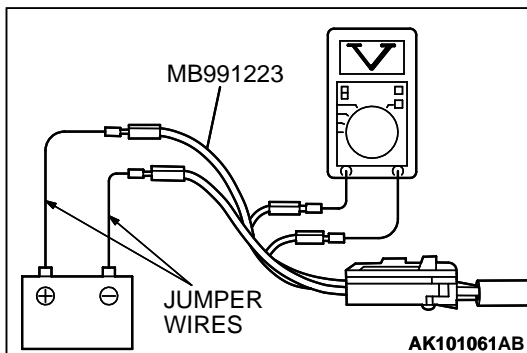
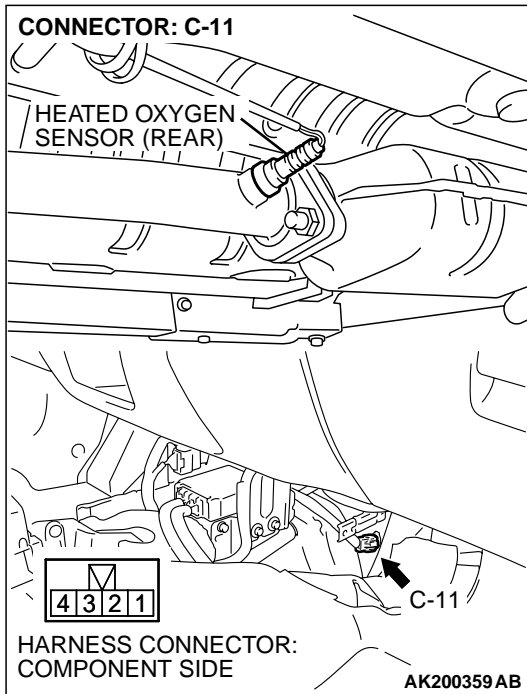
**Q: Is the sensor operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Check the heated oxygen sensor (rear).**

- (1) Disconnect the heated oxygen sensor (rear) connector C-11 and connect test harness special tool, MB991223, to the connector on the heated oxygen sensor (front) side.
- (2) Warm up the engine until engine coolant 80°C (176°F) or higher.

**CAUTION**

Be very careful when connecting the jumper wires; incorrect connection can damage the right bank heated oxygen sensor (rear).

- (3) Use the jumper wires to connect terminal No. 3 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- (4) Connect a digital volt meter between terminal No. 1 and terminal No. 2.
- (5) While repeatedly revving the engine, measure the heated oxygen sensor (rear) output voltage.

**Standard value: 0.6 – 1.0 volt**

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

**YES :** Go to Step 3.

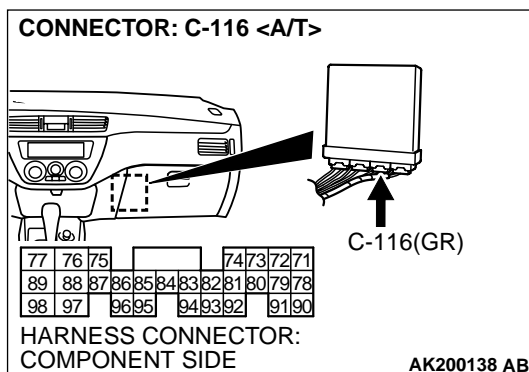
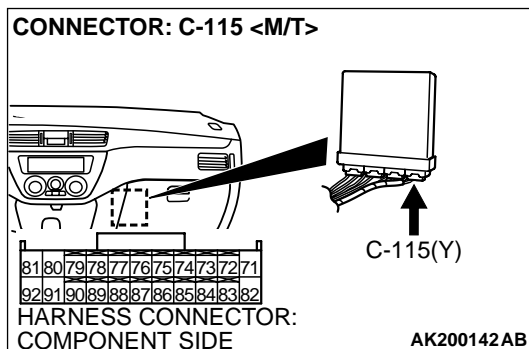
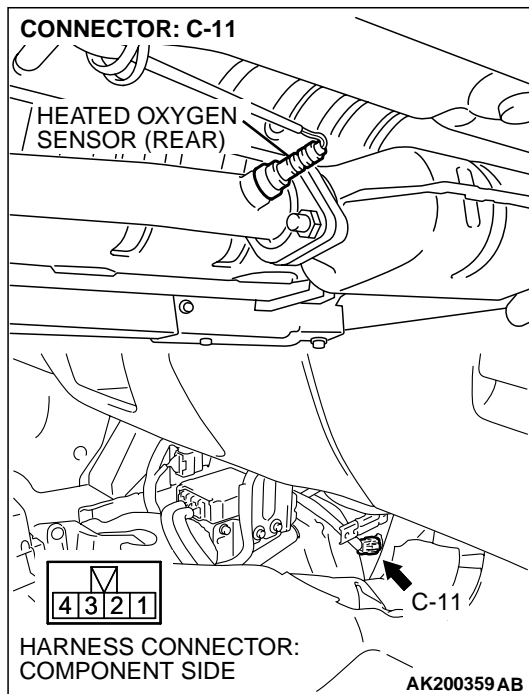
**NO :** Replace the heated oxygen sensor (rear). Then go to Step 5.

**STEP 3.** Check connector C-11 at heated oxygen sensor (rear) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.

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

**YES :** Go to Step 4.

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

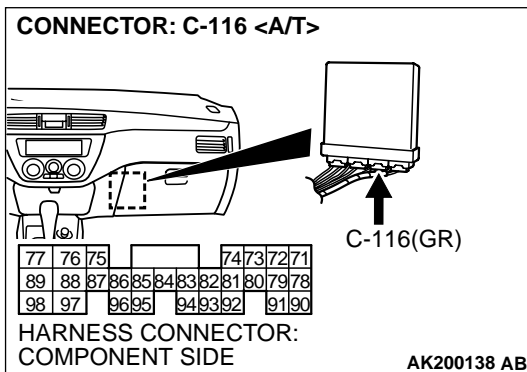
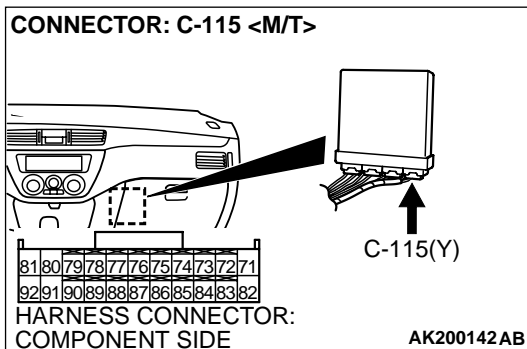
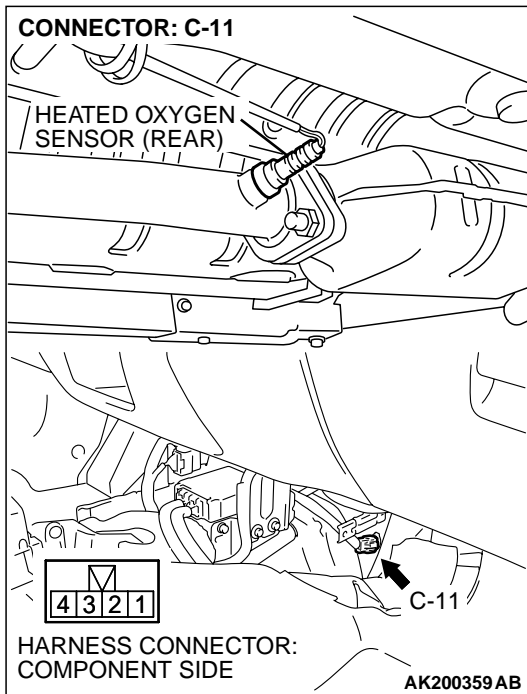


**STEP 4.** Check for short circuit to ground between heated oxygen sensor (rear) connector C-11 (terminal No. 1) and ECM connector C-115 (terminal No. 75) <M/T> or PCM connector C-116 (terminal No. 73) <A/T>.

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

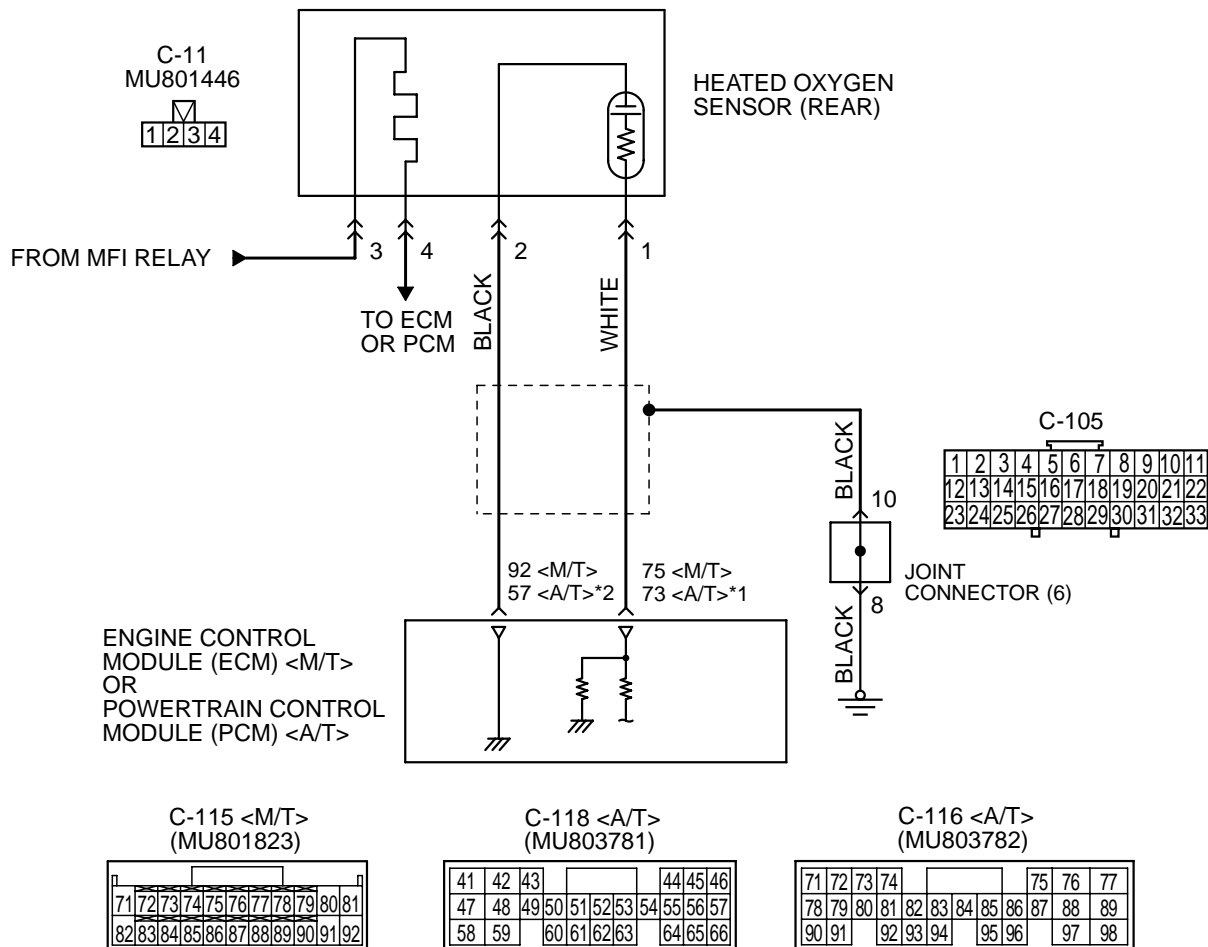
**YES :** Replace the ECM or PCM. Then go to Step 5.

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



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

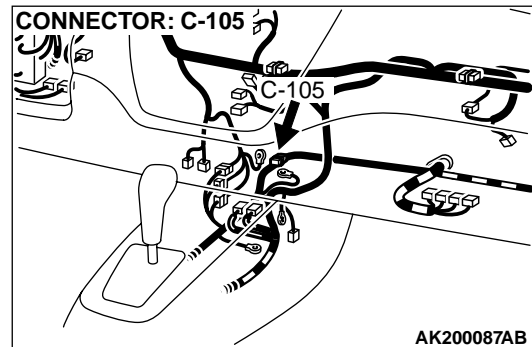
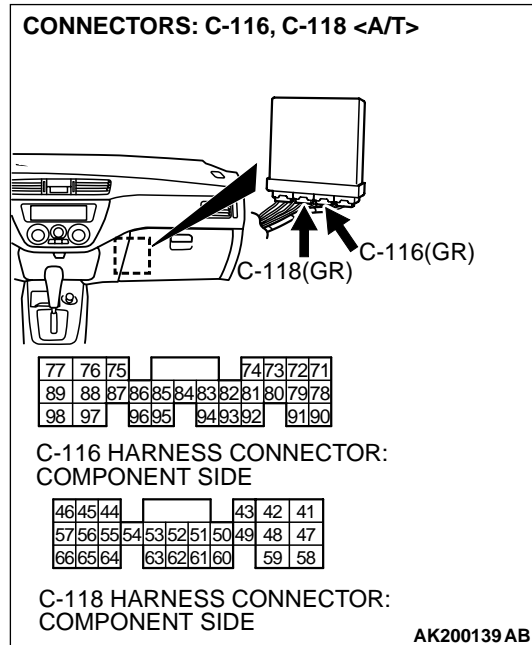
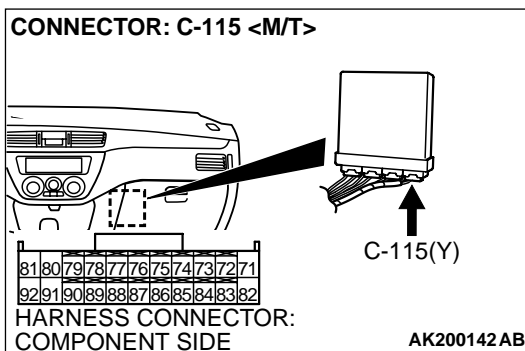
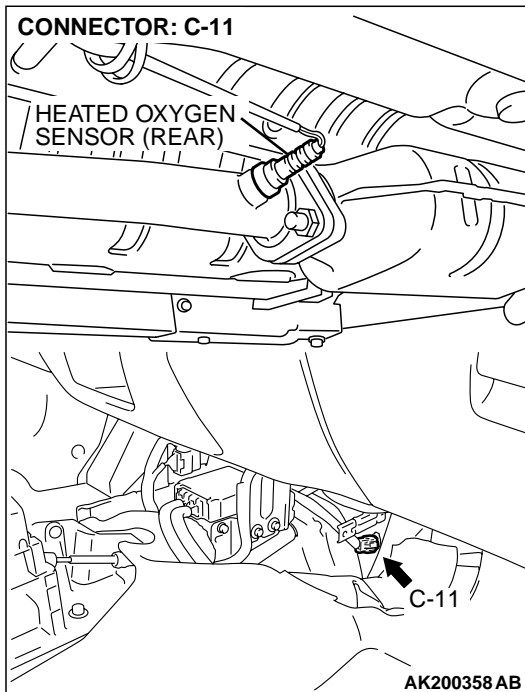
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0137 set?****YES :** Repeat the troubleshooting.**NO :** The procedure is complete.**DTC P0138: Heated Oxygen Sensor Circuit High Voltage (sensor 2)****Heated Oxygen Sensor (rear) Circuit****NOTE**

\*1: PCM connector C-116 &lt;A/T&gt;

\*2: PCM connector C-118 &lt;A/T&gt;

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## CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 75) <M/T> or PCM (terminal No. 73) <A/T> from the output terminal (terminal No. 1) of the heated oxygen sensor (rear).
- Terminal 2 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

## TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

## DTC SET CONDITIONS

### Check Conditions

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

### Judgment Criteria

- Heated oxygen sensor (rear) output voltage has continued to be 1.2 volts or higher for 2 seconds.

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

- Heated oxygen sensor (rear) failed.
- Short circuit in heated oxygen sensor (rear) output line.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

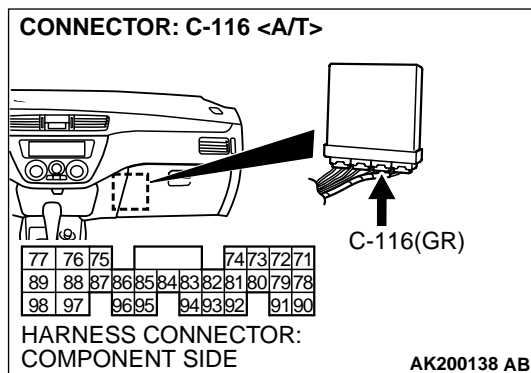
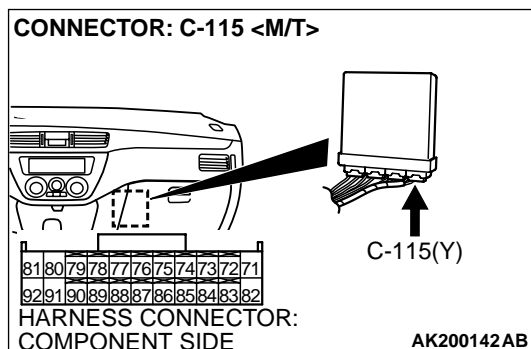
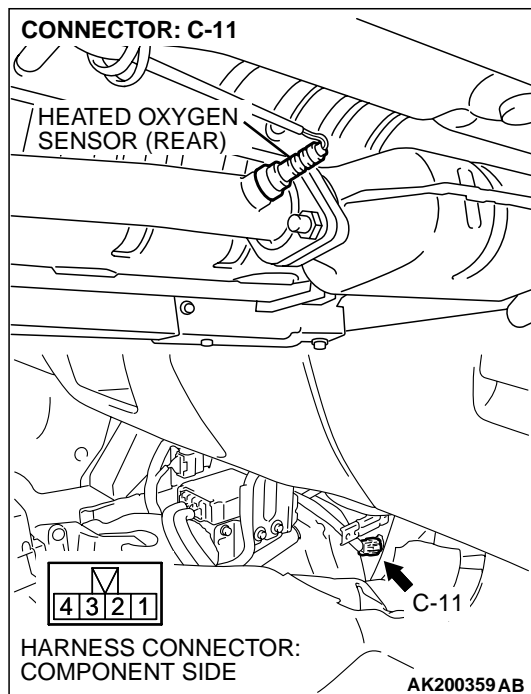
- MB991502: Scan Tool (MUT-II)

**STEP 1.** Check connector C-11 at heated oxygen sensor (rear) and connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> 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 go to Step 3.

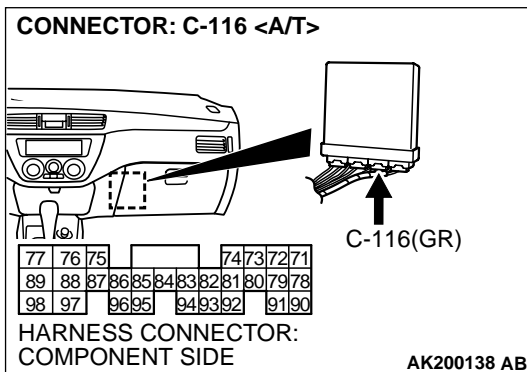
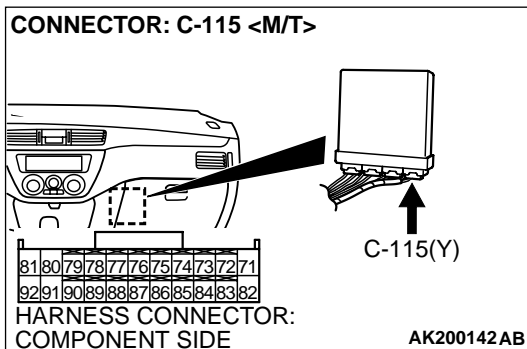
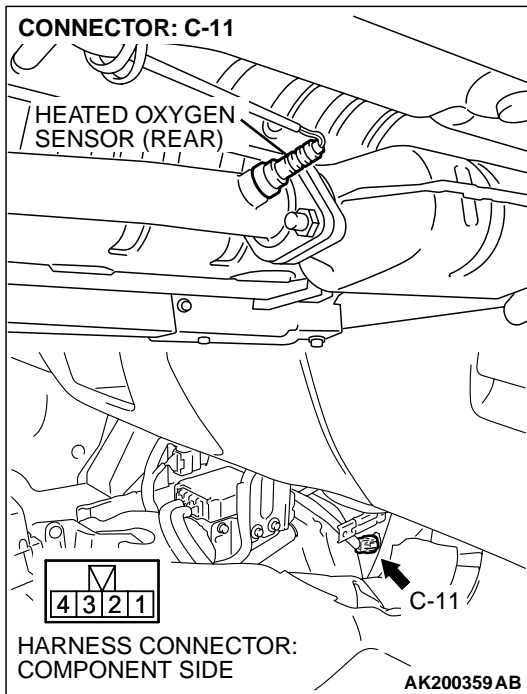


**STEP 2.** Check for short circuit to power supply between heated oxygen sensor (rear) connector C-11 (terminal No. 1) and ECM connector C-115 (terminal No. 75) <M/T> or PCM connector C-116 (terminal No. 73) <A/T>.

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

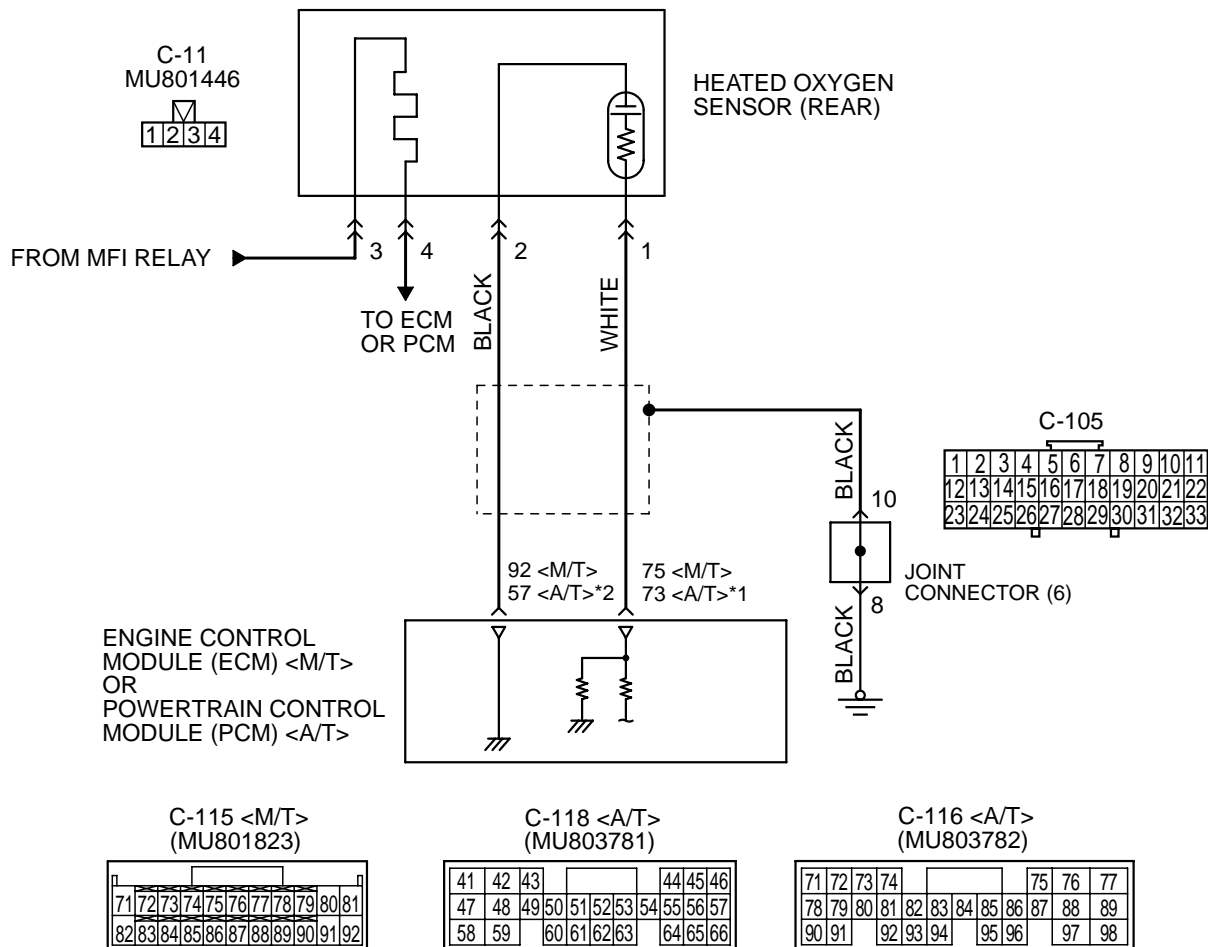
**YES :** Replace the ECM or PCM. Then go to Step 3.

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



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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

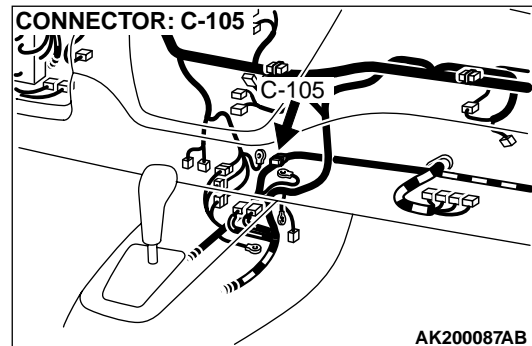
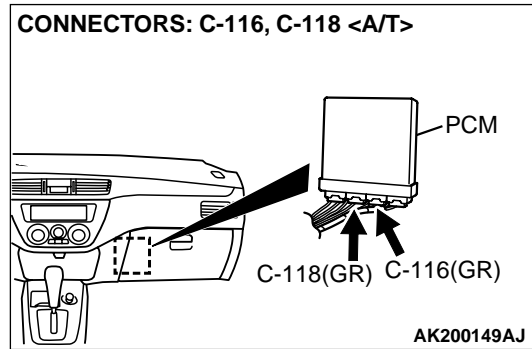
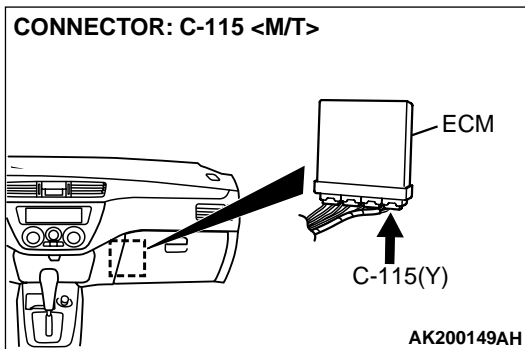
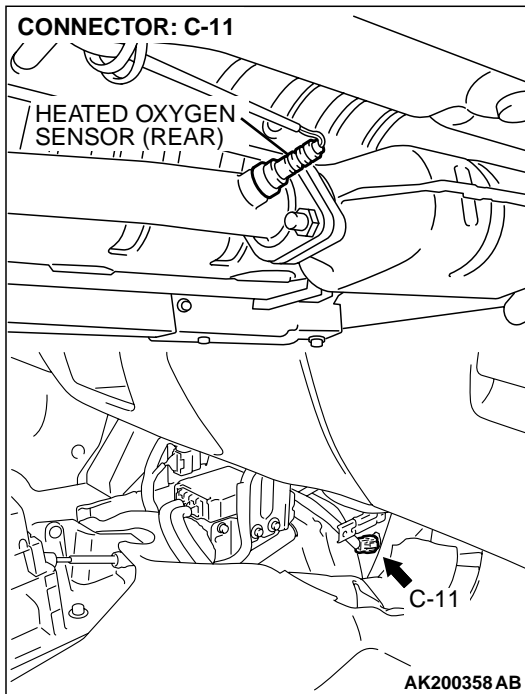
**Q: Is DTC P0138 set?****YES :** Repeat the troubleshooting.**NO :** The procedure is complete.**DTC P0139: Heated Oxygen Sensor Circuit Slow Response (sensor 2)****Heated Oxygen Sensor (rear) Circuit****NOTE**

\*1: PCM connector C-116 &lt;A/T&gt;

\*2: PCM connector C-118 &lt;A/T&gt;

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## CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 75) <M/T> or PCM (terminal No. 73) <A/T> from the output terminal (terminal No. 1) of the heated oxygen sensor (rear).
- Terminal No. 2 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.

## TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM <M/T> or PCM <A/T> checks for an open circuit in the heated oxygen sensor (rear) output line.

## DTC SET CONDITIONS

### Check Conditions

- Engine coolant temperature is higher than 76°C (169°F).
- The heated oxygen sensor (front) is active.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.
- Repeat 3 or more times: drive<sup>\*1</sup>, stop<sup>\*2</sup>.

#### Drive<sup>\*1</sup>:

- Engine speed is higher than 1,500 r/min.
- Volumetric efficiency is higher than 40 percent.
- Vehicle speed is higher than 30 km/h (18.7 mph).
- A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

#### Stop<sup>\*2</sup>:

- Vehicle speed is lower than 1.5 km/h (0.9 mph).

**Judgement Criteria**

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

*NOTE: Monitoring stops after fuel has been shut off for more than 38 seconds.*

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

- Heated oxygen sensor (rear) failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
- (4) Warm up the engine.
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

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

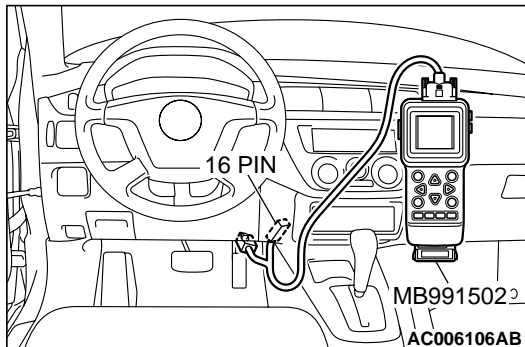
**STEP 2. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 4 – Heated Oxygen Sensor Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

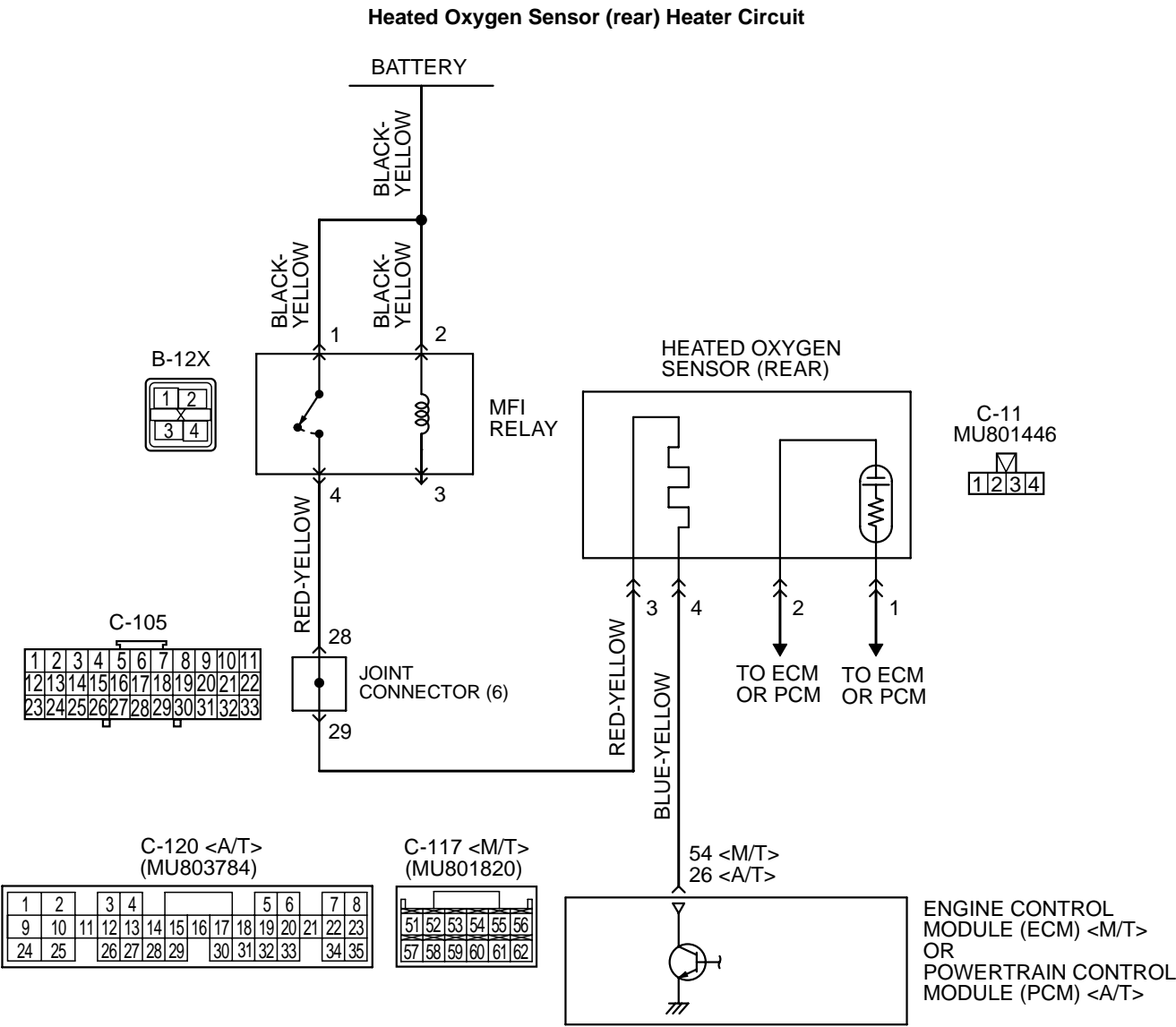
**Q: Is DTC P0139 set?**

**YES :** Repeat the troubleshooting.

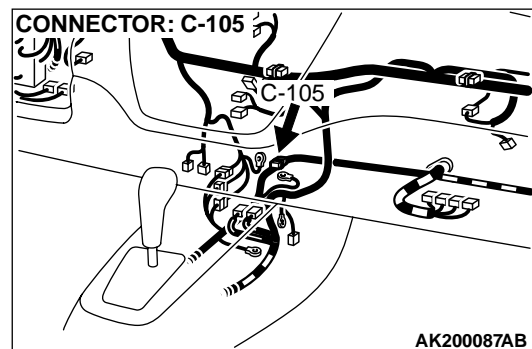
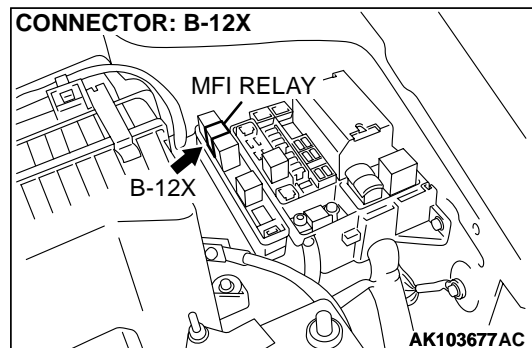
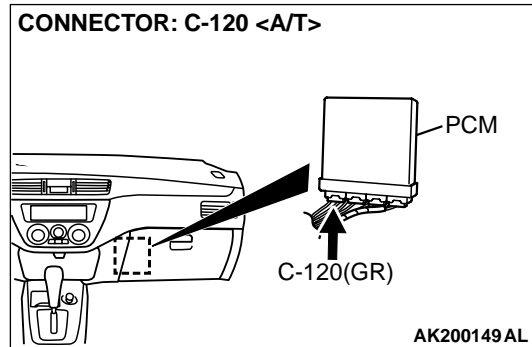
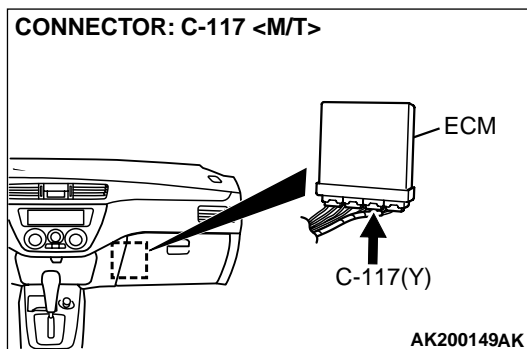
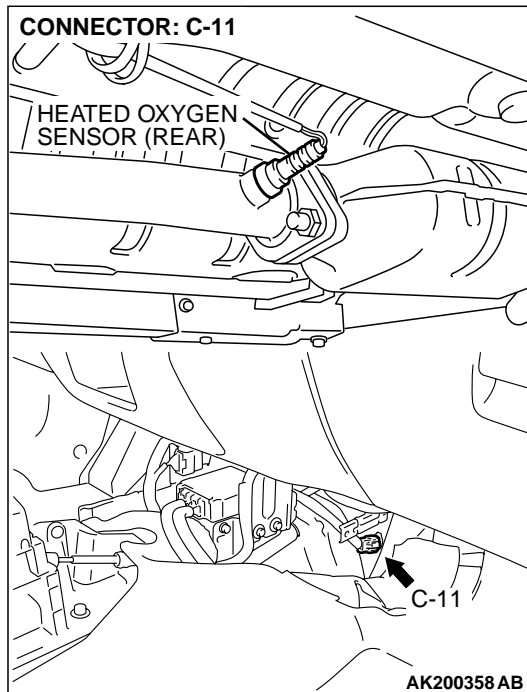
**NO :** The procedure is complete.



DTC P0141: Heated Oxygen Sensor Heater Circuit (sensor 2)



AK000869



### CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 4) to the heated oxygen sensor (rear) heater.
- The ECM (terminal No. 54) <M/T> or PCM (terminal No. 26) <A/T> controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

### BACKGROUND

- The ECM <M/T> or PCM <A/T> checks whether the heater current is within a specified range when the heater is energized.

### DTC SET CONDITIONS

#### Check Conditions

- 60 seconds have elapsed from the start of the previous monitoring.

- Engine coolant temperature is higher than 20°C (68°F).
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is at between 11 and 16 volts.

### Judgment Criteria

- Heater current of the heated oxygen sensor (rear) heater has continued to be lower than 0.16 ampere or higher than 5.0 ampere for 4 seconds.

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

- Open or shorted heated oxygen sensor (rear) heater circuit.
- Open circuit in heated oxygen sensor (rear) heater.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

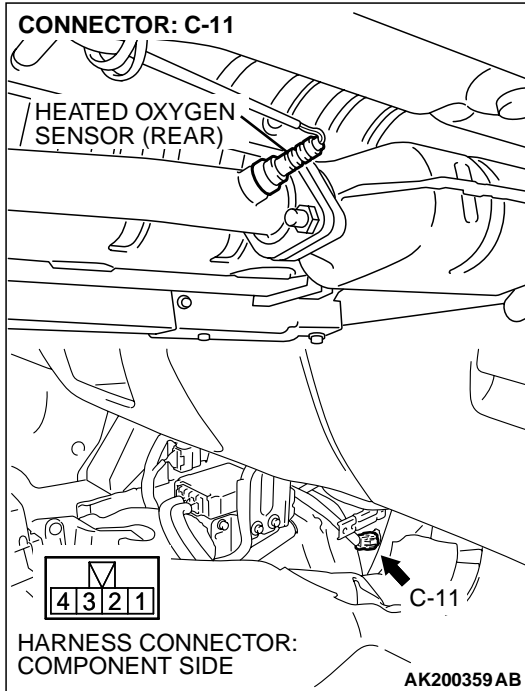
- MB991223: Test Harness Set

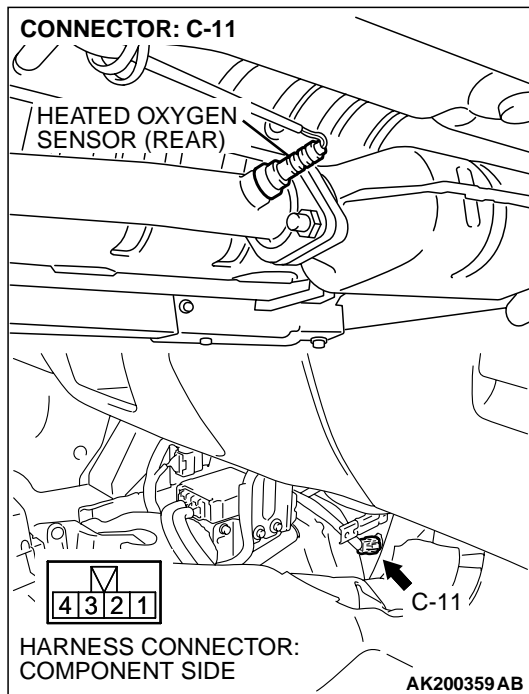
**STEP 1. Check connector C-11 at the heated oxygen sensor (rear) for damage.**

**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 go to Step 12.



**STEP 2. Check the heated oxygen sensor (rear).**

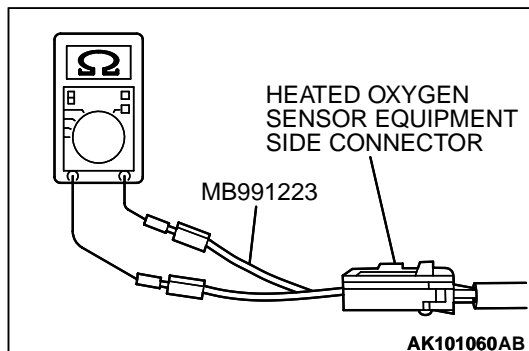
- (1) Disconnect heated oxygen sensor (rear) connector C-11 and connect test harness special tool, MB991223, to the connector on the heated oxygen (rear) sensor side.
- (2) Measure the resistance between heated oxygen sensor connector terminal No. 3 and terminal No. 4.

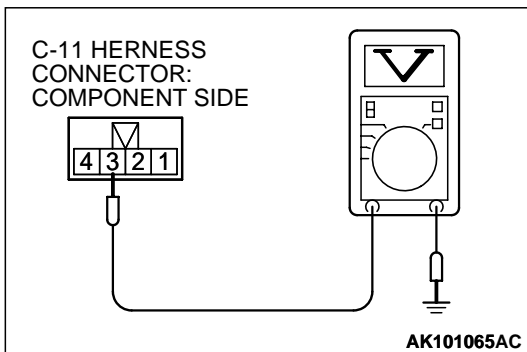
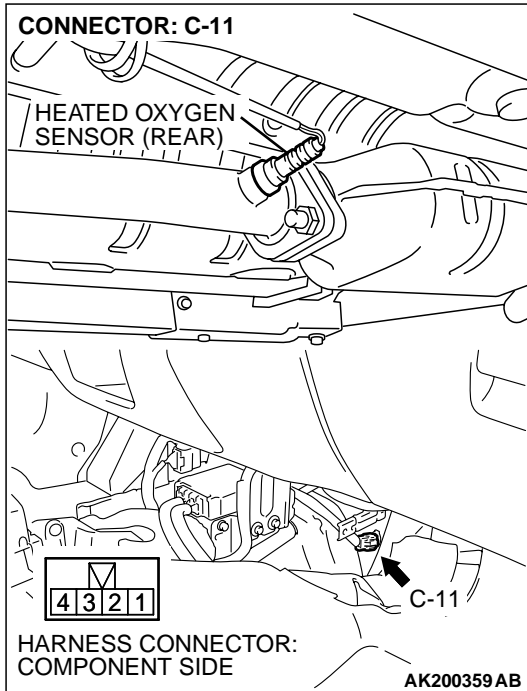
**Standard value: 11 – 18 ohms [at 20°C (68°F)]**

**Q: Is the measured resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 3.

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





**STEP 3. Measure the power supply voltage at heated oxygen sensor (rear) harness side connector C-11.**

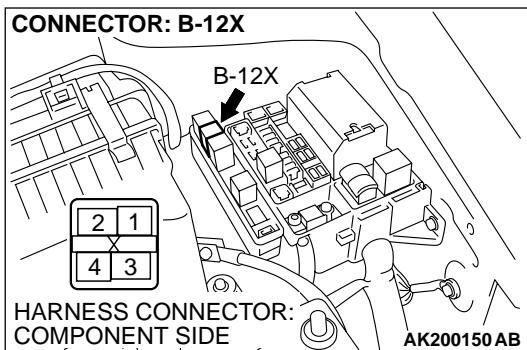
- (1) Disconnect connector C-11 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure 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.

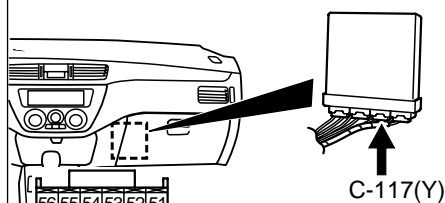


**STEP 4. Check harness connector B-12X at the MFI relay for damage.**

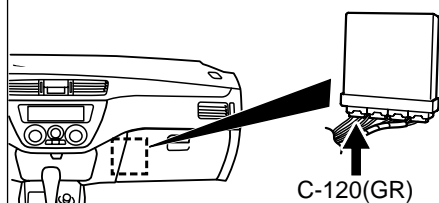
**Q: Is the connector in good condition?**

**YES :** Check connector C-105 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between MFI relay connector B-12X (terminal No. 4) and heated oxygen sensor (rear) connector C-11 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 12.

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

**CONNECTOR: C-117 <M/T>**HARNESS CONNECTOR:  
COMPONENT SIDE

AK200137AB

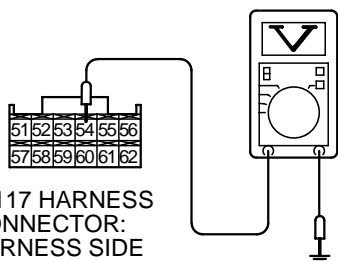
**CONNECTOR: C-120 <A/T>**HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB

**STEP 5. Measure the power supply voltage at ECM connector C-117 <M/T> or PCM connector C-120 <A/T> by backprobing.**

- (1) Do not disconnect connector C-117 <M/T> or C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

&lt;M/T&gt;

C-117 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000294AG

- (3) Measure the voltage between terminal No. 54 <M/T> or No. 26 <A/T> and ground by backprobing.

- Voltage should measure battery positive voltage.

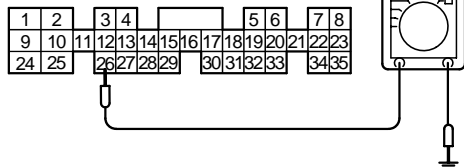
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

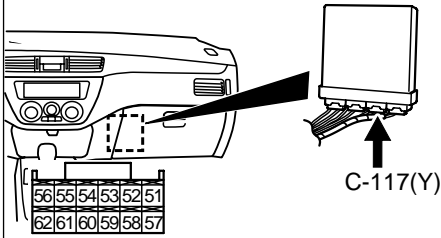
**NO :** Go to Step 6.

&lt;A/T&gt;

C-120 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000295AI



**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

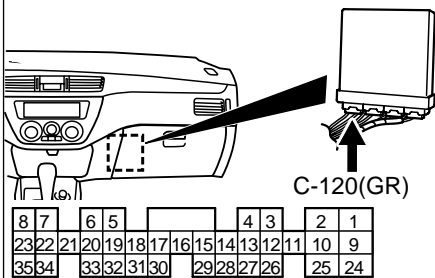
AK200137AB

**STEP 6.** Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> 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 go to Step 12.

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

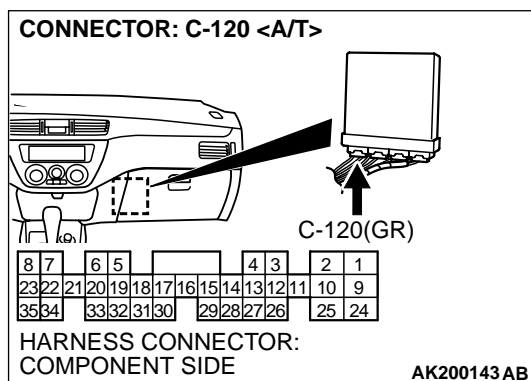
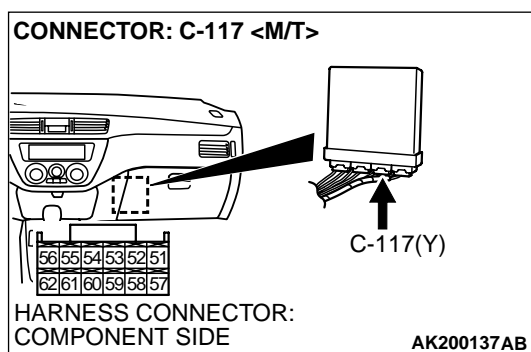
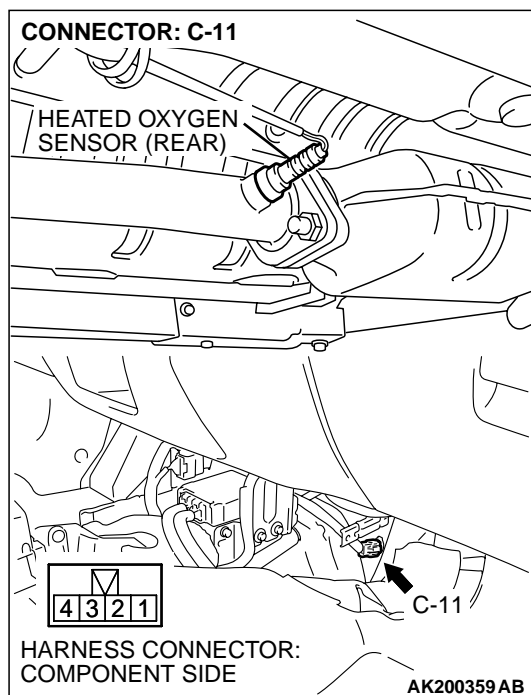
AK200143AB

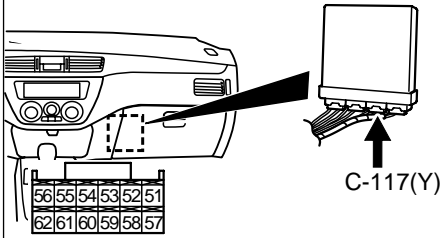
**STEP 7.** Check for open circuit and short circuit to ground between heated oxygen sensor (rear) connector C-11 (terminal No. 4) and ECM connector C-117 (terminal No. 54) <M/T> or PCM connector C-120 (terminal No. 26) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

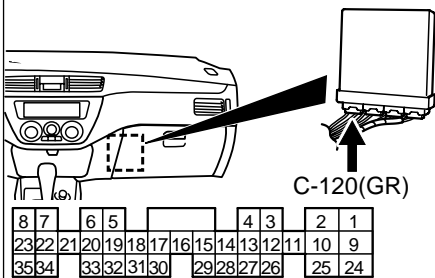
AK200137AB

**STEP 8.** Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

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

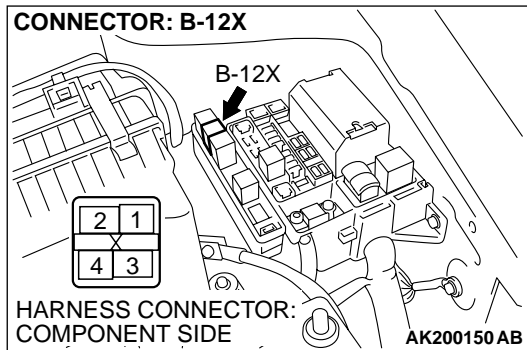
**YES :** Go to Step 9.

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

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB



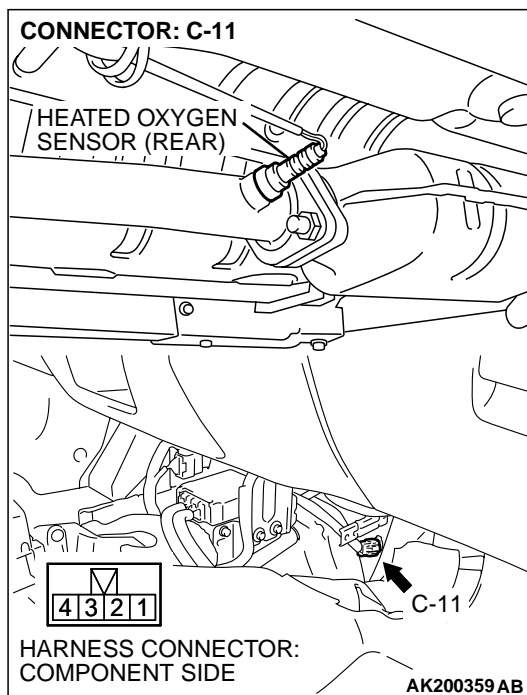
**STEP 9.** Check for harness damage between MFI relay connector B-12X (terminal No. 4) and heated oxygen sensor (rear) connector C-11 (terminal No. 3).

*NOTE:* Check harness after checking intermediate connector C-105. If intermediate connectors is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

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

**YES :** Go to Step 10.

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

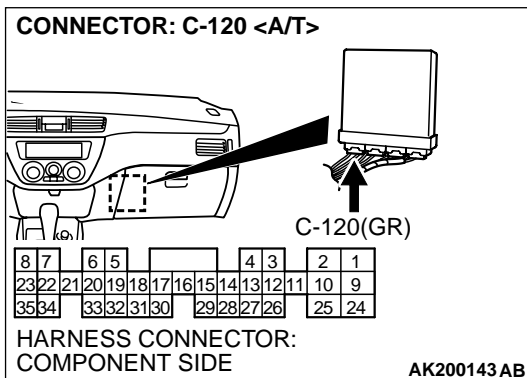
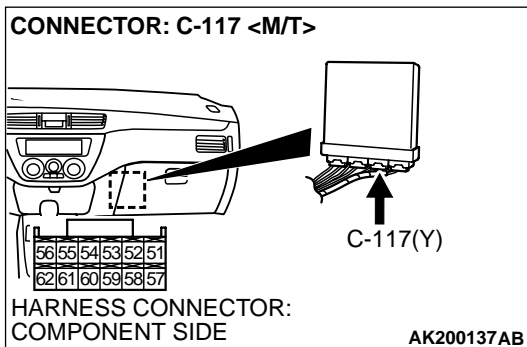
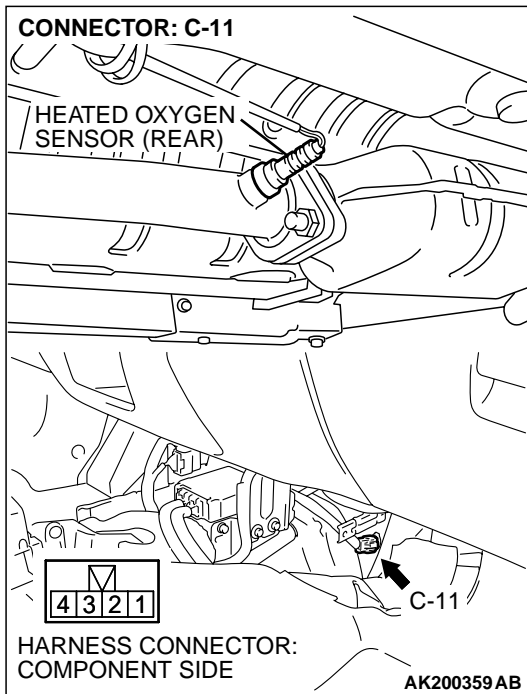


**STEP 10. Check for harness damage between heated oxygen sensor (rear) connector C-11 (terminal No. 4) and ECM connector C-117 (terminal No. 54) <M/T> or PCM connector C-120 (terminal No. 26) <A/T>.**

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

**YES :** Go to Step 11.

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



**STEP 11. Retest the system.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0141 set?**

**YES :** Replace the ECM or PCM. Then go to Step 12.

**NO :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0141 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

**DTC P0171: System too Lean****System too Lean Circuit**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction. [P.13Ac-254](#)

**CIRCUIT OPERATION**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction. [P.13Ac-254](#)

**TECHNICAL DESCRIPTION**

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 81 Hz or more.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be higher than +10.0 percent for 5 seconds.

**Check Conditions**

- Engine coolant temperature is lower than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is lower than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 81 Hz or less.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be higher than +15 percent for 5 seconds.

**Check Conditions**

- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.

- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 81 Hz or more.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be higher than +20.0 percent for 5 seconds.

**Check Conditions**

- Engine coolant temperature is higher than approximately 100°C (212°F) when the engine is started.
- Intake air temperature is higher than 60°C (140°F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 81 Hz or less.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be higher than +25.0 percent for 5 seconds.

**Check Conditions**

- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be +25.0 percent for 5 seconds.

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

- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Use of incorrect or contaminated fuel.
- ECU failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Check for exhaust leaks.****Q: Are there any abnormalities?**

**YES :** Go to Step 2.

**NO :** Repair it. Then go to Step 14.

**STEP 2. Check for intake system vacuum leaks.****Q: Are there any abnormalities?**

**YES :** Go to Step 3.

**NO :** Repair it. Then go to Step 14.

**STEP 3. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.****⚠ CAUTION**

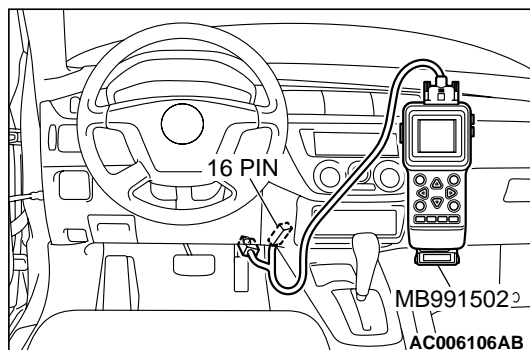
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
- (4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - When idling, between 20 and 46 Hz (between 1.3 and 3.3 gm/s).
  - When 2,500 r/min, between 70 and 110 Hz (between 6.6 and 10.2 gm/s).
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

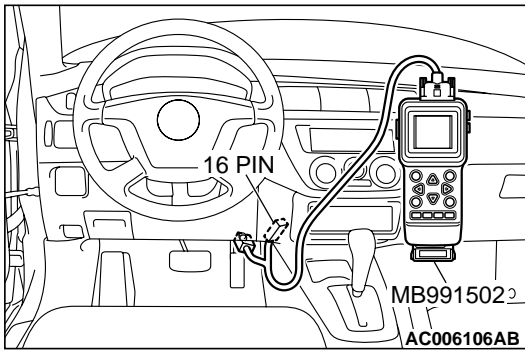
**Q: Is the sensor operating properly?**

**YES :** Go to Step 4.

**NO :** Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem [P.13Ac-2](#), DTC P0102 – Volume Air Flow Circuit Low Input [P.13Ac-11](#).







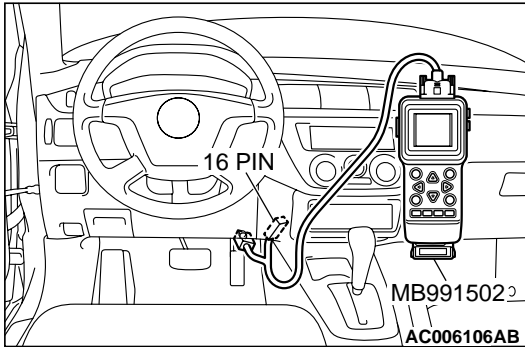
**STEP 4. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 5.

**NO :** Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem [P.13Ac-55](#), DTC P0112 – Intake Air Temperature Circuit Low Input [P.13Ac-63](#), DTC P0113 – Intake Air Temperature Circuit High Input [P.13Ac-69](#).



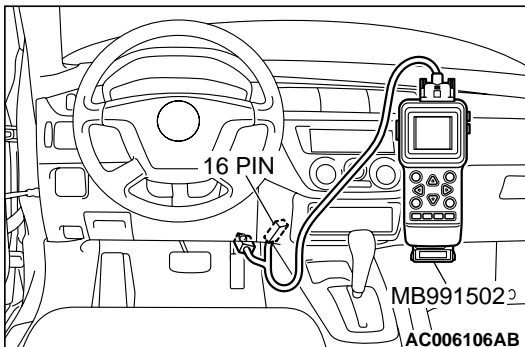
**STEP 5. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 6.

**NO :** Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem [P.13Ac-77](#), DTC P0117 – Engine Coolant Temperature Circuit Low Input [P.13Ac-87](#), DTC P0118 – Engine Coolant Temperature Circuit High Input [P.13Ac-92](#).



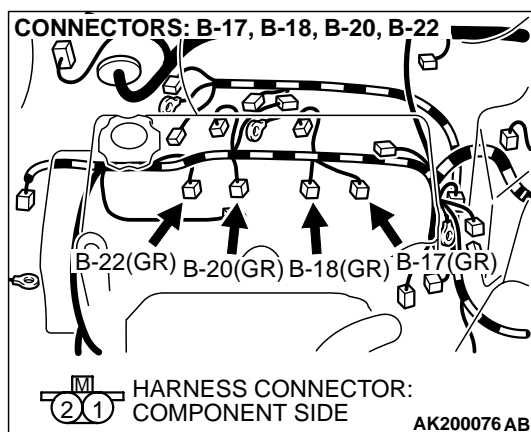
**STEP 6. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 7.

**NO :** Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem [P.13Ac-20](#), DTC P0107 – Barometric Pressure Circuit Low Input [P.13Ac-27](#), DTC P0108 – Barometric Pressure Circuit High Input [P.13Ac-45](#).

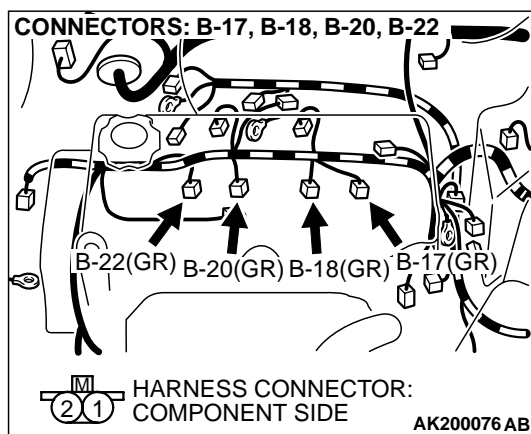


**STEP 7. Check connectors B-17, B-18, B-20, B-22 at injector for damage.**

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

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 8. Check the injector.**

(1) Disconnect each injector connector.

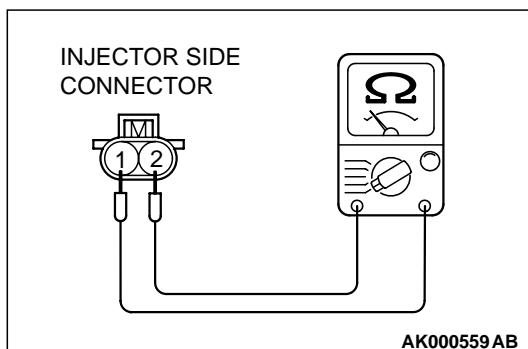
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 9.

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



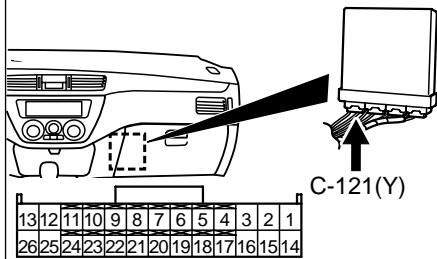
**STEP 9.** Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

**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 go to Step 14.

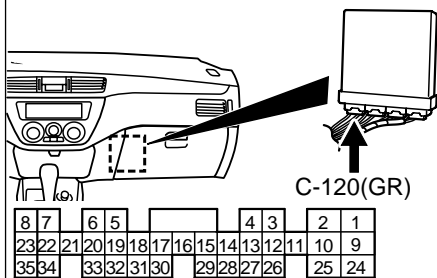
**CONNECTOR: C-121 <M/T>**



HARNESS CONNECTOR:  
COMPONENT SIDE

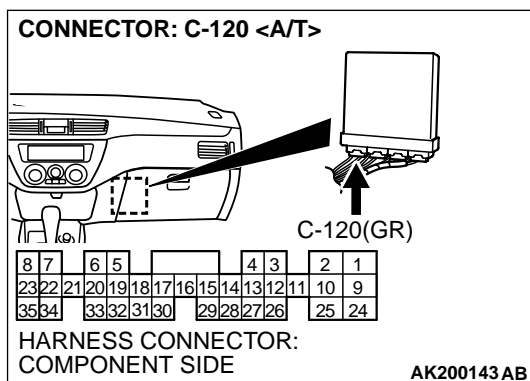
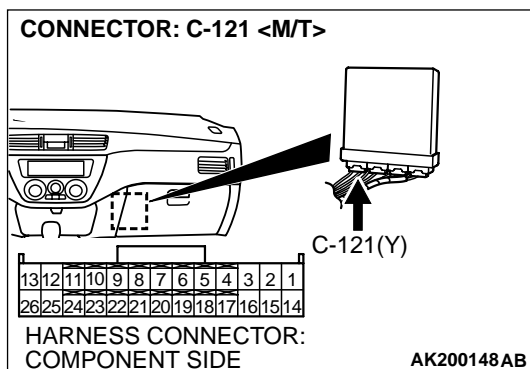
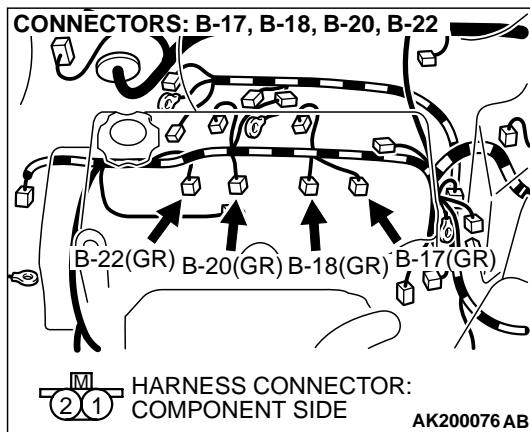
AK200148AB

**CONNECTOR: C-120 <A/T>**



HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB



**STEP 10. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.**

- Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) <M/T> or PCM connector C-120 (terminal No. 1) <A/T> when checking No. 1 cylinder.
- Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) <M/T> or PCM connector C-120 (terminal No. 9) <A/T> when checking No. 2 cylinder.
- Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) <M/T> or PCM connector C-120 (terminal No. 24) <A/T> when checking No. 3 cylinder.
- Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) <M/T> or PCM connector C-120 (terminal No. 2) <A/T> when checking No. 4 cylinder.

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

**YES :** Go to Step 11.

**NO :** Repair it. Then go to Step 14.

**STEP 11. Check the fuel pressure.**

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test [P.13Aa-14](#).

**Q: Is the fuel pressure normal?**

**YES :** Go to Step 12.

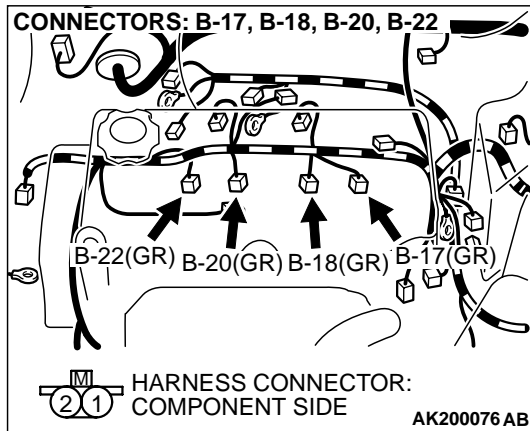
**NO :** Repair or replace it. Then go to Step 14.

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

**Q: Are there any abnormalities?**

**YES :** Go to Step 13.

**NO :** Replace the fuel. Then go to Step 14.

**STEP 13. Replace the injector.**

- (1) Replace the injector.
- (2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 2 – Fuel Trim Monitor [P.13Ab-2](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0171 set?**

**YES** : Replace the ECM or PCM. Then go to Step 14.

**NO** : The procedure is complete.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 2 – Fuel Trim Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0171 set?**

**YES** : Repeat the troubleshooting.

**NO** : The procedure is complete.

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**DTC P0172: System too Rich**

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**System too Rich Circuit**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

**CIRCUIT OPERATION**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

**TECHNICAL DESCRIPTION**

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM <M/T> or PCM <A/T> checks whether the fuel trim value is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).
- Volume air flow sensor output frequency is 81 Hz or more.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be lower than –6.0 percent for 5 seconds.

**Check Conditions**

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 77°C (171°F).

- Volume air flow sensor output frequency is 81 Hz or less.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be lower than –11.0 percent for 5 seconds.

**Check Conditions**

- Engine coolant temperature is higher than 77°C (171°F).
- Under the closed loop air/fuel ratio control.

**Judgment Criteria**

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

or

- Short-term fuel trim has continued to be –25.0 percent for 5 seconds.

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

- Volume air flow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Heated oxygen sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 12: Volume Air Flow Sensor.****⚠ CAUTION**

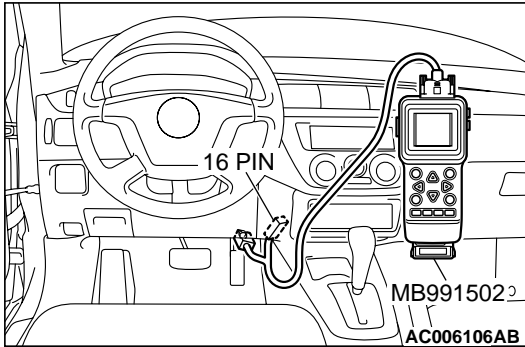
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 12, Volume Air Flow Sensor.
- (4) Warm up the engine to normal operating temperature: 80°C to 96°C (176°F to 205°F).
  - When idling, between 20 and 46 Hz (between 1.3 and 3.3 gm/s).
  - When 2,500 r/min, between 70 and 110 Hz (between 6.6 and 10.2 gm/s).
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 2.

**NO :** Refer to, DTC P0101 – Volume Air Flow Circuit Range/Performance Problem [P.13Ac-2](#), DTC P0102 – Volume Air Flow Circuit Low Input [P.13Ac-11](#).

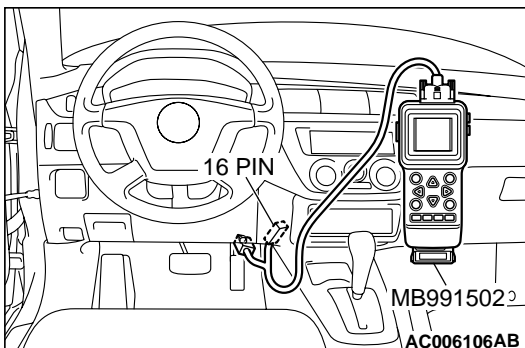
**STEP 2. Using scan tool MB991502, check data list item 13: Intake Air Temperature Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 13, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

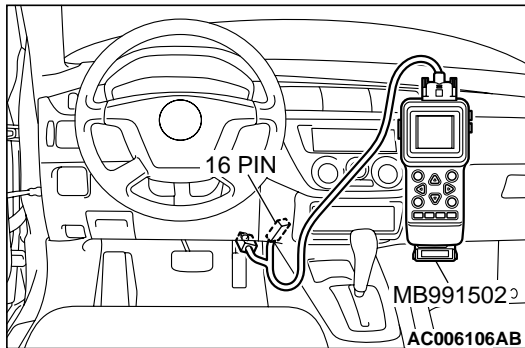
**Q: Is the sensor operating properly?**

**YES :** Go to Step 3.

**NO :** Refer to, DTC P0111 – Intake Air Temperature Circuit Range/Performance Problem [P.13Ac-55](#), DTC P0112 – Intake Air Temperature Circuit Low Input [P.13Ac-63](#), DTC P0113 – Intake Air Temperature Circuit High Input [P.13Ac-69](#).







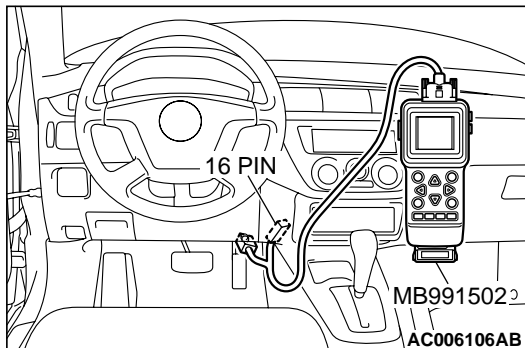
**STEP 3. Using scan tool MB991502, check data list item 21: Engine Coolant Temperature Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 21, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 4.

**NO :** Refer to, DTC P0116 – Engine Coolant Temperature Circuit Range/Performance Problem [P.13Ac-77](#), DTC P0117 – Engine Coolant Temperature Circuit Low Input [P.13Ac-87](#), DTC P0118 – Engine Coolant Temperature Circuit High Input [P.13Ac-92](#).



**STEP 4. Using scan tool MB991502, check data list item 25: Barometric Pressure Sensor.**

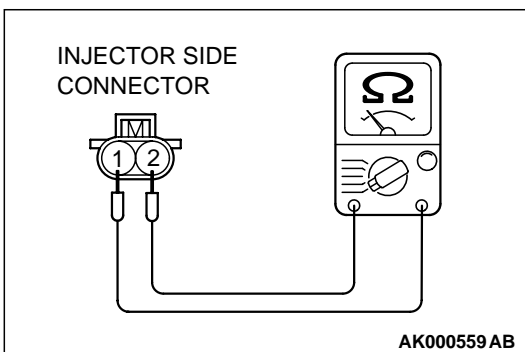
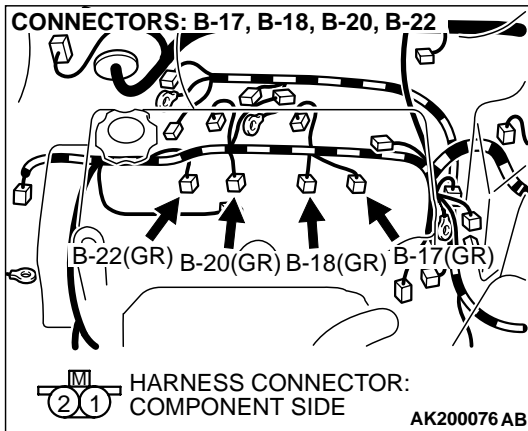
- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the data reading mode for item 25, Barometric Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 5.

**NO :** Refer to, DTC P0106 – Barometric Pressure Circuit Range/Performance Problem [P.13Ac-20](#), DTC P0107 – Barometric Pressure Circuit Low Input [P.13Ac-27](#), DTC P0108 – Barometric Pressure Circuit High Input [P.13Ac-45](#).



**STEP 5. Check the injector.**

(1) Disconnect each injector connector.

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

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 6.

**NO :** Replace the injector. Then go to Step 8.

**STEP 6. Check the fuel pressure.**

Refer to GROUP 13A, On-vehicle Service – Fuel Pressure Test [P.13Aa-14](#).

**Q: Is the fuel pressure normal?**

**YES :** Go to Step 7.

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

**STEP 7. Replace the injector.**

(1) Replace the injector.

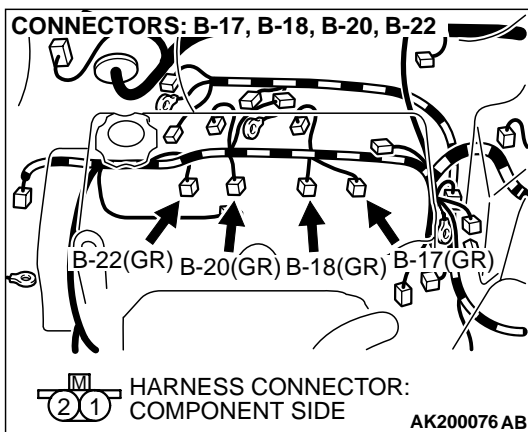
(2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 2 – Fuel Trim Monitor [P.13Ab-2](#).

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

**Q: Is DTC P0172 set?**

**YES :** Replace the ECM or PCM. Then go to Step 8.

**NO :** The procedure is complete.



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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 2 – Fuel Trim Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

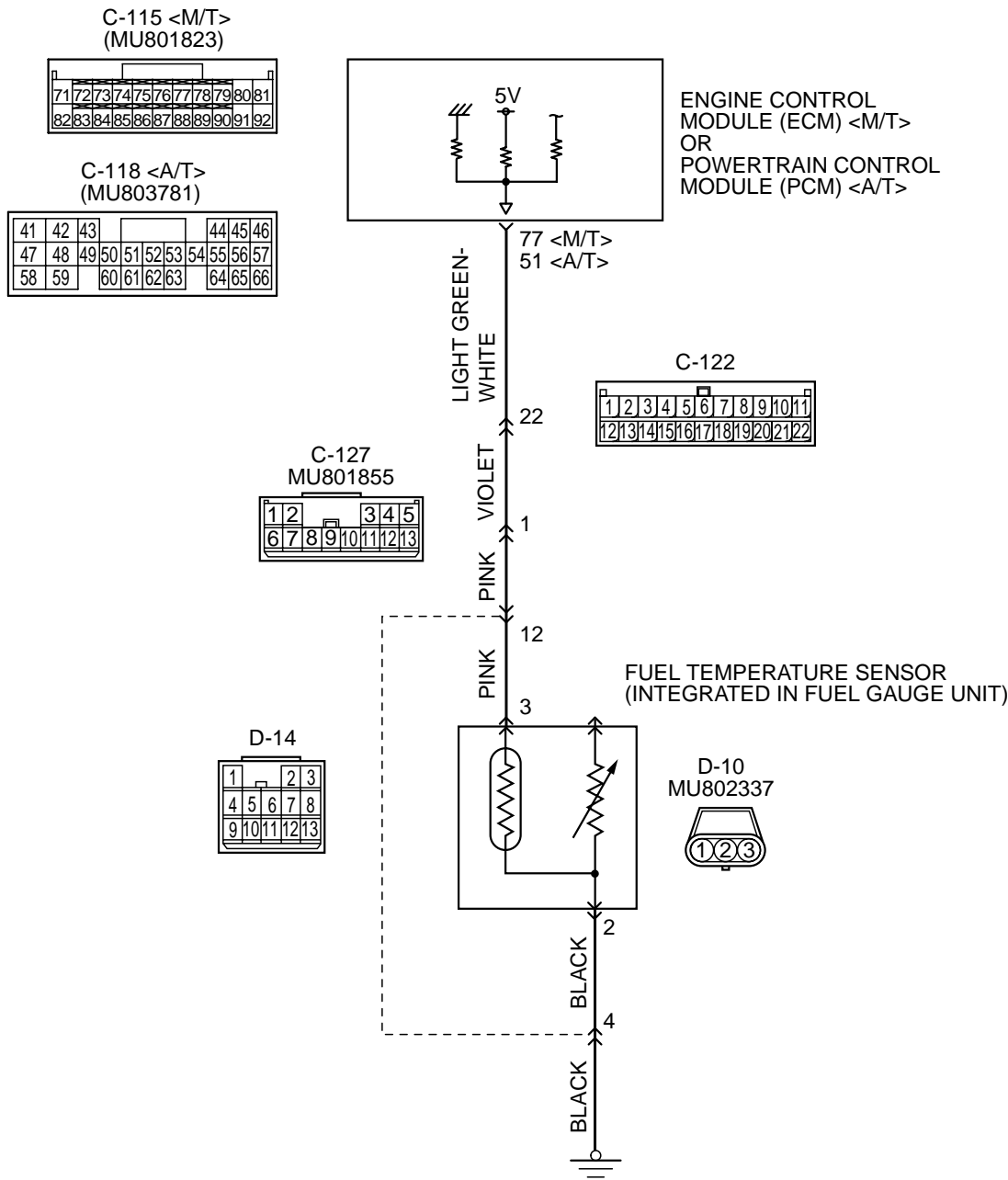
**Q: Is DTC P0172 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

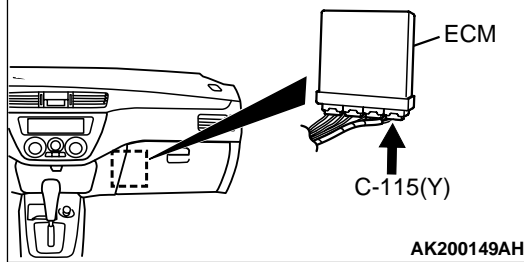
DTC P0181: Fuel Temperature Sensor Circuit Range/Performance

Fuel Temperature Sensor Circuit

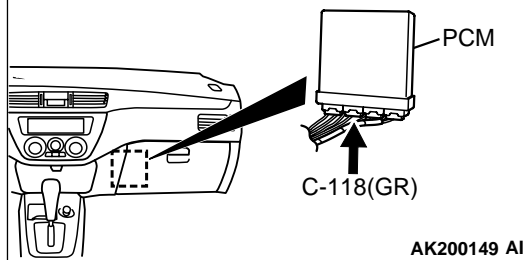


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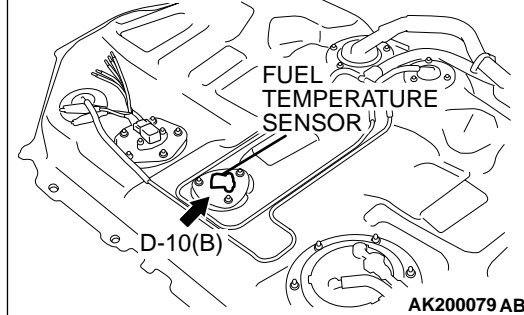
CONNECTOR: C-115 &lt;M/T&gt;



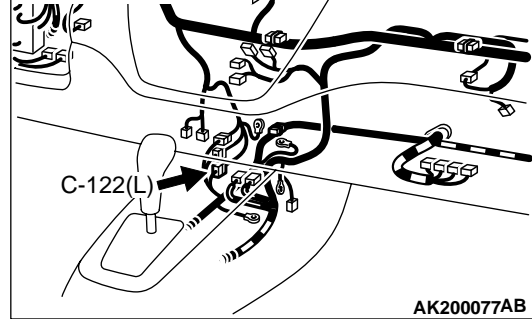
CONNECTOR: C-118 &lt;A/T&gt;



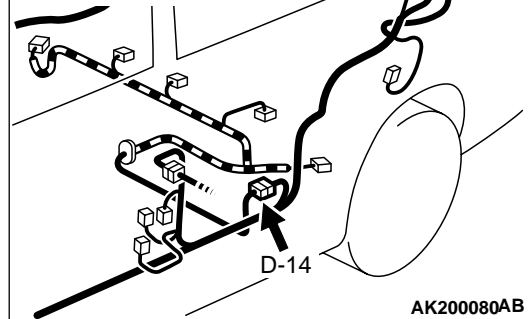
CONNECTOR: D-10



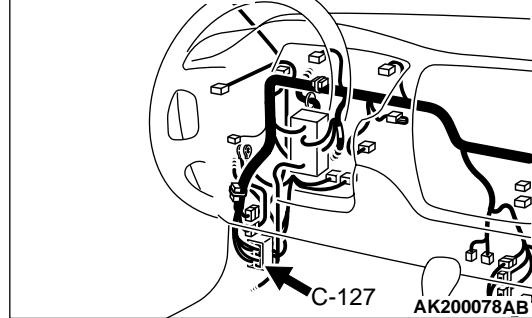
CONNECTOR: C-122



CONNECTOR: D-14



CONNECTOR: C-127



### CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) <M/T> or PCM (terminal No. 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

### TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.

- The ECM <M/T> or PCM<A/T> detects the fuel temperature in the fuel tank with this output voltage.

### DTC SET CONDITIONS

#### Check Conditions

- The engine coolant temperature – intake air temperature is 5°C (9°F) or less when the engine is started.
- The engine coolant temperature is between – 10°C (14°F) and 36°C (96.8°F) when the engine is started.
- Engine coolant temperature is higher than 60°C (140°F).
- Maximum vehicle speed is higher than 30 km/h (17 mph) after the starting sequence has been completed.

**Judgement Criteria**

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

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

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

*NOTE: A diagnostic trouble code (DTC) could be output if the engine coolant is changed as indicated below. Because this is not a failure, the DTC must be erased.*

*Make sure to test drive the vehicle in accordance with the drive cycle pattern in order to verify that a DTC will not be output.*

- The engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel temperature was high).

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
  - With the engine cool, the fuel temperature should be approximately the same as ambient air temperature.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

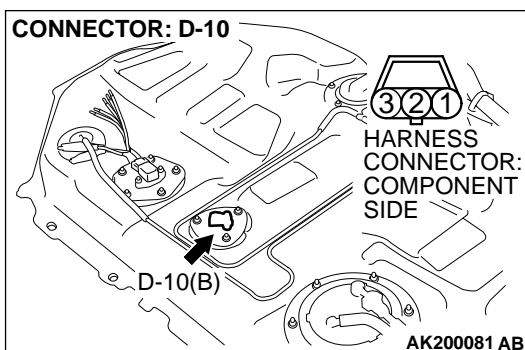
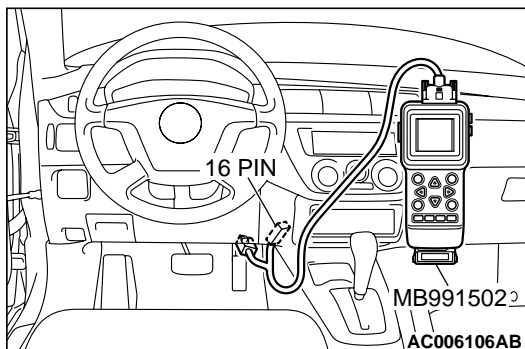
**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

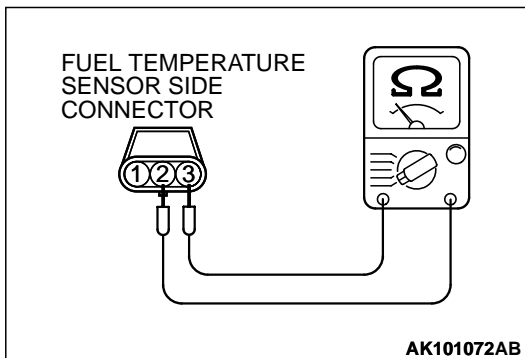
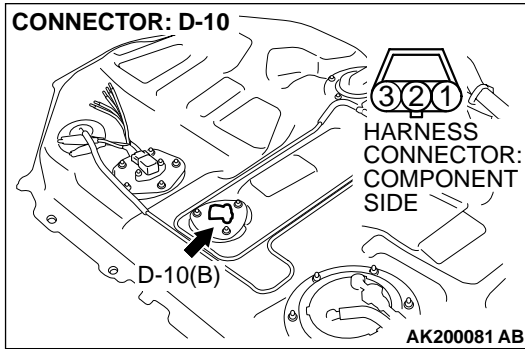
**NO :** Go to Step 2.

**STEP 2. Check connector D-10 at the fuel temperature sensor for damage.****Q: Is the connector in good condition?**

**YES :** Go to Step 3.

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



**STEP 3. Check the fuel temperature sensor.**

(1) Disconnect the fuel temperature sensor connector D-10.

(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel temperature sensor.

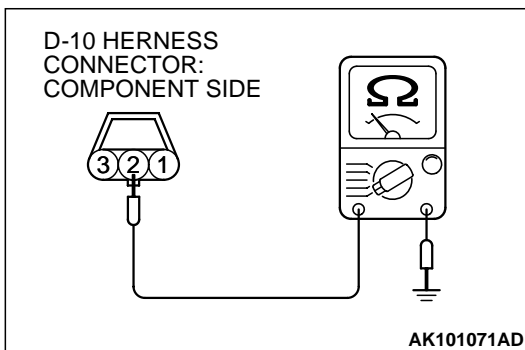
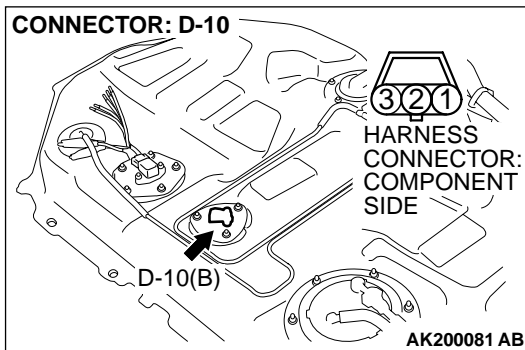
**Standard value:**

**0.5 – 12.0 kilohms**

**Q: Is the resistance between 0.5 and 12.0 kilohms?**

**YES :** Go to Step 4.

**NO :** Replace the fuel temperature sensor. Then go to Step 12.

**STEP 4. Check for continuity at fuel temperature sensor harness side connector D-10.**

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

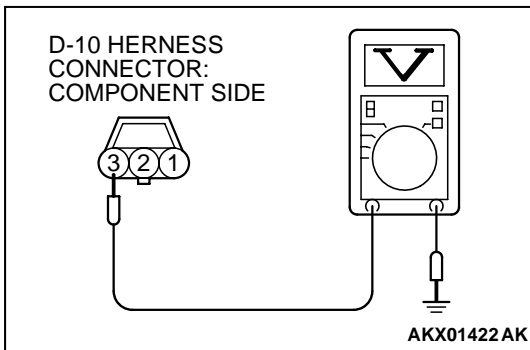
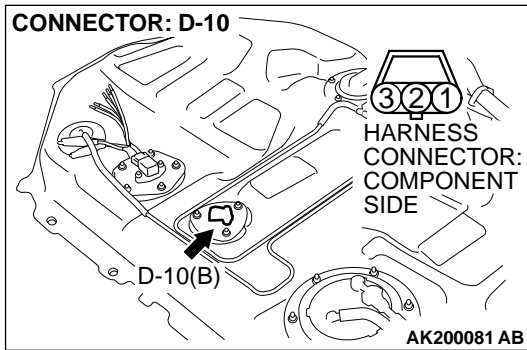
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 5.

**NO :** Check connector D-14 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 temperature sensor connector D-10 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 12.



**STEP 5. Measure the sensor supply voltage at fuel temperature sensor harness side connector D-10.**

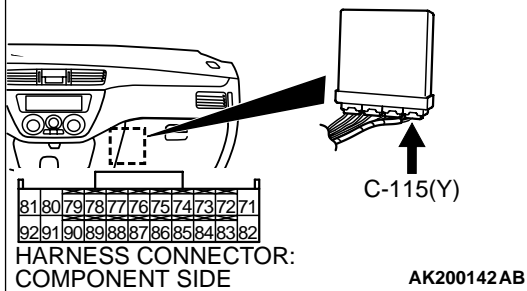
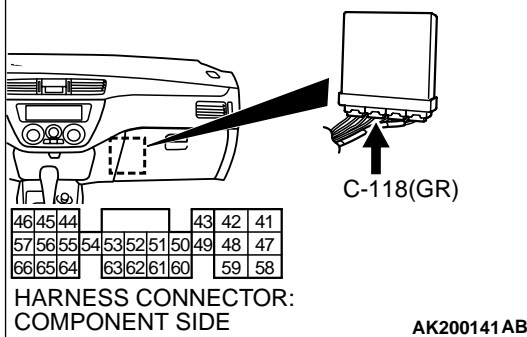
- (1) Disconnect connector D-10 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.5 and 4.9 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

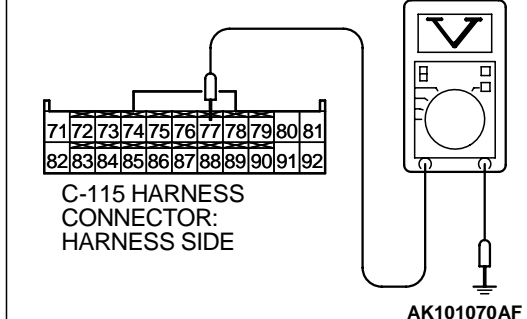
**Q: Is the measured voltage between 4.5 and 4.9 volts?**

**YES :** Go to Step 6.

**NO :** Go to Step 10.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>****STEP 6. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

**<M/T>**

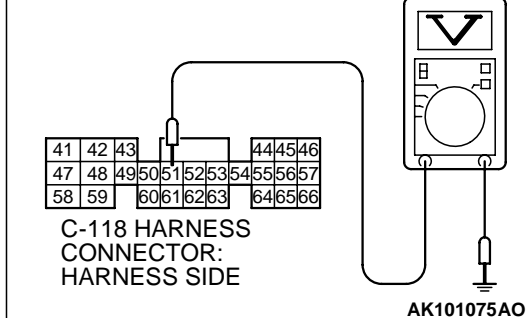
- (3) Measure the voltage between terminal No. 77 <M/T> or terminal No. 51 <A/T> and ground by backprobing.
  - When fuel temperature is 0°C (32°F), voltage should measure 2.7 and 3.1 volts.
  - When fuel temperature is 20°C (68°F), voltage should measure 2.1 and 2.5 volts.
  - When fuel temperature is 40°C (104°F), voltage should measure 1.6 and 2.0 volts.
  - When fuel temperature is 80°C (176°F), voltage should measure 0.8 and 1.2 volts.

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

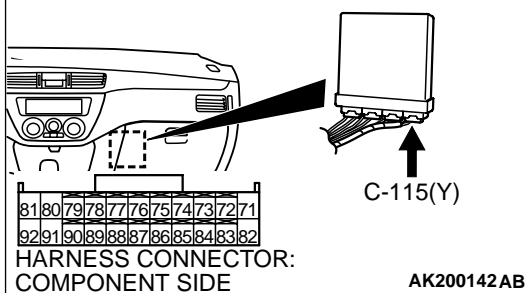
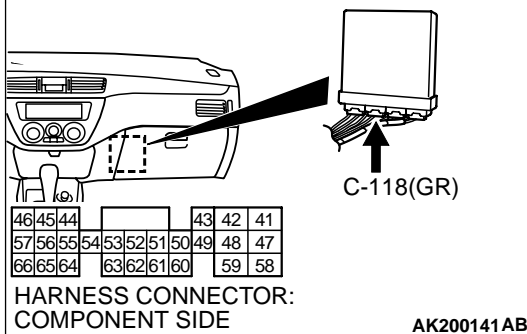
**Q: Is the measured voltage within the specified range?**

**YES** : Go to Step 7.

**NO** : Go to Step 8.

**<A/T>**



**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Check connector C-122, C-127 and D-14 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 fuel gauge unit connector D-10 (terminal No. 3) and ECM connector C-115 (terminal No. 77) <M/T> or PCM connector C-118 (terminal No. 51) <A/T> because of open circuit. Then go to Step 12.

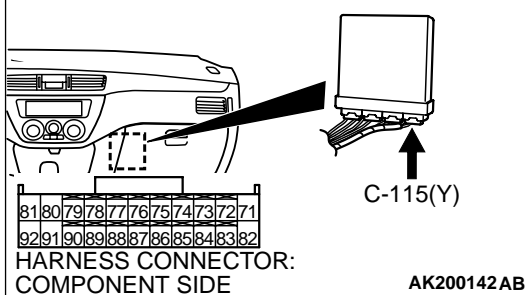
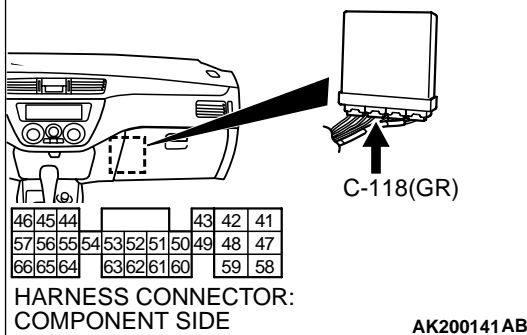
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

**STEP 8. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

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

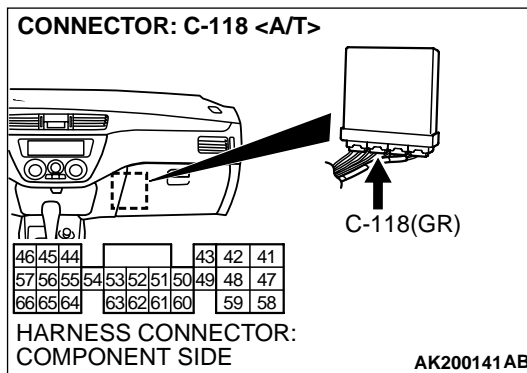
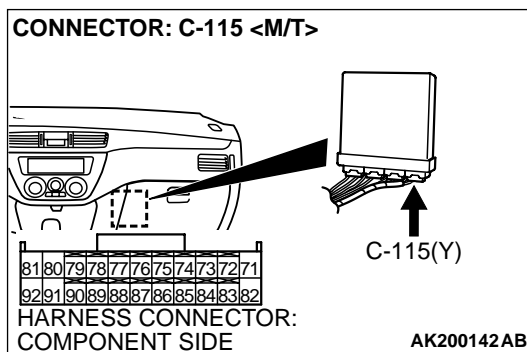
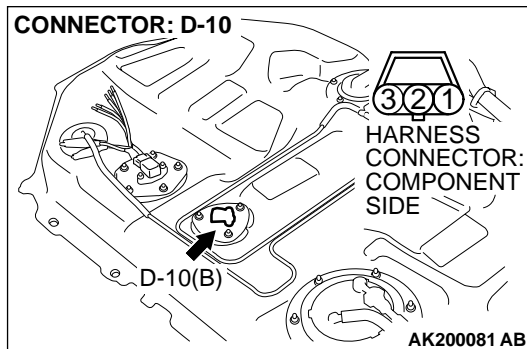
**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

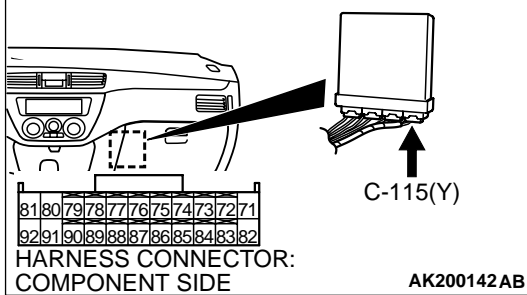
**STEP 9.** Check for short circuit to ground between fuel gauge unit connector D-10 (terminal No. 3) and ECM connector C-115 (terminal No. 77) <M/T> or PCM connector C-118 (terminal No. 51) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



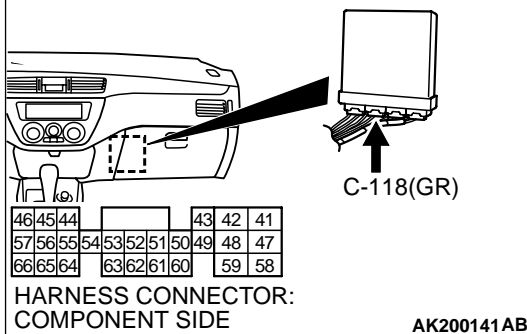
**CONNECTOR: C-115 <M/T>**

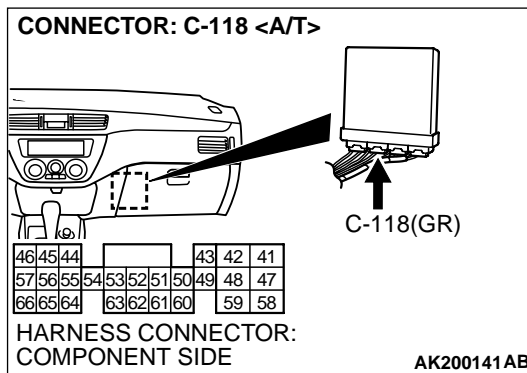
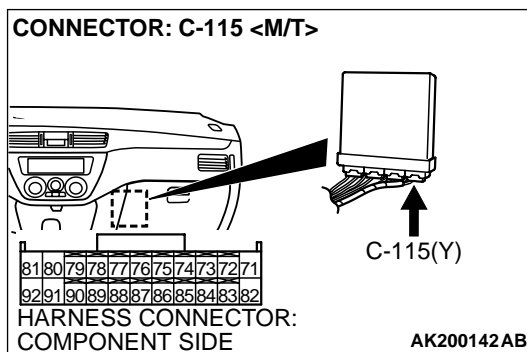
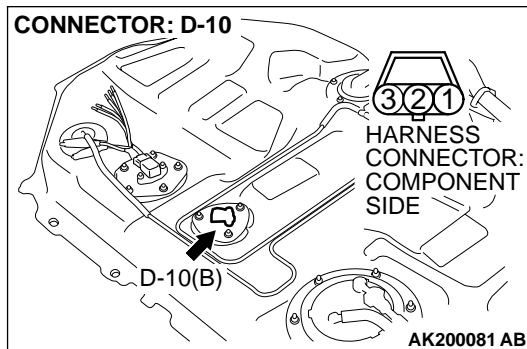
**STEP 10. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 11.

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

**CONNECTOR: C-118 <A/T>**



**STEP 11. Check for harness damage between fuel temperature sensor connector D-10 (terminal No. 3) and ECM connector C-115 (terminal No. 77) <M/T> or PCM connector C-118 (terminal No. 51) <A/T>.**

*NOTE: Check harness after checking intermediate connector C-122, C-127 and D-14. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.*

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
- (2) Check the diagnostic trouble code (DTC).

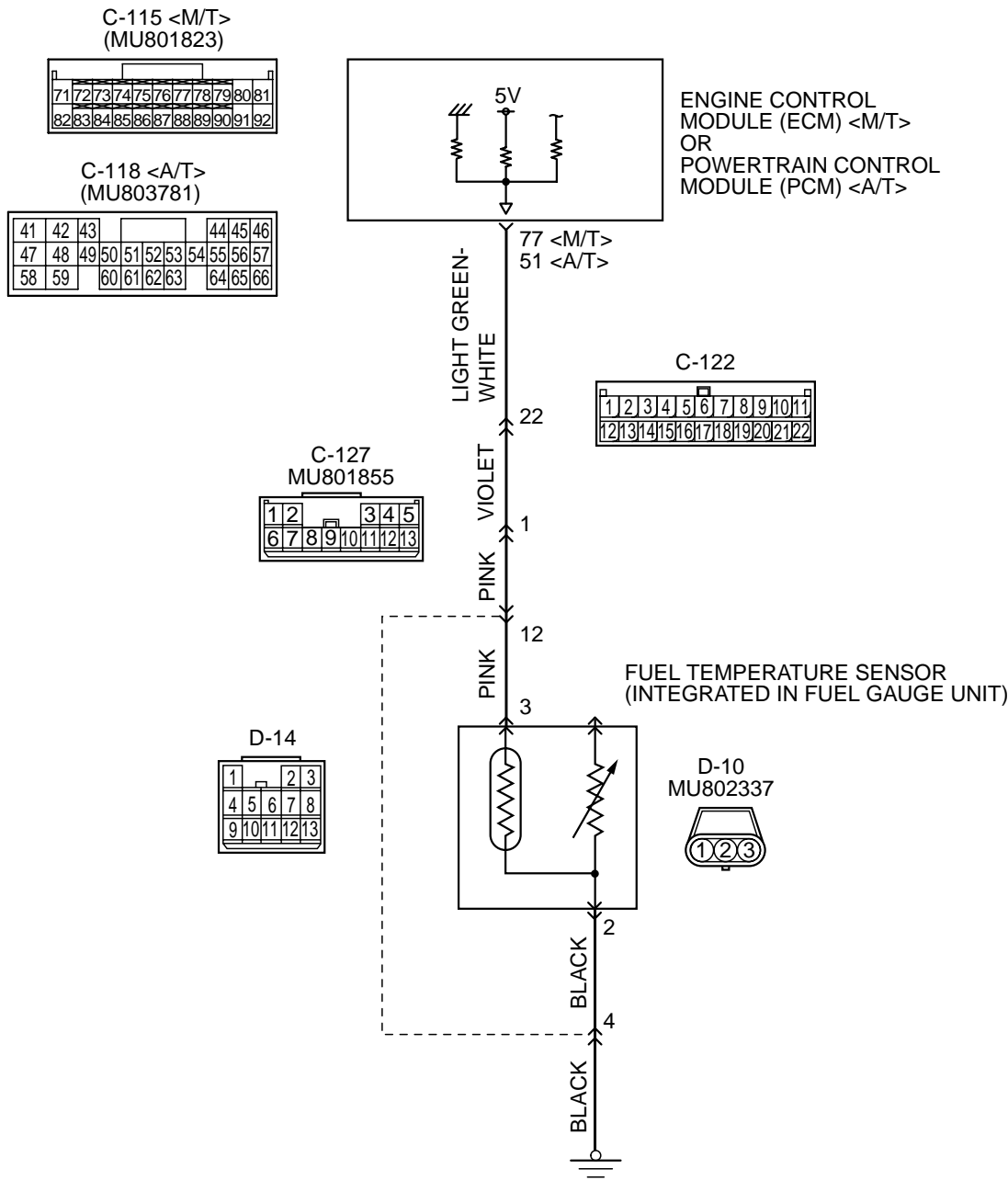
**Q: Is DTC P0181 set?**

**YES :** Repeat the troubleshooting.

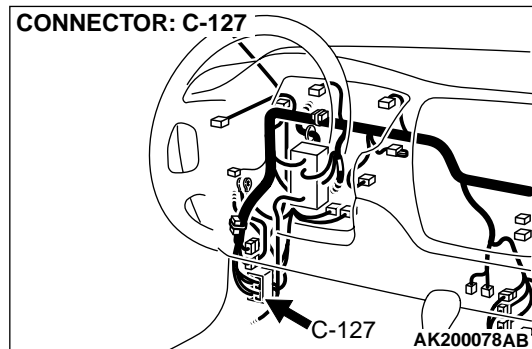
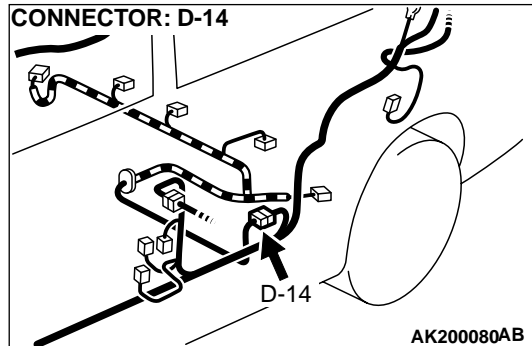
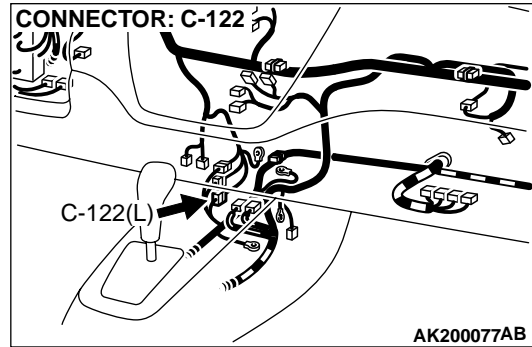
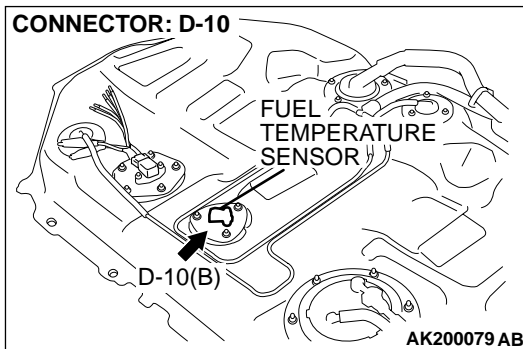
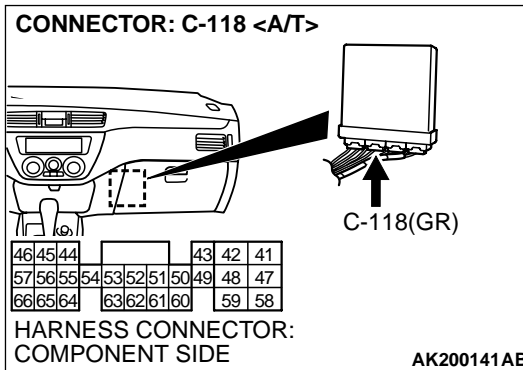
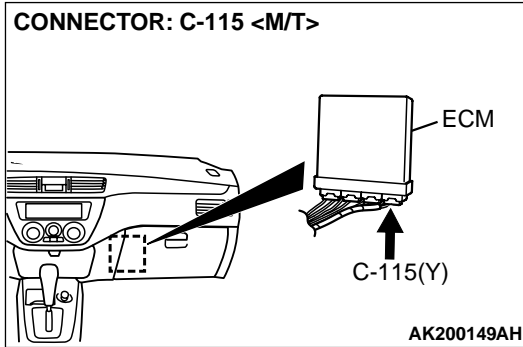
**NO :** The procedure is complete.

DTC P0182: Fuel Temperature Sensor Circuit Low Input

Fuel Temperature Sensor Circuit



AK100108



## CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) <M/T> or PCM (terminal No. 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

## TECHNICAL DESCRIPTION

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM <A/T> detects the fuel temperature in the fuel tank with this output voltage.

## DTC SET CONDITIONS

### Check Conditions

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

### Judgement Criteria

- Fuel temperature sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

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

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
  - With the engine cool, the fuel temperature should be approximately the same as ambient air temperature.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

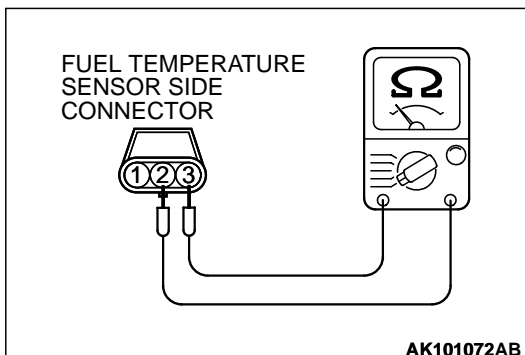
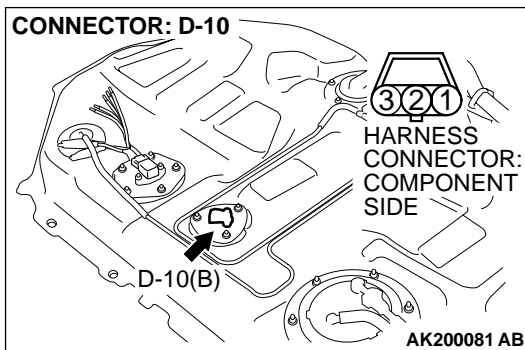
**Q: Is the sensor operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

**STEP 2. Check the fuel temperature sensor.**

- (1) Disconnect the fuel temperature sensor connector D-10.



- (2) Measure the resistance between terminal No. 2 and No. 3 of the fuel temperature sensor.

**Standard value:**

**0.5 – 12.0 kilohms**

**Q: Is the resistance between 0.5 and 12.0 kilohms?**

**YES :** Go to Step 3.

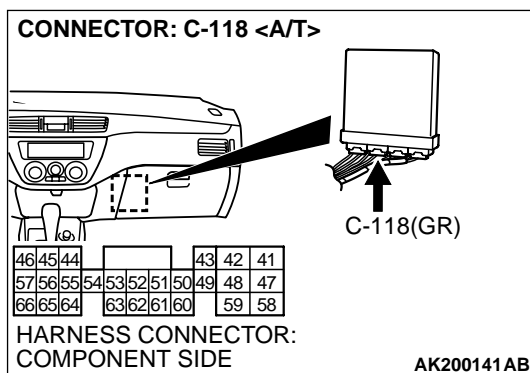
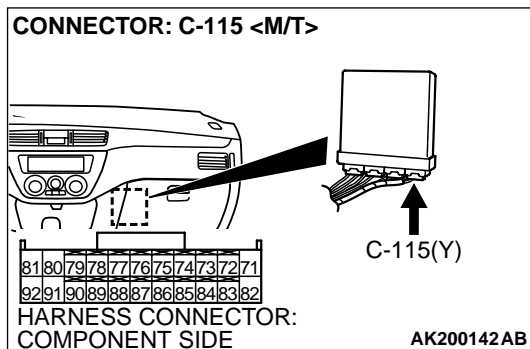
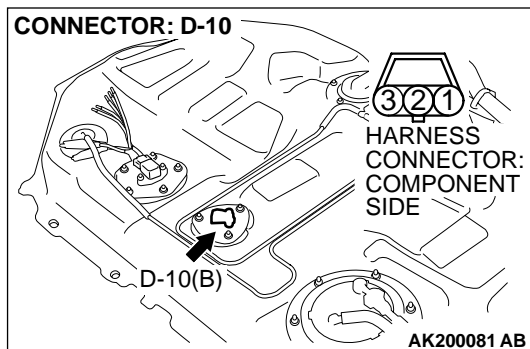
**NO :** Replace the fuel temperature sensor. Then go to Step 5.

**STEP 3.** Check connector D-10 at the fuel temperature sensor and connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

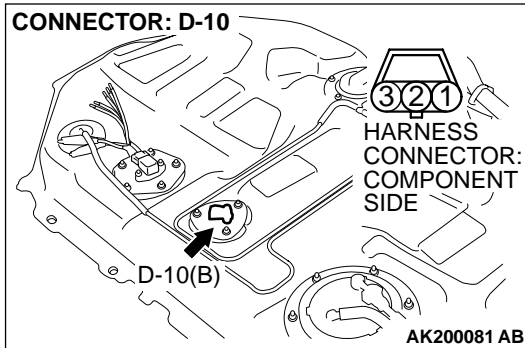
**Q:** Is the connector in good condition?

**YES :** Go to Step 4.

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







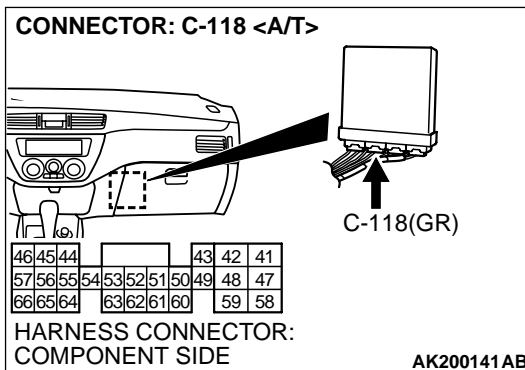
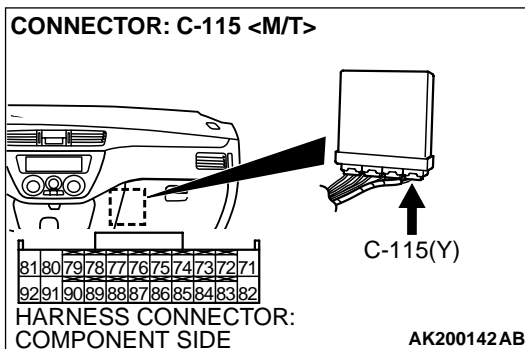
**STEP 4. Check for short circuit to ground between fuel temperature sensor connector D-10 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.**

**NOTE:** Check harness after checking intermediate connectors C-122, C-127 and D-14. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 5.

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

**YES :** Replace the ECM or PCM. Then go to Step 5.

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



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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

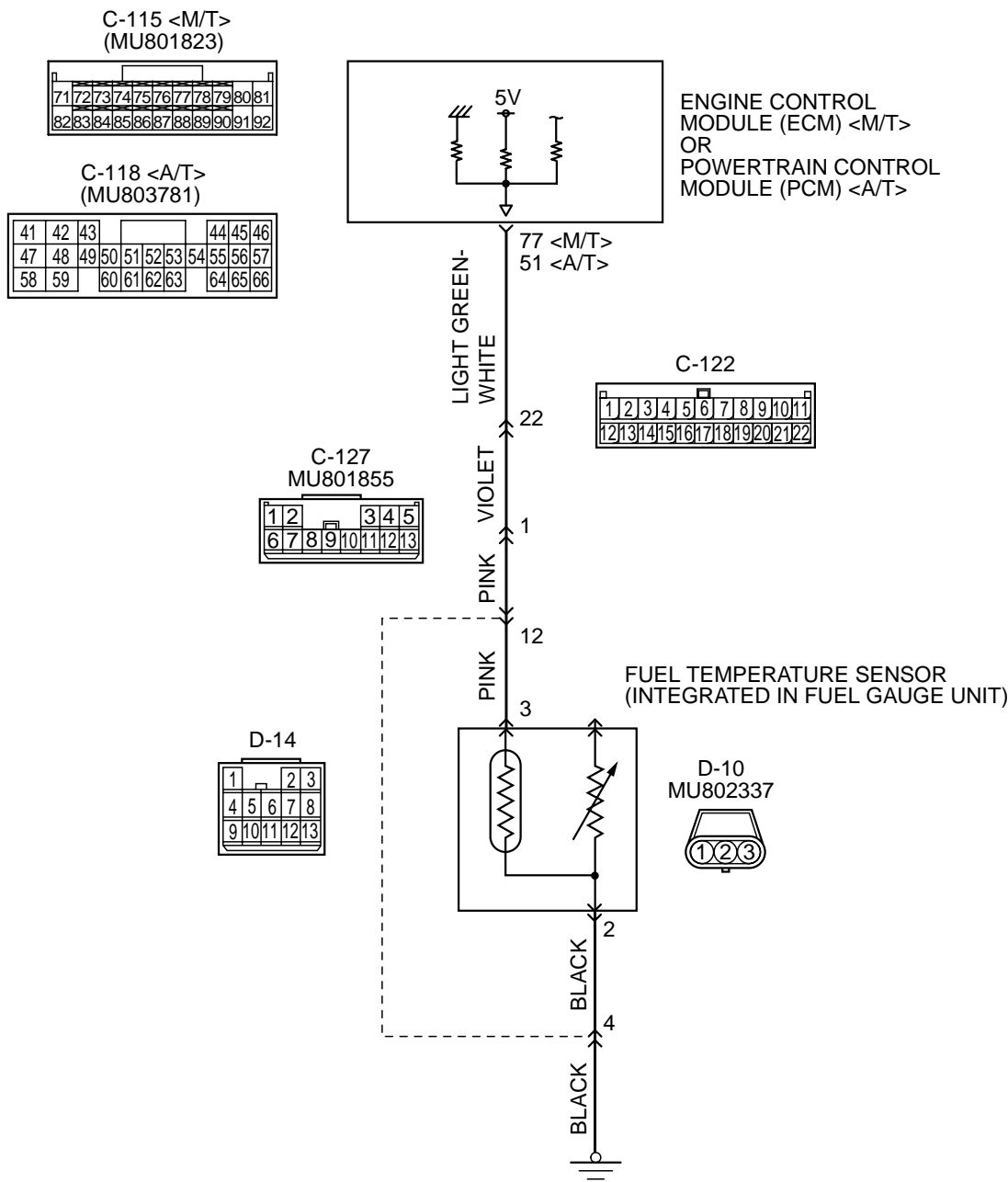
**Q: Is DTC P0182 set?**

**YES :** Repeat the troubleshooting.

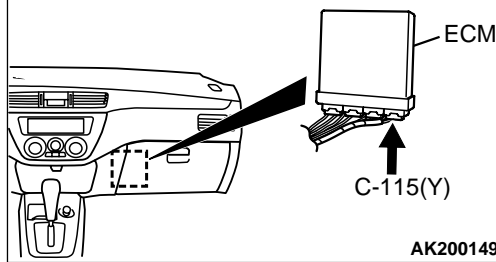
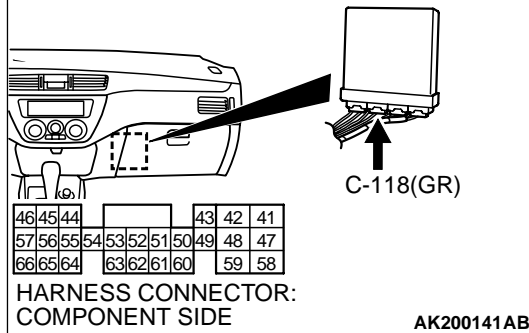
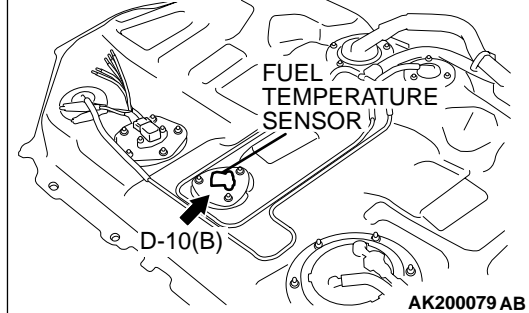
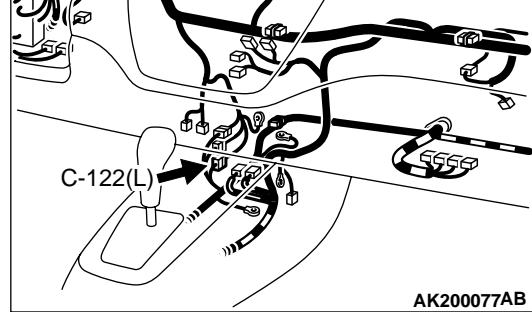
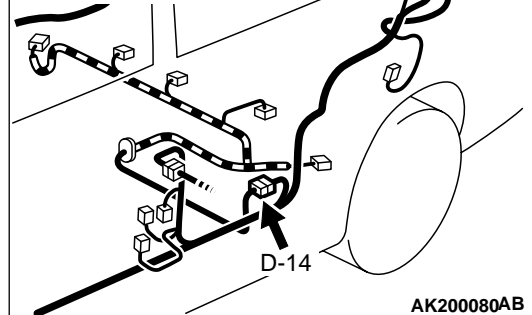
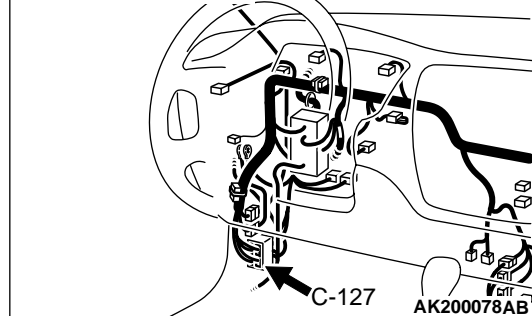
**NO :** The procedure is complete.

DTC P0183: Fuel Temperature Sensor Circuit High Input

Fuel Temperature Sensor Circuit



AK100108

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>****CONNECTOR: D-10****CONNECTOR: C-122****CONNECTOR: D-14****CONNECTOR: C-127****CIRCUIT OPERATION**

- 5-volt voltage is applied to the fuel temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 77) <M/T> or PCM (terminal No. 51) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.
- The fuel temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 2) is grounded to the vehicle body.

**TECHNICAL DESCRIPTION**

- The fuel temperature sensor converts the fuel temperature to a voltage.
- The ECM <M/T> or PCM <A/T> detects the fuel temperature in the fuel tank with this output voltage.

**DTC SET CONDITIONS****Check Conditions**

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

**Judgement Criteria**

- Fuel temperature sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

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

- Fuel temperature sensor failed.
- Open or shorted fuel temperature sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 4A: Fuel Temperature Sensor.**

### **⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 4A, Fuel Temperature Sensor.
  - With the engine cool, the fuel temperature should be approximately the same as ambient air temperature.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

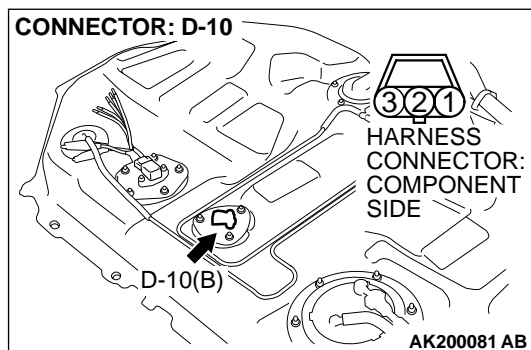
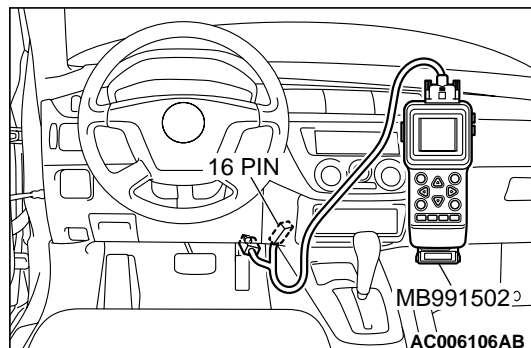
**NO :** Go to Step 2.

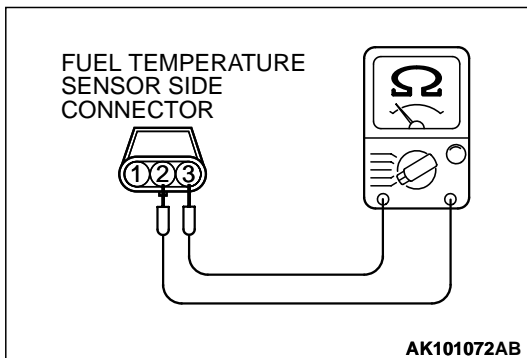
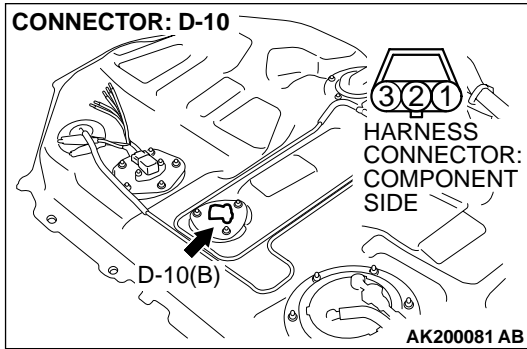
**STEP 2. Check connector D-10 at the fuel temperature sensor for damage.**

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

**YES :** Go to Step 3.

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



**STEP 3. Check the fuel temperature sensor.**

(1) Disconnect the fuel temperature sensor connector D-10.

(2) Measure the resistance between terminal No. 2 and No. 3 of the fuel temperature sensor.

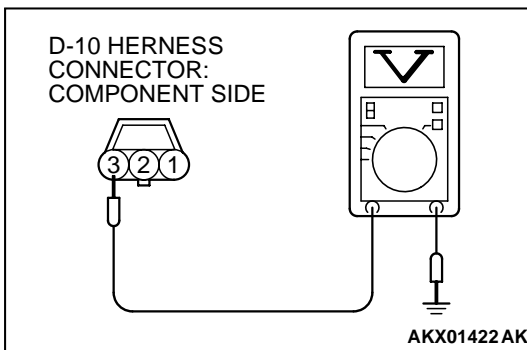
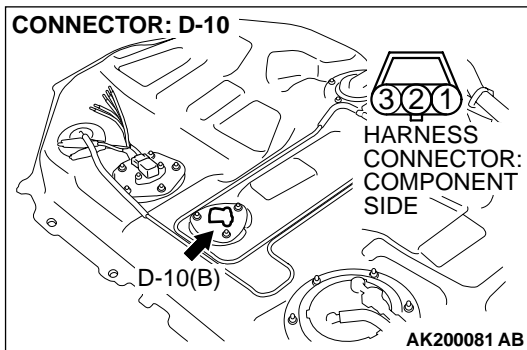
**Standard value:**

**0.5 – 12.0 kilohms**

**Q: Is the resistance between 0.5 and 12.0 kilohms?**

**YES :** Go to Step 4.

**NO :** Replace the fuel temperature sensor. Then go to Step 11.

**STEP 4. Measure the sensor supply voltage at fuel temperature sensor harness side connector D-10.**

(1) Disconnect connector D-10 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.

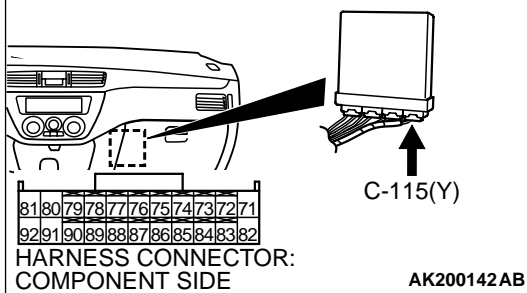
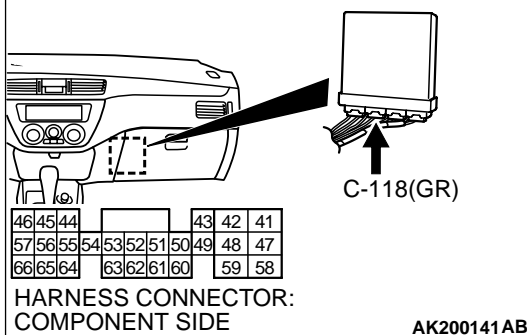
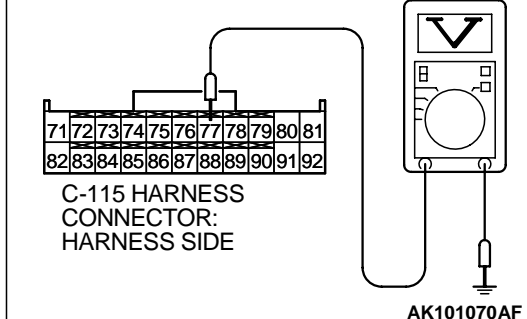
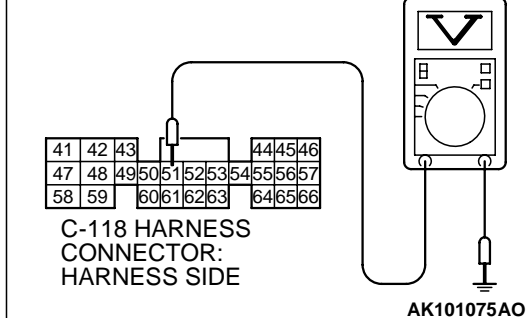
- Voltage should measure between 4.5 and 4.9 volts

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

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

**YES :** Go to Step 8.

**NO :** Go to Step 5.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>****<M/T>****<A/T>****STEP 5. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

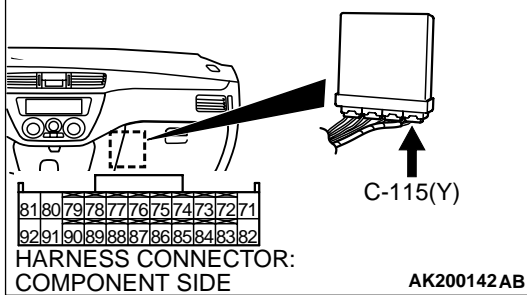
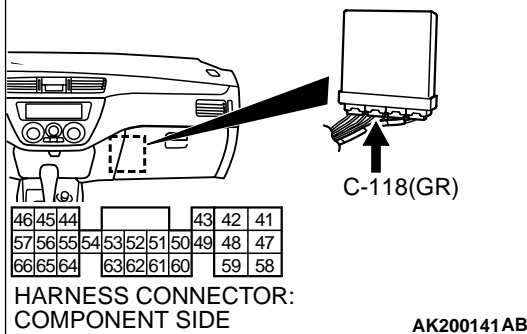
- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the fuel temperature sensor connector D-10.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 77 <M/T> or No. 51 <A/T> and ground by backprobing.
  - Voltage should measure between 4.5 and 4.9 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 6.

**NO :** Go to Step 7.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 6. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Check connector C-122, C-127 and D-14 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 fuel temperature sensor connector D-10 (terminal No. 3) and ECM connector C-115 (terminal No. 77) <M/T> or PCM connector C-118 (terminal No. 51) <A/T> because of open circuit. Then go to Step 11.

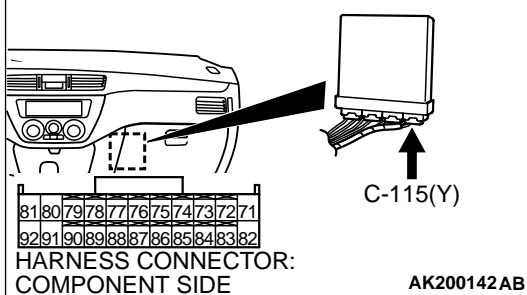
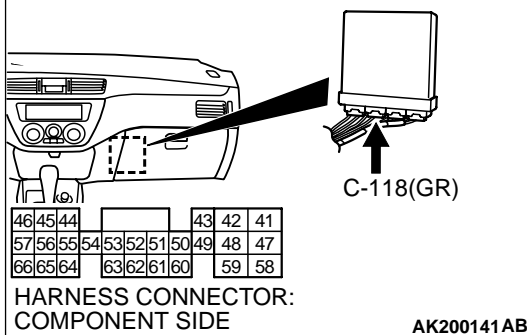
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

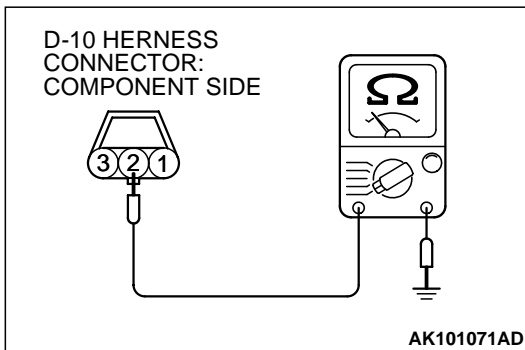
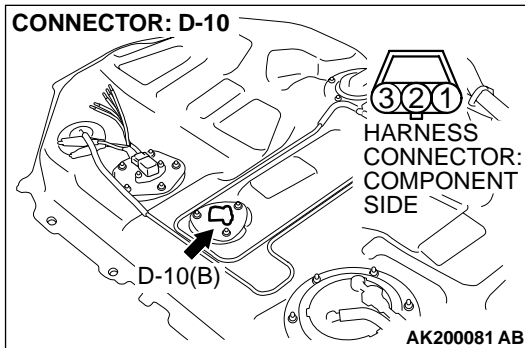
**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**



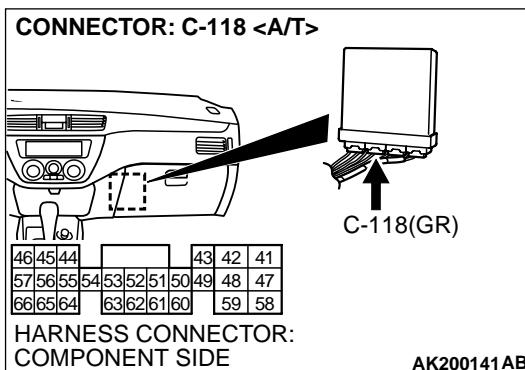
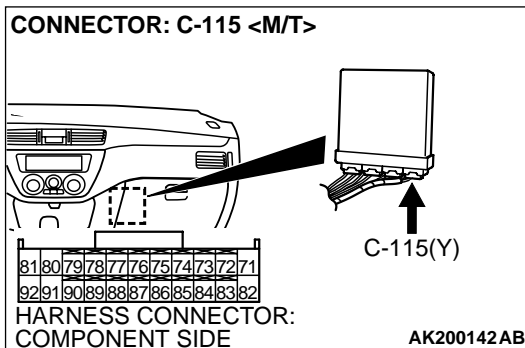
**STEP 8. Check for continuity at fuel temperature sensor harness side connector D-10.**

- (1) Disconnect connector D-10 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 9.

**NO :** Check connector D-14 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 temperature sensor connector D-10 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 11.



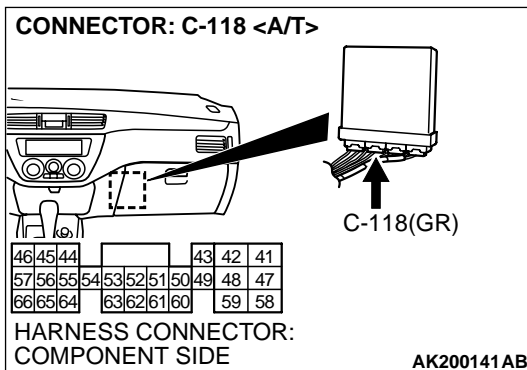
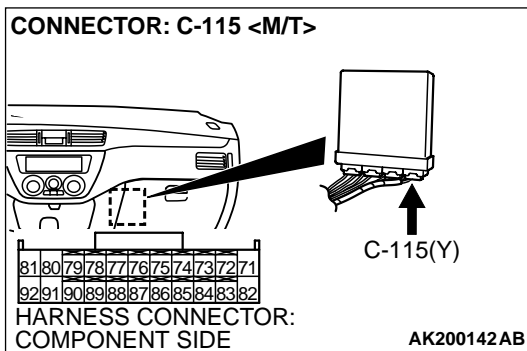
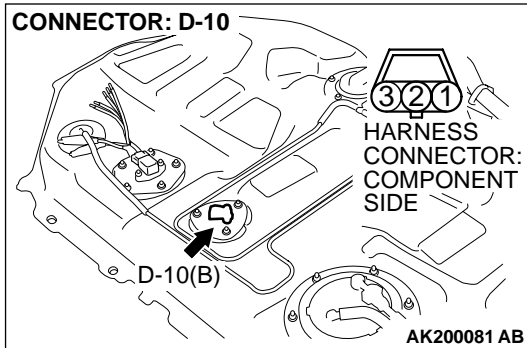
**STEP 9. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

**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 go to Step 11.





**STEP 10. Check for open circuit and harness damage between fuel temperature sensor connector D-10 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> .**

**NOTE:** Check harness after checking intermediate connectors C-122, C-127 and D-14. If intermediate connector are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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

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

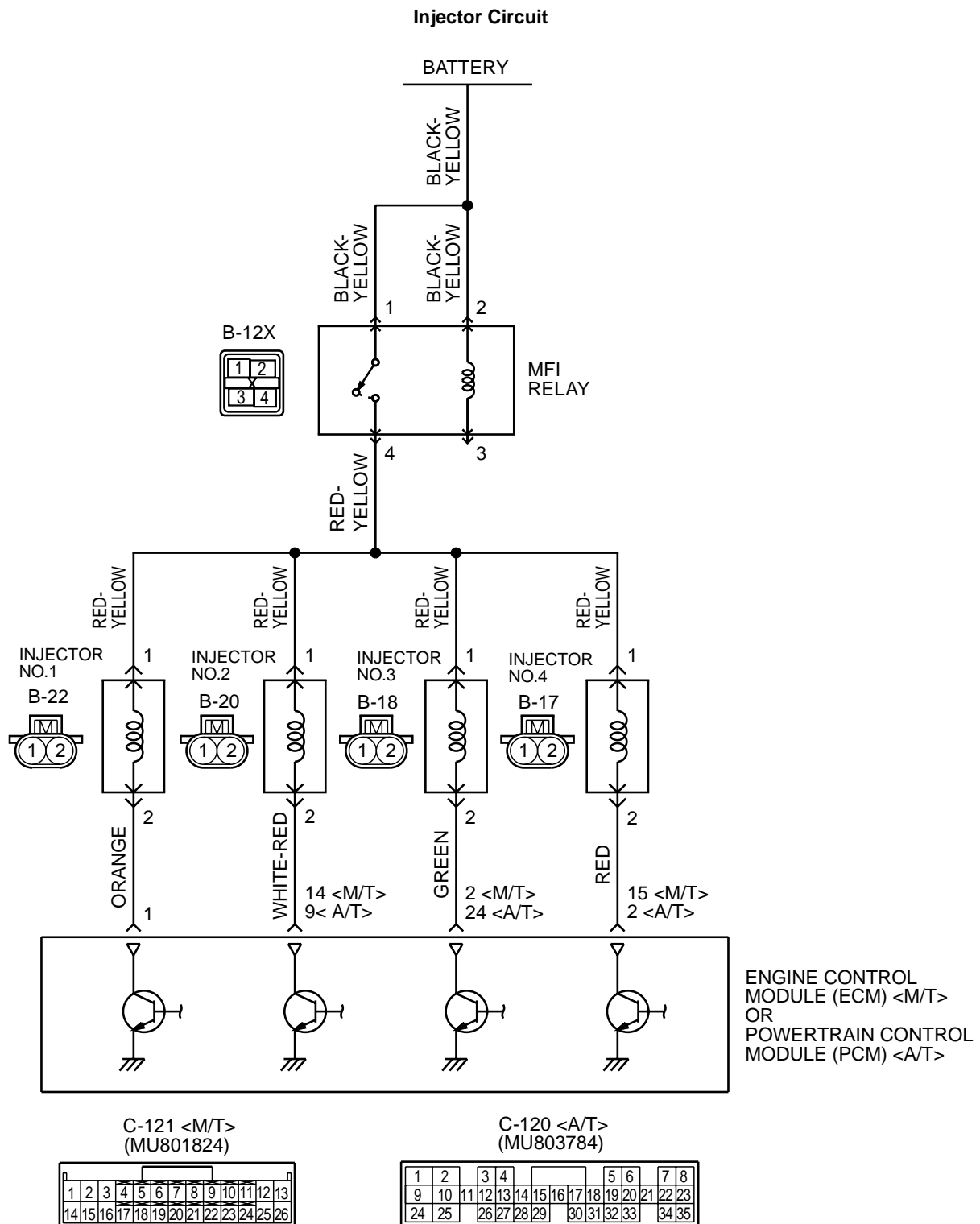
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0183 set?**

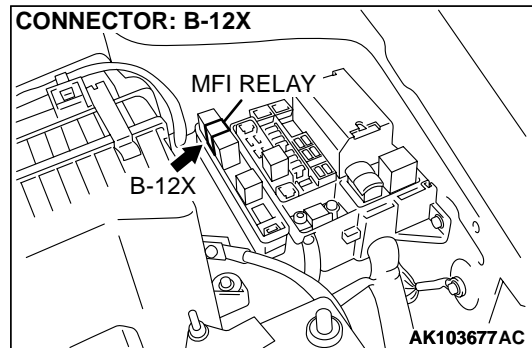
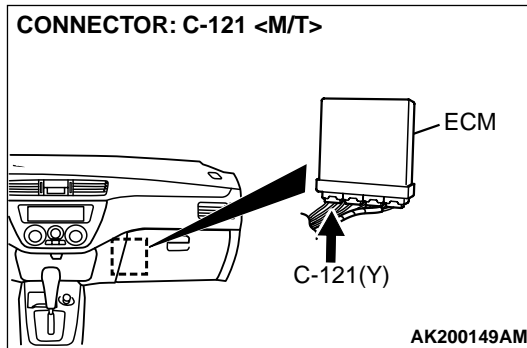
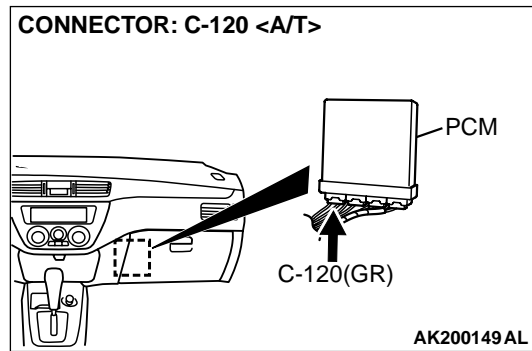
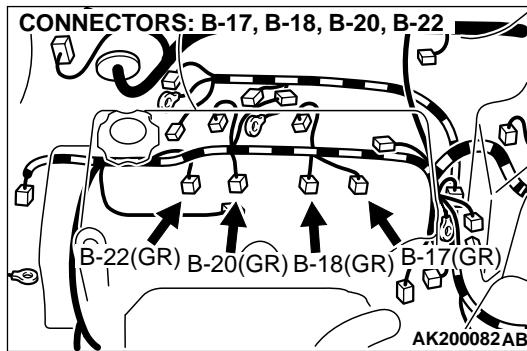
**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

**DTC P0201: Injector Circuit – Cylinder 1, DTC P0202: Injector Circuit – Cylinder 2, DTC P0203: Injector Circuit – Cylinder 3, DTC P0204: Injector Circuit – Cylinder 4**



**AK000870**



### CIRCUIT OPERATION

- The injector power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or PCM <A/T> controls the injector by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

### TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM <M/T> or PCM <A/T>.
- A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off.
- The ECM <M/T> or PCM <A/T> checks this surge voltage.

### DTC SET CONDITIONS

#### Check Conditions

- Engine speed is lower than 1,000 r/min.
- Throttle position sensor output voltage is lower than 1.16 volts.

#### Judgment Criteria

- Injector coil surge voltage (battery positive voltage +2 volts) has not been detected for two seconds.

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

- Injector failed.
- Open or shorted injector circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991348: Test Harness Set

**STEP 1. Using scan tool MB991502, check actuator test item 01, 02, 03, 04: Injectors.**

### ⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the actuator testing mode for item 01, 02, 03, 04 Injectors.
- (4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - Does the idle state worsen when the injector is cut off. (Does idling become unstable or does the engine stall.)
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is the actuator operating properly?

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

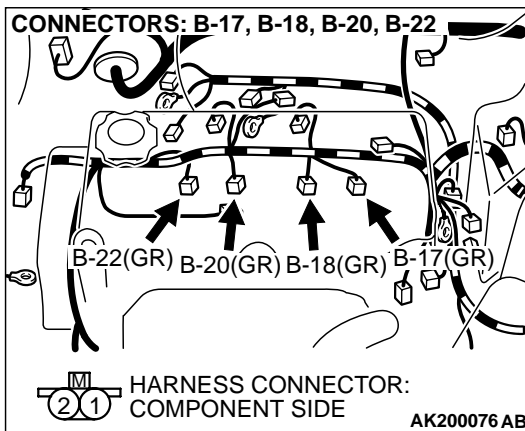
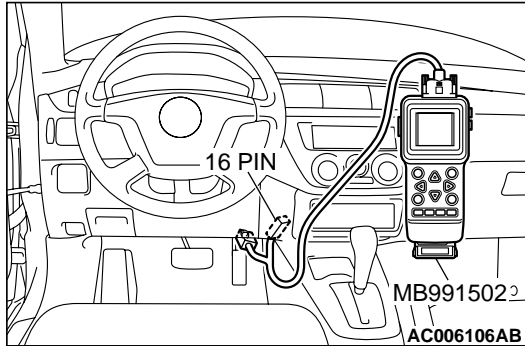
### STEP 2. Check the connector at injector for damage.

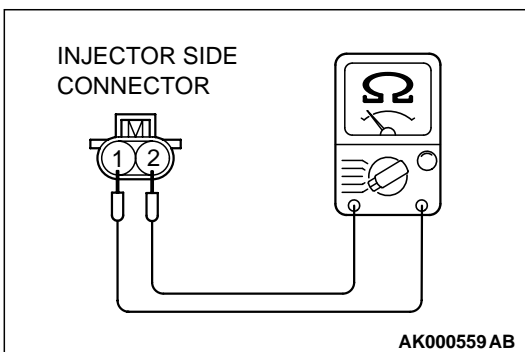
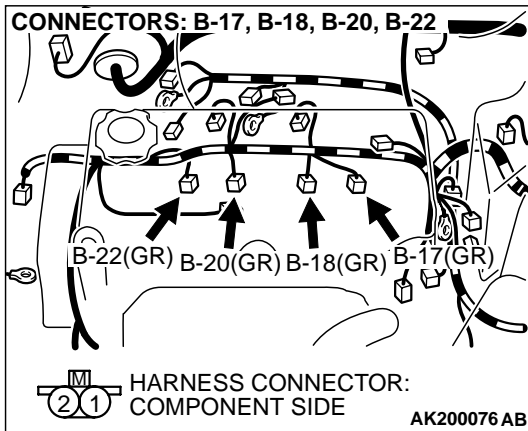
- a. Check connector B-22 when checking No. 1 cylinder.
- b. Check connector B-20 when checking No. 2 cylinder.
- c. Check connector B-18 when checking No. 3 cylinder.
- d. Check connector B-17 when checking No. 4 cylinder.

### Q: Is the connector in good condition?

**YES :** Go to Step 3.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 10.



**STEP 3. Check the injector.**

- (1) Disconnect the injector connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <No.3 cylinder> or B-17 <No.4 cylinder>.

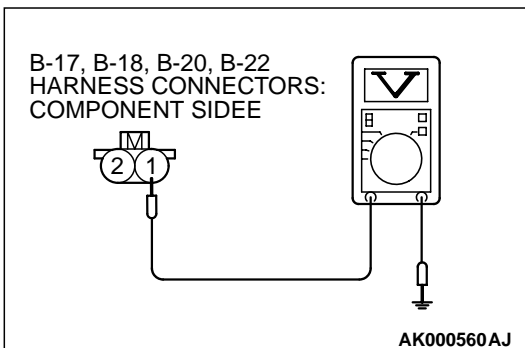
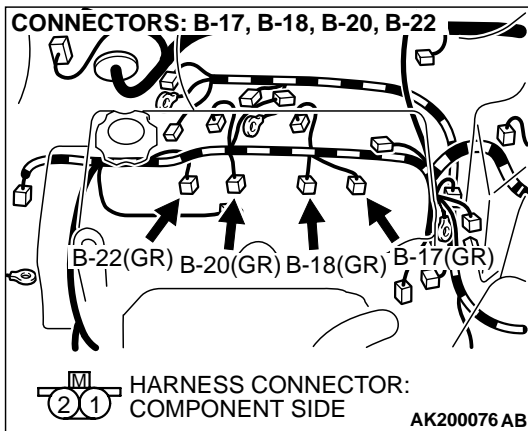
- (2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 4.

**NO :** Replace the injector. Then go to Step 10.

**STEP 4. Measure the power supply voltage at injector connector.**

- (1) Disconnect connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <No. 3 cylinder> or B-17 <No. 4 cylinder> 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.

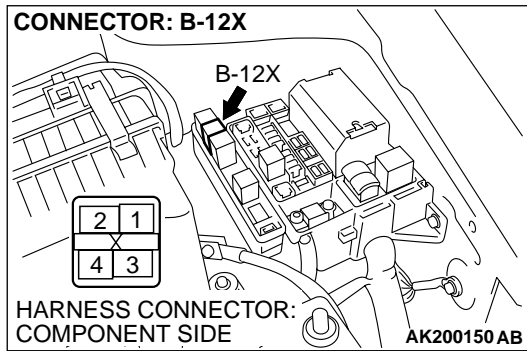
- Voltage should measure battery positive voltage.

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

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.



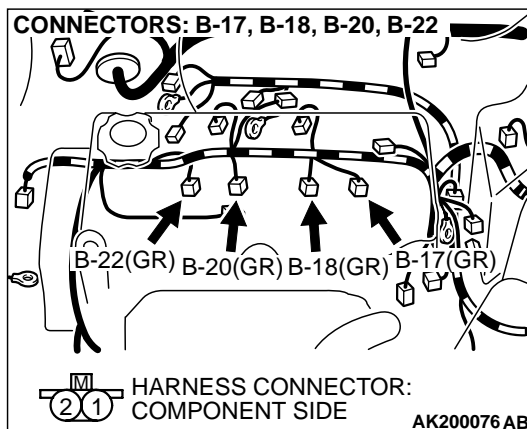
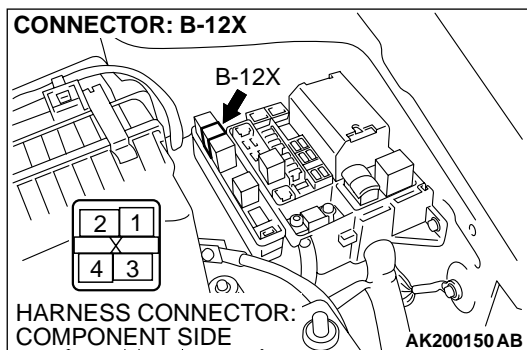
**STEP 5. Check connector B-12X at MFI relay for damage.**  
**Q: Is the connector in good condition?**

**YES :** Repair harness wire between MFI relay connector and injector connector because of open circuit or short circuit to ground.

- Repair harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-22 (terminal No. 1) when checking No. 1 cylinder.
- Repair harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-20 (terminal No. 1) when checking No. 2 cylinder.
- Repair harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-18 (terminal No. 1) when checking No. 3 cylinder.
- Repair harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-17 (terminal No. 1) when checking No. 4 cylinder.

Then go to Step 10.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 10.



**STEP 6. Check for harness damage between MFI relay connector and injector connector.**

- Check the harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-22 (terminal No. 1) when checking No.1 cylinder.
- Check the harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-20 (terminal No. 1) when checking No.2 cylinder.
- Check the harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-18 (terminal No. 1) when checking No.3 cylinder.
- Check the harness wire between MFI relay connector B-12X (terminal No. 4) and injector connector B-17 (terminal No. 1) when checking No.4 cylinder.

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

**YES :** Go to Step 7.

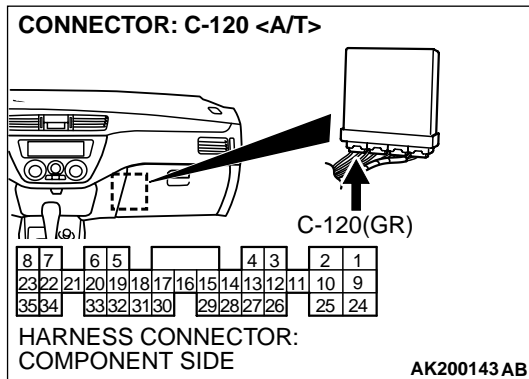
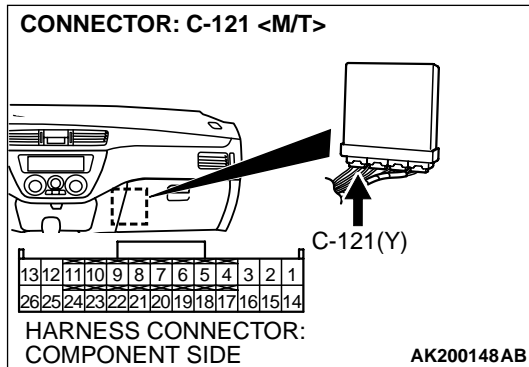
**NO :** Repair it. Then go to Step 10.

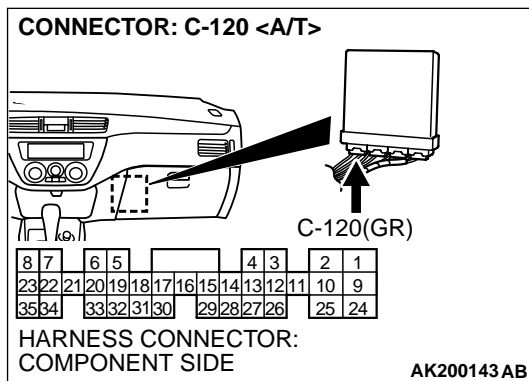
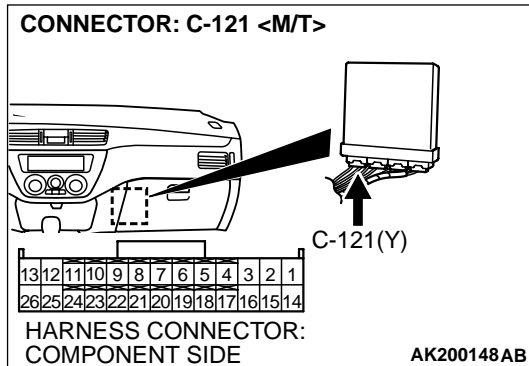
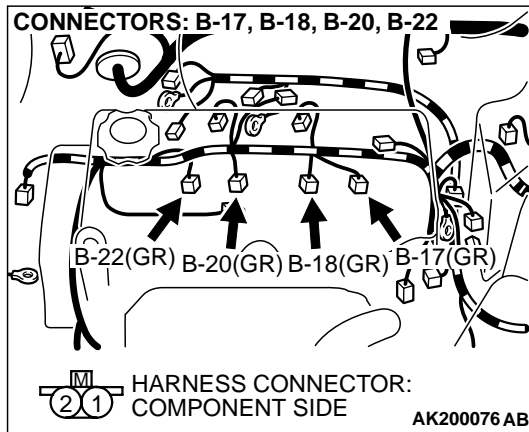
**STEP 7. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 10.





**STEP 8. Check for open circuit and short circuit to ground and harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.**

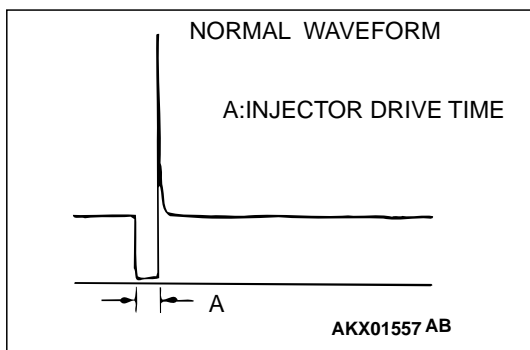
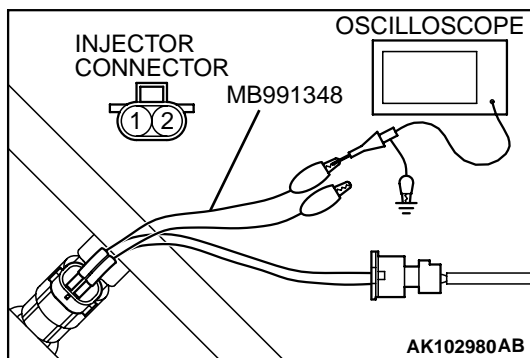
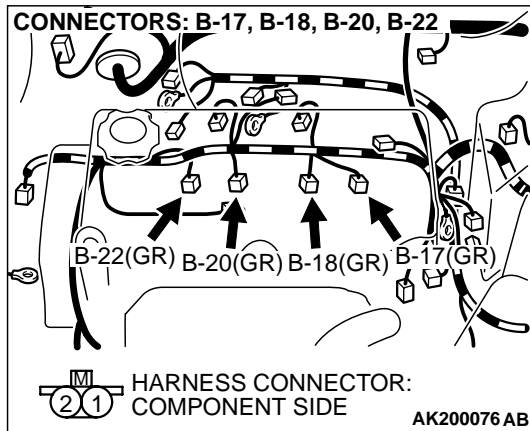
- Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) <M/T> or PCM connector C-120 (terminal No. 1) <A/T> when checking No.1 cylinder.
- Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) <M/T> or PCM connector C-120 (terminal No. 9) <A/T> when checking No.2 cylinder.
- Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) <M/T> or PCM connector C-120 (terminal No. 24) <A/T> when checking No.3 cylinder.
- Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) <M/T> or PCM connector C-120 (terminal No. 2) <A/T> when checking No.4 cylinder.

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

**YES :** Go to Step 9.

**NO :** Repair it. Then go to Step 10.



**STEP 9. Using the oscilloscope, check the injector.**

- (1) Disconnect the injector connector B-22 <No. 1 cylinder> or B-20 <No. 2 cylinder> or B-18 <No. 3 cylinder> or B-17 <No. 4 cylinder> and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)

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

**NOTE:** When measuring with the ECM or PCM side connector, connect an oscilloscope probe to the each of the following terminals.

- ECM terminal No. 1 or PCM terminal No. 1 when checking No. 1 cylinder.
- ECM terminal No. 14 or PCM terminal No. 9 when checking No. 2 cylinder.
- ECM terminal No. 2 or PCM terminal No. 24 when checking No. 3 cylinder.
- ECM terminal No. 15 or PCM terminal No. 2 when checking No. 4 cylinder.

- (3) Start the engine and run at idle.

- (4) Measure the waveform.

- The waveform should show a normal pattern similar to the illustration.

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

**Q: Is the waveform normal?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 10.

**STEP 10. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Are DTC P0201, P0202, P0203 and P0204 sets?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

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**DTC P0300: Random/Multiple Cylinder Misfire Detected**

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**Random Misfire Circuit**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

**CIRCUIT OPERATION**

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

**TECHNICAL DESCRIPTION**

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

**DTC SET CONDITIONS****Check Conditions**

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than –10°C (14°F).
- Intake air temperature is higher than –10°C (14°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Adaptive learning is complete for the vane which generates a crankshaft position signal.

- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is –0.059 volt/10 ms to +0.059 volt/10 ms.

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

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 950°C (1742°F)].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

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

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.****⚠ CAUTION**

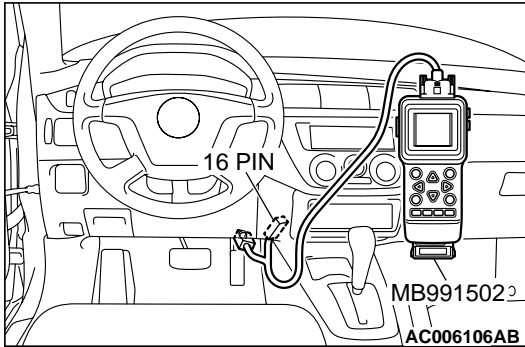
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
- (4) Check the waveform of the crankshaft position sensor while keeping the engine speed constant.
  - The pulse width should be constant.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES** : Go to Step 2.

**NO** : Refer to, DTC P0335 – Crankshaft Position Sensor Circuit Malfunction [P.13Ac-280](#).

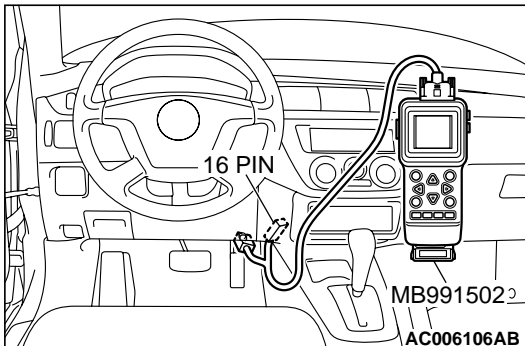
**STEP 2. Using scan tool MB991502, check data list item 81: Long-Term Fuel Compensation (trim).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991502 to the data reading mode for item 81, Long-Term Fuel Compensation (trim).
  - The fuel trim should be between –12.5 and +12.5 when the load is 2,500 r/min (during closed loop) after the engine is warmed.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the specification normal?**

**YES** : Go to Step 3.

**NO** : Refer to, DTC P0171 – System too Lean [P.13Ac-218](#), DTC P0172 – System too Rich [P.13Ac-226](#).

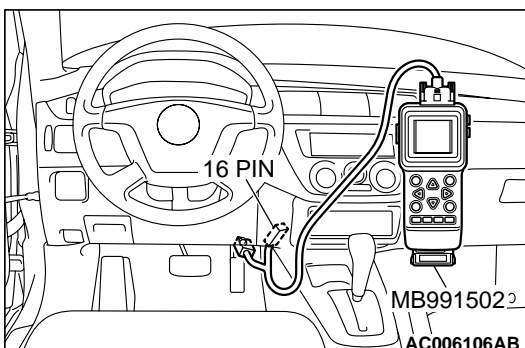
**STEP 3. Using scan tool MB991502, check data list item 82: Short-Term Fuel Compensation (trim).**

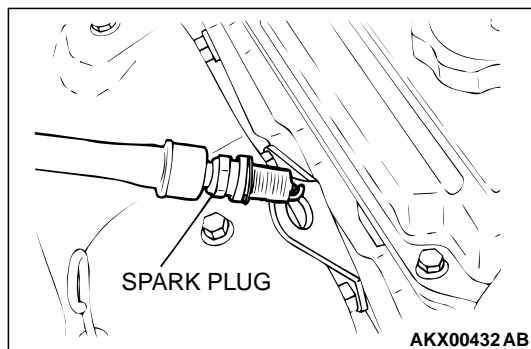
- (1) Start the engine and run at idle.
- (2) Set scan tool MB991502 to the data reading mode for item 82, Short-Term Fuel Compensation (trim).
  - The fuel trim should be between –25 and +25 when the load is 2,500 r/min (during closed loop) after the engine is warmed.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the specification normal?**

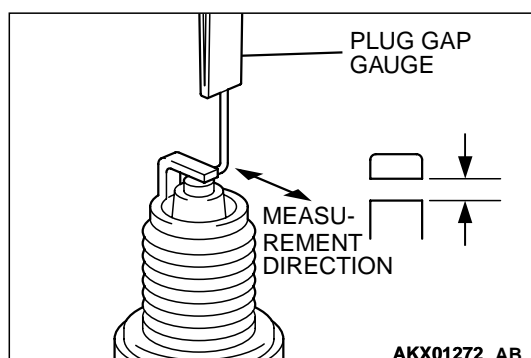
**YES** : Go to Step 4.

**NO** : Refer to, DTC P0171 – System too Lean [P.13Ac-218](#), DTC P0172 – System too Rich [P.13Ac-226](#).

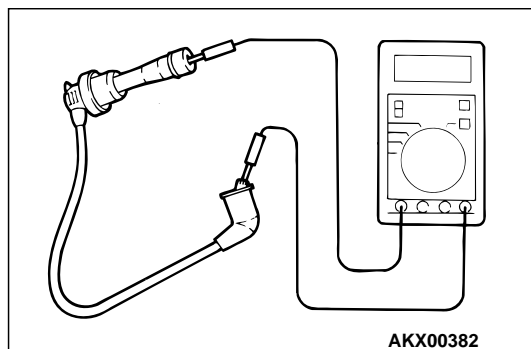


**STEP 4. Check the ignition coil spark.**

- (1) Check each ignition coil spark.
- (2) Remove the intake manifold.
- (3) Remove the spark plug and connect to the spark plug cable.
- (4) Ground the spark plug side electrode securely.
  - When the engine is cranked, the spark plug should spark.

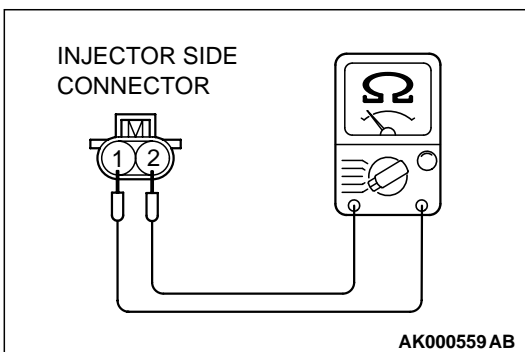
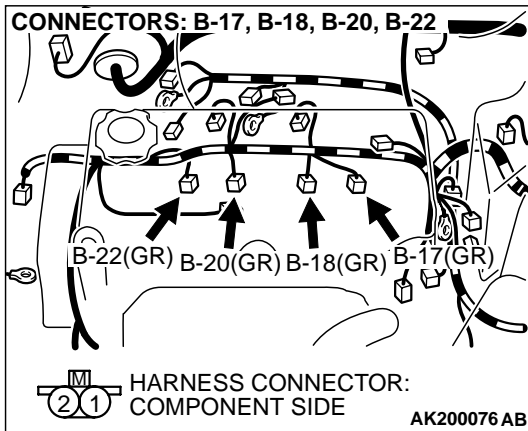
**Q: Did it spark?****YES** : Go to Step 7.**NO** : Go to Step 5.**STEP 5. Check the spark plugs.**

- (1) Check that the plug is not burned, that the insulator plug is not damaged, and that the seizure state is good.
- (2) If cleaning is required due to carbon deposits, etc., clean using a plug cleaner or wire brush, etc.
- (3) Check the plug gap using a plug gap gauge, and adjust if not within the standard value.

**Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)****Q: Is the spark plug in good condition?****YES** : Go to Step 6.**NO** : Replace the faulty spark plug. Then go to Step 13.**STEP 6. Check the spark plug cable.**

- (1) Check the cap and coating for cracks.
- (2) Measure the resistance.

**Limit: maximum 19 kilohms****Q: Is the measured resistance less than 19 kilohms?****YES** : Refer to GROUP 13A, INSPECTION PROCEDURE 33 – Ignition Circuit System [P.13Ad-118](#).**NO** : Replace the faulty spark plug cable. Then go to Step 13.

**STEP 7. Check the injector.**

(1) Disconnect the injector connector.

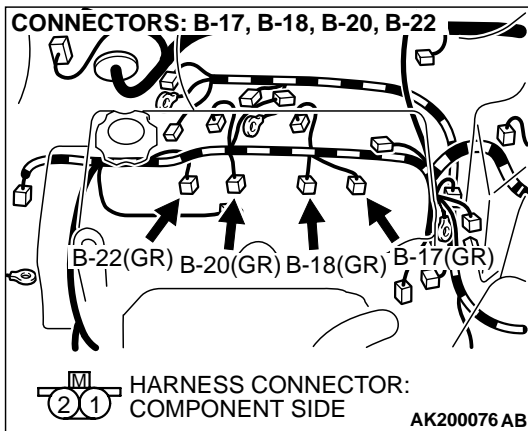
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 8.

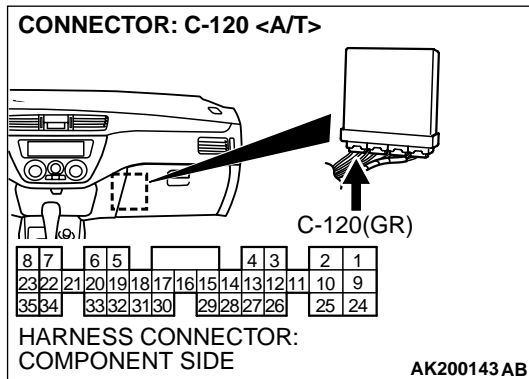
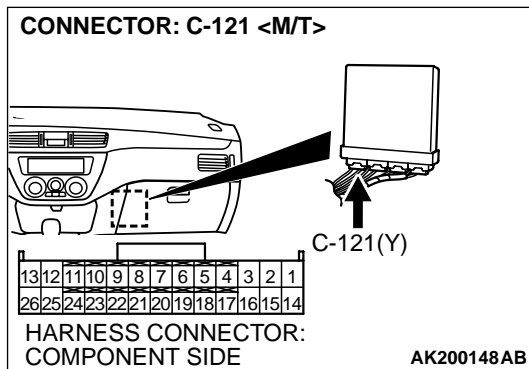
**NO :** Replace the faulty injector. Then go to Step 13.

**STEP 8. Check connectors B-17, B-18, B-20, B-22 at injector for damage.**

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

**YES :** Go to Step 9.

**NO :** Repair or replace the faulty injector. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 13.

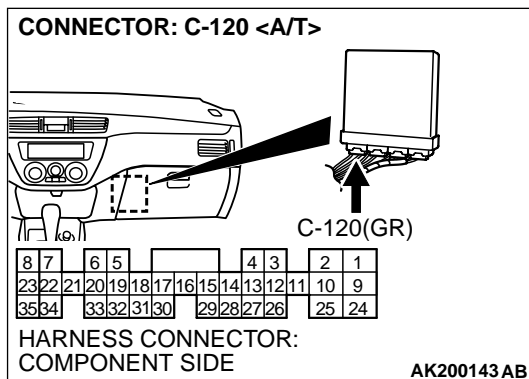
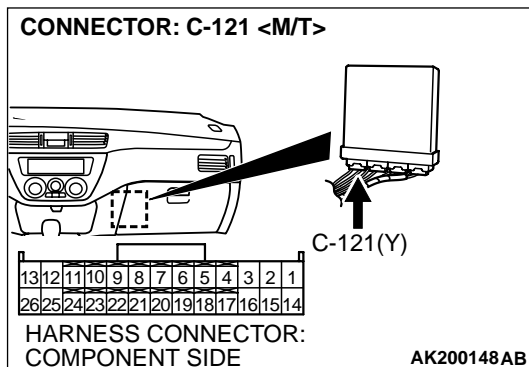
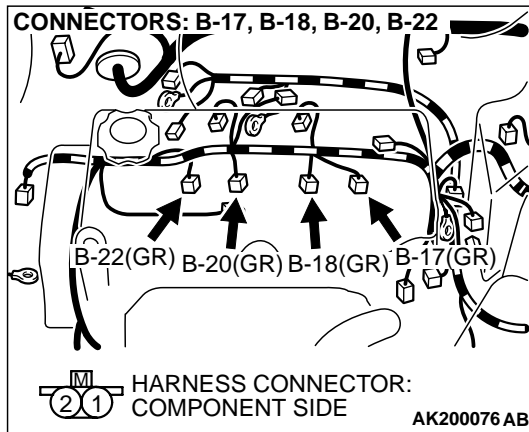


**STEP 9.** Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

**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 go to Step 13.



**STEP 10. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.**

- Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) <M/T> or PCM connector C-120 (terminal No. 1) <A/T> when checking No.1 cylinder.
- Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) <M/T> or PCM connector C-120 (terminal No. 9) <A/T> when checking No.2 cylinder.
- Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) <M/T> or PCM connector C-120 (terminal No. 24) <A/T> when checking No.3 cylinder.
- Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) <M/T> or PCM connector C-120 (terminal No. 2) <A/T> when checking No.4 cylinder.

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

**YES :** Go to Step 11.

**NO :** Repair it. Then go to Step 13.

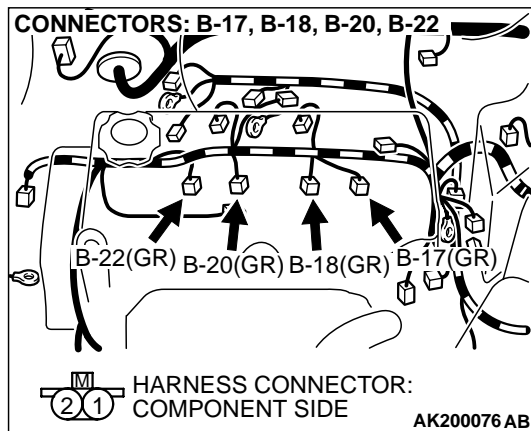
**STEP 11. Check the following items.**

- Check the following items, and repair or replace the defective component.
  - Check for skipped timing belt teeth.
  - Check compression.
  - EGR valve failed.

**Q: Are there any abnormalities?**

**YES :** Go to Step 12.

**NO :** Repair or replace it. Then go to Step 13.

**STEP 12. Replace the injector.**

- (1) Replace the injector.
- (2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0300 set?**

**YES :** Replace the ECM or PCM. Then go to Step 13.

**NO :** The procedure is complete.

**STEP 13. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0300 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.



**DTC P0301: Cylinder 1 Misfire Detected, DTC P0302: Cylinder 2 Misfire Detected, DTC P0303: Cylinder 3 Misfire Detected, DTC P0304: Cylinder 4 Misfire Detected**

#### Misfire Detected Circuit

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

#### CIRCUIT OPERATION

- Refer to, DTC P0201 – P0204 Injector Circuit Malfunction [P.13Ac-254](#).

#### TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM <M/T> or PCM <A/T> checks for such changes in engine speed.

#### DTC SET CONDITIONS

##### Check Conditions

- Engine speed is between 500 and 6,000 r/min.
- Engine coolant temperature is higher than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).
- Intake air temperature is higher than  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).
- Barometric pressure is at between 76 kPa (11 psi) and 106 kPa (15 psi).
- Volumetric efficiency is at between 30 and 55 percent.

- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is  $-0.059$  volt/10ms to  $+0.059$  volt/10ms.

#### Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection).

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than  $950^{\circ}\text{C}$  ( $1,742^{\circ}\text{F}$ )].

or

- Misfire has occurred in 20 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

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

- Ignition system related part(s) failed.
- Low compression pressure.
- Injector failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### STEP 1. Check the spark plugs.

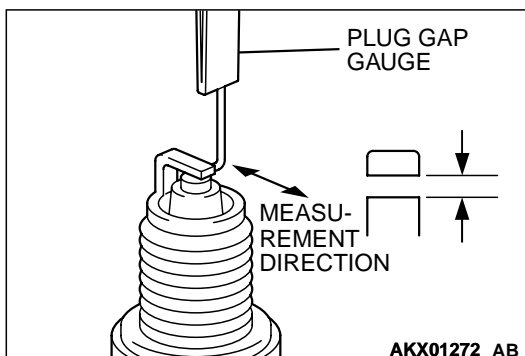
- Check that the plug is not burned, that the insulator plug is not damaged, and that the seizure state is good.
- If cleaning is required due to carbon deposits, etc., clean using a plug cleaner or wire brush, etc.
- Check the plug gap using a plug gap gauge, and adjust if not within the standard value.

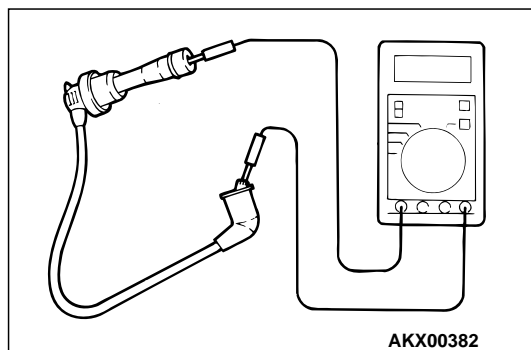
**Standard value: 1.0 – 1.1 mm (0.039 – 0.043 inch)**

#### Q: Is the spark plug in good condition?

**YES :** Go to Step 2.

**NO :** Replace the spark plug. Then go to Step 9.



**STEP 2. Check the spark plug cable.**

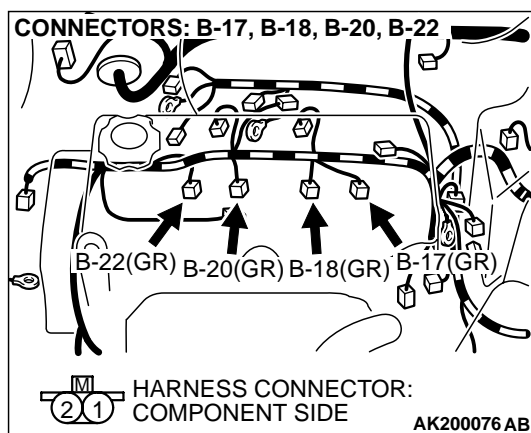
- (1) Check the cap and coating for cracks.
- (2) Measure the resistance.

**Limit: maximum 19 kilohms**

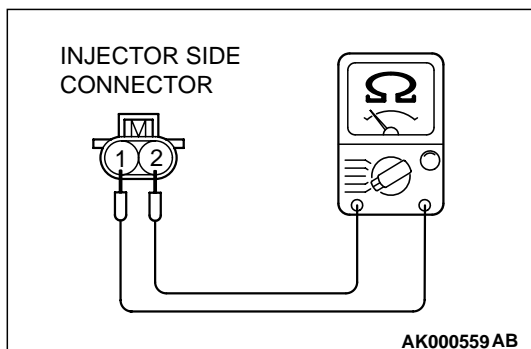
**Q: Is the measured resistance less than 19 kilohms?**

**YES :** Go to Step 3.

**NO :** Replace the spark plug cable. Then go to Step 9.

**STEP 3. Check the injector.**

- (1) Disconnect the injector connector B-22 <No. 1 cylinder>, B-20 <No. 2 cylinder>, B-18 <No. 3 cylinder>, B-17 <No. 4 cylinder>.



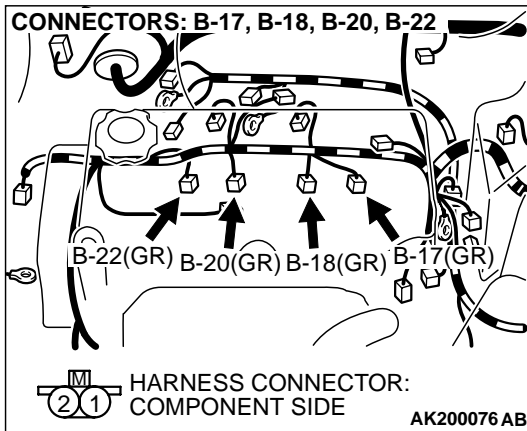
- (2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

**Standard value: 13 – 16 ohms [at 20°C (68°F)]**

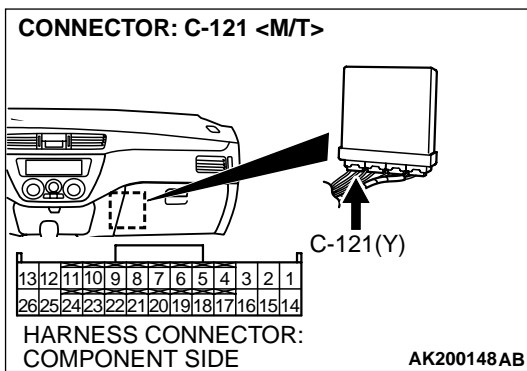
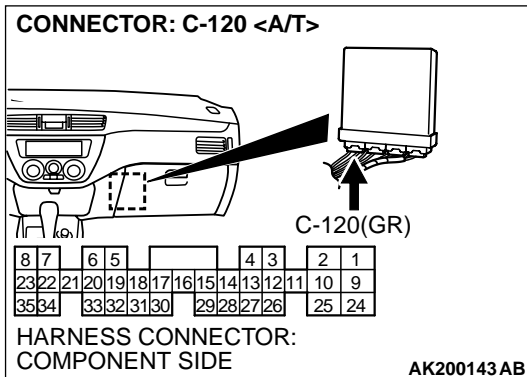
**Q: Is the resistance between 13 and 16 ohms [at 20°C (68°F)]?**

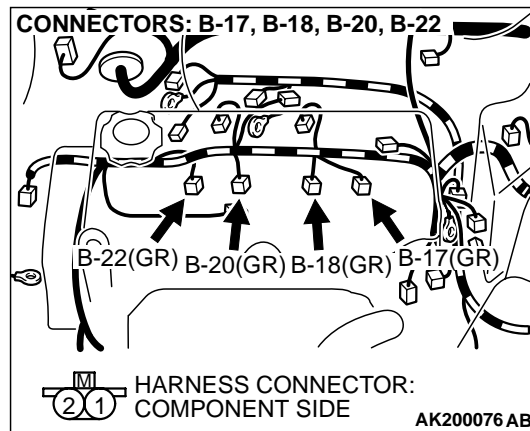
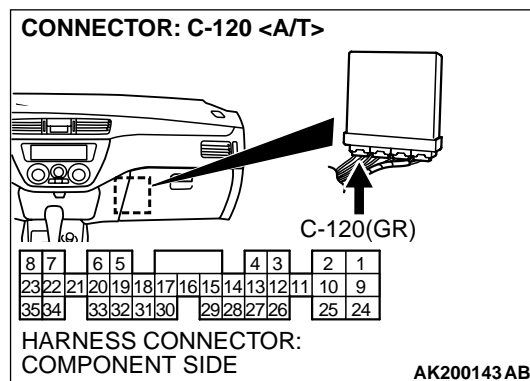
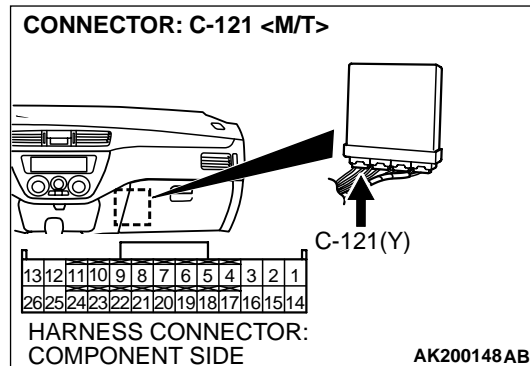
**YES :** Go to Step 4.

**NO :** Replace the injector. Then go to Step 9.

**STEP 4. Check connector at injector for damage.**

- Check connector B-22 when checking No. 1 cylinder.
- Check connector B-20 when checking No. 2 cylinder.
- Check connector B-18 when checking No. 3 cylinder.
- Check connector B-17 when checking No. 4 cylinder.

**Q: Is the connector in good condition?****YES :** Go to Step 5.**NO :** Repair or replace the injector. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.**STEP 5. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.****Q: Is the connector in good condition?****YES :** Go to Step 6.**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9



**STEP 6. Check for harness damage between injector connector and ECM connector <M/T> or PCM connector <A/T>.**

- Check the harness wire between injector connector B-22 (terminal No. 2) and ECM connector C-121 (terminal No. 1) <M/T> or PCM connector C-120 (terminal No. 1) <A/T> when checking No.1 cylinder.
- Check the harness wire between injector connector B-20 (terminal No. 2) and ECM connector C-121 (terminal No. 14) <M/T> or PCM connector C-120 (terminal No. 9) <A/T> when checking No.2 cylinder.
- Check the harness wire between injector connector B-18 (terminal No. 2) and ECM connector C-121 (terminal No. 2) <M/T> or PCM connector C-120 (terminal No. 24) <A/T> when checking No.3 cylinder.
- Check the harness wire between injector connector B-17 (terminal No. 2) and ECM connector C-121 (terminal No. 15) <M/T> or PCM connector C-120 (terminal No. 2) <A/T> when checking No.4 cylinder.

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

**YES :** Go to Step 7.

**NO :** Repair it. Then go to Step 9.

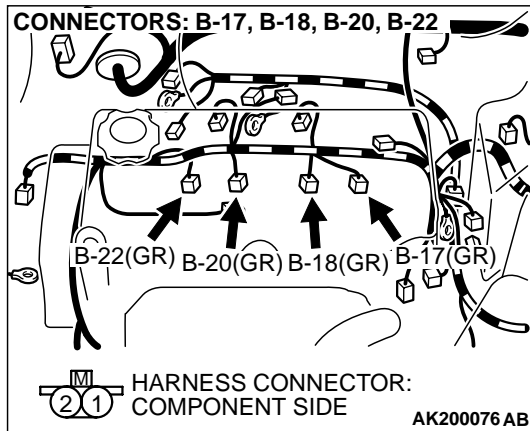
**STEP 7. Check the compression.**

Refer to GROUP 11A, On-Vehicle Service – Compression Pressure Check [P.11A-7](#).

**Q: Are there any abnormalities?**

**YES :** Go to Step 8.

**NO :** Repair or replace it. Then go to Step 9.

**STEP 8. Replace the injector.**

- (1) Replace the injector.
- (2) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (3) Check the diagnostic trouble code (DTC).

**Q: Are DTC P0301, P0302, P0303 and P0304 sets?**

**YES :** Replace the ECM or PCM. Then go to Step 9.

**NO :** The procedure is complete.

**STEP 9. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

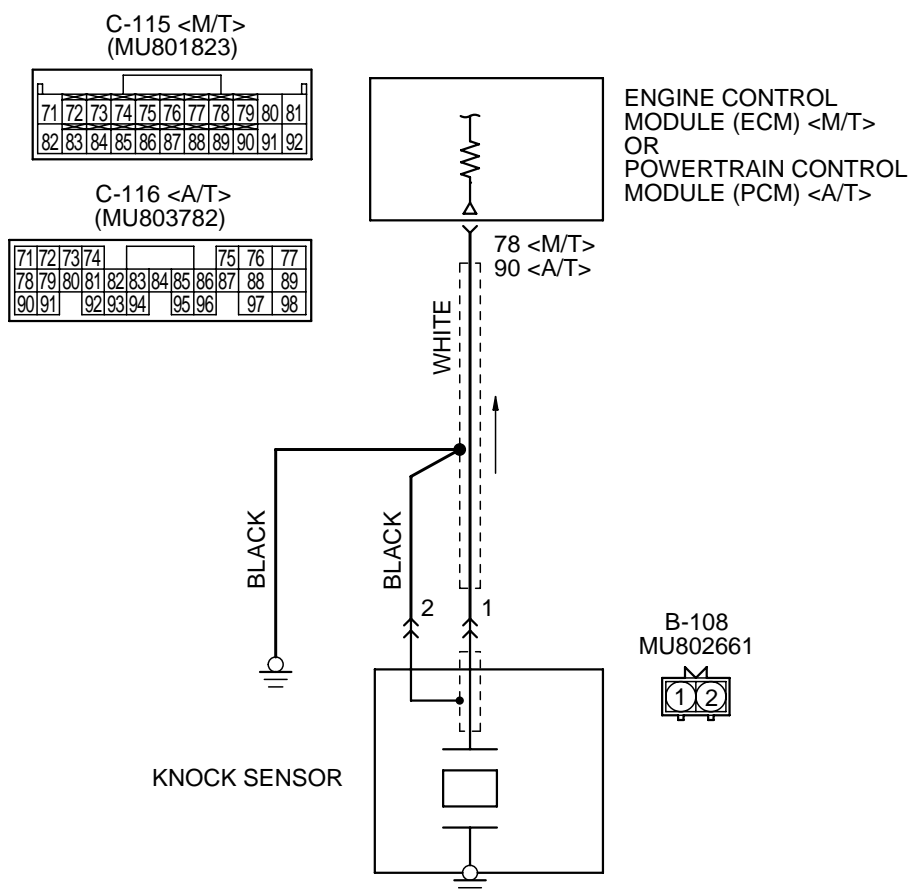
**Q: Are DTC P0301, P0302, P0303 and P0304 sets?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

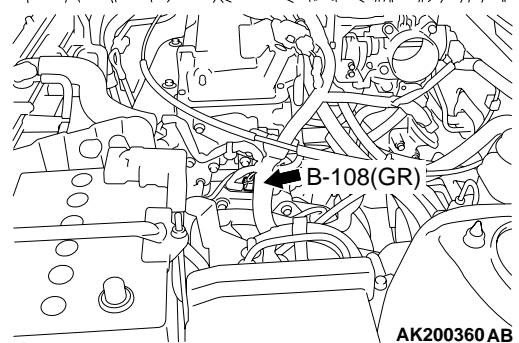
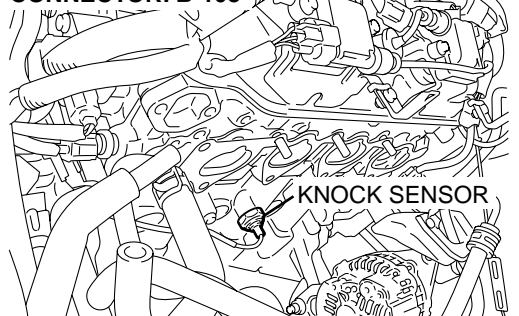
## DTC P0325: Knock Sensor Circuit

## Knock Sensor Circuit

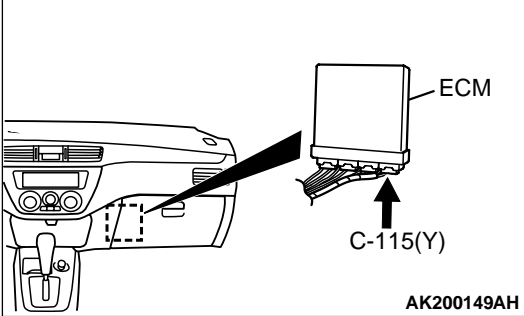


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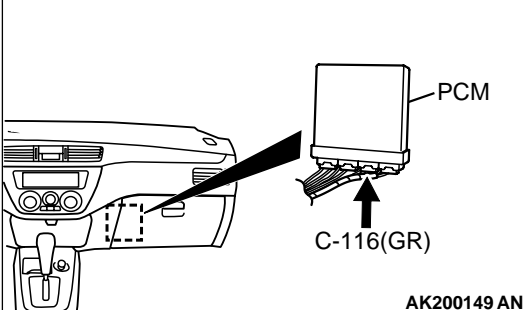
## CONNECTOR: B-108



## CONNECTOR: C-115 &lt;M/T&gt;



## CONNECTOR: C-116 &lt;A/T&gt;



**CIRCUIT OPERATION**

- The knock sensor sends a signal voltage to the ECM (terminal No. 78) <M/T> or PCM (terminal No. 90) <A/T>.

**TECHNICAL DESCRIPTION**

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output changes.

**DTC SET CONDITIONS****Check Conditions**

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

- Engine speed is higher than 2,500 r/min.

**Judgment Criteria**

- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

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

- Knock sensor failed.
- Open or shorted knock sensor circuit, or loose connector.
- ECM <M/T> failed.
- PCM <A/T> failed.

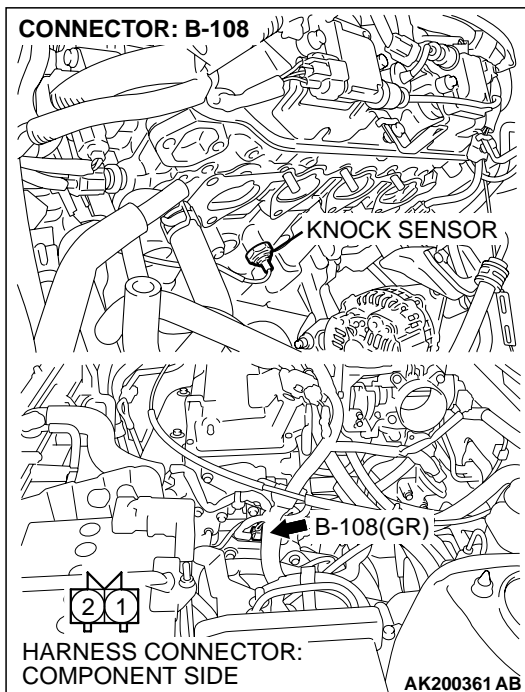
**DIAGNOSIS****Required Special Tool:**

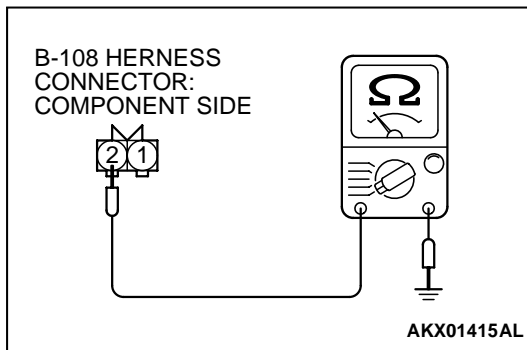
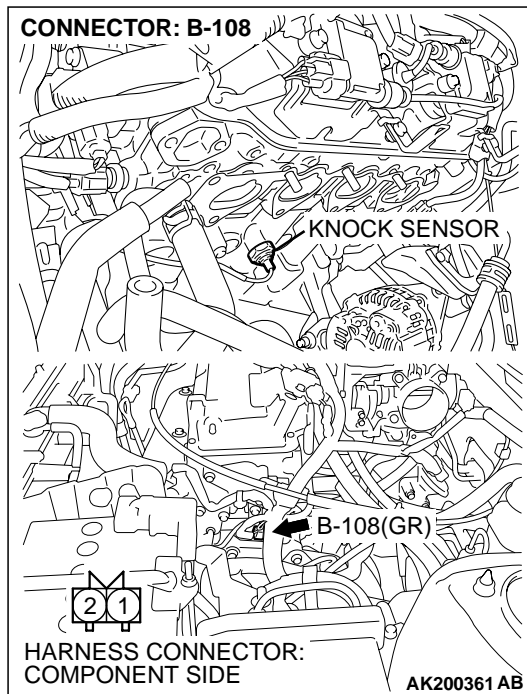
- MB991502: Scan Tool (MUT-II)

**STEP 1. Check connector B-108 at the knock sensor 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 go to Step 6.





**STEP 2. Check for continuity at knock sensor harness side connector B-108.**

- (1) Disconnect connector B-108 and measure at the harness side.

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

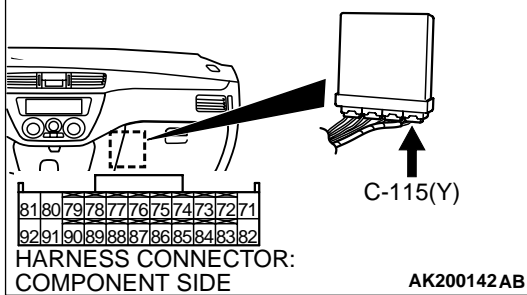
- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 3.

**NO :** Repair harness wire between knock sensor connector B-108 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 6.



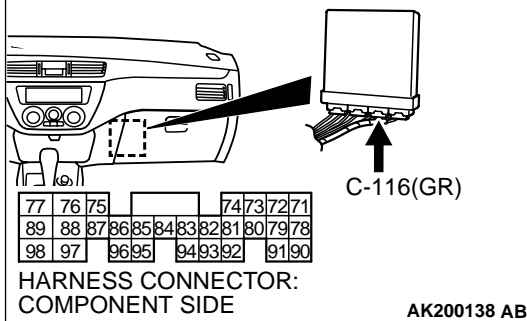
**CONNECTOR: C-115 <M/T>**

**STEP 3. Check connector C-115 at ECM <M/T> or connector C-116 at PCM <A/T> for damage.**

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

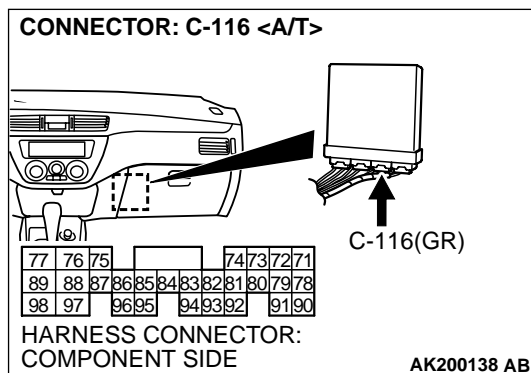
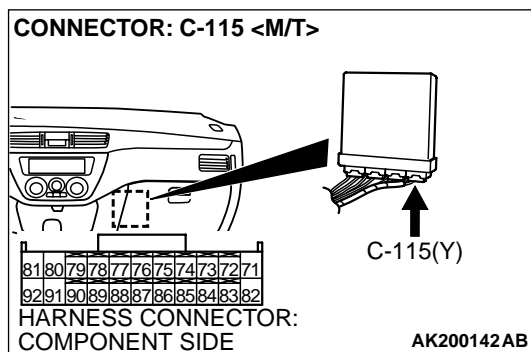
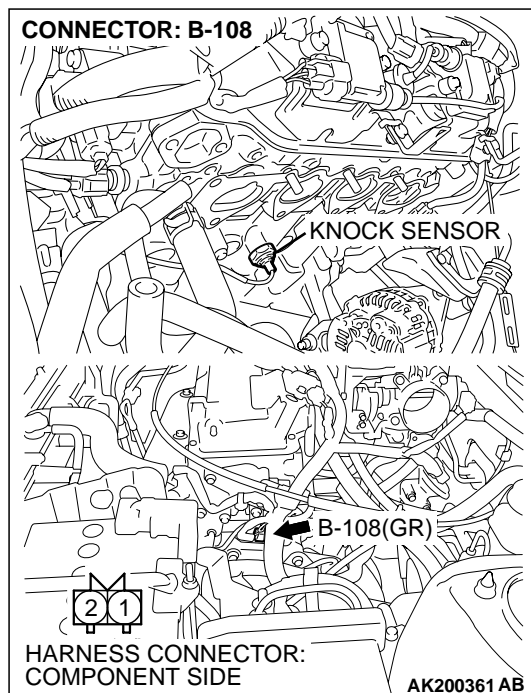
**CONNECTOR: C-116 <A/T>**

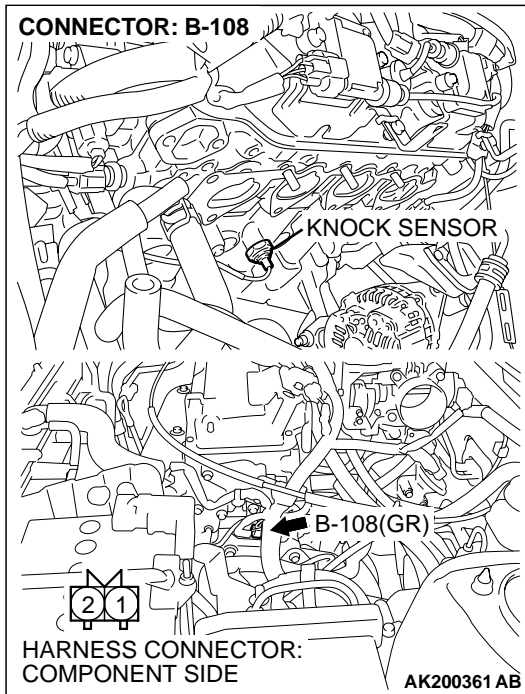
**STEP 4.** Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-108 (terminal No. 1) and ECM connector C-115 (terminal No. 78) <M/T> or PCM connector C-116 (terminal No. 90) <A/T>.

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

**YES :** Go to Step 5.

**NO :** Repair it. Then go to Step 6.



**STEP 5. Check the knock sensor.**

- (1) Disconnect the knock sensor connector B-108.
- (2) Start the engine and run at idle.
- (3) Measure the voltage between knock sensor side connector terminal No. 1 (output) and No. 2 (ground).
- (4) Gradually increase the engine speed.
  - The voltage increases with the increase in the engine speed.
- (5) Turn the ignition switch to the "LOCK"(OFF) position.

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

**YES** : Replace the ECM or PCM. Then go to Step 6.

**NO** : Replace the knock sensor. Then go to Step 6.

**STEP 6. Using scan tool MB991502, read the diagnostic trouble code (DTC).****⚠ CAUTION**

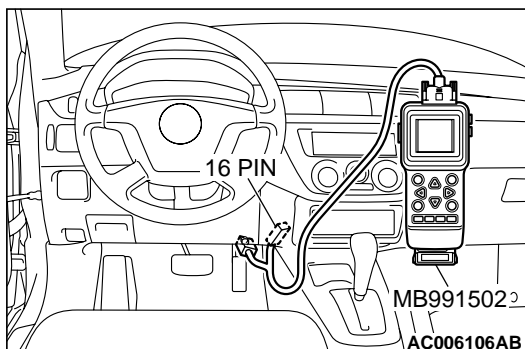
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTC.
- (4) Test drive under the following conditions:
  - Engine speed: 3, 000 – 5, 000r/min
  - Engine load : 40 % or more
  - Drive a minimum of 3 seconds after the above conditions have been met.
- (5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is DTC P0325 set?**

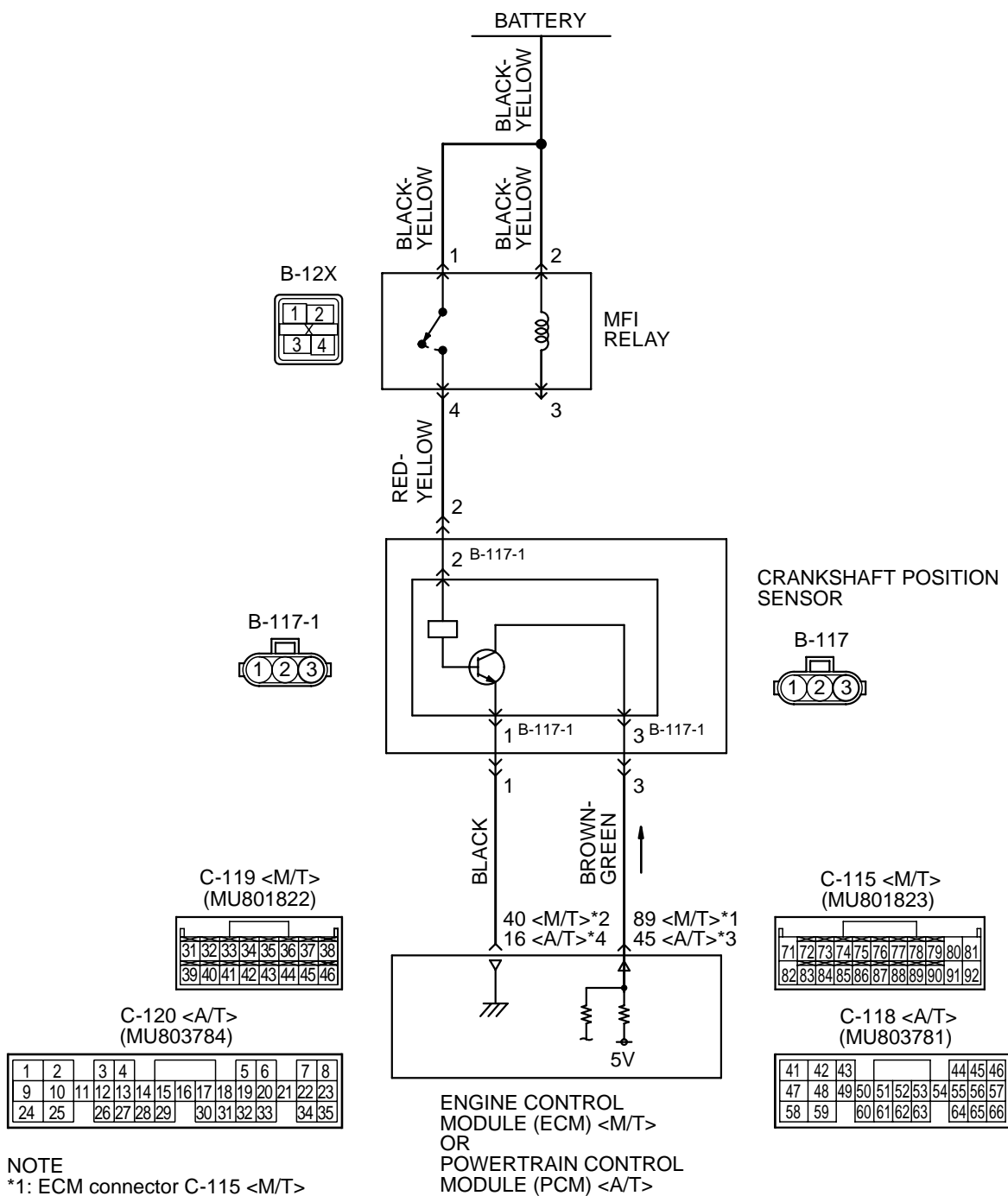
**YES** : The procedure is complete.

**NO** : Repeat the troubleshooting.

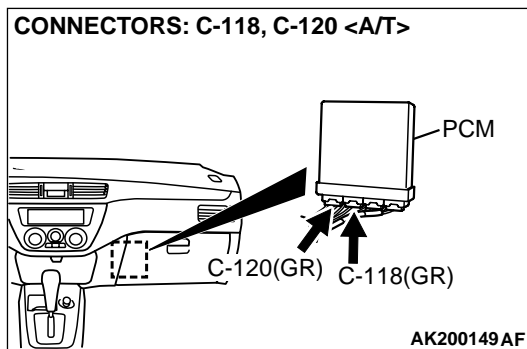
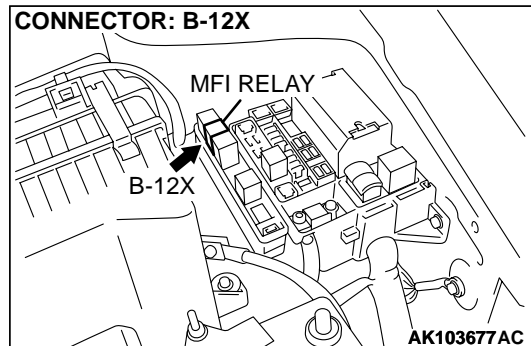
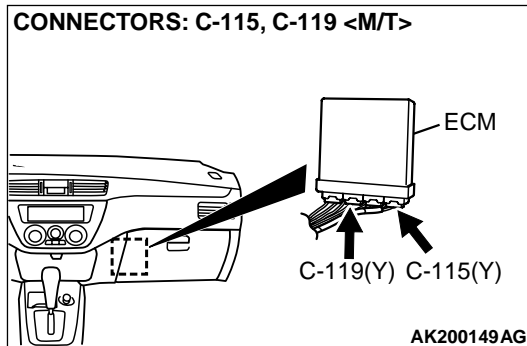
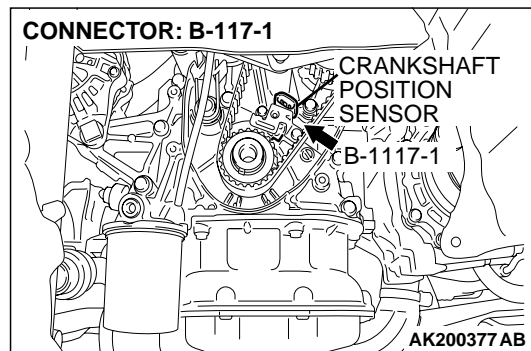
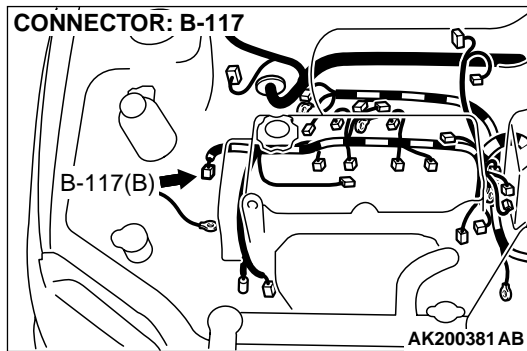


## DTC P0335: Crankshaft Position Sensor Circuit

## Crankshaft Position Sensor Circuit



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### CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the crankshaft position sensor is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 89) <M/T> or PCM (terminal No. 45) <A/T>. The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

### TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, which are then input to the ECM <M/T> or PCM <A/T>.

- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

### DTC SET CONDITIONS

#### Check Conditions

- Engine is being cranked.

#### Judgment Criteria

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

#### Check Conditions, Judgment Criteria

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

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

- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.****⚠ CAUTION**

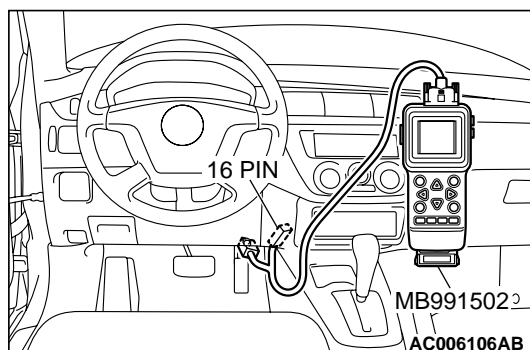
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

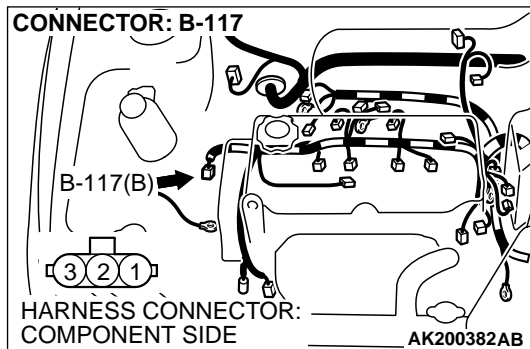
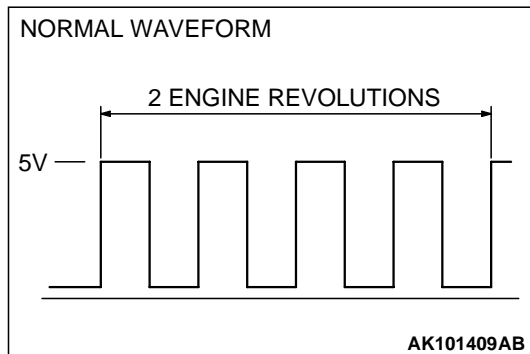
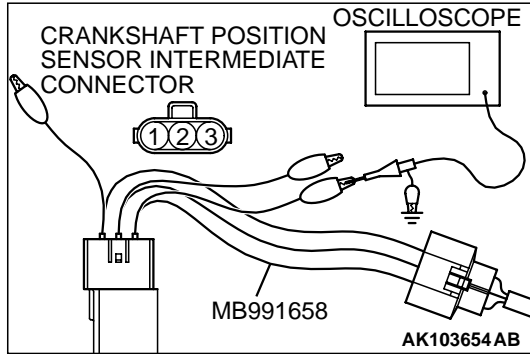
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should much.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





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

- (1) Disconnect the crankshaft position sensor intermediate connector B-117, and connect test harness special tool (MB991658) in between. (All terminals should be connected.)
- (2) Connect the oscilloscope probe to the crankshaft position sensor side connector terminal No. 3.  
*NOTE: Connect the oscilloscope probe to terminal No. 89 <M/T> or terminal No. 45 <A/T> by backprobing when measuring with the ECM or PCM connector.*
- (3) Start the engine and run at idle.

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

**Q: Is the waveform normal?**

**YES :** Go to Step 3.

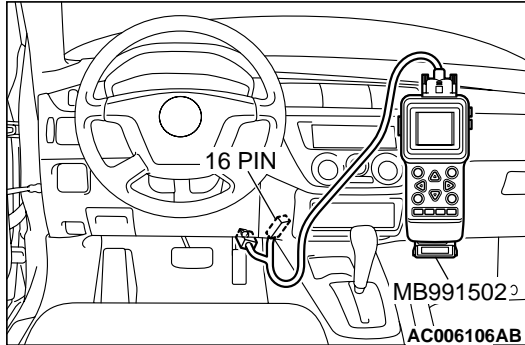
**NO :** Go to Step 5.

### STEP 3. Check connector B-117 at the crankshaft position sensor for damage.

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.



**STEP 4. Using scan tool MB991502, check data list item 22: Crankshaft Position Sensor.**

**⚠ CAUTION**

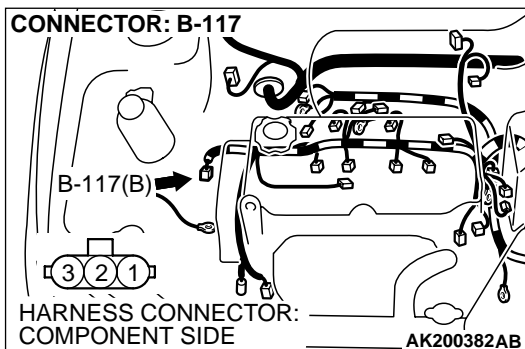
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the data reading mode for item 22, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should much.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM or PCM. Then go to Step 23.



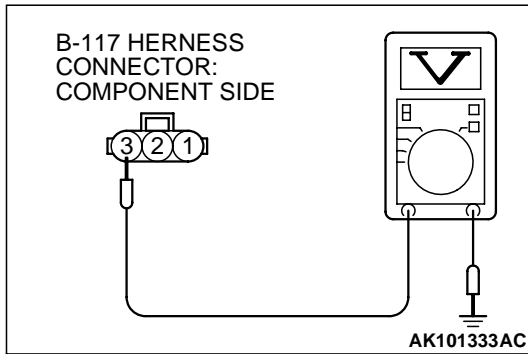
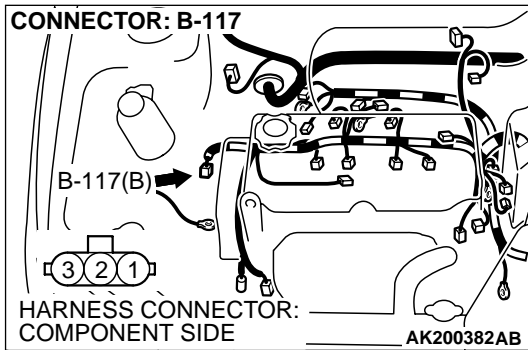
**STEP 5. Check connector B-117 at the crankshaft position sensor for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.



**STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-117.**

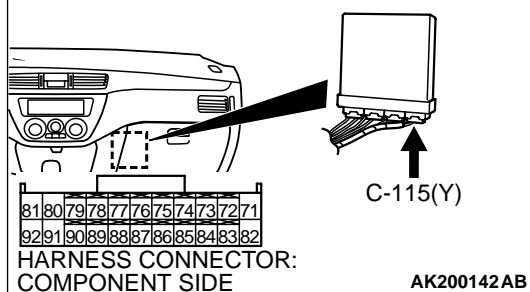
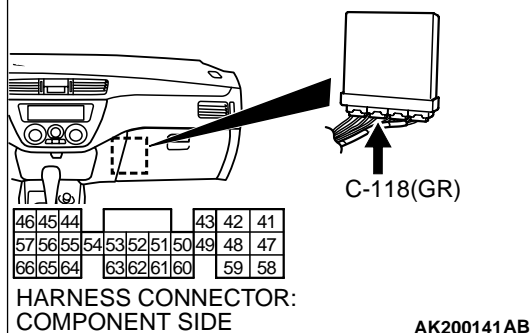
- (1) Disconnect connector B-117 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.8 and 5.2 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 11.

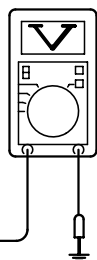
**NO :** Go to Step 7.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

&lt;M/T&gt;

C-115 HARNESS  
CONNECTOR:  
HARNESS SIDE

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92



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**STEP 7. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the crankshaft position sensor connector B-117.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 89 <M/T> or No. 45 <A/T> and ground by backprobing.

- Voltage should measure between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

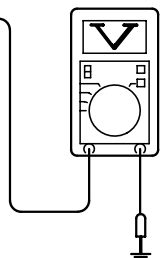
**YES :** Go to Step 8.

**NO :** Go to Step 9.

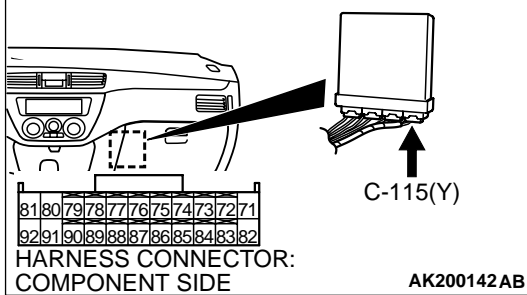
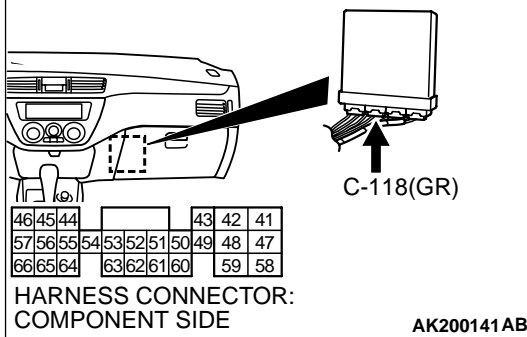
&lt;A/T&gt;

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

41	42	43					44	45	46	
47	48	49	50	51	52	53	54	55	56	57
58	59		60	61	62	63		64	65	66



AK000297AJ

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 8. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair it because of open circuit between crankshaft position sensor connector B-117 (terminal No. 3) and ECM connector C-115 (terminal No. 89) <M/T> or PCM connector C-118 (terminal No. 45) <A/T>. Then go to Step 23.

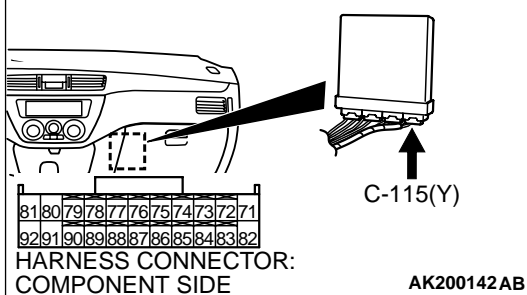
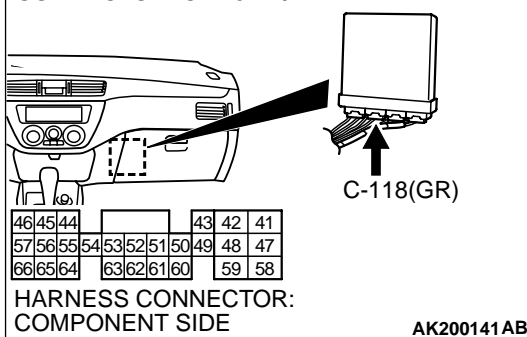
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.

**STEP 9. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> 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 go to Step 23.

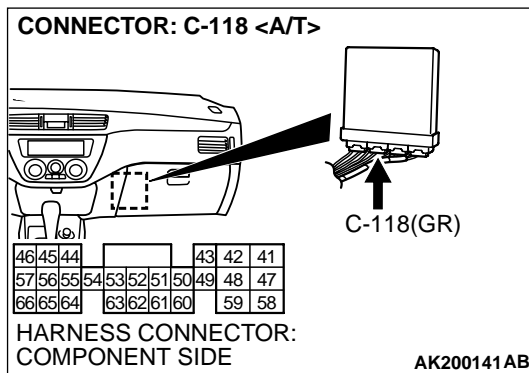
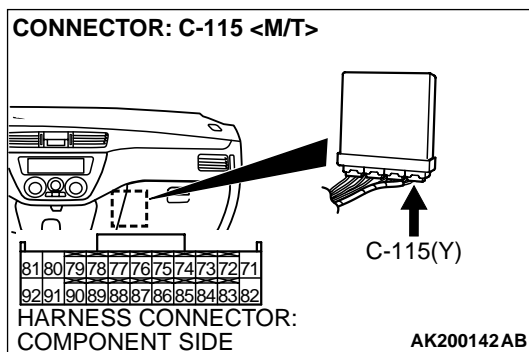
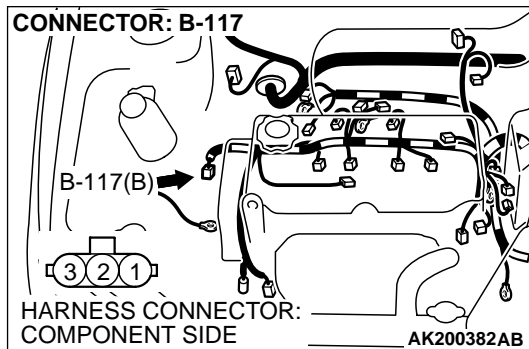
**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

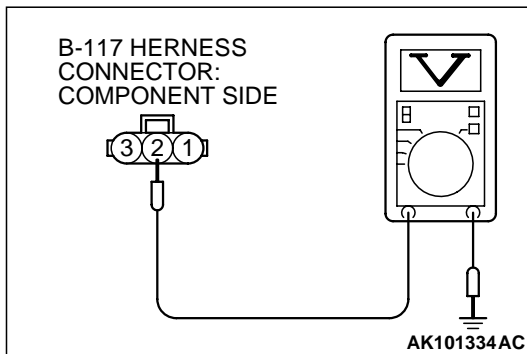
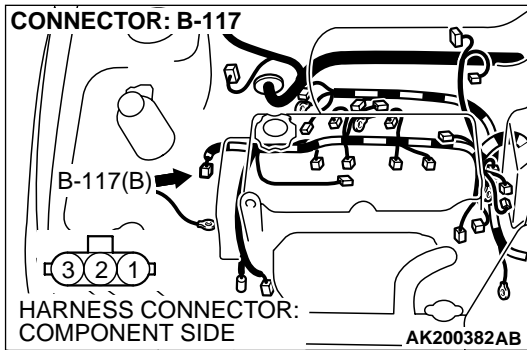
**STEP 10.** Check for short circuit to ground between crankshaft position sensor connector B-117 (terminal No. 3) and ECM connector C-115 (terminal No. 89) <M/T> or PCM connector C-118 (terminal No. 45) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 23.

**NO :** Repair it. Then go to Step 23.





**STEP 11. Measure the power supply voltage at crankshaft position sensor harness side connector B-117.**

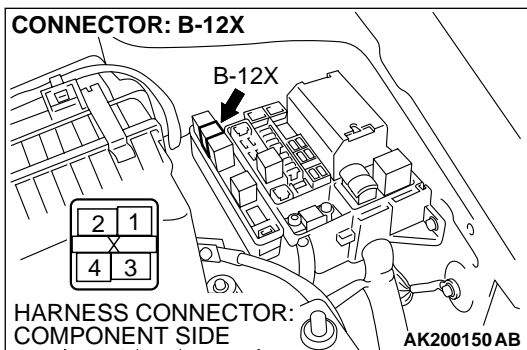
- (1) Disconnect connector B-117 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 2 and ground.
  - Voltage should measure battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 13.

**NO :** Go to Step 12.

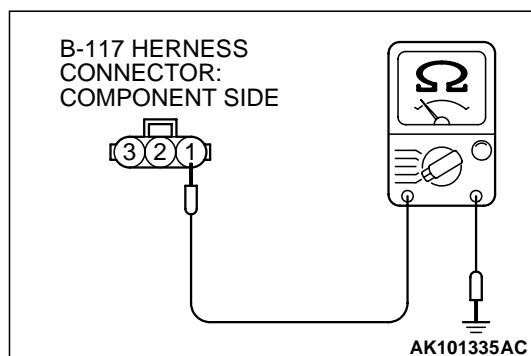
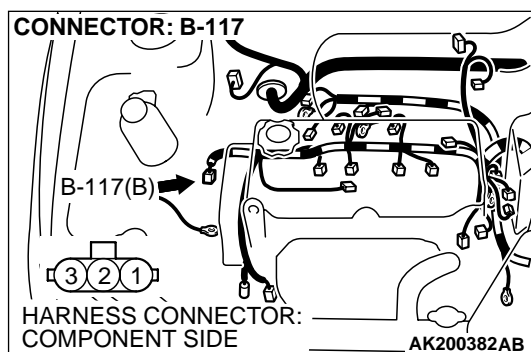


**STEP 12. Check connector B-12X at MFI relay for damage.**

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

**YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and crankshaft position sensor connector B-117 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 23.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.



**STEP 13. Check for continuity at crankshaft position sensor harness side connector B-117.**

(1) Disconnect connector B-117 and measure at the harness side.

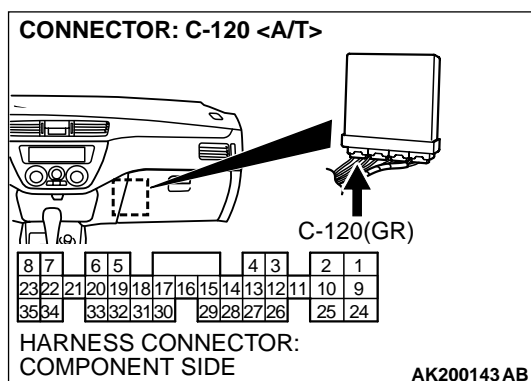
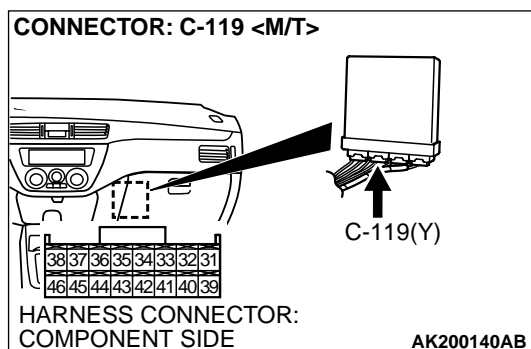
(2) Check for the continuity between terminal No. 1 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 16.

**NO :** Go to Step 14.

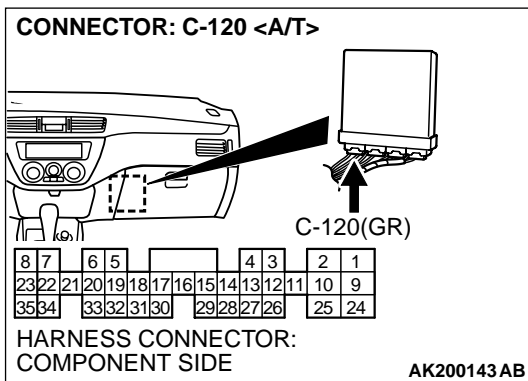
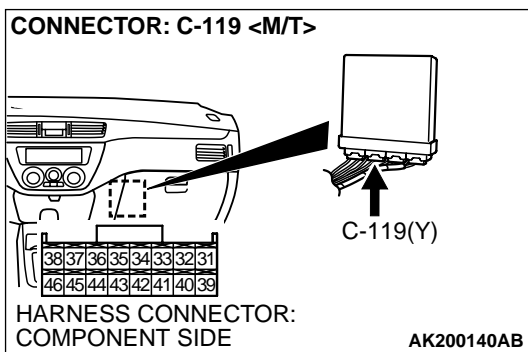
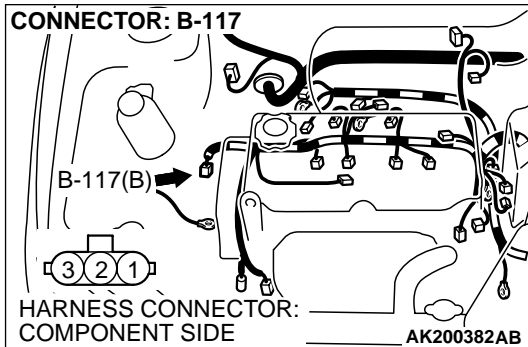


**STEP 14. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 15.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.

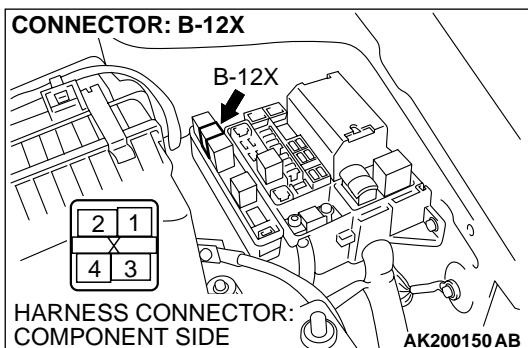


**STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-117 (terminal No. 1) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 23.

**NO :** Repair it. Then go to Step 23.

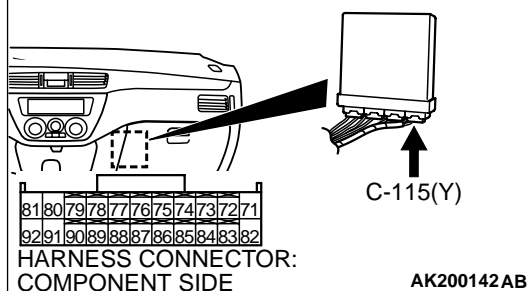


**STEP 16. Check connector B-12X at the MFI relay for damage.**

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

**YES :** Go to Step 17.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.

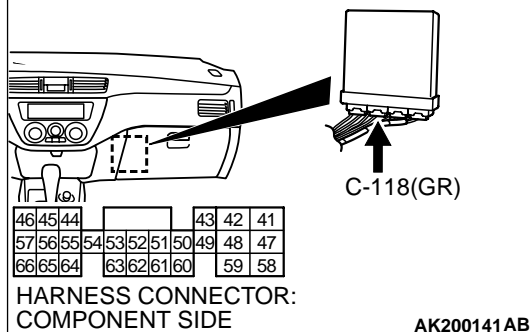
**CONNECTOR: C-115 <M/T>**

**STEP 17. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 18.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.

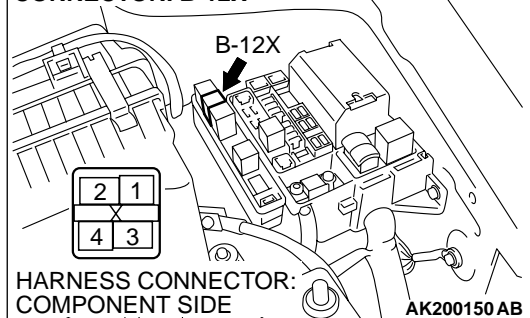
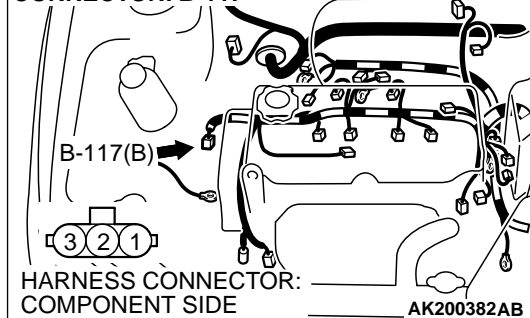
**CONNECTOR: C-118 <A/T>**

**STEP 18. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and crankshaft position sensor connector B-117 (terminal No. 2).**

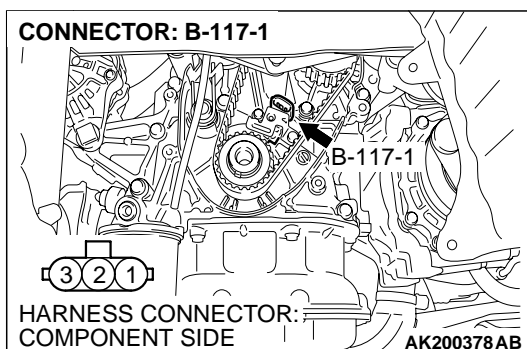
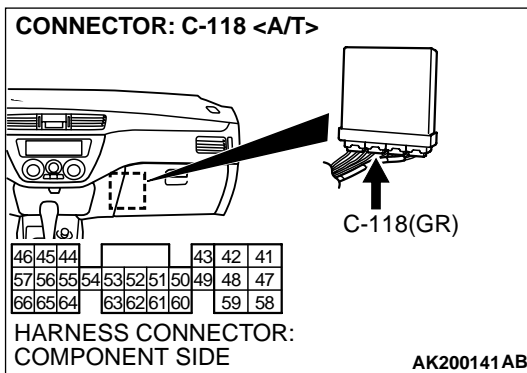
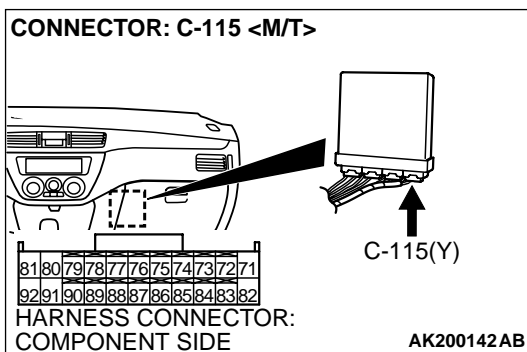
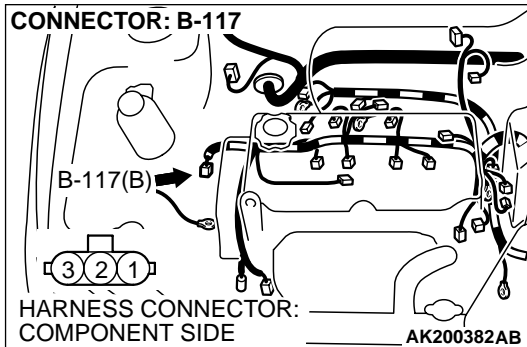
**Q: Is the harness wire in good condition?**

**YES :** Go to Step 19.

**NO :** Repair it. Then go to Step 23.

**CONNECTOR: B-12X****CONNECTOR: B-117**





**STEP 19. Check for harness damage between crankshaft position sensor connector B-117 (terminal No. 3) and ECM connector C-115 (terminal No. 89) <M/T> or PCM connector C-118 (terminal No. 45) <A/T>.**

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

**YES :** Go to Step 20.

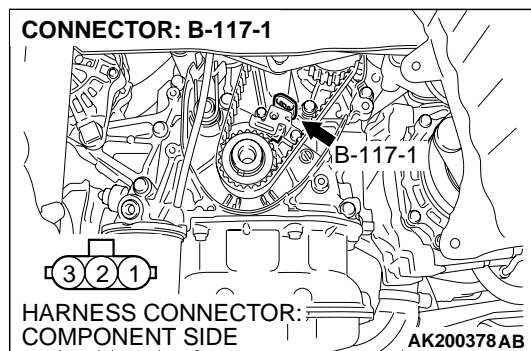
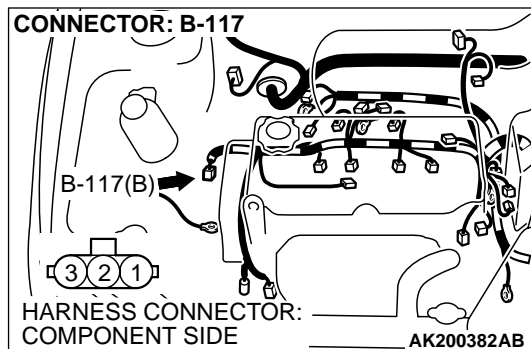
**NO :** Repair it. Then go to Step 23.

**STEP 20. Check connector B-117-1 for damage.**

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

**YES :** Go to Step 21.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 23.



**STEP 21. Check for open circuit and short circuit to ground and harness damage between connector B-117 and connector B-117-1.**

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

**YES :** Go to Step 22.

**NO :** Replace the timing belt cover (lower). Then go to Step 23.

**STEP 22. Check the crankshaft sensing blade.**

**Q: Is the crankshaft sensing blade in a good condition?**

**YES :** Replace the crankshaft position sensor. Then go to Step 23.

**NO :** Repair it. Then go to Step 23.

**STEP 23. Perform the OBD-II drive cycle.**

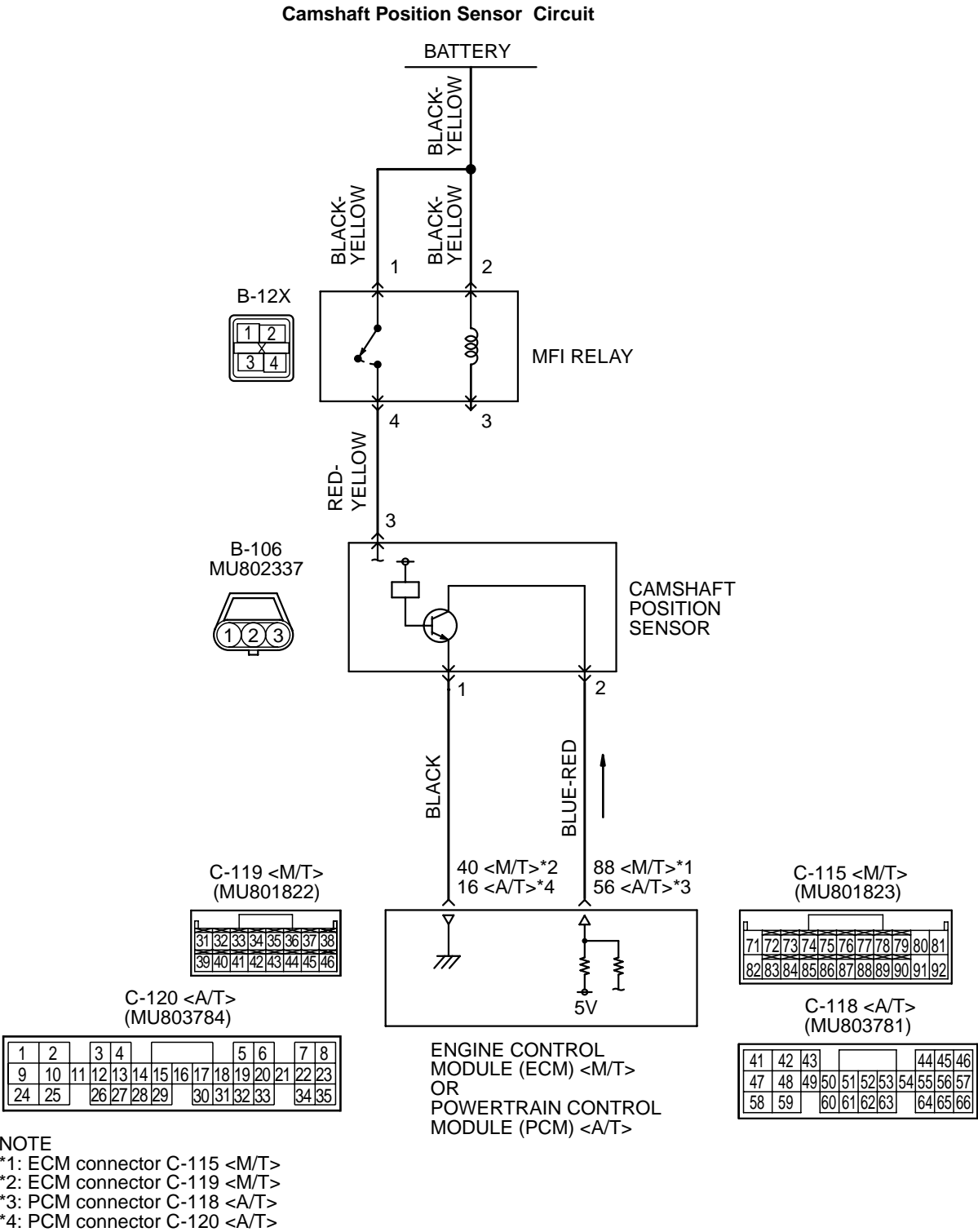
- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0335 set?**

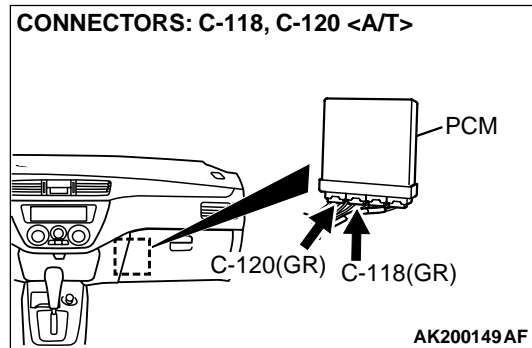
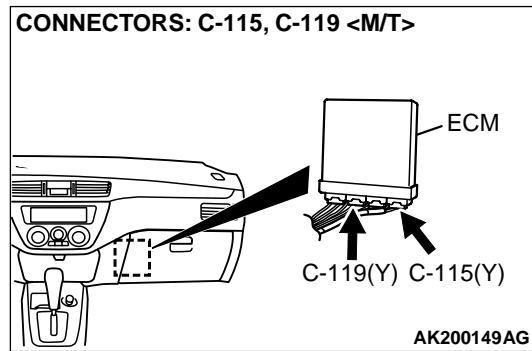
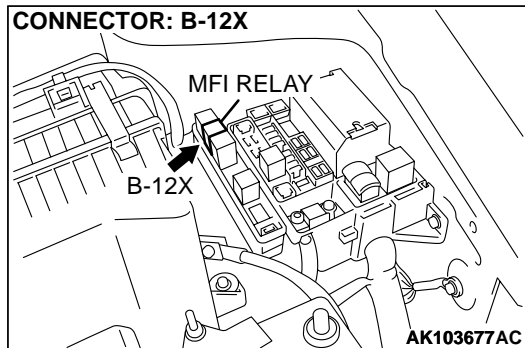
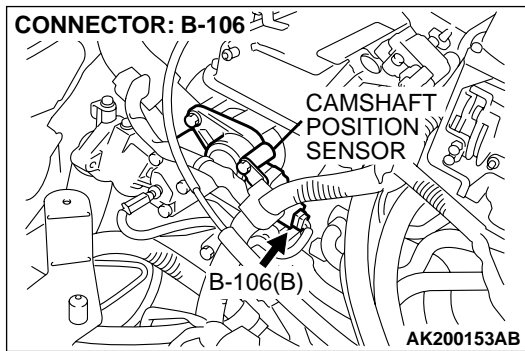
**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

DTC P0340: Camshaft Position Sensor Circuit



AK100029



### CIRCUIT OPERATION

- The camshaft position sensor power is supplied from the MFI relay (terminal No. 4).
- Terminal No. 1 of the camshaft position sensor is grounded with ECM (terminal No. 40) <M/T> or PCM (terminal No. 16) <A/T>.
- A 5-volt voltage is applied on the camshaft position sensor output terminal (terminal No. 2) from the ECM (terminal No. 88) <M/T> or PCM (terminal No. 56) <A/T>. The camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

### TECHNICAL DESCRIPTION

- The camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM <M/T> or PCM <A/T>.
- When the engine is running, the camshaft position sensor outputs a pulse signal.
- The ECM <M/T> or PCM <A/T> checks whether pulse signal is input while the engine is cranking.

### DTC SET CONDITIONS

#### Check Conditions

- Engine speed is higher than 50 r/min.

#### Judgment Criteria

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

#### Check Conditions

- Engine speed is higher than 50 r/min.

#### Judgment Criteria

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

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

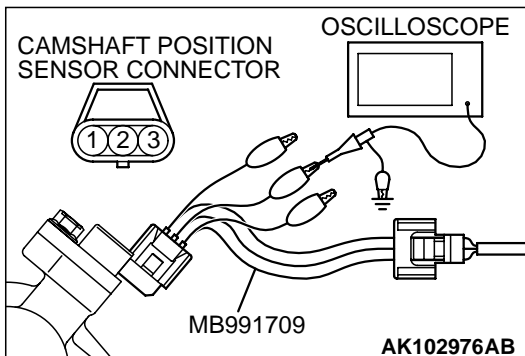
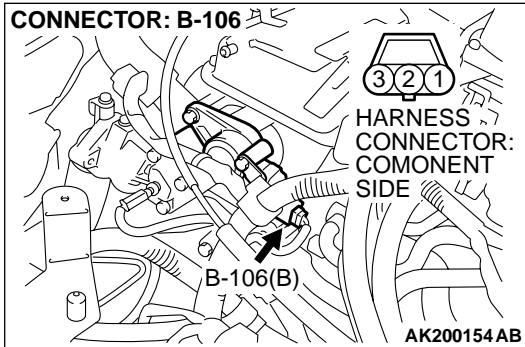
- Camshaft position sensor failed.
- Open or shorted camshaft position sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991709: Test Harness Set

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

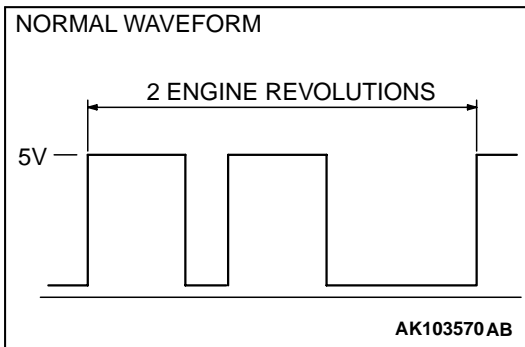
- (1) Disconnect the camshaft position sensor connector B-106, and connect test harness special tool (MB991709) in between. (All terminals should be connected.)



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

*NOTE: When measuring with the ECM or PCM side connector, connect an oscilloscope probe to terminal No. 88 <M/T> or terminal No. 56 <A/T>.*

- (3) Start the engine and run at idle.



- (4) Check the waveform.

- The waveform should show a pattern similar to the illustration.

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

**Q: Is the waveform normal?**

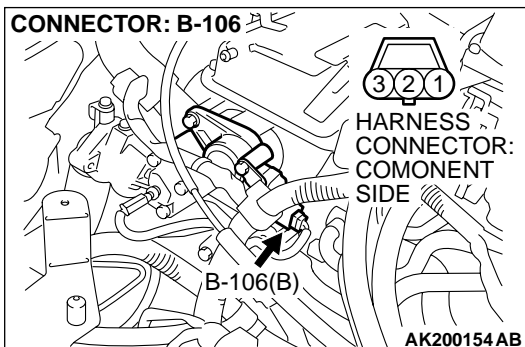
**YES :** Go to Step 2..

**NO :** Go to Step 4.

**STEP 2. Check connector B-106 at camshaft position sensor for damage.****Q: Is the connector in good condition?**

**YES :** Go to Step 3.

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



**STEP 3. Retest the system.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0340 set?**

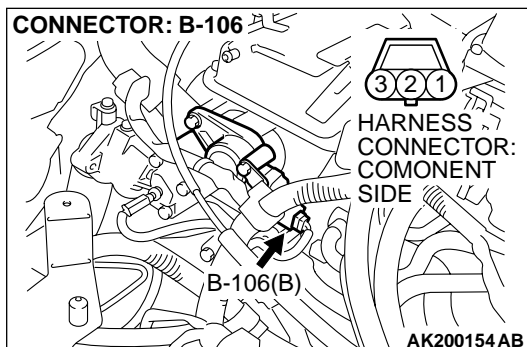
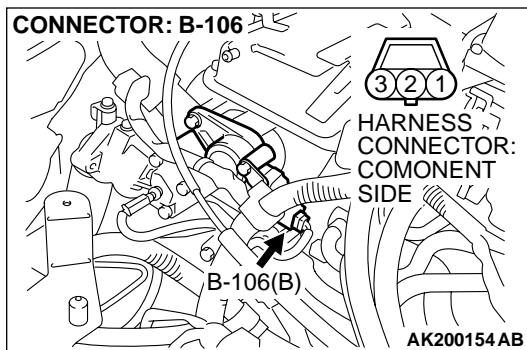
**YES :** Replace the ECM or PCM. Then go to Step 20.

**NO :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

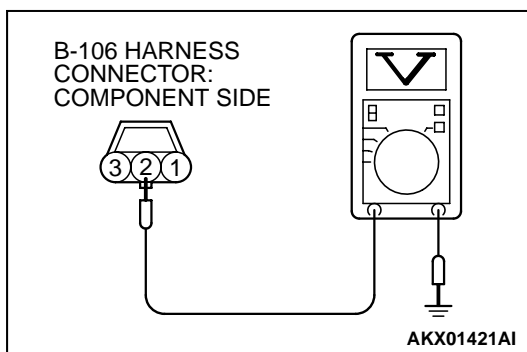
**STEP 4. Check connector B-106 at camshaft position sensor for damage.****Q: Is the connector in good condition?**

**YES :** Go to Step 5.

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

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

- (1) Disconnect connector B-106 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.



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

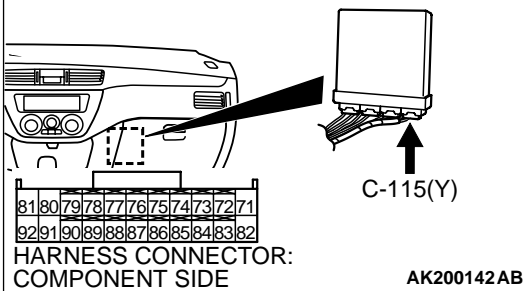
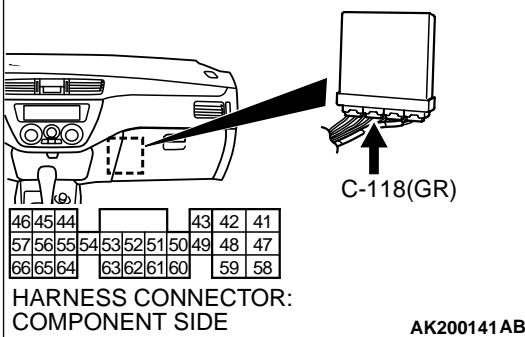
- Voltage should measure between 4.8 and 5.2 volts.

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

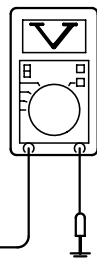
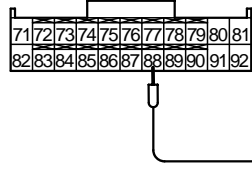
**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 10.

**NO :** Go to Step 6.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

&lt;M/T&gt;

C-115 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000317 AG

**STEP 6. Measure the sensor supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the camshaft position sensor connector B-106.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 88 <M/T> or No. 56 <A/T> and ground by backprobing.

- Voltage should measure between 4.8 and 5.2 volts.

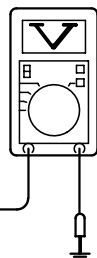
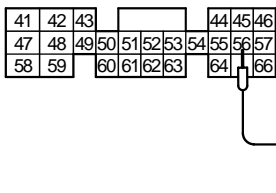
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

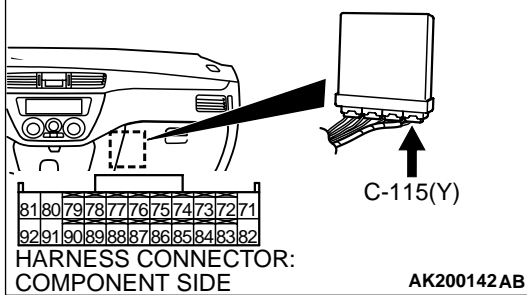
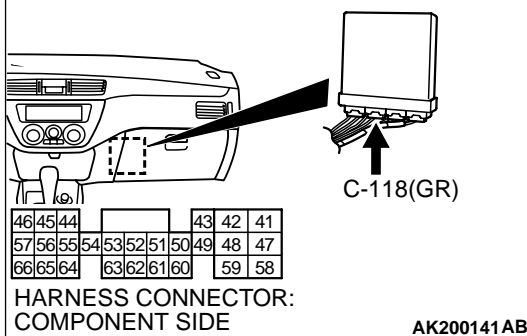
**YES :** Go to Step 7.

**NO :** Go to Step 8.

&lt;A/T&gt;

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000318 AJ

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88) <M/T> or PCM connector C-118 (terminal No. 56) <A/T> because of open circuit. Then go to Step 20.

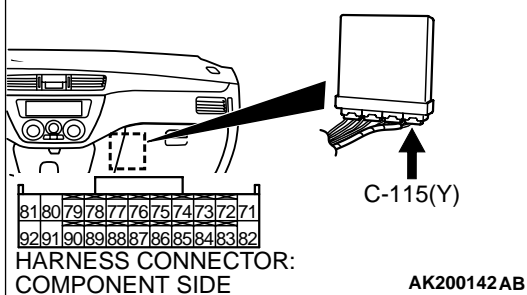
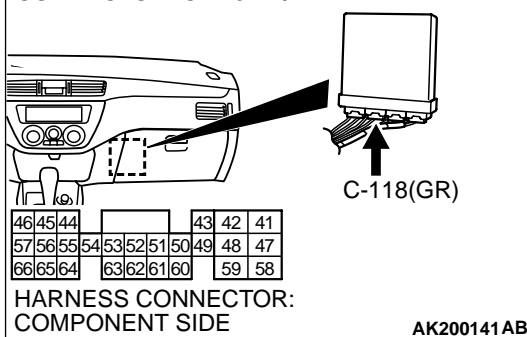
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 20.

**STEP 8. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

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

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

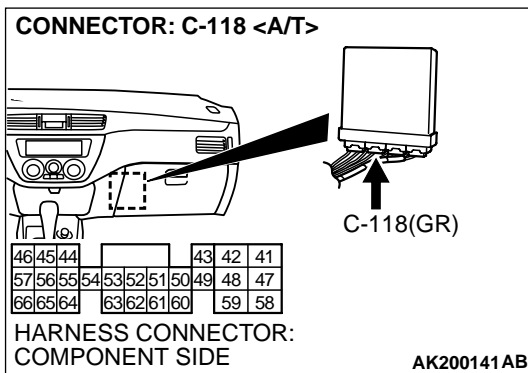
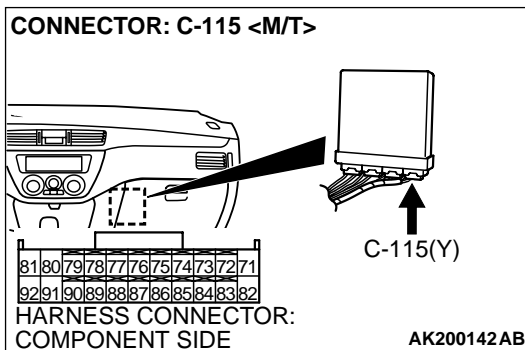
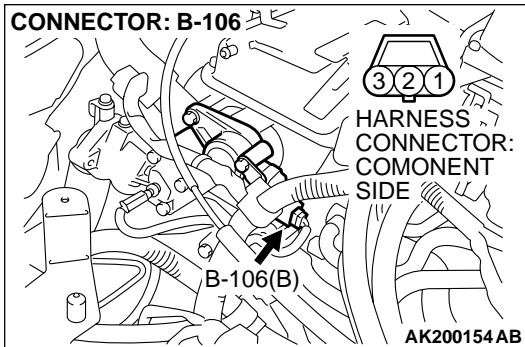


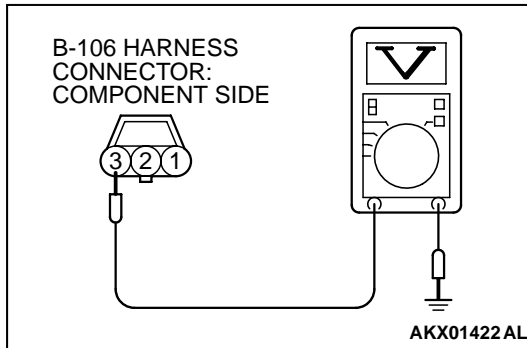
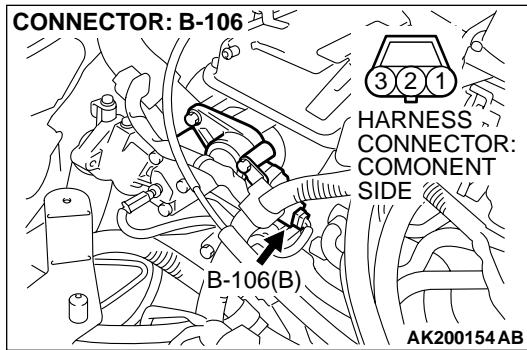
**STEP 9.** Check for short circuit to ground between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88) <M/T> or PCM connector C-118 (terminal No. 56) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 20.

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





**STEP 10. Measure the power supply voltage at camshaft position sensor connector B-106.**

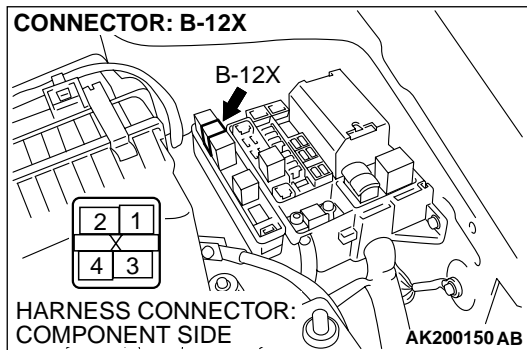
- (1) Disconnect connector B-106 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

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

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

**YES :** Go to Step 12.

**NO :** Go to Step 11.

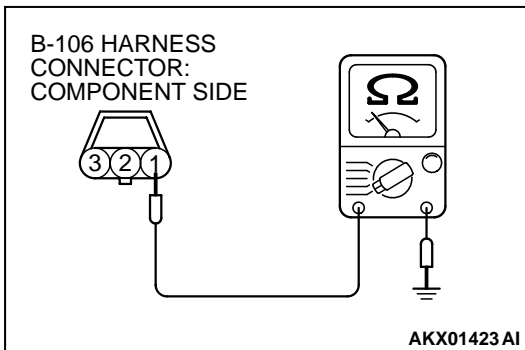
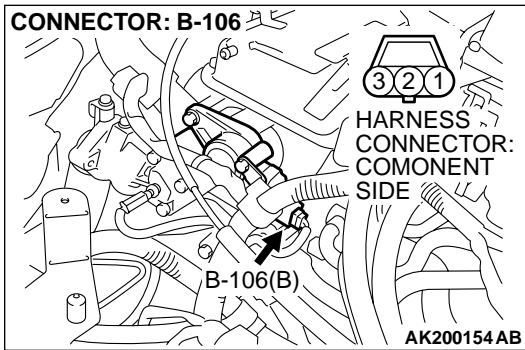


**STEP 11. Check connector B-12X at MFI relay for damage.**

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

**YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 20.

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



**STEP 12. Check for continuity at camshaft position sensor connector B-106.**

(1) Disconnect connector B-106 and measure at the harness side.

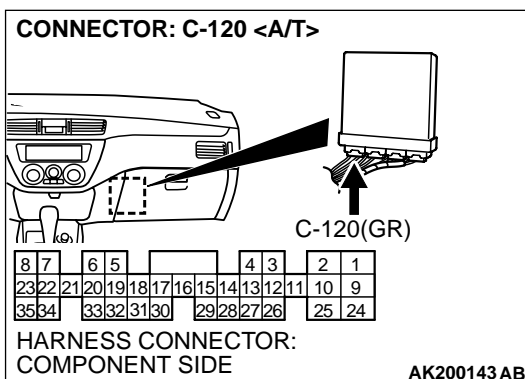
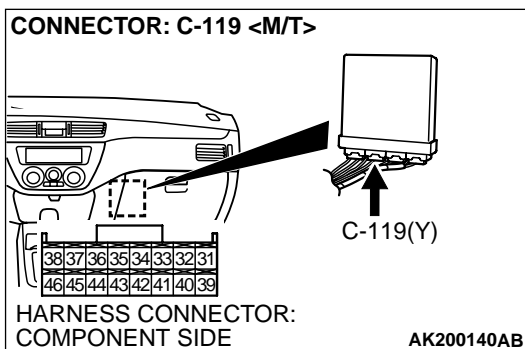
(2) Check for the continuity between terminal No. 1 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 15.

**NO :** Go to Step 13.

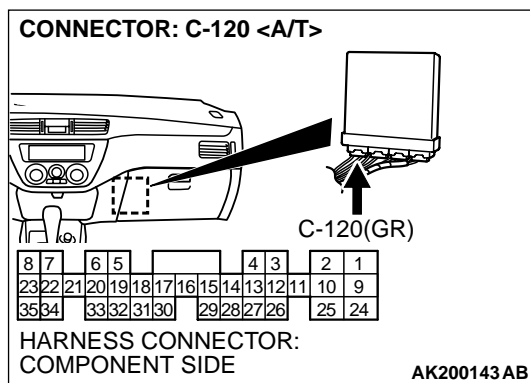
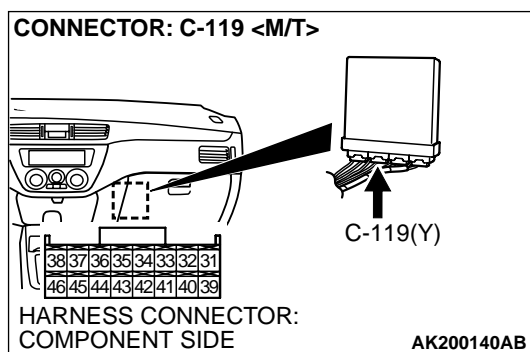
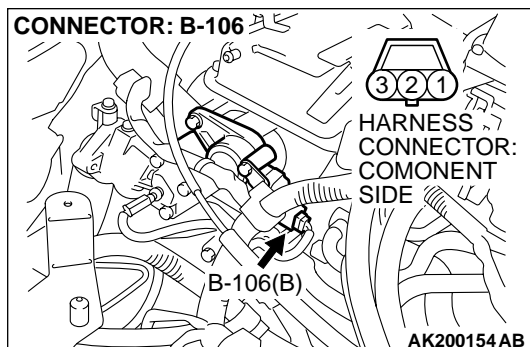


**STEP 13. Check connector C-119 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

**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 go to Step 20.

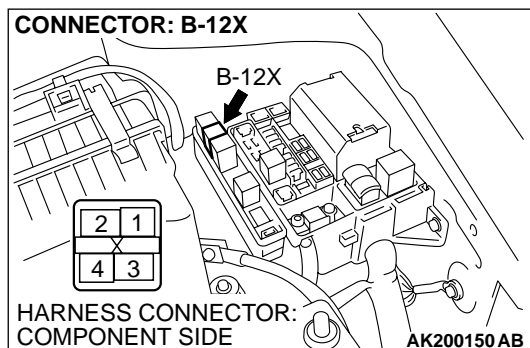


**STEP 14. Check for open circuit and harness damage between camshaft position sensor connector B-106 (terminal No. 1) and ECM connector C-119 (terminal No. 40) <M/T> or PCM connector C-120 (terminal No. 16) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 20.

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

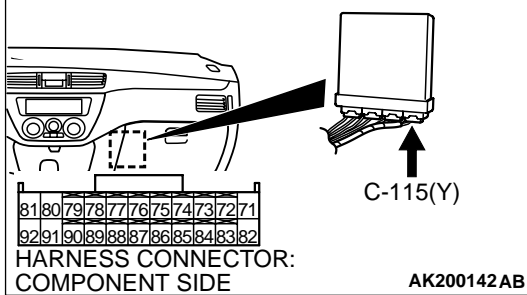


**STEP 15. Check connector B-12X at the MFI relay for damage.**

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

**YES :** Go to Step 16.

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

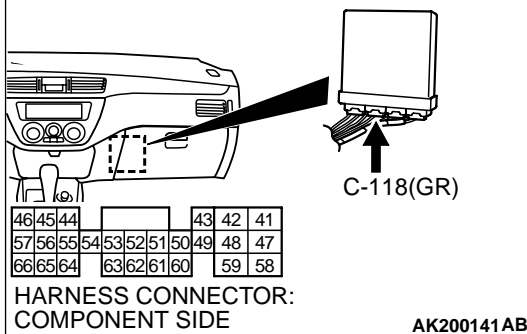
**CONNECTOR: C-115 <M/T>**

**STEP 16. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 17.

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

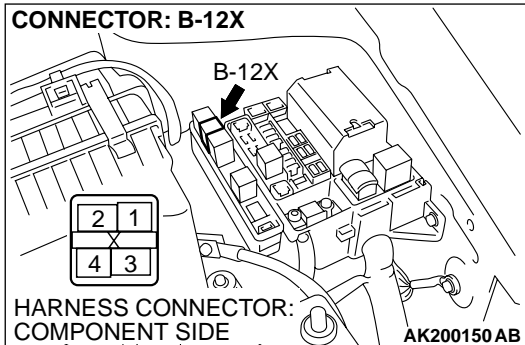
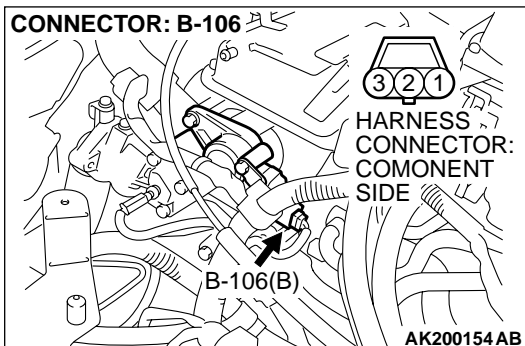
**CONNECTOR: C-118 <A/T>**

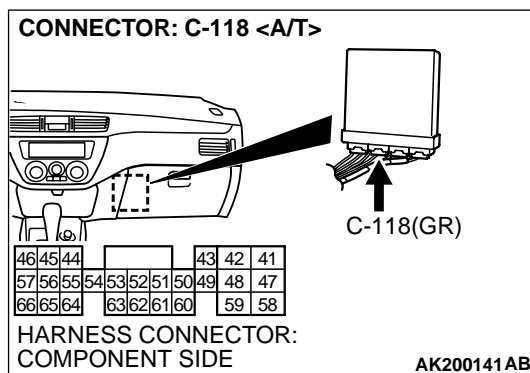
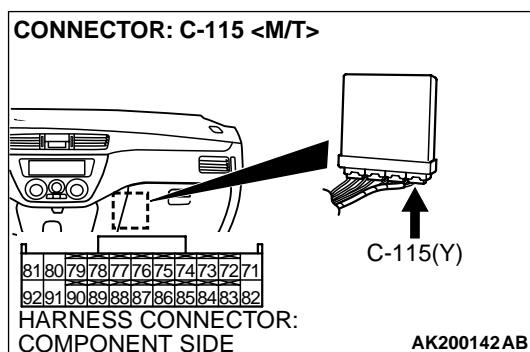
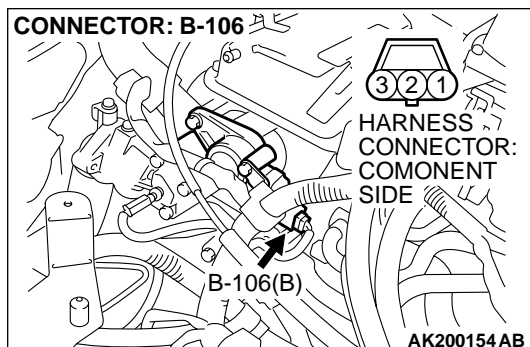
**STEP 17. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and camshaft position sensor connector B-106 (terminal No. 3).**

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

**YES :** Go to Step 18.

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

**CONNECTOR: B-12X****CONNECTOR: B-106**



**STEP 18. Check for harness damage between camshaft position sensor connector B-106 (terminal No. 2) and ECM connector C-115 (terminal No. 88) <M/T> or PCM connector C-118 (terminal No. 56) <A/T>.**

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

**YES :** Go to Step 19.

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

**STEP 19. Check the camshaft position sensing cylinder.**

**Q: Is the camshaft position sensing cylinder in a good condition?**

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

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

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0340 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

---

**DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected**

---

**TECHNICAL DESCRIPTION**

- When the EGR solenoid switches from "OFF" to "ON" while the engine is running, EGR gas flows.
- The ECM <M/T> or PCM <A/T> checks how the EGR gas flow signal changes.

**DTC SET CONDITIONS****Check Conditions**

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76°C (169°F).
- Engine speed is at between 1,000 and 1,800 <M/T> or 880 and 1,800 <A/T> r/min.
- Intake air temperature is higher than 0°C (32°F).
- Barometric pressure is higher than 76 kPa (11 psi).
- Vehicle speed is 1.5 km/h (0.9 mph) <M/T> or 30 km/h (18.7 mph) <A/T> or more.
- At least 90 seconds have passed since manifold differential pressure sensor output voltage fluctuated 1.5 volts or more.
- The throttle valve is closed.

- Volumetric efficiency is lower than 15 <M/T> or 25 <A/T> percent.
- While fuel is being shut off. <M/T>
- 20 seconds have elapsed from the start of the previous monitoring.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 3 cycles of 2 seconds each during the drive cycle.

**Judgement Criteria**

- The intake manifold pressure fluctuation width is lower than 3.5 kPa (0.50 psi). When the EGR solenoid is turned ON.

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

- EGR valve does not open.
- EGR control vacuum is too low.
- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- Manifold differential pressure sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

---

### STEP 1. Check the EGR system.

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR System Check [P.17-117](#).

#### Q: Are there any abnormalities?

**YES** : Go to Step 2.

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

---

### STEP 2. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.

#### CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
- (4) Warm up the engine to normal operating temperature: 80°C to 95°C (176°F to 203°F).
  - Should be between 64 – 78 kPa (18.9 – 23.0 in.Hg) at engine idling.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES** : Clean the EGR valve and EGR passage. Then go to Step 3.

**NO** : Refer to, DTC P1400 – Manifold Differential Pressure Sensor Circuit Malfunction [P.13Ac-537](#).

---

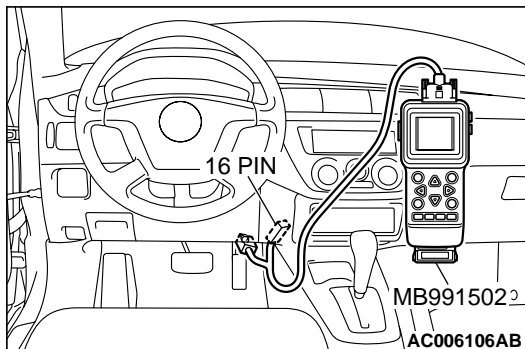
### STEP 3. Perform the OBD-II drive cycle.

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 5 – Exhaust Gas Recirculation (EGR) System Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

#### Q: Is DTC P0401 set?

**YES** : Repeat the troubleshooting.

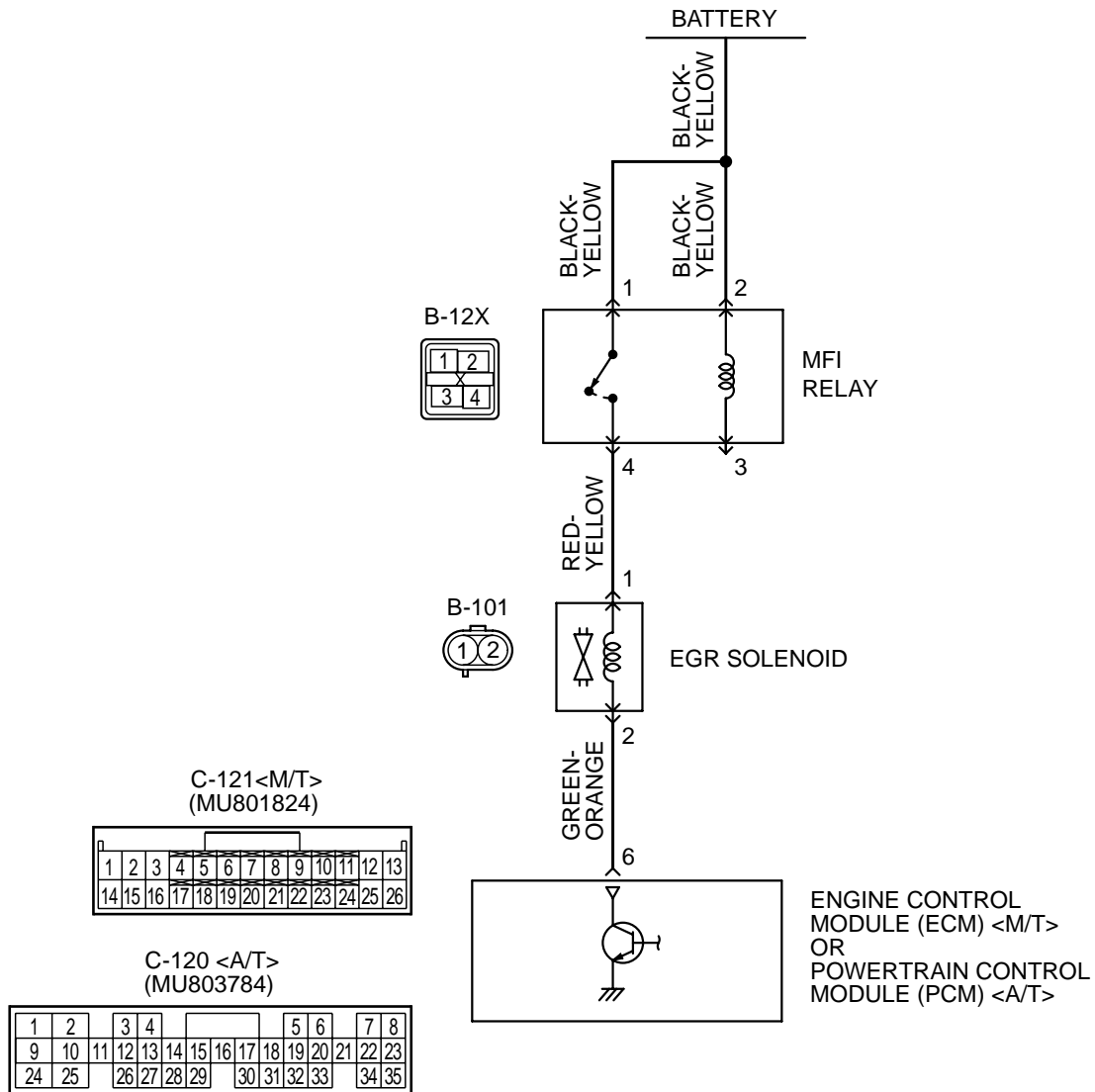
**NO** : The procedure is complete.



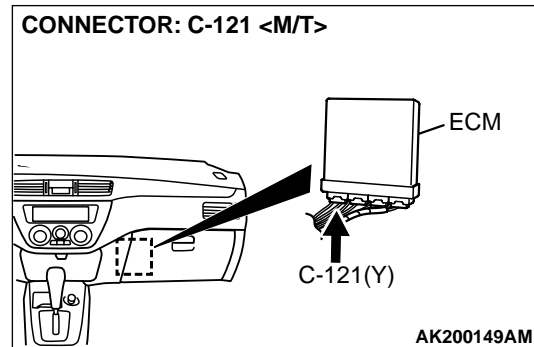
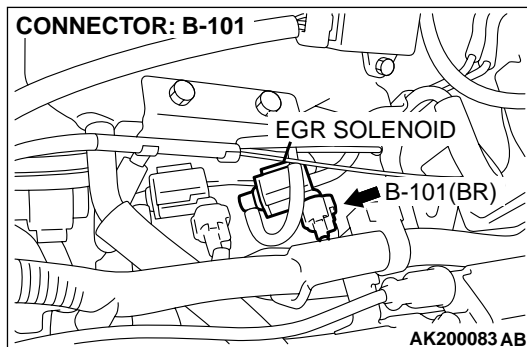


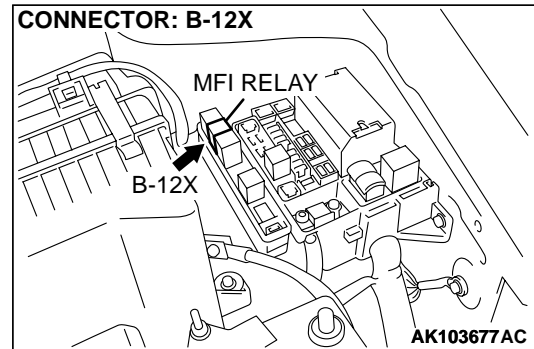
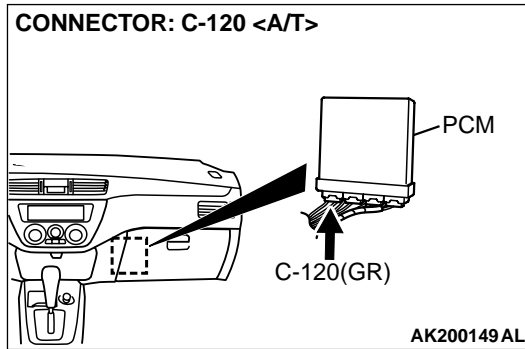
## DTC P0403: Exhaust Gas Recirculation Control circuit

## EGR Solenoid Circuit



AK100030





### CIRCUIT OPERATION

- The EGR solenoid power is supplied from the MFI relay (terminal 4).
- The ECM <M/T> or PCM <A/T> controls the EGR solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

### TECHNICAL DESCRIPTION

- To judge if there is open circuit in the EGR solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the EGR solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the EGR solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 volts or more.

### DTC SET CONDITIONS

#### Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

#### Judgment Criteria

- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.

- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

#### Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the EGR solenoid is between 10 and 90 percent.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

#### Judgment Criteria

- The EGR solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the EGR solenoid is turned OFF.

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

- EGR solenoid failed.
- Open or shorted EGR solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check actuator test item 10: EGR solenoid.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the actuator test mode for item 10, EGR solenoid.
  - An operation sound should be heard and vibration should be felt when the EGR solenoid is operated.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

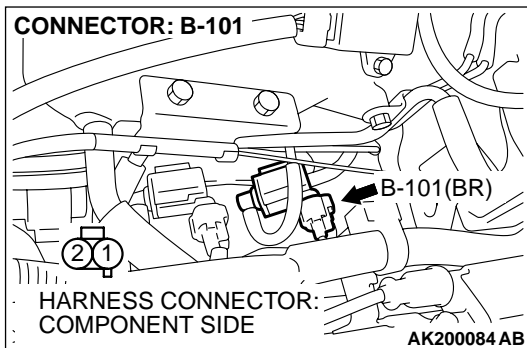
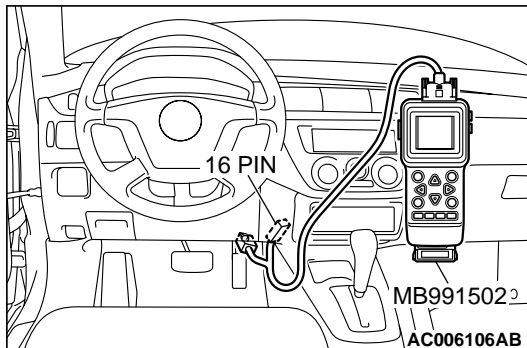
**NO :** Go to Step 2.

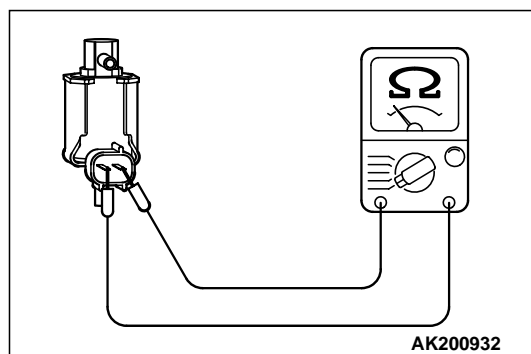
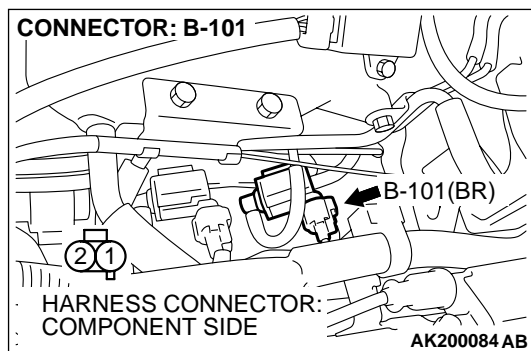
**STEP 2. Check connector B-101 at the EGR solenoid for damage.**

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

**YES :** Go to Step 3.

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



**STEP 3 Check the EGR solenoid.**

(1) Disconnect the EGR solenoid connector B-101.

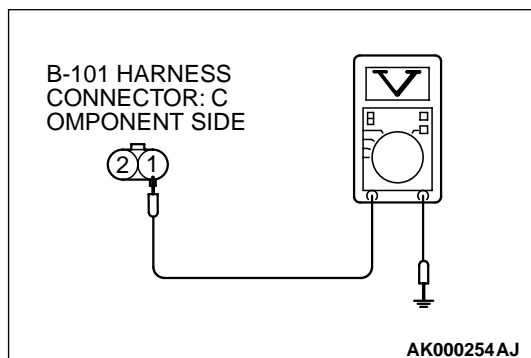
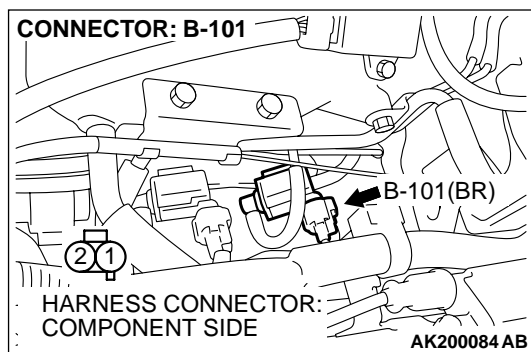
(2) Measure the resistance between EGR solenoid side connector terminal No. 1 and No. 2.

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

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

**YES :** Go to Step 4.

**NO :** Replace the EGR solenoid. Then go to Step 12.

**STEP 4. Measure the power supply voltage at EGR solenoid harness side connector B-101.**

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

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

(3) Measure the voltage between terminal No. 1 and ground.

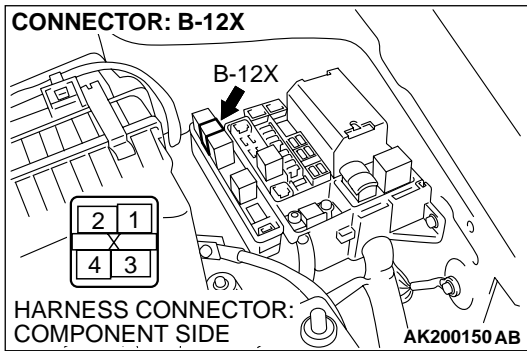
- Voltage should measure battery positive voltage.

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

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.

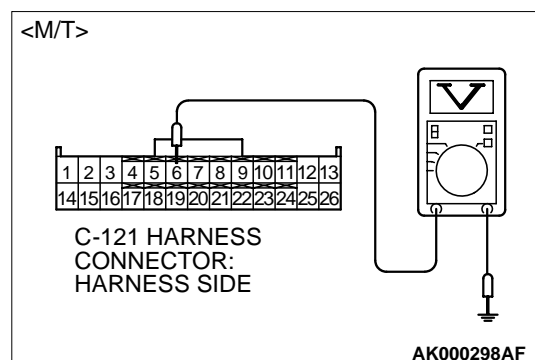
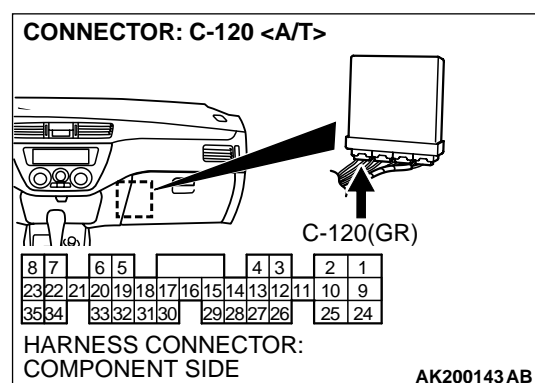
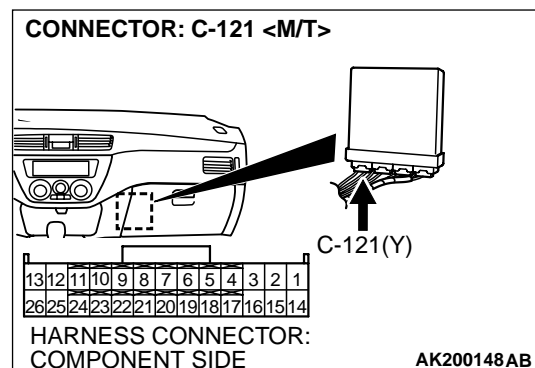
**STEP 5. Check connector B-12X at MFI relay for damage.****Q: Is the connector in good condition?**

**YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and EGR solenoid connector B-101 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

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

**STEP 6. Measure the power supply voltage at ECM connector C-121 <M/T> or PCM connector C-120 <A/T> by backprobing.**

- (1) Do not disconnect connector C-121 <M/T> or C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal No. 6 and ground by backprobing.

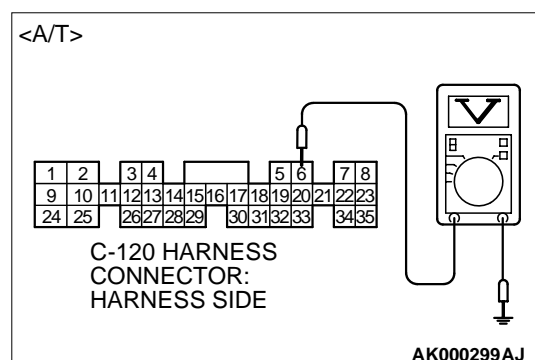
- Voltage should measure battery positive voltage.

- (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 :** Go to Step 7.



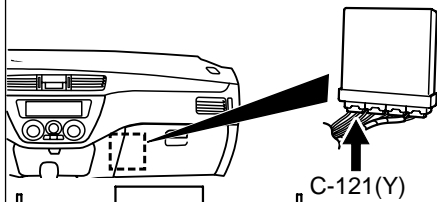
**STEP 7. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

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

**CONNECTOR: C-121 <M/T>**

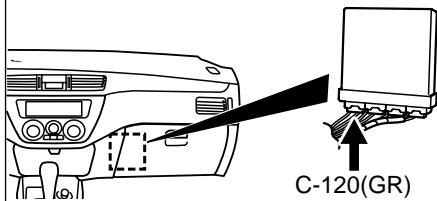


13	12	11	10	9	8	7	6	5	4	3	2	1
26	25	24	23	22	21	20	19	18	17	16	15	14

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200148AB

**CONNECTOR: C-120 <A/T>**



8	7	6	5			4	3	2	1
23	22	21	20	19	18	17	16	15	14
35	34	33	32	31	30	29	28	27	26
								25	24

HARNESS CONNECTOR:  
COMPONENT SIDE

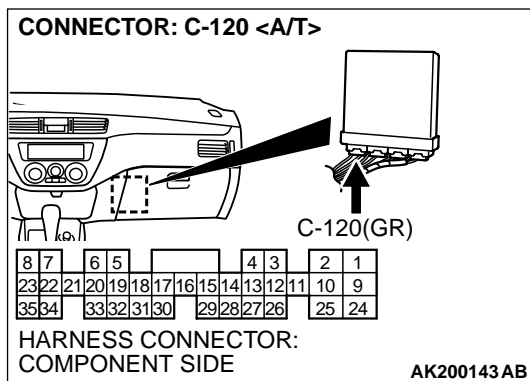
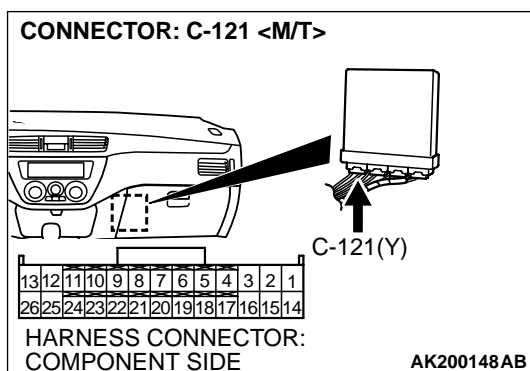
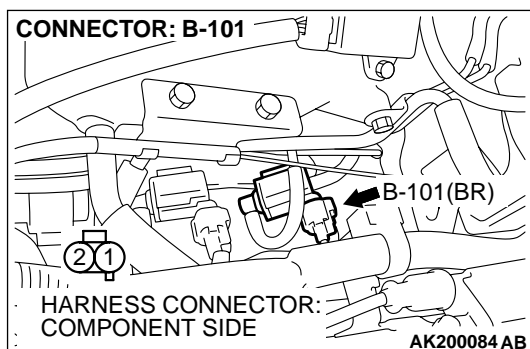
AK200143AB

**STEP 8.** Check for open circuit and short circuit to ground between EGR solenoid connector B-101 (terminal No. 2) and ECM connector C-121 (terminal No. 6) <M/T> or PCM connector C-120 (terminal No. 6) <A/T>.

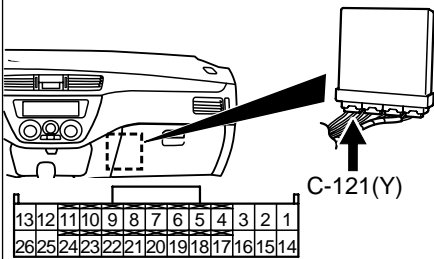
**Q:** Is the harness wire in good condition?

**YES :** Replace the ECM or PCM. Then go to Step 12.

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

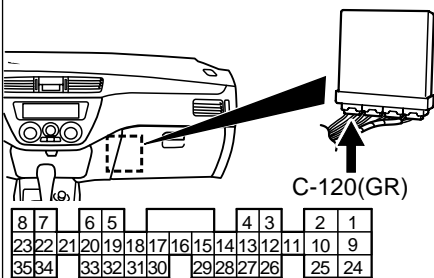




**CONNECTOR: C-121 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200148AB

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

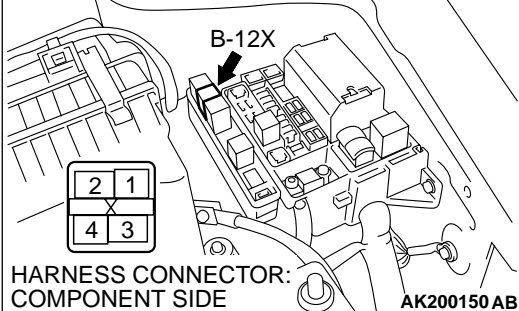
AK200143AB

**STEP 9. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> 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 go to Step 12.

**CONNECTOR: B-12X**

HARNESS CONNECTOR:  
COMPONENT SIDE

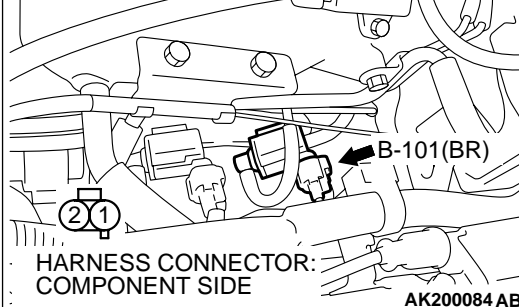
AK200150AB

**STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and EGR solenoid connector B-101 (terminal No. 1).**

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

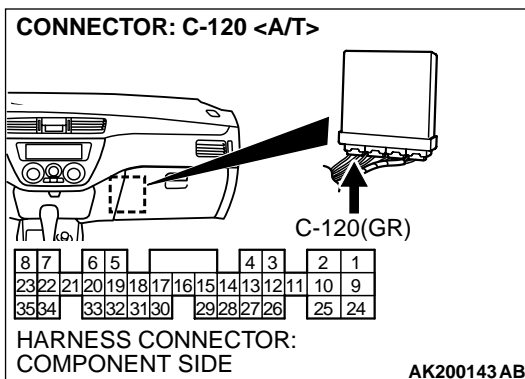
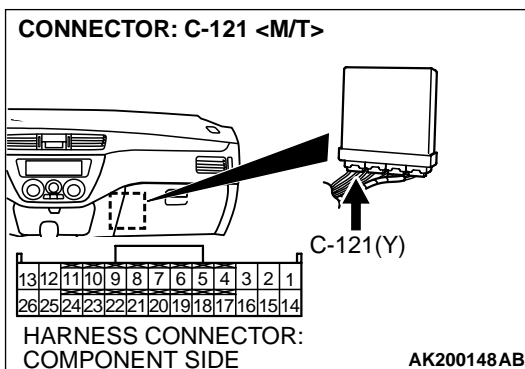
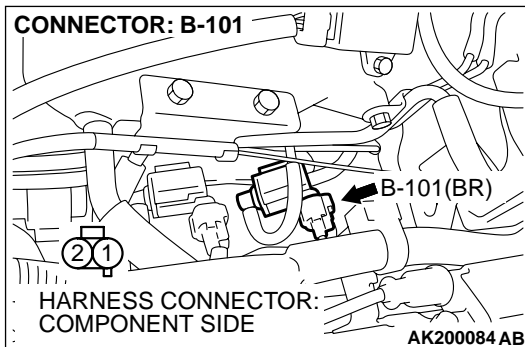
**YES :** Go to Step 11.

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

**CONNECTOR: B-101**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200084AB



**STEP 11. Check for harness damage between EGR solenoid connector B-101 (terminal No. 2) and ECM connector C-121 (terminal No. 6) <M/T> or PCM connector C-120 (terminal No. 6) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0403 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

---

**DTC P0421: Warm Up Catalyst Efficiency Below Threshold**

---

**TECHNICAL DESCRIPTION**

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM <M/T> or PCM <A/T> compares the output of the front and rear heated oxygen sensor signals.
- Barometric pressure is higher than 76 kPa (11 psi).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (0.93 mph) or more.
- The ECM <M/T> or PCM <A/T> monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is at between -25 and +25 percent.
- The cumulative volume air flow sensor output frequency is higher than 4,000 Hz.

**DTC SET CONDITIONS****Check Conditions**

- Engine speed is lower than 3,000 r/min.
- Volume air flow sensor output frequency is at between 75 and 150 Hz.
- The throttle valve is open.
- More than 3 seconds has elapsed after the three above-mentioned conditions have been met.
- Intake air temperature is higher than -10°C (14°F).

**Judgment Criteria**

- The heated oxygen sensor (rear) signal frequency divided by heated oxygen sensor (front) signal frequency = 0.75 <Federal emission regulation> or 0.8 <California emission regulation> or more.

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

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

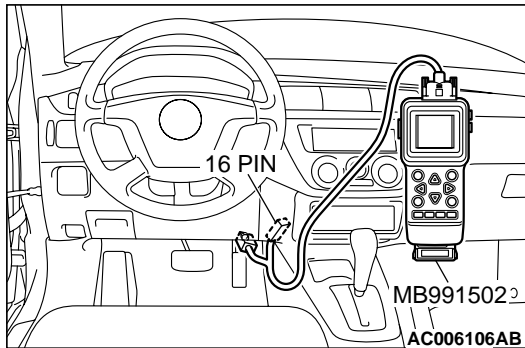
- MB991502: Scan Tool (MUT-II)

---

**STEP 1. Check for exhaust leaks.****Q: Are there any abnormalities?**

**YES** : Go to Step 2.

**NO** : Repair it. Then go to Step 7.



**STEP 2. Using scan tool MB991502, check data list item 59: Heated Oxygen Sensor (rear).**

**⚠ CAUTION**

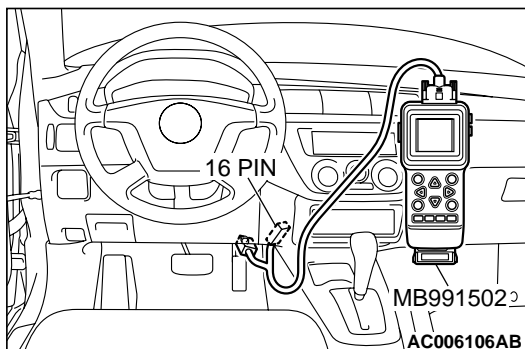
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 59, Heated Oxygen Sensor (rear).
  - Warm up the engine. When the engine is revved, the output voltage should repeat 0 volt and 0.6 to 1.0 volt alternately.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 3.

**NO :** Refer to, DTC P0136 – Heated Oxygen Sensor Circuit (sensor 2) [P.13Ac-179](#), DTC P0137 – Heated Oxygen Sensor Circuit Low Voltage (sensor 2) [P.13Ac-194](#), DTC P0138 – Heated Oxygen Sensor Circuit High Voltage (sensor 2) [P.13Ac-200](#), DTC P0139 – Heated Oxygen Sensor Circuit Slow Response (sensor 2) [P.13Ac-204](#).



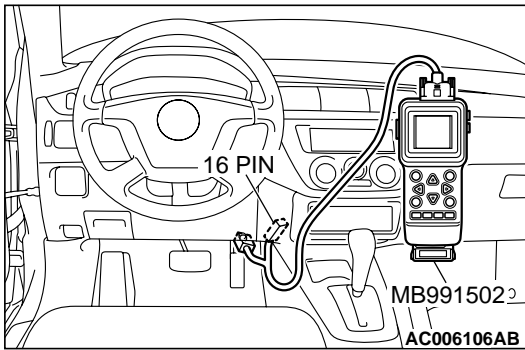
**STEP 3. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 4.

**NO :** Refer to, DTC P0130 – Heated Oxygen Sensor Circuit (sensor 1) [P.13Ac-138](#), DTC P0131 – Heated Oxygen Sensor Low Voltage (sensor 1) [P.13Ac-151](#), DTC P0132 – Heated Oxygen Sensor Circuit High Voltage (sensor 1) [P.13Ac-156](#), DTC P0133 – Heated Oxygen Sensor Circuit Slow Response (sensor 1) [P.13Ac-160](#), DTC P0134 – Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) [P.13Ac-163](#).

**STEP 4. Using scan tool MB991502, check data list item 11: Heated Oxygen Sensor (front).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991502 to the data reading mode for item 11, Heated Oxygen Sensor (front).
- (3) Keep the engine speed at 2,000 r/min.
  - 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 5.

**NO :** Replace the heated oxygen sensor (front). Then go to Step 7.

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0421 set?**

**YES :** Replace the catalytic converter. Then go to Step 6.

**NO :** The procedure is complete.

**STEP 6. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor and Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0421 set?**

**YES :** Replace the ECM or PCM. Then go to Step 7.

**NO :** The procedure is complete.

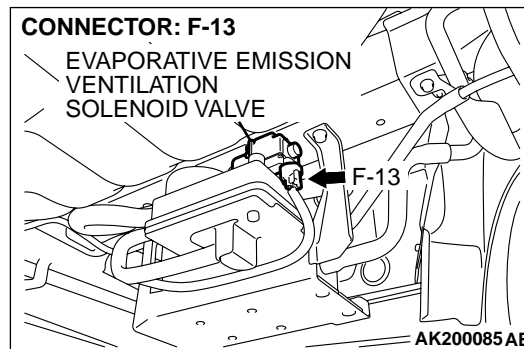
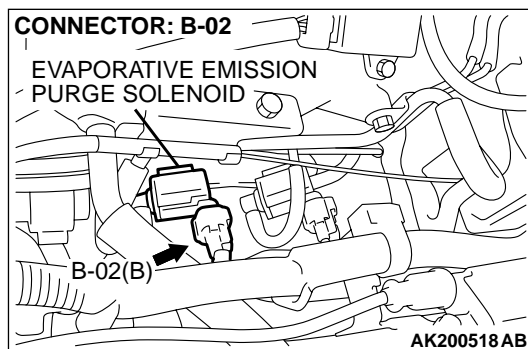
**STEP 7. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 3 – Catalytic Converter Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0421 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

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

- ECM <M/T> or PCM <A/T> detects stuck open of evaporative emission purge solenoid valve and stuck close of evaporative emission ventilation solenoid valve by pressure change in fuel tank.
- Stuck open of evaporative emission purge solenoid valve is judged through monitoring leak of evaporative emission control system.
- Stuck close of evaporative emission ventilation solenoid valve is judged after 20 seconds of end of monitoring leak of evaporative emission control system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

**DTC SET CONDITIONS****Check Conditions**

- ON duty cycle of the evaporative emission purge solenoid is 0 percent.

- 20 seconds have elapsed from the time the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

**Judgment Criteria**

- The pressure in the fuel tank is  $-2$  kPa (0.29 psi) or less for 0.1 second.

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

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Choking up of hose between evaporative emission canister and evaporative emission ventilation solenoid.

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1.** Using scan tool MB991502, read the diagnostic trouble code (DTC).

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

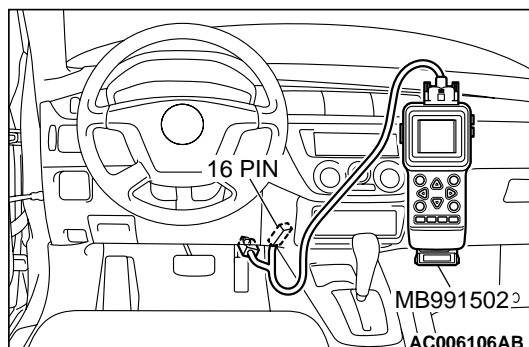
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

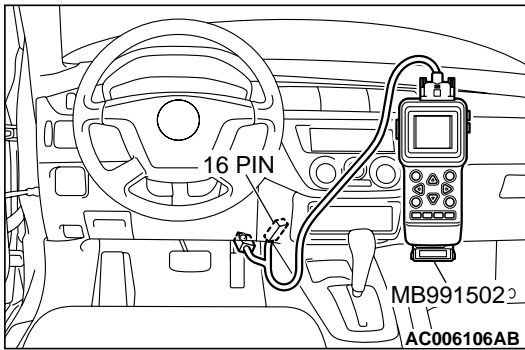
**Q: Is DTC P0451 set?**

**YES :** Refer to, DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance

[P.13Ac-356.](#)

**NO :** Go to Step 2.



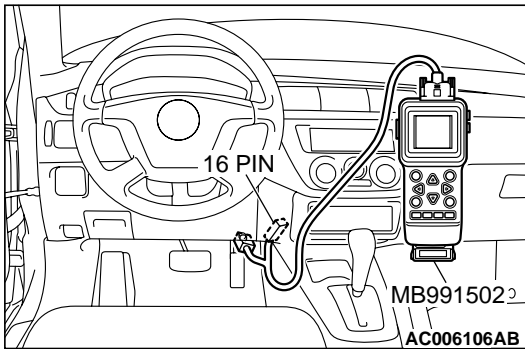
**STEP 2. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Remove the fuel cap.
- (3) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.
  - The fuel tank differential pressures should be  $-3.3$  to  $3.3$  kPa ( $-0.97$  –  $0.97$  in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the fuel tank pressure between  $-3.3$  and  $3.3$  kPa ( $-0.97$  to  $0.97$  inHg)?**

**YES :** Go to Step 3.

**NO :** Refer to, DTC P0451 - Evaporative Emission Control System Pressure Sensor Range/Performance  
[P.13Ac-356](#).

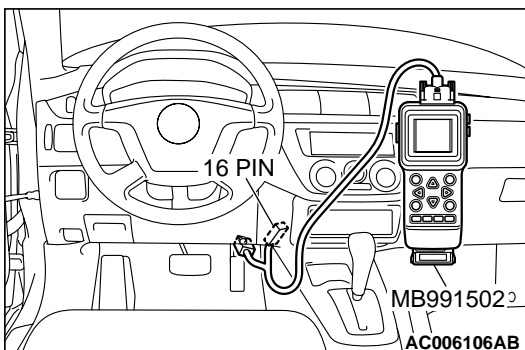
**STEP 3. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 4.

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 5.

**STEP 4. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

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

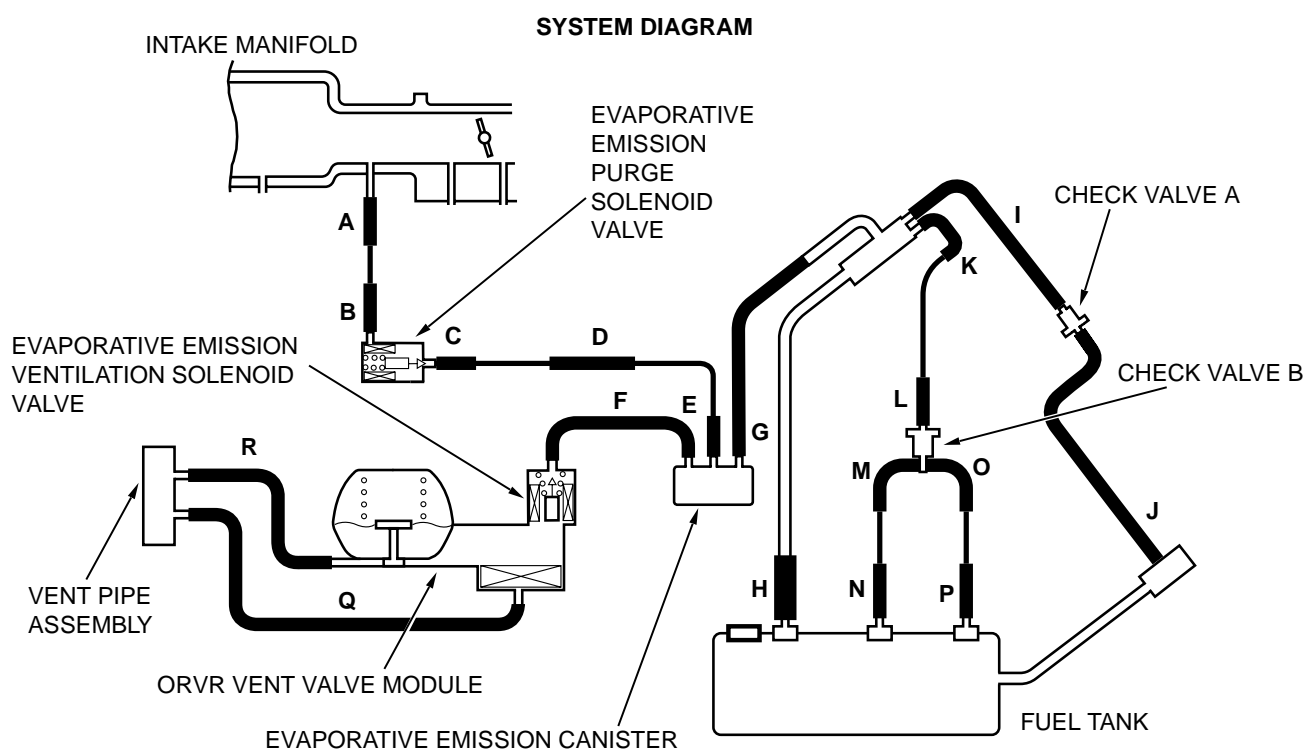
**YES :** Repair or replace the vent hose and air filter. Then go to Step 5.

**NO :** Replace the evaporative emission ventilation solenoid. Then go to Step 5.

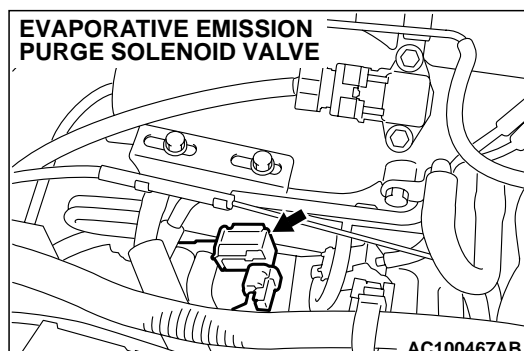
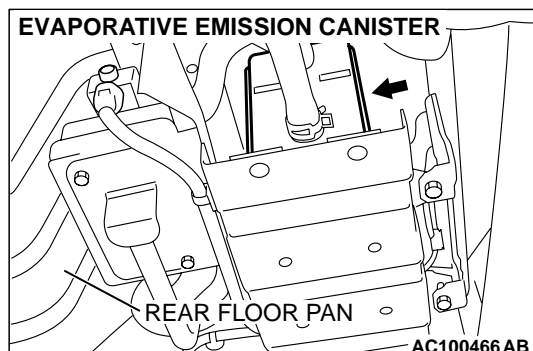


**STEP 5 Perform the OBD-II drive cycle.**

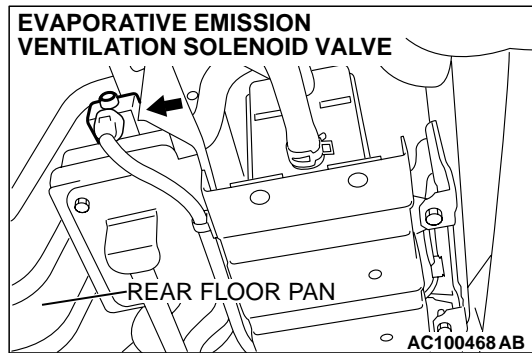
- (1) Carry out a test drive with the drive cycle pattern. (Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 1 – Evaporative Emission Control System Leak Monitor [P.13Ab-2.](#))
- (2) Read the diagnostic trouble code.

**Q: Is DTC P0441 set?****YES :** Go to Step 1.**NO :** The procedure is complete.**DTC P0442: Evaporative Emission Control System Leak Detected (Small Leak)**

AC100465 AB







### TECHNICAL DESCRIPTION

- The ECM <M/T> or PCM <A/T> monitors the Evaporative Emission (EVAP) System pressure.
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa. (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

### DTC SET CONDITIONS

Remaining fuel amount is 15 – 40 percent of capacity. (fuel level sensor output signal voltage is 1.4 – 2.4 volts)

#### Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature is 36 °C (97 °F) or less when the engine is started.

#### Check Conditions B: For Test to Run

- Fuel temperature is less than 36 °C (97 °F), and with in 800 seconds have elapsed since the engine was started.
- Engine coolant temperature is greater than 60°C (140°F).
- Power steering pressure switch: "OFF"
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

- Vehicle speed is greater than or equal to 20 km/h (12.4 mph).

#### Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- The pressure fluctuation is less than 647 Pa (0.094 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 75 – 125 seconds.

#### Judgment Criteria

- Internal pressure of the fuel tank has changed more than 785 Pa (0.114 psi) in 20 seconds after the tank and vapor line were closed.
- ECM <M/T> or PCM <A/T> monitors for this condition once during drive cycle.

### DTC SET CONDITIONS

Remaining fuel amount is 40 – 85 percent of capacity. (fuel level sensor output voltage is 2.4 – 3.7 volts)

#### Check Conditions A: At Start up

- Intake air temperature is less than 36 °C (97 °F) when the engine is started.
- The engine coolant temperature is less than 36 °C (97 °F) when the engine is started.

#### Check Conditions B: For Test to Run

- The fuel temperature is less than 36 °C (97 °F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

#### Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10 °C (14°F).
- Engine coolant temperature is greater than 20 °C (68 °F).

- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

**Judgment Criteria**

- Internal pressure of the fuel tank has changed more than 1.96 kPa (0.285 psi) 128 seconds after the purge and ventilation solenoids were closed.
- ECM <M/T> or PCM <A/T> monitors for this condition once during drive cycle.

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

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is leaking.
- Fuel tank, purge line or vapor line seal is leaking.

- Evaporative emission ventilation solenoid does not seal.
- Evaporative emission purge solenoid does not seal.

**OVERVIEW OF TROUBLESHOOTING**

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set to the data reading mode for the fuel tank differential pressure sensor (TANK PRES SNER 73). The mechanical gauge reading is used to verify the scan tool reading. A comparison of the mechanical gauge and scan tool MB991502 determines whether there is a problem in the system.
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all EVAP system hoses and tubes for damage.

## DIAGNOSIS

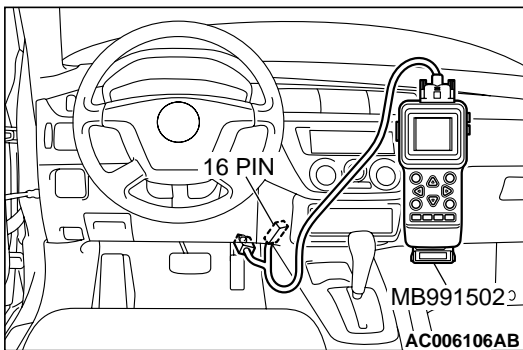
### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check the evaporative emission system monitor test.**

### CAUTION

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the ECM <M/T> or PCM <A/T> will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



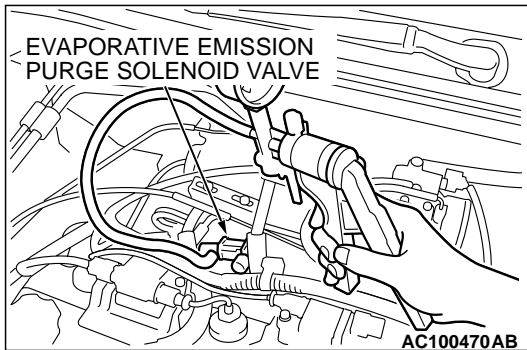
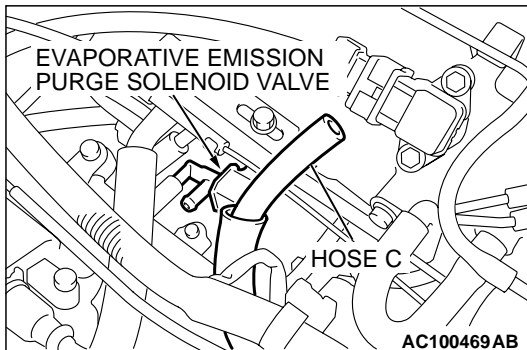
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "Evap Leak Mon.," and press the "YES" key.
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

### Q: What is displayed on scan tool MB991502?

**"Evap Leak Mon. Completed Test Passed"** : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to turn on. Return the vehicle to the customer.

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"** : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13Ab-19](#). If no other DTCs have been set, go to Step 2.

**"Evap Leak Mon. Discontinued. Retest again from the first"** : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



**STEP 2. Check the evaporative emission purge solenoid for leaks.**

- (1) Disconnect hose C from the evaporative emission purge solenoid and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.

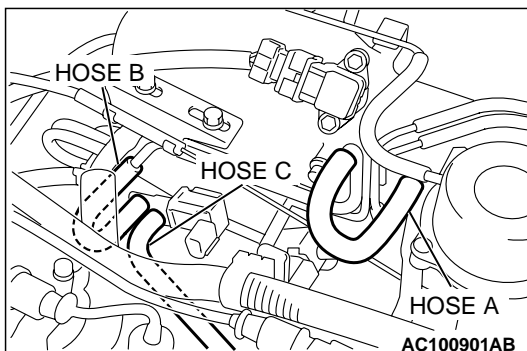
- (2) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.

- (3) Disconnect the hand vacuum pump, and connect hose C to the evaporative emission purge solenoid.

**Q: Does the evaporative emission purge solenoid hold vacuum?**

**YES :** Go to Step 3.

**NO :** Replace the evaporative emission purge solenoid. Go to Step 15.



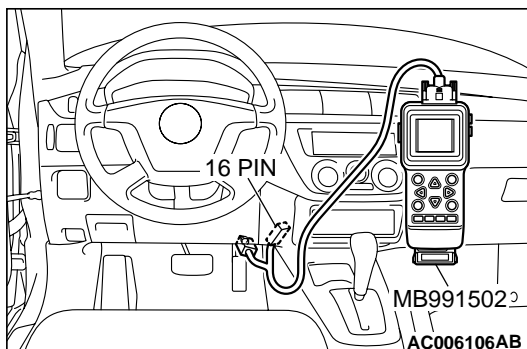
**STEP 3. Check for leaks in evaporative emission system hoses A through C.**

Use a hand vacuum pump to test each hose from hose A to hose C.

**Q: Are the hoses in good condition?**

**YES :** Go to Step 4.

**NO :** Replace any damaged hose. Go to Step 15.

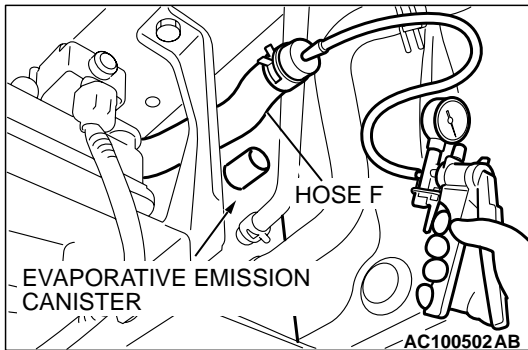
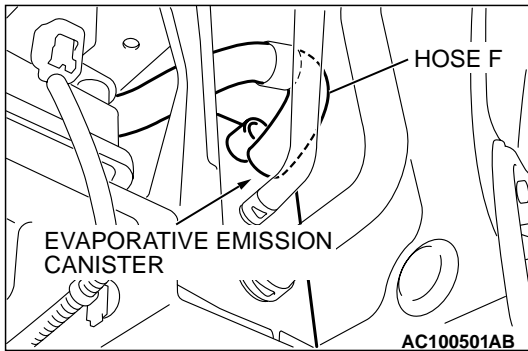


**STEP 4. Check the evaporative emission ventilation solenoid and hose F using scan tool MB991502.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.

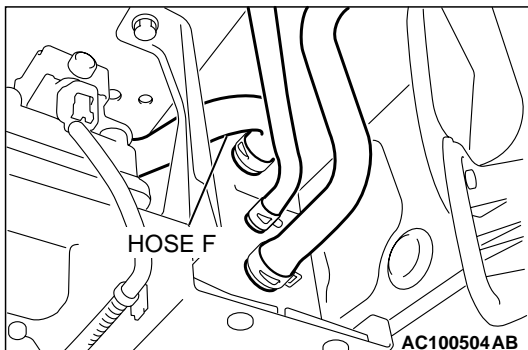


- (2) Disconnect hose F from the evaporative emission canister side, and connect a hand vacuum pump.
- (3) Turn the ignition switch to the "ON" position.
- (4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.
- (5) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.
- (6) Disconnect the hand vacuum pump, and connect hose F to the evaporative emission canister.

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.



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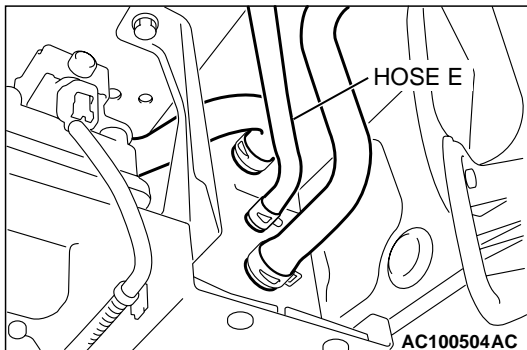
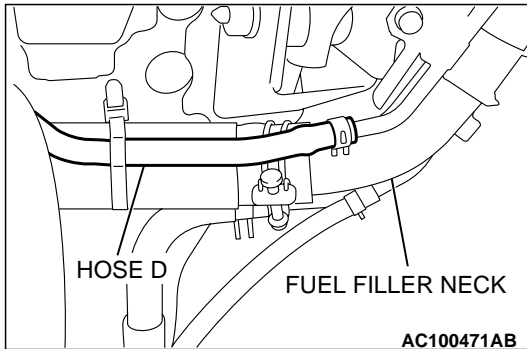
**STEP 5. Check for leaks in evaporative emission system hose F.**

Use a hand vacuum pump to test each hose from hose G.

**Q: Are the hoses in good condition?**

**YES :** Replace the evaporative emission ventilation solenoid. Go to Step 15.

**NO :** Replace hose G. Go to Step 15.



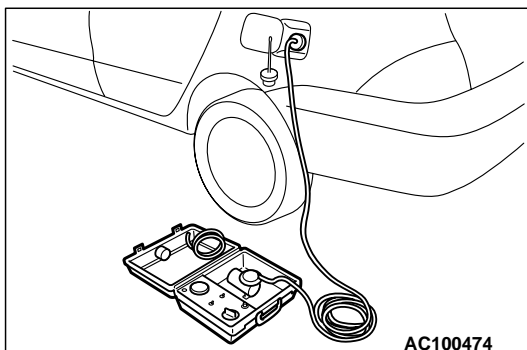
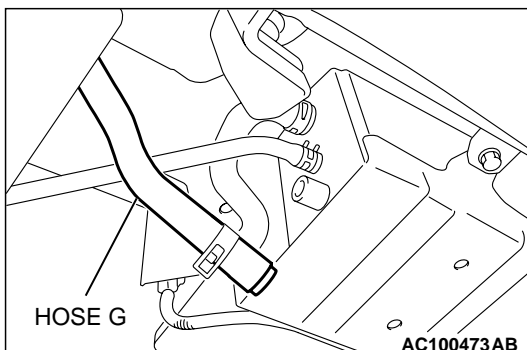
**STEP 6. Check for leaks in evaporative emission system hoses D and E.**

Use a hand vacuum pump to test each hose from hose D to hose E.

**Q: Are the hoses in good condition?**

**YES :** Go to Step 7.

**NO :** Replace the damaged hose. Go to Step 15.



**STEP 7. Pressure test the evaporative emission system lines between hoses G and P through the fuel tank.**

- (1) Disconnect hose G from the canister, and plug hose G securely.
- (2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.

- (3) Connect the evaporative emission system pressure pump to the fuel filler neck.
- (4) Pressure test the system to determine whether any leaks are present.

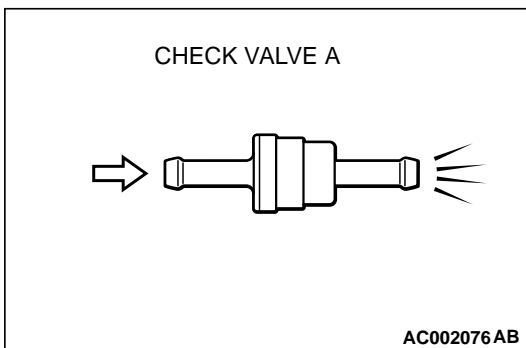
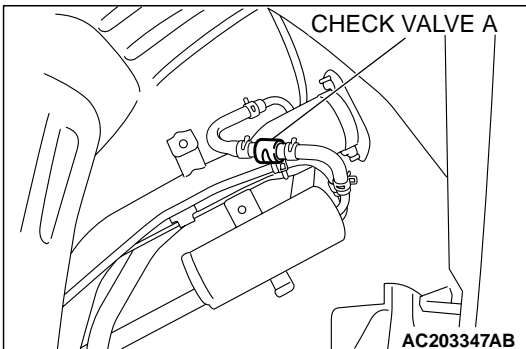
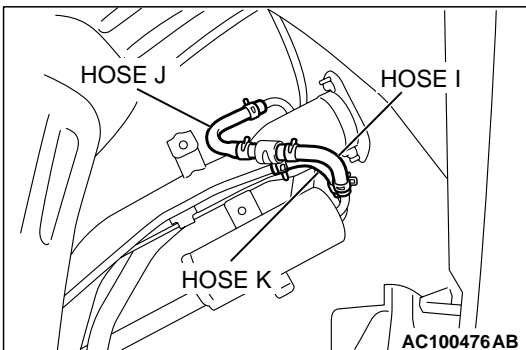
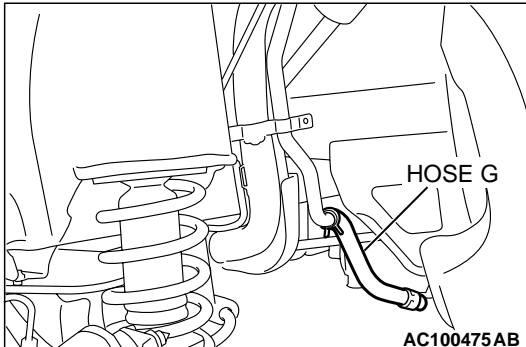
*NOTE: The "Pressure test" in this procedure refers to the I/ M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.*

- (5) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (6) Connect hose G to the canister.

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

**YES :** Go to Step 14.

**NO :** Go to Step 8.



### STEP 8. Check for leaks in evaporative emission system hoses G, I, J and K.

- (1) Remove the fuel filler neck protector. (Refer to GROUP 13B, Fuel Tank P.13B-11.)
- (2) Perform a leakage test with a hand vacuum pump on each hose: H, J, K and L.

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

**YES :** Go to Step 9.

**NO :** Replace any damaged hose, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank P.13B-11. Go to Step 15.

### STEP 9. Test check valve A.

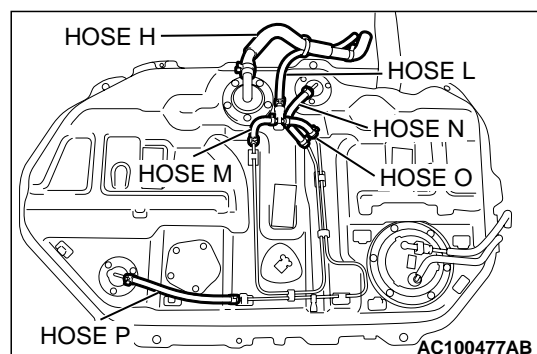
- (1) Check valve A is a one-way check valve.

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

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

**YES :** Go to Step 10.

**NO :** Replace check valve A, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank P.13B-11. Go to Step 15.

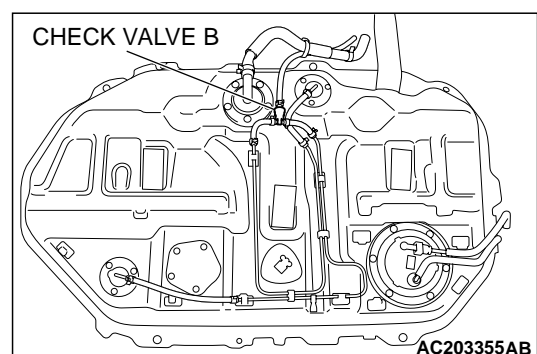

**STEP 10. Check for leaks in evaporative emission system hoses H, L, M, N, O and P.**

- (1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11.](#))
- (2) Perform a leakage test with a hand vacuum pump on each hose: H, L, M, N, O and P.

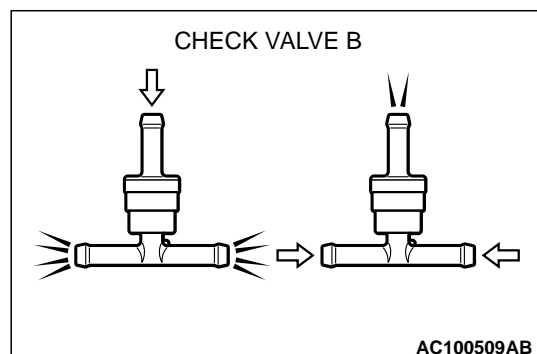
**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 11.

**NO :** Replace any damaged hose, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11.](#) Go to Step 15.


**STEP 11. Test check valve B.**

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

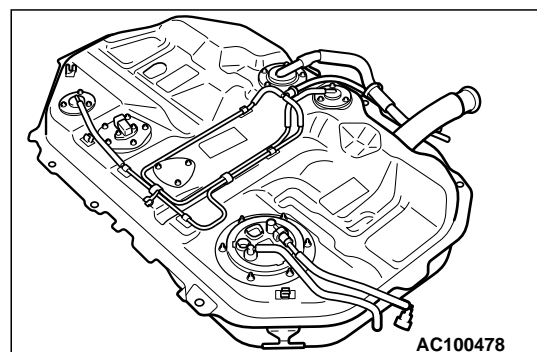


- (2) Check valve B should allow air to flow in only one direction.

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

**YES :** Go to Step 12.

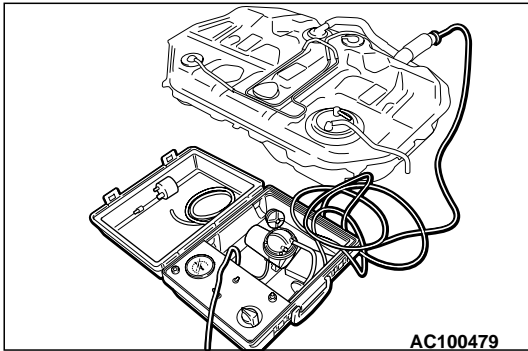
**NO :** Replace check valve B, and reinstall the fuel tank and the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11.](#) Go to Step 15.


**STEP 12. Check for leaks in the fuel tank.**

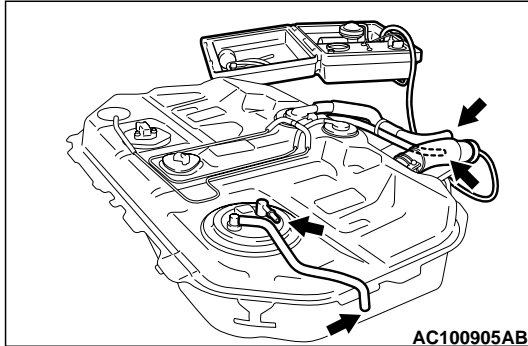
- (1) Visually check for cracks or other leaks in the fuel tank.

*NOTE: Carefully check the fuel pump assembly and the differential pressure sensor installation in the fuel tank.*





- (2) Connect an evaporative emission system pressure pump (Miller number 6872A) to the filler hose.



- (3) Plug the fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.

*NOTE: If these items are not securely plugged here, the fuel could leak in the next step.*

- (4) Pressurize the fuel tank with the evaporative emission system pressure pump.  
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

**Q: Is the fuel tank free of leaks?**

**There are leaks at the fuel pump assembly, the fuel tank differential pressure sensor, leveling valve or the fuel tank rollover valve installation section.** : After

reassemble the leaked parts, check again that there are no leaks. Then reinstall the fuel tank. Go to Step 15.

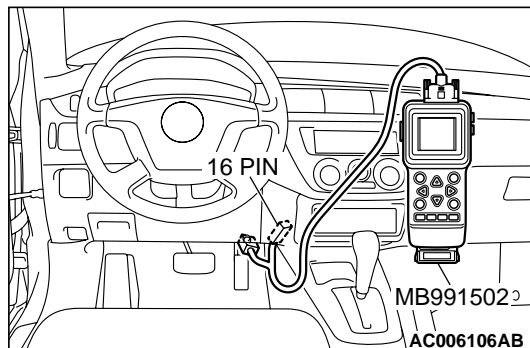
**There are leaks at the fuel tank.** : Replace the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 15.

**There are no leaks.** : Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 13.

**STEP 13. Using scan tool MB991502, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



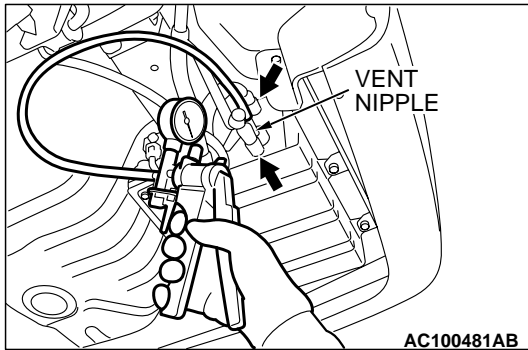
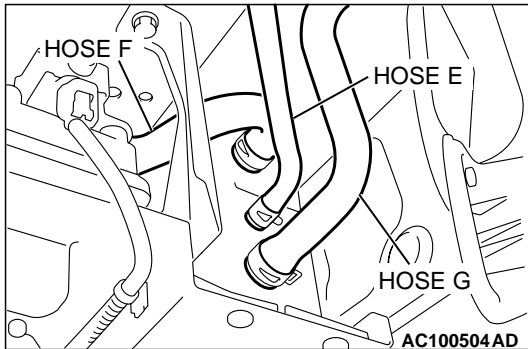
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "Evap Leak Mon," and press the "YES" key.
- (8) During the test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

**Q: What is displayed on scan tool MB991502?**

**"Evap Leak Mon. Completed. Test Passed"** : The evaporative emission system is working properly at this time. Go to Step 15 .

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"**  
: Replace the ECM <M/T> or PCM <A/T>. Go to Step 15.

**"Evap Lead Mon. discontinued. Retest again from the first"** : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the evaporative emission system monitor test.

**STEP 14. Check for leaks in the evaporative emission canister.**

- (1) Disconnect hoses E, F and G from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose E, and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump, and connect hoses E, F and G to the canister.

**Q: Does the evaporative emission canister hold vacuum?**

**YES :** Go to Step 13.

**NO :** Replace the evaporative emission canister. Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve [P.17-120](#). Go to Step 15.

**STEP 15. Perform the OBD-II drive cycle.**

- (1) Confirm the repair by performing the appropriate drive cycle. Refer to, Procedure 1 - Evaporative Emission Control System Leak Monitor [P.13Ab-2](#).
- (2) Read the diagnostic trouble code (DTC).

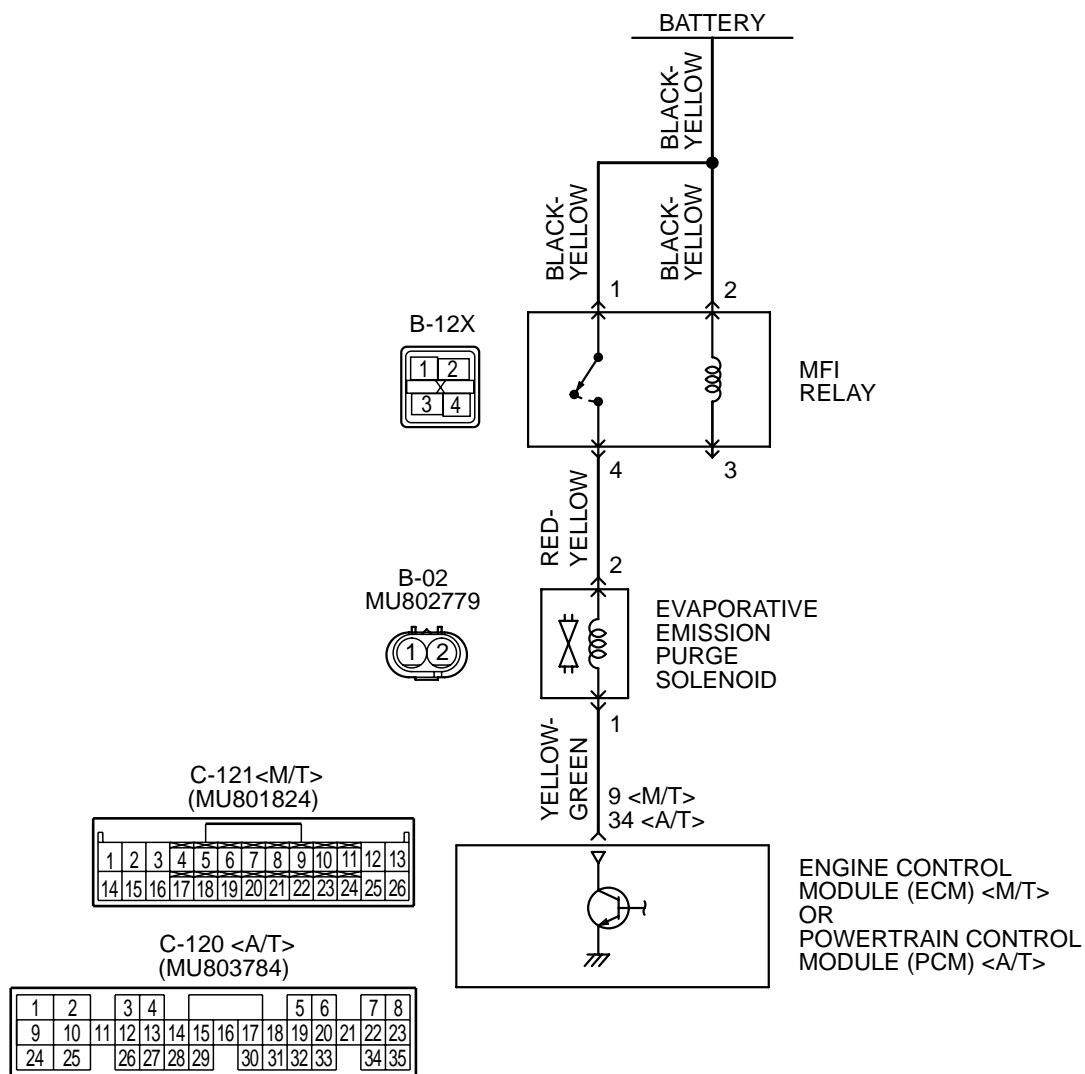
**Q: Is DTC P0442 set?**

**YES :** Go to Step 1.

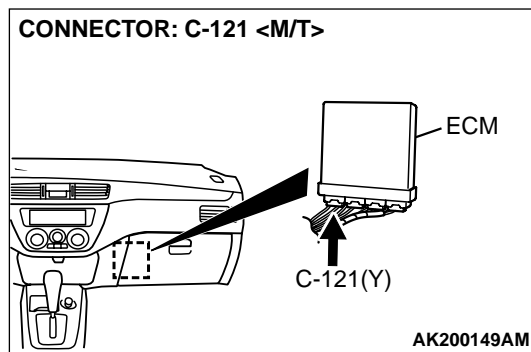
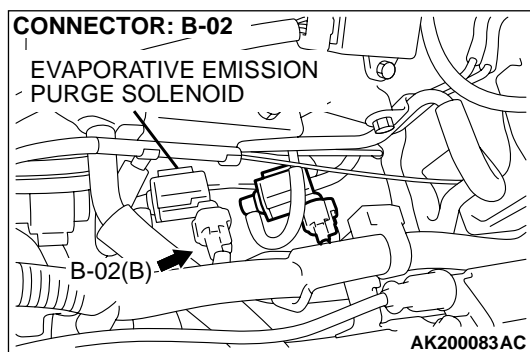
**NO :** The inspection is complete.

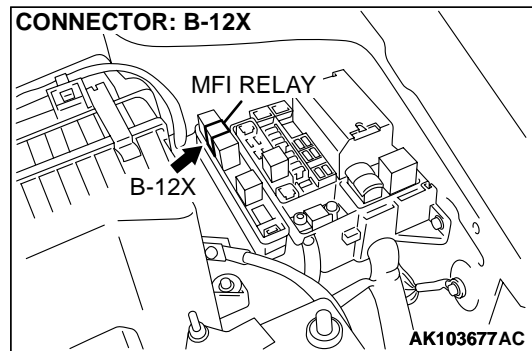
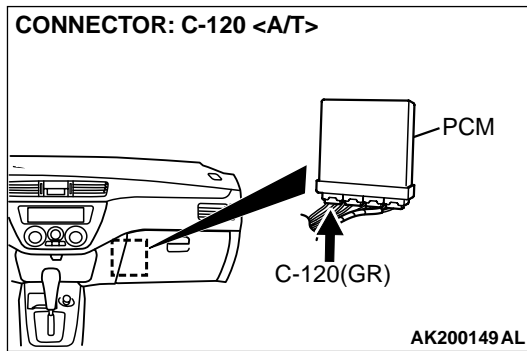
## DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

## Evaporative Emission Purge Solenoid Circuit



AK100031





### CIRCUIT OPERATION

- Power to the evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or PCM <A/T> controls ground evaporative emission purge solenoid by turning the power transistor in the ECM <M/T> or PCM <A/T> "ON" and "OFF".

### TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission purge solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission purge solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 volts or more.

### DTC SET CONDITIONS

#### Check Conditions

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

### Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> PCM monitors for this condition once during the drive cycle.

### Check Conditions

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- ON duty cycle of the EGR solenoid is 0 percent.
- Evaporative emission ventilation solenoid is OFF.
- More than 1 second has elapsed after the above mentioned conditions have been met.

### Judgment Criteria

- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission purge solenoid is turned OFF.

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

- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid.**

### **⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the actuator test mode for item 08, Evaporative emission purge solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

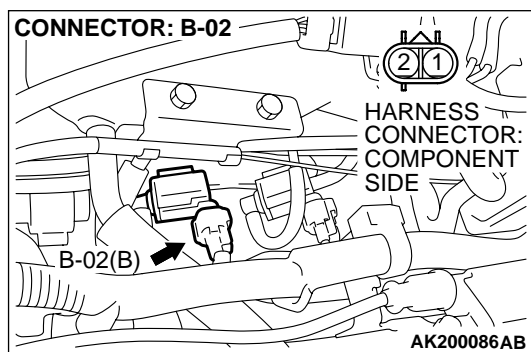
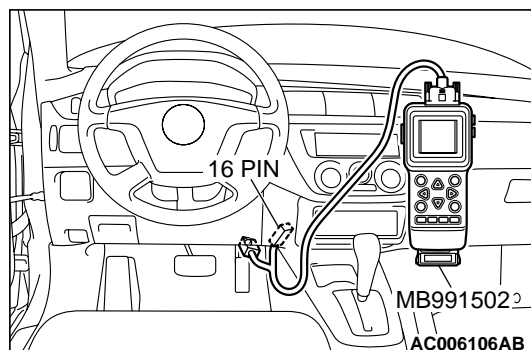
### **Q: Is the solenoid operating properly?**

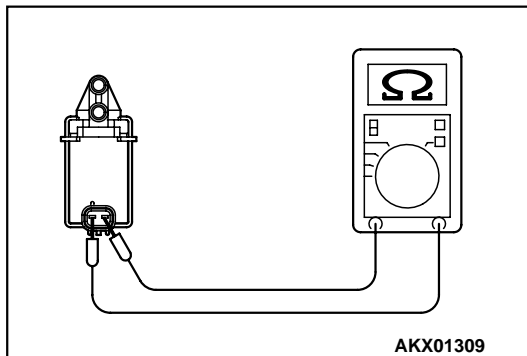
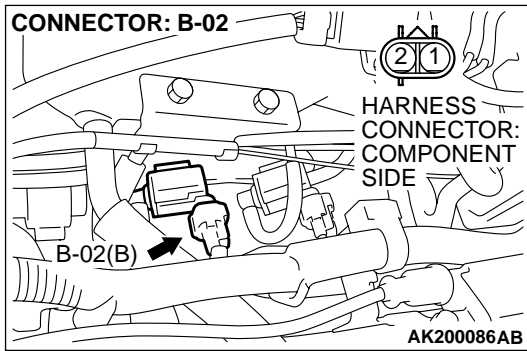
- YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).
- NO :** Go to Step 2.

**STEP 2. Check connector B-02 at the evaporative emission purge solenoid for damage.**

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

- YES :** Go to Step 3.
- NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.



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

- (1) Disconnect the evaporative emission purge solenoid connector B-02.

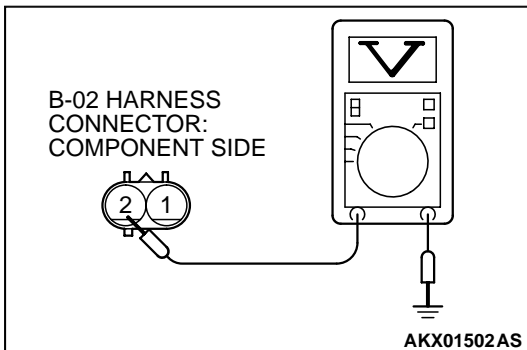
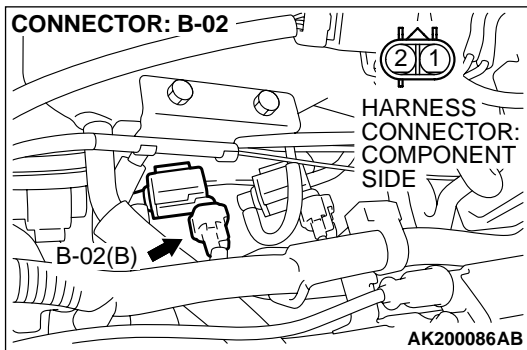
- (2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

**Standard value: 30 – 34 ohms [at 20°C (68°F)]**

**Q: Is the resistance between 30 and 34 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 4.

**NO :** Replace the evaporative emission purge solenoid.  
Then go to Step 12.

**STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-02.**

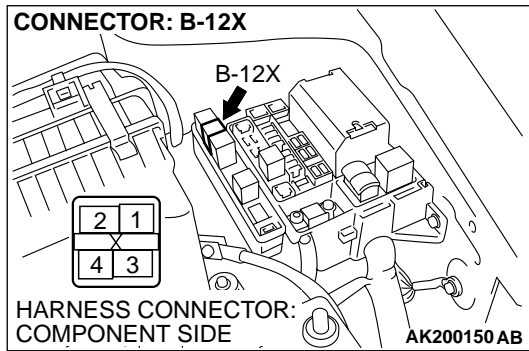
- (1) Disconnect connector B-02 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 2 and ground.
  - Voltage should measure battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.

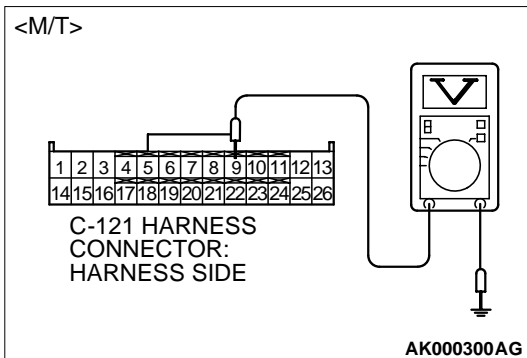
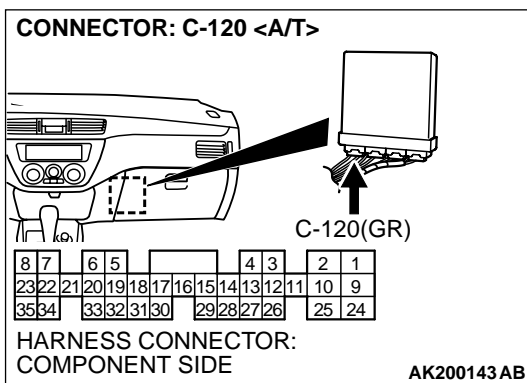
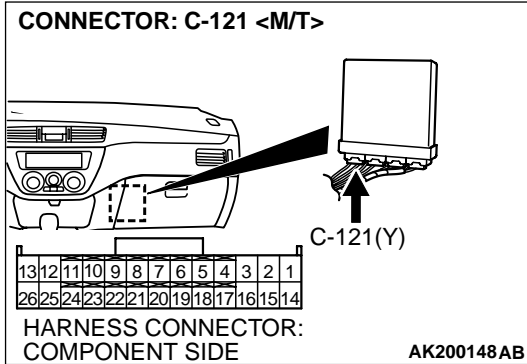
**STEP 5. Check connector B-12X at MFI relay for damage.****Q: Is the connector in good condition?**

- YES :** Repair harness wire between MFI relay connector B-12X (terminal No. 4) and evaporative emission purge solenoid connector B-02 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.
- NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.



**STEP 6. Measure the power supply voltage at ECM connector C-121 <M/T> or PCM connector <A/T> C-120 by backprobing.**

- (1) Do not disconnect connector C-121 <M/T> or C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal No. 9 <M/T> or No. 34 <A/T> and ground by backprobing.

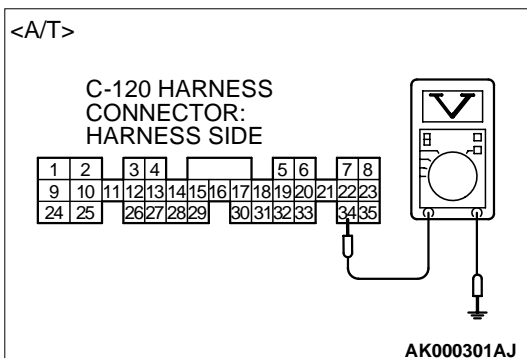
- Voltage should measure battery positive voltage.

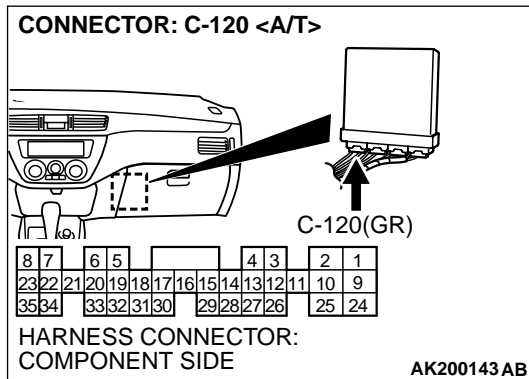
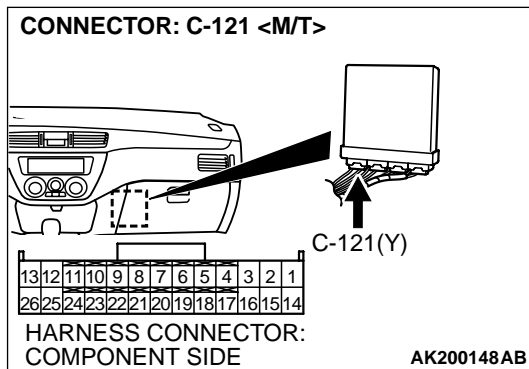
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 9.

**NO :** Go to Step 7.





**STEP 7. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

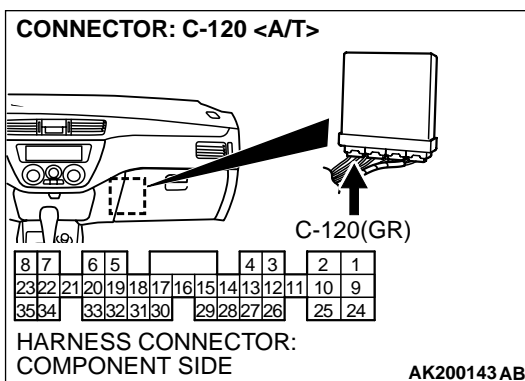
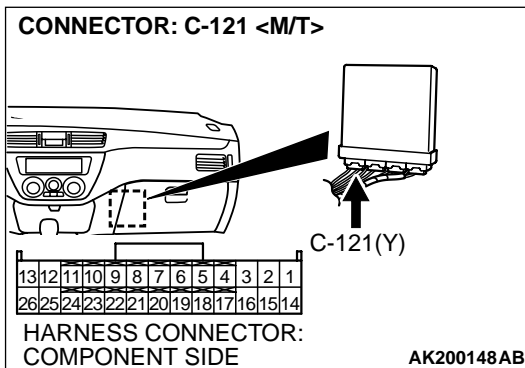
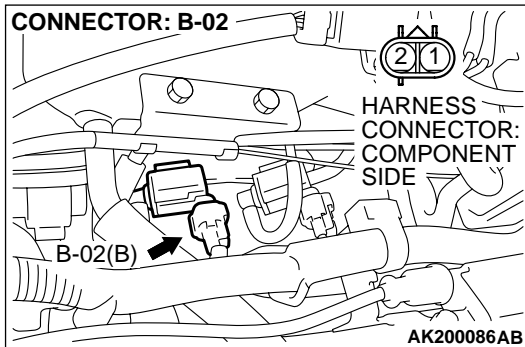
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

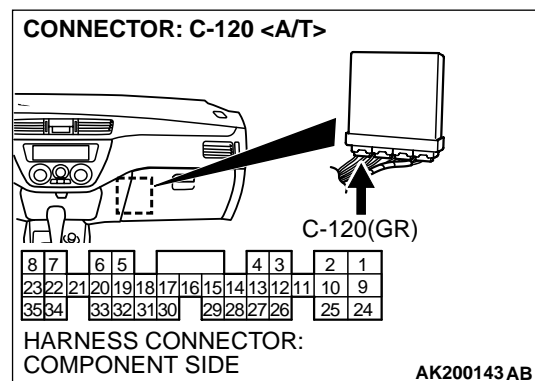
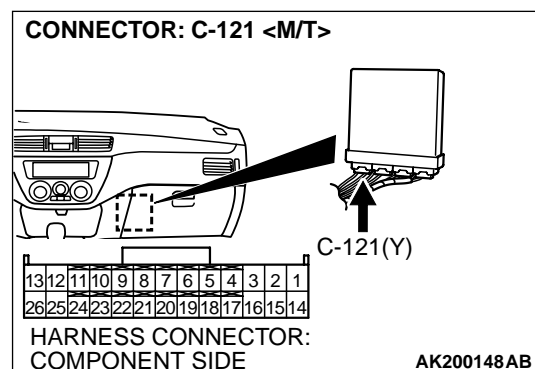
**STEP 8.** Check for open circuit and short circuit to ground between evaporative emission purge solenoid connector B-02 (terminal No. 1) and ECM connector C-121 (terminal No. 9) <M/T> or PCM connector C-120 (terminal No. 34) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



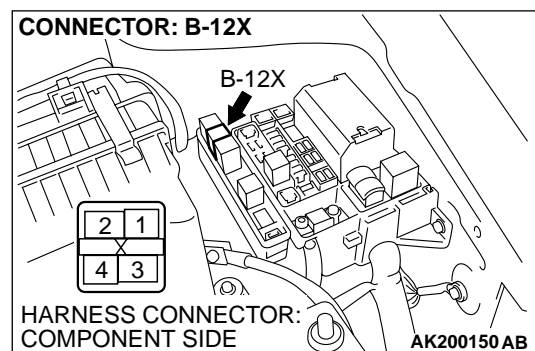


**STEP 9. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

**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 go to Step 12.

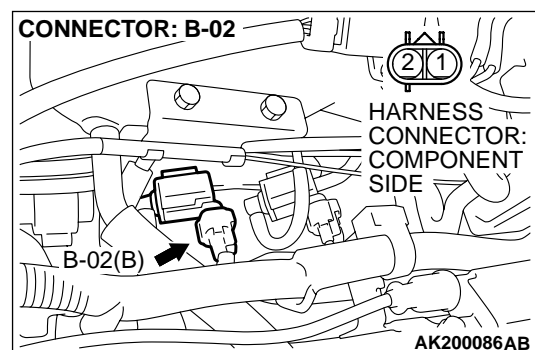


**STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and evaporative emission purge solenoid connector B-02 (terminal No. 2).**

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

**YES :** Go to Step 11.

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

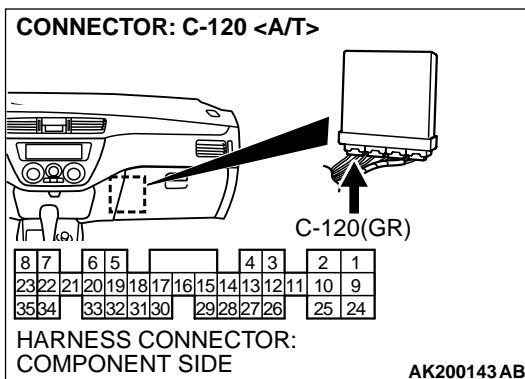
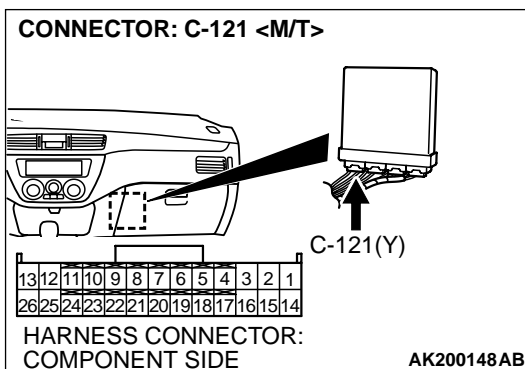
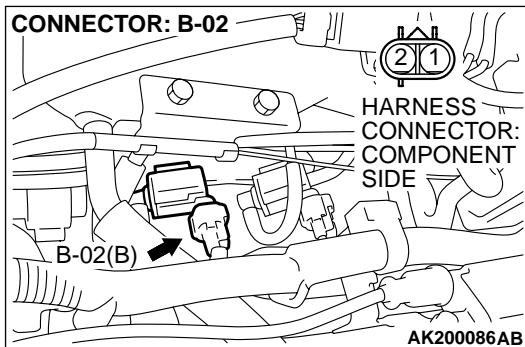


**STEP 11. Check for harness damage between evaporative emission purge solenoid connector B-02 (terminal No. 1) and ECM connector C-121 (terminal No. 9) <M/T> or PCM connector C-120 (terminal No. 34) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

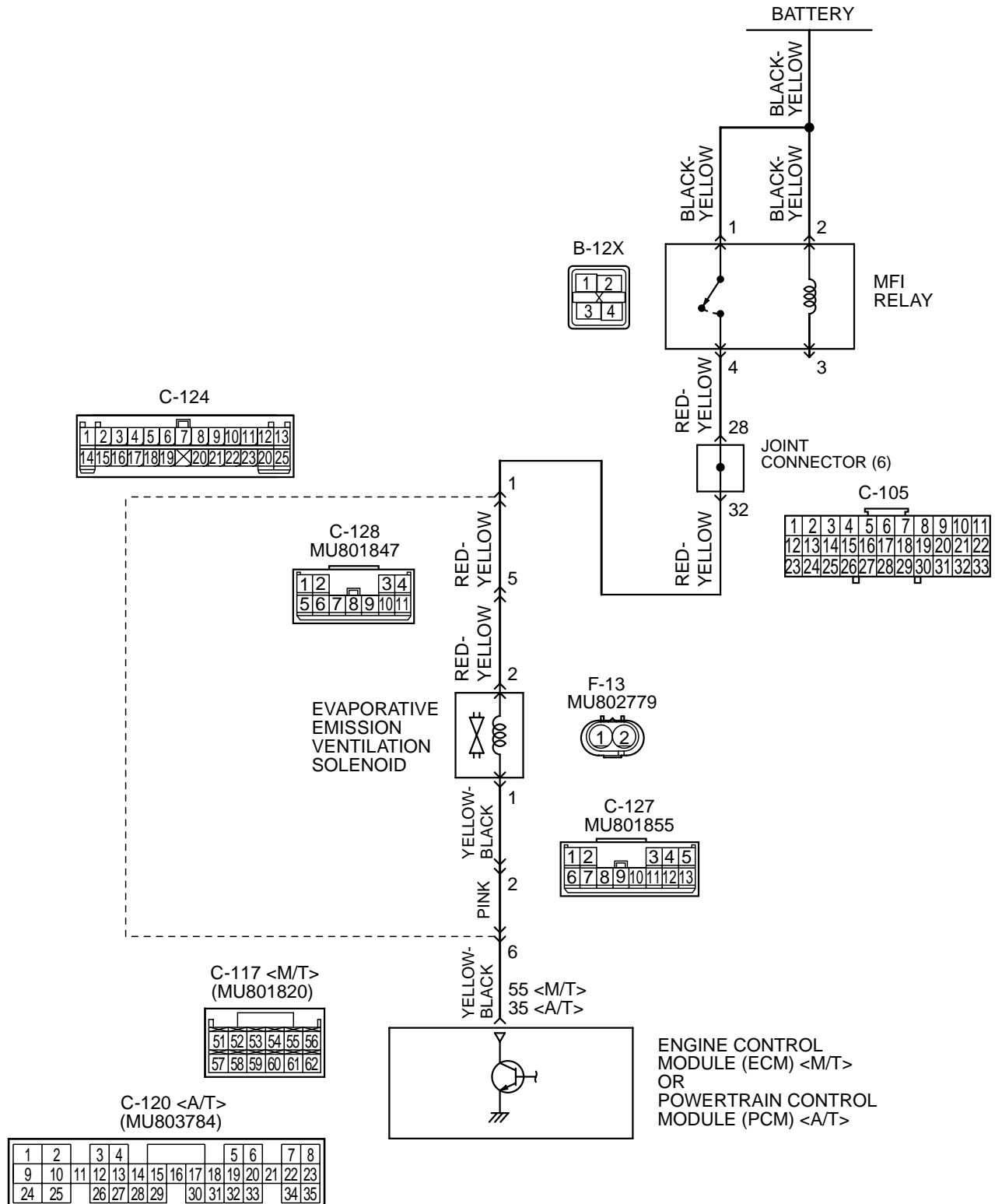
**Q: Is DTC P0443 set?**

**YES :** Repeat the troubleshooting.

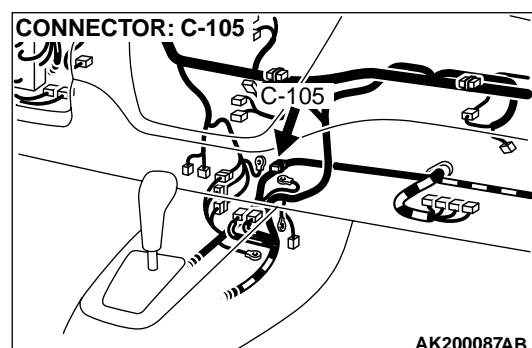
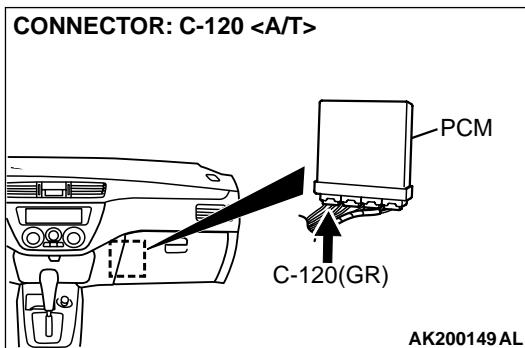
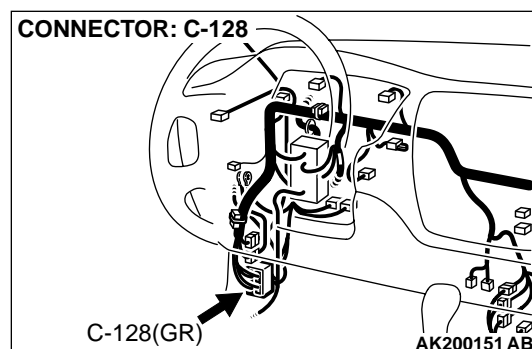
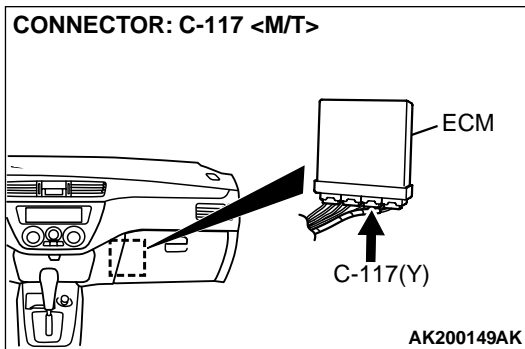
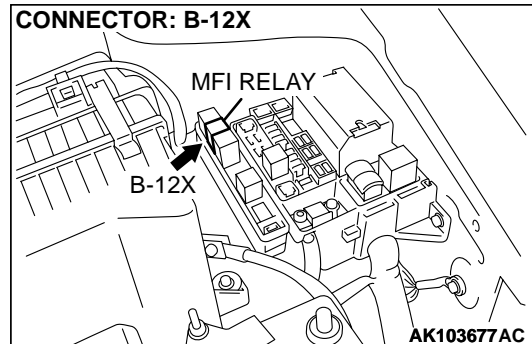
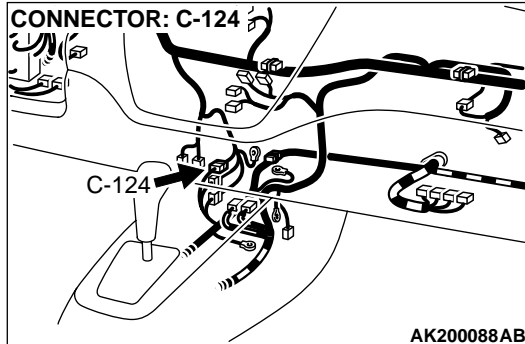
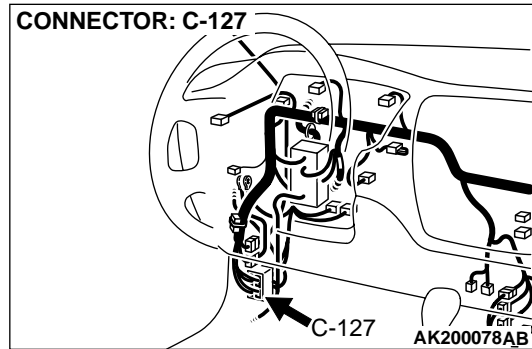
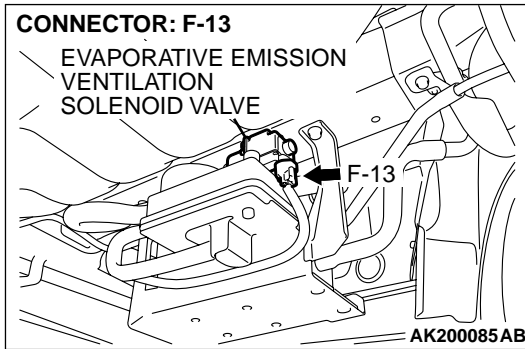
**NO :** The procedure is complete.

## DTC P0446: Evaporative Emission Control System Vent Control Circuit

## Evaporative Emission Ventilation Solenoid Circuit



AK100032



### CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 4).
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM <M/T> or PCM <A/T> ON and OFF.

### TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM <M/T> or PCM <A/T> measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM <M/T> or PCM <A/T> drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM <M/T> or PCM <A/T> will check if the solenoid coil produces a surge voltage of 2 V or more.

**DTC SET CONDITIONS****Check Conditions**

- Engine is being cranked.
- Battery positive voltage is at between 10 and 16 volts.

**Judgment Criteria**

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM <M/T> or PCM <A/T> monitors for this condition once during the drive cycle.

**Check Conditions**

- Battery positive voltage is at between 10 and 16 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- ON duty cycle of the EGR solenoid is 0 percent.

- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

**Judgment Criteria**

- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second. When the evaporative emission ventilation solenoid is turned OFF.

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

- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check actuator test item 29: Evaporative Emission Ventilation Solenoid.****⚠ CAUTION**

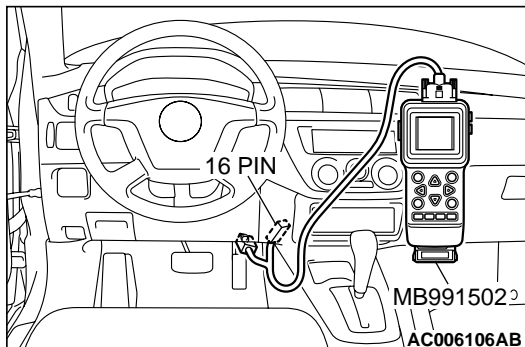
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502 to the actuator test mode for item 29, Evaporative emission ventilation solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

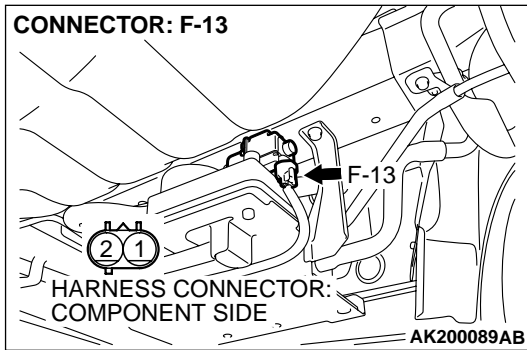
**Q: Is the solenoid operating properly?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





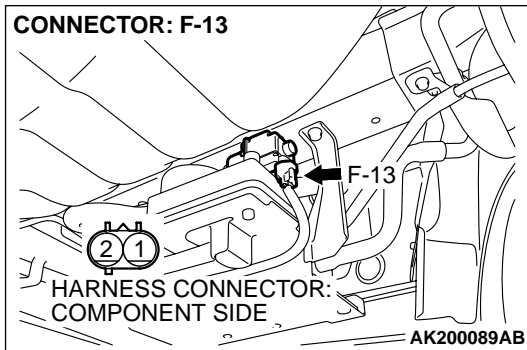


**STEP 2. Check connector F-13 at the evaporative emission ventilation solenoid for damage.**

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

**YES :** Go to Step 3.

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



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

(1) Disconnect the evaporative emission ventilation solenoid connector F-13.

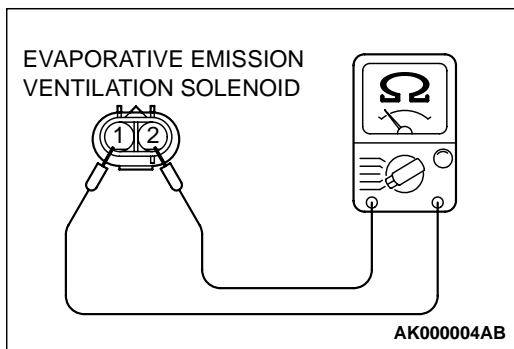
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

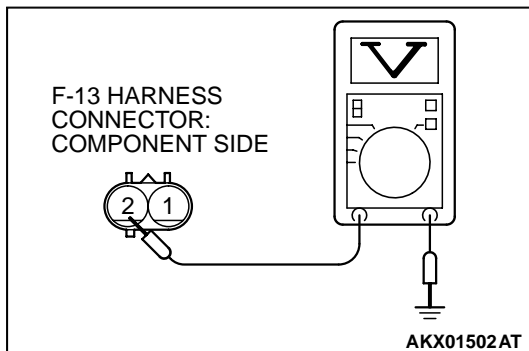
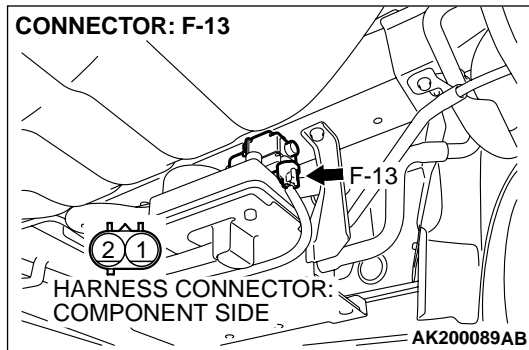
**Standard value: 17 – 21 ohms [at 20°C (68°F)]**

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

**YES :** Go to Step 4.

**NO :** Replace the over vent valve module. Then go to Step 12.





**STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-13.**

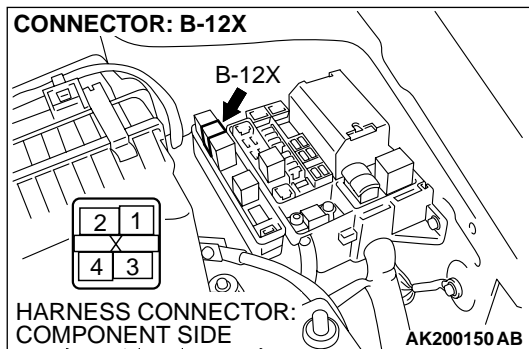
- (1) Disconnect connector F-13 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 2 and ground.
  - Voltage should measure battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.



**STEP 5. Check connector B-12X at MFI relay for damage.**

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

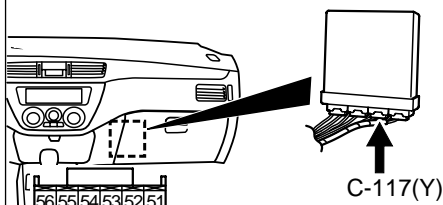
**YES :** Check connectors C-105, C-124 and C-128 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connectors are in good condition, repair harness wire between MFI relay connector B-12X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 12.

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

**STEP 6. Measure the power supply voltage at ECM connector C-117 <M/T> or PCM connector C-120 <A/T> by backprobing.**

- (1) Do not disconnect connector C-117 <M/T> or C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

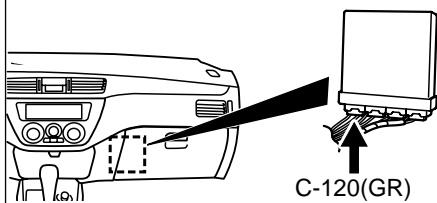
**CONNECTOR: C-117 <M/T>**



HARNESS CONNECTOR:  
COMPONENT SIDE

AK200137AB

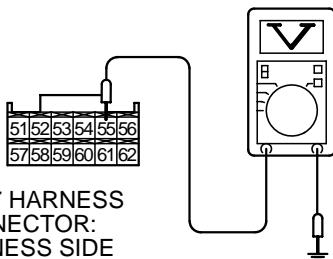
**CONNECTOR: C-120 <A/T>**



HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB

<M/T>



C-117 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000302AG

- (3) Measure the voltage between terminal No. 55 <M/T> or No. 35 <A/T> and ground by backprobing.

- Voltage should measure battery positive voltage.

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

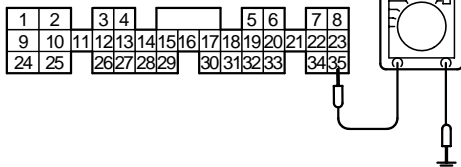
**Q: Is battery positive voltage (approximately 12 volts) present?**

**YES :** Go to Step 9.

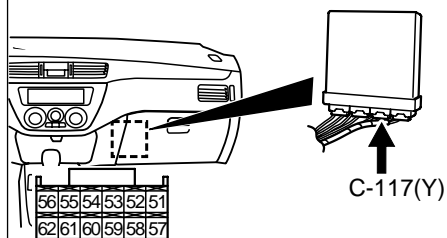
**NO :** Go to Step 7.

<A/T>

C-120 HARNESS  
CONNECTOR:  
HARNESS SIDE



AK000303AJ

**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

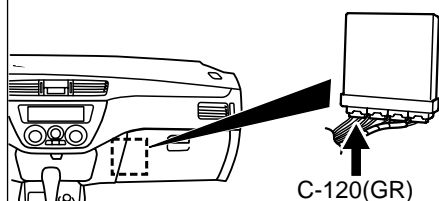
AK200137AB

**STEP 7. Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

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

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200143AB

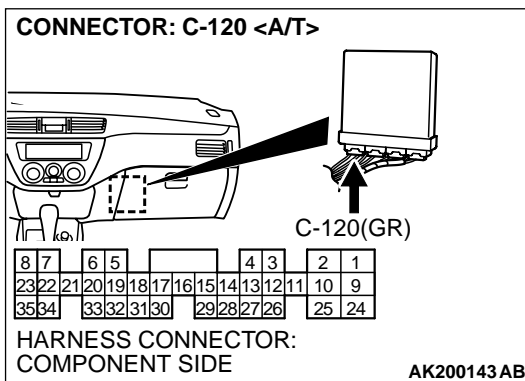
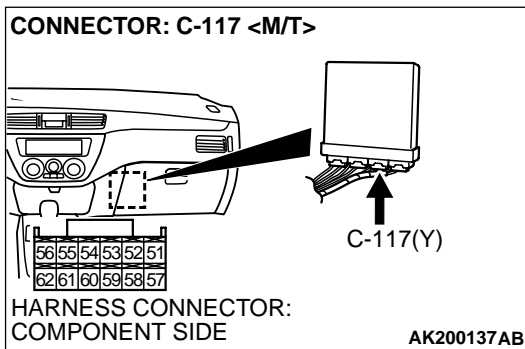
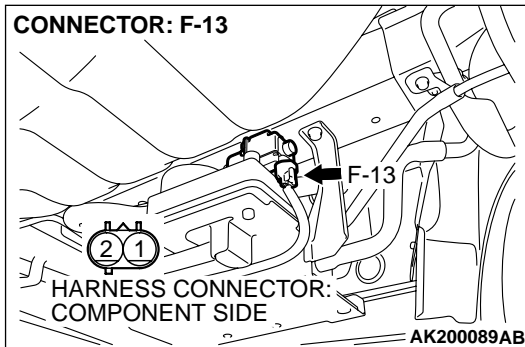
**STEP 8.** Check for open circuit and short circuit to ground between evaporative emission ventilation solenoid connector F-13 (terminal No. 1) and ECM connector C-117 (terminal No. 55) <M/T> or PCM connector C-120 (terminal No. 35) <A/T>.

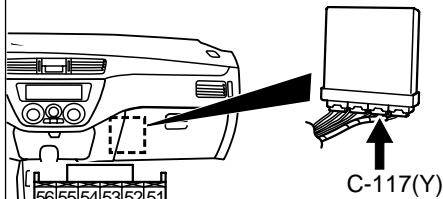
**NOTE:** Check harness after checking intermediate connectors C-124 and C-127. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

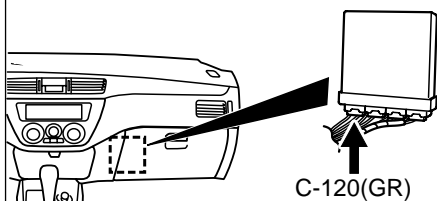
**NO :** Repair it. Then go to Step 12.



**CONNECTOR: C-117 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200137AB

**CONNECTOR: C-120 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

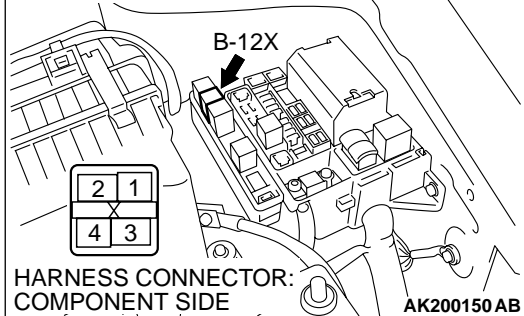
AK200143AB

**STEP 9. Check connector C-117 at ECM <M/T> or connector C-120 at PCM <A/T> 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 go to Step 12.

**CONNECTOR: B-12X**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200150AB

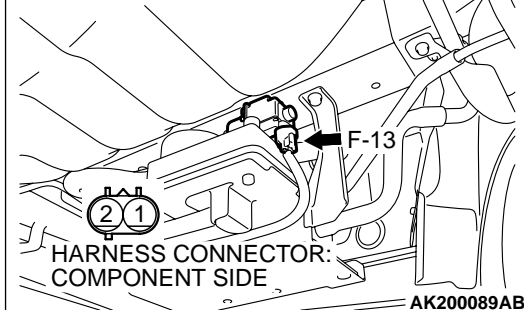
**STEP 10. Check for harness damage between MFI relay connector B-12X (terminal No. 4) and evaporative emission ventilation solenoid connector F-13 (terminal No. 2).**

**NOTE:** Check harness after checking intermediate connectors C-105, C-124 and C-128. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

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

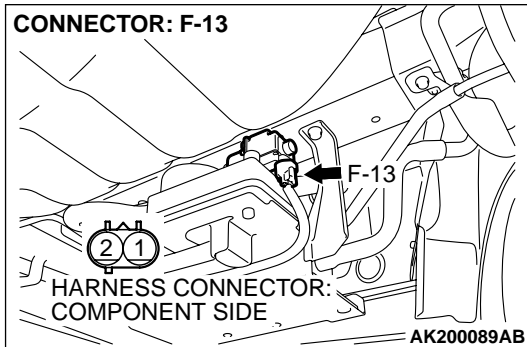
**YES :** Go to Step 11.

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

**CONNECTOR: F-13**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200089AB



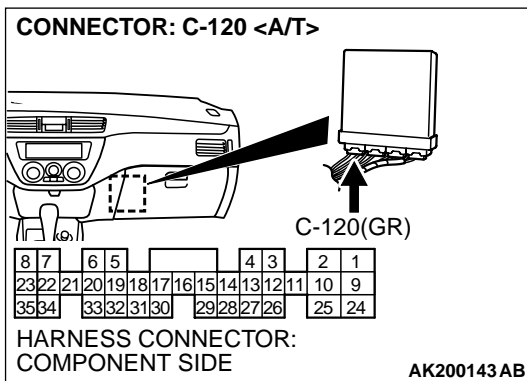
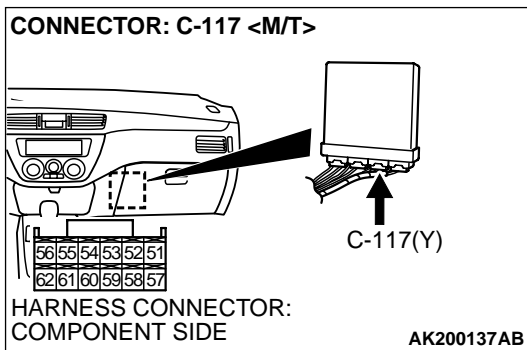
**STEP 11. Check for harness damage between evaporative emission ventilation solenoid connector F-13 (terminal No. 1) and ECM connector C-117 (terminal No. 55) <M/T> or PCM connector C-120 (terminal No. 35) <A/T>.**

*NOTE: Check harness after checking intermediate connectors C-124 and C-127. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.*

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



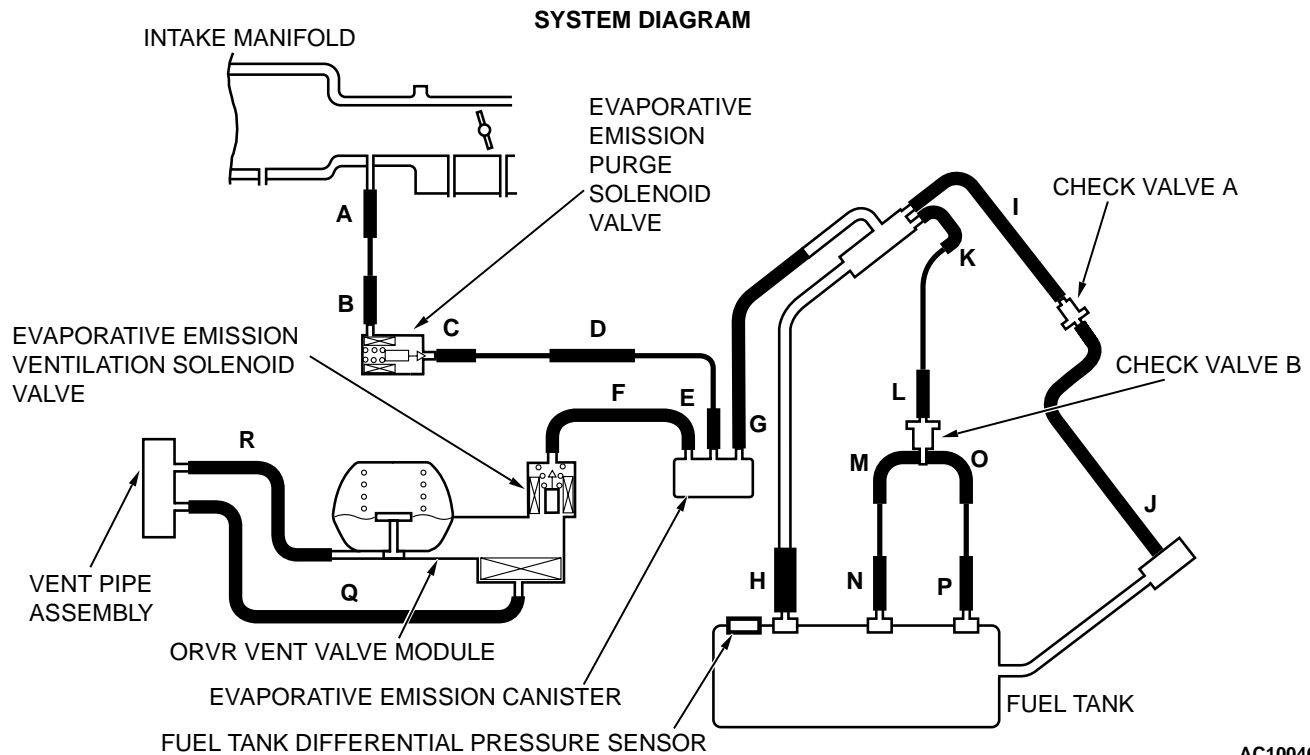
**STEP 12. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor P.13Ab-2.
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0446 set?**

**YES :** Repeat the troubleshooting.

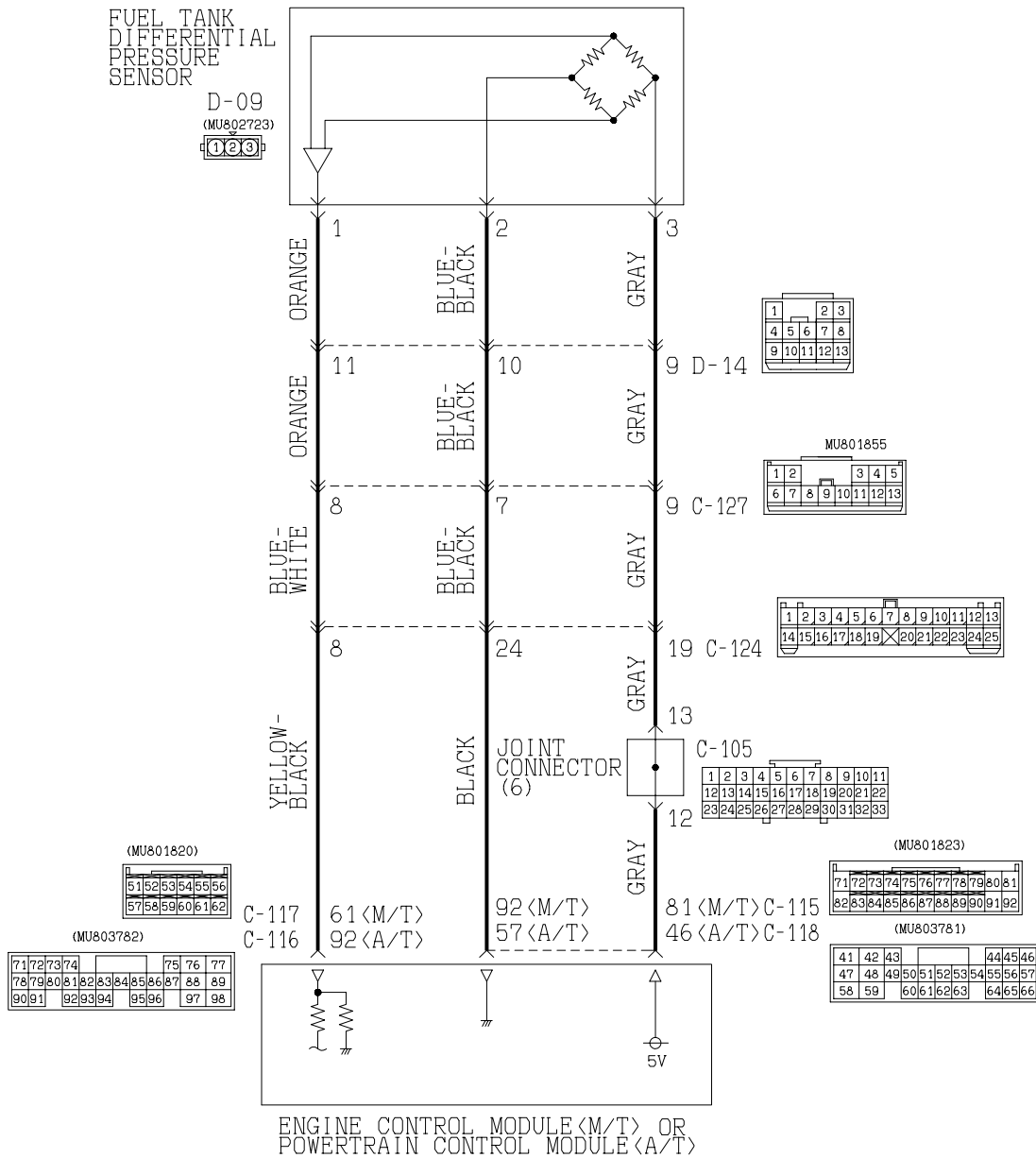
**NO :** The procedure is complete.

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

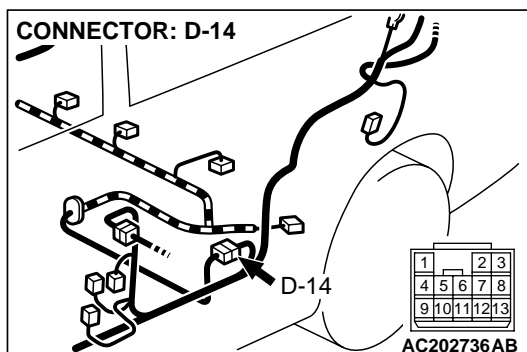
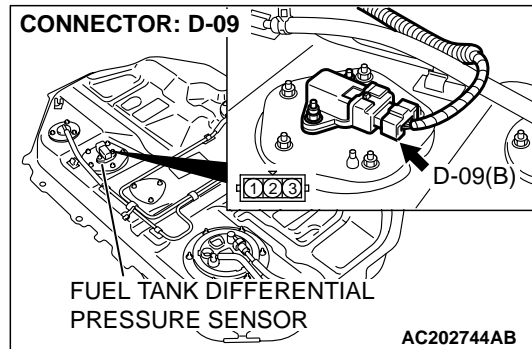
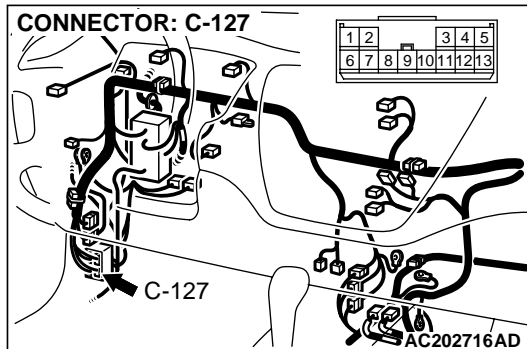
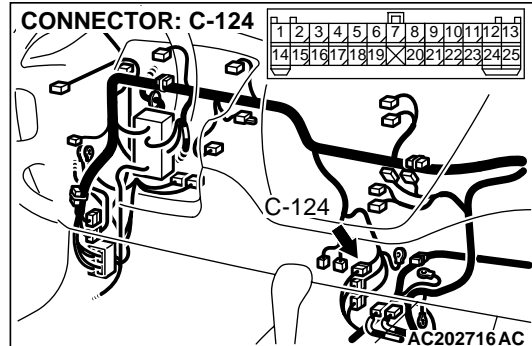
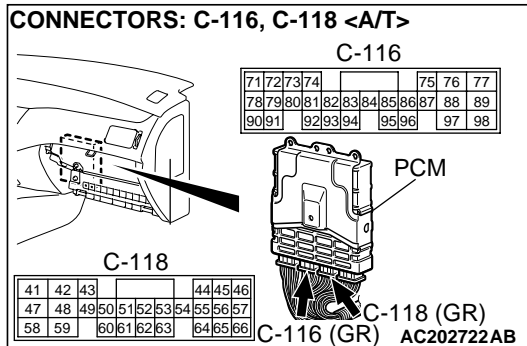
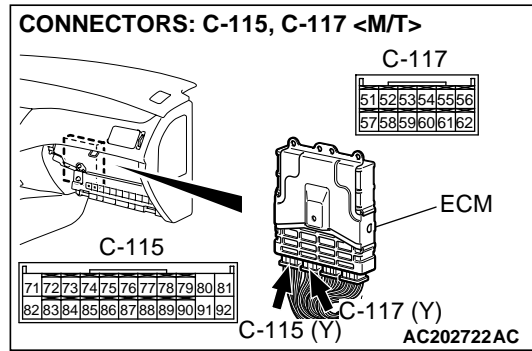
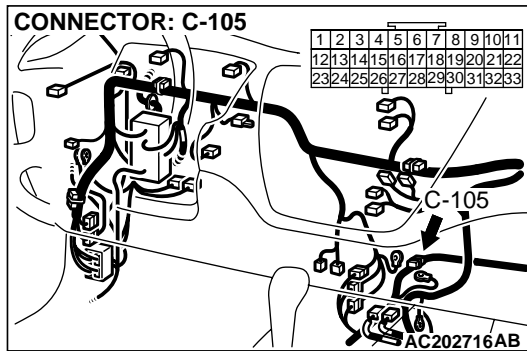
AC100465AC



## Fuel Tank Differential Pressure Sensor Circuit



W2J06M01AA



### CIRCUIT OPERATION

- The ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T> supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM (terminal 81) <M/T> or PCM (terminal 57) <A/T>.
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM (terminal 81) <M/T> or PCM (terminal 92) <A/T> that is proportional to the pressure in the fuel tank.

**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor signal voltage.
- The ECM <M/T> or PCM <A/T> determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

**DTC SET CONDITIONS****Check Conditions:**

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

**Judgment Criteria**

- If the voltage signal from the fuel tank differential pressure sensor changes by 0.2 volt or more, DTC P0451 will set. The code may also set if a sudden pressure fluctuation occurs twenty times while the engine is idling, and then eight consecutive times during normal driving.

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

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

- *Engine speed is greater than 2,500 r/min.*
- *Vehicle speed is 15 km/h (9.3 mph) or greater.*
- *Volumetric efficiency is 55 percent or greater.*

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

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

**OVERVIEW OF TROUBLESHOOTING**

- DTC P0451 can be set by a faulty fuel differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

## DIAGNOSIS

### Required Special Tools:

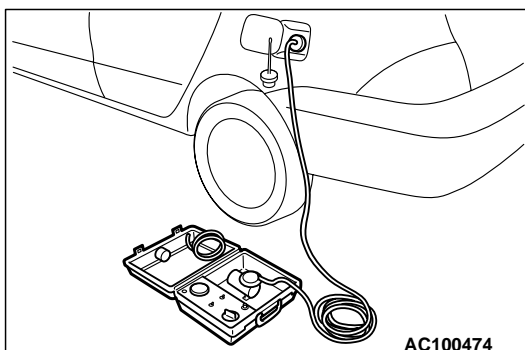
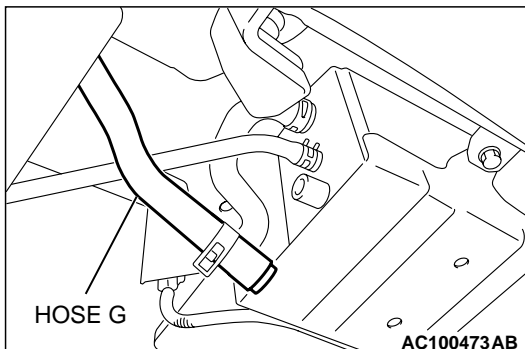
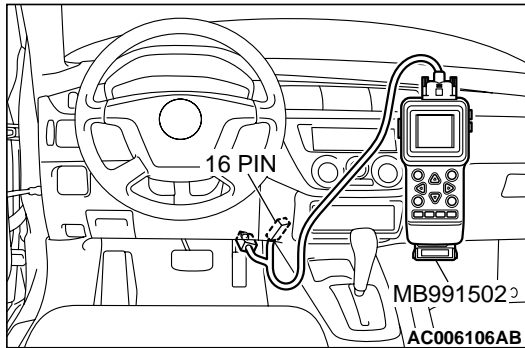
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

### ⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).

(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(9) Connect hose G to the canister.

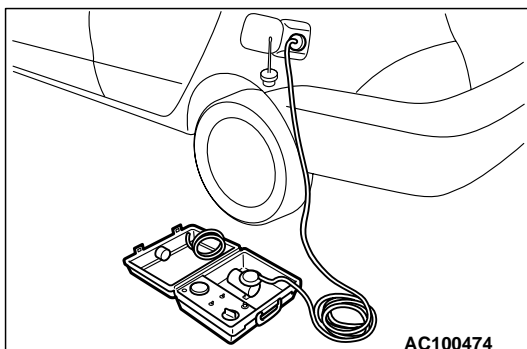
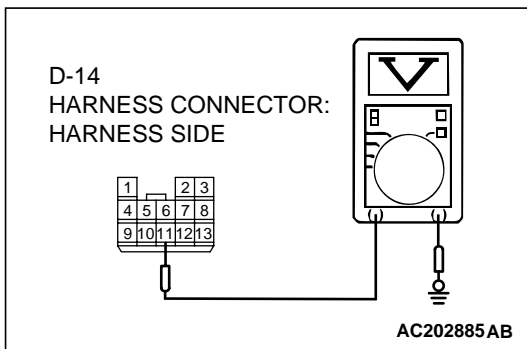
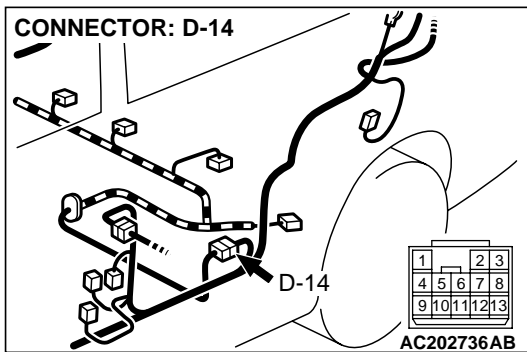
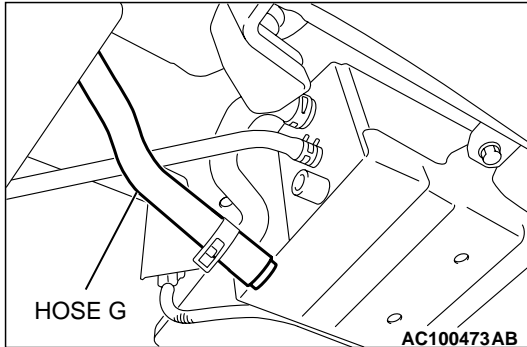
**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Go to Step 2.

**STEP 2. Measure the signal voltage at intermediate connector D-14 by backprobing.**

- (1) Remove the rear seat cushion. (Refer to GROUP 52A, Rear Seat P.52A-18.)
- (2) Pull up the carpet.
- (3) Disconnect hose G from the evaporative emission canister side, and plug the hose.
- (4) Turn the ignition switch to the "ON" position.
- (5) Remove the fuel cap.



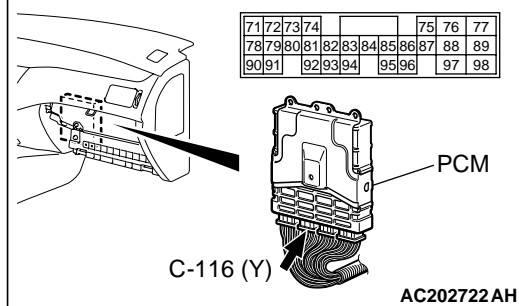
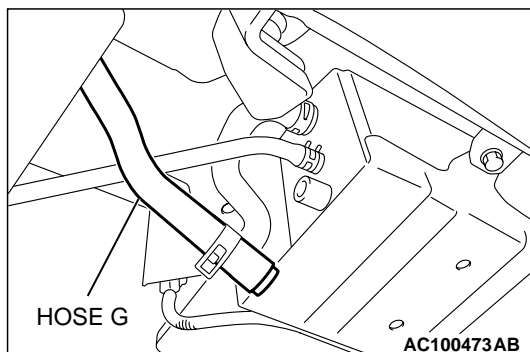
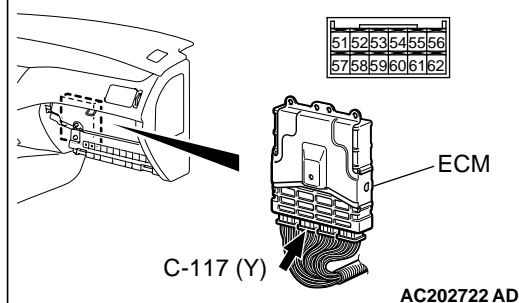
- (6) Measure the voltage between connector D-14 terminal 11 and ground by backprobing.
  - The measured voltage should be between 2.0 and 3.0 volts.

- (7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.
  - The fuel tank pressure reading should increase.
- (8) Turn the ignition switch to the "LOCK" (OFF) position.
- (9) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (10) Connect hose G to the canister.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

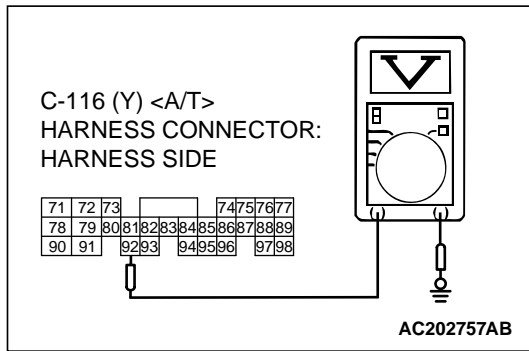
**YES :** Go to Step 3.

**NO :** Go to Step 8.

**CONNECTOR: C-116 <A/T>****CONNECTOR: C-117 <M/T>****STEP 3. Measure the signal voltage at ECM connector C-117 <M/T> or PCM connector C-116 <A/T> by backprobing.**

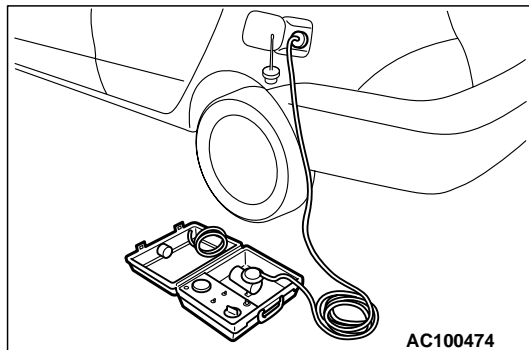
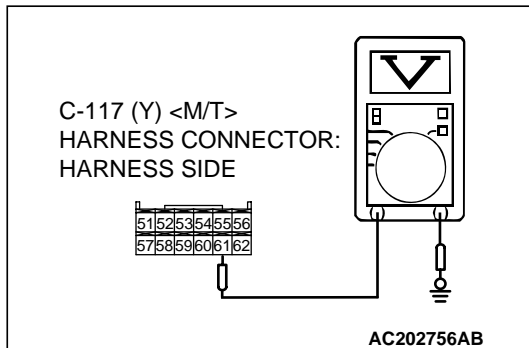
- (1) Do not disconnect ECM connector C-117 <M/T> or the PCM connector C-116 <A/T>.

- (2) Disconnect hose G from the evaporative emission canister side, and plug the hose.
- (3) Turn the ignition switch to the "ON" position.
- (4) Remove the fuel cap.



- (5) Measure the voltage between connector C-117 terminal 61 <M/T> or connector C-116 terminal 92 <A/T> and ground by backprobing.

- The measured voltage should be between 2.0 and 3.0 volts.



- (6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

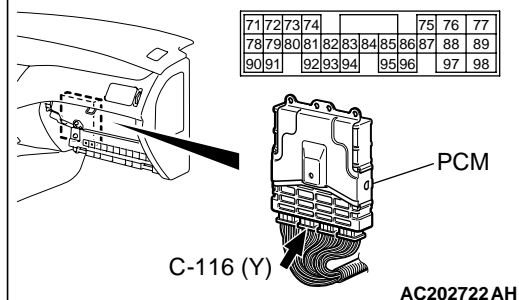
- The fuel tank pressure reading should increase.

- (7) Turn the ignition switch to the "LOCK" (OFF) position.  
(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.  
(9) Connect hose G to the canister.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 4.

**NO :** Go to Step 6.

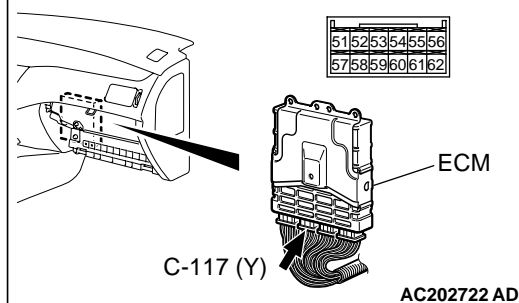
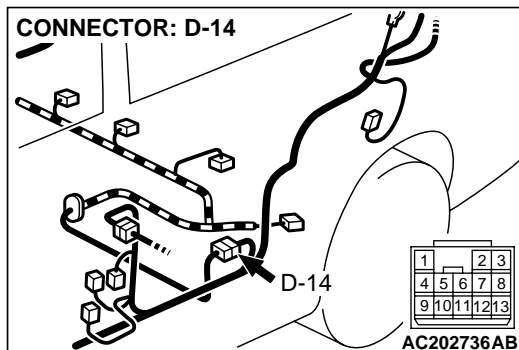
**CONNECTOR: C-116 <A/T>**

**STEP 4.** Check intermediate connector D-14 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

**Q:** Are the connectors and terminals in good condition?

**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**CONNECTOR: C-117 <M/T>****CONNECTOR: D-14**

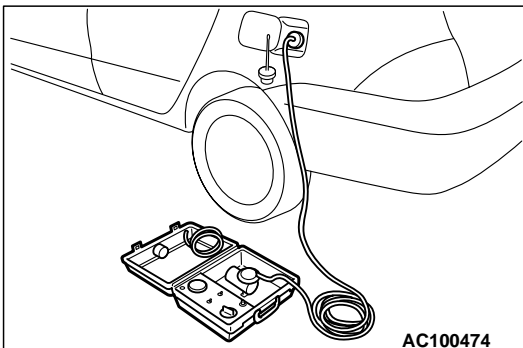
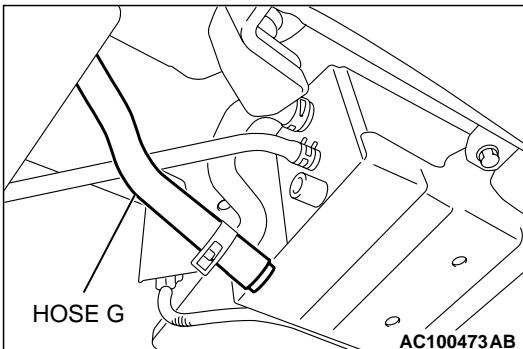
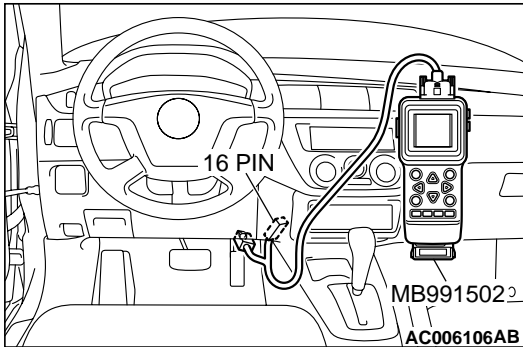


**STEP 5. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).

(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and apply pressure.

- The scan tool reading should increase.

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

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(9) Connect hose G to the canister.

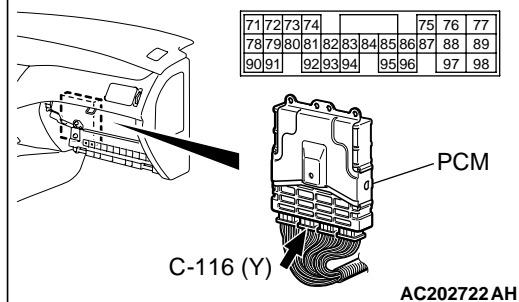
**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

**YES :** It can be assumed that this malfunction is intermittent . Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

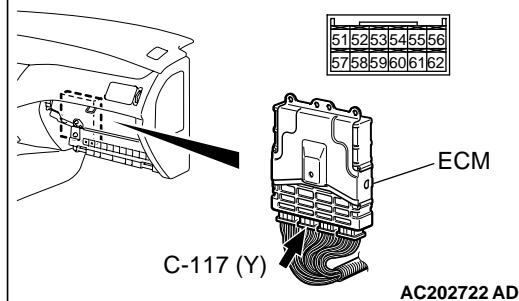
**NO :** Replace the ECM <M/T> or PCM <A/T>. Go to Step 29.

**STEP 6.** Check intermediate connectors D-14, C-127, and C-124 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

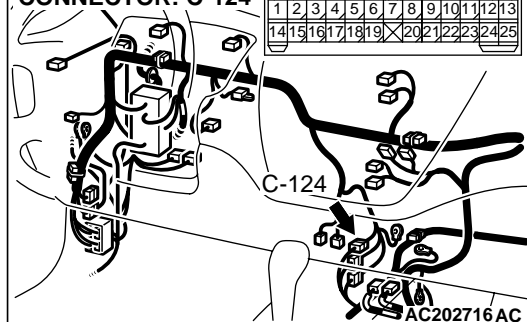
#### CONNECTOR: C-116 <A/T>



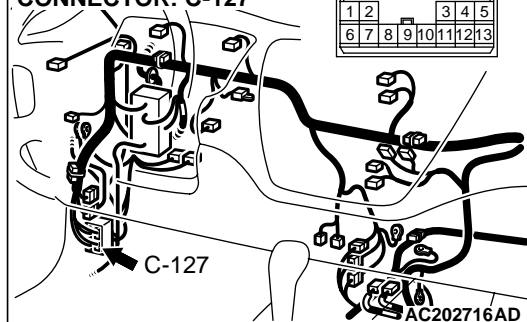
#### CONNECTOR: C-117 <M/T>

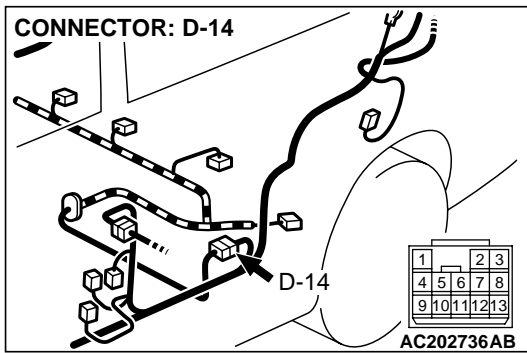


#### CONNECTOR: C-124



#### CONNECTOR: C-127





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 7.

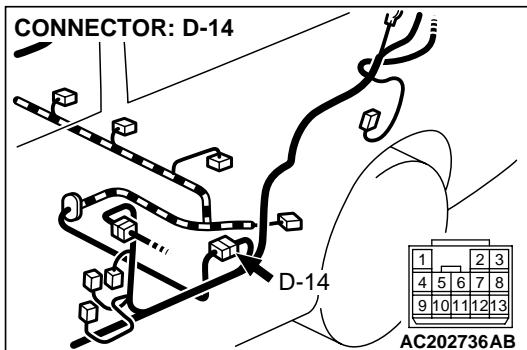
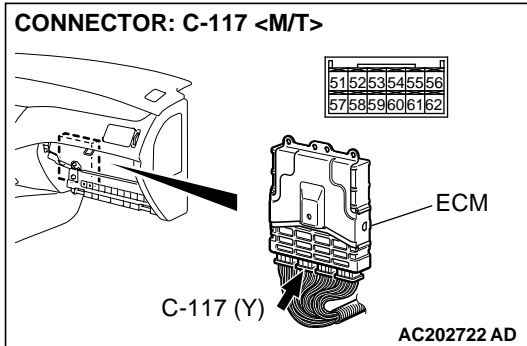
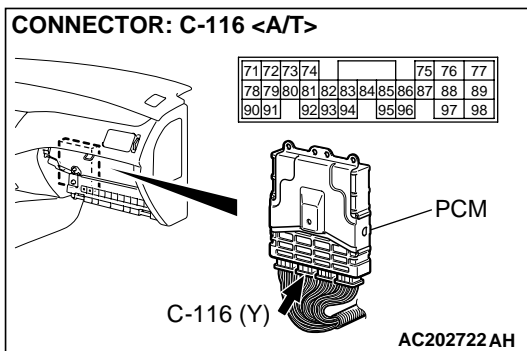
**NO :** Repair or replace the faulty component. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

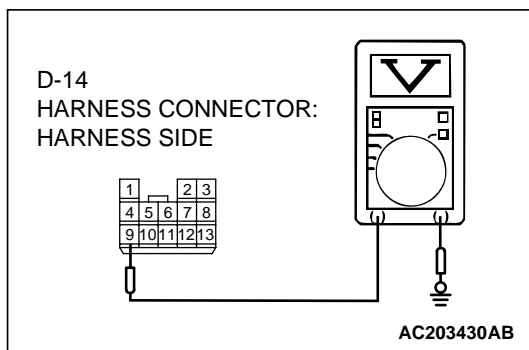
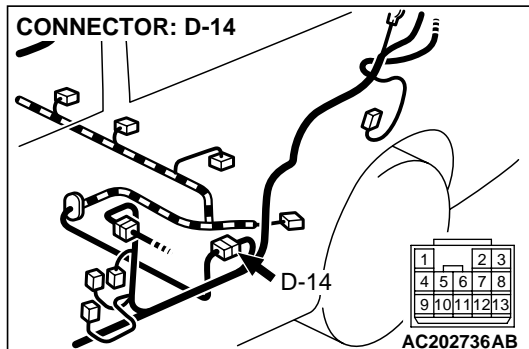
**STEP 7. Check the harness wire between ECM connector C-117 terminal 61 <M/T> or PCM connector C-116 terminal 92 <A/T> and intermediate connector D-14 terminal 11 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.





**STEP 8. Measure the 5-volt reference signal at intermediate connector D-14 by backprobing.**

- (1) Do not disconnect intermediate connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 9 and ground.

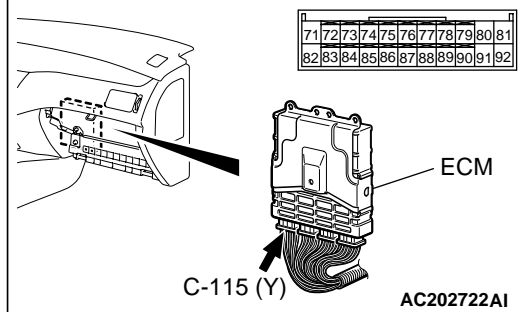
- The voltage should be between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

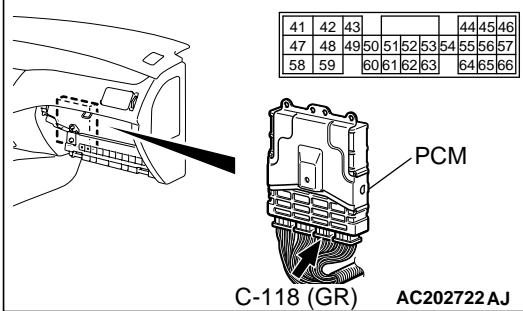
**YES :** Go to Step 14.

**NO :** Go to Step 9.

**CONNECTOR: C-115 <M/T>**

**STEP 9. Measure the 5-volt reference signal at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

**CONNECTOR: C-118 <A/T>**

- (3) Measure the voltage between connector C-115 terminal 81 <M/T> or connector C-118 terminal 46 <A/T> and ground by backprobing.

- The measured voltage should be between 4.8 and 5.2 volts.

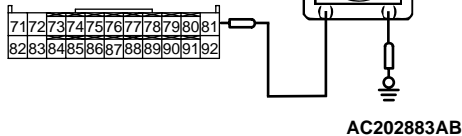
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

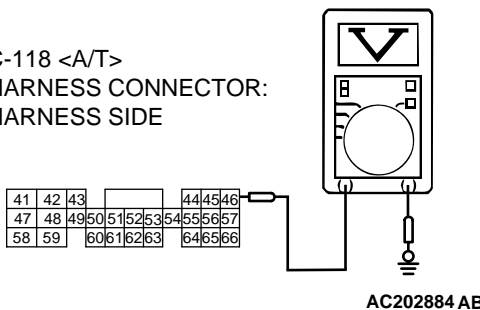
**YES :** Go to Step 10.

**NO :** Go to Step 12.

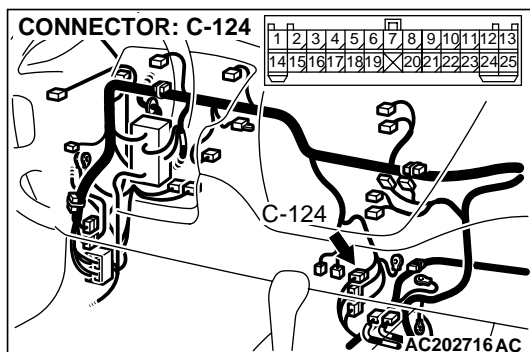
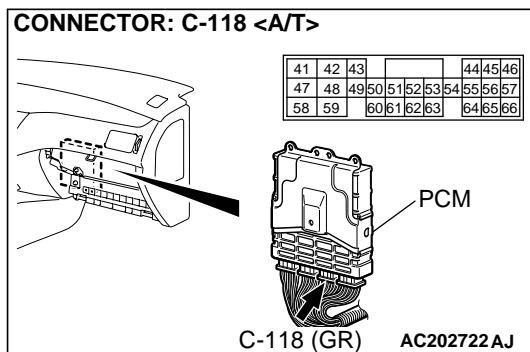
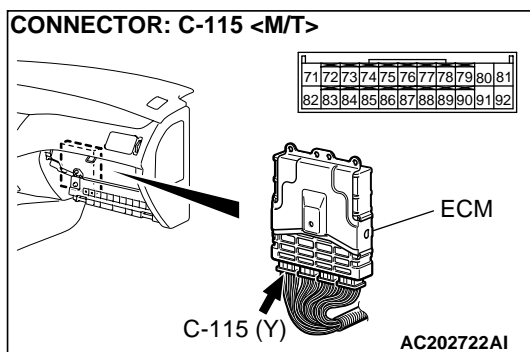
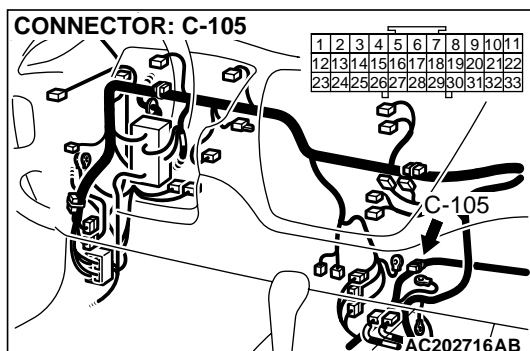
C-115 <M/T>  
HARNESS CONNECTOR:  
HARNESS SIDE

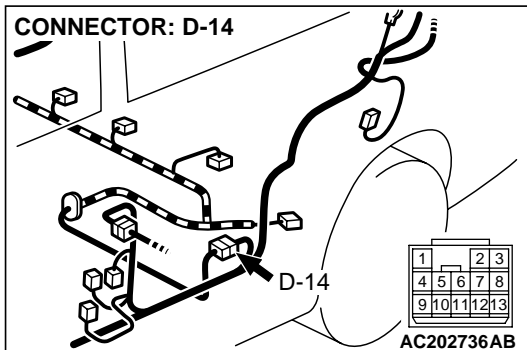
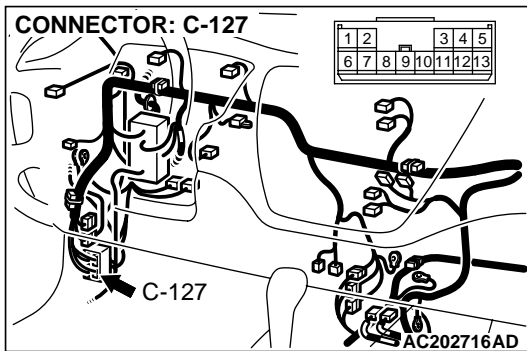


C-118 <A/T>  
HARNESS CONNECTOR:  
HARNESS SIDE



**STEP 10.** Check intermediate connectors C-105, C-124, C-127, and D-14 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 11.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

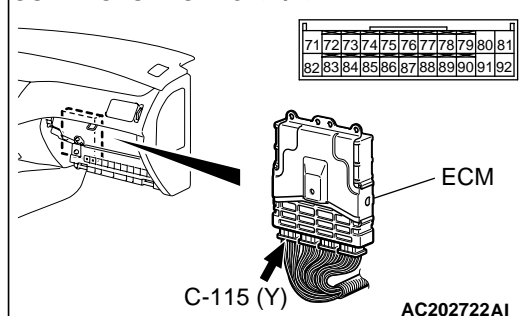
**STEP 11.** Check the harness wire between ECM connector C-115 terminal 81 <M/T> or PCM connector C-118 terminal 46 <A/T> and intermediate connector D-14 terminal 9 for damage.

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

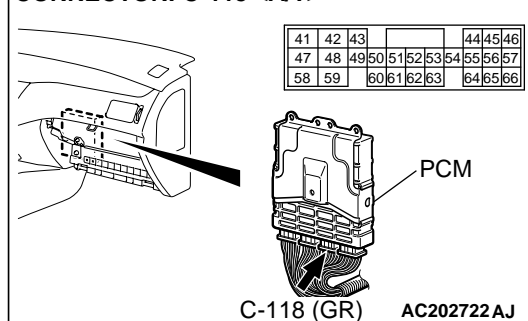
**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.

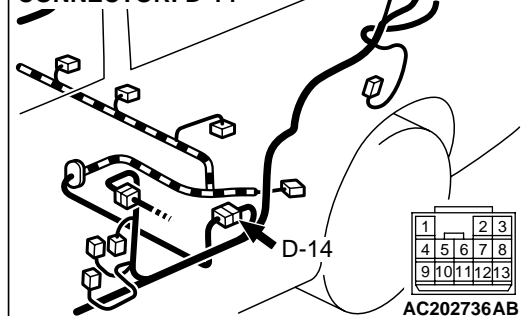
**CONNECTOR: C-115 <M/T>**



**CONNECTOR: C-118 <A/T>**

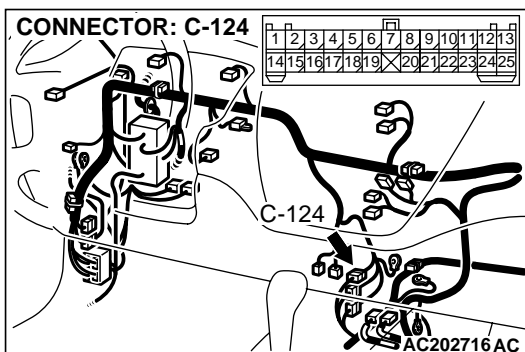
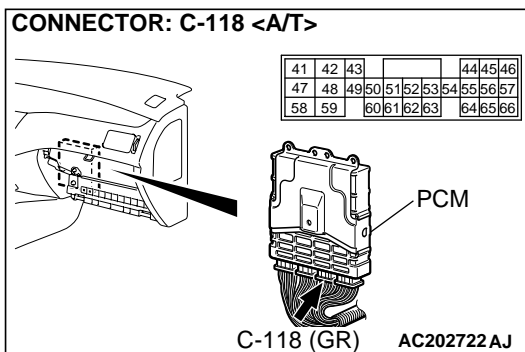
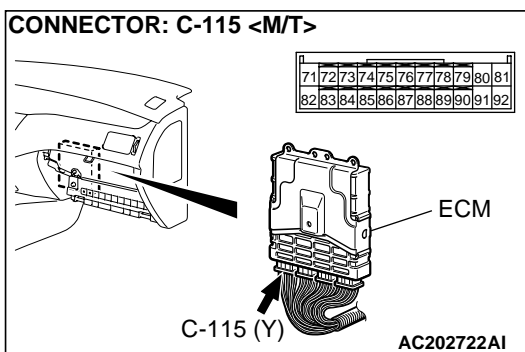
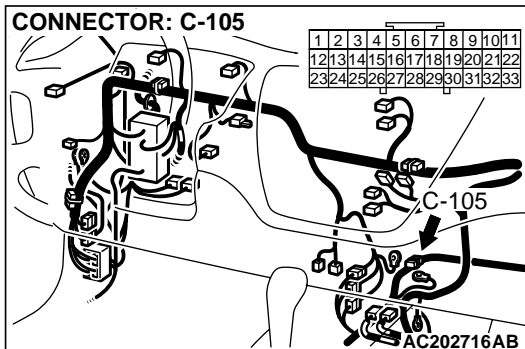


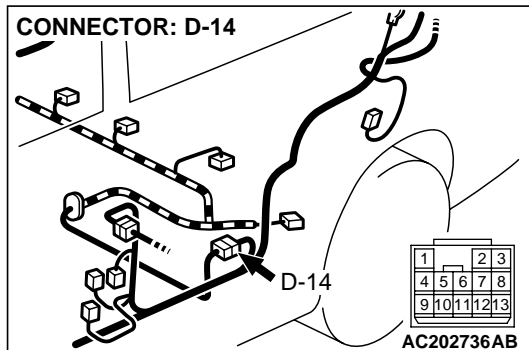
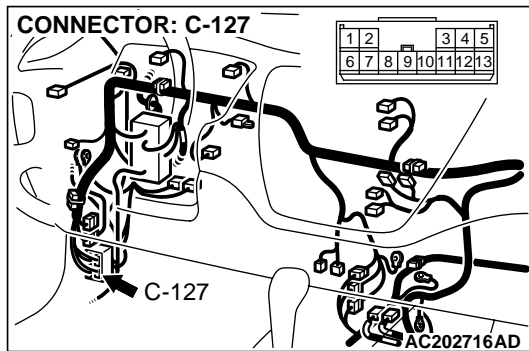
**CONNECTOR: D-14**





**STEP 12.** Check intermediate connectors C-105, C-124, C-127, and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.





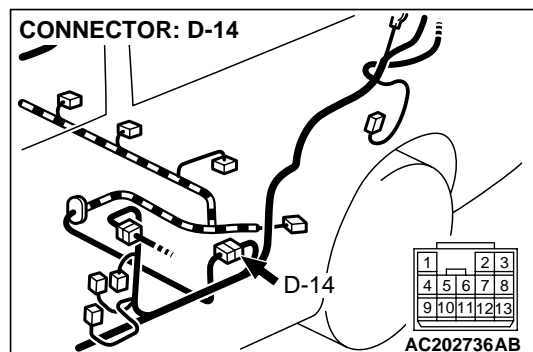
**Q: Are the connectors and terminals in good condition?**

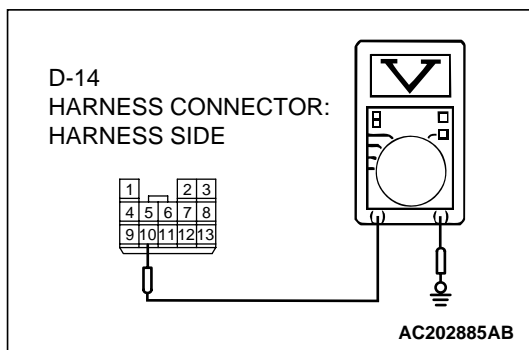
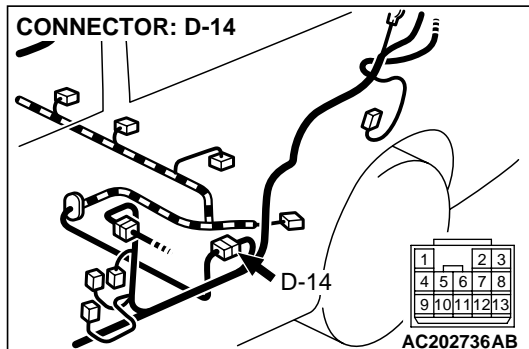
**YES :** Go to Step 13.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

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

**NO :** Repair or replace the harness wire. Go to Step 29.



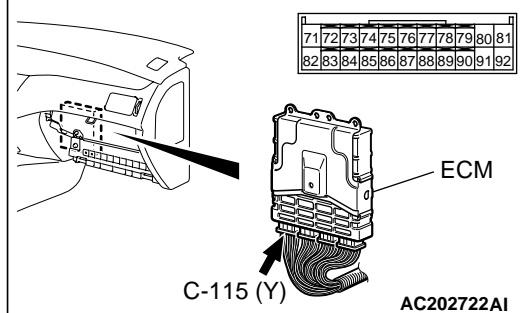
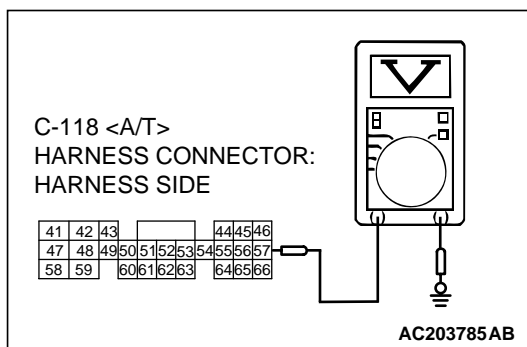
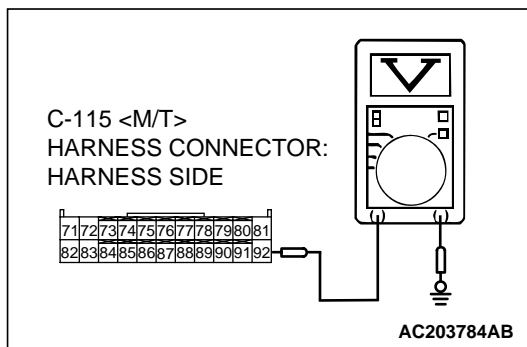
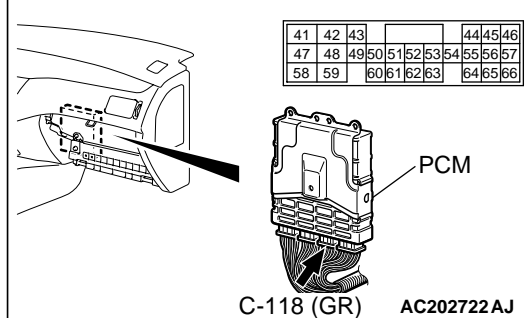
**STEP 14. Check the sensor ground at intermediate connector D-14 by backprobing.**

- (1) Do not disconnect connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 10 and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

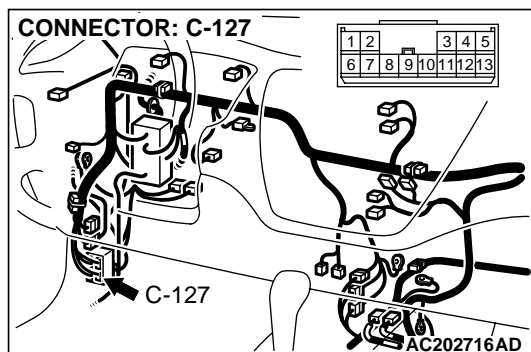
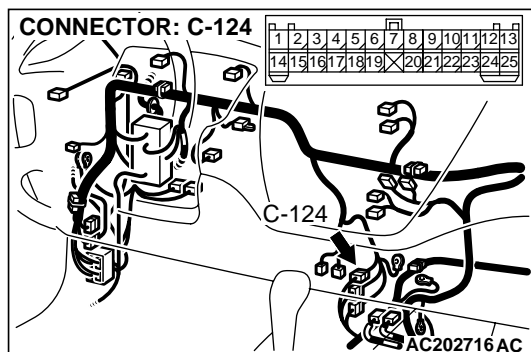
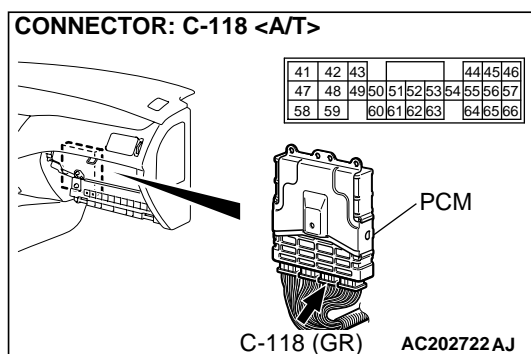
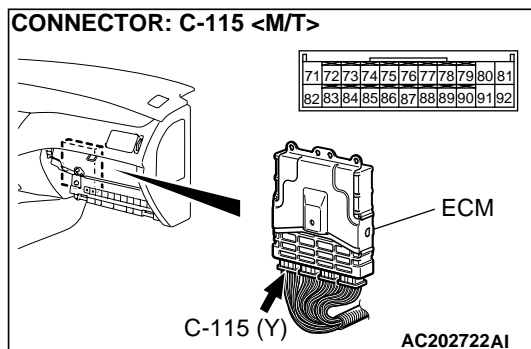
**Q: Is the measured voltage 0.5 volt or less?****YES :** Go to Step 19.**NO :** Go to Step 15.

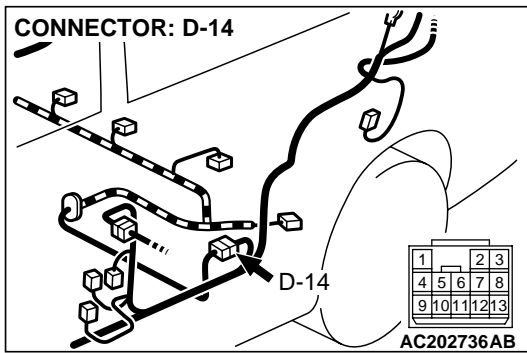
**STEP 15. Check the sensor ground at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector C-115 terminal 92 <M/T> or connector C-118 terminal 57 <A/T> and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage 0.5 volt or less?****YES :** Go to Step 16.**NO :** Go to Step 18.**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 16.** Check intermediate connectors C-124, C-127 and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 17.

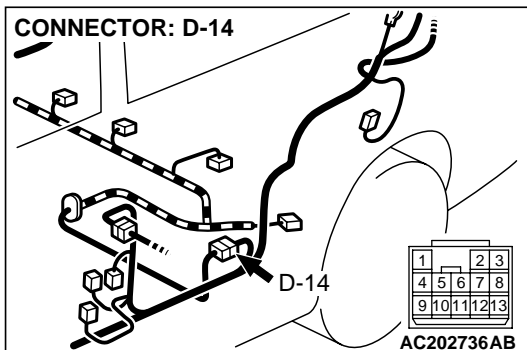
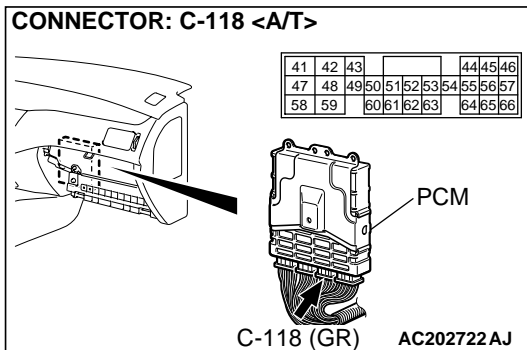
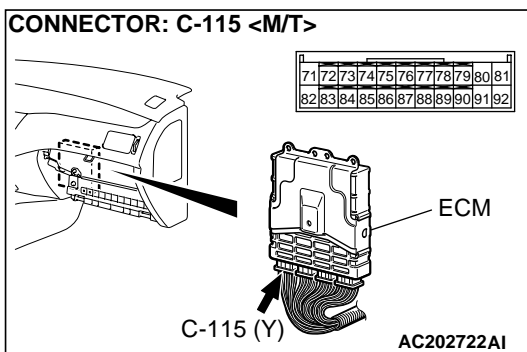
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

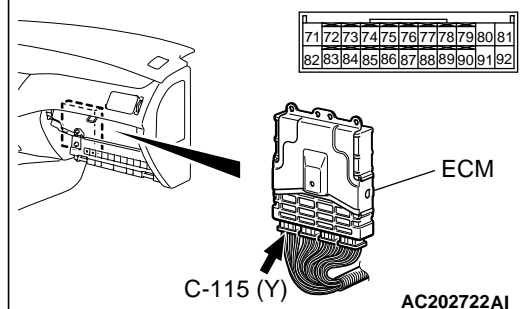
**STEP 17. Check the harness wire between ECM connector C-115 terminal 92 <M/T> or PCM connector C-118 terminal 57 <A/T> and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.



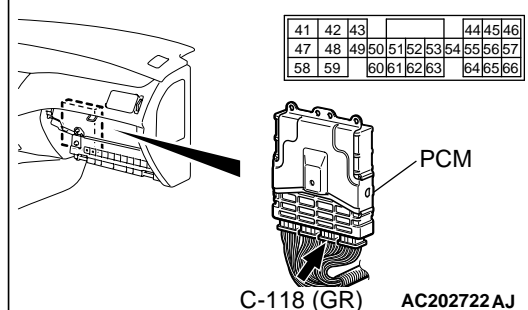
**CONNECTOR: C-115 <M/T>**

**STEP 18. Check ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connector and terminals in good condition?**

**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

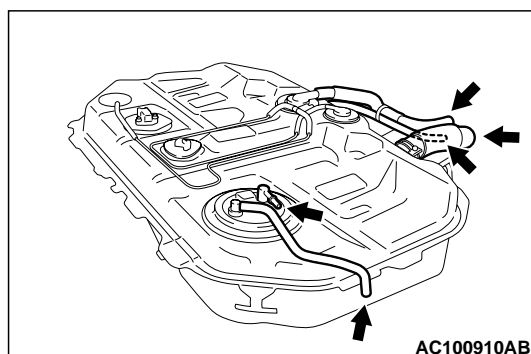
**CONNECTOR: C-118 <A/T>**

**STEP 19. Check the signal voltage at fuel tank differential pressure sensor connector D-09.**

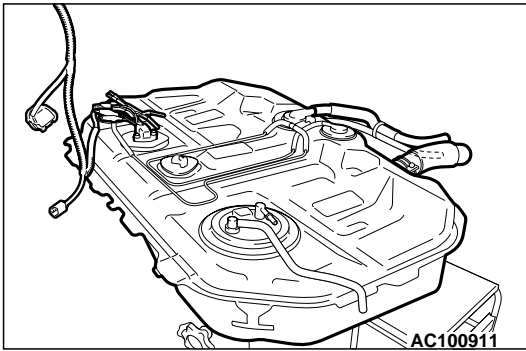
(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)

(2) Plug the filler hose, fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.

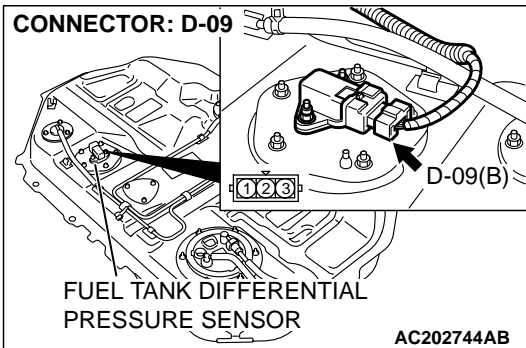
*NOTE: If these items are not securely plugged here, the fuel could leak in the next step.*





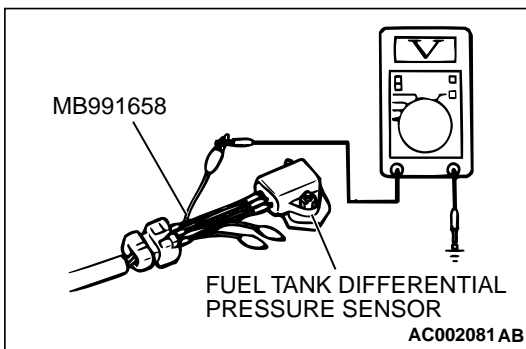
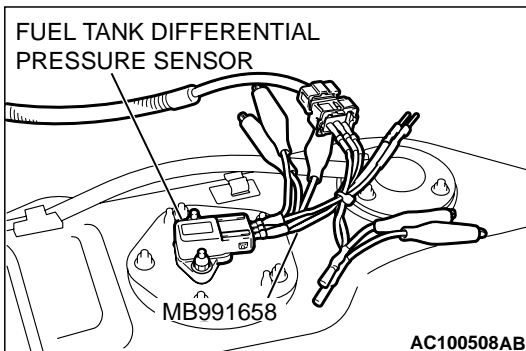


(3) Lift the fuel tank.



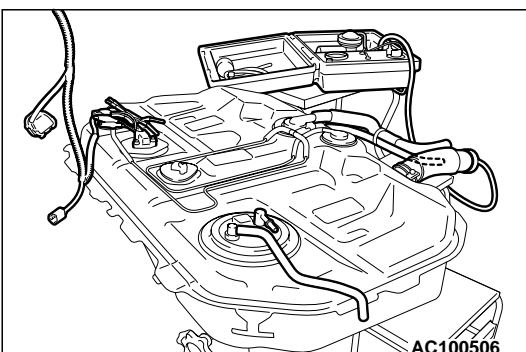
(4) Connect special tool MB991658 to both halves of connector D-09.

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



(6) Measure the voltage between connector D-09 terminal 1 and ground.

- The measured voltage should be between 2.0 and 3.0 volts.



(7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

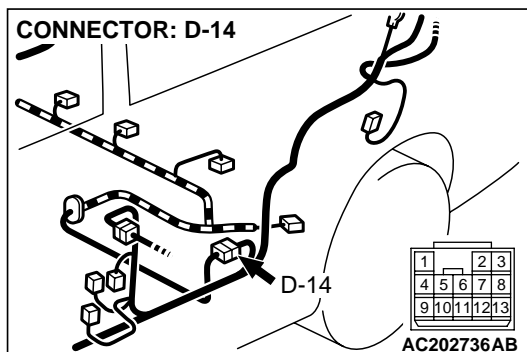
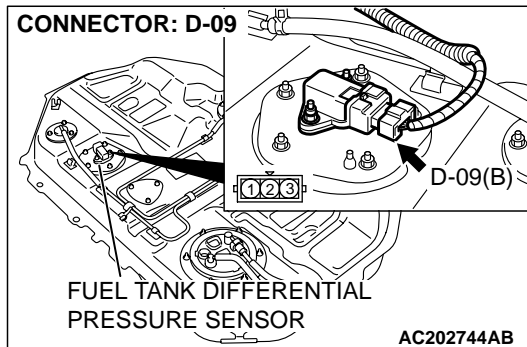
(8) Turn the ignition switch to the "LOCK" (OFF) position.

(9) Disconnect the evaporative emission system pressure pump.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 20.

**NO :** Go to Step 22.

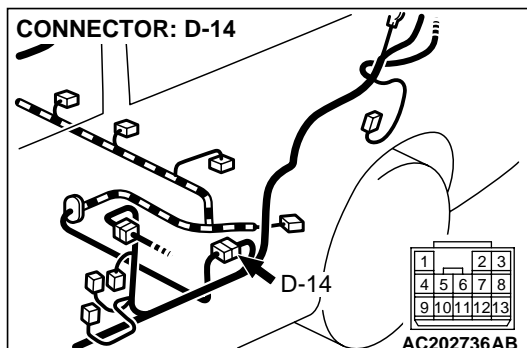
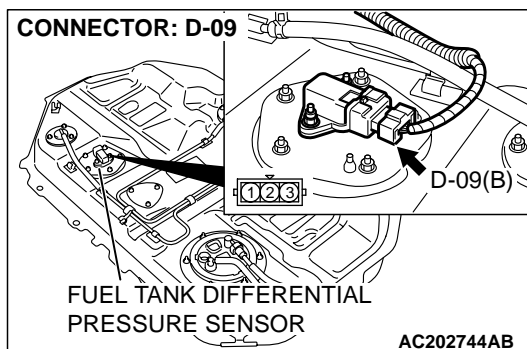


**STEP 20. Check fuel tank differential pressure sensor connector D-09 and intermediate connector for D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 21.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

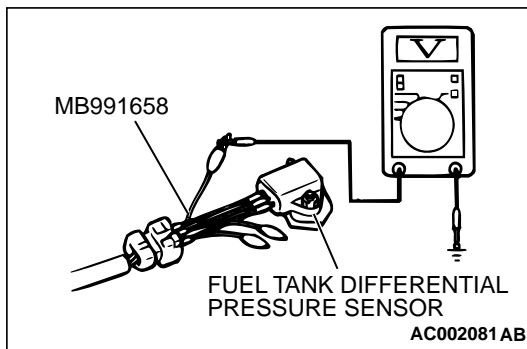
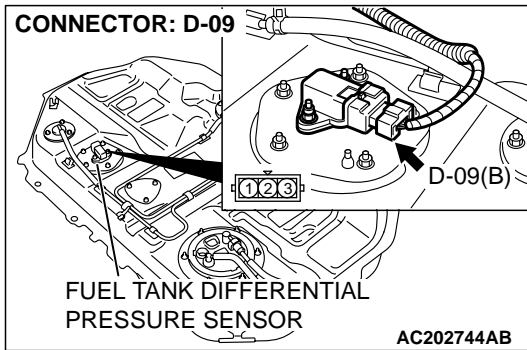


**STEP 21. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 1 and intermediate connector D-14 terminal 11 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair the damaged harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 22. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-09.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Measure the voltage between connector D-09 terminal 3 and ground.

- The voltage should be between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 25.

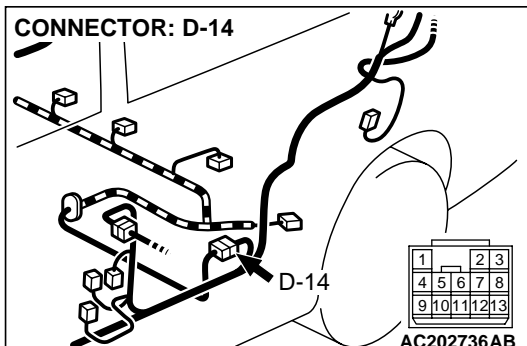
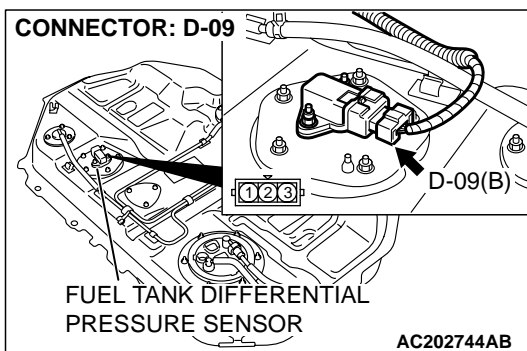
**NO :** Go to Step 23.

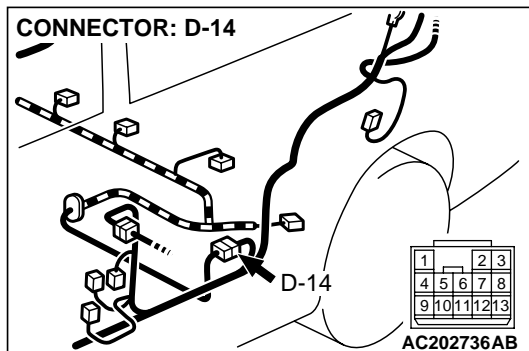
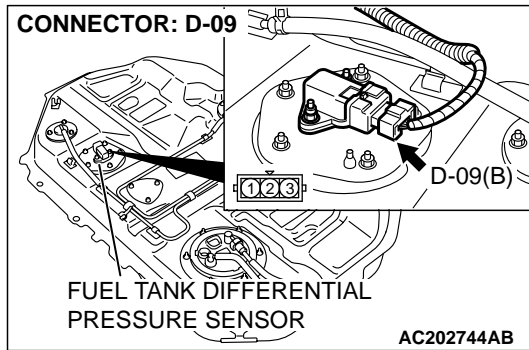
**STEP 23. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 24.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



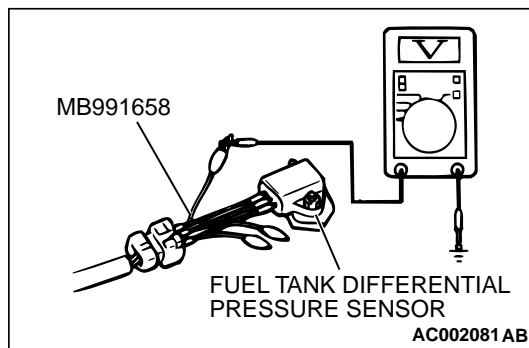
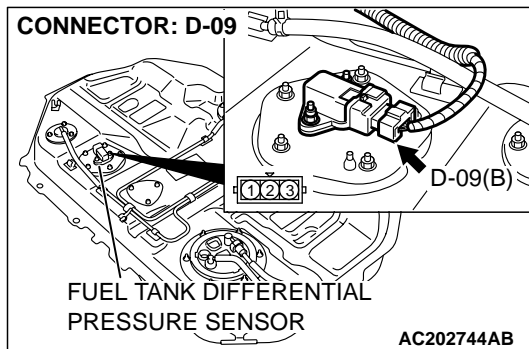


**STEP 24. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 3 and intermediate connector D-14 terminal 9 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 25. Check the return circuit voltage at fuel tank differential pressure sensor connector D-11.**

(1) Use special tool MB991658 to connect terminal 3 of connector D-11.

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

(3) Measure the voltage between connector D-11 terminal 2 and ground.

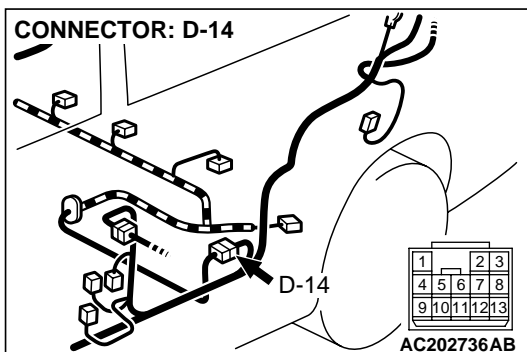
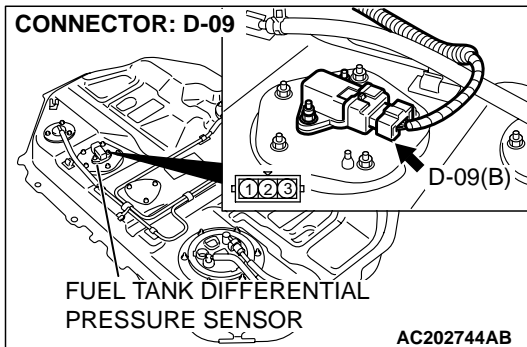
- The voltage should be 0.5 volt or less.

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

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

**YES :** Go to Step 28.

**NO :** Go to Step 26.

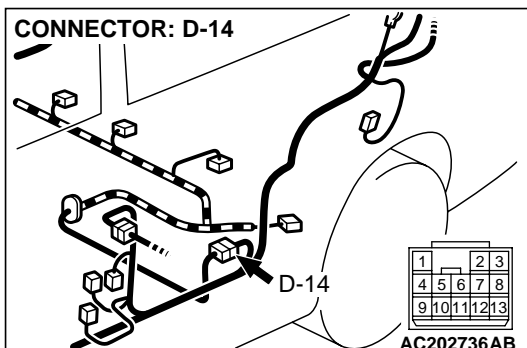
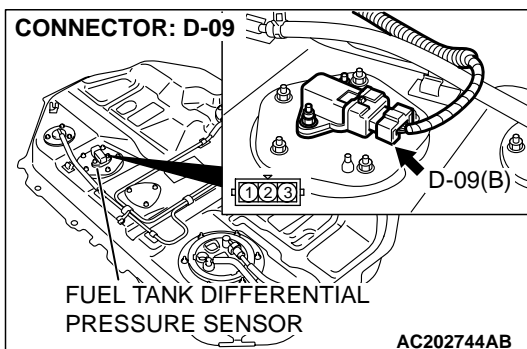


**STEP 26. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 27.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

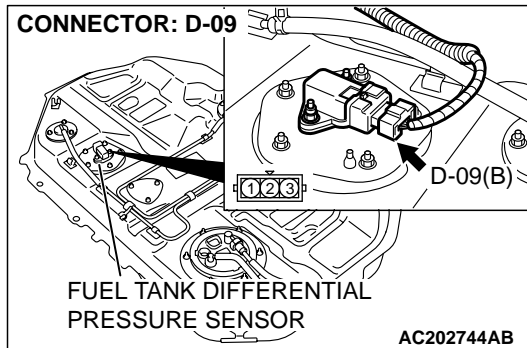


**STEP 27. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 2 and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 28. Check fuel tank differential pressure sensor connector D-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Replace the fuel tank differential pressure sensor, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**STEP 29. Perform the OBD-II drive cycle.**

(1) Carry out a test drive with the drive cycle pattern. Refer to [P.13Ab-2](#), Procedure 1 - Evaporative Emission Control System Leak Monitor .

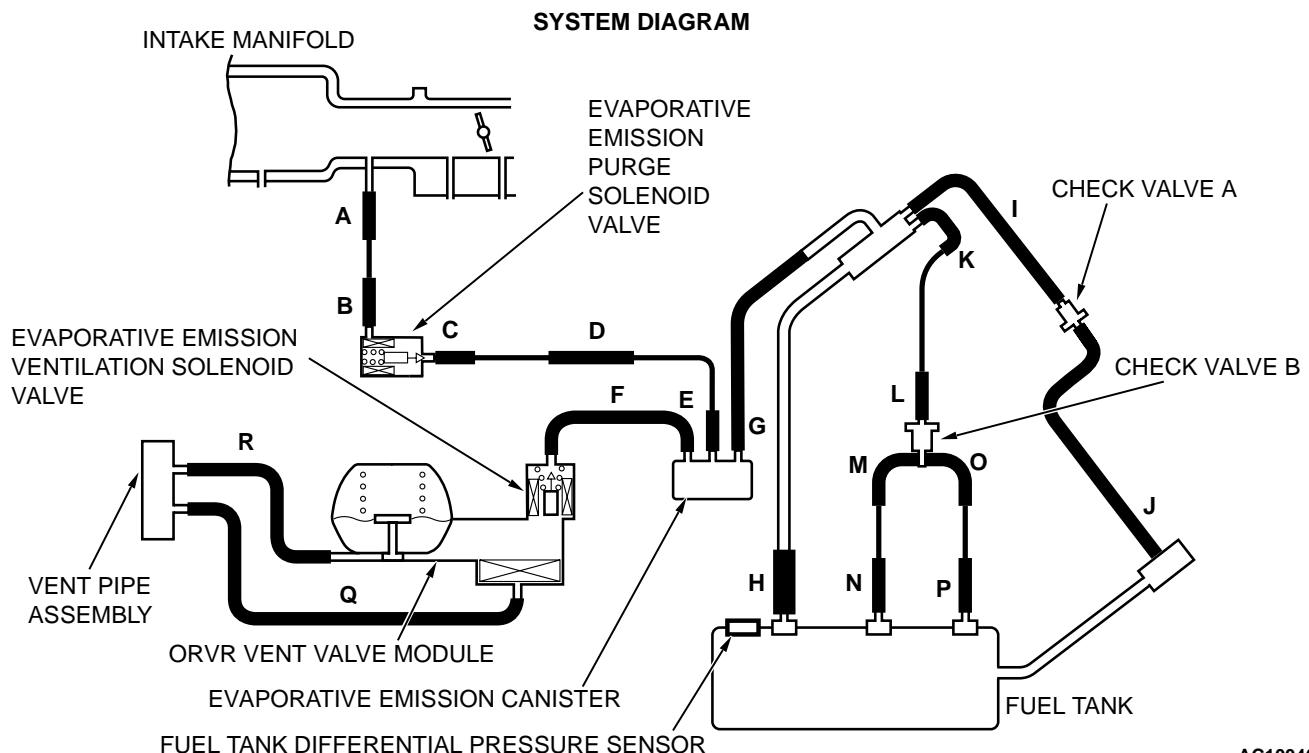
(2) Read the diagnostic trouble code (DTC).

**Q: Is DTC P0451 set?**

**YES :** Go to Step 2.

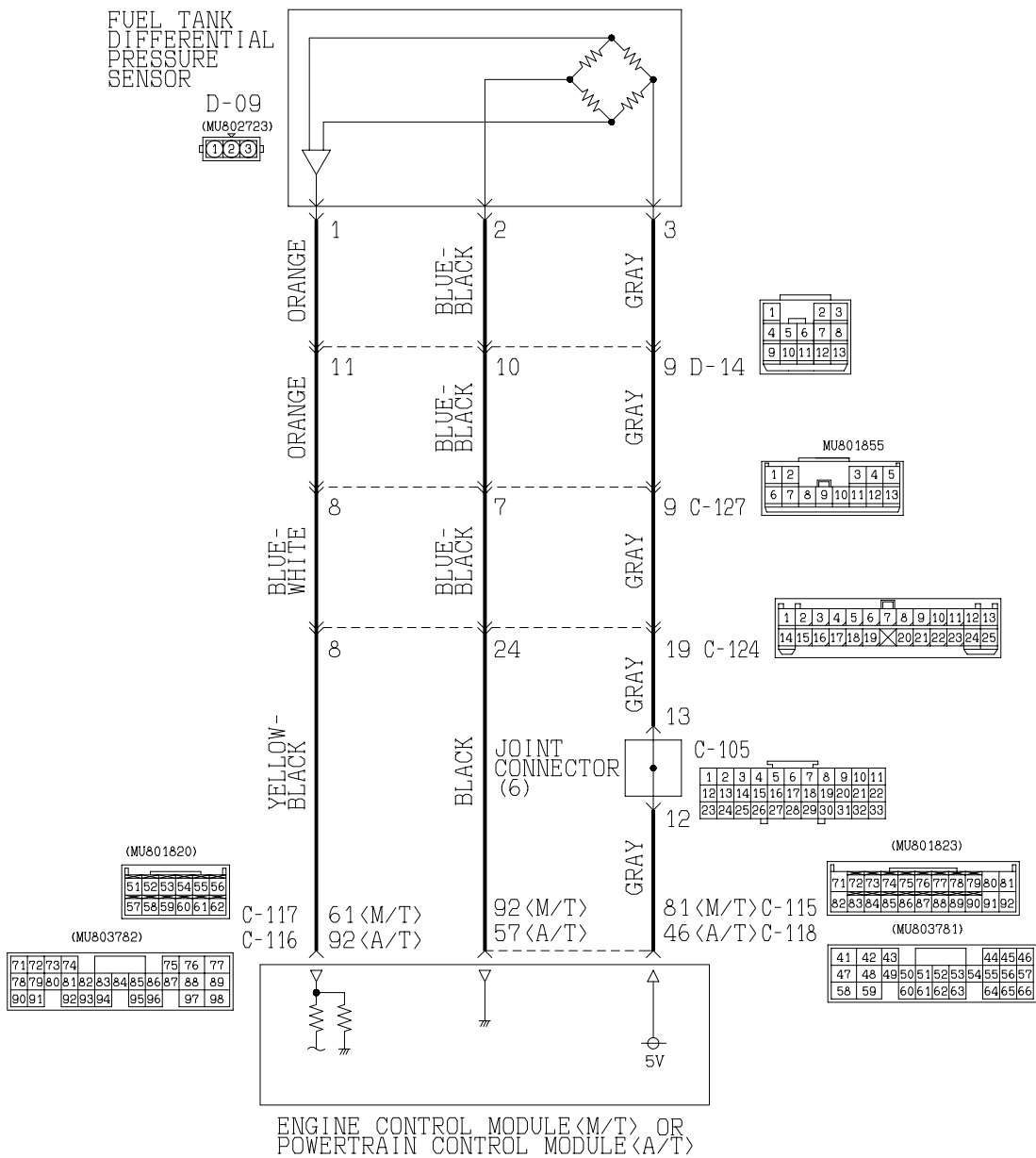
**NO :** The procedure is complete.

### DTC P0452: Evaporative Emission Control System Pressure Sensor Low Input

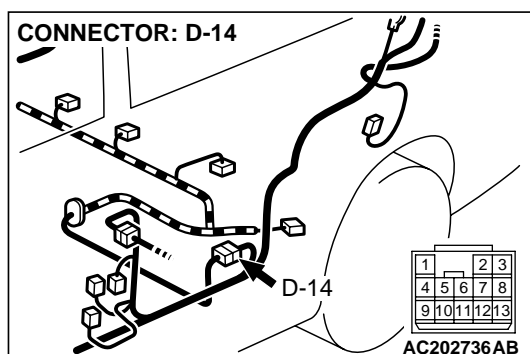
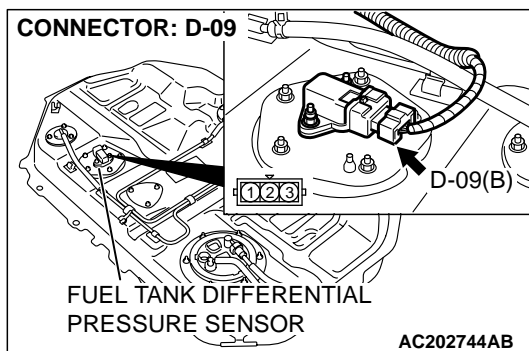
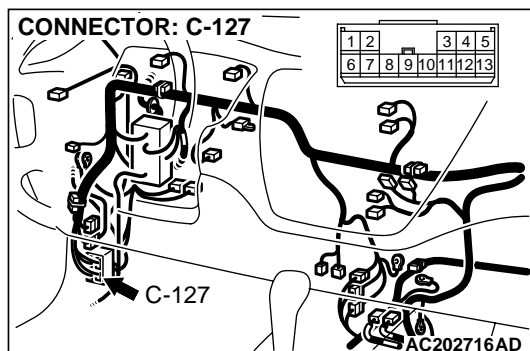
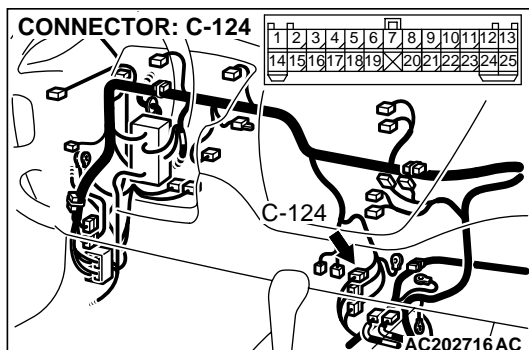
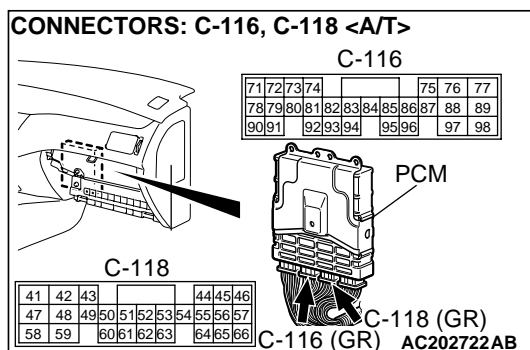
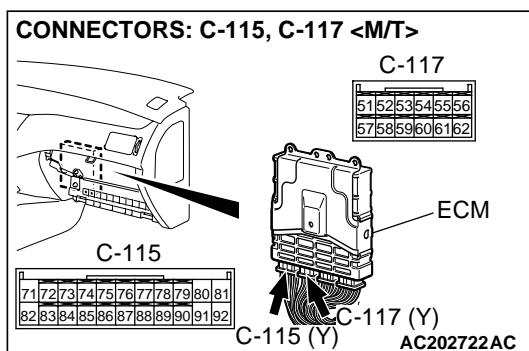
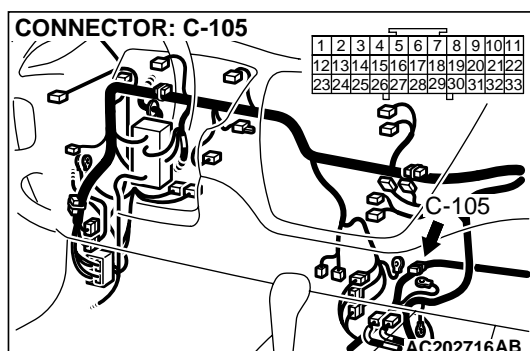


AC100465AC

Fuel Tank Differential Pressure Sensor Circuit



W2J06M01AA



### CIRCUIT OPERATION

- The ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T> supplies a 5-volt reference signal to the fuel tank differential pressure sensor (terminal 3). The fuel tank differential pressure sensor (terminal 2) is grounded through the ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T>.
- The fuel tank differential pressure sensor (terminal 1) returns a voltage signal to the ECM (terminal 61) <M/T> or PCM (terminal 92) <A/T> that is proportional to the pressure in the fuel tank.



**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- The ECM <M/T> or PCM <A/T> determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

**DTC SET CONDITIONS****Check Conditions:**

- Intake air temperature is greater than 5°C (41°F).
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 and 80 percent.

**Judgment Criteria**

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains at 1.0 volt or less for ten seconds.

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

- Malfunction of the fuel tank differential pressure sensor.
- A damaged harness in the fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

**OVERVIEW OF TROUBLESHOOTING**

- DTC P0452 can be set by a faulty fuel differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73.)  
The mechanical gauge reading is used to verify scan tool MB991502 reading.  
A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.

## DIAGNOSIS

### Required Special Tools:

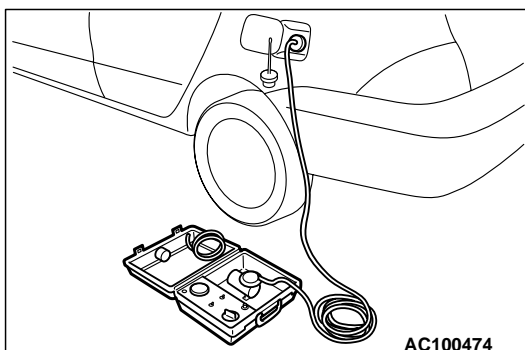
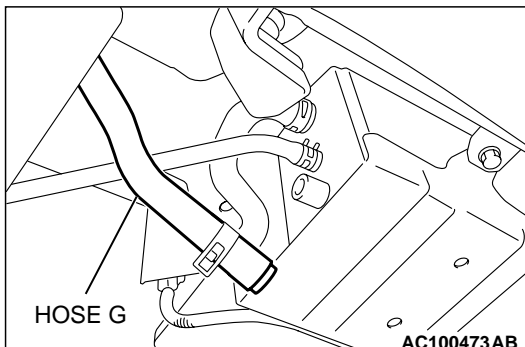
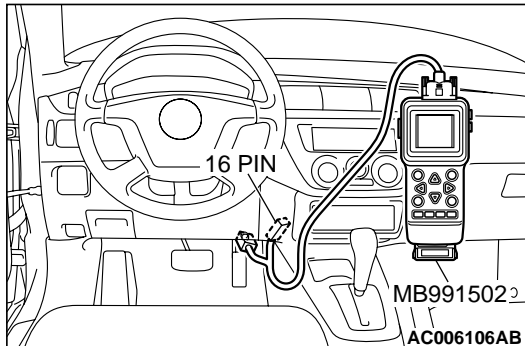
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

### ⚠ CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).

(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(9) Connect hose G to the canister.

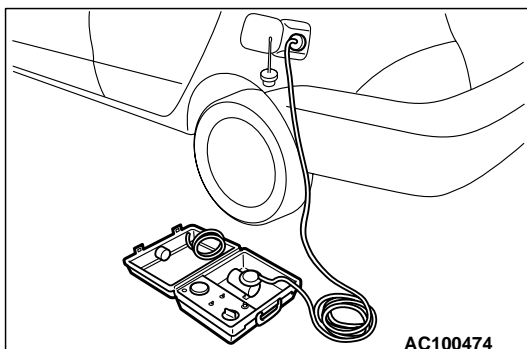
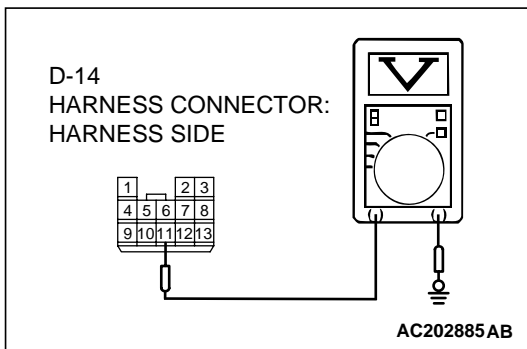
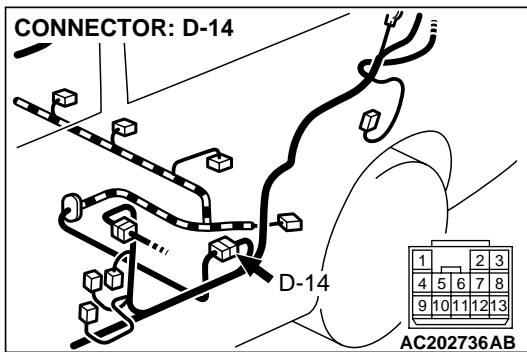
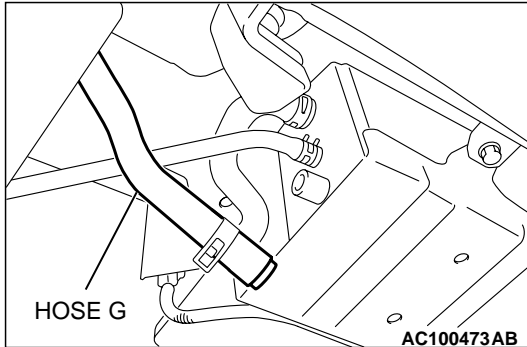
**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction P.00-6. Go to Step 29.

**NO :** Go to Step 2.

**STEP 2. Measure the signal voltage at intermediate connector D-14 by backprobing.**

- (1) Remove the rear seat cushion. (Refer to GROUP 52A, Rear Seat P.52A-18.)
- (2) Pull up the carpet.
- (3) Disconnect hose G from the evaporative emission canister side, and plug the hose.
- (4) Turn the ignition switch to the "ON" position.
- (5) Remove the fuel cap.



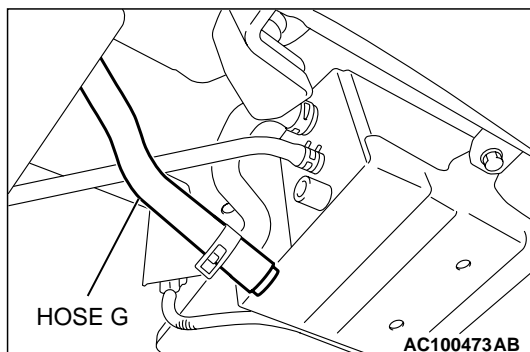
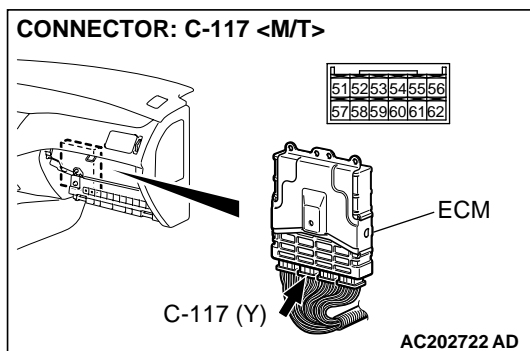
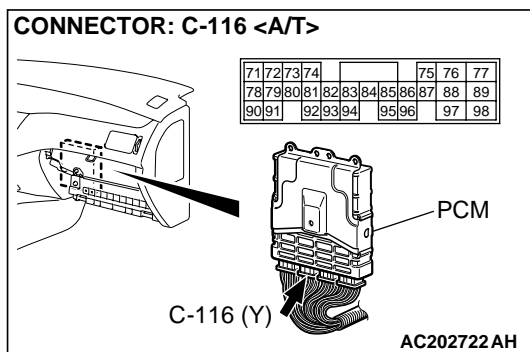
- (6) Measure the voltage between connector D-14 terminal 11 and ground by backprobing.
  - The measured voltage should be between 2.0 and 3.0 volts.

- (7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.
  - The fuel tank pressure reading should increase.
- (8) Turn the ignition switch to the "LOCK" (OFF) position.
- (9) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (10) Connect hose G to the canister.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 3.

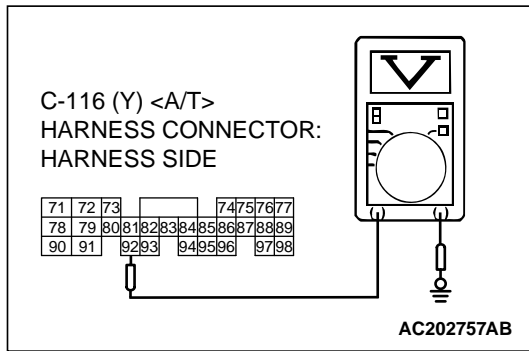
**NO :** Go to Step 8.



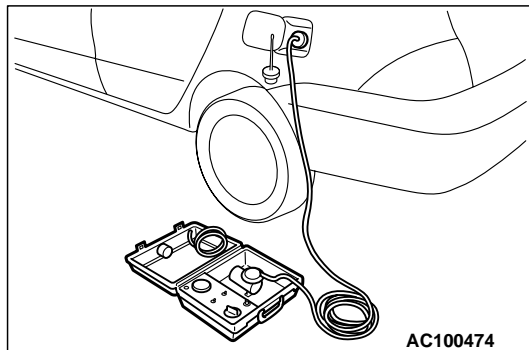
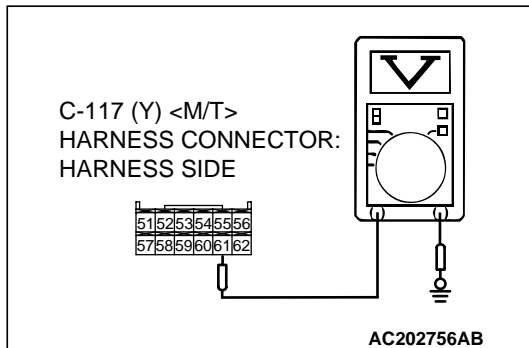
**STEP 3. Measure the signal voltage at ECM connector C-117 <M/T> or PCM connector C-116 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-117 <M/T> or the PCM connector C-116 <A/T>.

- (2) Disconnect hose G from the evaporative emission canister side, and plug the hose.
- (3) Turn the ignition switch to the "ON" position.
- (4) Remove the fuel cap.



- (5) Measure the voltage between connector C-117 terminal 61 <M/T> or connector C-116 terminal 92 <A/T> and ground by backprobing.
- The measured voltage should be between 2.0 and 3.0 volts.

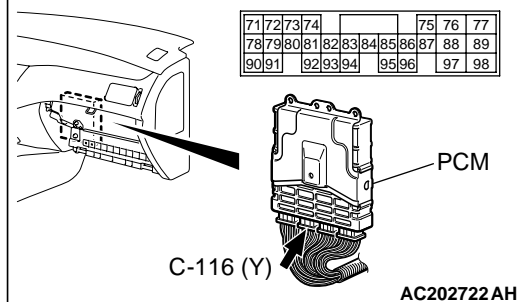


- (6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.
- The fuel tank pressure reading should increase.
- (7) Turn the ignition switch to the "LOCK" (OFF) position.
- (8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (9) Connect hose G to the canister.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 4.

**NO :** Go to Step 6.

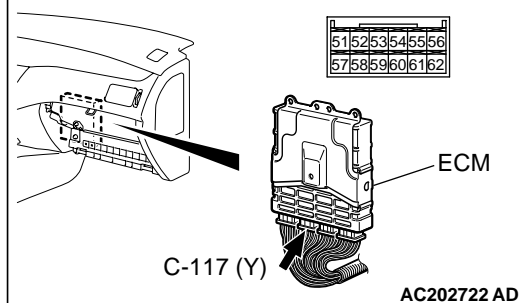
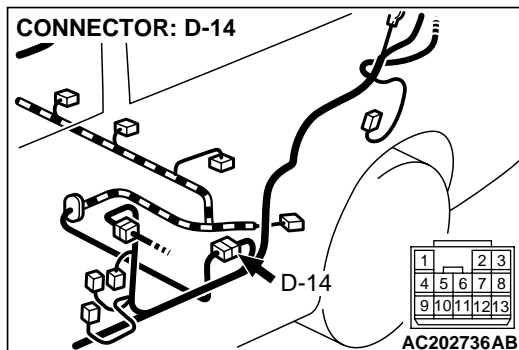
**CONNECTOR: C-116 <A/T>**

**STEP 4.** Check intermediate connector D-14 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

**Q:** Are the connectors and terminals in good condition?

**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

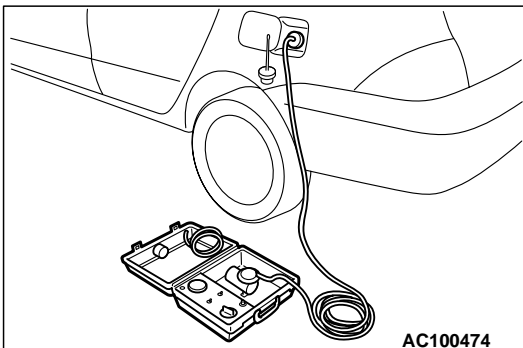
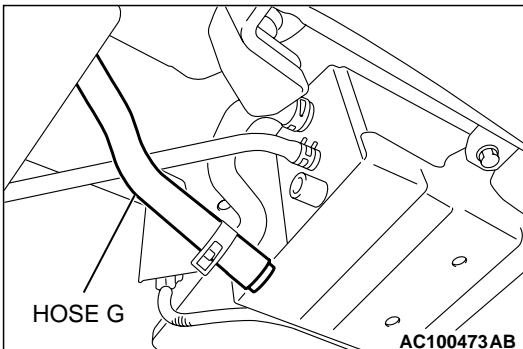
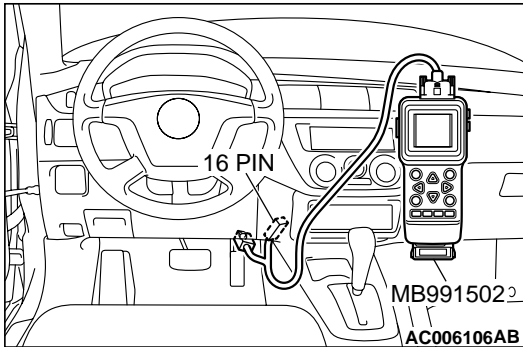
**CONNECTOR: C-117 <M/T>****CONNECTOR: D-14**

**STEP 5. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).

(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and apply pressure.

- The scan tool reading should increase.

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

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

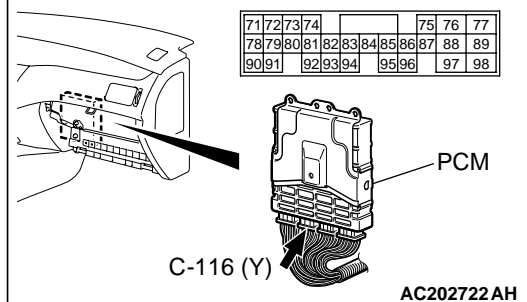
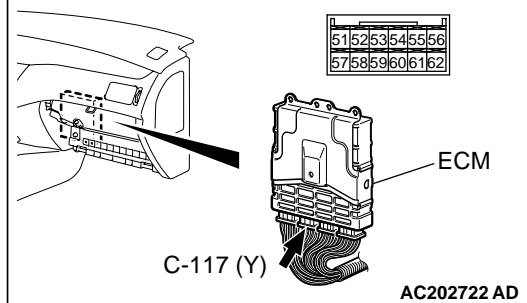
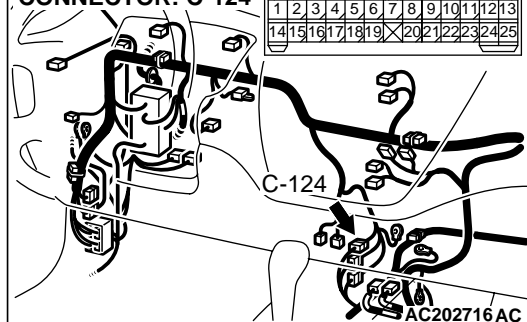
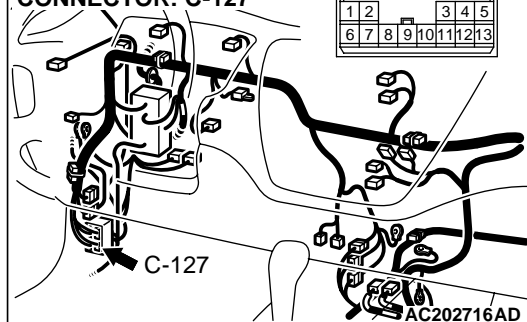
(9) Connect hose G to the canister.

**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

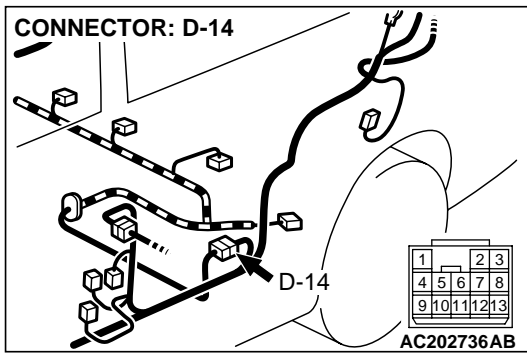
**YES :** It can be assumed that this malfunction is intermittent . Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Replace the ECM <M/T> or PCM <A/T>. Go to Step 29.

**STEP 6.** Check intermediate connectors D-14, C-127, and C-124 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

**CONNECTOR: C-116 <A/T>**

**CONNECTOR: C-117 <M/T>**

**CONNECTOR: C-124**

**CONNECTOR: C-127**






**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 7.

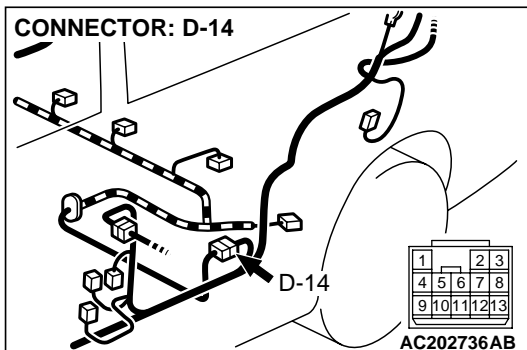
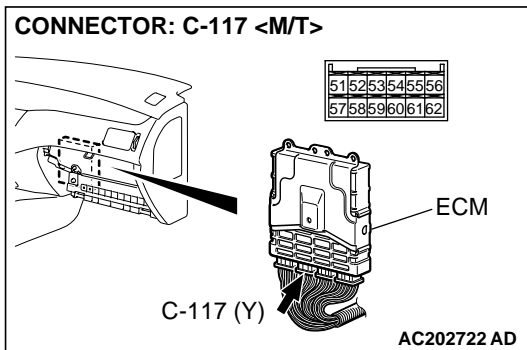
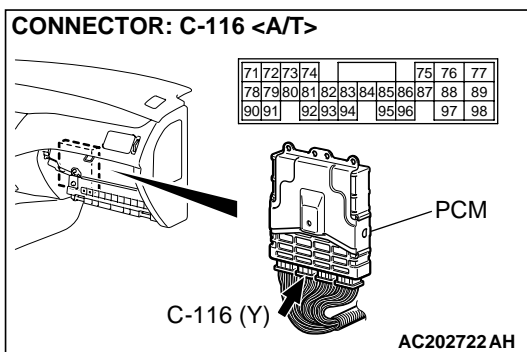
**NO :** Repair or replace the faulty component. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

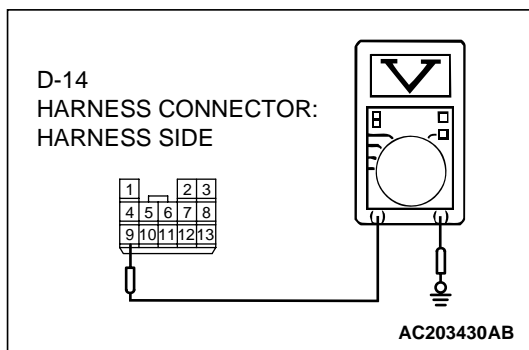
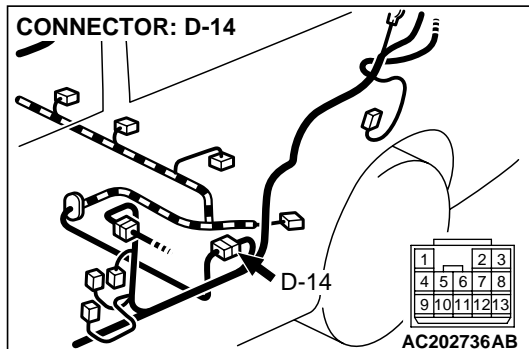
**STEP 7. Check the harness wire between ECM connector C-117 terminal 61 <M/T> or PCM connector C-116 terminal 92 <A/T> and intermediate connector D-14 terminal 11 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.





**STEP 8. Measure the 5-volt reference signal at intermediate connector D-14 by backprobing.**

- (1) Do not disconnect intermediate connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 9 and ground .

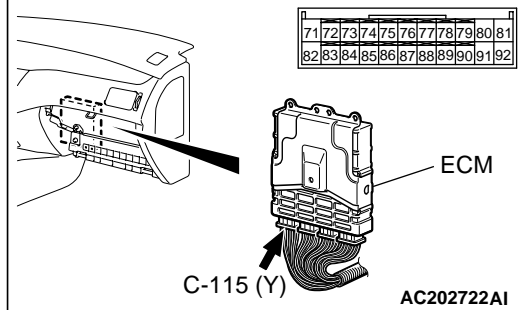
- The voltage should be between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

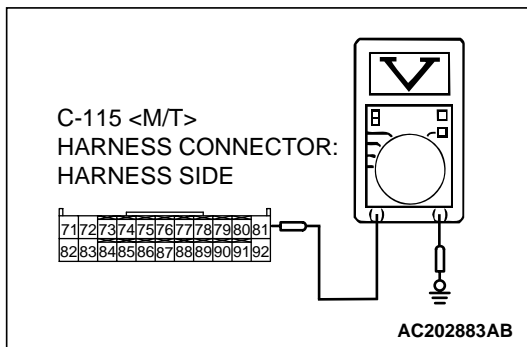
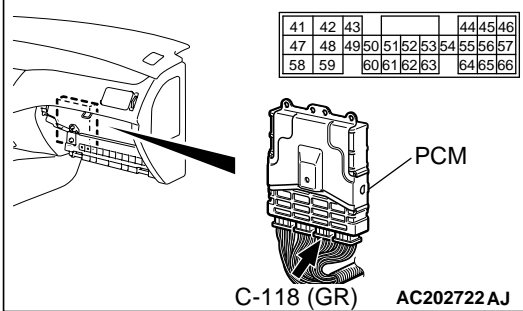
**YES :** Go to Step 14.

**NO :** Go to Step 9.

**CONNECTOR: C-115 <M/T>**

**STEP 9. Measure the 5-volt reference signal at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

**CONNECTOR: C-118 <A/T>**

- (3) Measure the voltage between connector C-115 terminal 81 <M/T> or connector C-118 terminal 46 <A/T> and ground by backprobing.

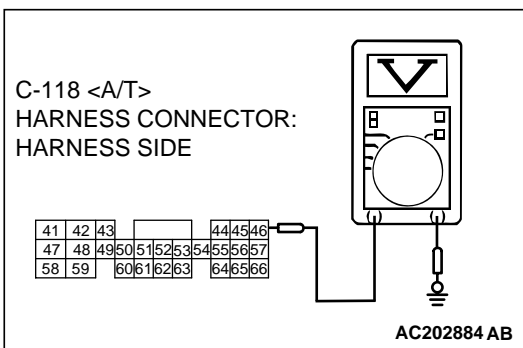
- The measured voltage should be between 4.8 and 5.2 volts.

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

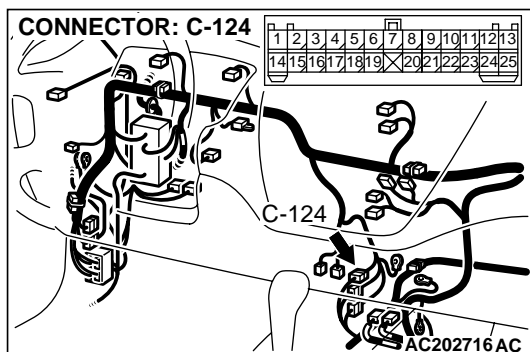
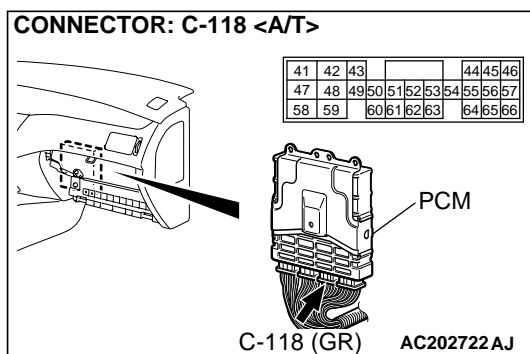
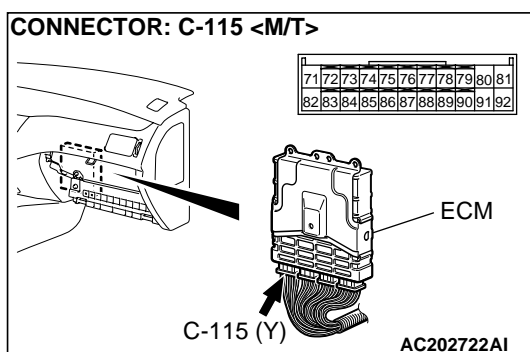
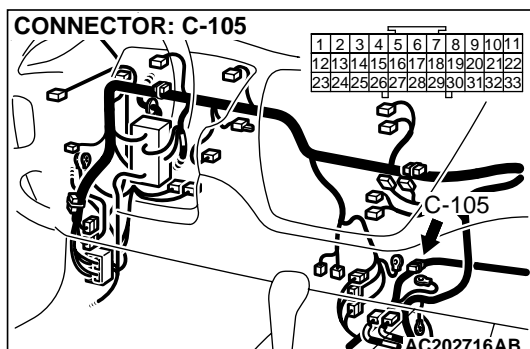
**Q: Is the measured voltage between 4.8 and 5.2 volts?**

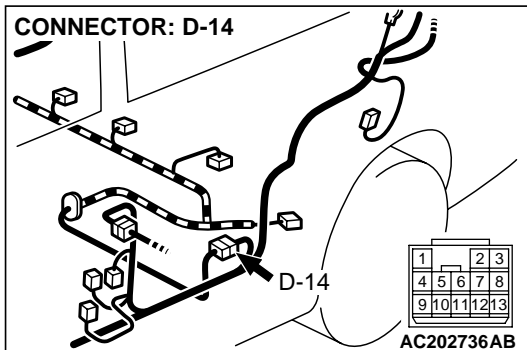
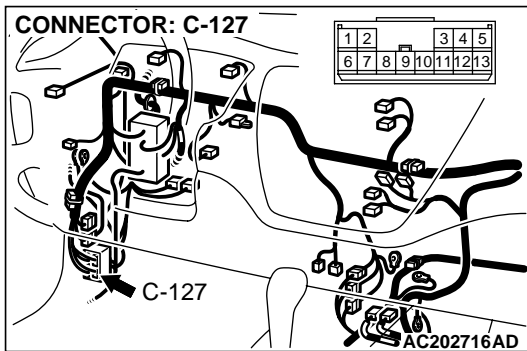
**YES :** Go to Step 10.

**NO :** Go to Step 12.



**STEP 10.** Check intermediate connectors C-105, C-124, C-127, and D-14 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 11.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

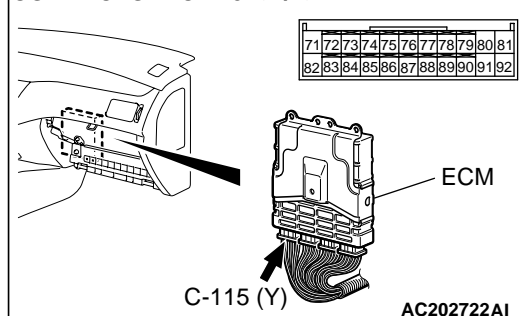
**STEP 11.** Check the harness wire between ECM connector C-115 terminal 81 <M/T> or PCM connector C-118 terminal 46 <A/T> and intermediate connector D-14 terminal 9 for damage.

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

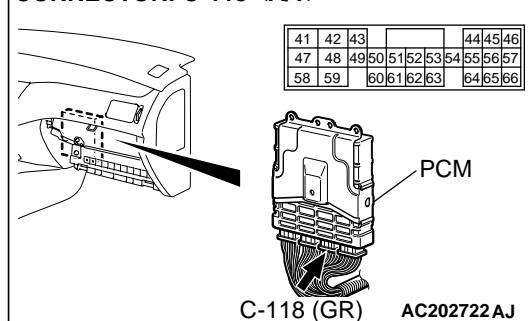
**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.

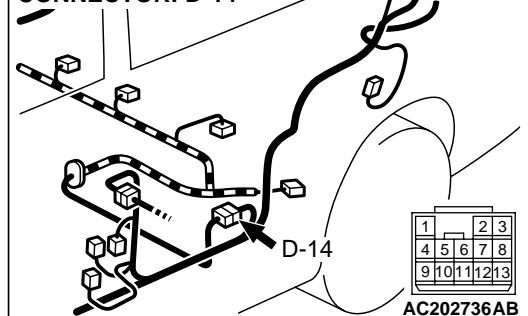
**CONNECTOR: C-115 <M/T>**



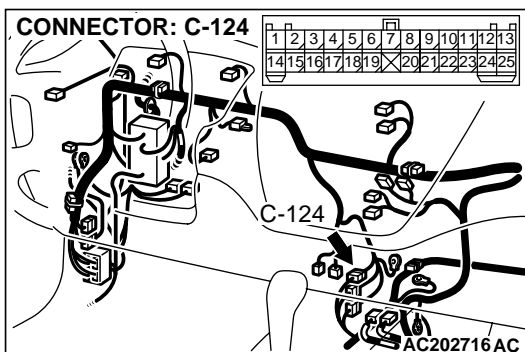
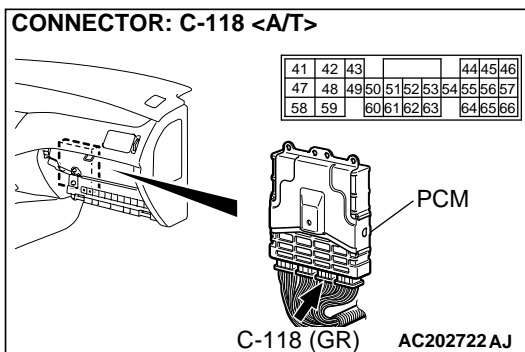
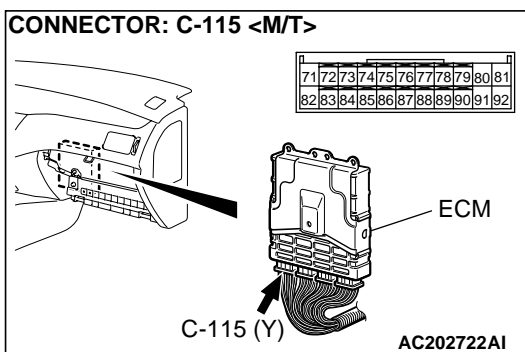
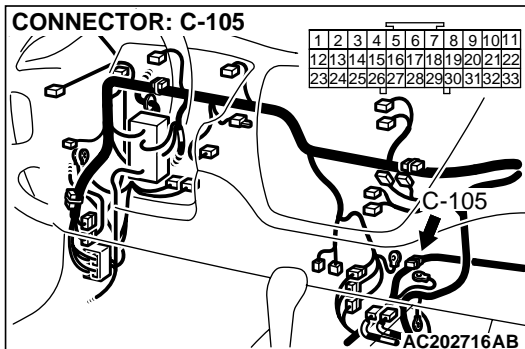
**CONNECTOR: C-118 <A/T>**

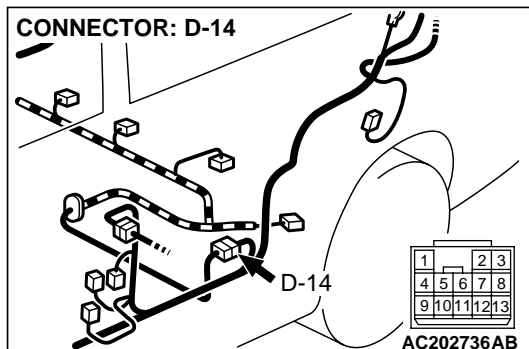
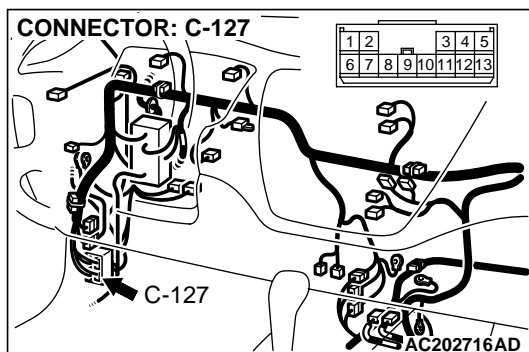


**CONNECTOR: D-14**



**STEP 12.** Check intermediate connectors C-105, C-124, C-127, and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 13.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.



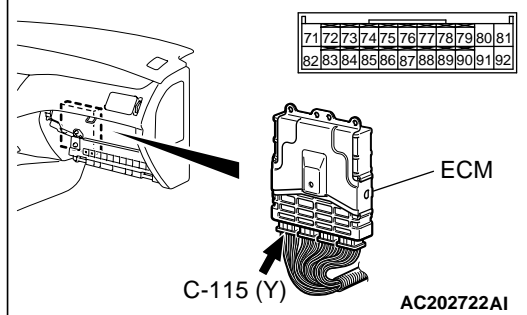
**STEP 13.** Check the harness wire between intermediate connector D-14 terminal 9 and ECM connector C-115 terminal 81 <M/T> or PCM connector C-118 terminal 46 <A/T> for damage.

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

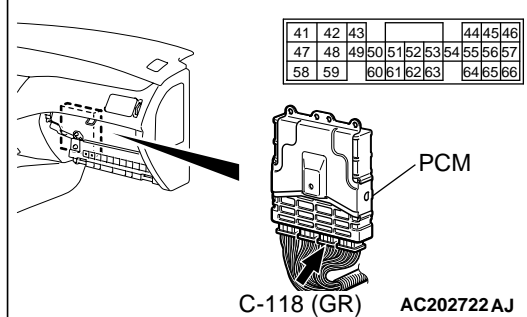
**YES :** Go to Step 5.

**NO :** Repair or replace the harness wire. Go to Step 29.

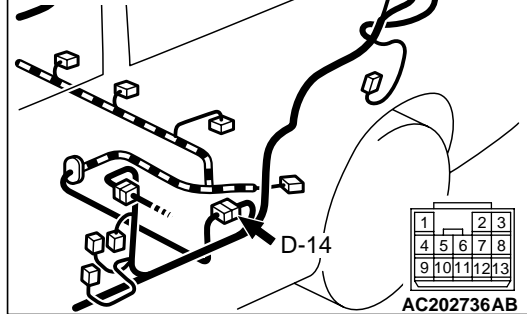
**CONNECTOR: C-115 <M/T>**

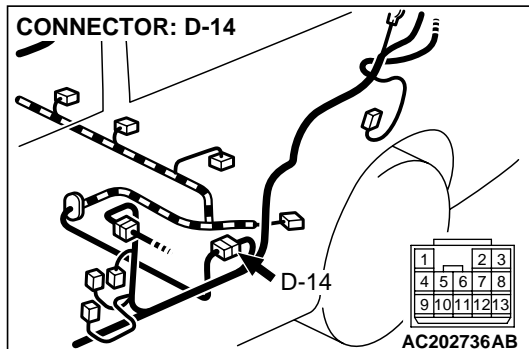


**CONNECTOR: C-118 <A/T>**



**CONNECTOR: D-14**



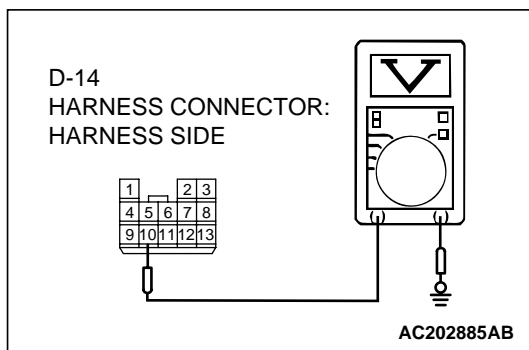
**STEP 14. Check the sensor ground at intermediate connector D-14 by backprobing.**

- (1) Do not disconnect connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 10 and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

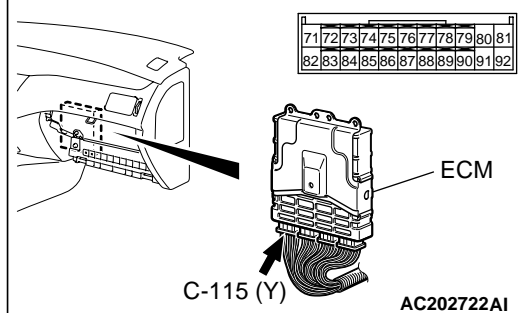
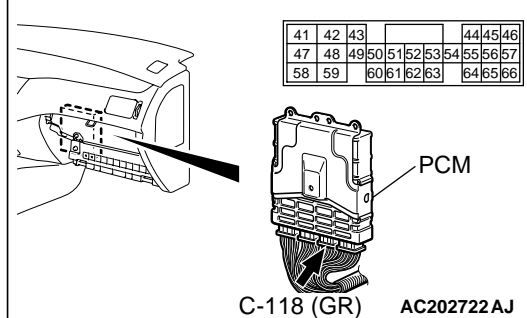
**YES :** Go to Step 19.

**NO :** Go to Step 15.

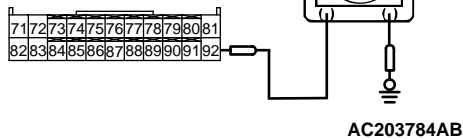


**STEP 15. Check the sensor ground at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

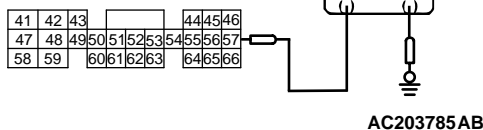
- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector C-115 terminal 92 <M/T> or connector C-118 terminal 57 <A/T> and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage 0.5 volt or less?****YES :** Go to Step 16.**NO :** Go to Step 18.**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

C-115 <M/T>  
HARNESS CONNECTOR:  
HARNESS SIDE

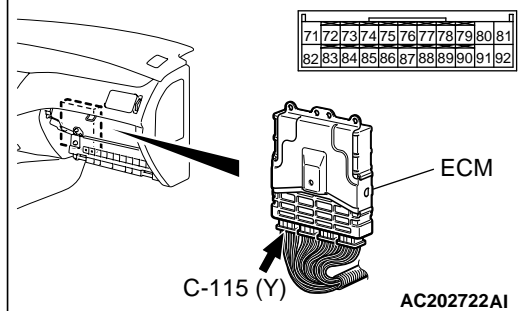


C-118 <A/T>  
HARNESS CONNECTOR:  
HARNESS SIDE

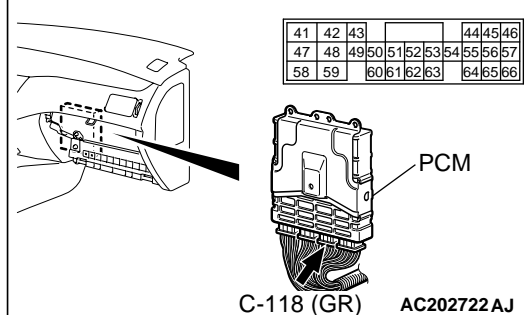


**STEP 16.** Check intermediate connectors C-124, C-127 and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.

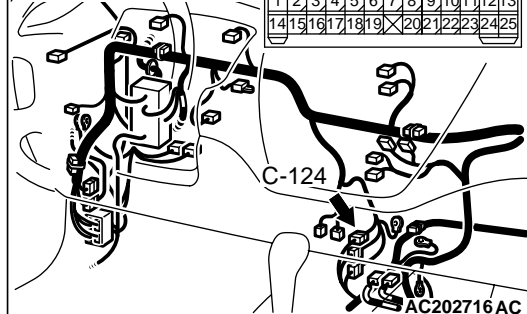
**CONNECTOR: C-115 <M/T>**



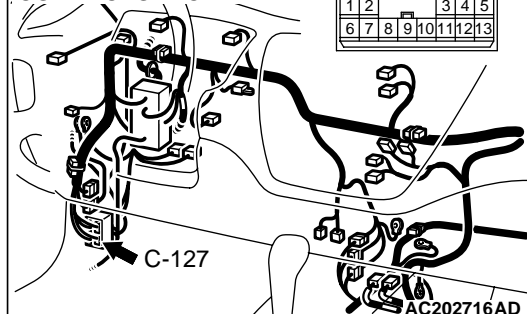
**CONNECTOR: C-118 <A/T>**

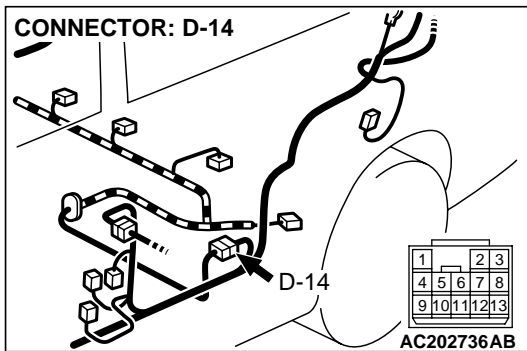


**CONNECTOR: C-124**



**CONNECTOR: C-127**





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 17.

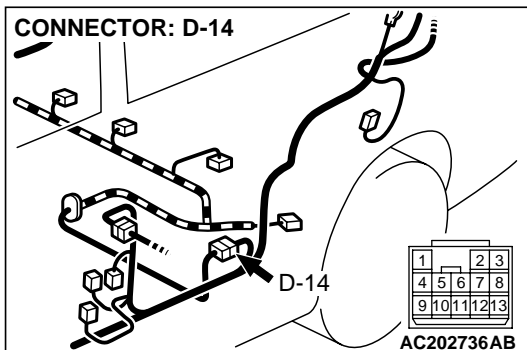
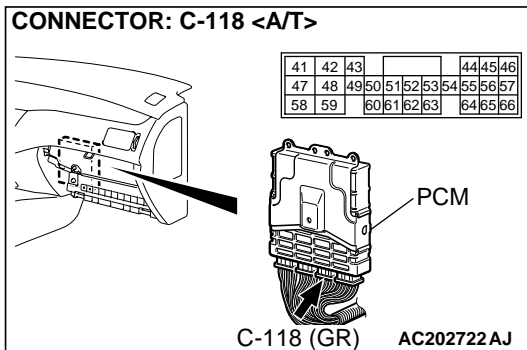
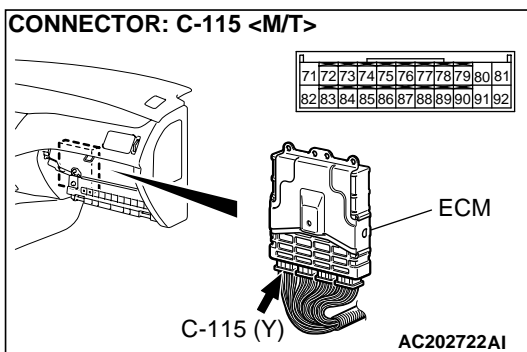
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

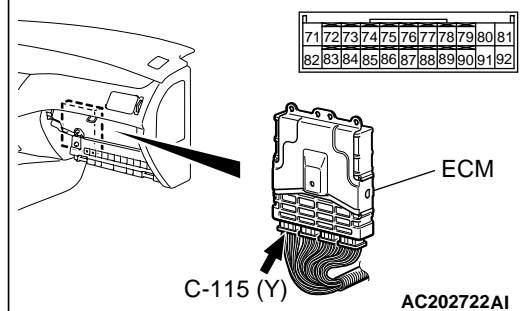
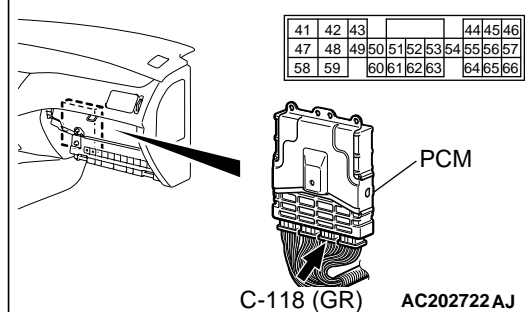
**STEP 17. Check the harness wire between ECM connector C-115 terminal 92 <M/T> or PCM connector C-118 terminal 57 <A/T> and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.



**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 18. Check ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connector and terminals in good condition?**

**YES :** Go to Step 5.

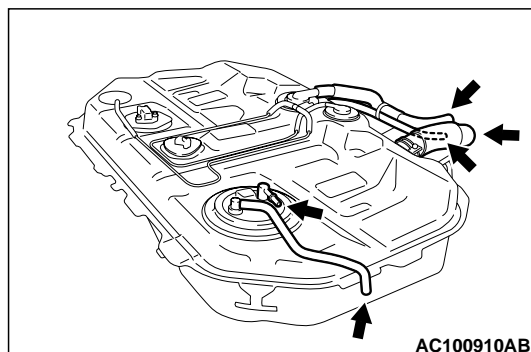
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

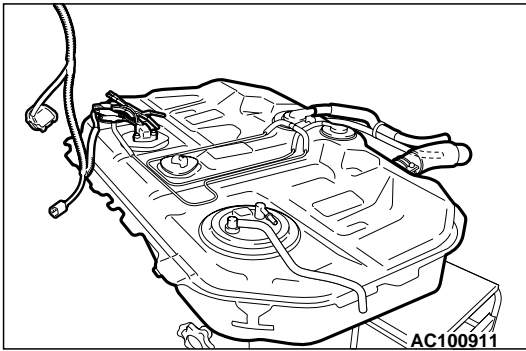
**STEP 19. Check the signal voltage at fuel tank differential pressure sensor connector D-09.**

(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)

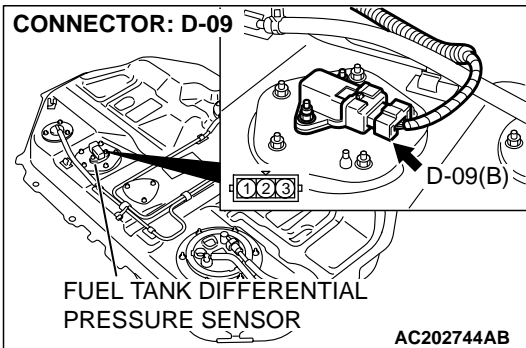
(2) Plug the filler hose, fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.

*NOTE: If these items are not securely plugged here, the fuel could leak in the next step.*



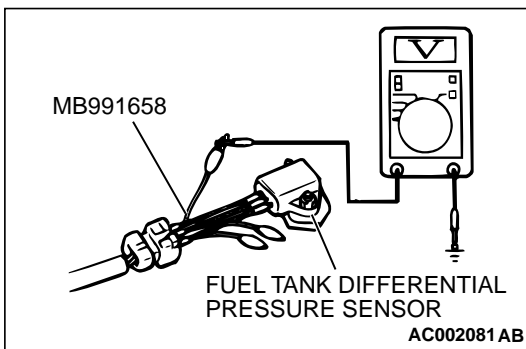
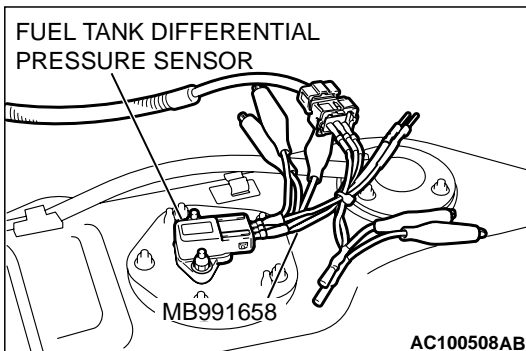


(3) Lift the fuel tank.



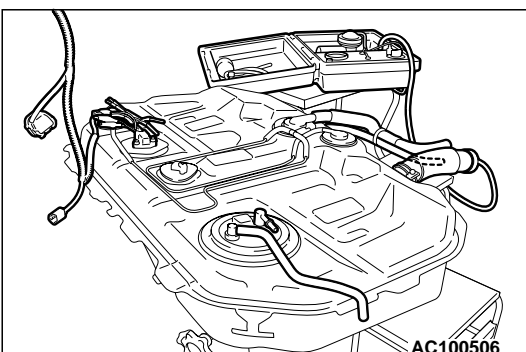
(4) Connect special tool MB991658 to both halves of connector D-09.

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



(6) Measure the voltage between connector D-09 terminal 1 and ground.

- The measured voltage should be between 2.0 and 3.0 volts.



(7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

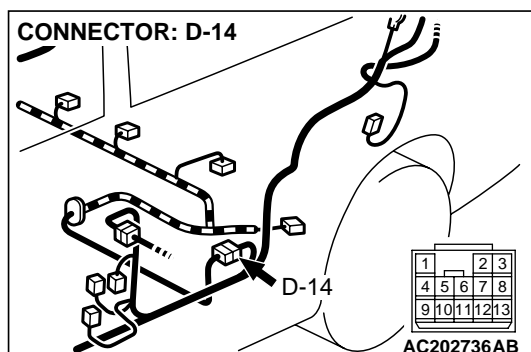
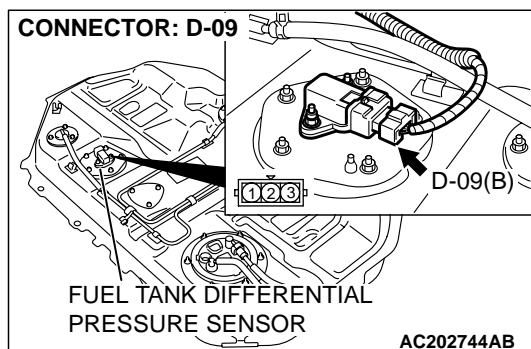
(8) Turn the ignition switch to the "LOCK" (OFF) position.

(9) Disconnect the evaporative emission system pressure pump.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 20.

**NO :** Go to Step 22.

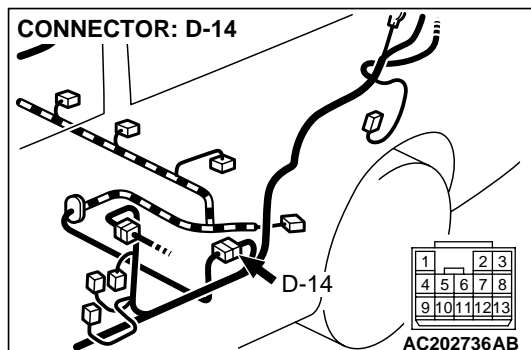
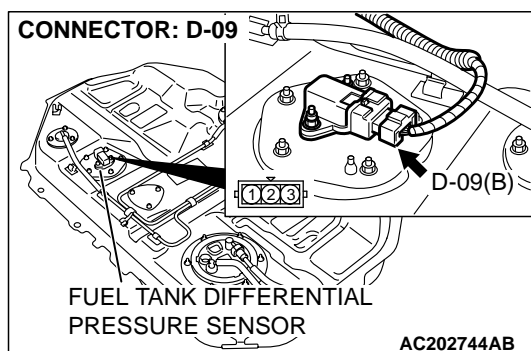


**STEP 20. Check fuel tank differential pressure sensor connector D-09 and intermediate connector for D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 21.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



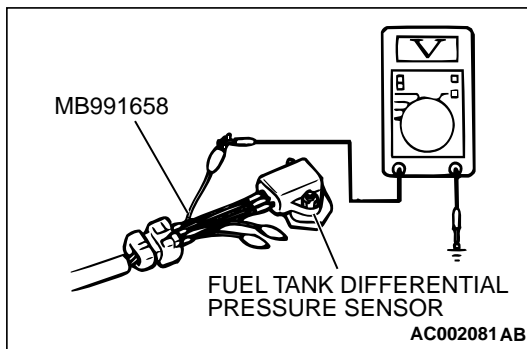
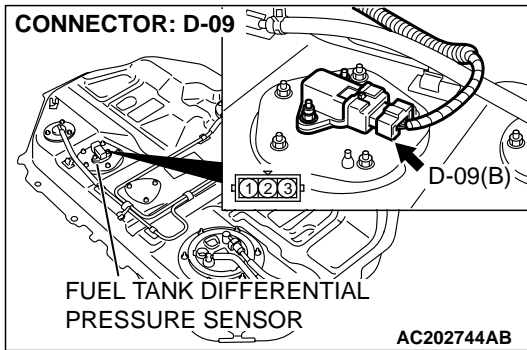
**STEP 21. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 1 and intermediate connector D-14 terminal 11 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair the damaged harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.





**STEP 22. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-09.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Measure the voltage between connector D-09 terminal 3 and ground.

- The voltage should be between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 25.

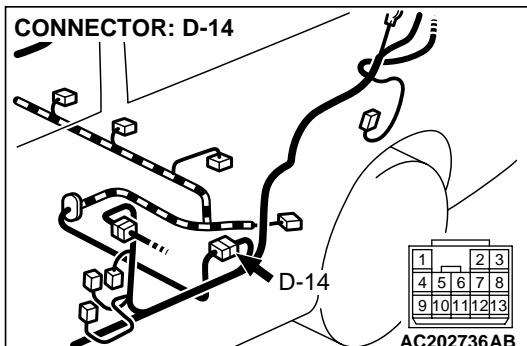
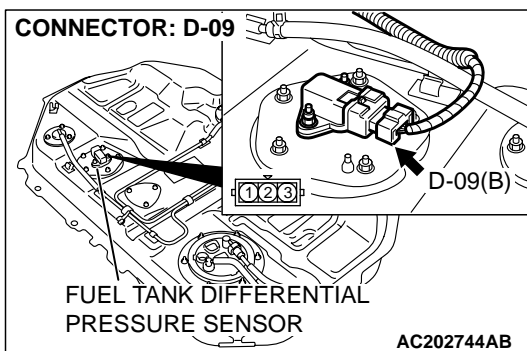
**NO :** Go to Step 23.

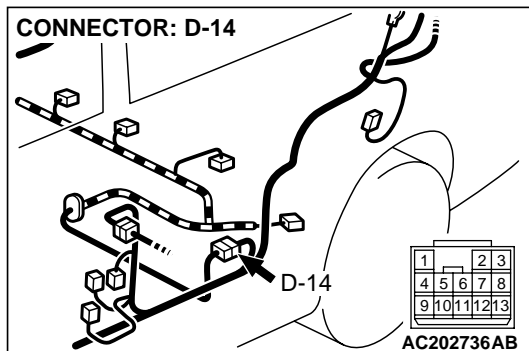
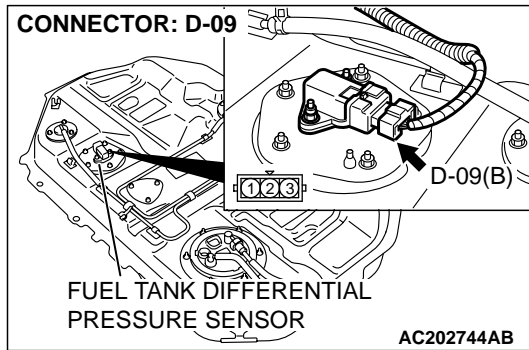
**STEP 23. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 24.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



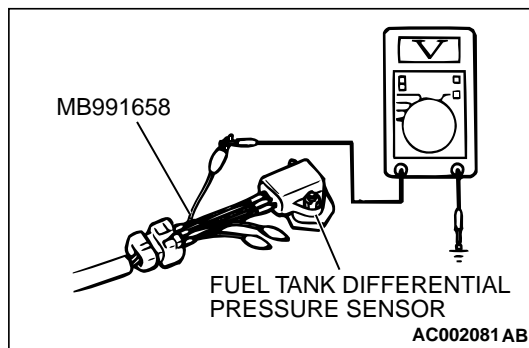
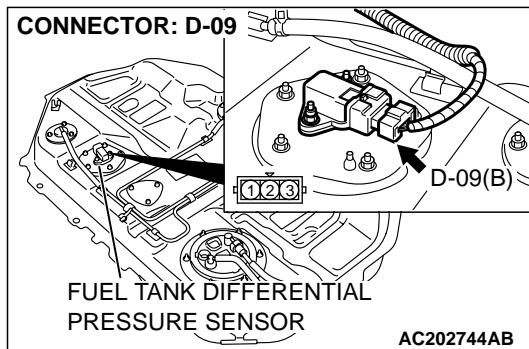


**STEP 24. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 3 and intermediate connector D-14 terminal 9 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 25. Check the return circuit voltage at fuel tank differential pressure sensor connector D-11.**

(1) Use special tool MB991658 to connect terminal 3 of connector D-11.

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

(3) Measure the voltage between connector D-11 terminal 2 and ground.

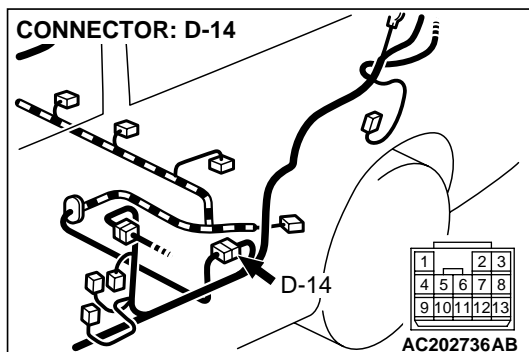
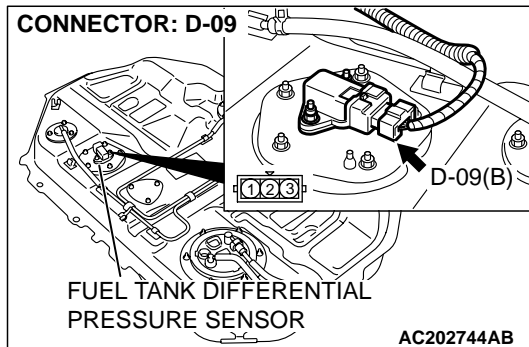
- The voltage should be 0.5 volt or less.

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

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

**YES :** Go to Step 28.

**NO :** Go to Step 26.

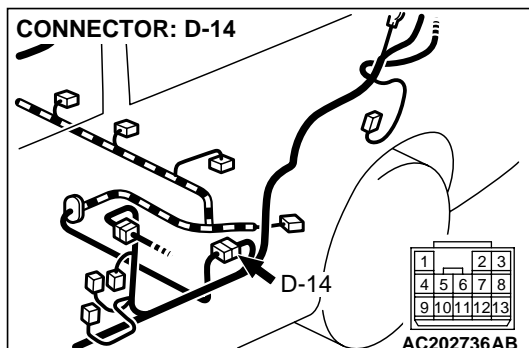
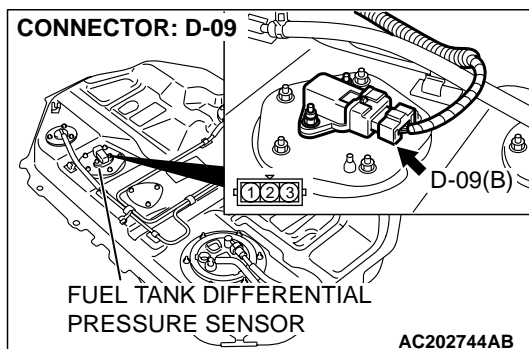


**STEP 26. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 27.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

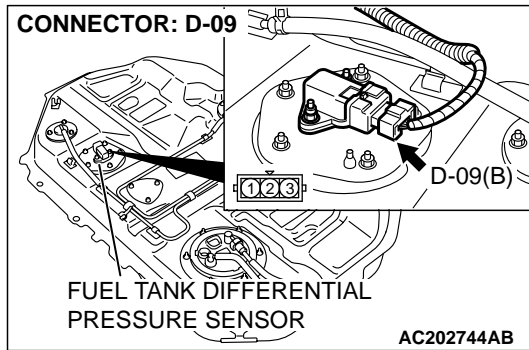


**STEP 27. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 2 and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 28. Check fuel tank differential pressure sensor connector D-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Replace the fuel tank differential pressure sensor, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**STEP 29. Perform the OBD-II drive cycle.**

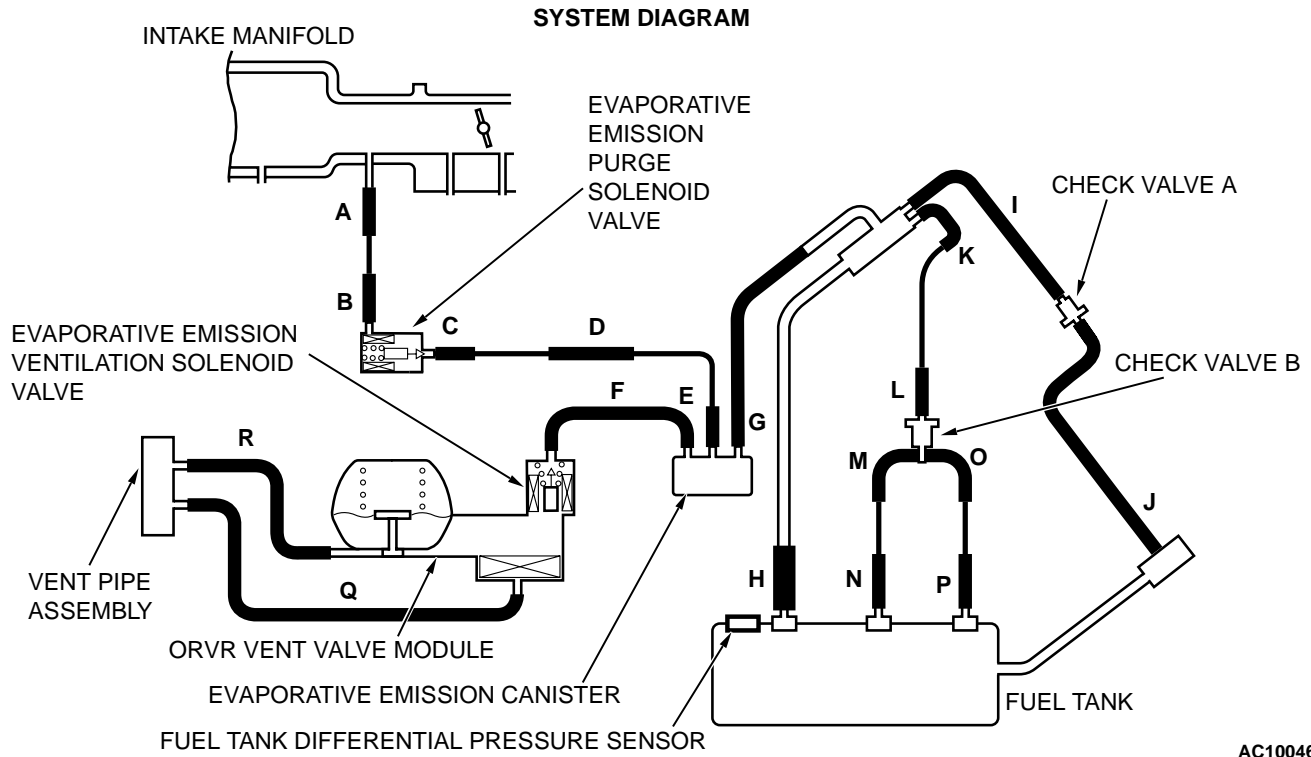
(1) Carry out a test drive with the drive cycle pattern. Refer to [P.13Ab-2](#), Procedure 1 - Evaporative Emission Control System Leak Monitor.

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

**Q: Is DTC P0452 set?**

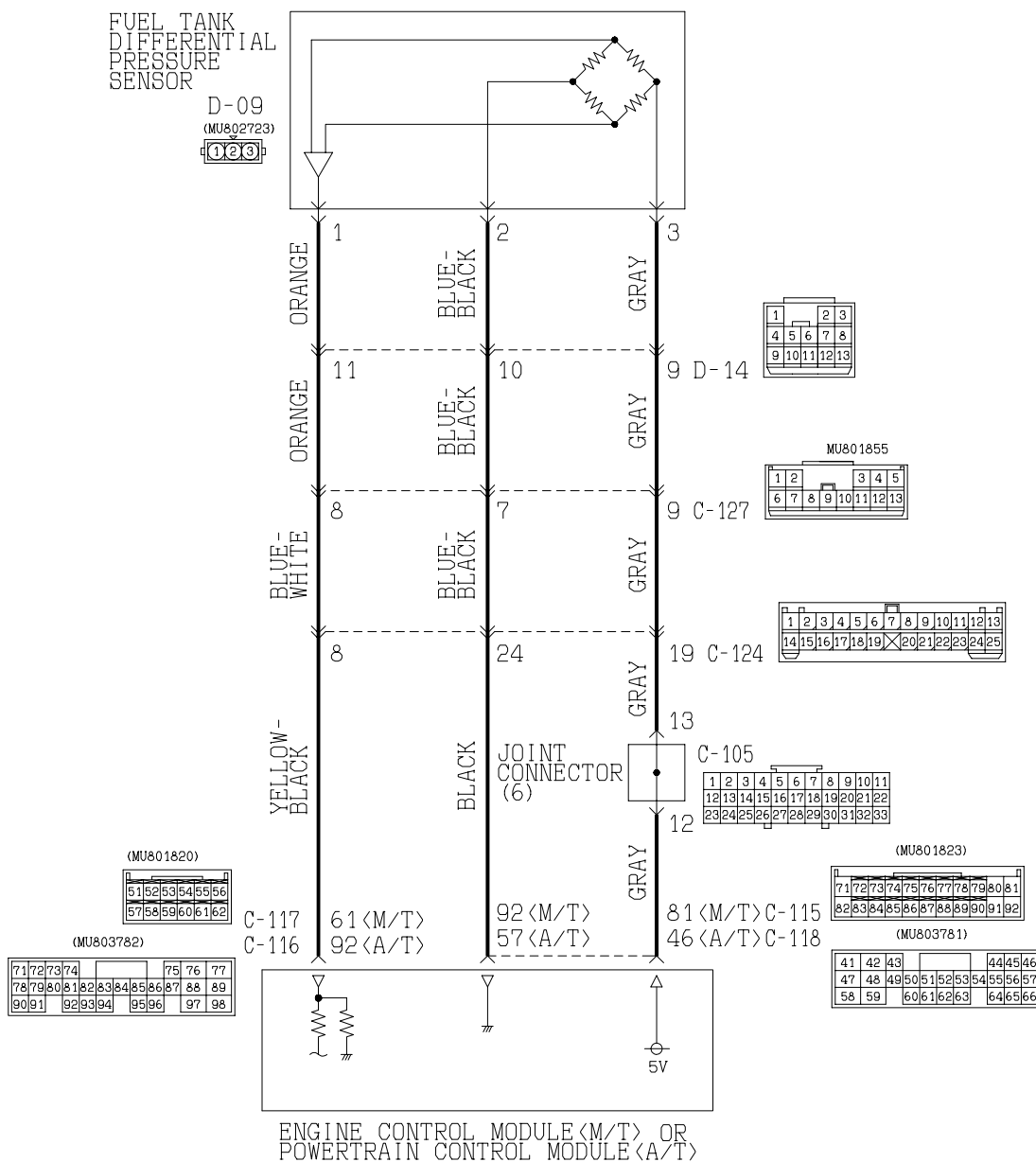
**YES :** Go to Step 2.

**NO :** The procedure is complete.

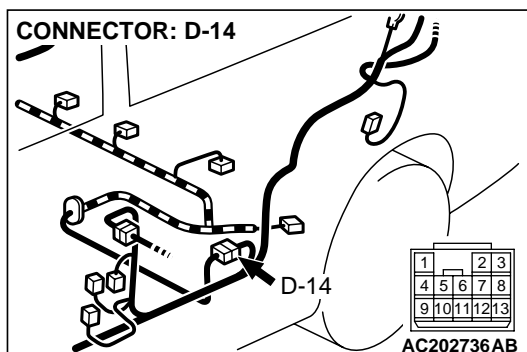
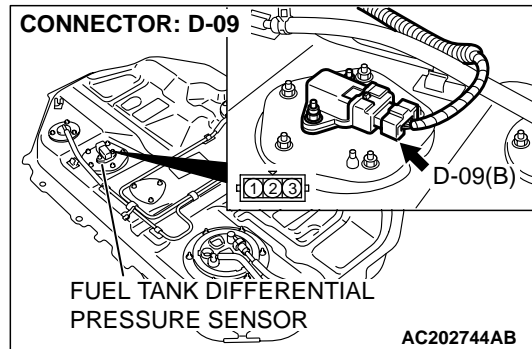
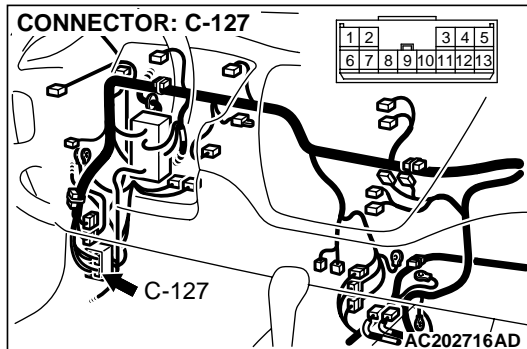
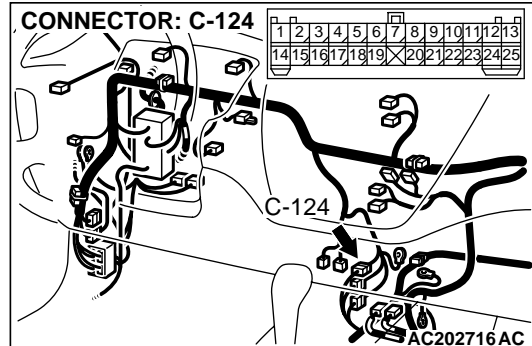
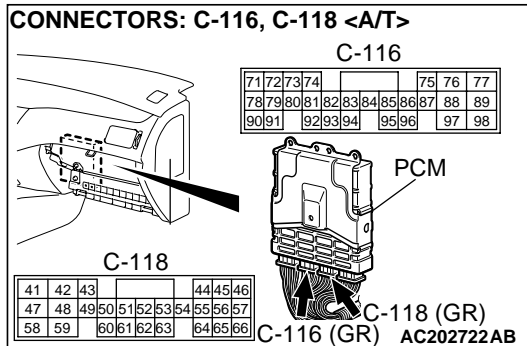
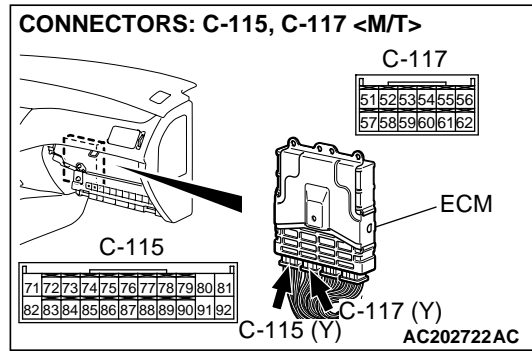
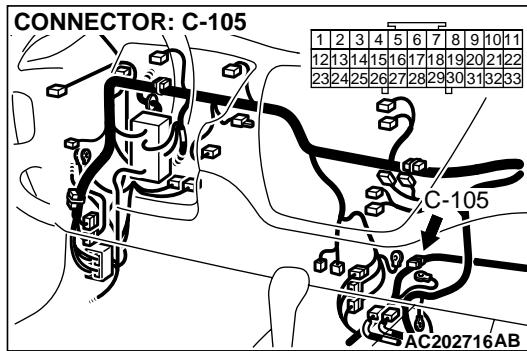
**DTC P0453: Evaporative Emission Control System Pressure Sensor High Input**

AC100465AC

## Fuel Tank Differential Pressure Sensor Circuit



W2J06M01AA



### CIRCUIT OPERATION

- The ECM (terminal 81) <M/T> or PCM (terminal 46) <A/T> supplies a 5-volt reference voltage to the fuel tank differential pressure sensor (terminal 3). The ECM (terminal 92) <M/T> or PCM (terminal 57) <A/T> supplies a ground to the fuel tank differential pressure sensor (terminal 2).
- The ECM (terminal 61) <M/T> or PCM (terminal 92) <A/T> receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal 1).

**TECHNICAL DESCRIPTION**

- To determine whether the fuel tank differential pressure sensor is defective, the ECM <M/T> or PCM <A/T> monitors the fuel tank differential pressure sensor output voltage.
- Based on the test conditions and judgment criteria, the ECM <M/T> or PCM <A/T> determines whether the fuel tank differential pressure sensor output voltage is normal.

*NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.*

**DTC SET CONDITIONS****Test Conditions: For Test to Run**

- Intake air temperature is between 5°C (41°F) and 45°C (113°F) or greater.
- Engine speed is 1,600 r/min or greater.
- Volumetric efficiency is between 20 to 80 percent.

**Judgment Criteria**

- When the evaporative emission purge solenoid valve is fully operational (100 percent ratio), the fuel differential pressure sensor output voltage remains at 4.0 volts or greater for ten seconds.

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

- Malfunction of the fuel tank differential pressure sensor.
- Open or shorted fuel tank differential pressure sensor circuit.
- Malfunction of the ECM <M/T> or PCM <A/T>.

**OVERVIEW OF TROUBLESHOOTING**

- DTC P0453 can be set by a faulty fuel differential pressure sensor or related circuit, or ECM <M/T> or PCM <A/T> failure.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR73.) The mechanical gauge reading is used to verify scan tool reading. A comparison of the mechanical gauge with the reading on scan tool MB991502 will locate a problem in the system.



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

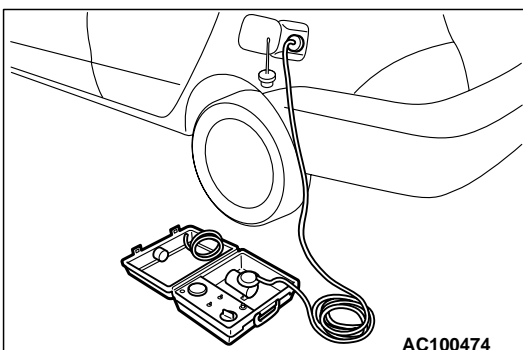
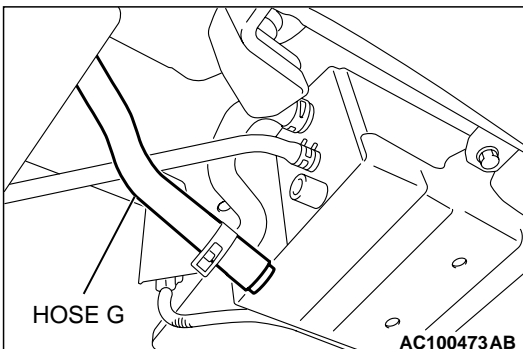
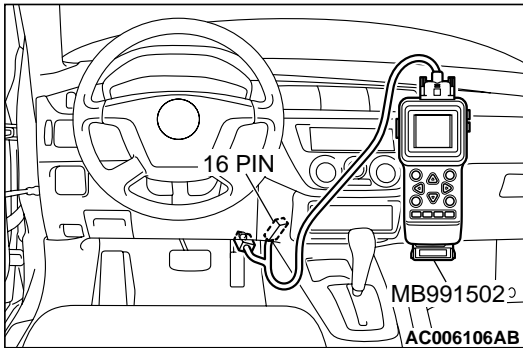
- MB991502: Scan Tool (MUT-II)
- MB991658: Test Harness Set

**STEP 1. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).

(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(9) Connect hose G to the canister.

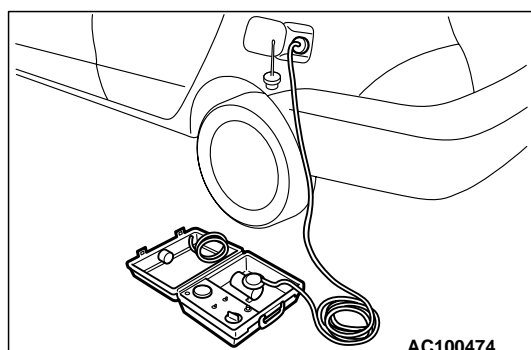
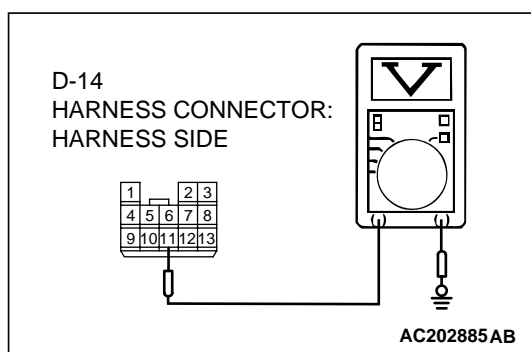
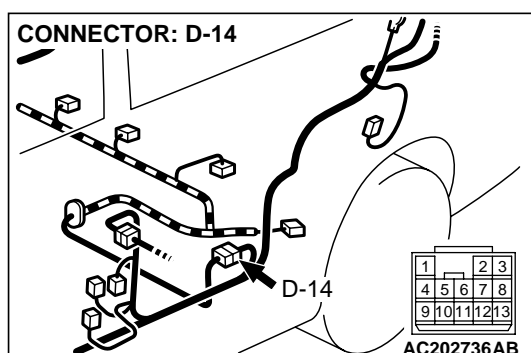
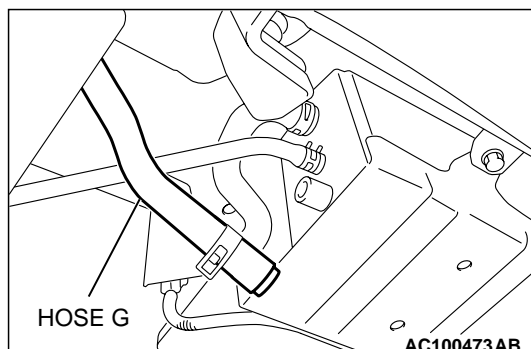
**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Go to Step 2.

**STEP 2. Measure the signal voltage at intermediate connector D-14 by backprobing.**

- (1) Remove the rear seat cushion. (Refer to GROUP 52A, Rear Seat P.52A-18.)
- (2) Pull up the carpet.
- (3) Disconnect hose G from the evaporative emission canister side, and plug the hose.
- (4) Turn the ignition switch to the "ON" position.
- (5) Remove the fuel cap.



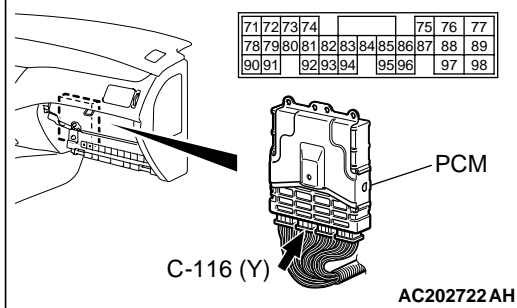
- (6) Measure the voltage between connector D-14 terminal 11 and ground by backprobing.
  - The measured voltage should be between 2.0 and 3.0 volts.

- (7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.
  - The fuel tank pressure reading should increase.
- (8) Turn the ignition switch to the "LOCK" (OFF) position.
- (9) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (10) Connect hose G to the canister.

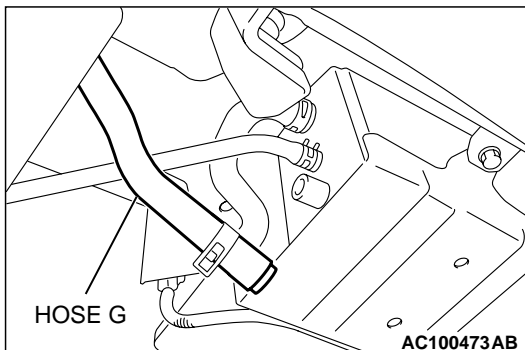
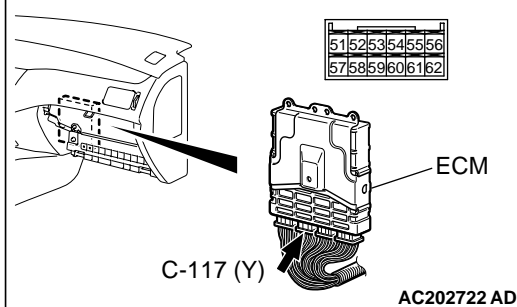
**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 3.

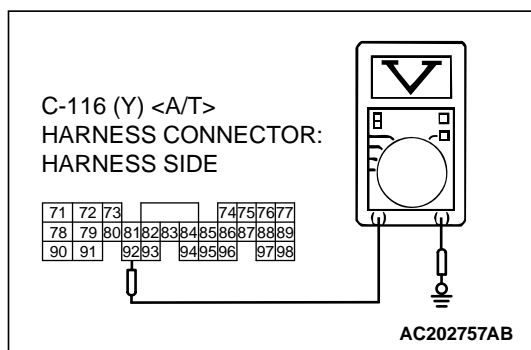
**NO :** Go to Step 8.

**CONNECTOR: C-116 <A/T>****STEP 3. Measure the signal voltage at ECM connector C-117 <M/T> or PCM connector C-116 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-117 <M/T> or the PCM connector C-116 <A/T>.

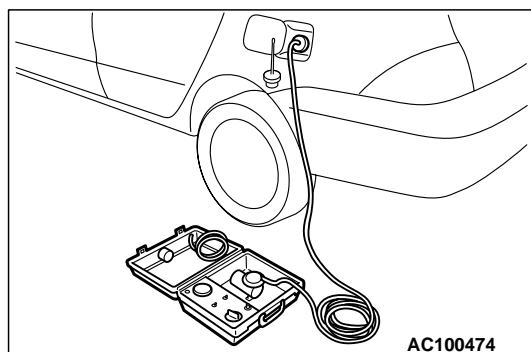
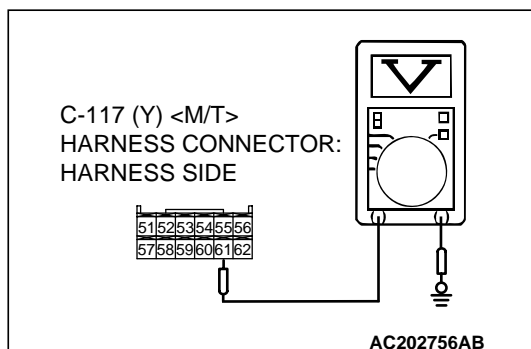
**CONNECTOR: C-117 <M/T>**

- (2) Disconnect hose G from the evaporative emission canister side, and plug the hose.  
 (3) Turn the ignition switch to the "ON" position.  
 (4) Remove the fuel cap.



- (5) Measure the voltage between connector C-117 terminal 61 <M/T> or connector C-116 terminal 92 <A/T> and ground by backprobing.

- The measured voltage should be between 2.0 and 3.0 volts.



- (6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

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

- (8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

- (9) Connect hose G to the canister.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 4.

**NO :** Go to Step 6.

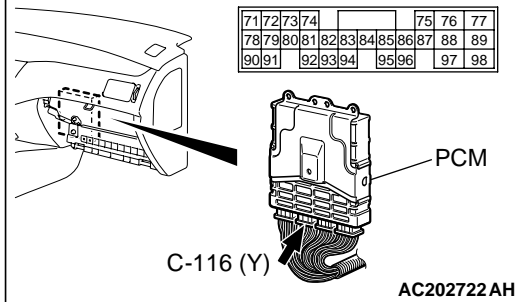
**STEP 4.** Check intermediate connector D-14 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

**Q:** Are the connectors and terminals in good condition?

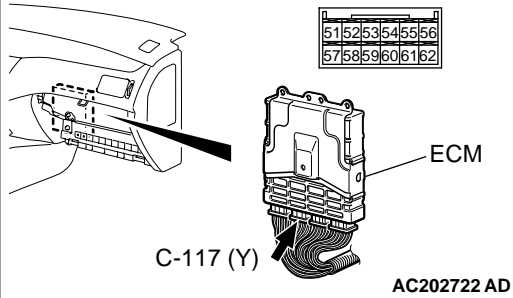
**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

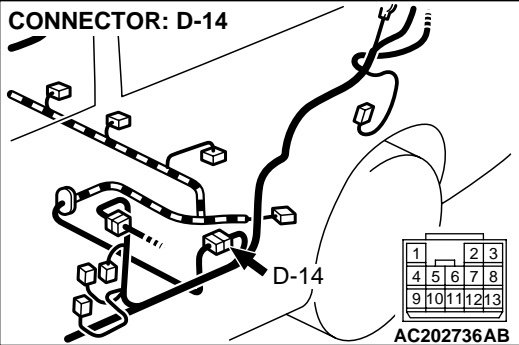
**CONNECTOR: C-116 <A/T>**



**CONNECTOR: C-117 <M/T>**



**CONNECTOR: D-14**

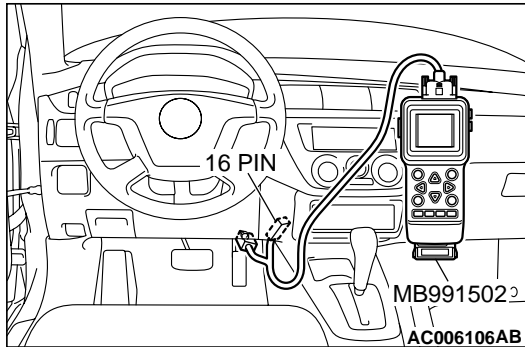


**STEP 5. Using scan tool MB991502, check data list item 73: Fuel Tank Differential Pressure Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



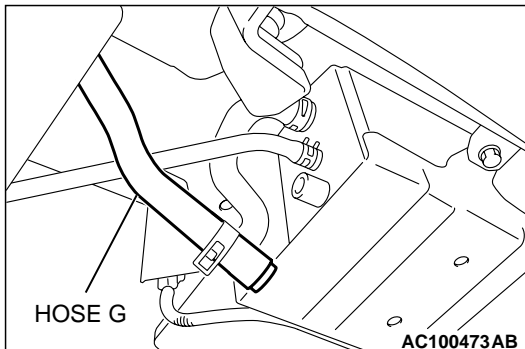
(2) Disconnect hose G from the evaporative emission canister side, and plug the hose.

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

(4) Remove the fuel cap.

(5) Set scan tool MB991502 to the data reading mode for item 73, Fuel Tank Differential Pressure Sensor.

- The fuel tank pressure reading on the scan tool should be  $-1.5$  to  $+1.5$  kPa ( $-0.443$  to  $+0.443$  inHg).



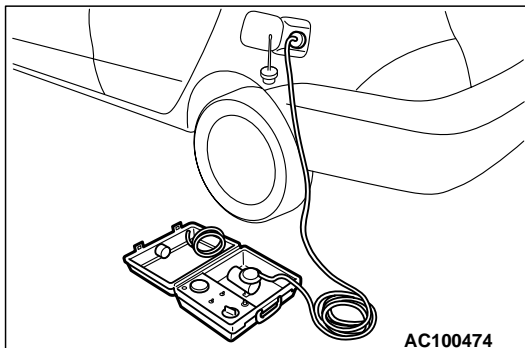
(6) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and apply pressure.

- The scan tool reading should increase.

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

(8) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.

(9) Connect hose G to the canister.

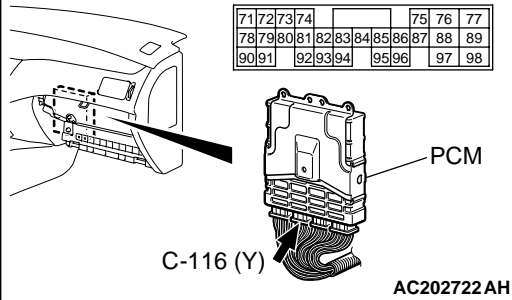
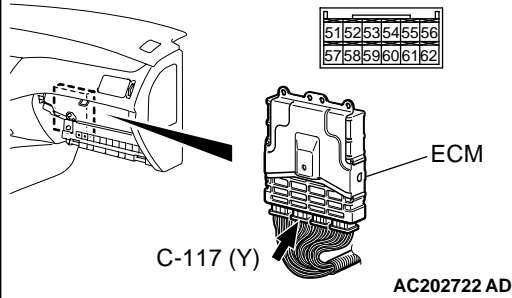
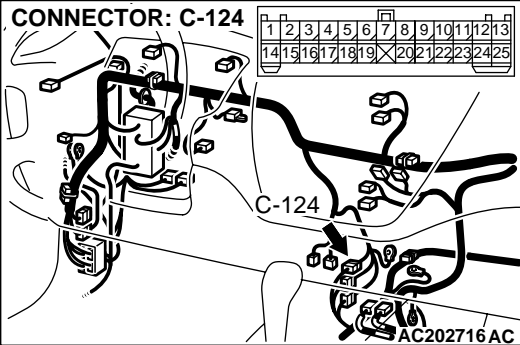
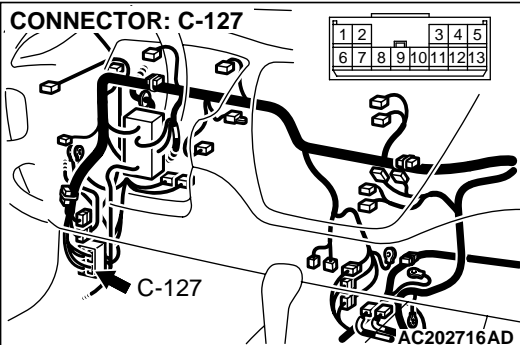


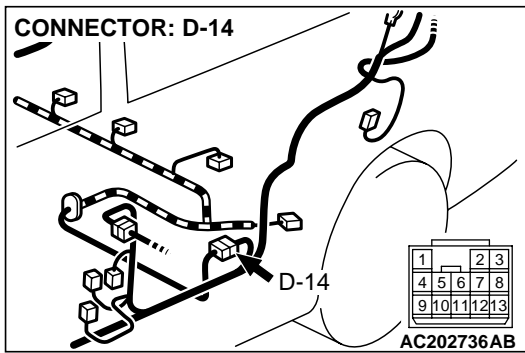
**Q: Is the fuel tank pressure between  $-1.5$  and  $+1.5$  kPa ( $-0.443$  and  $+0.443$  inHg)?**

**YES :** It can be assumed that this malfunction is intermittent . Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Replace the ECM <M/T> or PCM <A/T>. Go to Step 29.

**STEP 6.** Check intermediate connectors D-14, C-127, and C-124 and ECM <M/T> connector C-117 or PCM <A/T> connector C-116 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

**CONNECTOR: C-116 <A/T>**

**CONNECTOR: C-117 <M/T>**

**CONNECTOR: C-124**

**CONNECTOR: C-127**




**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 7.

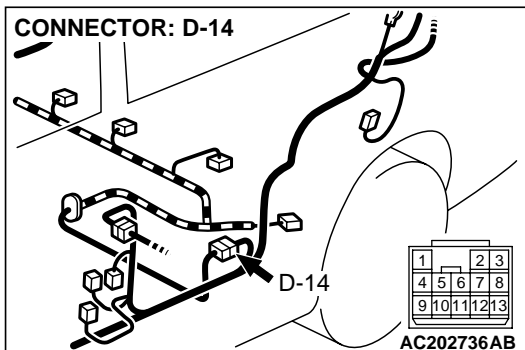
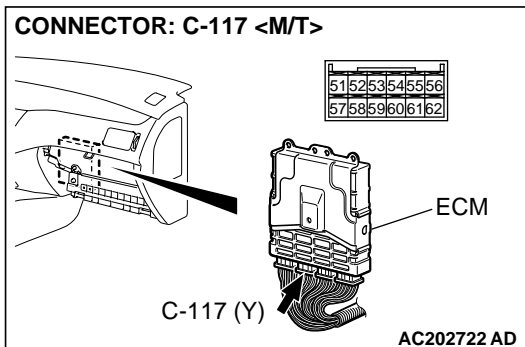
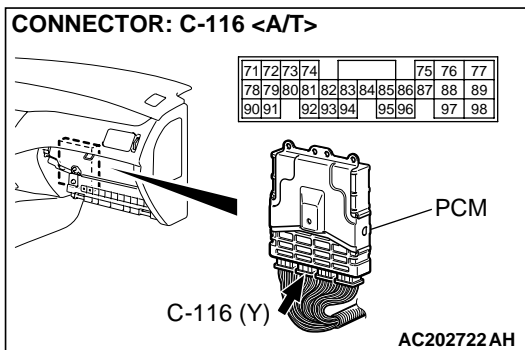
**NO :** Repair or replace the faulty component. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**STEP 7. Check the harness wire between ECM connector C-117 terminal 61 <M/T> or PCM connector C-116 terminal 92 <A/T> and intermediate connector D-14 terminal 11 for damage.**

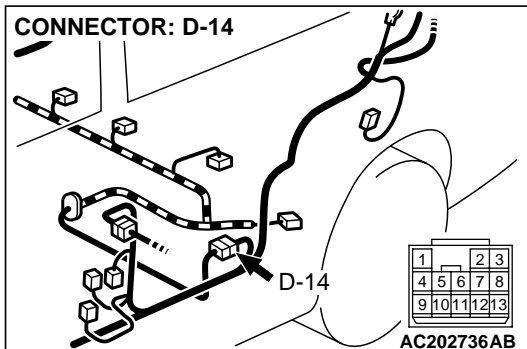
**Q: Is the harness wire in good condition?**

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.







**STEP 8. Measure the 5-volt reference signal at intermediate connector D-14 by backprobing.**

- (1) Do not disconnect intermediate connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 9 and ground .

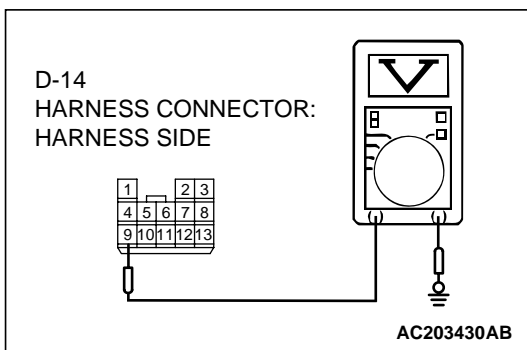
- The voltage should be between 4.8 and 5.2 volts.

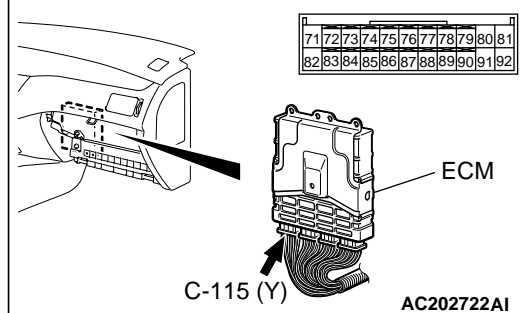
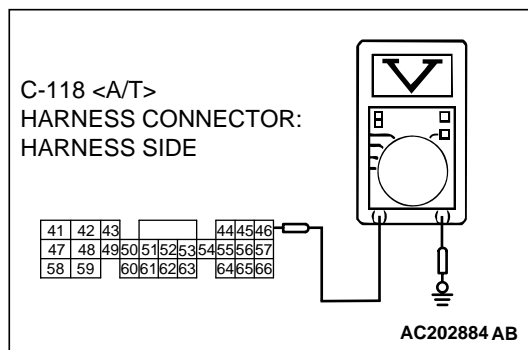
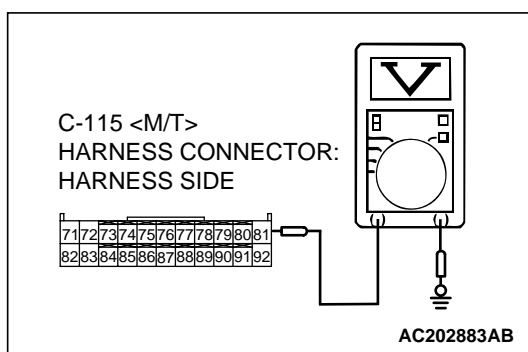
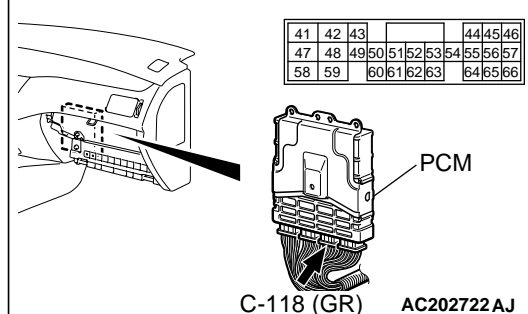
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 14.

**NO :** Go to Step 9.



**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 9. Measure the 5-volt reference signal at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between connector C-115 terminal 81 <M/T> or connector C-118 terminal 46 <A/T> and ground by backprobing.

- The measured voltage should be between 4.8 and 5.2 volts.

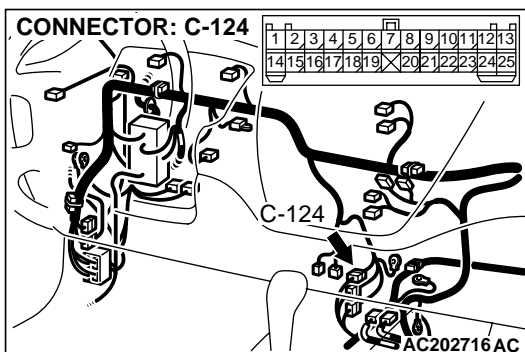
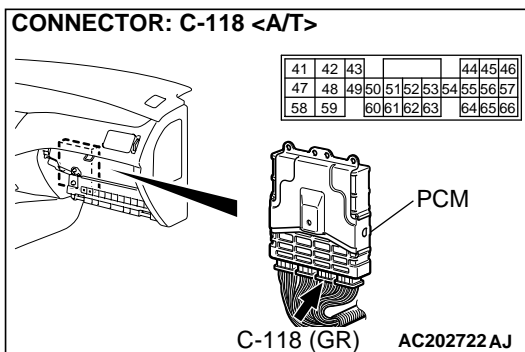
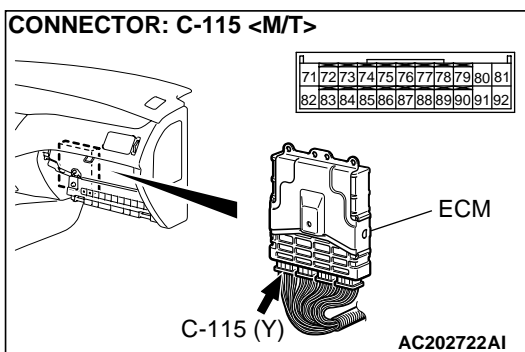
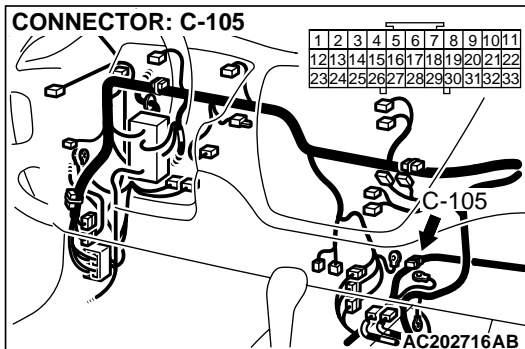
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

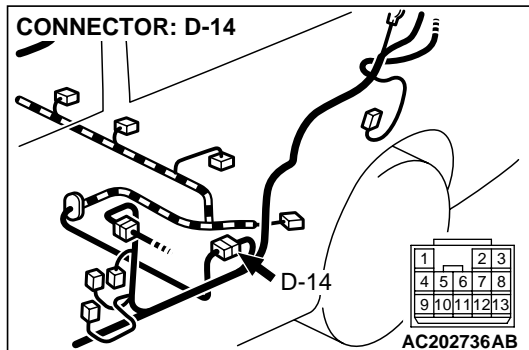
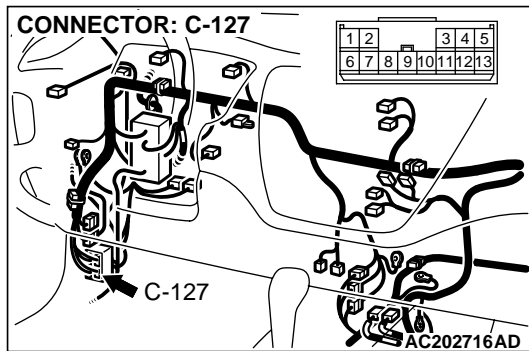
**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 10.

**NO :** Go to Step 12.

**STEP 10.** Check intermediate connectors C-105, C-124, C-127, and D-14 and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 11.

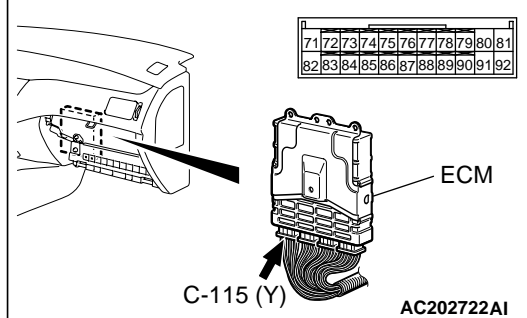
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**STEP 11.** Check the harness wire between ECM connector C-115 terminal 81 <M/T> or PCM connector C-118 terminal 46 <A/T> and intermediate connector D-14 terminal 9 for damage.

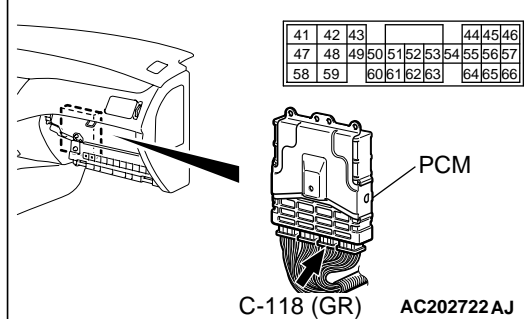
**Q:** Is the harness wire in good condition?

- YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.
- NO :** Repair the damaged harness wire. Go to Step 29.

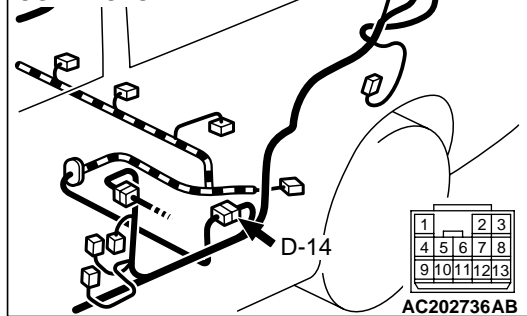
**CONNECTOR: C-115 <M/T>**



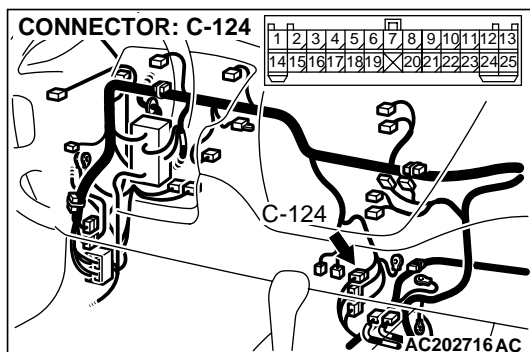
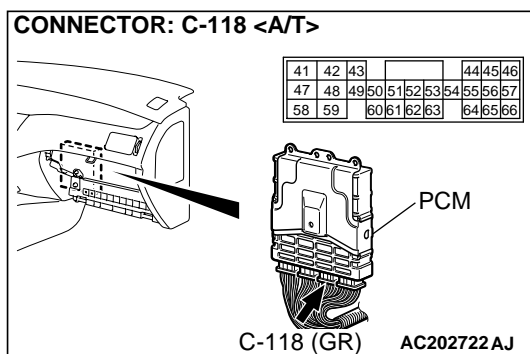
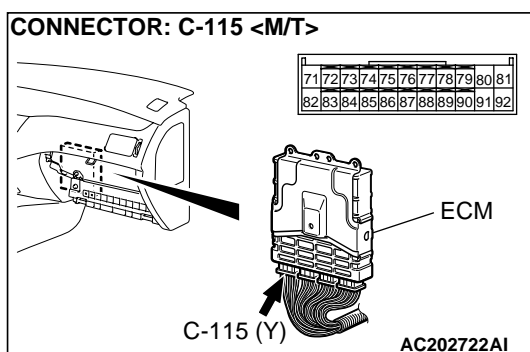
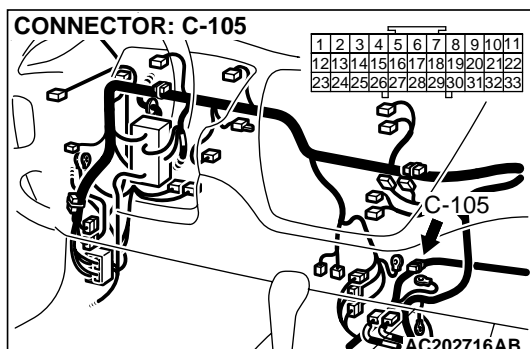
**CONNECTOR: C-118 <A/T>**

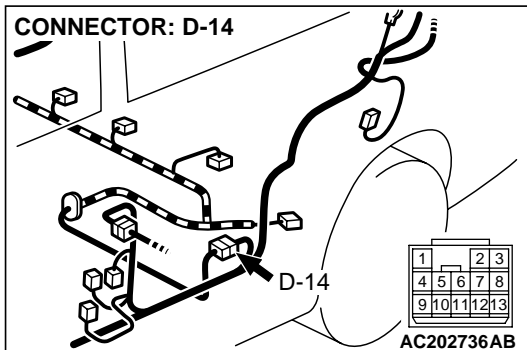
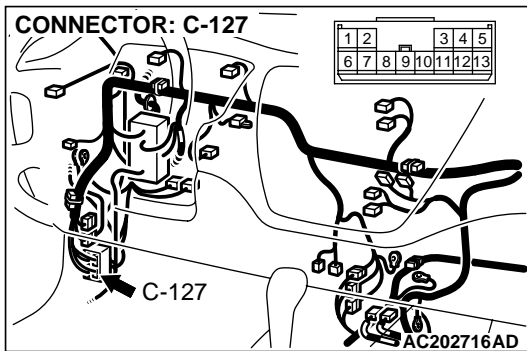


**CONNECTOR: D-14**



**STEP 12.** Check intermediate connectors C-105, C-124, C-127, and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 13.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

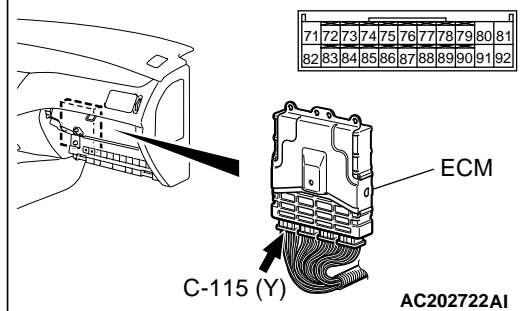
**STEP 13.** Check the harness wire between intermediate connector D-14 terminal 9 and ECM connector C-115 terminal 81 <M/T> or PCM connector C-118 terminal 46 <A/T> for damage.

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

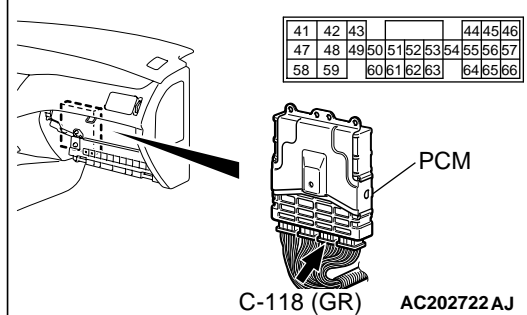
**YES :** Go to Step 5.

**NO :** Repair or replace the harness wire. Go to Step 29.

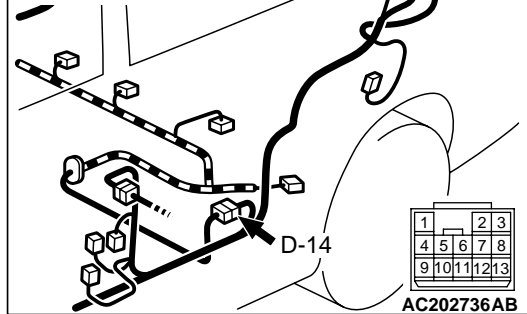
**CONNECTOR: C-115 <M/T>**



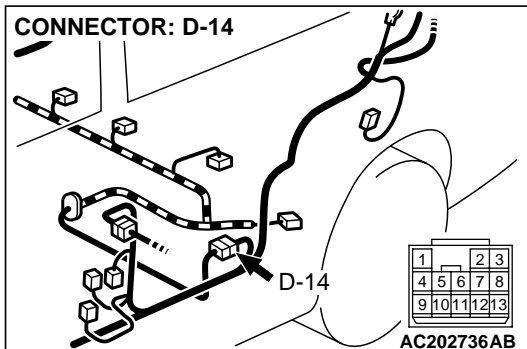
**CONNECTOR: C-118 <A/T>**



**CONNECTOR: D-14**





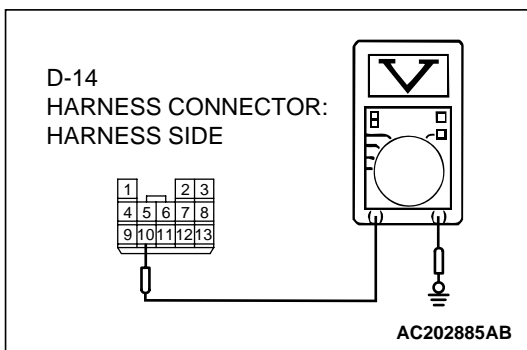
**STEP 14. Check the sensor ground at intermediate connector D-14 by backprobing.**

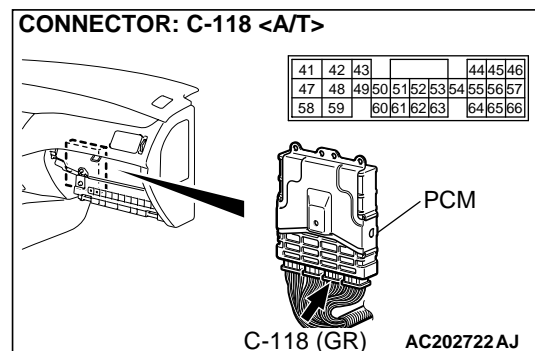
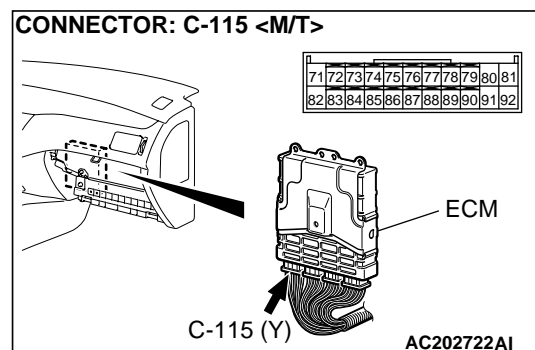
- (1) Do not disconnect connector D-14.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector D-14 terminal 10 and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 19.

**NO :** Go to Step 15.





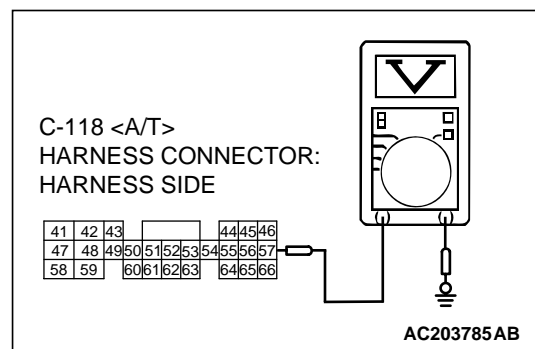
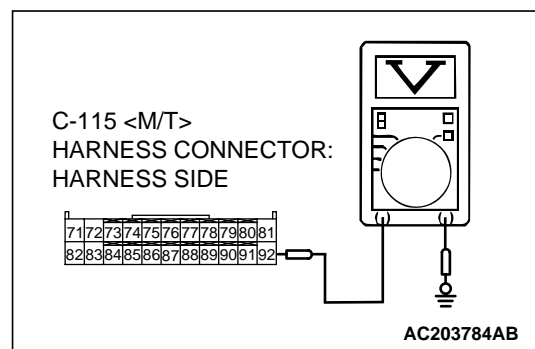
**STEP 15. Check the sensor ground at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect ECM connector C-115 <M/T> or the PCM connector C-118 <A/T>.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between connector C-115 terminal 92 <M/T> or connector C-118 terminal 57 <A/T> and ground by backprobing.
  - The measured voltage should be 0.5 volt or less.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

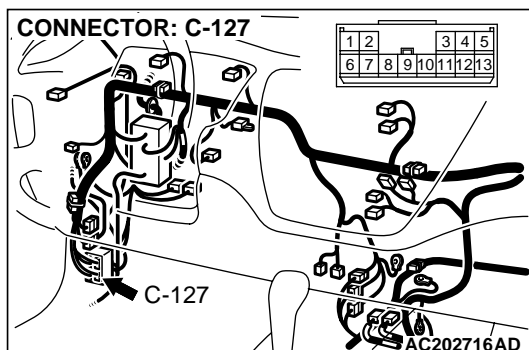
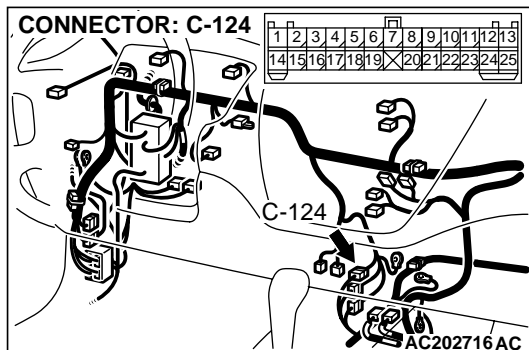
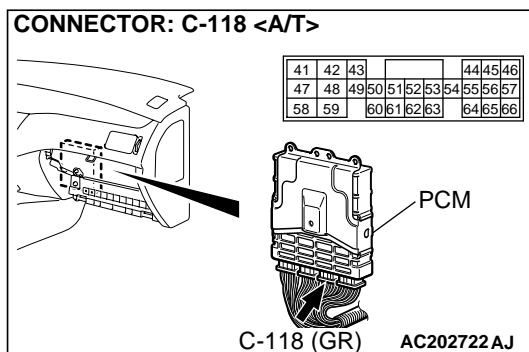
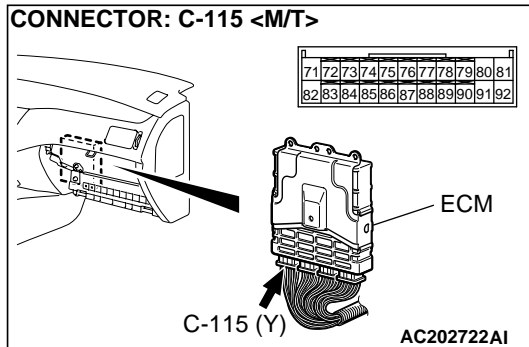
**Q: Is the measured voltage 0.5 volt or less?**

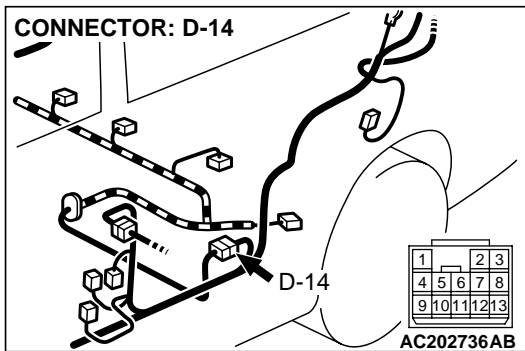
**YES :** Go to Step 16.

**NO :** Go to Step 18.



**STEP 16.** Check intermediate connectors C-124, C-127 and D-14, and ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.





**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 17.

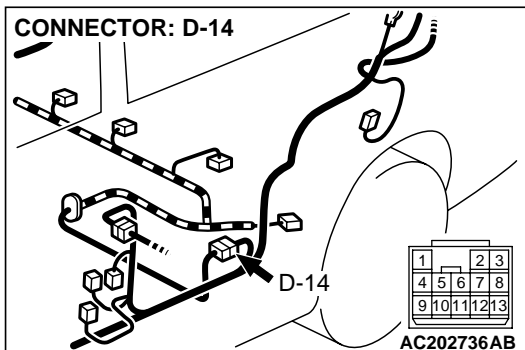
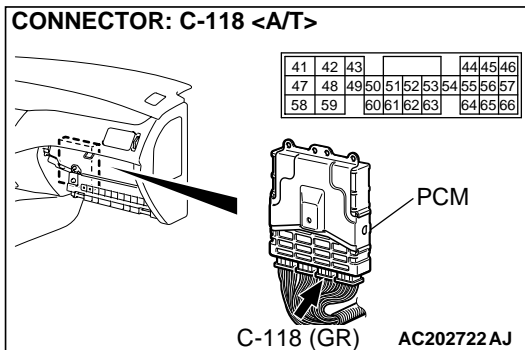
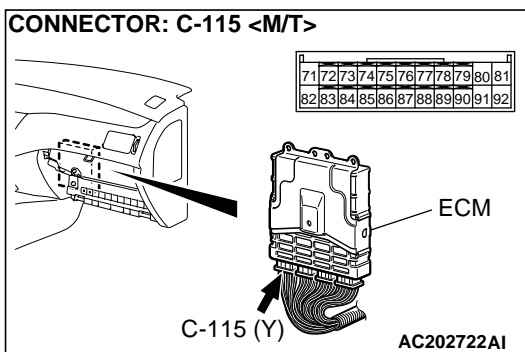
**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

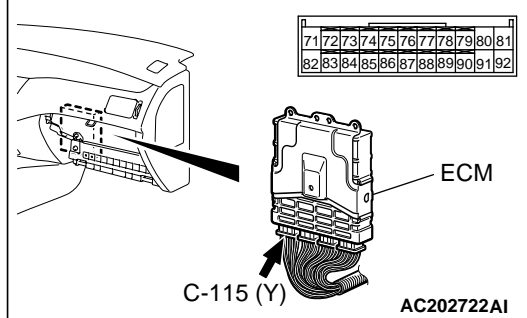
**STEP 17. Check the harness wire between ECM connector C-115 terminal 92 <M/T> or PCM connector C-118 terminal 57 <A/T> and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-6](#). Go to Step 29.

**NO :** Repair the damaged harness wire. Go to Step 29.



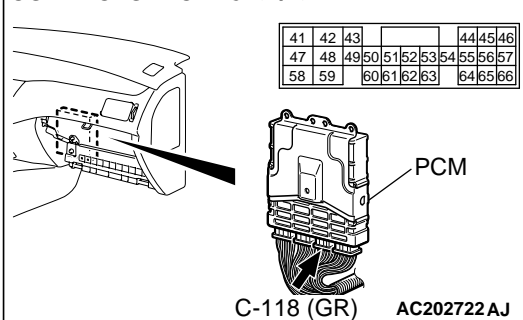
**CONNECTOR: C-115 <M/T>**

**STEP 18. Check ECM connector C-115 <M/T> or PCM connector C-118 <A/T> for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connector and terminals in good condition?**

**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

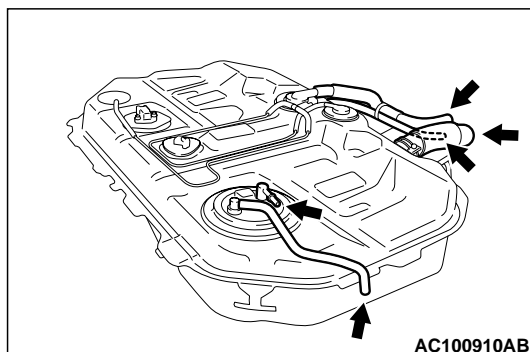
**CONNECTOR: C-118 <A/T>**

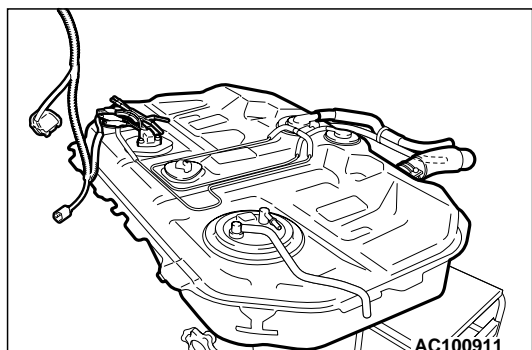
**STEP 19. Check the signal voltage at fuel tank differential pressure sensor connector D-09.**

(1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)

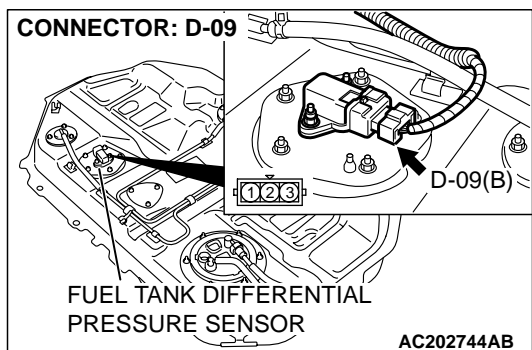
(2) Plug the filler hose, fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.

*NOTE: If these items are not securely plugged here, the fuel could leak in the next step.*



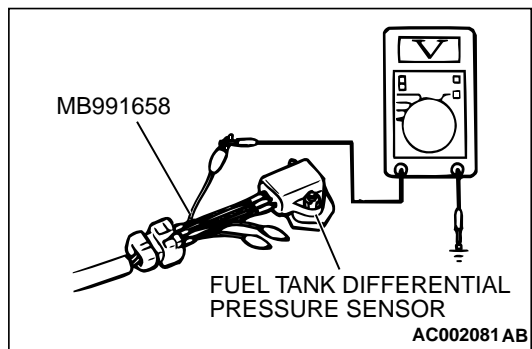
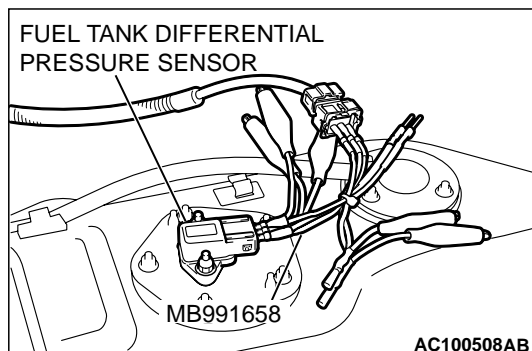


(3) Lift the fuel tank.



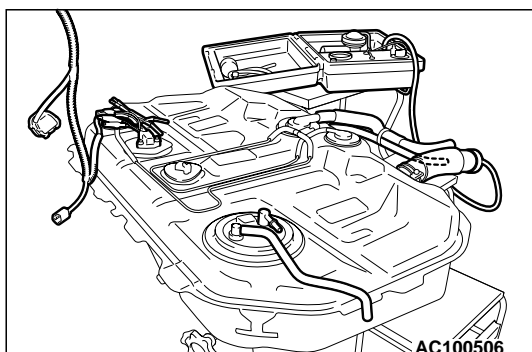
(4) Connect special tool MB991658 to both halves of connector D-09.

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



(6) Measure the voltage between connector D-09 terminal 1 and ground.

- The measured voltage should be between 2.0 and 3.0 volts.



(7) Connect an evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and pressurize the fuel tank.

- The fuel tank pressure reading should increase.

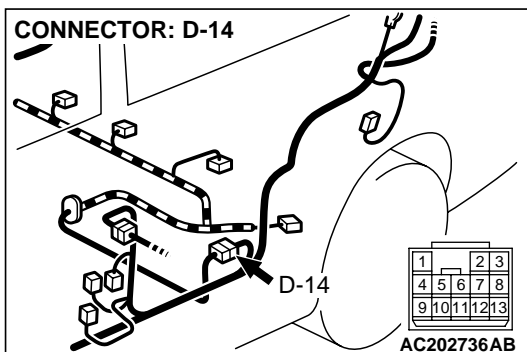
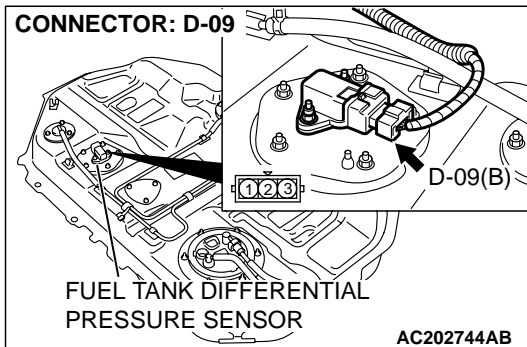
(8) Turn the ignition switch to the "LOCK" (OFF) position.

(9) Disconnect the evaporative emission system pressure pump.

**Q: Is the measured voltage between 2.0 and 3.0 volts?**

**YES :** Go to Step 20.

**NO :** Go to Step 22.

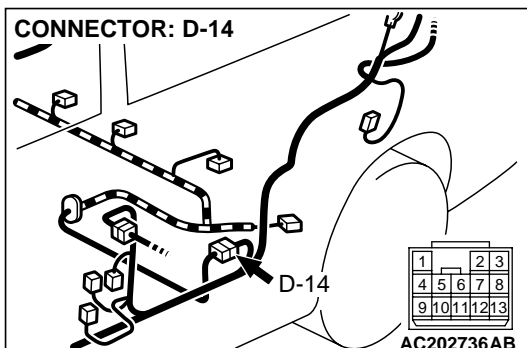
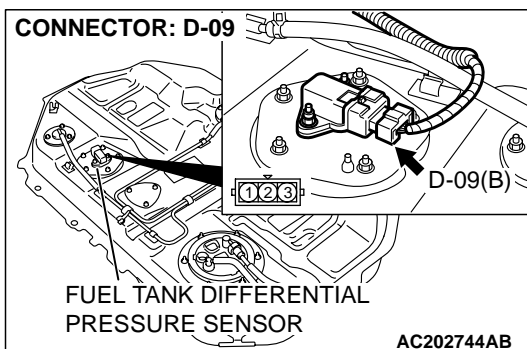


**STEP 20. Check fuel tank differential pressure sensor connector D-09 and intermediate connector for D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 21.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

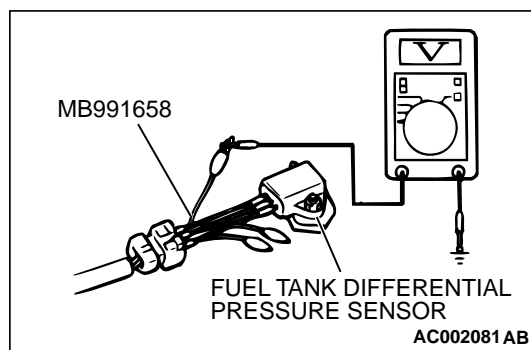
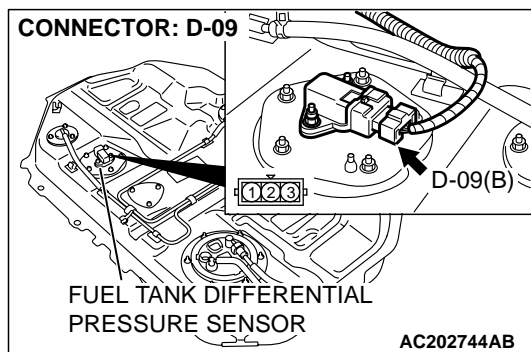


**STEP 21. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 1 and intermediate connector D-14 terminal 11 for damage.**

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

**YES :** It can be assumed that this malfunction is intermittent, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair the damaged harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 22. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-09.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Measure the voltage between connector D-09 terminal 3 and ground.

- The voltage should be between 4.8 and 5.2 volts.

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

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 25.

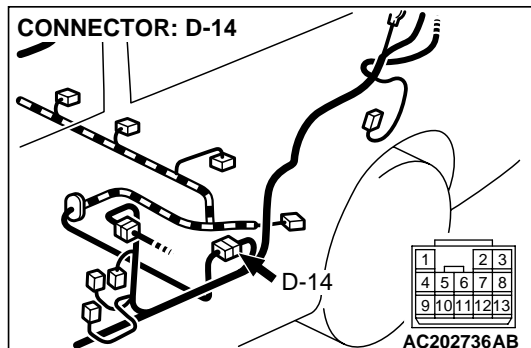
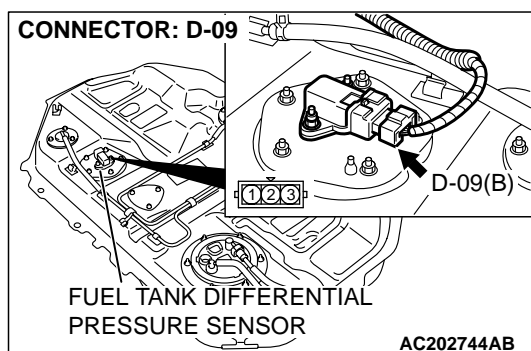
**NO :** Go to Step 23.

**STEP 23. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

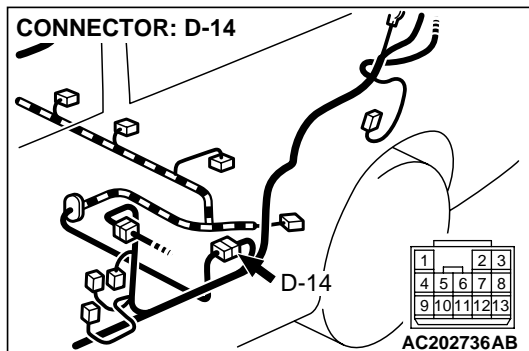
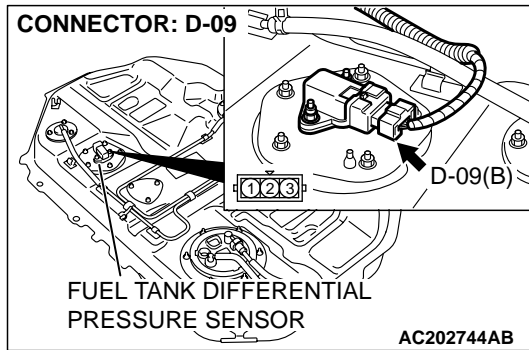
**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 24.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.





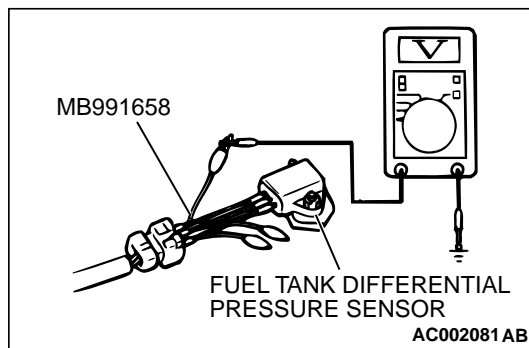
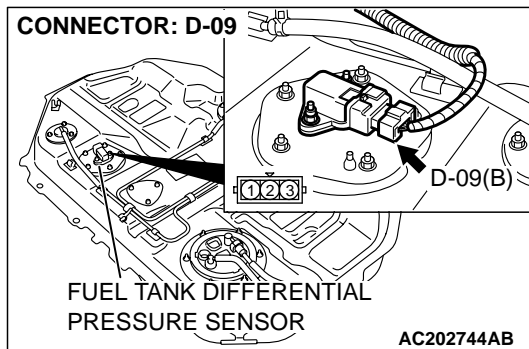


**STEP 24. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 3 and intermediate connector D-14 terminal 9 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 25. Check the return circuit voltage at fuel tank differential pressure sensor connector D-11.**

(1) Use special tool MB991658 to connect terminal 3 of connector D-11.

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

(3) Measure the voltage between connector D-11 terminal 2 and ground.

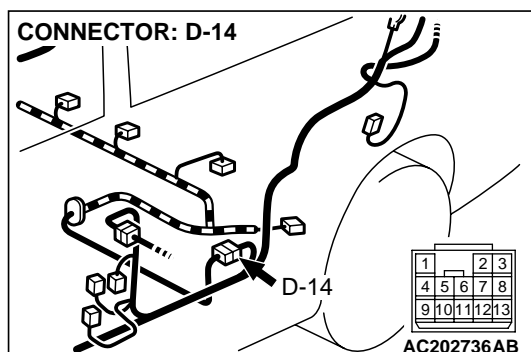
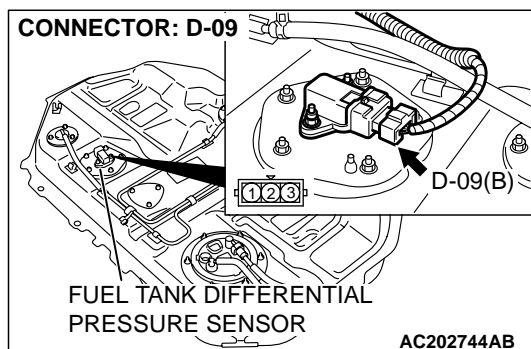
- The voltage should be 0.5 volt or less.

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

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

**YES :** Go to Step 28.

**NO :** Go to Step 26.

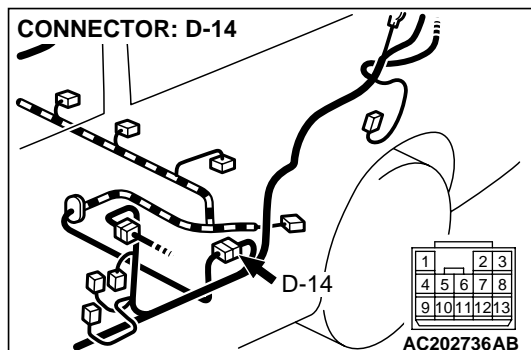
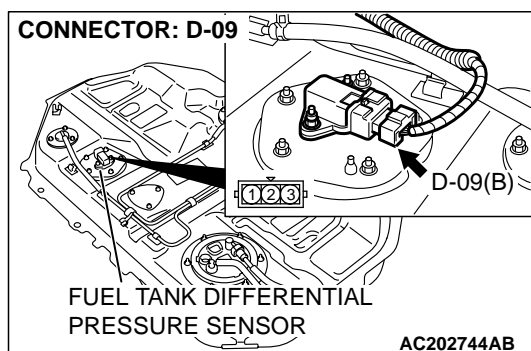


**STEP 26. Check fuel tank differential pressure sensor connector D-09 and intermediate connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Go to Step 27.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

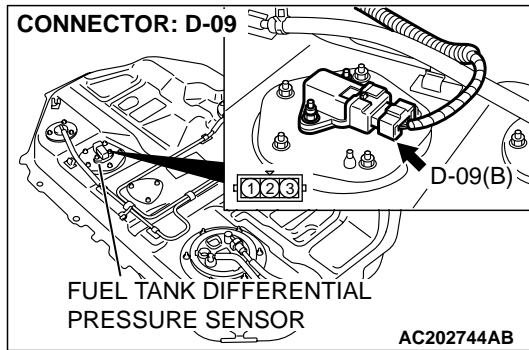


**STEP 27. Check the harness wire between fuel tank differential pressure sensor connector D-09 terminal 2 and intermediate connector D-14 terminal 10 for damage.**

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

**YES :** Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the harness wire, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.



**STEP 28. Check fuel tank differential pressure sensor connector D-09 for loose, corroded or damaged terminals, or terminals pushed back in the connector.**

**Q: Are the connectors and terminals in good condition?**

**YES :** Replace the fuel tank differential pressure sensor, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 29.

**NO :** Repair or replace the damaged components. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Go to Step 29.

**STEP 29. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to [P.13Ab-2](#), Procedure 1 - Evaporative Emission Control System Leak Monitor.

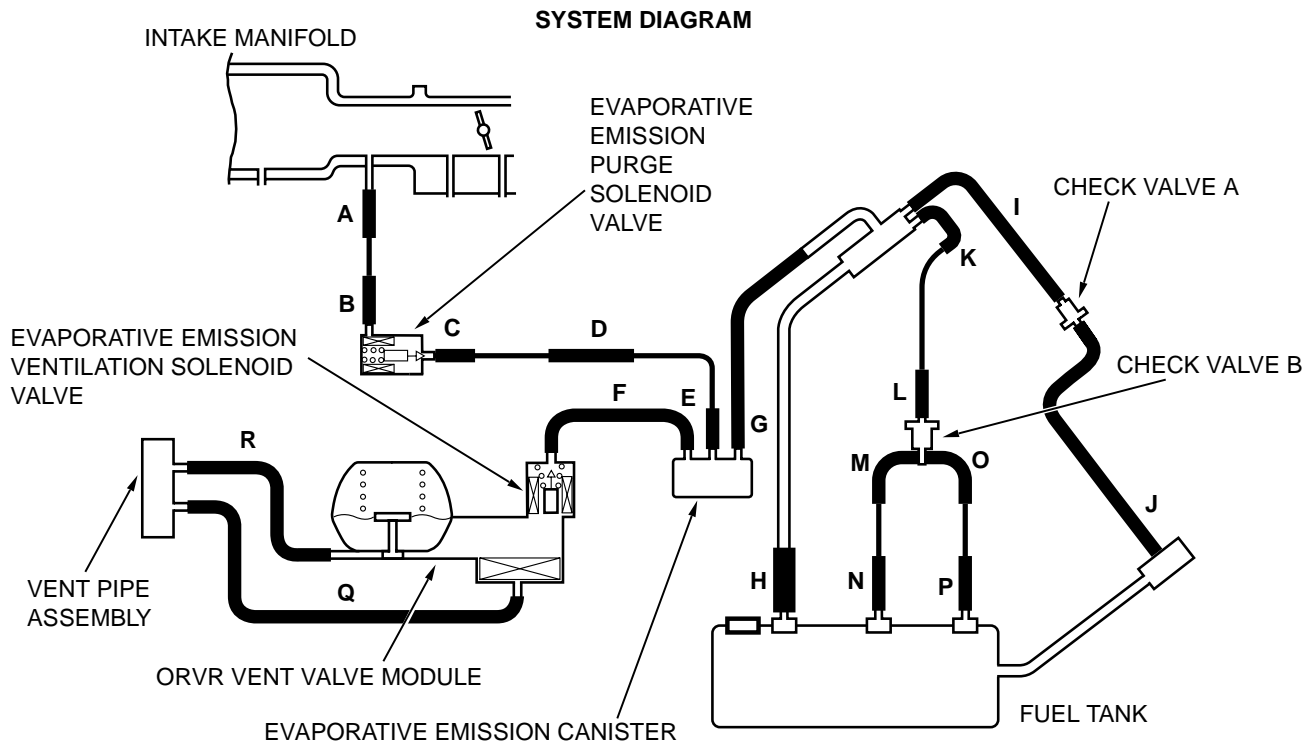
(2) Read the diagnostic trouble code (DTC).

**Q: Is DTC P0453 set?**

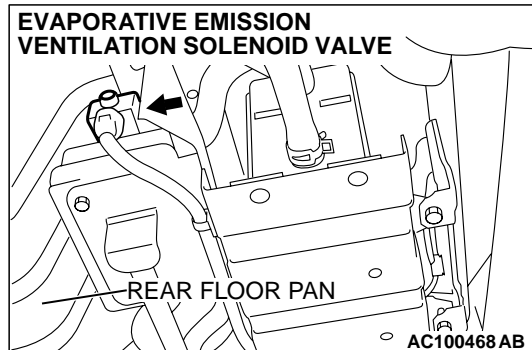
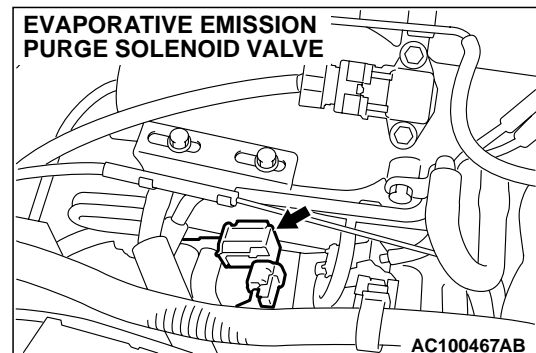
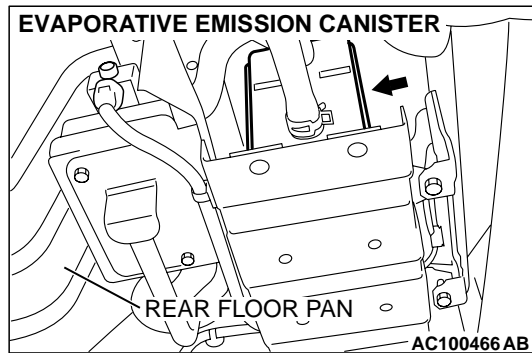
**YES** : Go to Step 2.

**NO :** The procedure is complete.

## DTC P0455: Evaporative Emission Control System Leak Detected (Gross Leak)



AC100465 AB



## TECHNICAL DESCRIPTION

- The fuel tank may be under a slight pressure or vacuum depending on the state of the evaporative emission (EVAP) system. The ECM <M/T> or PCM <A/T> monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the ECM <M/T> or PCM <A/T> will set DTC P0455.
- The ECM <M/T> or PCM <A/T> energizes the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- The evaporative emission purge solenoid is activated to apply engine manifold vacuum to the EVAP system.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines whether there is a leak or clog in the fuel system by measuring the change in vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is determined to be too high.

## DTC SET CONDITIONS

### Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less upon engine start up.

- The engine coolant temperature is 36°C (97°F) or less upon engine start up.

### Check Conditions B: For Test to Run

- Engine coolant temperature is greater than 60°C (140°F) When the amount of remaining fuel is 15 – 40 percent of capacity upon engine start up.
- Engine coolant temperature is greater than 20°C (68°F) when the amount of remaining fuel is 40 – 85 percent of capacity upon engine start up.
- The engine speed is greater than or equal to 1,600 r/min.
- Barometric pressure is greater than 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 70 percent.
- The fuel temperature is 36°C (97°F) or less.
- The fuel tank differential pressure sensor output voltage is 1 – 4 volts.

### Check Conditions C: For Test to Stop

- The intake air temperature is greater than 5°C (41°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 451 Pa (0.065 psi) or less and the amount of remaining fuel is 15 – 40 percent of capacity upon engine start up.

- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 324 Pa (0.047 psi) or less and the amount of remaining fuel is 40 – 85 percent of capacity upon engine start up.
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 130 seconds.

**Judgment Criteria**

- The fuel tank internal pressure is greater than 2 kPa (0.29 psi) after the evaporative emission purge solenoid has been driven when the fuel tank and vapor line were closed

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

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.

- Evaporative emission purge solenoid valve failed.
- Evaporative emission ventilation solenoid valve failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

**OVERVIEW OF TROUBLESHOOTING**

- To determine the cause of DTC P0455, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set to the data reading mode for the fuel tank differential pressure sensor (TANK PRES SNER 73). The mechanical gauge reading is used to verify the scan tool reading. A comparison of the mechanical gauge and scan tool MB991502 determines whether there is a problem in the system.
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all EVAP system hoses and tubes for damage.

## DIAGNOSIS

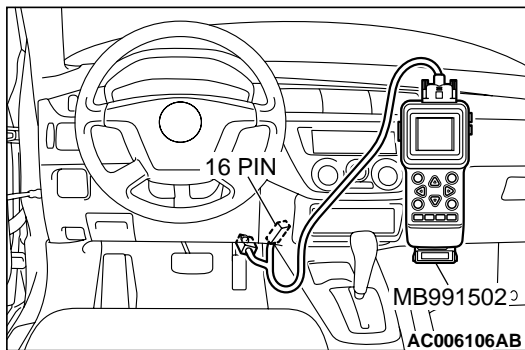
### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

### STEP 1. Using scan tool MB991502, check evaporative emission system monitor test.

#### CAUTION

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the ECM <M/T> or PCM <A/T> automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "EVAP Leak Mon," and press the "YES" key.
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

### Q: What is displayed on scan tool MB991502?

**"Evap Leak Mon. Completed. Test Passed"** : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to turn on. Return the vehicle to the customer.

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"** : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13Ab-19](#). If no other DTCs have been set, go to Step 2.

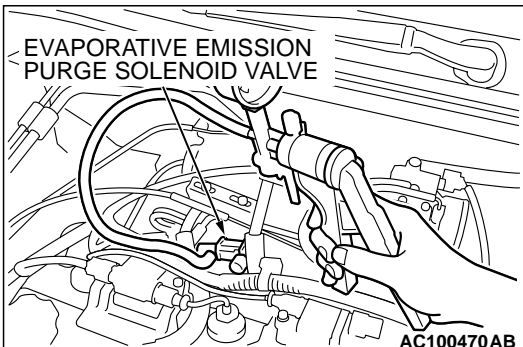
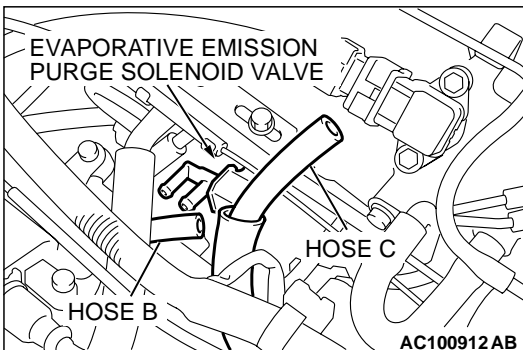
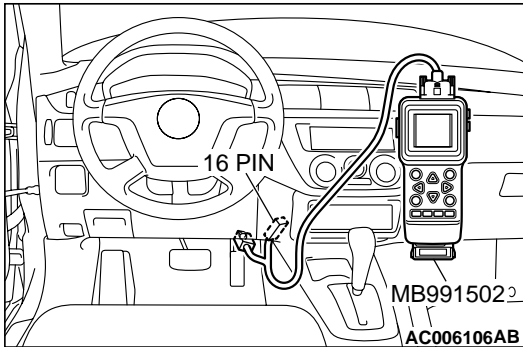
**"Evap Lead Mon. Discontinued. Retest again from the first"** : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

**STEP 2.** Using scan tool MB991502, check actuator test item 08: Evaporative Emission Purge Solenoid Valve.

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hoses B and C from the evaporative emission purge solenoid valve side, and connect the hand vacuum pump to the evaporative emission purge solenoid valve instead of hose C.

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

(4) Set scan tool MB991502 to actuator test mode for item 08: Evaporative Emission Purge Solenoid Valve. When the evaporative emission purge solenoid valve is operated, apply a pressure on the hand vacuum pump and confirm that air is blown from the other side nipple.

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

(6) Disconnect the hand vacuum pump, and connect hoses B and C to the evaporative emission purge solenoid valve.

**Q: Is the solenoid valve in good condition?**

**YES :** Go to Step 3.

**NO :** Replace the evaporative emission purge solenoid valve. Go to Step 20.

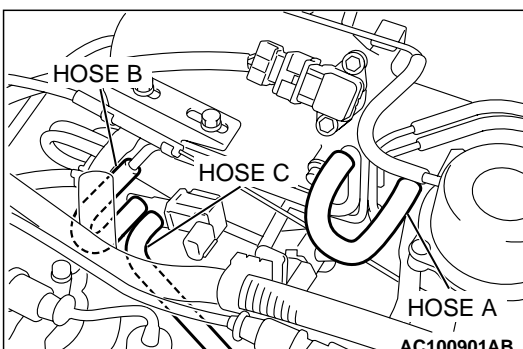
**STEP 3.** Check for leaks and clogging in evaporative emission system hoses A through C.

Use a hand vacuum pump to test each hose from hose A to hose C.

**Q: Are the hoses in good condition?**

**YES :** Go to Step 4.

**NO :** Replace the damaged hose. Go to Step 20.

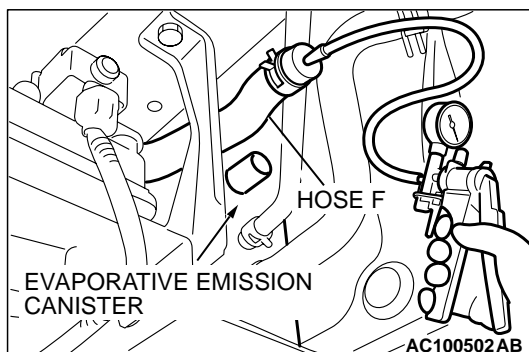
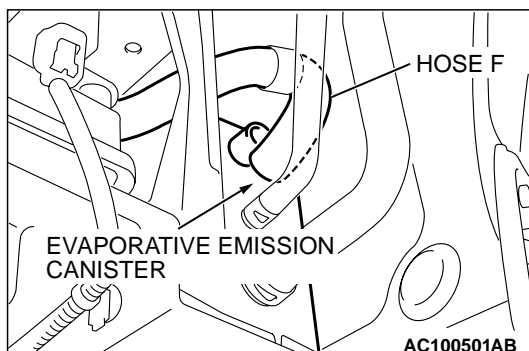
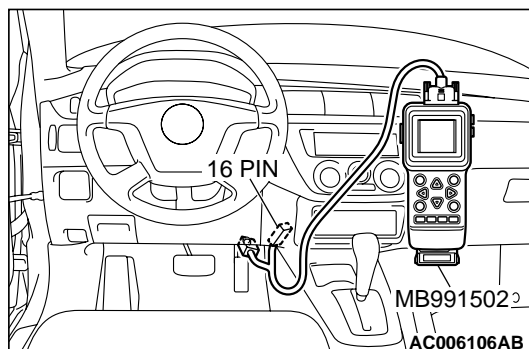


**STEP 4.** Using scan tool MB991502, check the evaporative emission ventilation solenoid and hose F.

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.



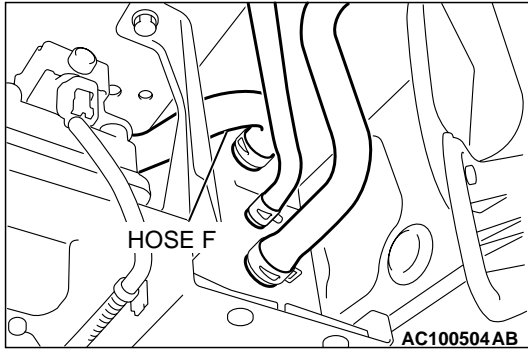
- (2) Disconnect hose F from the evaporative emission canister side, and connect a hand vacuum pump.
- (3) Turn the ignition switch to the "ON" position.
- (4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid Valve. While the evaporative emission ventilation solenoid valve is activated, operate the hand vacuum pump and confirm that the solenoid holds vacuum.
- (5) Turn the ignition switch to the "LOCK" (OFF) position and disconnect scan tool MB991502.
- (6) Disconnect the hand vacuum pump, and connect hose F to the evaporative emission canister.

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

**YES :** Go to Step 6.

**NO :** Go to Step 5.



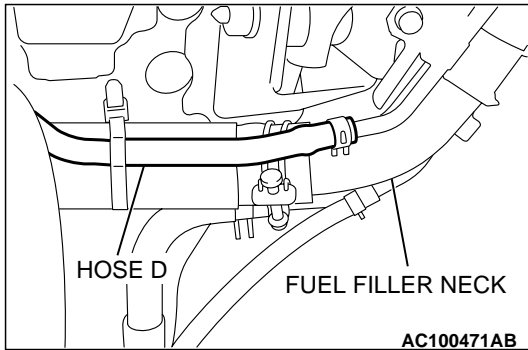
**STEP 5. Check for leaks in the evaporative emission system hose F.**

Perform a vacuum test using a hand vacuum pump on hose F.

**Q: Is the hose in good condition?**

**YES :** Replace the evaporative emission ventilation solenoid. Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve [P.17-120](#). Go to Step 20.

**NO :** Replace the damaged hose. Go to Step 20.

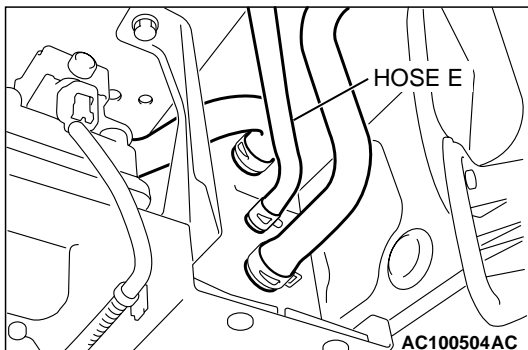
**STEP 6. Check for leaks and clogging in evaporative emission system hoses D through E.**

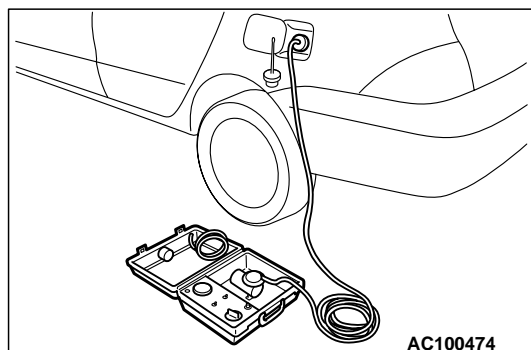
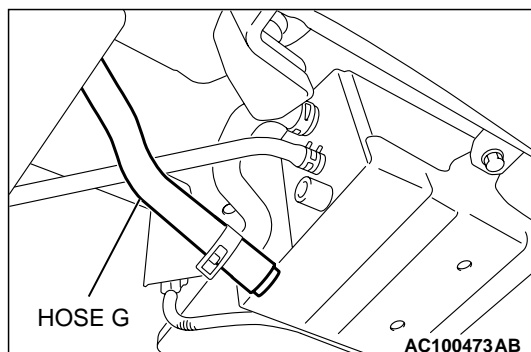
Perform a vacuum test using a hand vacuum pump on hoses D through E.

**Q: Are the hoses in good condition?**

**YES :** Go to Step 7.

**NO :** Replace the damaged hose. Go to Step 20.



**STEP 7. Pressure test the evaporative emission system lines from hose G and P through the fuel tank.**

- (1) Disconnect hose G from the canister, and plug hose G securely.
- (2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.
- (3) Remove the fuel cap.

- (4) Connect the evaporative emission system pressure pump to the fuel filler neck.
- (5) Pressure test the system to determine whether any leaks are present.

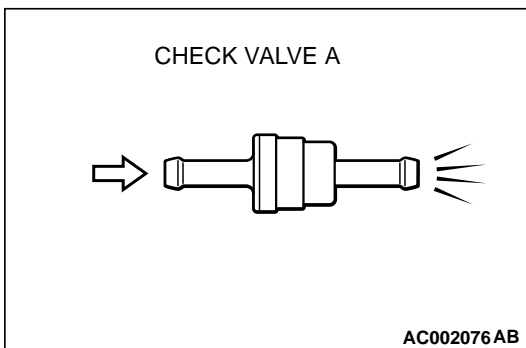
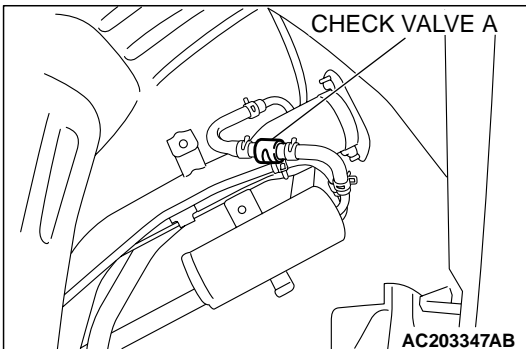
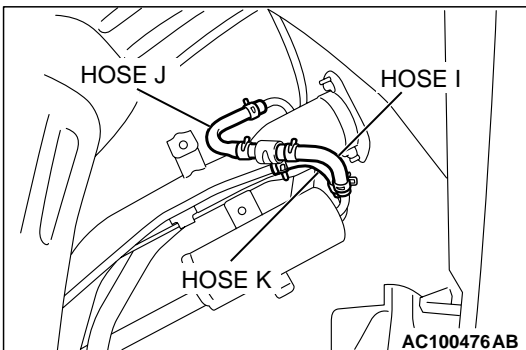
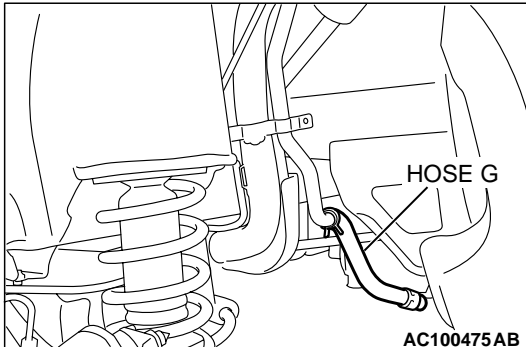
*NOTE: The "Pressure test" in this procedure refers to the I/ M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.*

- (6) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (7) Connect hose G to the canister.

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

**YES :** Go to Step 14.

**NO :** Go to Step 8.



### STEP 8. Check for vacuum leaks in evaporative emission system hoses G, I, J and K.

- (1) Remove the fuel filler neck protector. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)
- (2) Perform a leakage test with a hand vacuum pump on each hose from hoses G, I, J and K.

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

**YES :** Go to Step 9.

**NO :** Replace the damaged hose, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.

### STEP 9. Test check valve A.

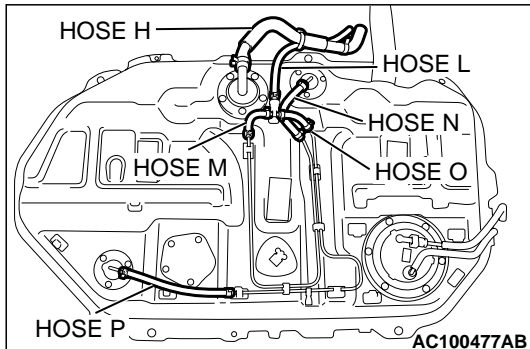
- (1) Check valve A is a one-way check valve.

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

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

**YES :** Go to Step 10.

**NO :** Replace check valve A, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.

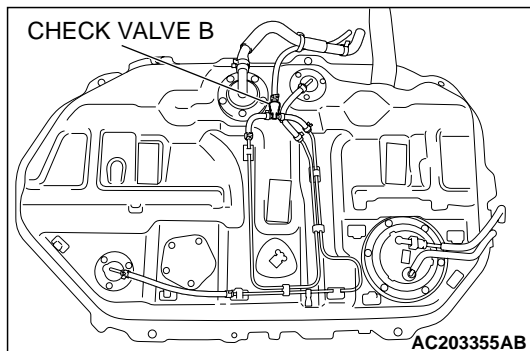

**STEP 10. Check for vacuum leaks in evaporative emission system hoses H, L, M, N, O and P.**

- (1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)
- (2) Perform a leakage test with a hand vacuum pump on each hose I, M, N, O, P and Q.

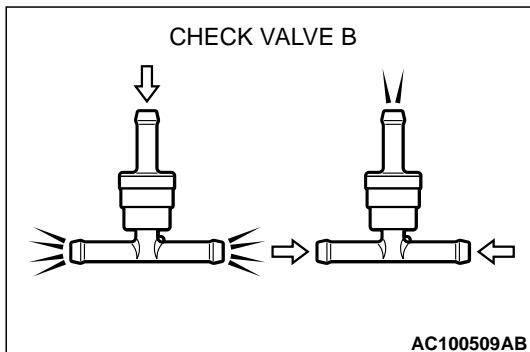
**Q: Are the hoses in good condition?**

**YES :** Go to Step 11.

**NO :** Replace the damaged hose, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.


**STEP 11. Test check valve B.**

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

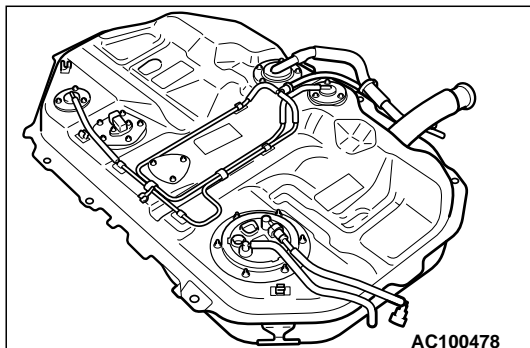


- (2) Check valve B should allow air to flow in only one direction.

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

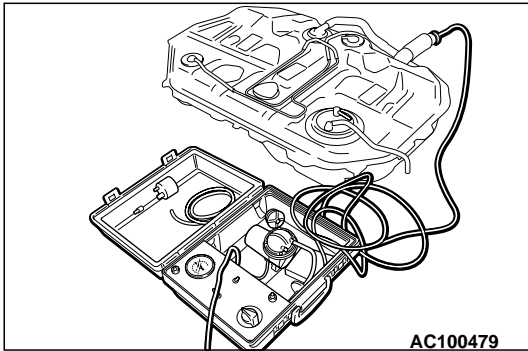
**YES :** Go to Step 12.

**NO :** Replace check valve B, and reinstall the fuel tank and the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.

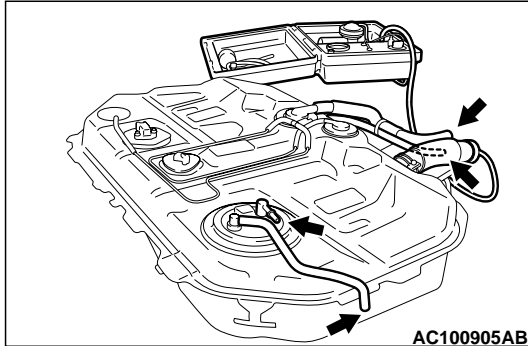

**STEP 12. Check for leaks in the fuel tank.**

- (1) Visually check for cracks or other leaks in the fuel tank.

*NOTE: Carefully check the fuel pump assembly and the inner pressure sensor installation section in the fuel tank.*



- (2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the filler hose.



- (3) Plug the fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.

*NOTE: If these items are not securely plugged here, the fuel could leak in the next step.*

- (4) Pressurize the fuel tank with the evaporative emission system pressure pump.  
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

**Q: Is the fuel tank free of leaks?**

**There are leaks at the fuel pump assembly, the fuel tank differential pressure sensor, leveling valve or the fuel tank rollover valve installation section.** : After

reassemble the leaked parts, check again that there are no leaks. Then reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20 .

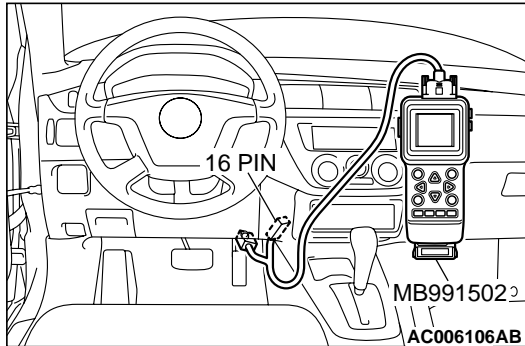
**There are leaks at the fuel tank.** : Replace the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.

**There are no leaks.** : Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 13.

**STEP 13. Using scan tool MB991502, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



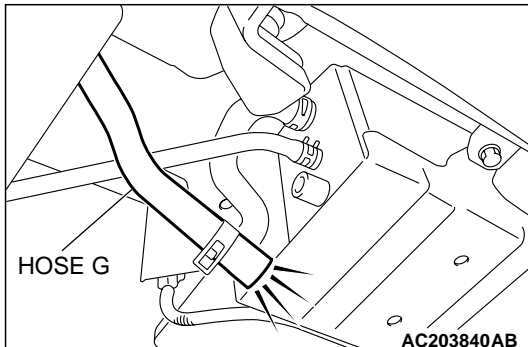
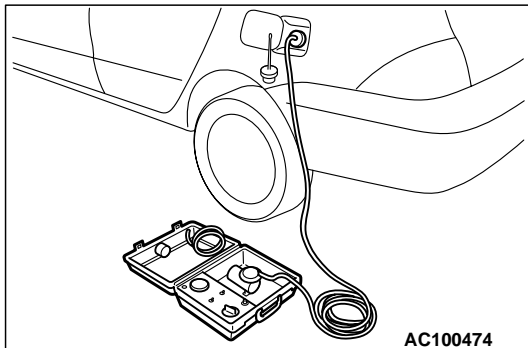
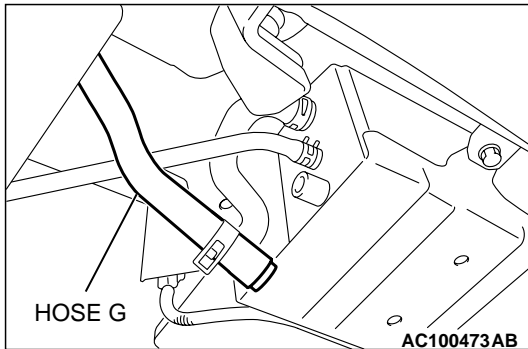
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "Evap Leak Mon," and press the "YES" key.
- (8) During the test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

**Q: What is displayed on scan tool MB991502?**

**"Evap Leak Mon. Completed. Test Passed"** : The evaporative emission system is working properly at this time. Go to Step 20 .

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"**  
: Replace the ECM <M/T> or PCM <A/T>. Go to Step 20.

**"Evap Lead Mon. discontinued. Retest again from the first"** : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the evaporative emission system monitor test.

**STEP 14. Pressure test for clogging in evaporator line from hose G to hose P.**

- (1) Disconnect hose G from the canister side, and plug the hose.
- (2) Remove the fuel cap.

- (3) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler neck and apply pressure.

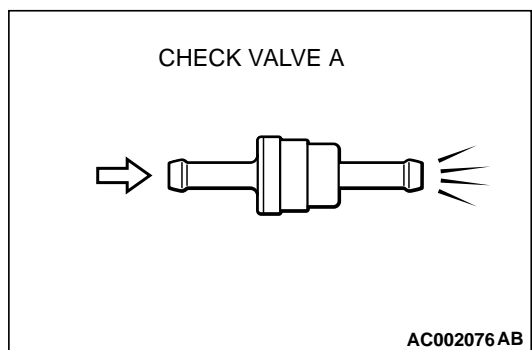
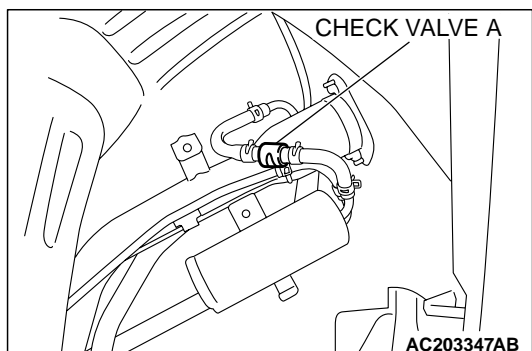
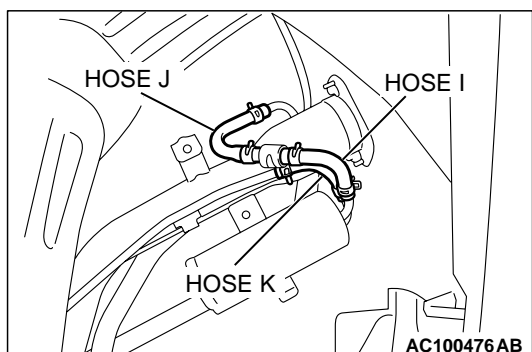
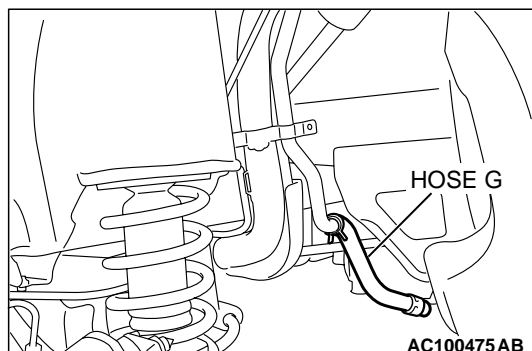
*NOTE: "Pressure test" in this procedure refers to the I/ M240 Simulation Test (8 simple steps) described in the evaporative emission system pressure pump (Miller number 6872A) manufacture's instructions located in the lid of the pump box.*

- (4) After it is confirmed that pressure maintained, unplug hose G.
- (5) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (6) Connect hose G to the evaporative emission canister.

**Q: Is air blown from hose G?**

**YES :** Go to Step 20.

**NO :** Go to Step 15.



### STEP 15. Check for clogging in the evaporator line hoses G, I, J and K.

- (1) Remove the fuel filler neck protector. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)
- (2) The clogging test with a hand vacuum pump on each hose from hoses G, I, J and K.

#### Q: Are the hoses in good condition?

**YES :** Go to Step 16.

**NO :** Replace the damaged hose, and the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.

### STEP 16. Test check valve A.

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

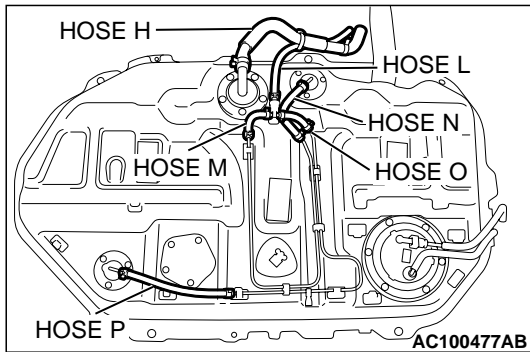
- (2) Check valve A should allow air to flow in only one direction.

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

**YES :** Go to Step 17.

**NO :** Replace check valve A, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.





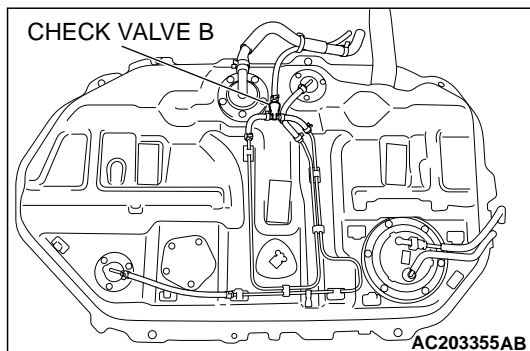
**STEP 17. Check for clogging in the evaporator line from hoses H, L, M, N, O and P.**

Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)

**Q: Are the hoses in good condition?**

**YES :** Go to Step 18.

**NO :** Replace the damaged hose, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.



**STEP 18. Test check valve B.**

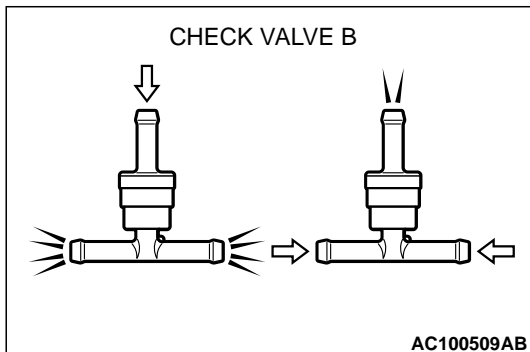
(1) Check valve B is a one-way check valve.

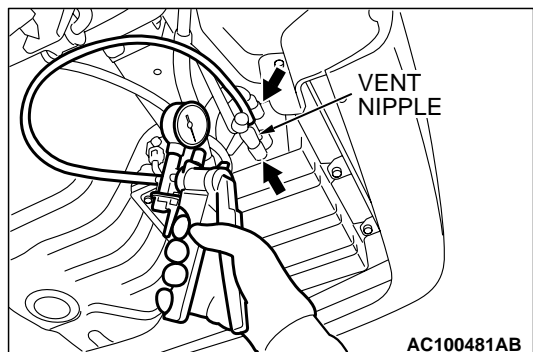
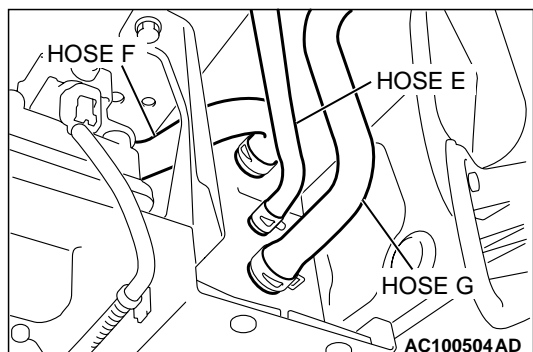
(2) Check valve B should allow air to flow in only one direction.

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

**YES :** Go to Step 19.

**NO :** Replace check valve B, reinstall the fuel tank and the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 20.



**STEP 19. Check the evaporative emission canister for leaks and clogging.**

- (1) Disconnect hoses E, F and G from the canister side, and connect a hand vacuum pump to the canister instead of hose E, and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump, and connect hoses E, F and G to the canister.

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

**YES :** Go to Step 13.

**NO :** Replace the canister. Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve [P.17-120](#). Go to Step 20.

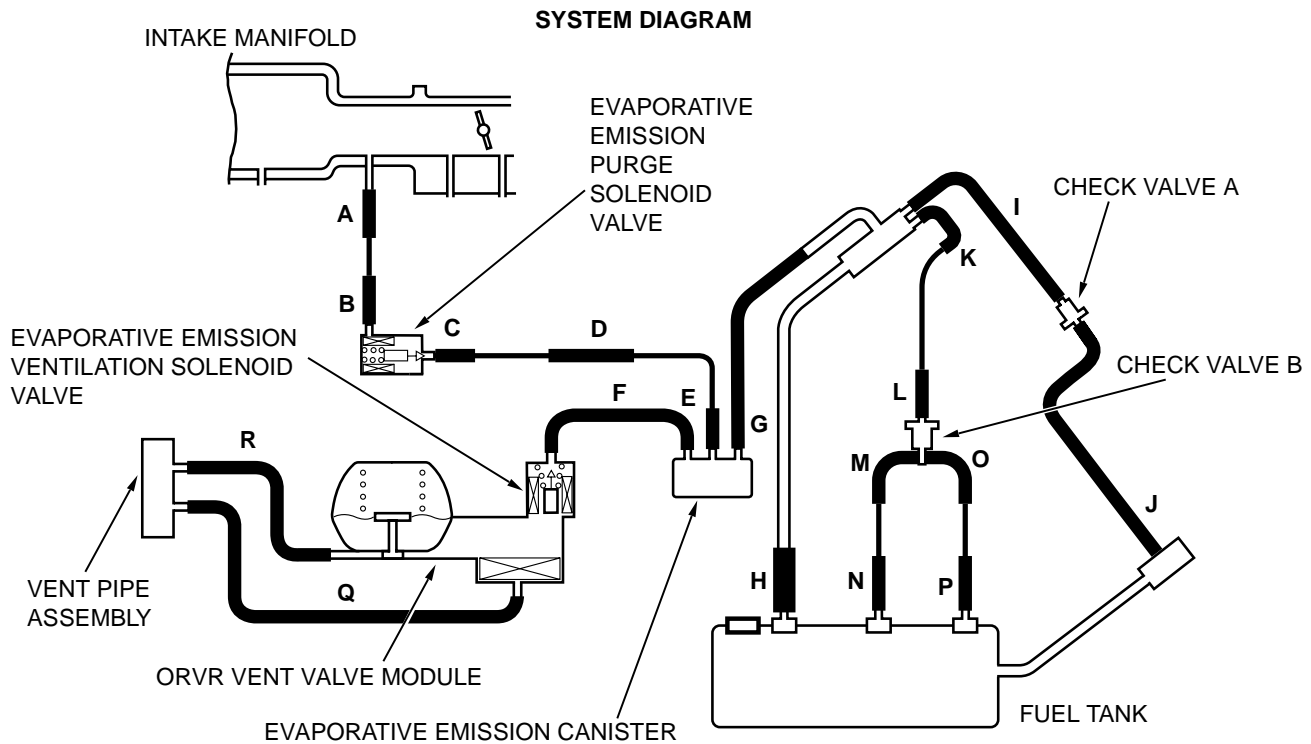
**STEP 20. Test the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to, Procedure 1 - Evaporative Emission Control System Leak Monitor [P.13Ab-2](#).
- (2) Read the DTC.

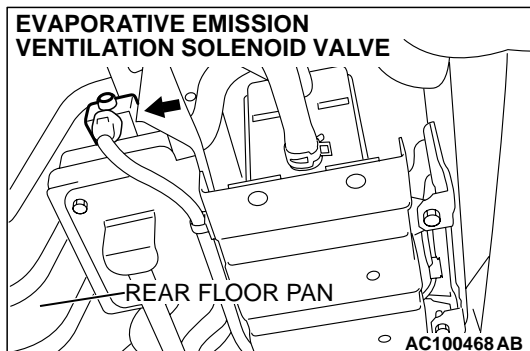
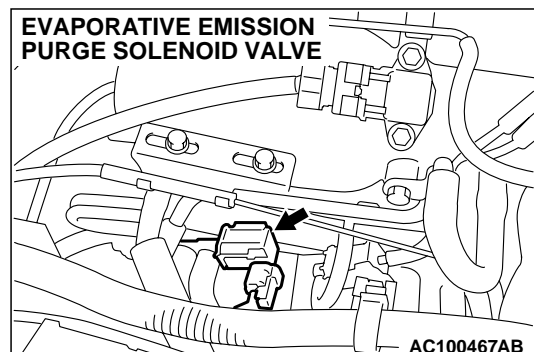
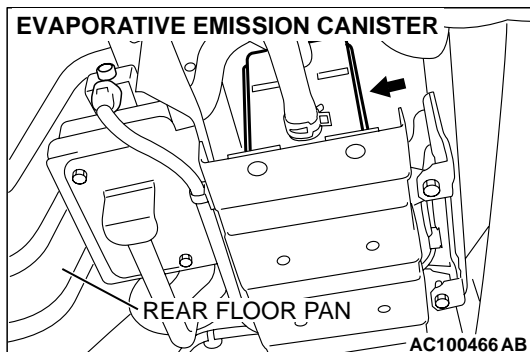
**Q: Is DTC P0455 set?**

**YES :** Go to Step 1.

**NO :** The procedure is complete.

**DTC P0456: Evaporative Emission Control System Leak Detected (Very Small Leak)**

AC100465 AB

**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> monitors the Evaporative Emission (EVAP) System pressure.
- The ECM <M/T> or PCM <A/T> controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.

- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM <M/T> or PCM <A/T> determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

### DTC SET CONDITIONS

#### Check Conditions A: At Start up

- Intake air temperature is 36°C (97°F) or less when the engine is started.
- The engine coolant temperature 36°C (97°F) or less when the engine is started.
- Fuel level sensor output voltage is 2.4 – 3.7 volts when the engine is started, and the amount of remaining fuel is 40 – 85 percent of capacity.

#### Check Conditions B: For Test to Run

- Barometric pressure is greater than 76 kPa (11 psi).
- The fuel temperature is 33°C (91°F) or less.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

#### Check Conditions C: For Test to Stop

- Intake air temperature is greater than –10°C (14°F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises in the fuel tank is less than 324 Pa (0.047 psi).
- Engine coolant temperature is greater than 20°C (68°F).

- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 – 14 minutes.

### Judgment Criteria

- Internal pressure of the fuel tank has changed greater than 1,177 – 1,373 Pa (0.177 – 0.199 psi) in 128 seconds after the tank and vapor line were closed.
- ECM <M/T> or PCM <A/T> monitors for this condition once during drive cycle.

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

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Malfunction of the evaporative emission canister seal.
- Malfunction of the fuel tank, purge line or vapor line seal.
- Malfunction of the evaporative emission ventilation solenoid.

### OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0456, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRES SNER 73.) The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines whether there is a problem in the system.
- Prior to doing the performance test, ensure that the fuel cap is closed securely. Inspect all evaporative emission system hoses and tubes for damage.

## DIAGNOSIS

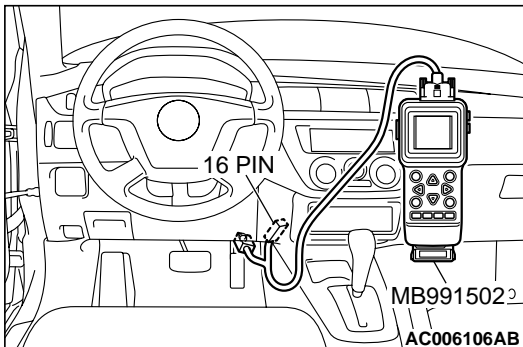
### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check the evaporative emission system monitor test.**

#### CAUTION

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the PCM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



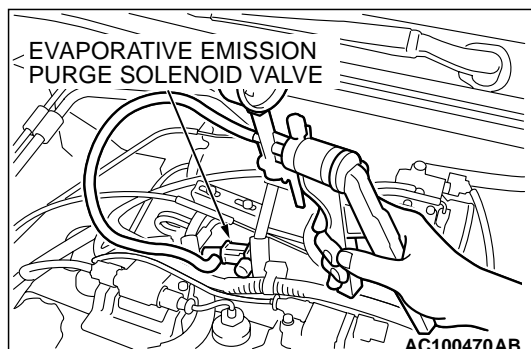
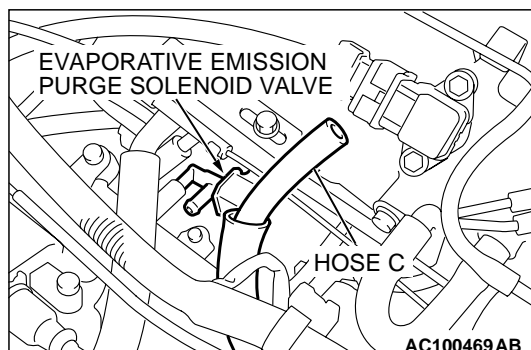
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check that the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "Evap Leak Mon," and press the "YES" key.
- (8) During this test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

### Q: What is displayed on scan tool MB991502?

**"Evap Leak Mon. Completed. Test Passed"** : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to turn on. Return the vehicle to the customer.

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"** : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set [P.13Ab-19](#). If no other DTCs have been set, go to Step 2.

**"Evap Lead Mon. discontinued. Retest again from the first"** : The EVAP monitor was interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.



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**STEP 2. Check the evaporative emission purge solenoid for leaks.**

- (1) Disconnect hose C from the evaporative emission purge solenoid and connect a hand vacuum pump to the nipple of the evaporative emission purge solenoid.

- (2) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
- (3) Disconnect the hand vacuum pump, and connect hose C to the evaporative emission purge solenoid.

**Q: Does the evaporative emission purge solenoid hold vacuum?**

**YES :** Go to Step 3.

**NO :** Replace the evaporative emission purge solenoid. Go to Step 15.

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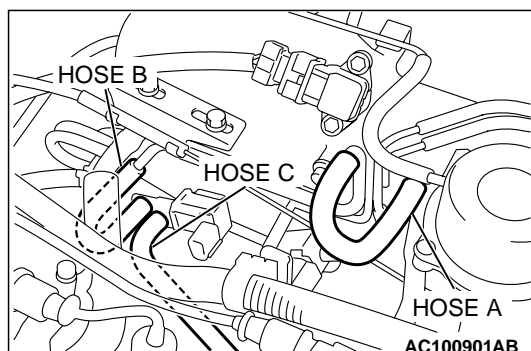
**STEP 3. Check for leaks in evaporative emission system hoses A through C.**

Use a hand vacuum pump to test each hose from hose A to hose C.

**Q: Are the hoses in good condition?**

**YES :** Go to Step 4.

**NO :** Replace any damaged hose. Go to Step 15.

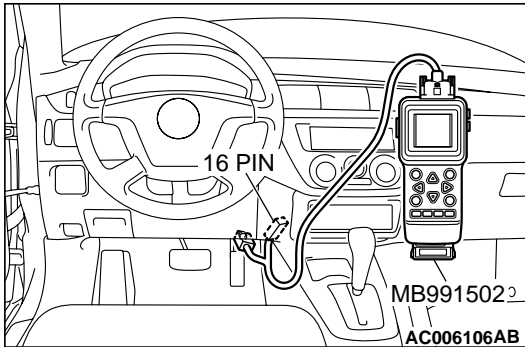


**STEP 4. Check the evaporative emission ventilation solenoid and hose F using scan tool MB991502.**

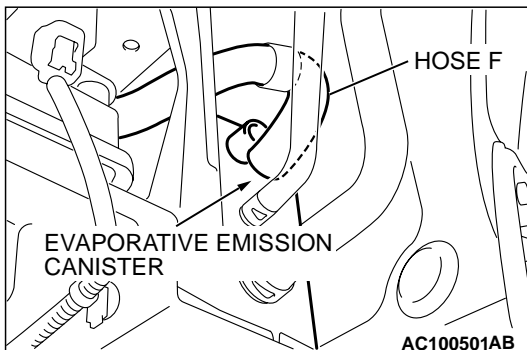
**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

(1) Connect scan tool MB991502 to the data link connector.



(2) Disconnect hose F from the evaporative emission canister side, and connect a hand vacuum pump.

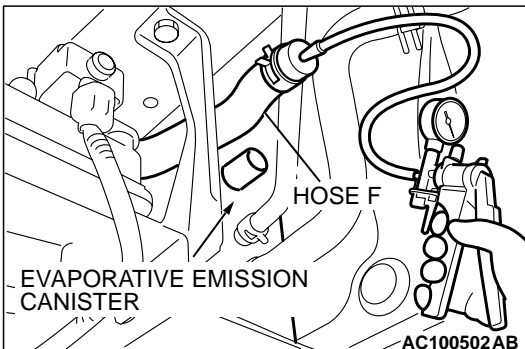


(3) Turn the ignition switch to the "ON" position.

(4) Set scan tool MB991502 to actuator test mode for item 29: Evaporative Emission Ventilation Solenoid. While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(5) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991502.

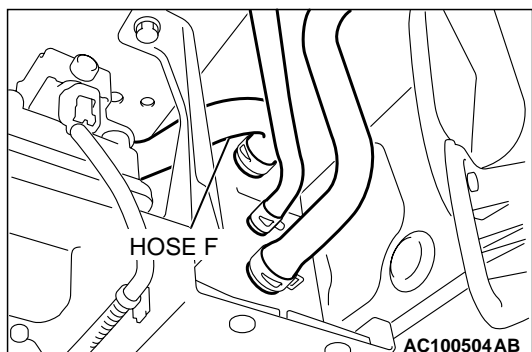
(6) Disconnect the hand vacuum pump, and connect hose F to the evaporative emission canister.



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

**YES :** Go to Step 6.

**NO :** Go to Step 5.

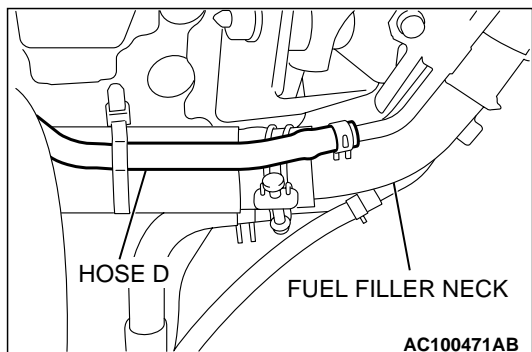
**STEP 5. Check for leaks in the evaporative emission system line hose F.**

Perform a leakage test using a hand vacuum pump on hose G.

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

**YES :** Replace the evaporative emission ventilation solenoid valve. Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation [P.17-120](#). Go to Step 15.

**NO :** Replace the inferior hose. Go to Step 15.

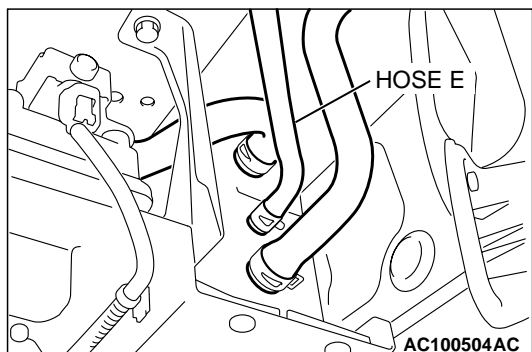
**STEP 6. Check for leaks in the evaporative emission system line between hoses D and E.**

Perform a leakage test with a hand vacuum pump on each hose between hose D and hose E.

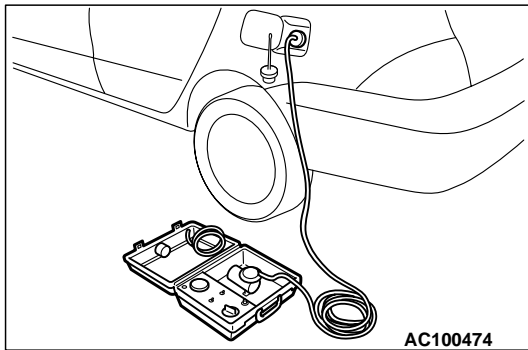
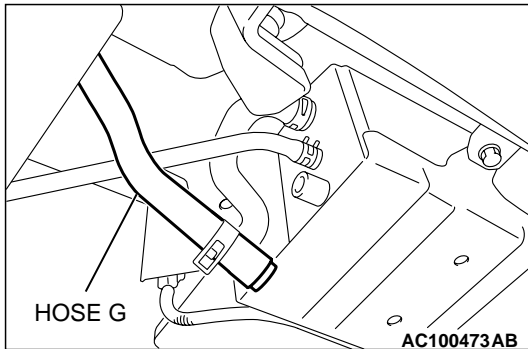
**Q: Do the hoses hold vacuum?**

**YES :** Go to Step 7.

**NO :** Replace the damaged hose. Go to Step 15.





**STEP 7. Pressure test the evaporative emission system lines from hose G and P through the fuel tank to hose Q.**

- (1) Disconnect hose H from the canister, and plug hose H securely.
- (2) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the manufacturer's instructions.
- (3) Remove the fuel cap.

- (4) Connect the evaporative emission system pressure pump to the fuel filler neck.
- (5) Pressure test the system to determine whether any leaks are present.

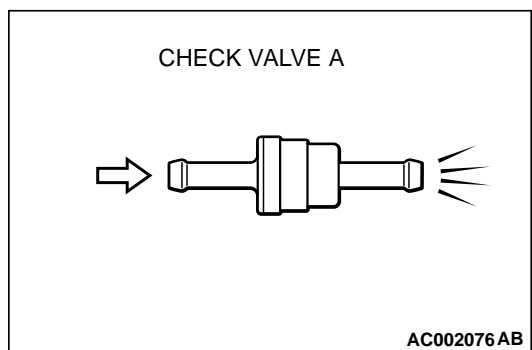
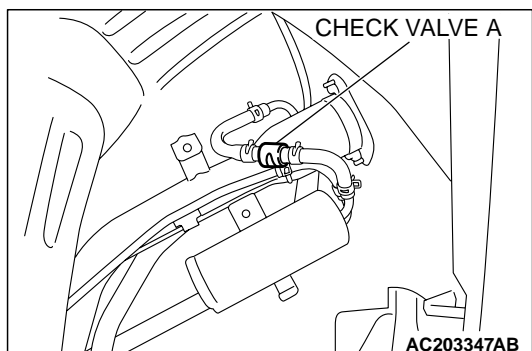
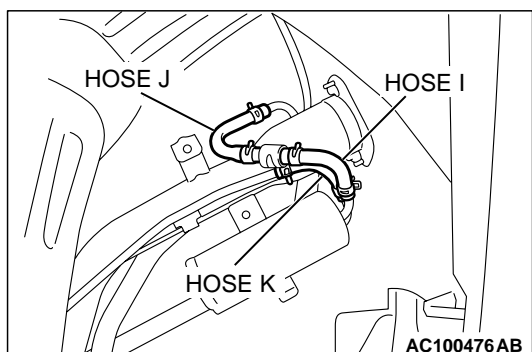
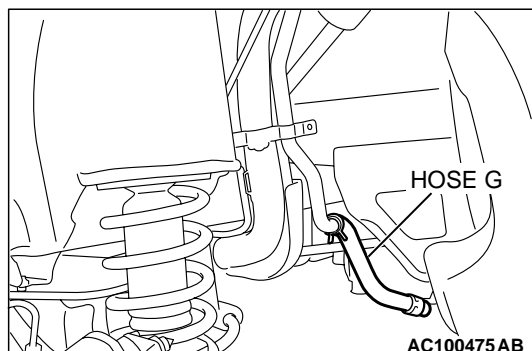
*NOTE: The "Pressure test" in this procedure refers to the I/ M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.*

- (6) Disconnect the evaporative emission system pressure pump, and reinstall the fuel cap.
- (7) Connect hose H to the canister.

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

**YES :** Go to Step 14.

**NO :** Go to Step 8.



### STEP 8. Check for vacuum leaks in evaporative emission system hoses G, I, J and K.

- (1) Remove the fuel filler neck protector. (Refer to GROUP 13B, Fuel Tank P.13B-11.)
- (2) Perform a leakage test with a hand vacuum pump on each hose from hoses G, I, J and K.

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

**YES :** Go to Step 9.

**NO :** Replace the inferior hose, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank P.13B-11. Go to Step 15.

### STEP 9. Test check valve A.

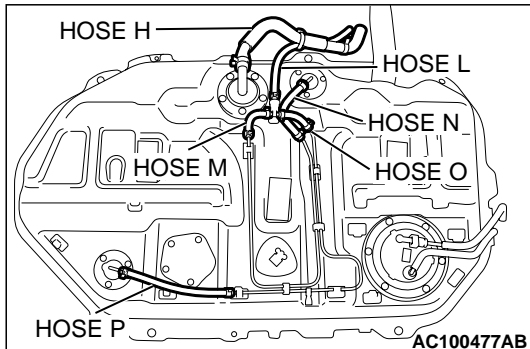
- (1) Check valve A is a one-way check valve.

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

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

**YES :** Go to Step 10.

**NO :** Replace check valve A, and reinstall the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank P.13B-11. Go to Step 15.



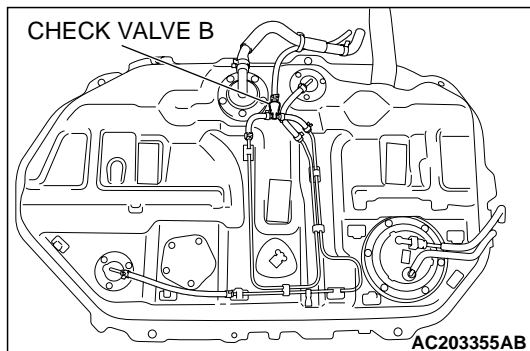
**STEP 10. Check for vacuum leaks in evaporative emission system hoses H, L, M, N, O and P.**

- (1) Remove the fuel tank. (Refer to GROUP 13B, Fuel Tank [P.13B-11](#).)
- (2) Perform a leakage test with a hand vacuum pump on each hose H, L, M, N, O and P.

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

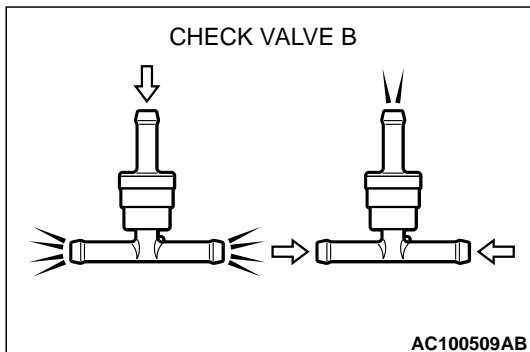
**YES :** Go to Step 11.

**NO :** Replace the damaged hose, and reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 15.



**STEP 11. Test check valve B.**

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

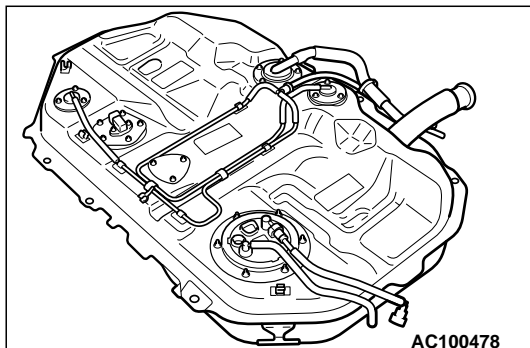


- (2) Check valve B should allow air to flow in only one direction.

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

**YES :** Go to Step 12.

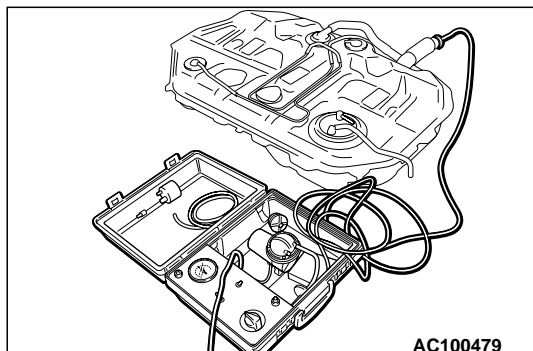
**NO :** Replace check valve B, and reinstall the fuel tank and the fuel filler neck protector. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 15.



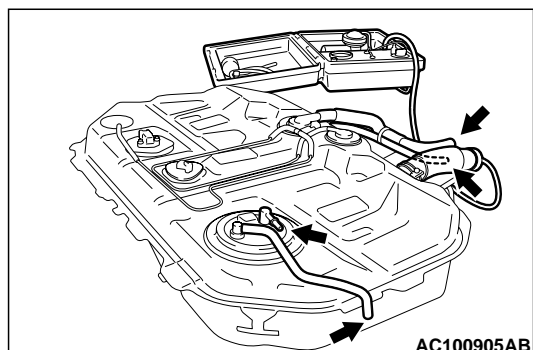
**STEP 12. Check for leaks in the fuel tank.**

- (1) Visually check for cracks or other leaks in the fuel tank.

*NOTE: Carefully check the fuel pump assembly and the differential pressure sensor installation in the fuel tank.*



- (2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the filler hose.



- (3) Plug the fuel pump feed nipple, return hose, hose L and hose H connected to the fuel tank.  
*NOTE: If these items are not securely plugged at this time, the fuel could leak from the tank.*
- (4) Pressurize the fuel tank with the evaporative emission system pressure pump.
- (5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

**Q: Is the fuel tank free of leaks?**

**There are leaks at the fuel pump assembly, the fuel tank differential pressure sensor, leveling valve or the fuel tank rollover valve installation section.** : After reassemble the leaked parts, check again that there are no leaks. Then reinstall the fuel tank. Go to Step 15.

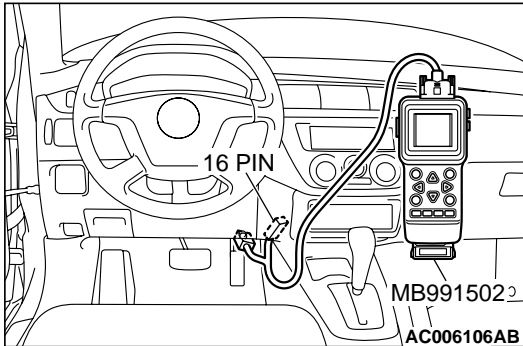
**There are leaks at the fuel tank.** : Replace the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 15.

**There are no leaks.** : Reinstall the fuel tank. Refer to GROUP 13B, Fuel Tank [P.13B-11](#). Go to Step 13.

**STEP 13. Using scan tool MB991502, check the evaporative emission system monitor test.**

**⚠ CAUTION**

- To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.
- During this test, the ECM <M/T> or PCM <A/T> automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to the "P" position.



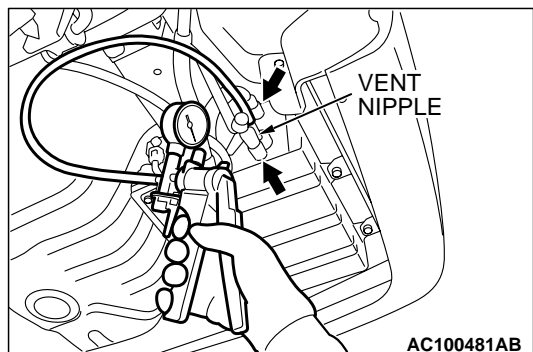
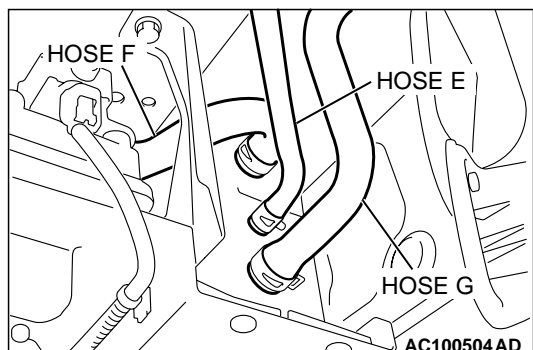
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTCs using scan tool MB991502.
- (4) Check the fuel cap is securely closed. (Tighten until three clicks are heard.)
- (5) Start the engine.
- (6) Select "System Test," and press the "YES" key.
- (7) Select "EVAP Leak Mon," and press the "YES" key.
- (8) During the test, keep the accelerator pedal at the idle position.
- (9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991502 will change from "NO" to "YES."
- (10) Turn the ignition switch to the "LOCK" (OFF) position. Disconnect scan tool MB991502.

**Q: What is displayed on scan tool MB991502?**

**"Evap Leak Mon. Completed. Test Passed"** : The evaporative emission system is working properly at this time. Go to Step 15 .

**"Evap Leak Mon. Completed. Test Failed and DTCs Set"**  
: Replace the ECM <M/T> or PCM <A/T>. Go to Step 15.

**"Evap Lead Mon. discontinued. Retest again from the first"** : The monitor test was interrupted. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the evaporative emission system monitor test.

**STEP 14. Check the evaporative emission canister for vacuum leaks.**

- (1) Disconnect hoses E, F and G from the evaporative emission canister side, and connect a hand vacuum pump to the evaporative emission canister instead of hose E, and plug the other nipples.
- (2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
- (3) Disconnect the hand vacuum pump, and connect hoses E, F and G to the canister.

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

**YES :** Go to Step 13.

**NO :** Replace the canister. Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve [P.17-120](#). Go to Step 15.

**STEP 15. Perform the OBD-II drive cycle.**

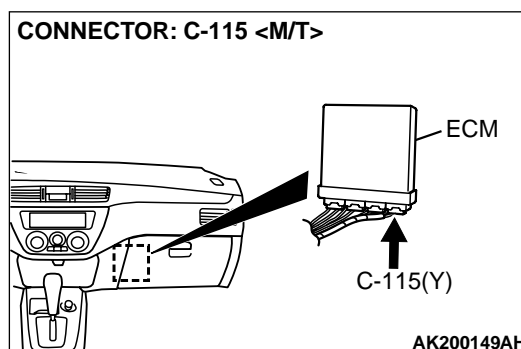
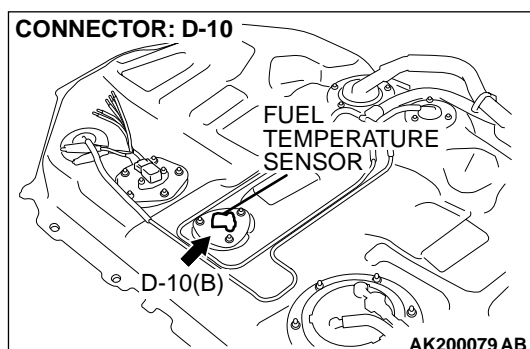
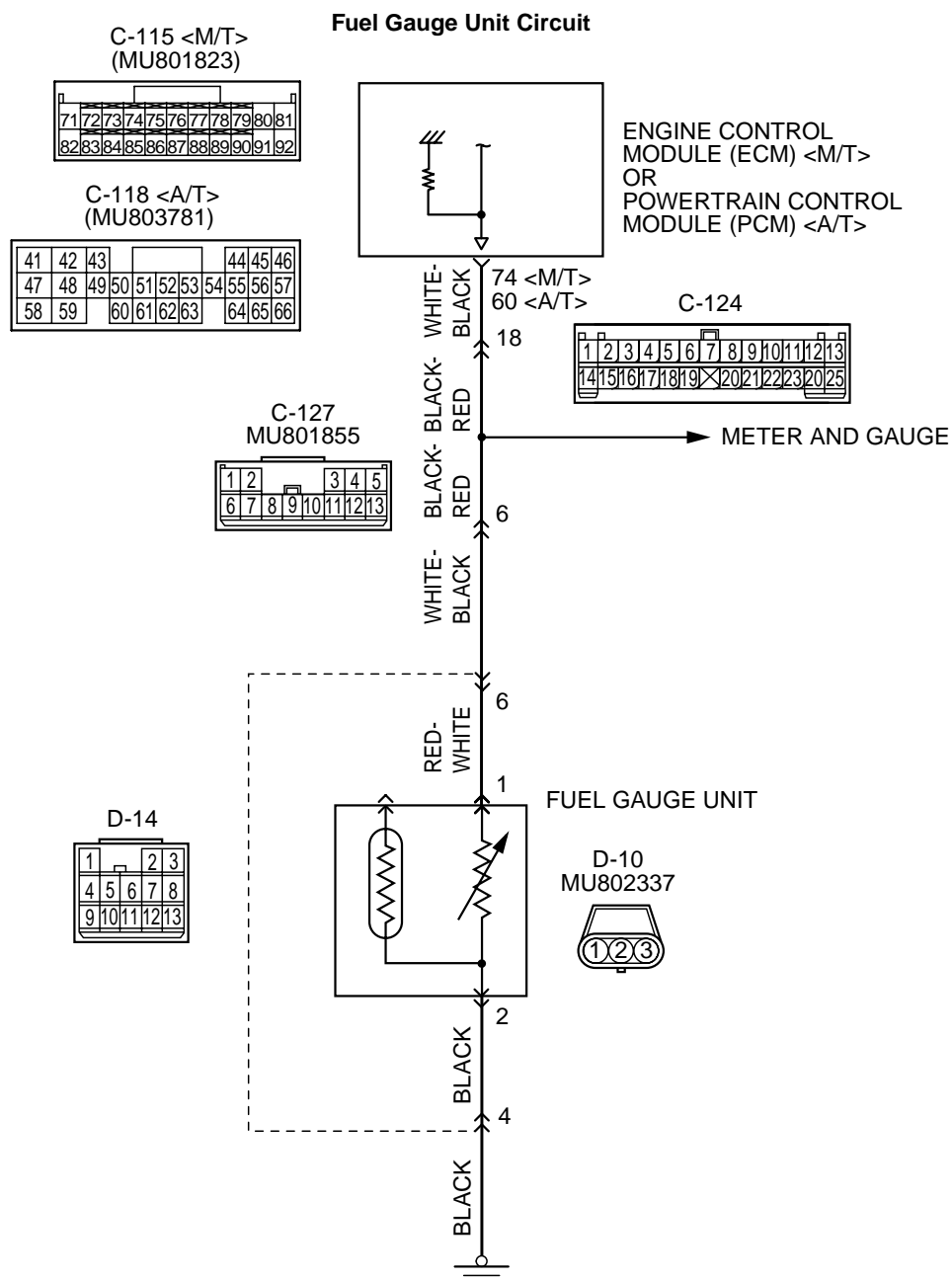
- (1) Confirm the repair by performing the appropriate drive cycle. Refer to, Procedure 1 - Evaporative Emission Control System Leak Monitor [P.13Ab-2](#).
- (2) Read the DTC.

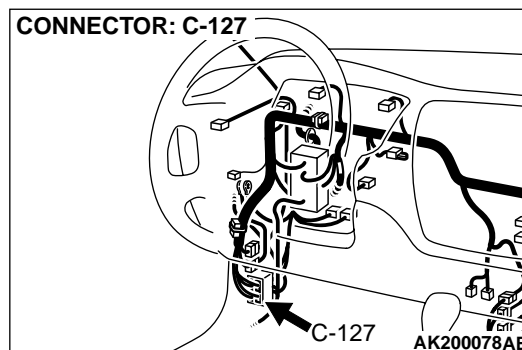
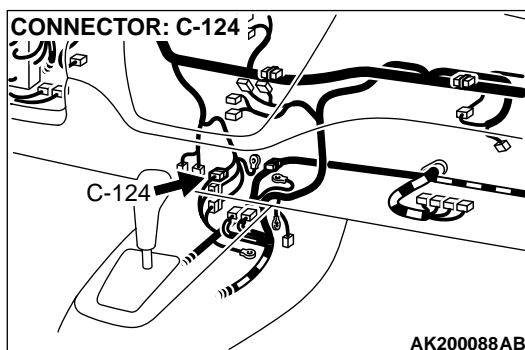
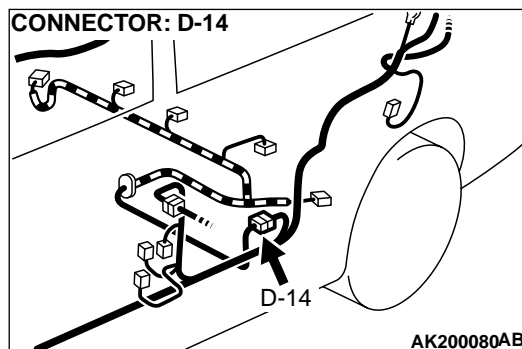
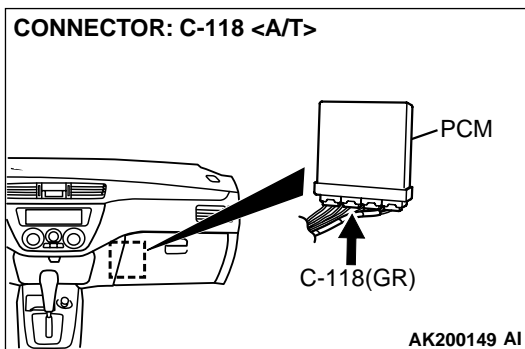
**Q: Is DTC P0456 set?**

**YES :** Go to Step 1.

**NO :** The inspection is complete.

## DTC P0461: Fuel Level Sensor Circuit Range/Performance





### CIRCUIT OPERATION

- The fuel gauge drive signal is input in ECM (terminal No. 74) <M/T> or PCM (terminal No. 60) <A/T>.

### TECHNICAL DESCRIPTION

- Branch the drive signal from the fuel gauge circuit, and input it into ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or PCM <A/T> detects the amount of fuel left in the fuel tank with this signal, and also controls the fuel level warning light.

### DTC SET CONDITIONS

#### Check Conditions, Judgement Criteria

- When the fuel consumption calculated from the operation time of the injector amounts to 20 liter, the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liter or less.

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

- Fuel gauge unit failed.
- Open or shorted fuel gauge unit circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

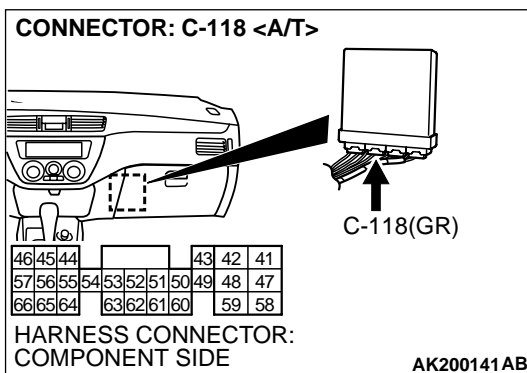
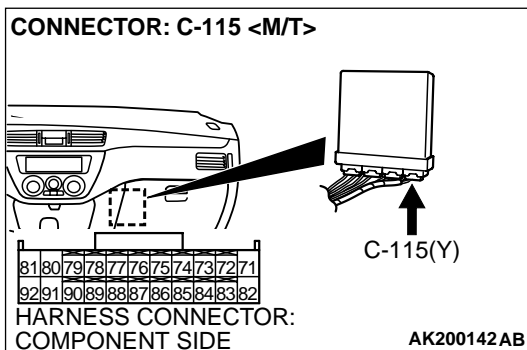
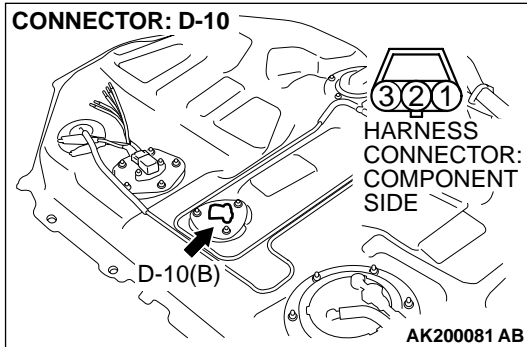


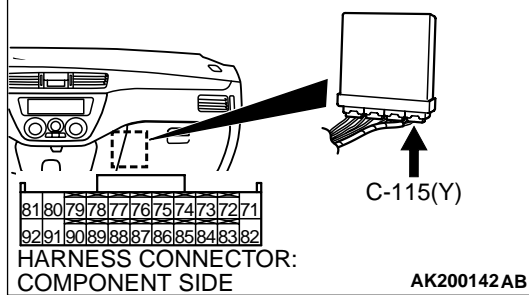
## DIAGNOSIS

**STEP 1. Check fuel gauge.****Q: Is the fuel gauge functioning?****YES :** Go to Step 3.**NO :** Go to Step 2.

**STEP 2. Check for short circuit to ground between fuel gauge unit connector D-10 (terminal No. 2) and ECM connector C-115 (terminal No. 74) <M/T> or PCM connector C-118 (terminal No. 60) <A/T>.**

**NOTE:** Check harness after checking intermediate connectors C-124, C-127 and D-14. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

**Q: Is the harness wire in good condition?****YES :** Refer to GROUP 54A, Combination Meter [P.54A-40](#).**NO :** Repair it. Then go to Step 6.

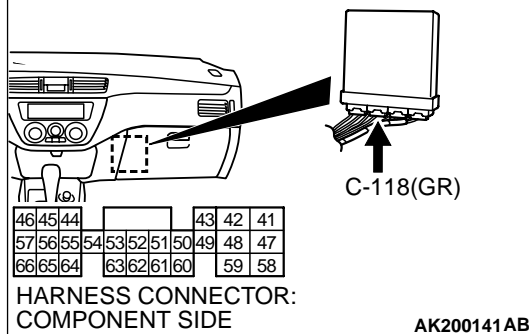
**CONNECTOR: C-115 <M/T>**

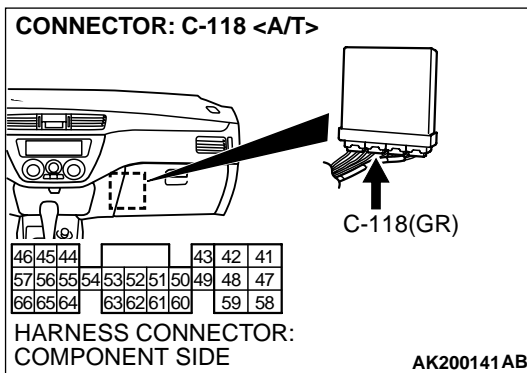
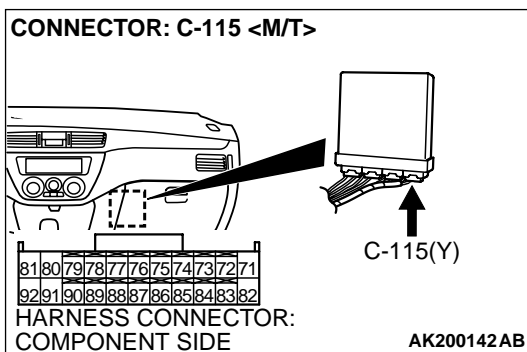
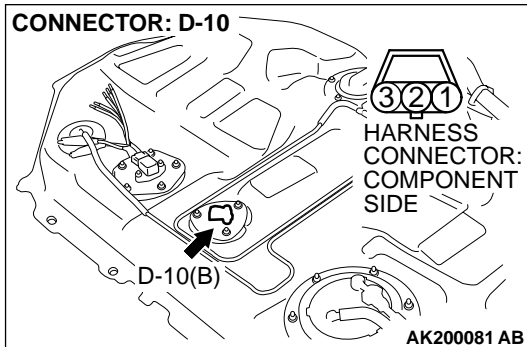
**STEP 3. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

**CONNECTOR: C-118 <A/T>**



**STEP 4. Check for open circuit or harness damage between fuel gauge unit connector D-10 (terminal No. 2) and ECM connector C-115 (terminal No. 74) <M/T> or PCM connector C-118 (terminal No. 60) <A/T>.**

**NOTE:** Check harness after checking intermediate connectors C-124, C-127 and D-14. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

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

**YES :** Go to Step 5.

**NO :** Repair it. Then go to Step 6.

**STEP 5. Retest the system.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

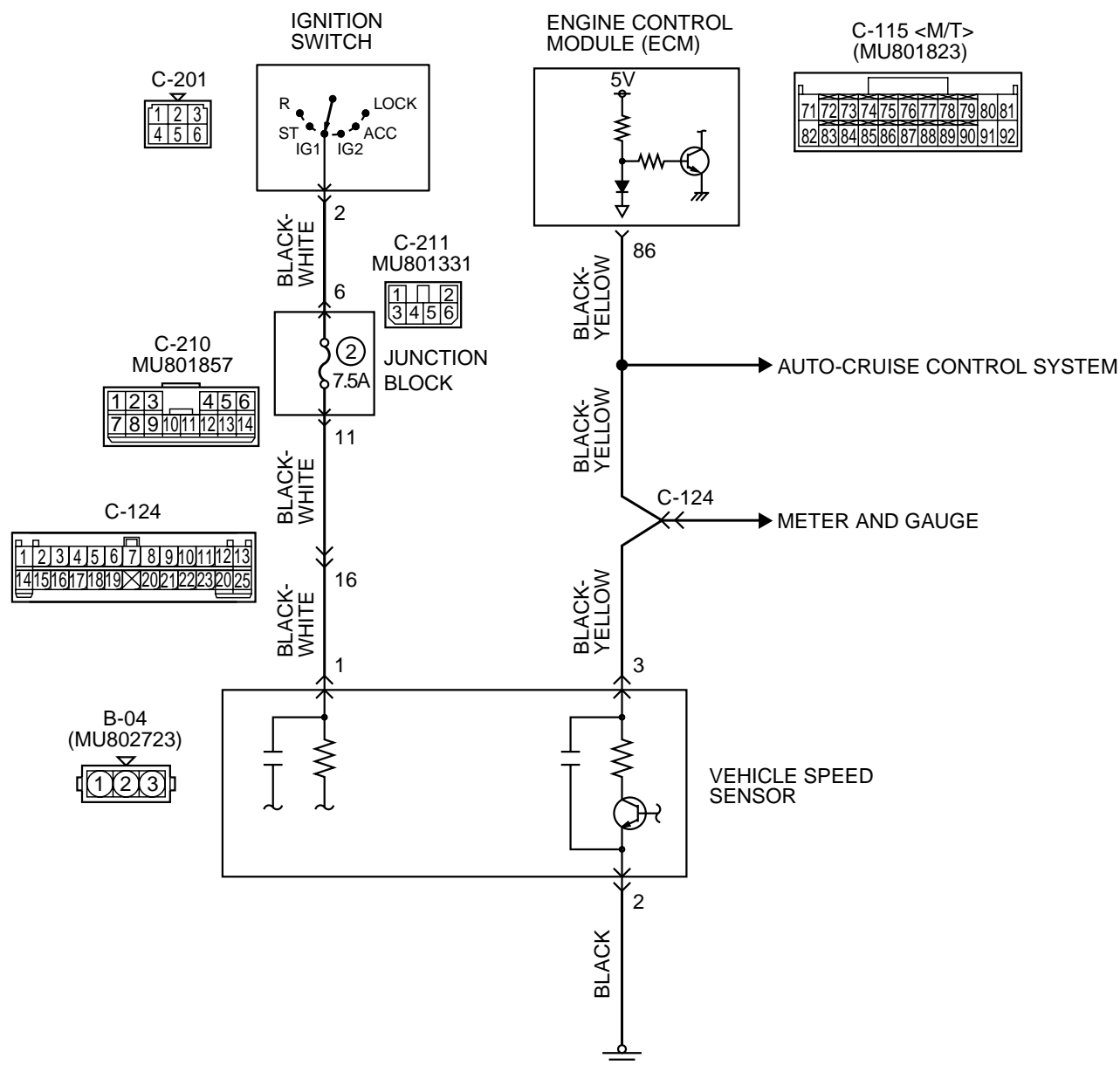
**Q: Is DTC P0461 set?**

**YES :** Replace the ECM or PCM. Then go to Step 6.

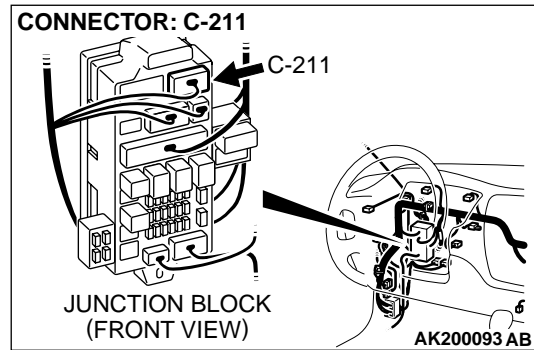
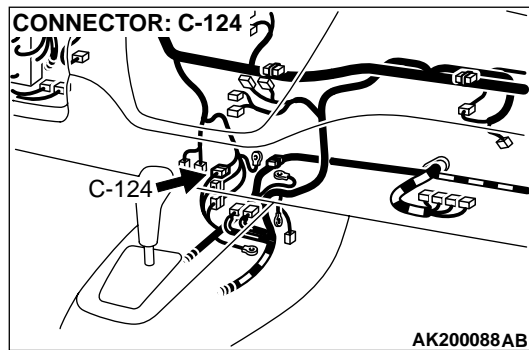
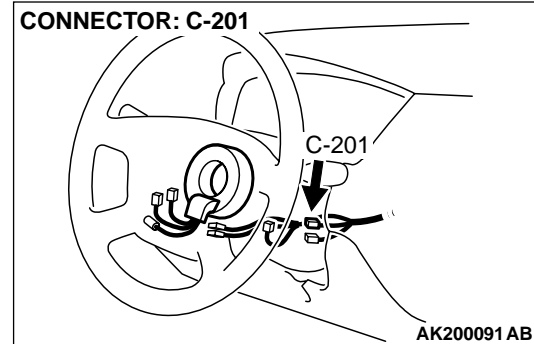
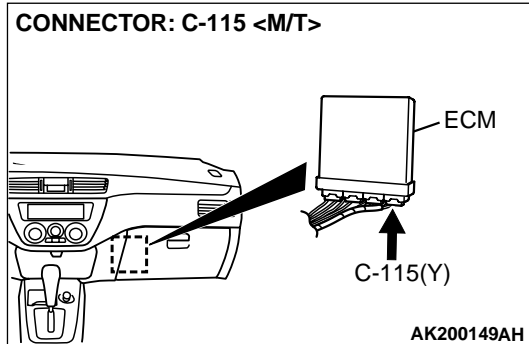
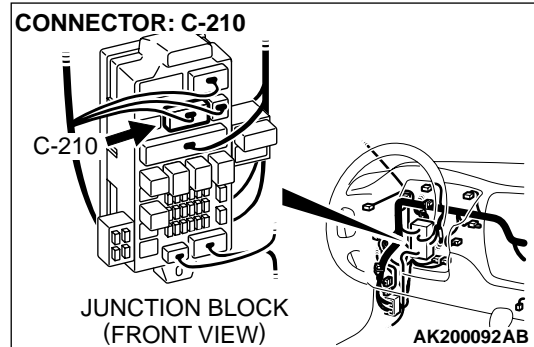
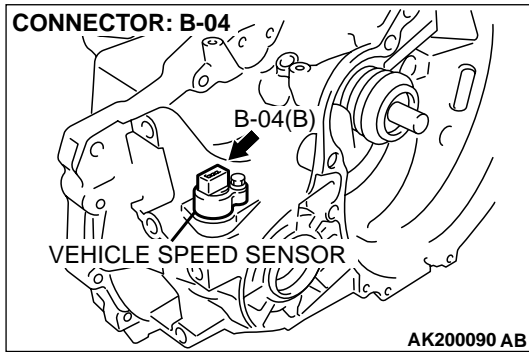
**NO :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**STEP 6. Perform the OBD-II drive cycle.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0461 set?****YES :** Repeat the troubleshooting.**NO :** The procedure is complete.**DTC P0500: Vehicle Speed Sensor <M/T>****Vehicle Speed Sensor Circuit**

AK200385



### CIRCUIT OPERATION

- A 5-volt voltage is applied to the vehicle speed sensor output terminal (terminal No. 3) from the ECM (terminal No. 86). The vehicle speed sensor generates a pulse signal when the output terminal is opened and grounded.

### TECHNICAL DESCRIPTION

- The vehicle speed sensor converts the vehicle speed into pulse signals and inputs them to the ECM.
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
- The ECM checks whether the pulse signal is output.

### DTC SET CONDITIONS

#### Check Conditions

- Two seconds or more have passed the starting sequence was completed.
- Engine speed is at between 2,000 and 4,000 r/min.
- Volumetric efficiency is at between 45 and 100 percent.

#### Judgement Criteria

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

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

- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or loose connector.
- ECM failed.

## DIAGNOSIS

### Required Special Tool:

- MB991502: Scan Tool (MUT-II)

---

### STEP 1. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.

#### CAUTION

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
  - Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

### Q: Is the sensor operating properly?

**YES** : It can be assumed that this malfunction is intermittent.  
Refer to GROUP 00, How to Use Troubleshooting/  
Inspection Service Points [P.00-6](#).

**NO** : Go to Step 2.

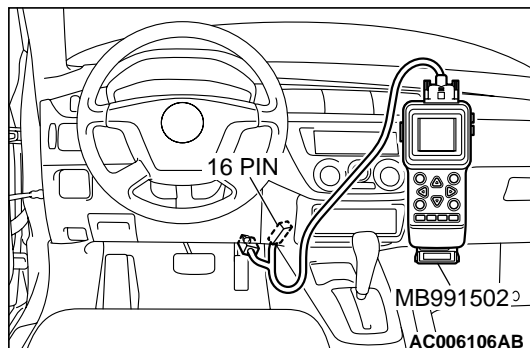
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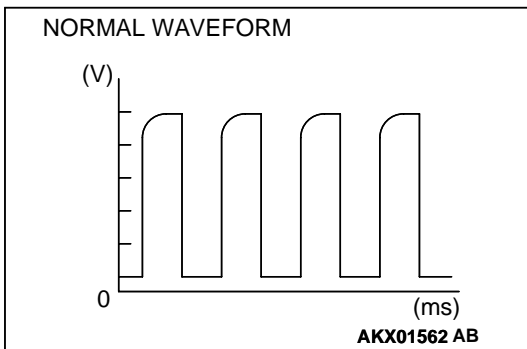
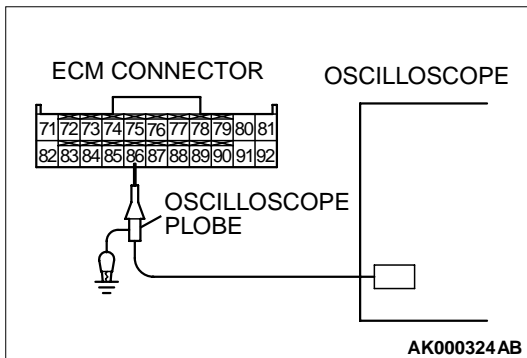
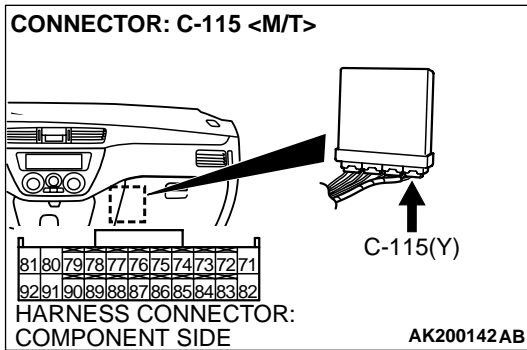
### STEP 2. Check speed meter.

### Q: Is the speed meter functioning?

**YES** : Go to Step 3.

**NO** : Go to Step 8.



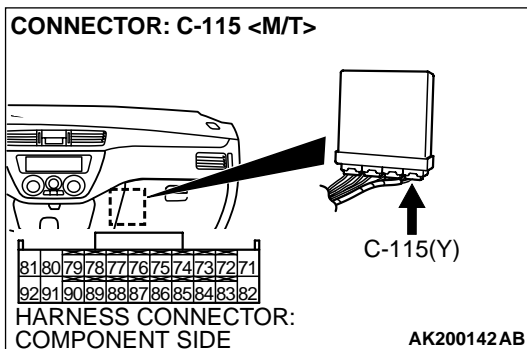


**STEP 3. Using the oscilloscope, check the sensor output voltage at ECM connector C-115.**

- (1) Do not disconnect the ECM connector C-115.
- (2) Disconnect the combination meter connector, auto-cruise control-ECU connector and A/C-ECU connector.
- (3) Connect the oscilloscope probe to ECM terminal No. 86 by backprobing.
- (4) Start the engine.
- (5) Check the waveform.
  - The waveform should show a pattern similar to the illustration while the vehicle is being moved.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the waveform normal?**

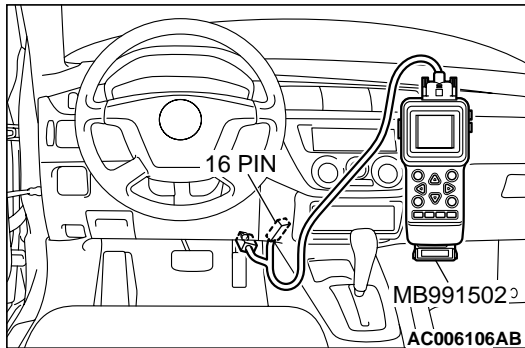
- YES :** Go to Step 4.  
**NO :** Go to Step 6.



**STEP 4. Check connector C-115 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 go to Step 17.



**STEP 5. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.**

**⚠ CAUTION**

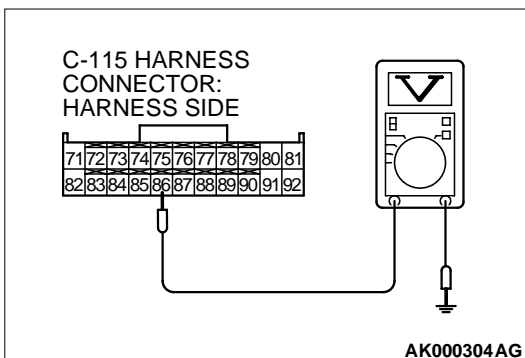
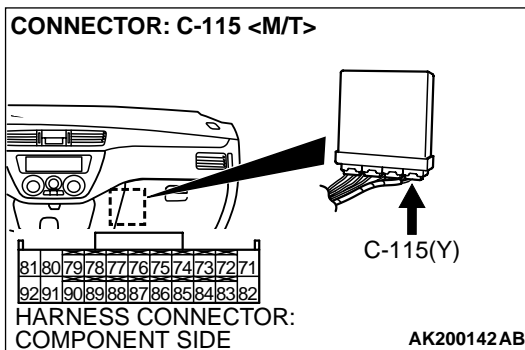
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
  - Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Replace the ECM. Then go to Step 17.



**STEP 6. Measure the sensor supply voltage at ECM connector C-115 by backprobing.**

- (1) Do not disconnect the ECM connector C-115.
- (2) Disconnect the vehicle speed sensor connector B-04.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 86 and ground by backprobing.
  - Voltage should measure between 4.8 and 5.2 volts.

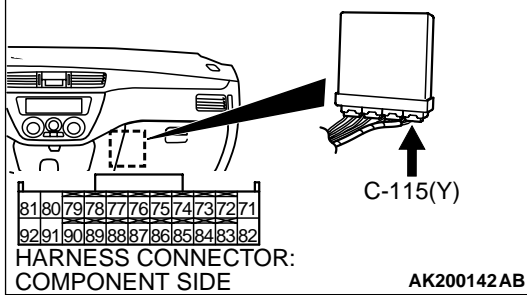
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 7.

**NO :** Replace the ECM. Then go to Step 17.



**CONNECTOR: C-115 <M/T>****STEP 7. Check connector C-115 at ECM for damage.****Q: Is the connector in good condition?**

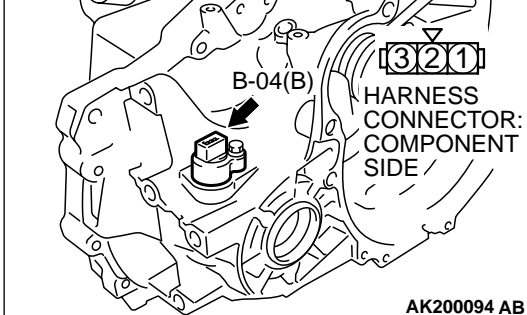
**YES :** Check connector C-124 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between vehicle speed sensor connector B-04 (terminal No. 3) and ECM connector C-115 (terminal No. 86) because of open circuit. Then go to Step 17.

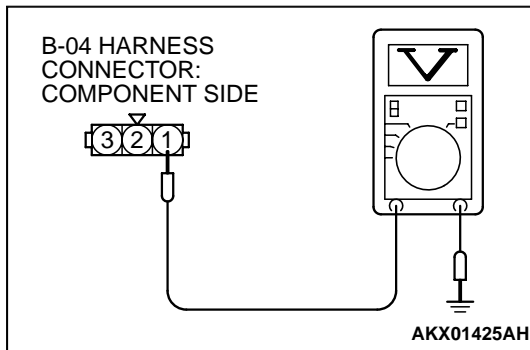
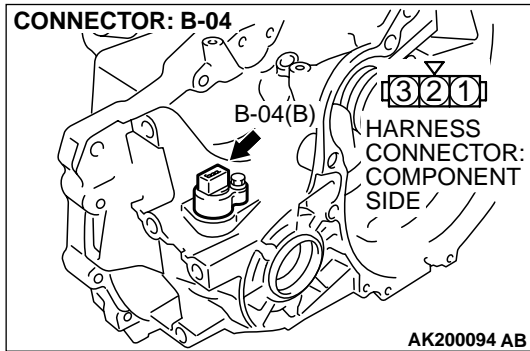
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 17.

**STEP 8. Check connector B-04 at vehicle speed sensor for damage.****Q: Is the connector in good condition?**

**YES :** Go to Step 9.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 17.

**CONNECTOR: B-04**



**STEP 9. Measure the power supply voltage at vehicle speed sensor harness side connector B-04.**

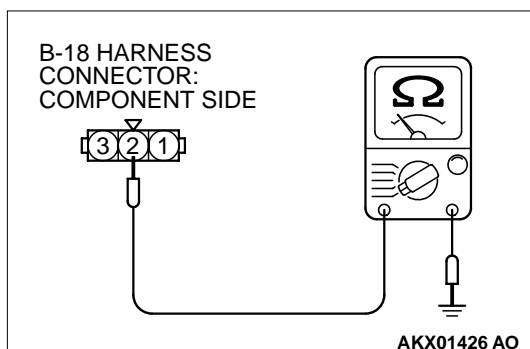
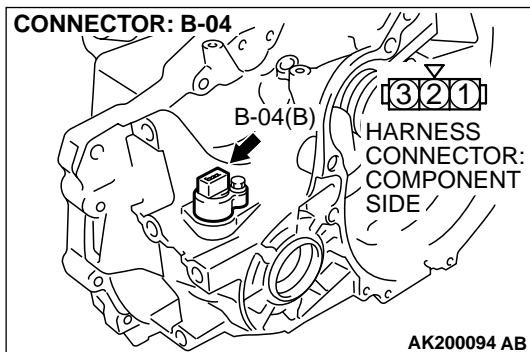
- (1) Disconnect connector B-04 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should measure 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 10.

**NO :** Check connectors C-124, C-210 and C-211 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-201 (terminal No. 2) and vehicle speed sensor connector B-04 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 17.



**STEP 10. Check for continuity at vehicle speed sensor harness side connector B-04.**

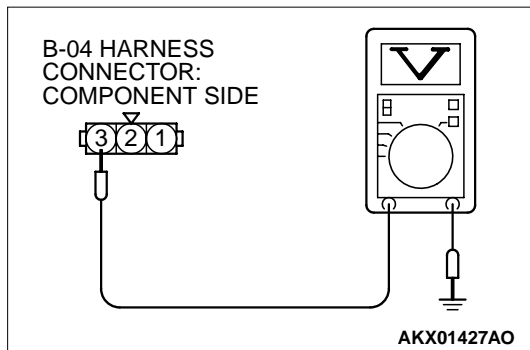
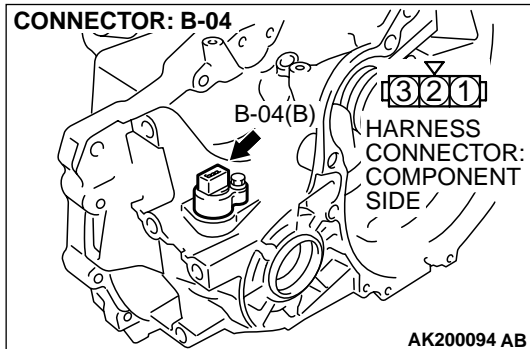
- (1) Disconnect connector B-04 and measure at the harness side.

- (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 11.

**NO :** Repair harness wire between vehicle speed sensor connector B-04 (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 17.



**STEP 11. Measure the sensor supply voltage at vehicle speed sensor harness side connector B-04.**

- (1) Disconnect the vehicle speed sensor connector B-04 and measure at the harness side.
- (2) Disconnect the combination meter connector, auto-cruise control-ECU connector and A/C-ECU connector.
- (3) Turn the ignition switch to the "ON" position.

- (4) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.8 and 5.2 volts.
- (5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 12.

**NO :** Check connector C-124 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 vehicle speed sensor connector B-04 (terminal No. 3) and ECM connector C-115 (terminal No. 86) because of short circuit to ground or harness damage. Then go to Step 17.

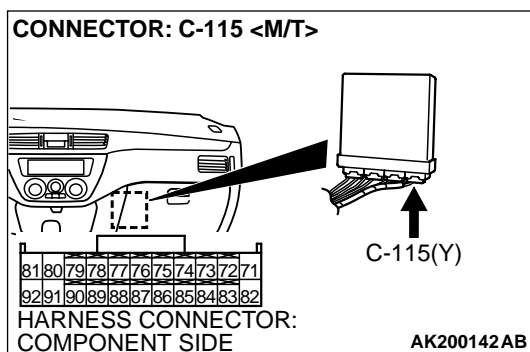
**STEP 12. Check the vehicle speed sensor.**

Refer to GROUP 54A, Combination Metre – Inspection – Vehicle Speed Sensor Check [P.54A-43](#).

**Q: Is the vehicle speed sensor normal?**

**YES :** Go to Step 13.

**NO :** Replace the vehicle speed sensor. Then go to Step 17.

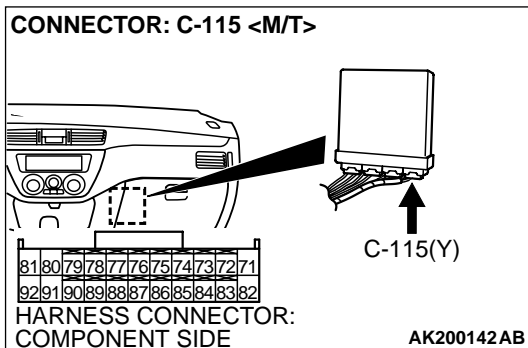
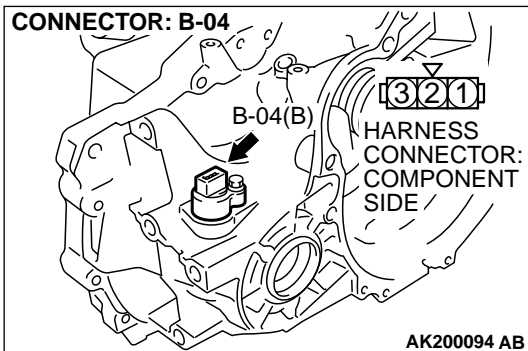
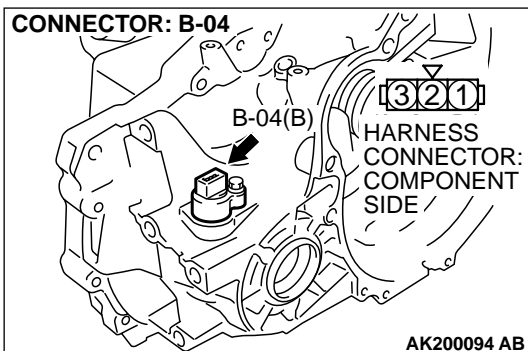
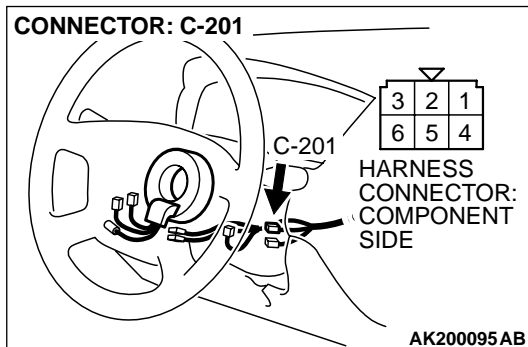


**STEP 13. Check connector C-115 at ECM for damage.**

**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 go to Step 17.



**STEP 14. Check for harness damage between ignition switch connector C-201 (terminal No. 2) and vehicle speed sensor connector B-04 (terminal No. 1).**

**NOTE:** Check harness after checking intermediate connectors C-124, C-210 and C-211. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 17.

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

**YES :** Go to Step 15.

**NO :** Repair it. Then go to Step 17.

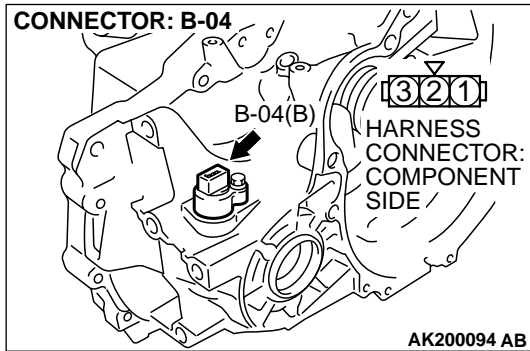
**STEP 15. Check for harness damage between vehicle speed sensor connector B-04 (terminal No. 3) and ECM connector C-115 (terminal No. 86).**

**NOTE:** Check harness after checking intermediate connector C-124. If intermediate connector is damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 17.

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

**YES :** Go to Step 16.

**NO :** Repair it. Then go to Step 17.

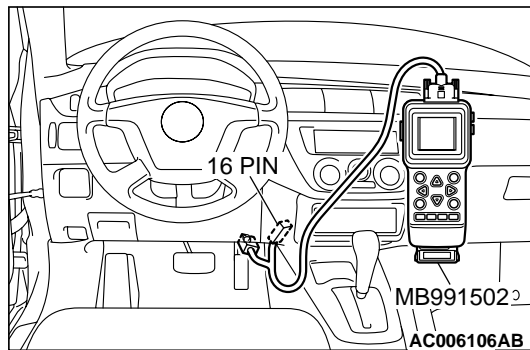


**STEP 16. Check for harness damage between vehicle speed sensor connector B-04 (terminal No. 2) and ground.**

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

**YES :** Check for harness wire between vehicle speed sensor connector B-04 (terminal No. 3) and other system because of short circuit to ground. Then go to Step 17.

**NO :** Repair it. Then go to Step 17.



**STEP 17. Using scan tool MB991502, check data list item 24: Vehicle Speed Sensor.**

**⚠ CAUTION**

**To prevent damage to scan tool MB991502, always turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.**

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991502 to the data reading mode for item 24, Vehicle Speed Sensor.
  - Check that the speedometer and MUT-II display speed match when traveling at a vehicle speed of 40 km/h (25 mph).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

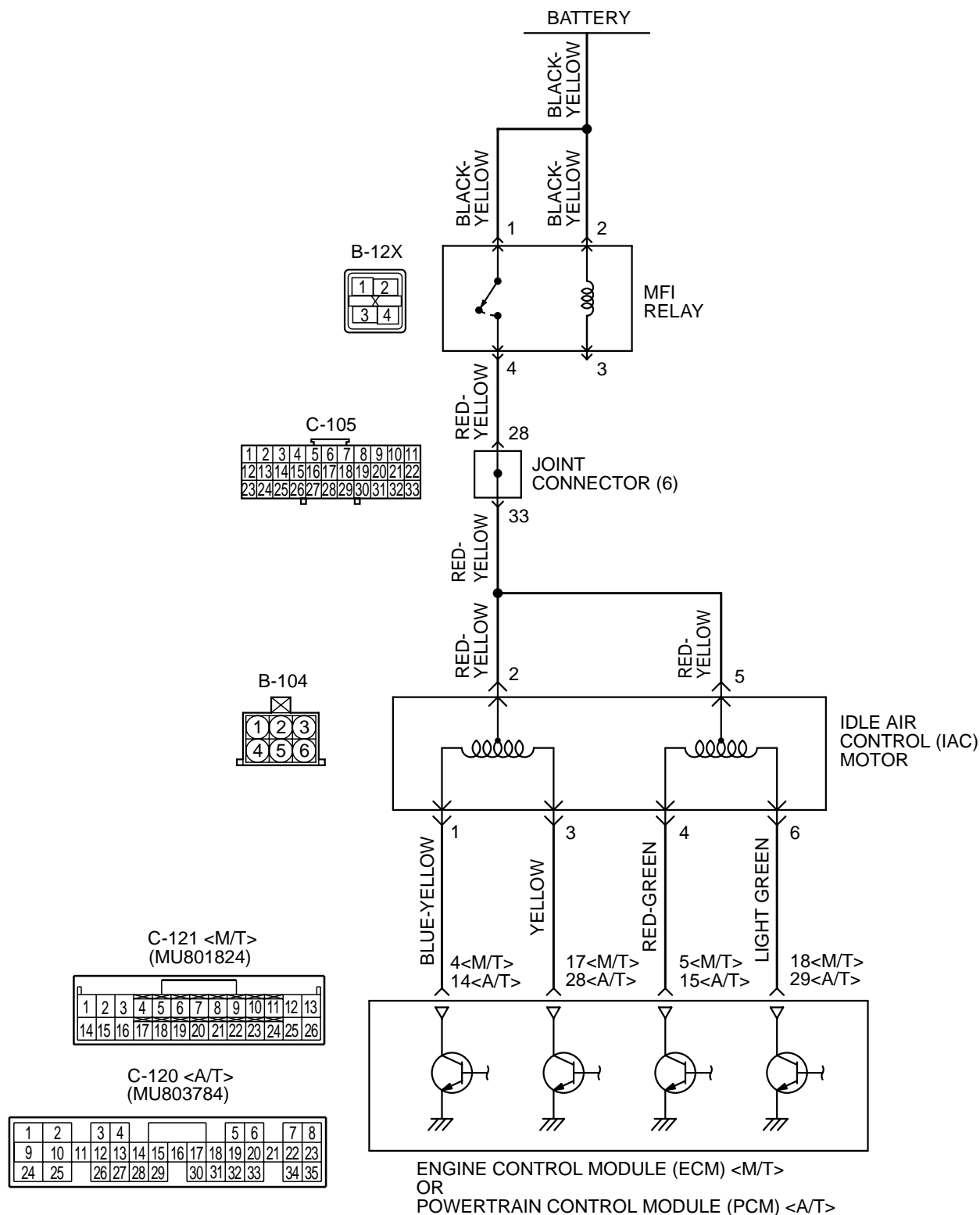
**Q: Is the sensor operating properly?**

**YES :** The procedure is complete.

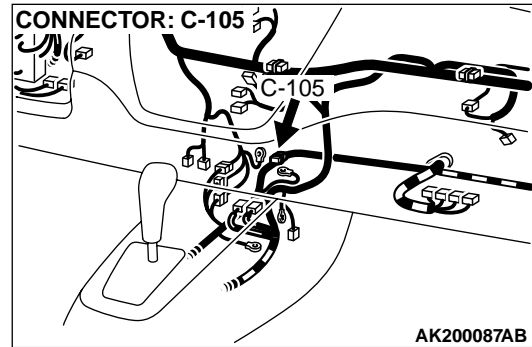
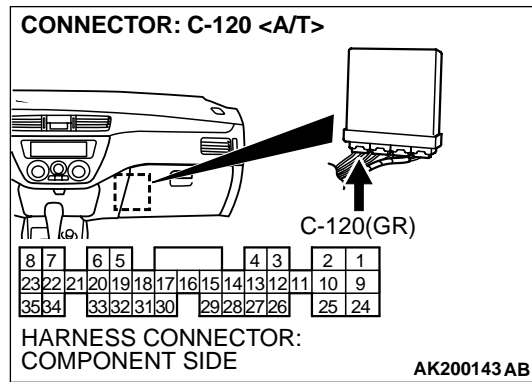
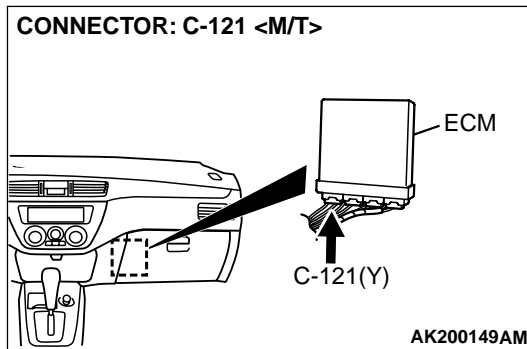
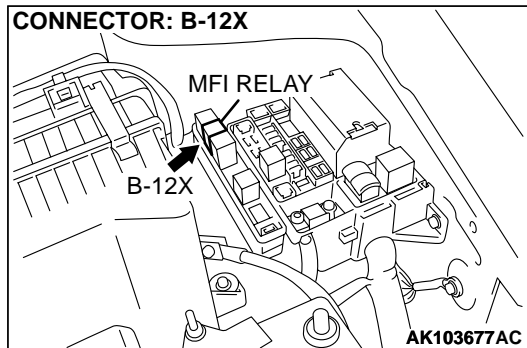
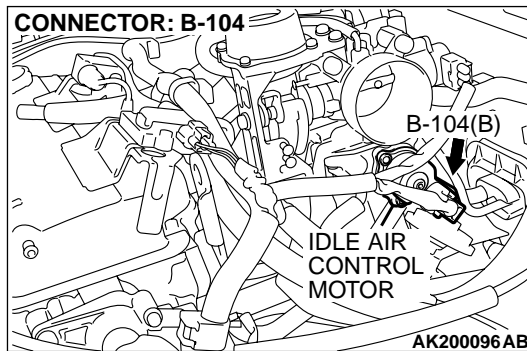
**NO :** Repeat the troubleshooting.

## DTC P0506: Idle Control System RPM Lower Than Expected

## Idle Air Control (IAC) Motor Circuit



AK100034



## CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal No. 4).
- The ECM (terminals No. 4, No. 5, No. 17, No. 18) <M/T> or PCM (terminals No. 14, No. 15, No. 28, No. 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals No. 1, No. 3, No. 4, No. 6).

## TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.

- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

## DTC SET CONDITIONS

### Check Conditions

- Under the closed loop idle speed control.
- Engine coolant temperature is more than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: "OFF".
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than -10°C (14°F).
- 60 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is more than 100 steps.

**Judgment Criteria**

- The actual idle speed is more than 100 r/min lower than the target idle speed for 12 seconds.

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

- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MB991709: Test Harness Set

**STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Set scan tool MB991502, read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the diagnostic trouble code other than P0506 output?**

**YES :** Refer to GROUP 13A, Diagnostic Trouble Code Chart [P.13Ab-19](#).

**NO :** Go to Step 2.

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

**Q: Is the throttle valve area dirty?**

**YES :** Perform cleaning. Refer to GROUP 13A, On-vehicle Service – Throttle body (throttle valve area) cleaning [P.13Aa-11](#). Then go to Step 14.

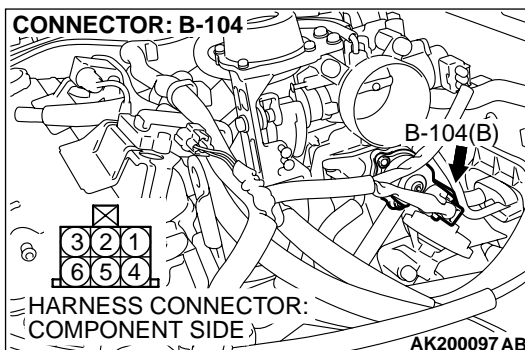
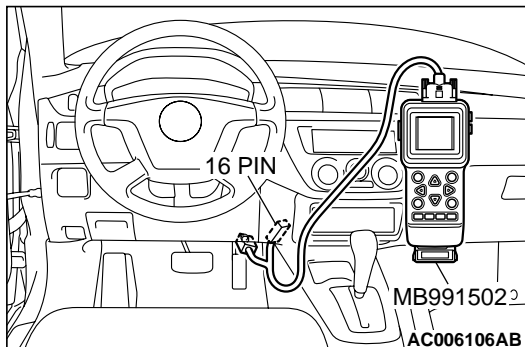
**NO :** Go to Step 3.

**STEP 3. Check connector B-104 at idle air control motor for damage.**

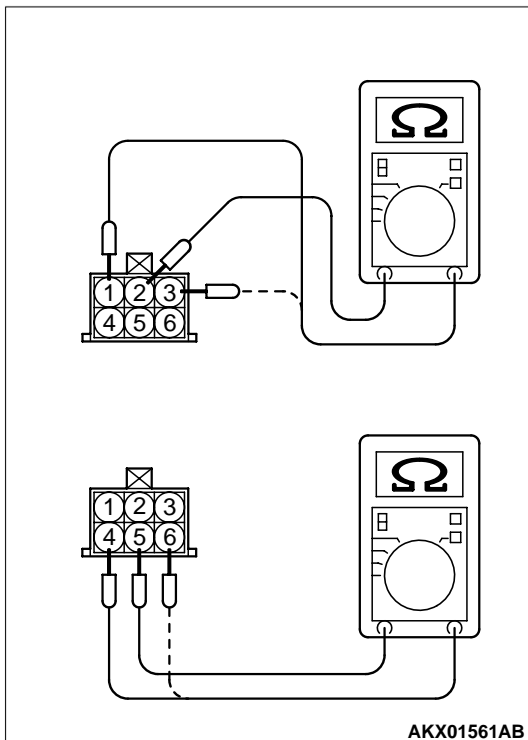
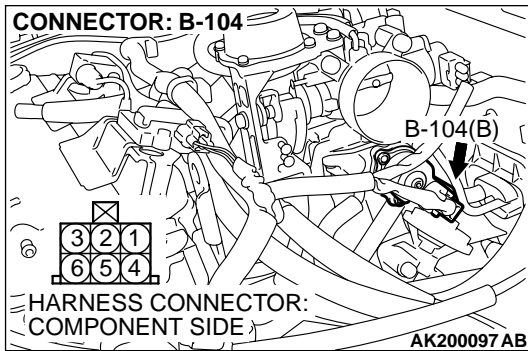
**Q: Is the connector in good condition?**

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 4. Measure the idle air control motor coil resistance.**

(1) Disconnect the idle air control motor connector B-104.

(2) Measure the resistance between idle air control motor connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

**Standard value: 28 – 33 ohms [at 20°C (68°F)]**

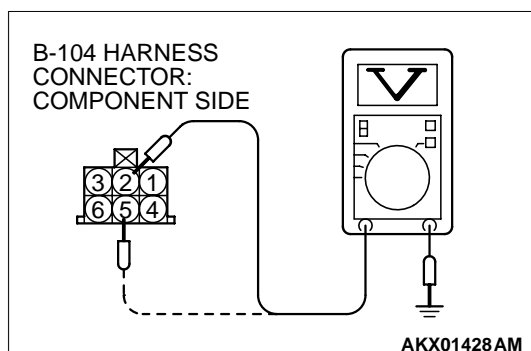
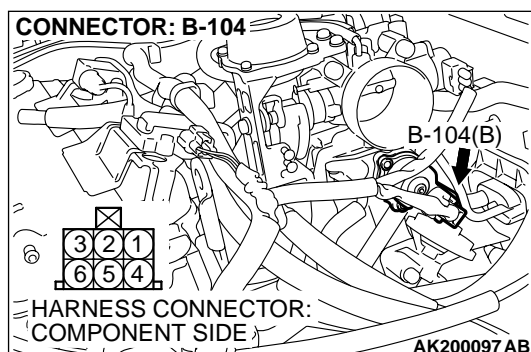
(3) Measure the resistance between idle air control motor connector terminal No. 5 and either terminal No. 4 or terminal No. 6.

**Standard value: 28 – 33 ohms [at 20°C (68°F)]**

**Q: Is the measured resistance between 28 and 33 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 5.

**NO :** Replace the idle air control motor. Then go to Step 14.



**STEP 5. Measure the power supply voltage at idle air control motor harness side connector B-104.**

- (1) Disconnect connector B-104 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminals No. 2, No. 5 and ground.

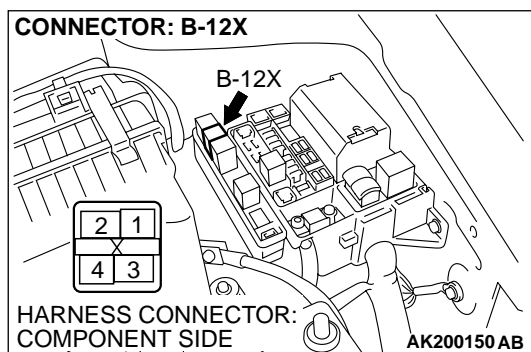
- Voltage should measure battery positive voltage.

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

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

**YES :** Go to Step 7.

**NO :** Go to Step 6.



**STEP 6. Check connector B-12X at MFI relay for damage.**

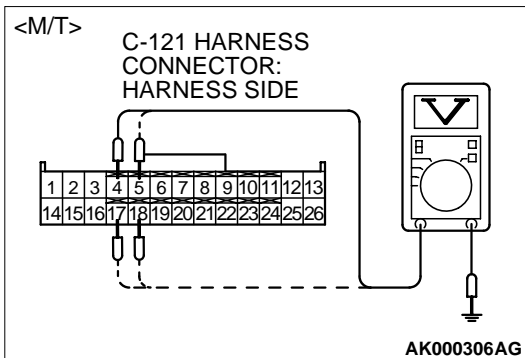
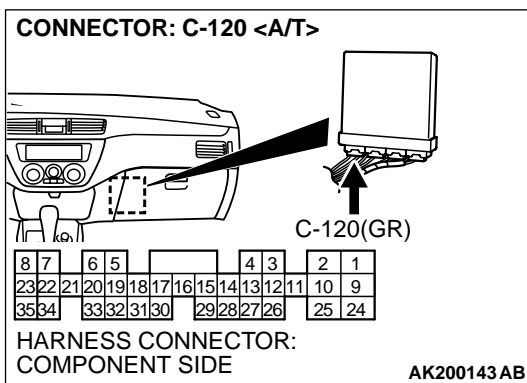
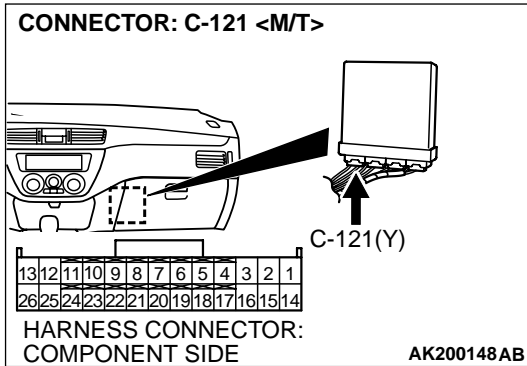
**Q: Is the connector in good condition?**

**YES :** Check connector C-105 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between MFI relay connector B-12X (terminal No. 4) and idle air control motor connector B-104 (terminals No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 14.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**STEP 7. Measure the power supply voltage at ECM connector C-121 <M/T> or PCM connector C-120 <A/T> by backprobing.**

(1) Do not disconnect connector C-121 <M/T> or C-120 <A/T>.



(2) Measure the voltage between terminals (No. 4, No. 5, No. 17, No. 18) <M/T> or (No. 14, No. 15, No. 28, No. 29) <A/T> and ground by backprobing.

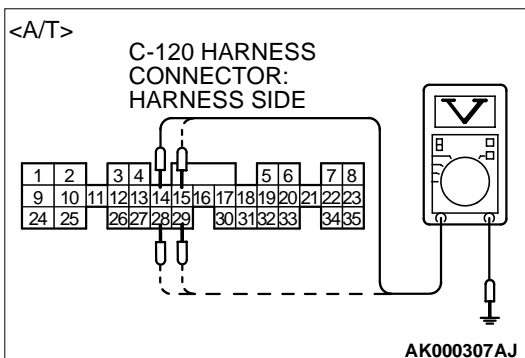
- The voltage is 1 volt or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

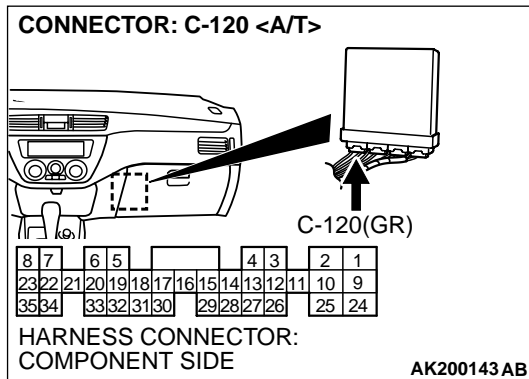
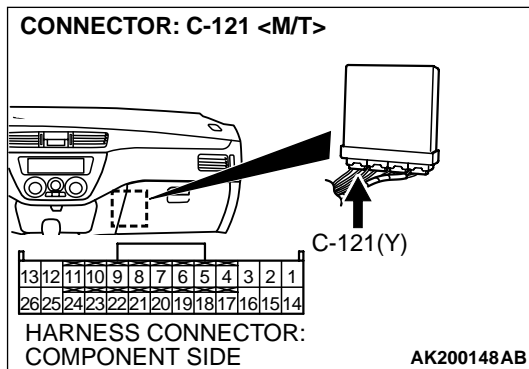
(3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 10.

**NO :** Go to Step 8.



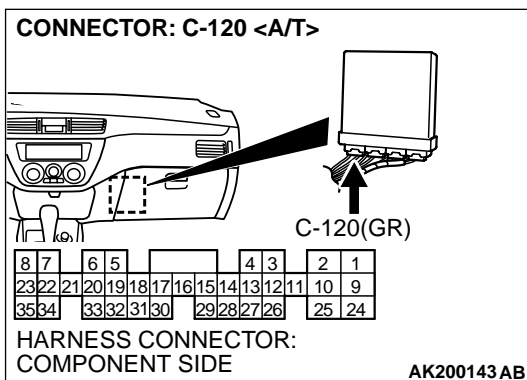
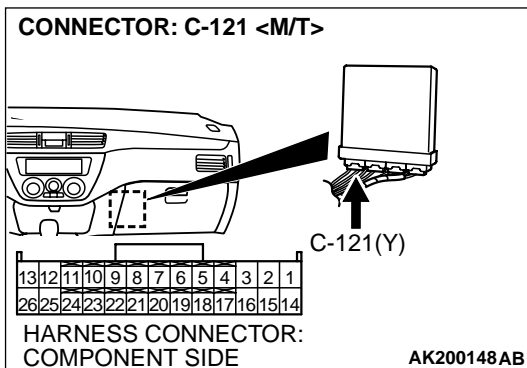
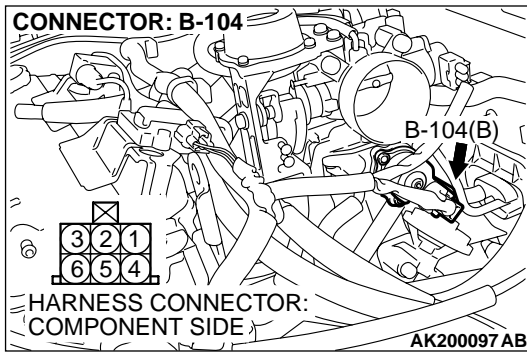


**STEP 8. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 9.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



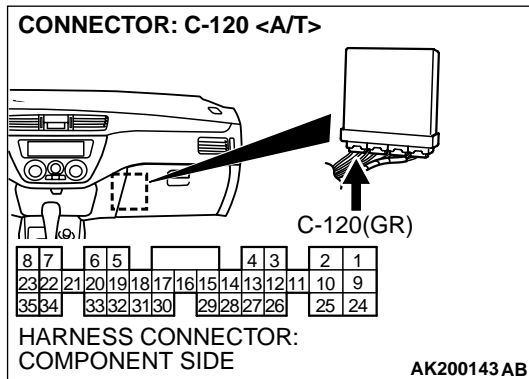
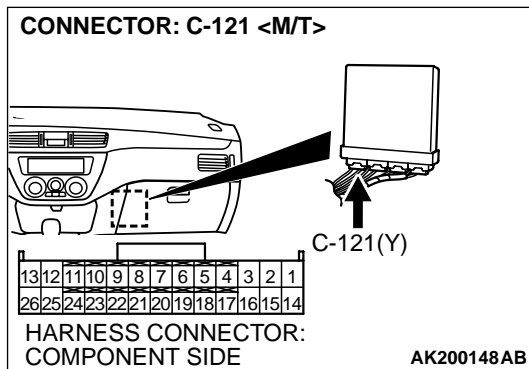
**STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-104 and ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.**

- Idle air control motor connector B-104 (terminal No. 1) and ECM connector C-121 (terminal No. 4) <M/T> or PCM connector C-120 (terminal No. 14) <A/T>.
- Idle air control motor connector B-104 (terminal No. 3) and ECM connector C-121 (terminal No. 17) <M/T> or PCM connector C-120 (terminal No. 28) <A/T>.
- Idle air control motor connector B-104 (terminal No. 4) and ECM connector C-121 (terminal No. 5) <M/T> or PCM connector C-120 (terminal No. 15) <A/T>.
- Idle air control motor connector B-104 (terminal No. 6) and ECM connector C-121 (terminal No. 18) <M/T> or PCM connector C-120 (terminal No. 29) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

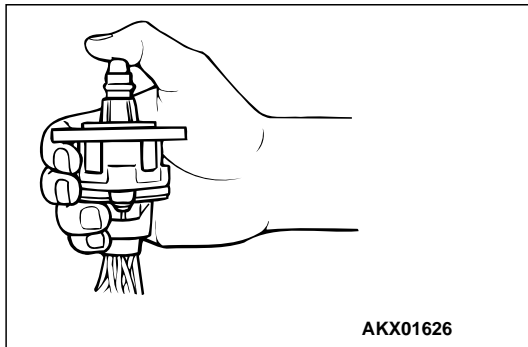
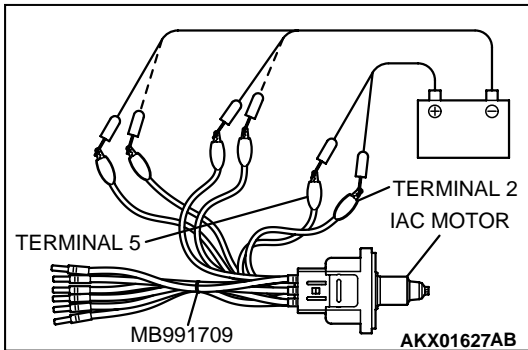
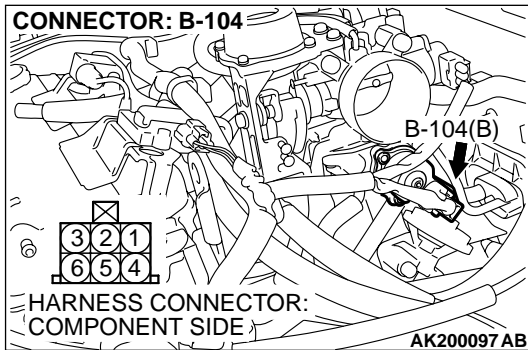


**STEP 10. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 11. Check the idle air control motor operation using special tool MB991709.**

(1) Remove the idle air control motor.

(2) Connect special tool MB991709 to the idle air control motor. (All terminals should be connected.)

(3) Use the jumper wires to connect terminal No. 2 of the idle air control motor connector to the positive battery terminal.

(4) Check to ensure that the motor operates when the terminals No. 1 and No. 3 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.

- Vibration should be present at each application of voltage to test clip combination.

(5) Then, use jumper wires to connect the terminal No. 5 of the idle air control motor connector to the positive battery terminal.

(6) Check to ensure that the motor operates when the terminals No. 4 and No. 6 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.

- Vibration should be present at each application of voltage to test clip combination.

(7) Install the idle air control motor. Refer to GROUP 13A, Throttle Body Assembly – Disassembly and Assembly [P.13Aa-30](#).

**Q: Is the idle air control motor operating properly?**

**YES :** Go to Step 12.

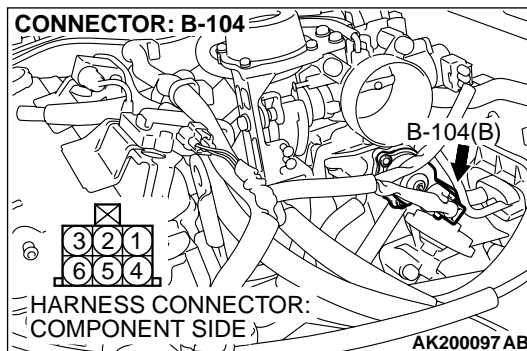
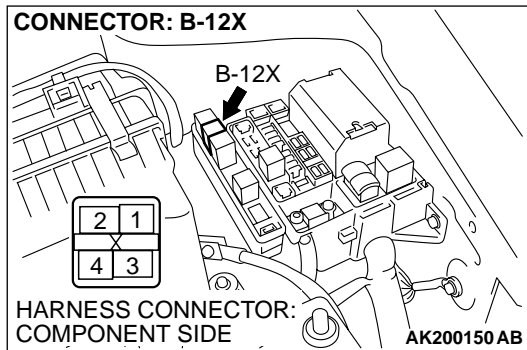
**NO :** Replace the idle air control motor. Then go to Step 14.

**STEP 12.** Check for harness damage between MFI relay connector B-12X (terminal No. 4) and idle air control motor connector B-104 (terminals No. 2, No. 5).

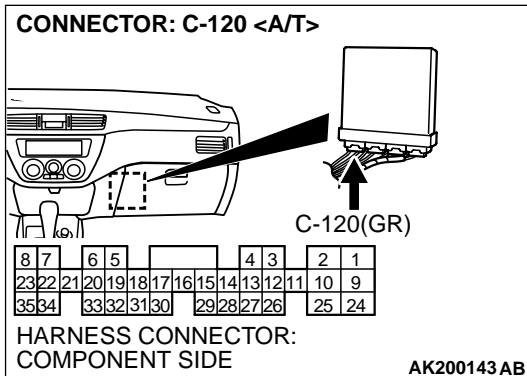
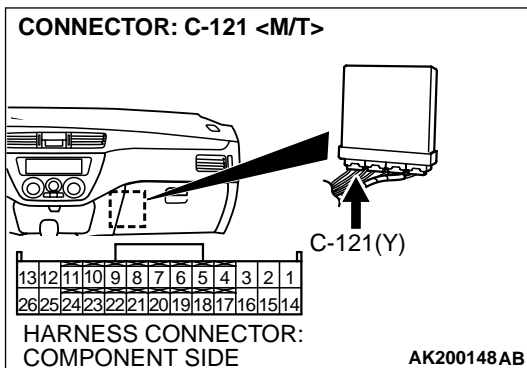
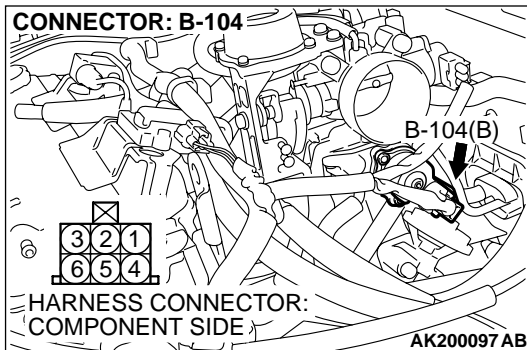
**Q:** Is the harness wire in good condition?

**YES :** Go to Step 13.

**NO :** Repair it. Then go to Step 14.







**STEP 13. Check for harness damage between idle air control motor connector B-104 and ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.**

- Idle air control motor connector B-104 (terminal No. 1) and ECM connector C-121 (terminal No. 4) <M/T> or PCM connector C-120 (terminal No. 14) <A/T>.
- Idle air control motor connector B-104 (terminal No. 3) and ECM connector C-121 (terminal No. 17) <M/T> or PCM connector C-120 (terminal No. 28) <A/T>.
- Idle air control motor connector B-104 (terminal No. 4) and ECM connector C-121 (terminal No. 5) <M/T> or PCM connector C-120 (terminal No. 15) <A/T>.
- Idle air control motor connector B-104 (terminal No. 6) and ECM connector C-121 (terminal No. 18) <M/T> or PCM connector C-120 (terminal No. 29) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

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

- Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- Check the diagnostic trouble code (DTC).

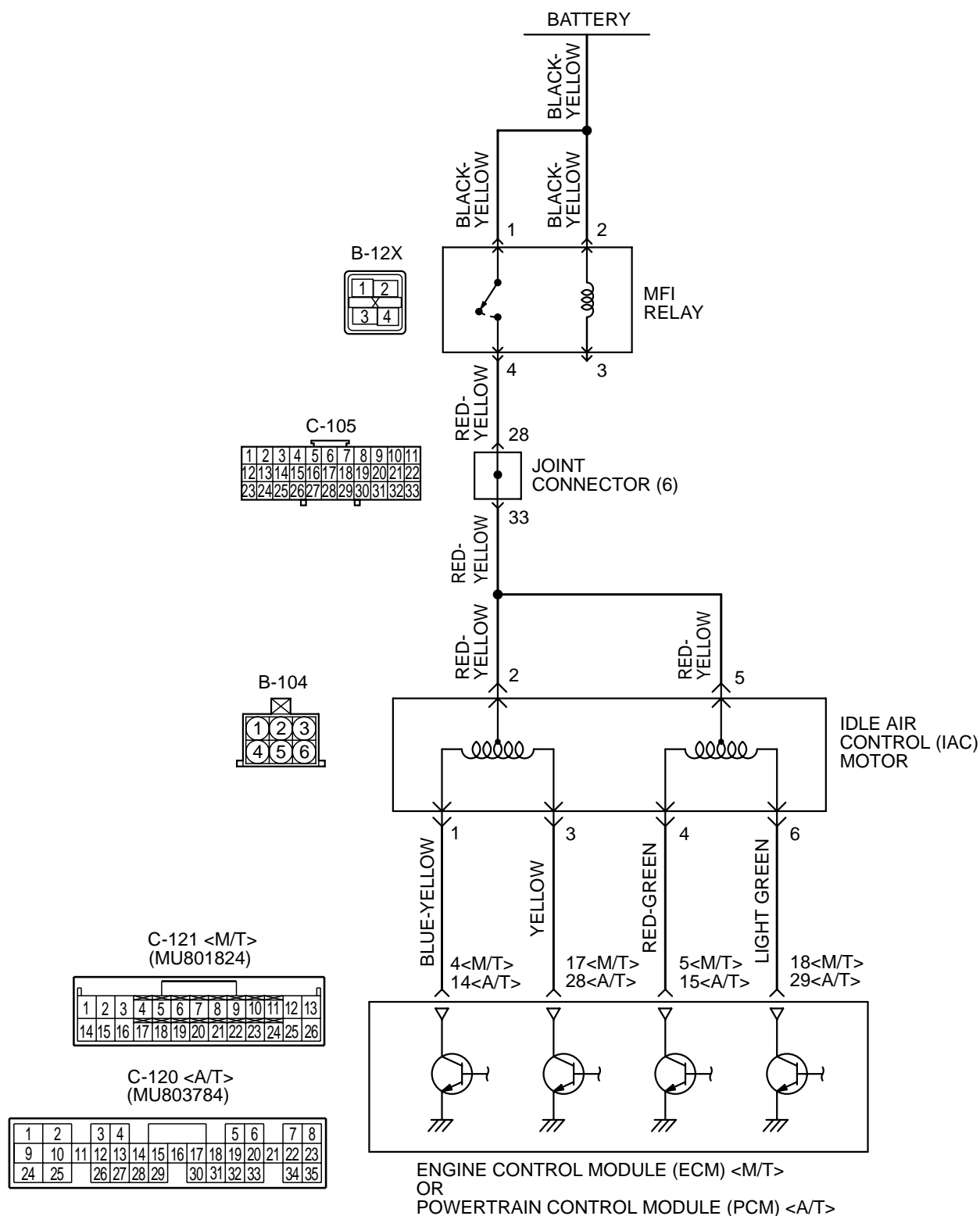
**Q: Is DTC P0506 set?**

**YES :** Repeat the troubleshooting.

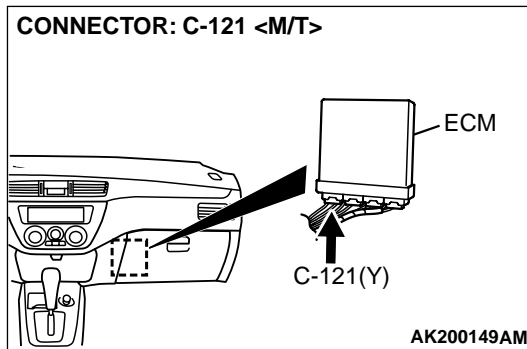
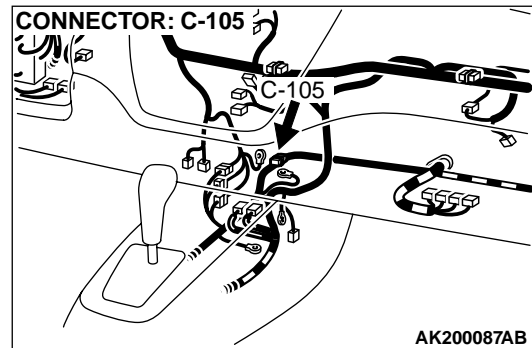
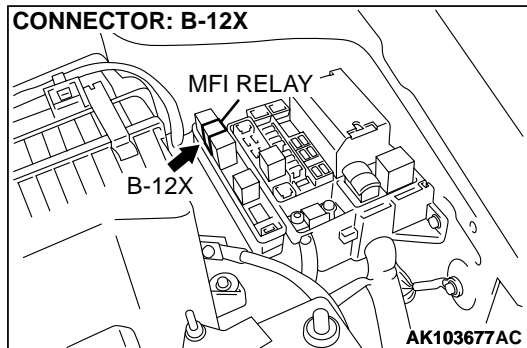
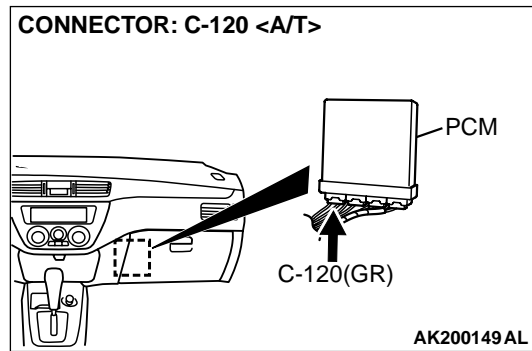
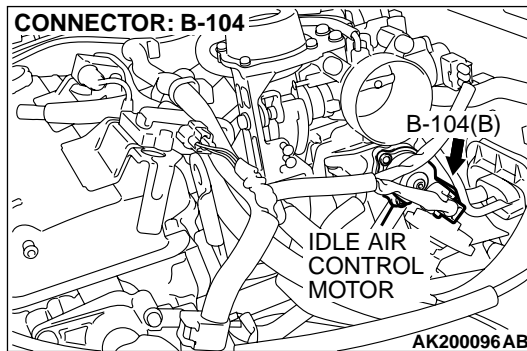
**NO :** The procedure is complete.

## DTC P0507: Idle Control System RPM Higher Than Expected

Idle Air Control (IAC) Motor Circuit



AK100034



### CIRCUIT OPERATION

- The idle air control motor power is supplied from the MFI relay (terminal No. 4).
- The ECM (terminals No. 4, No. 5, No. 17, No. 18) <M/T> or PCM (terminals No. 14, No. 15, No. 28, No. 29) <A/T> drives the stepper motor by sequentially turning "ON" the power transistors in the ECM <M/T> or PCM <A/T> and providing ground to the idle air control motor (terminals No. 1, No. 3, No. 4, No. 6).

### TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle body.
- If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed.

- The ECM <M/T> or PCM <A/T> checks the difference between the actual engine speed and the target engine speed.

### DTC SET CONDITIONS

#### Check Conditions

- Vehicle speed has reached 1.5 km/h (0.93 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 77°C (171°F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (11 psi).
- Intake air temperature is higher than -10°C (14°F).
- 60 seconds have elapsed from the start of the previous monitoring.
- Target idle air control motor position is 0 steps.

**Judgment Criteria**

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min\*) or more for 12 seconds.

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

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

- Idle air control motor failed.
- Open or shorted idle air control motor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

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

- MB991502: Scan Tool (MUT-II)
- MB991709: Test Harness Set

**STEP 1. Using scan tool MB991502, read the diagnostic trouble code (DTC).****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- Connect scan tool MB991502 to the data link connector.
- Turn the ignition switch to the "ON" position.
- Set scan tool MB991502, read the DTC.
- Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the diagnostic trouble code other than P0507 output?**

**YES** : Refer to GROUP 13A, Diagnostic Trouble Code Chart [P.13Ab-19](#).

**NO** : Go to Step 2.

**STEP 2. Check for intake system vacuum leaks.****Q: Are there any abnormalities?**

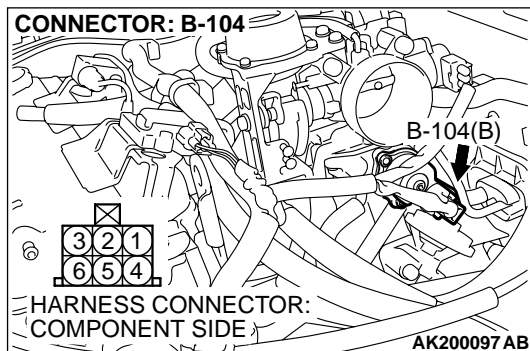
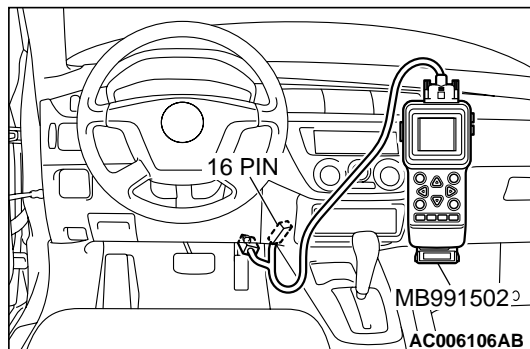
**YES** : Go to Step 3.

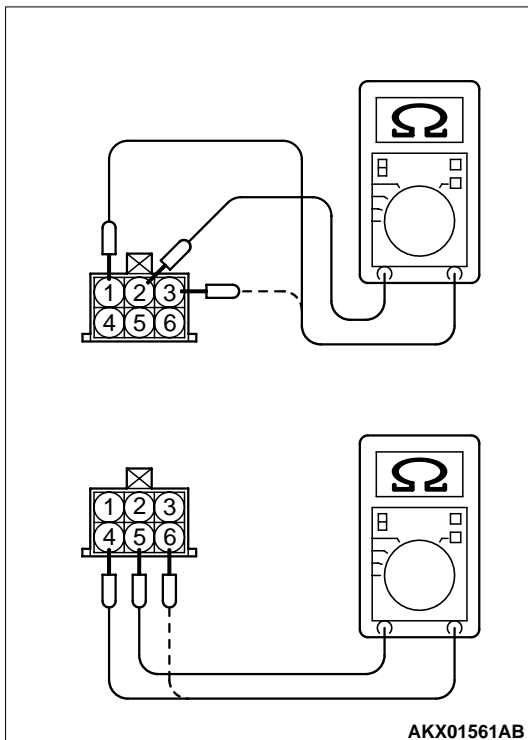
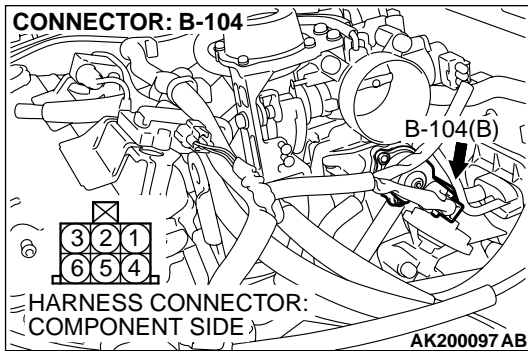
**NO** : Repair or replace it. Then go to Step 14.

**STEP 3. Check connector B-104 at idle air control motor for damage.****Q: Is the connector in good condition?**

**YES** : Go to Step 4.

**NO** : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 4. Measure the idle air control motor coil resistance.**

(1) Disconnect the idle air control motor connector B-104.

(2) Measure the resistance between idle air control motor connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

**Standard value: 28 – 33 ohms [at 20°C (68°F)]**

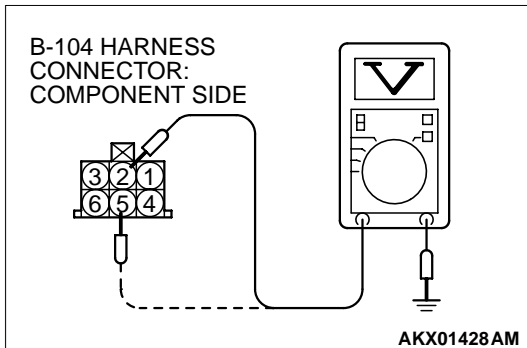
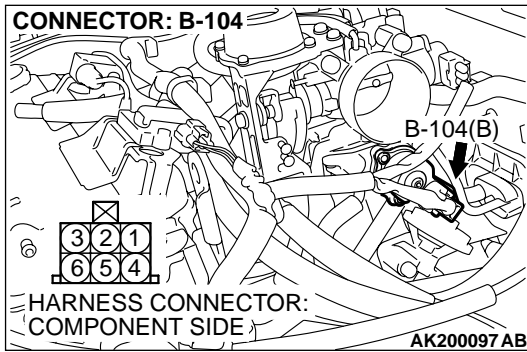
(3) Measure the resistance between idle air control motor connector terminal No. 5 and either terminal No. 4 or terminal No. 6.

**Standard value: 28 – 33 ohms [at 20°C (68°F)]**

**Q: Is the measured resistance between 28 and 33 ohms [at 20°C (68°F)]?**

**YES :** Go to Step 5.

**NO :** Replace the idle air control motor. Then go to Step 14.



**STEP 5. Measure the power supply voltage at idle air control motor harness side connector B-104.**

- (1) Disconnect connector B-104 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminals No. 2, No. 5 and ground.

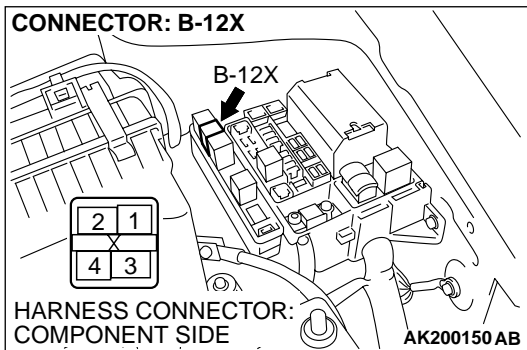
- Voltage should measure battery positive voltage.

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

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

**YES :** Go to Step 7.

**NO :** Go to Step 6.



**STEP 6. Check connector B-12X at MFI relay for damage.**

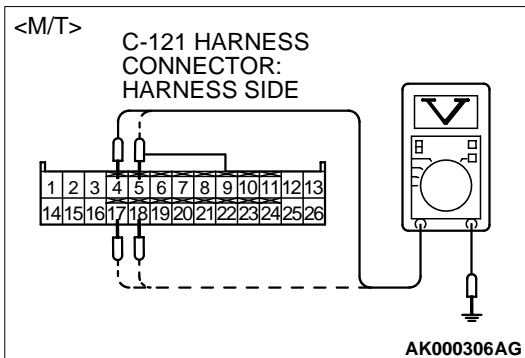
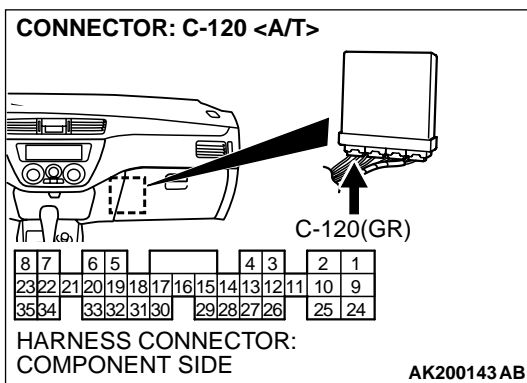
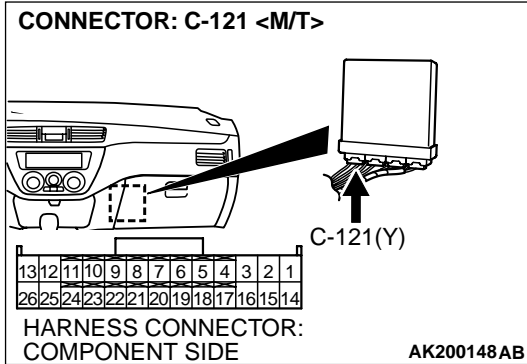
**Q: Is the connector in good condition?**

**YES :** Check connector C-105 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between MFI relay connector B-12X (terminal No. 4) and idle air control motor connector B-104 (terminals No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 14.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**STEP 7. Measure the power supply voltage at ECM connector C-121 <M/T> or PCM connector C-120 <A/T> by backprobing.**

(1) Do not disconnect connector C-121 <M/T> or C-120 <A/T>.



(2) Measure the voltage between terminals (No. 4, No. 5, No. 17, No. 18) <M/T> or (No. 14, No. 15, No. 28, No. 29) <A/T> and ground by backprobing.

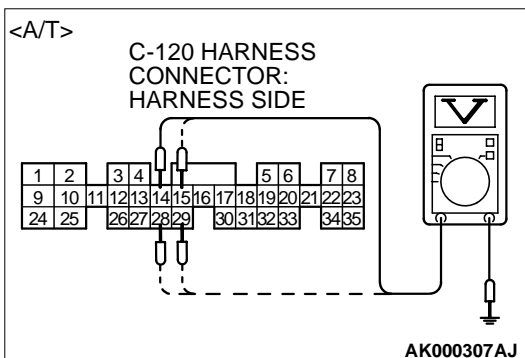
- The voltage is 1 V or lower for approximately 3 seconds, then changes to the battery positive voltage when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

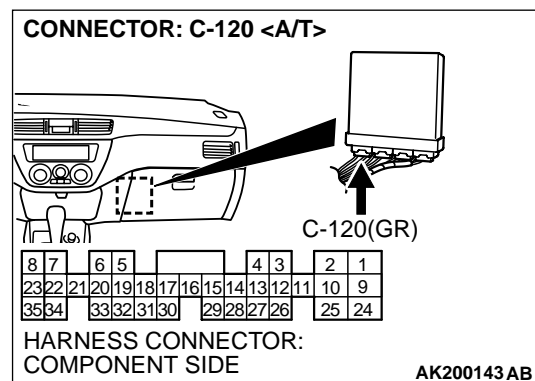
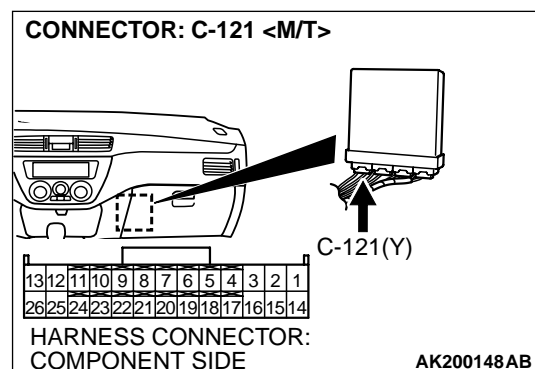
(3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 10.

**NO :** Go to Step 8.





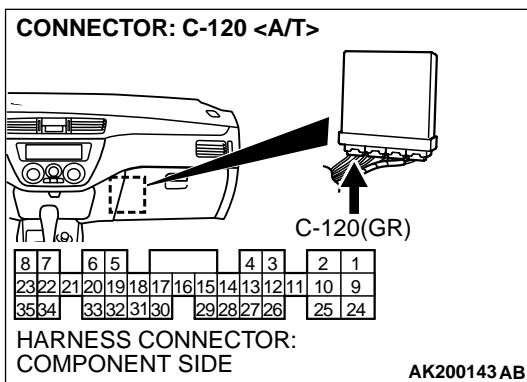
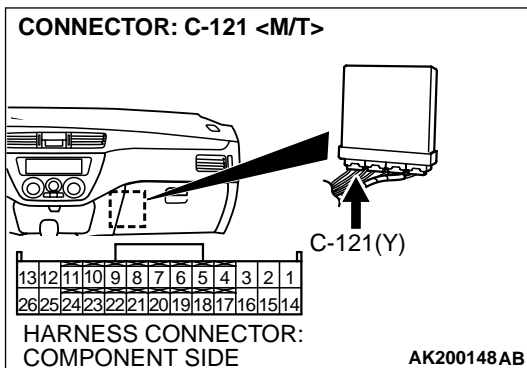
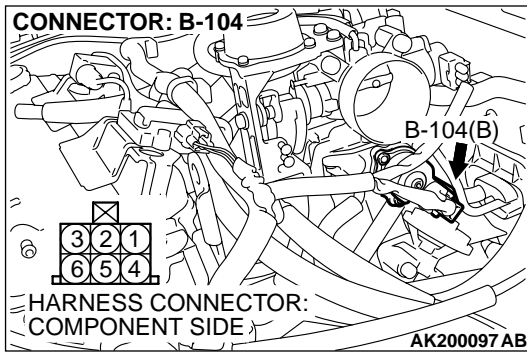
**STEP 8.** Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.

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

**YES :** Go to Step 9.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





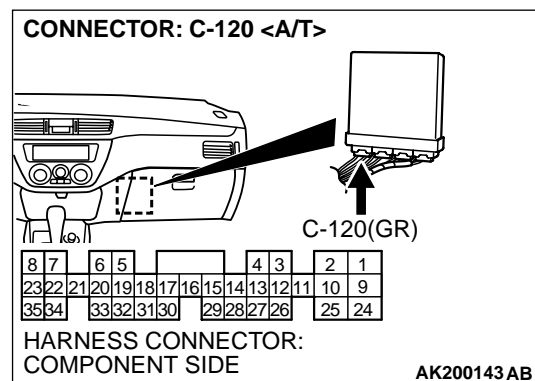
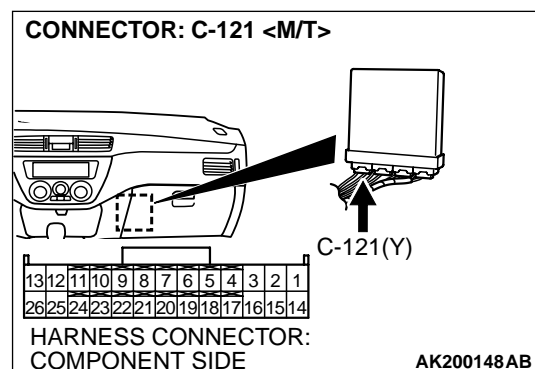
**STEP 9. Check for open circuit and short circuit to ground between idle air control motor connector B-104 and ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.**

- Idle air control motor connector B-104 (terminal No. 1) and ECM connector C-121 (terminal No. 4) <M/T> or PCM connector C-120 (terminal No. 14) <A/T>.
- Idle air control motor connector B-104 (terminal No. 3) and ECM connector C-121 (terminal No. 17) <M/T> or PCM connector C-120 (terminal No. 28) <A/T>.
- Idle air control motor connector B-104 (terminal No. 4) and ECM connector C-121 (terminal No. 5) <M/T> or PCM connector C-120 (terminal No. 15) <A/T>.
- Idle air control motor connector B-104 (terminal No. 6) and ECM connector C-121 (terminal No. 18) <M/T> or PCM connector C-120 (terminal No. 29) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

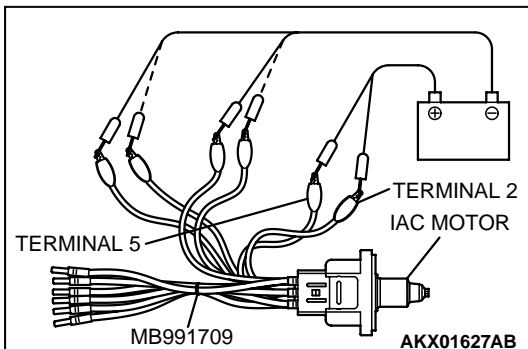
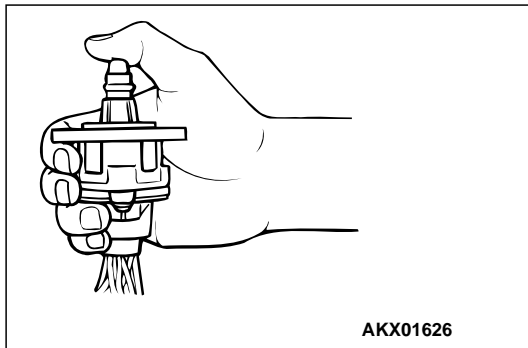
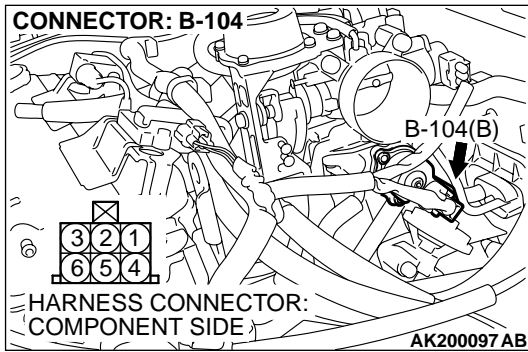


**STEP 10. Check connector C-121 at ECM <M/T> or connector C-120 at PCM <A/T> for damage.**

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

**YES :** Go to Step 11.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.



**STEP 11. Check the idle air control motor operation using special tool MB991709.**

(1) Remove the idle air control motor.

(2) Connect special tool MB991709 to the idle air control motor.  
(All terminals should be connected.)

(3) Use the jumper wires to connect terminal No. 2 of the idle air control motor connector to the positive battery terminal.

(4) Check to ensure that the motor operates when the terminals No. 1 and No. 3 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.

- Vibration should be present at each application of voltage to test clip combination.

(5) Then, use jumper wires to connect the terminal No. 5 of the idle air control motor connector to the positive battery terminal.

(6) Check to ensure that the motor operates when the terminals No. 4 and No. 6 of the idle air control motor connector are respectively connected to the negative battery terminal using a jumper wire.

- Vibration should be present at each application of voltage to test clip combination.

(7) Install the idle air control motor. Refer to GROUP 13A, Throttle Body Assembly – Disassembly and Assembly [P.13Aa-30](#).

**Q: Is the idle air control motor operating properly?**

**YES :** Go to Step 12.

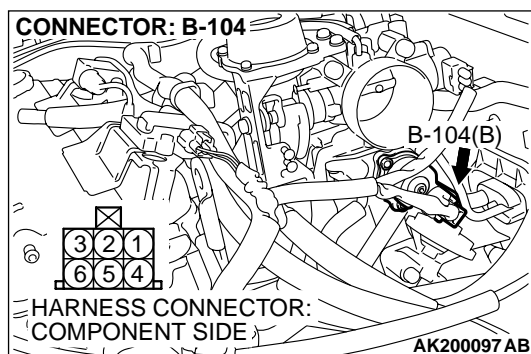
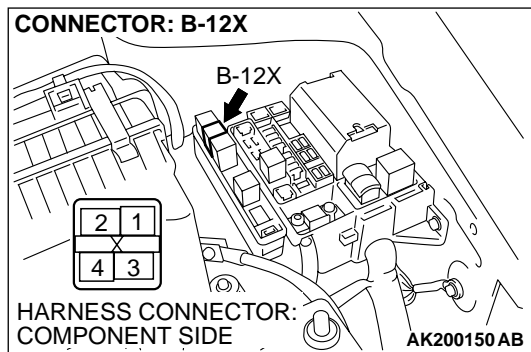
**NO :** Replace the idle air control motor. Then go to Step 14.

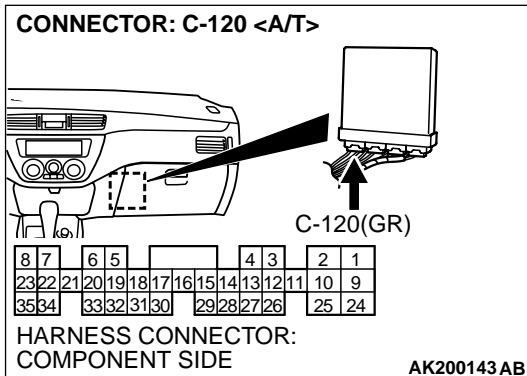
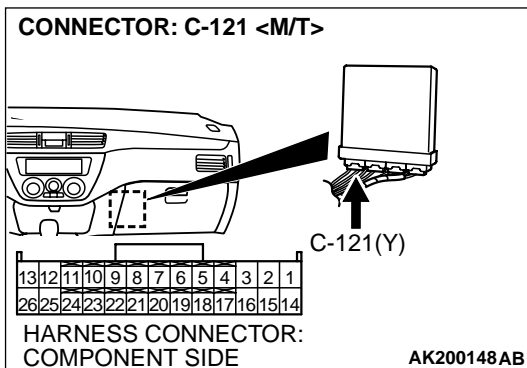
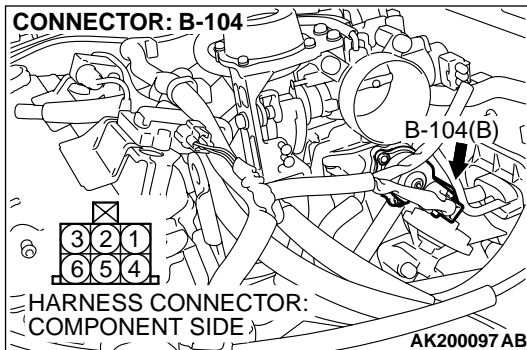
**STEP 12.** Check for harness damage between MFI relay connector B-12X (terminal No. 4) and idle air control motor connector B-104 (terminals No. 2, No. 5).

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

**YES :** Go to Step 13.

**NO :** Repair it. Then go to Step 14.





**STEP 13. Check for harness damage between idle air control motor connector B-104 and ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.**

- Idle air control motor connector B-104 (terminal No. 1) and ECM connector C-121 (terminal No. 4) <M/T> or PCM connector C-120 (terminal No. 14) <A/T>.
- Idle air control motor connector B-104 (terminal No. 3) and ECM connector C-121 (terminal No. 17) <M/T> or PCM connector C-120 (terminal No. 28) <A/T>.
- Idle air control motor connector B-104 (terminal No. 4) and ECM connector C-121 (terminal No. 5) <M/T> or PCM connector C-120 (terminal No. 15) <A/T>.
- Idle air control motor connector B-104 (terminal No. 6) and ECM connector C-121 (terminal No. 18) <M/T> or PCM connector C-120 (terminal No. 29) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.

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

- Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- Check the diagnostic trouble code (DTC).

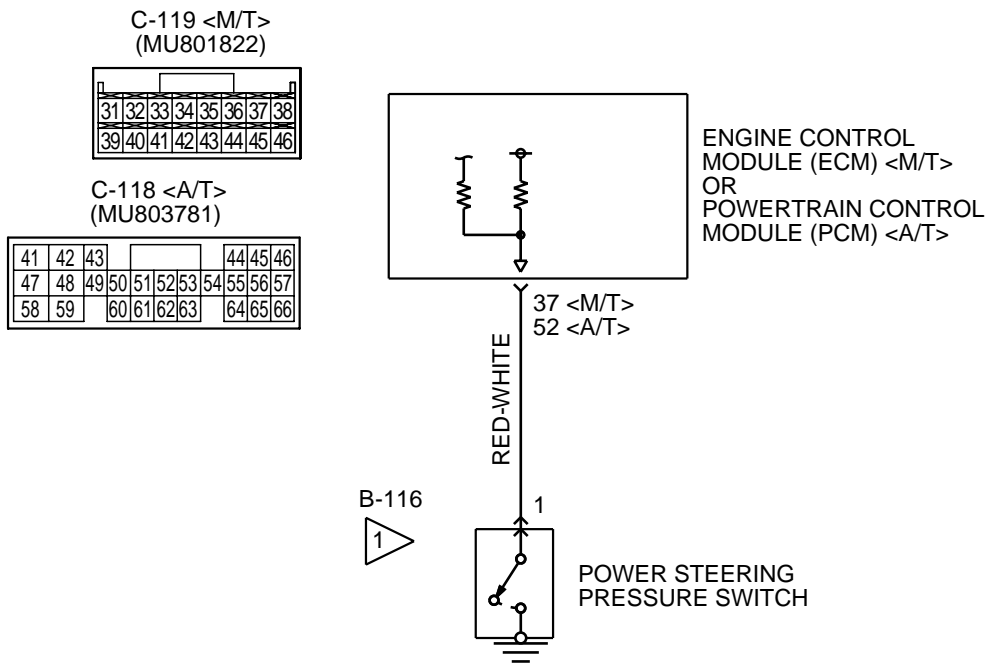
**Q: Is DTC P0507 set?**

**YES :** Repeat the troubleshooting.

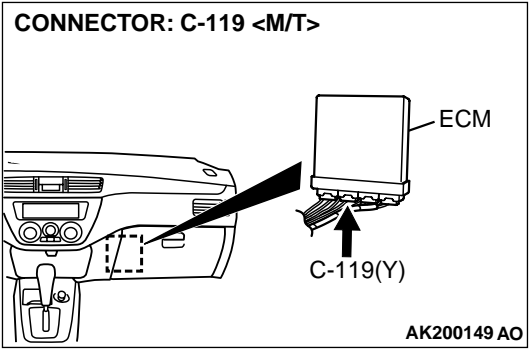
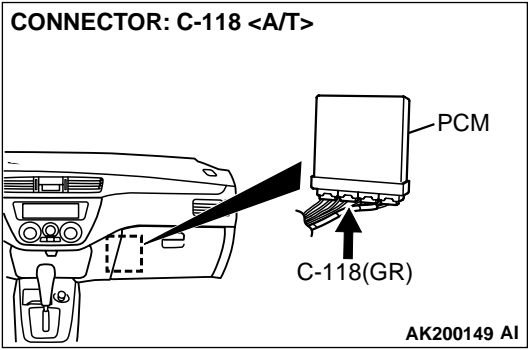
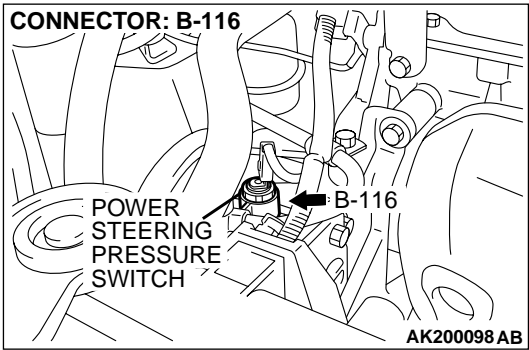
**NO :** The procedure is complete.

DTC P0551: Power Steering Pressure Sensor Circuit Range/Performance

Power Steering Pressure Switch Circuit



AK100035



**CIRCUIT OPERATION**

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM (terminal No. 37) or PCM (terminal No. 52) <A/T> via the resistor in the ECM <M/T> or PCM <A/T>.

**TECHNICAL DESCRIPTION**

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or PCM <A/T>.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM <M/T> or PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

**DTC SET CONDITIONS****Check Conditions**

- Engine coolant temperature is higher than 30°C (86°F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (0.93 mph) or less]. Repeat 10 times or more.

**Judgment Criteria**

- Power steering pressure switch continues to be "ON".

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

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.****⚠ CAUTION**

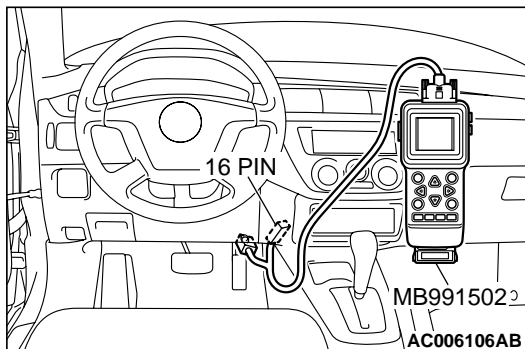
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

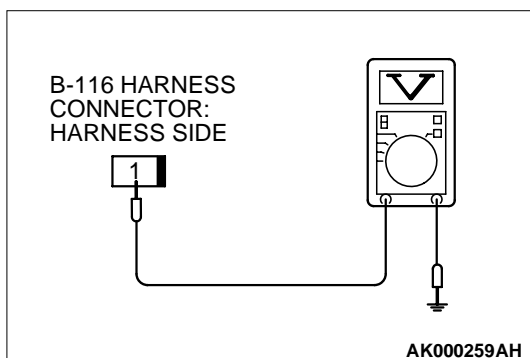
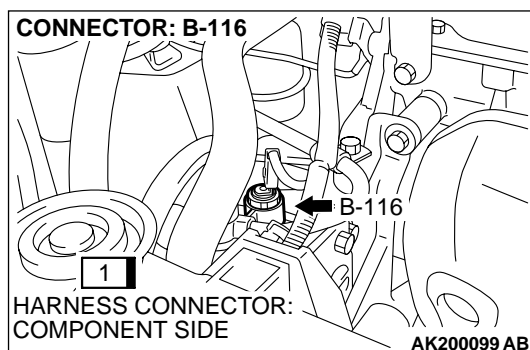
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.





**STEP 2. Measure the power supply voltage at power steering pressure switch connector B-116 by backprobing.**

- (1) Do not disconnect connector B-116.
- (2) Start the engine and run at idle.

- (3) Measure the voltage between terminal No. 1 and ground by backprobing.

- When steering wheel is stationary, voltage should measure battery positive voltage.
- When steering wheel is turned, voltage should measure 1 volt or less.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 3.

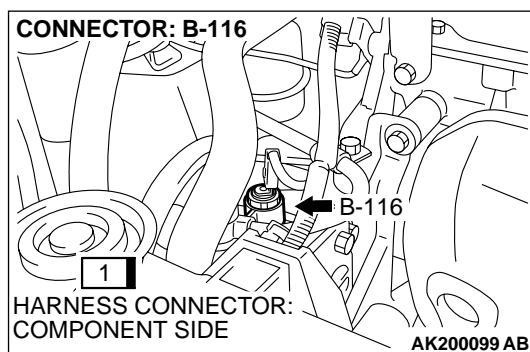
**NO :** Go to Step 5.

**STEP 3. Check connector B-116 at power steering pressure switch for damage.**

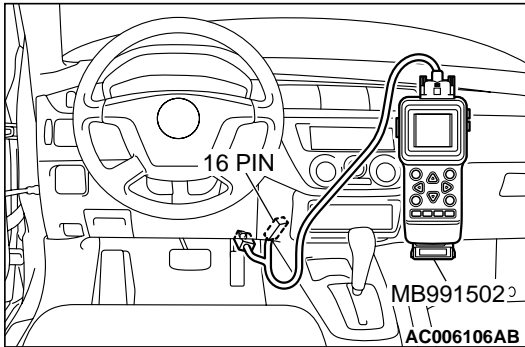
**Q: Is the connector in good condition?**

**YES :** Go to Step 4.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.







**STEP 4. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00E-2](#).

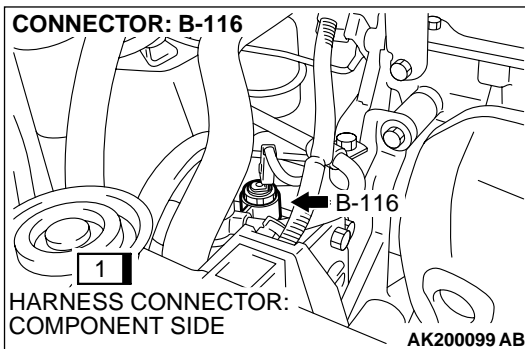
**NO :** Replace the ECM or PCM. Then go to Step 14.

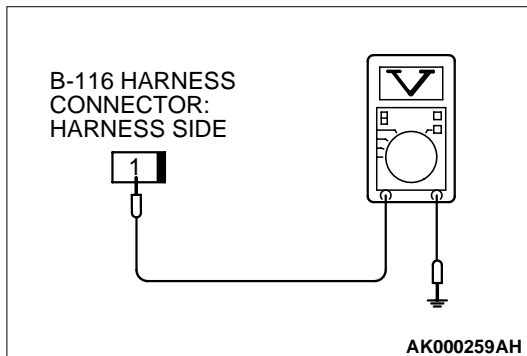
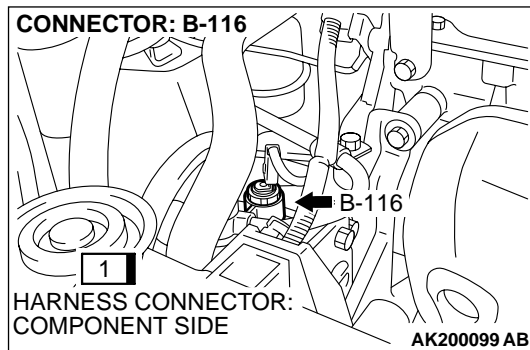
**STEP 5. Check connector B-116 at power steering pressure switch for damage.**

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.





**STEP 6. Measure the power supply voltage at power steering pressure switch harness side connector B-116.**

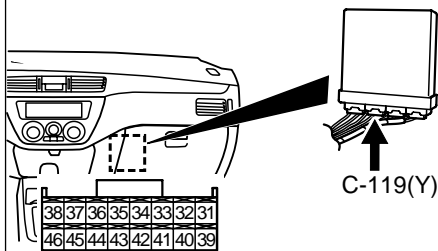
- (1) Disconnect connector B-116 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should measure battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

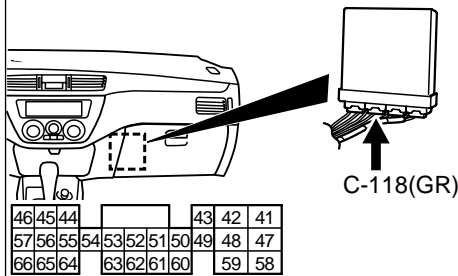
**Q: Is battery positive voltage (approximately 12 volts) present?**

**YES :** Go to Step 11.

**NO :** Go to Step 7.

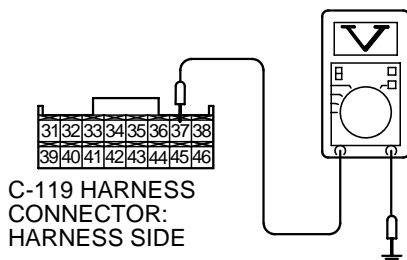
**CONNECTOR: C-119 <M/T>**HARNESS CONNECTOR:  
COMPONENT SIDE

AK200140AB

**CONNECTOR: C-118 <A/T>**HARNESS CONNECTOR:  
COMPONENT SIDE

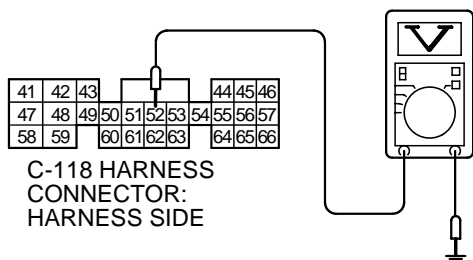
AK200141AB

&lt;M/T&gt;

C-119 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000308AG

&lt;A/T&gt;

C-118 HARNESS  
CONNECTOR:  
HARNESS SIDE

AK000309AJ

**STEP 7. Measure the power supply voltage at ECM connector C-119 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-119 <M/T> or PCM connector C-118 <A/T>.
- (2) Disconnect the power steering pressure switch connector B-116.
- (3) Turn the ignition switch to the "ON" position.

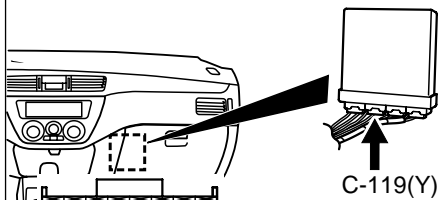
- (4) Measure the voltage between terminal No. 37 <M/T> or No. 52 <A/T> and ground by backprobing.
  - Voltage should measure between battery positive voltage.

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

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

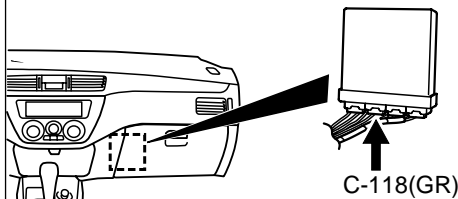
**YES :** Go to Step 8.

**NO :** Go to Step 9.

**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200140AB

**CONNECTOR: C-118 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200141AB

**STEP 8. Check connector C-119 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Repair harness wire between power steering pressure switch connector B-116 (terminal No. 1) and ECM connector C-119 (terminal No. 37) <M/T> or PCM connector C-118 (terminal No. 52) <A/T> because of open circuit. Then go to Step 14.

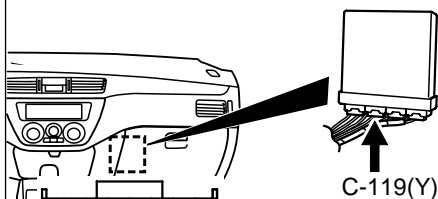
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**STEP 9. Check connector C-119 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

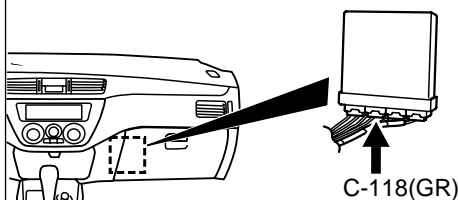
**YES :** Go to Step 10.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200140AB

**CONNECTOR: C-118 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

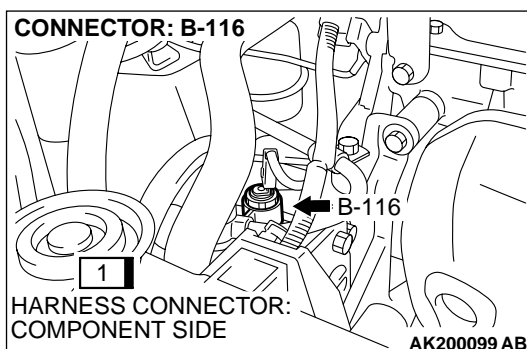
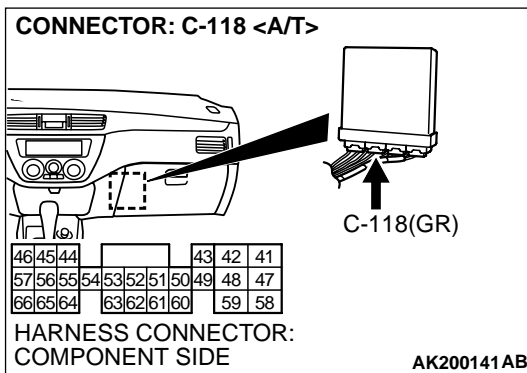
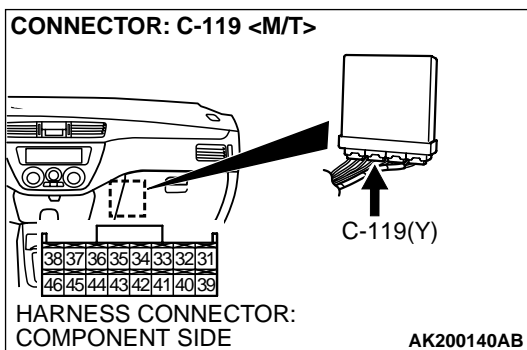
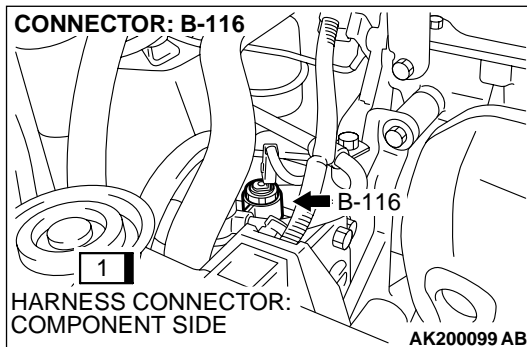
AK200141AB

**STEP 10. Check for short circuit to ground between power steering pressure switch connector B-116 (terminal No. 1) and ECM connector C-119 (terminal No. 37) <M/T> or PCM connector C-118 (terminal No. 52) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.



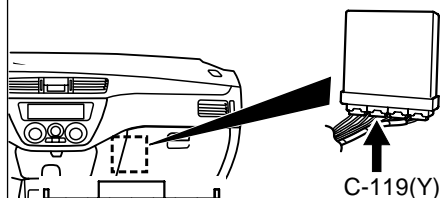
**STEP 11. Replace the power steering pressure switch.**

- (1) Replace the power steering pressure switch.
- (2) Retest the system.
- (3) Check the diagnostic trouble code (DTC).

**Q: Is DTC P0551 set?**

**YES :** Go to Step 12.

**NO :** Go to Step 14.

**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

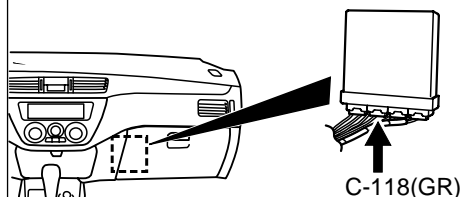
AK200140AB

**STEP 12. Check connector C-119 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 13.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 14.

**CONNECTOR: C-118 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

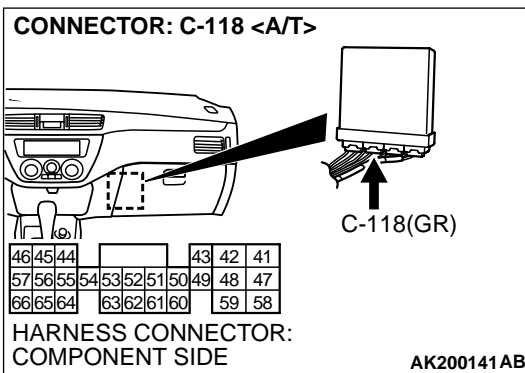
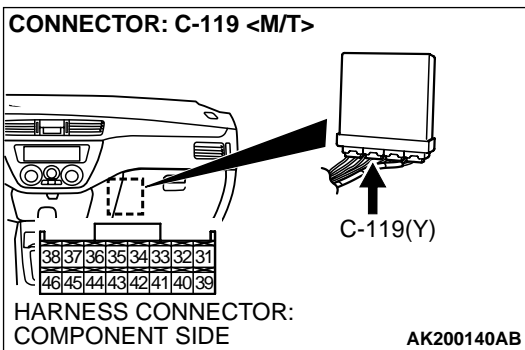
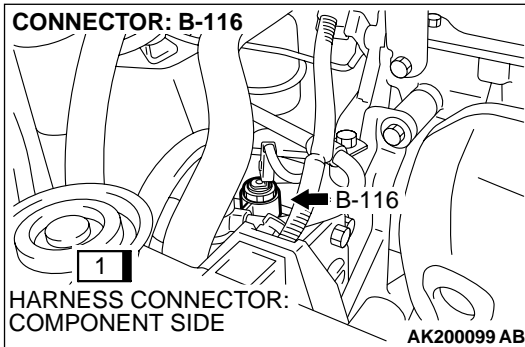
AK200141AB

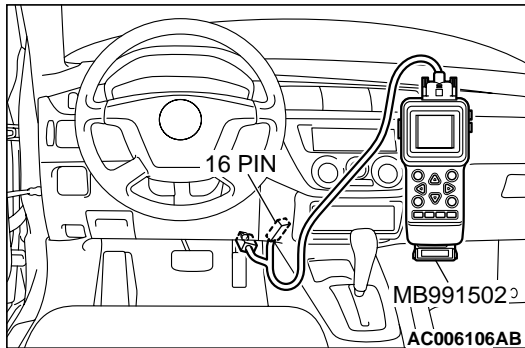
**STEP 13. Check for harness damage between power steering pressure switch connector B-116 (terminal No. 1) and ECM connector C-119 (terminal No. 37) <M/T> or PCM connector C-118 (terminal No. 52) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 14.

**NO :** Repair it. Then go to Step 14.





**STEP 14.** Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

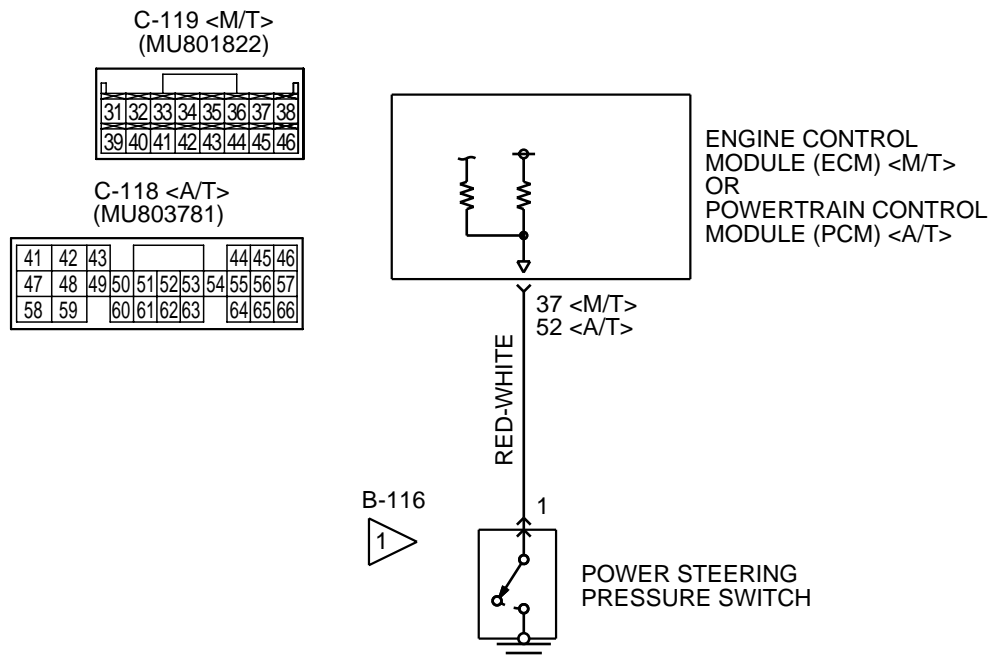
**Q: Is the switch operating properly?**

**YES :** The procedure is complete.

**NO :** Repeat the troubleshooting.

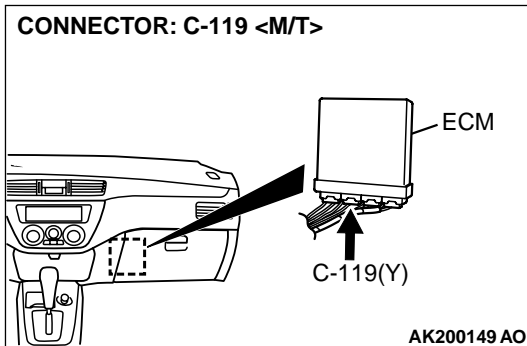
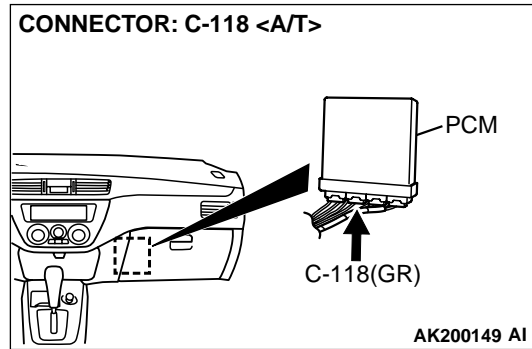
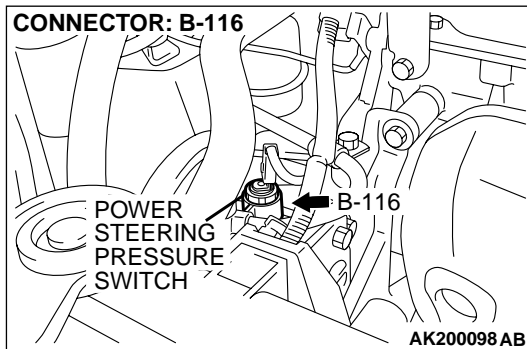
## DTC P0554: Power Steering Pressure Sensor Circuit Intermittent

### Power Steering Pressure Switch Circuit



AK100035





### CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM (terminal No. 37) or PCM (terminal No. 52) via the resistor in the ECM <M/T> or PCM <A/T>.

### TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM <M/T> or PCM <A/T>.
- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 12 volts and 0 volt.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".

- The ECM <M/T> or PCM <A/T> checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

### DTC SET CONDITIONS

#### Check Conditions

- Engine coolant temperature is higher than 30°C (86°F).
- Vehicle speed is higher than 50 km/h (31 mph).

#### Judgment Criteria

- The ON/OFF frequency of a power steering pressure switch is 10 Hz or more for 20 seconds.

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

- Power steering pressure switch failed.
- Air entered to power steering system.
- Open or shorted power steering pressure switch circuit, or loose connector.
- ECM <M/T> or PCM <A/T> failed.

---

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

---

**STEP 1. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.****⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

**NO :** Go to Step 2.

---

**STEP 2. Check the power steering fluid level.**

Refer to GROUP 37A, On-Vehicle Service - Fluid Level Check [P.37A-16](#).

**Q: Are there any abnormalities?**

**YES :** Go to Step 3.

**NO :** Repair it. Then go to Step 7.

---

**STEP 3. Check the power steering pressure switch.**

Refer to GROUP 37A, On-Vehicle Service - Power Steering Pressure Switch Check [P.37A-19](#).

**Q: Are there any abnormalities?**

**YES :** Go to Step 4.

**NO :** Replace the power steering pressure switch. Then go to Step 7.

---

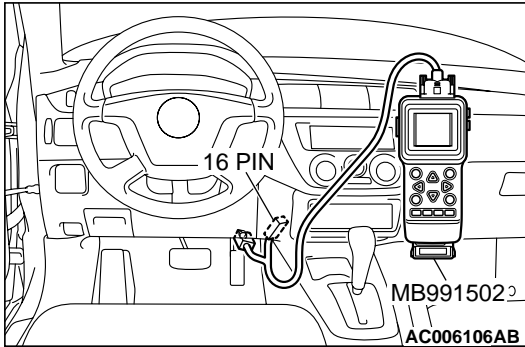
**STEP 4. Check the oil pump pressure .**

Refer to GROUP 37A, On-Vehicle Service - Oil Pump Pressure Test [P.37A-2](#).

**Q: Are there any abnormalities?**

**YES :** Go to Step 5.

**NO :** Repair it. Then go to Step 7.

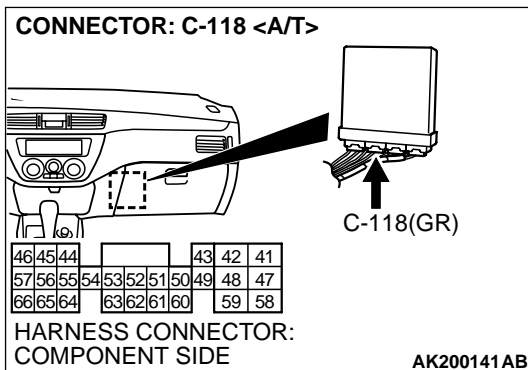
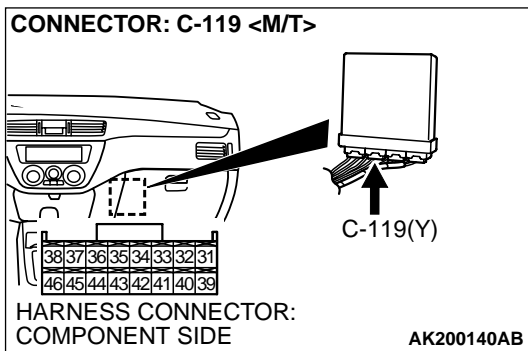
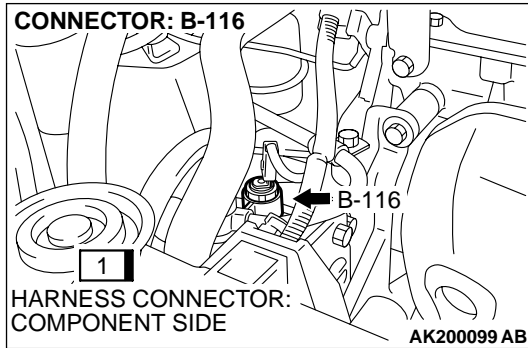


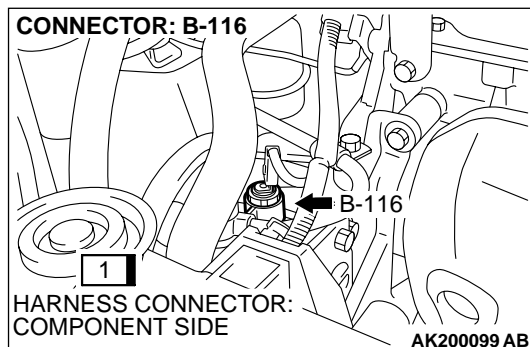
**STEP 5.** Check connector B-116 at the power steering pressure switch and connector C-119 at ECM <M/T> or connector C-113 at PCM <A/T> for damage.

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

**YES :** Go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 7.



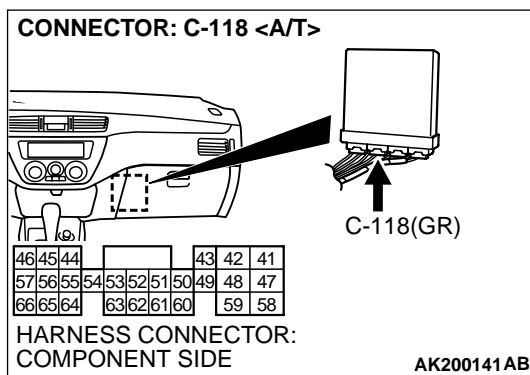
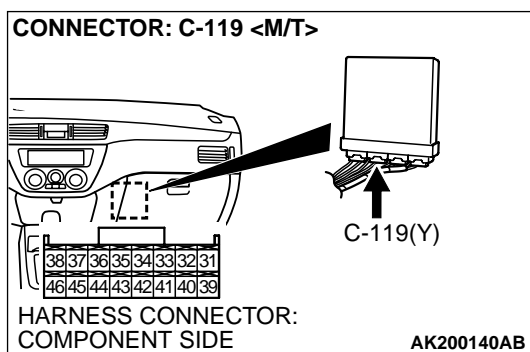


**STEP 6.** Check for harness damage between power steering pressure switch connector B-116 (terminal No. 1) and ECM connector C-119 (terminal No. 37) <M/T> or PCM connector C-118 (terminal No. 52) <A/T>.

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

**YES :** Replace the ECM <M/T> or PCM <A/T>. Then go to Step 7.

**NO :** Repair it. Then go to Step 7.



**STEP 7. Using scan tool MB991502, check data list item 27: Power Steering Pressure Switch.**

**⚠ CAUTION**

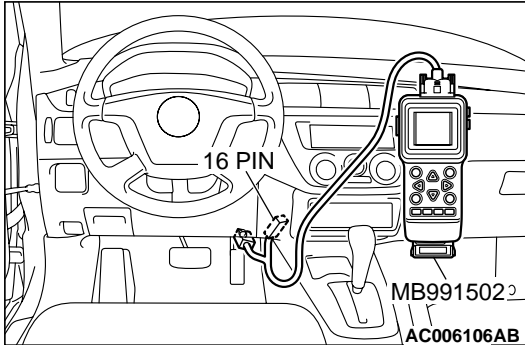
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 27, Power Steering Pressure Switch.
  - If the steering wheel is stopped while idling, "OFF" will be displayed.
  - If the steering wheel is steered while idling, "ON" will be displayed.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

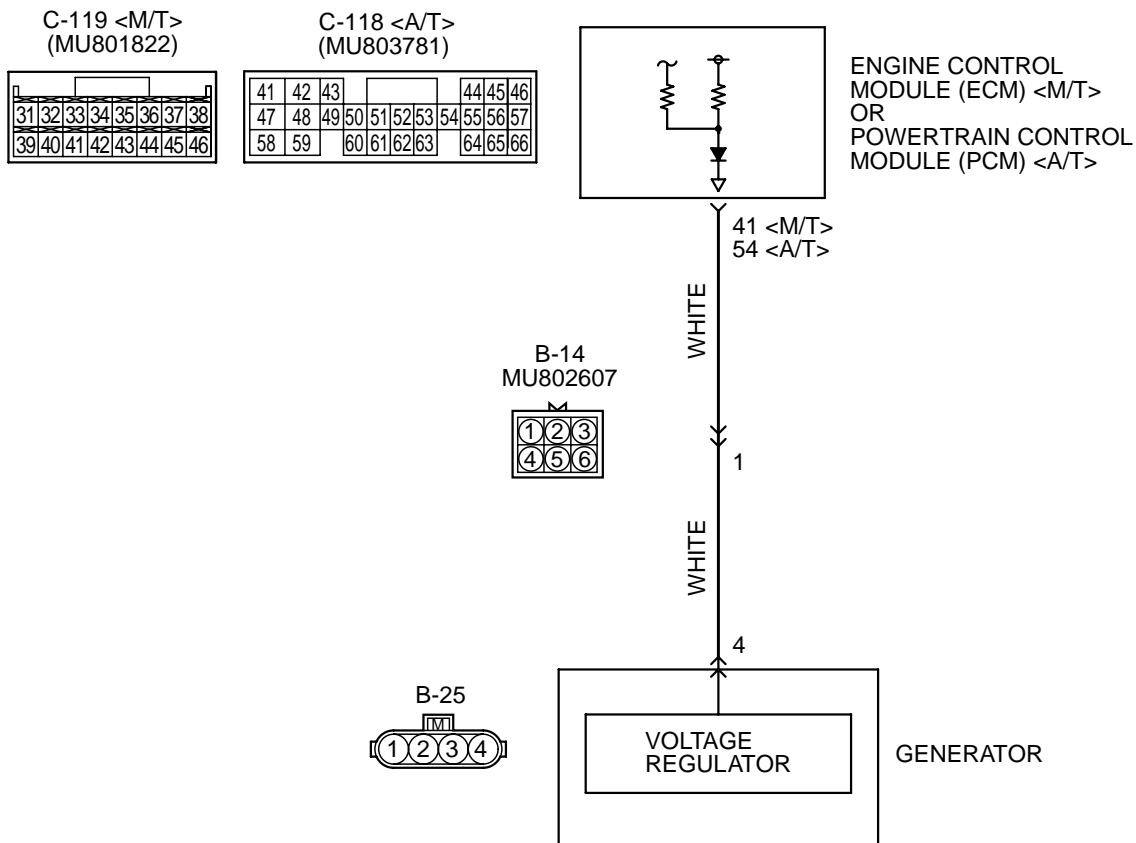
**YES :** The procedure is complete.

**NO :** Repeat the troubleshooting.

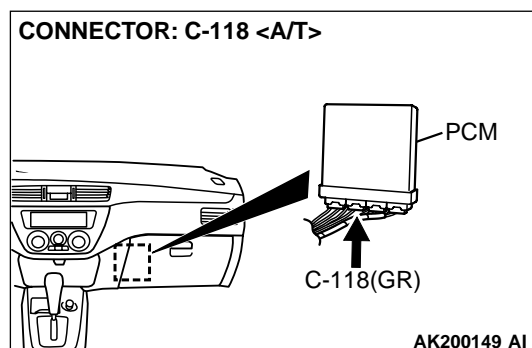
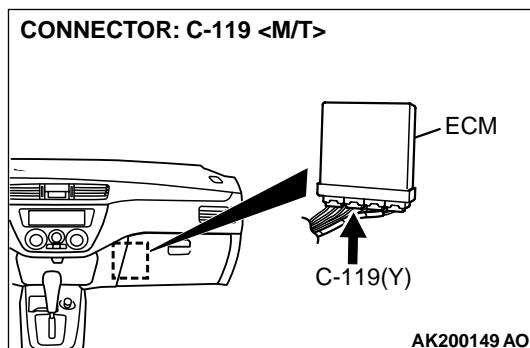
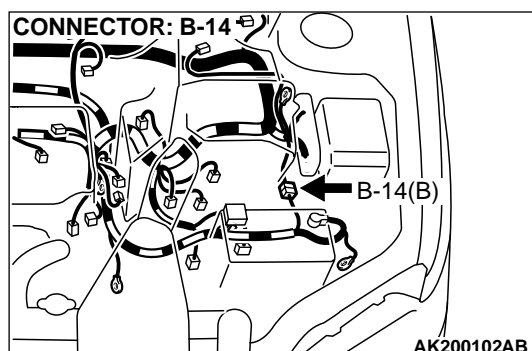
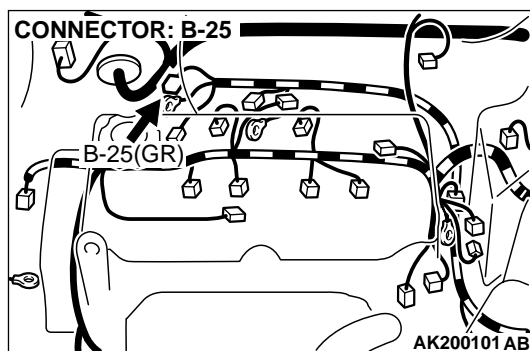


## DTC P0622: Generator FR Terminal Circuit Malfunction

### Generator Circuit



AK100037



### CIRCUIT OPERATION

- The ECM (terminal 41) <M/T> or PCM (terminal 54) <A/T> apply a battery positive voltage into the generator FR terminal No. 4 via resistance inside the unit.

### TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the ECM <M/T> or PCM <A/T>.
- The ECM <M/T> or PCM <A/T> detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

### DTC SET CONDITIONS

#### Check Conditions

- Engine speed is higher than 50 r/min.

#### Judgement Criteria

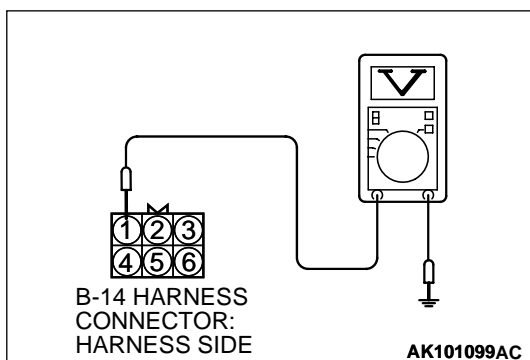
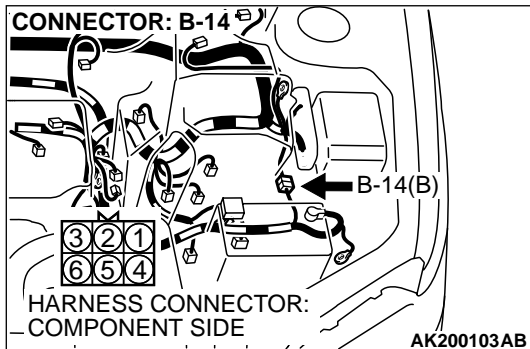
- Input voltage from the generator FR terminal has continued to be approximately battery positive voltage for 20 seconds.

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

- Open circuit in generator FR terminal circuit.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****STEP 1. Measure the voltage at generator intermediate connector B-14 by backprobing.**

- (1) Do not disconnect connector B-14.
- (2) Start the engine and run at idle.



- (3) Measure the voltage between terminal No. 1 and ground by backprobing.
  - a. Engine: warming up
  - b. Radiator fan: stopped
  - c. Headlight switch: OFF to ON
  - d. Rear defogger switch: OFF to ON
  - e. Stoplight switch: OFF to ON
    - Voltage should measure drops.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 2.

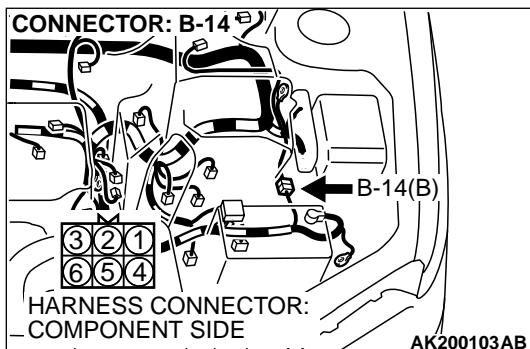
**NO :** Go to Step 4.

**STEP 2. Check connector B-14 at generator intermediate connector for damage.**

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

**YES :** Go to Step 3.

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

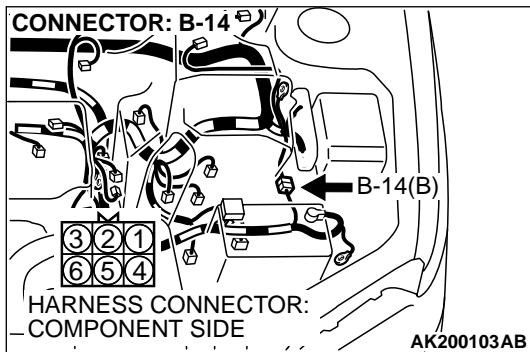
**STEP 3. Retest the system.**

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

**Q: Is DTC P1500 set?**

**YES :** Replace the ECM or PCM. Then go to Step 11.

**NO :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

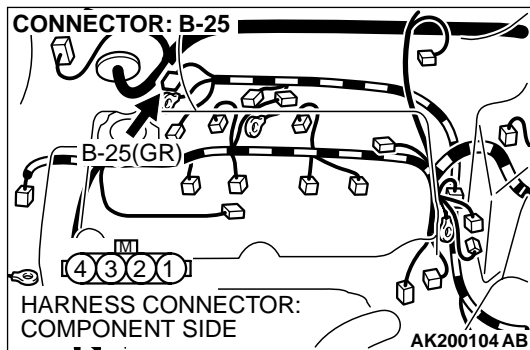


**STEP 4. Check connector B-14 at generator intermediate connector for damage.**

**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 go to Step 11.

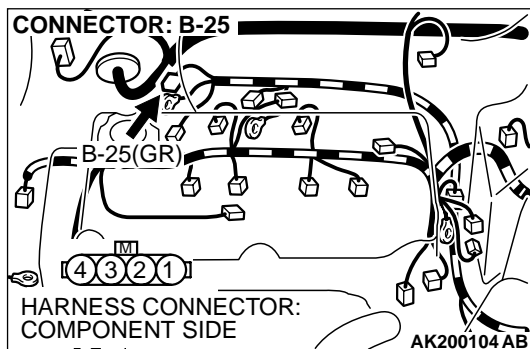


**STEP 5. Check connector B-25 at generator connector for damage.**

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

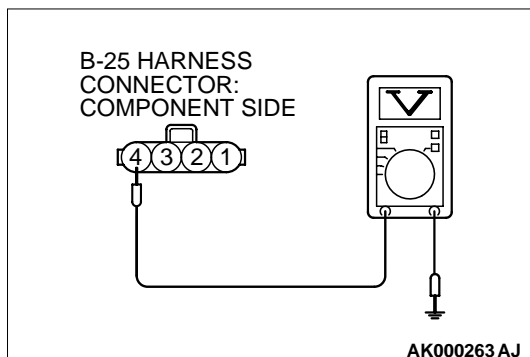
**YES :** Go to Step 6.

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



**STEP 6. Measure the voltage at generator harness side connector B-25.**

- (1) Disconnect connector B-25 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal No. 4 and ground.

- Voltage should measure battery positive voltage.

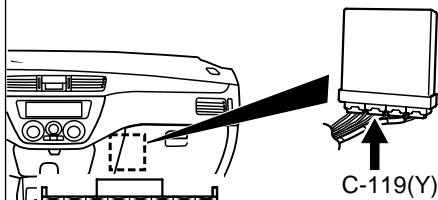
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 9.

**NO :** Go to Step 7.



**CONNECTOR: C-119 <M/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

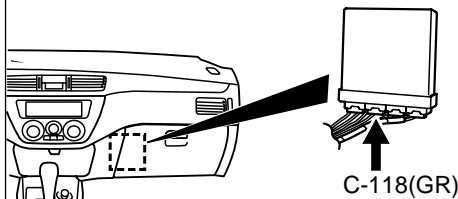
AK200140AB

**STEP 7. Check connector C-119 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

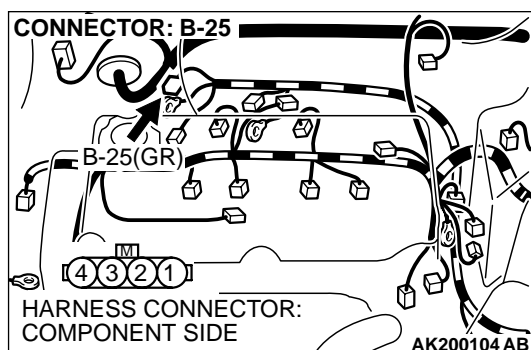
**YES :** Go to Step 8.

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

**CONNECTOR: C-118 <A/T>**

HARNESS CONNECTOR:  
COMPONENT SIDE

AK200141AB

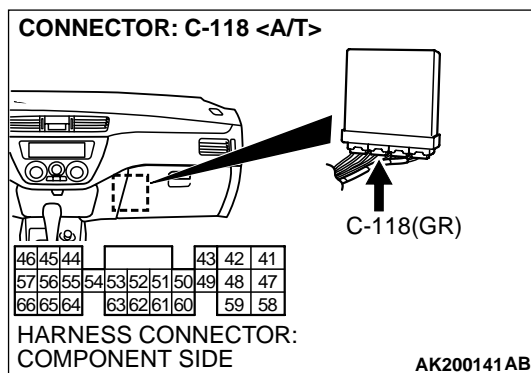
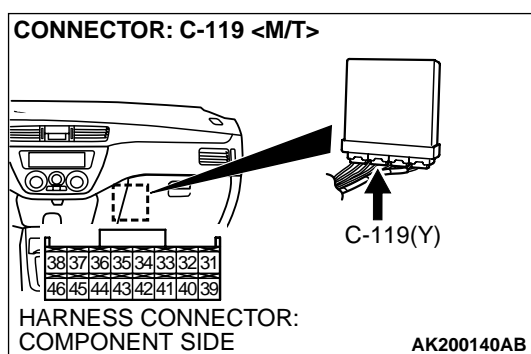


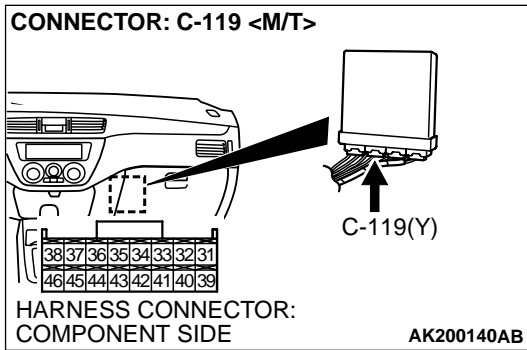
**STEP 8.** Check for open circuit and short circuit to ground between generator connector B-25 (terminal No. 4) and ECM connector C-119 (terminal No. 41) <M/T> or PCM connector C-118 (terminal No. 54) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 11.

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



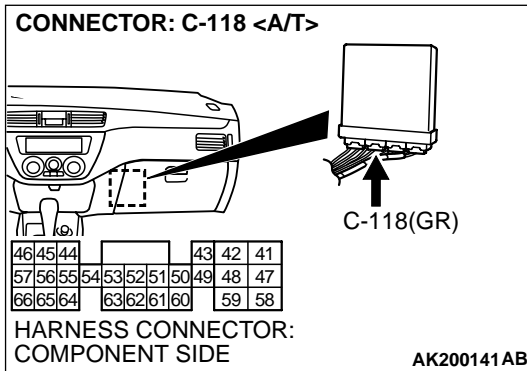


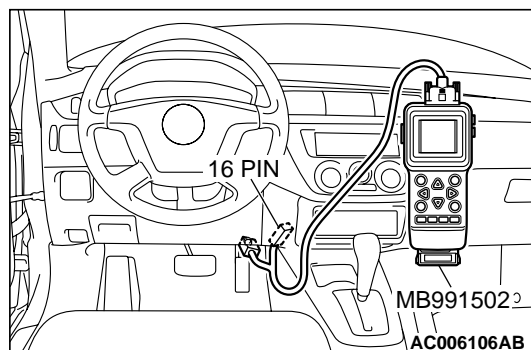
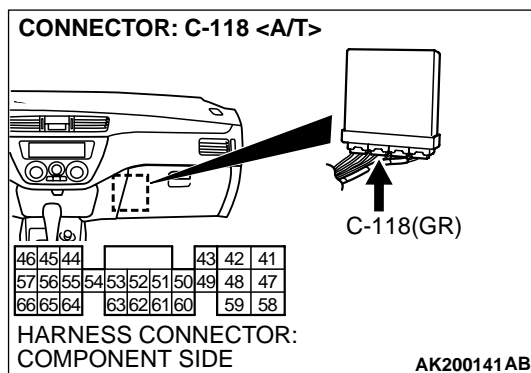
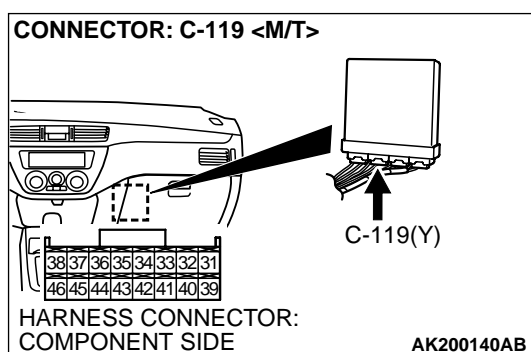
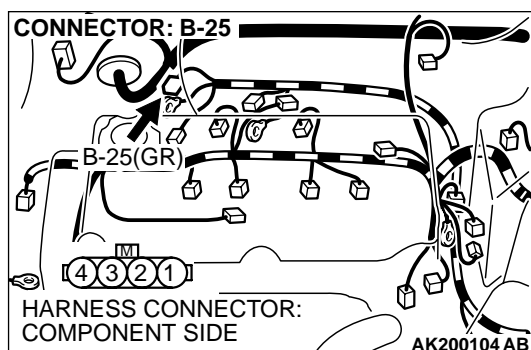
**STEP 9.** Check connector C-119 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.

**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 go to Step 11.





**STEP 10. Check for harness damage between generator connector B-25 (terminal No. 4) and ECM connector C-119 (terminal No. 41) <M/T> or PCM connector C-118 (terminal No. 54) <A/T>.**

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

**YES :** Replace the generator. Then go to Step 11.

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

**STEP 11. Using scan tool MB991502, read the diagnostic trouble code (DTC).**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

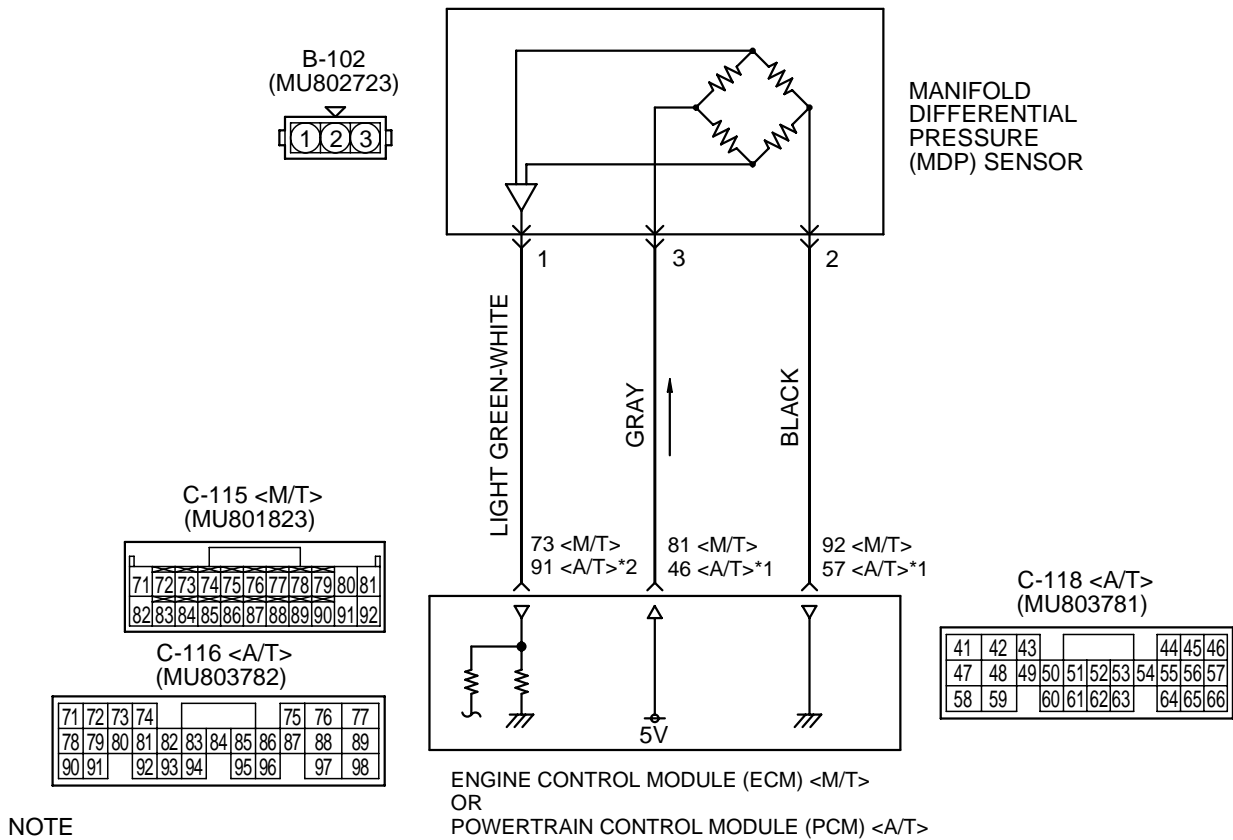
**Q: Is DTC P0622 set?**

**YES :** Repeat the troubleshooting.

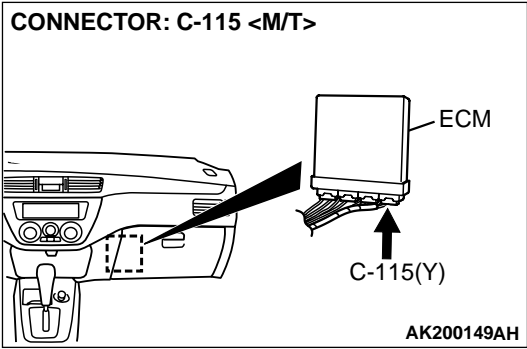
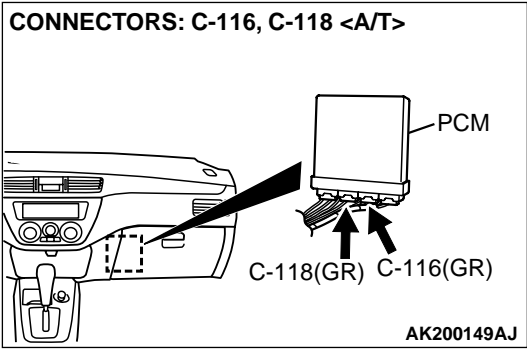
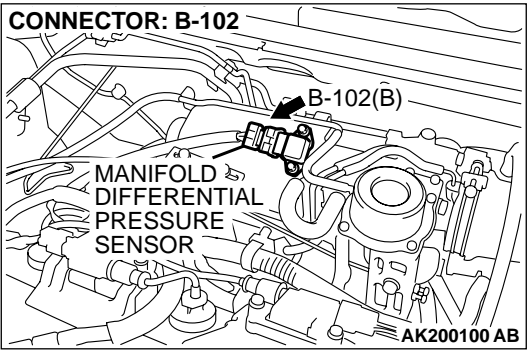
**NO :** The procedure is complete.

DTC P1400: Manifold Differential Pressure Sensor Circuit Malfunction

Manifold Differential Pressure Sensor Circuit



AK100036



**CIRCUIT OPERATION**

- A 5-volt voltage is applied on the manifold differential pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 81) <M/T> or PCM (terminal No. 46) <A/T>. The ground terminal (terminal No. 2) is grounded with the ECM (terminal No. 92) <M/T> or PCM (terminal No. 57) <A/T>.
- A voltage proportional to the pressure in the intake manifold plenum is sent from the manifold differential pressure sensor output terminal (terminal No. 1) to the ECM (terminal No. 73) <M/T> or PCM (terminal No. 91) <A/T>.

**TECHNICAL DESCRIPTION**

- The manifold differential pressure sensor outputs a voltage which corresponds to the negative pressure in the intake manifold.
- The ECM <M/T> or PCM <A/T> checks whether the voltage output by manifold differential pressure sensor is within a specified range.

**DTC SET CONDITIONS****Check Conditions**

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is less than 0°C (32°F) when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is between 30 and 45 percent.

**Judgment Criteria**

- Manifold differential pressure sensor output voltage has continued to be higher than 4.6 volts [corresponding to an absolute pressure of 118 kPa (17 psi) or higher] for 2 seconds.

or

- Manifold differential pressure sensor output voltage has continued to be lower than 0.1 volt [corresponding to an absolute pressure of 2.4 kPa (0.3 psi) or lower] for 2 seconds.

**Check Conditions**

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 0°C (32°F).
- Volumetric efficiency is lower than 30 percent.

**Judgment Criteria**

- Manifold differential pressure sensor output voltage has continued to be higher than 4.2 volts [corresponding to an absolute pressure of 108 kPa (16 psi) or higher] for 2 seconds.

**Check Conditions**

- 8 minutes or more have passed after starting the engine. Note that this is only if the engine coolant temperature is 0°C (32°F) or more when starting.
- Engine coolant temperature is higher than 45°C (113°F).
- Intake air temperature is higher than 5°C (41°F).
- Volumetric efficiency is higher than 70 percent.

**Judgment Criteria**

- Manifold differential pressure sensor output voltage has continued to be lower than 1.8 volts [corresponding to an absolute pressure of 46 kPa (4.6 psi) or lower] for 2 seconds.

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

- Manifold differential pressure sensor failed.
- Open or shorted manifold differential pressure sensor circuit, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>

**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1. Using scan tool MB991502, check data list item 95: Manifold Differential Pressure Sensor.**

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991502 to the data reading mode for item 95, Manifold Differential Pressure Sensor.
  - While engine is idling, pressure should be between 65 and 78 kPa (19.2 – 23.0 in.Hg).
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points [P.00-6](#).

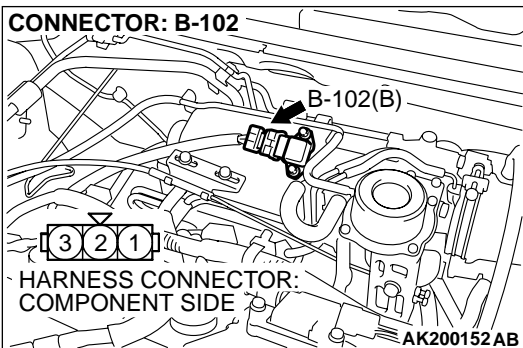
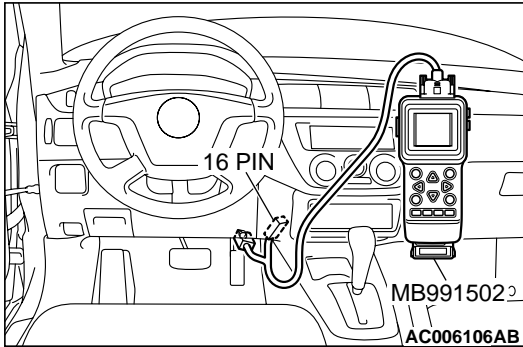
**NO :** Go to Step 2.

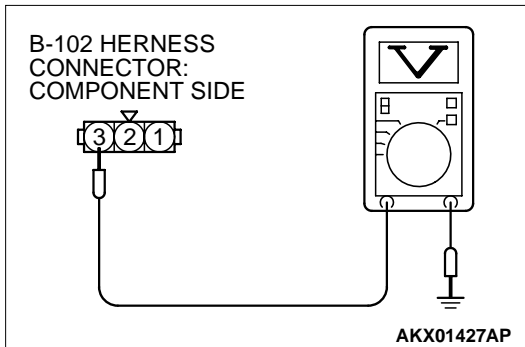
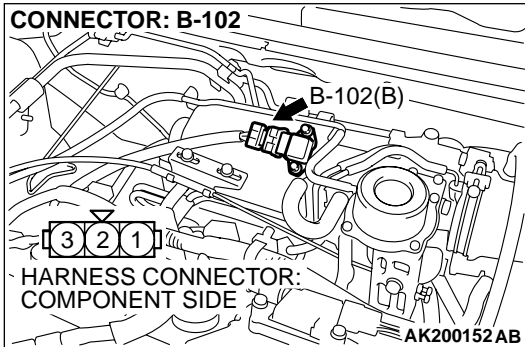
**STEP 2. Check connector B-102 at manifold differential pressure sensor for damage.**

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

**YES :** Go to Step 3.

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





**STEP 3. Measure the sensor supply voltage at manifold differential pressure sensor harness side connector B-102.**

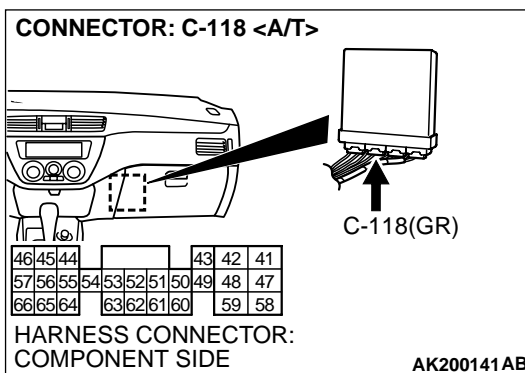
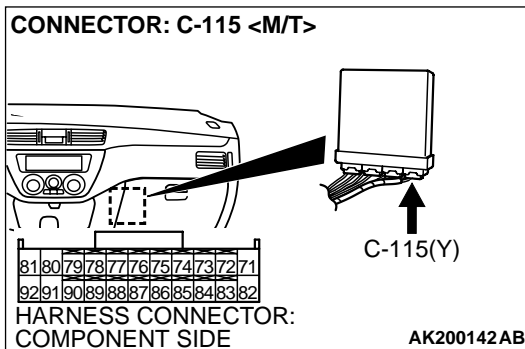
- (1) Disconnect connector B-102 and measure at the harness side.
- (2) Turn the ignition switch to "ON" position.

- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should measure between 4.8 and 5.2 volts.
- (4) Turn the ignition switch to "LOCK" (OFF) position.

**Q: Is the measured voltage between 4.8 and 5.2 volts?**

**YES :** Go to Step 6.

**NO :** Go to Step 4.



**STEP 4. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> 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 go to Step 12.

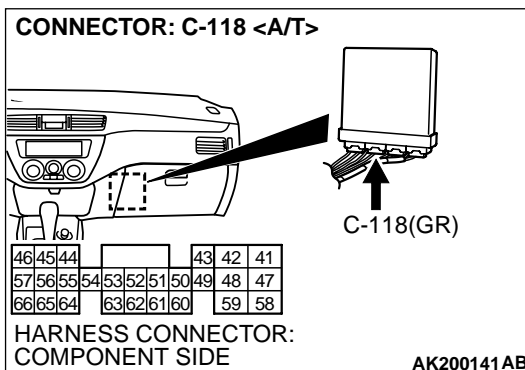
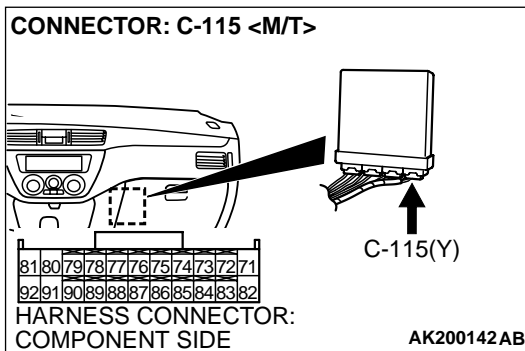
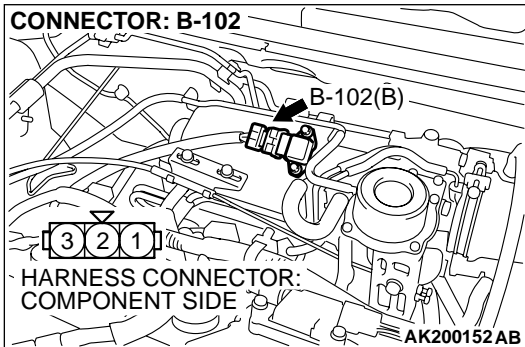


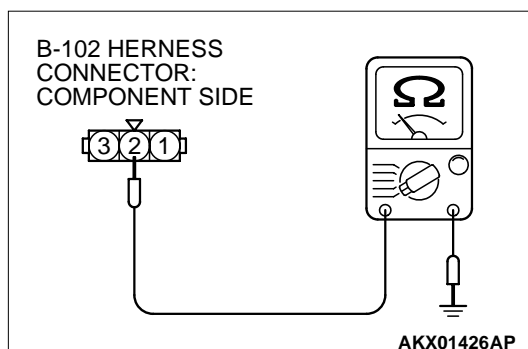
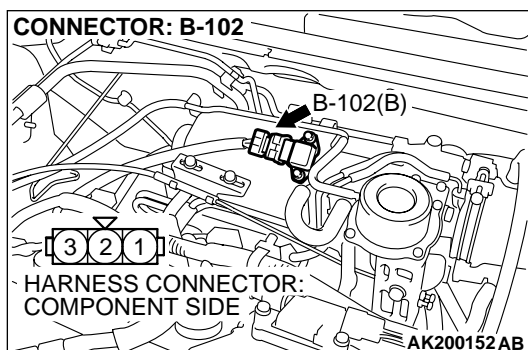
**STEP 5.** Check for open circuit and short circuit to ground between manifold differential pressure sensor connector B-102 (terminal No. 3) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T>.

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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





**STEP 6. Check for continuity at manifold differential pressure sensor harness side connector B-102.**

(1) Disconnect connector B-102 and measure at the harness side.

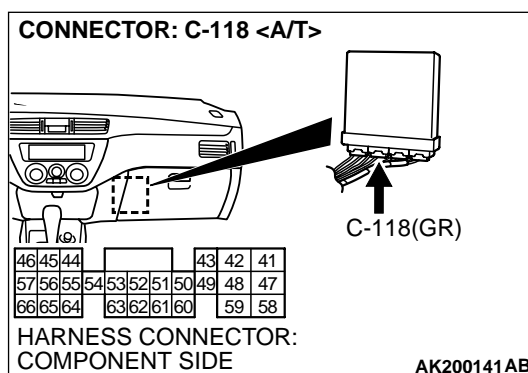
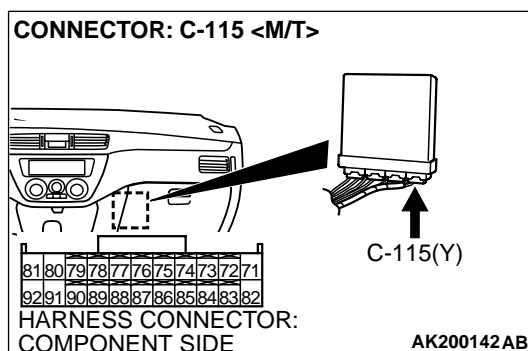
(2) Measure the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 9.

**NO :** Go to Step 7.



**STEP 7. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Go to Step 8.

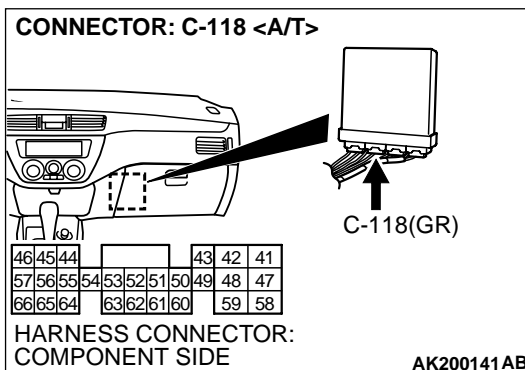
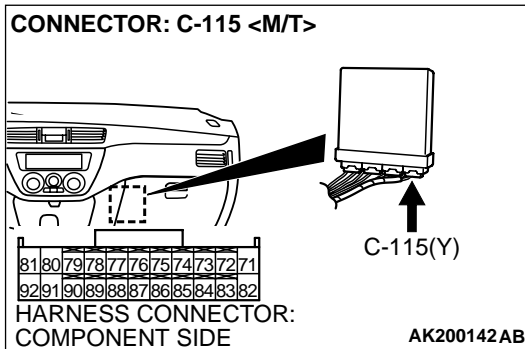
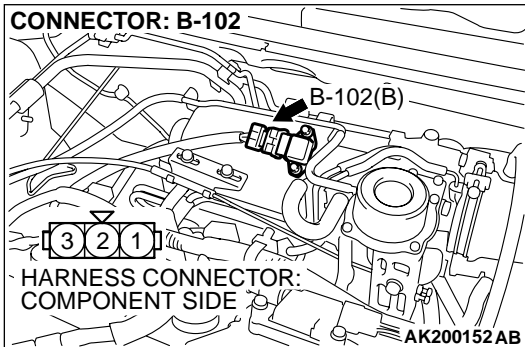
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 12.

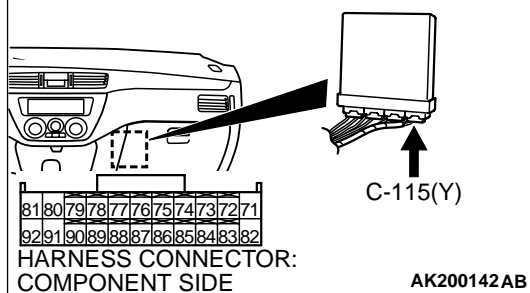
**STEP 8. Check for open circuit and harness damage between manifold differential pressure sensor connector B-102 (terminal No. 2) and ECM connector C-115 (terminal No. 92) <M/T> or PCM connector C-118 (terminal No. 57) <A/T>.**

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

**YES :** Replace the ECM or PCM. Then go to Step 12.

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



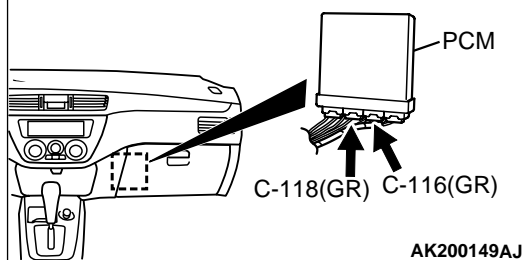
**CONNECTOR: C-115 <M/T>**

**STEP 9. Check connector C-115 at ECM <M/T> or connectors C-118, C-116 at PCM <A/T> 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 go to Step 12.

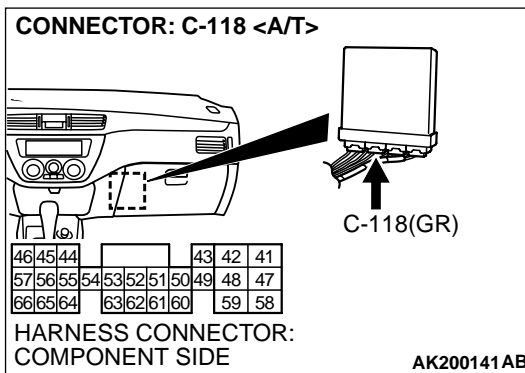
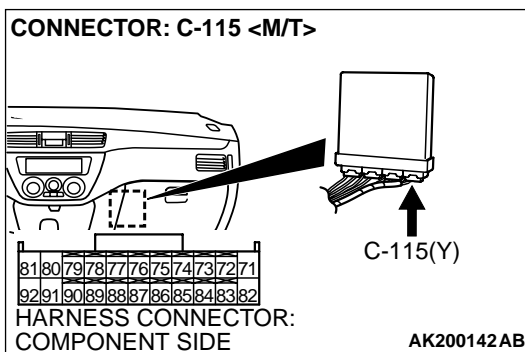
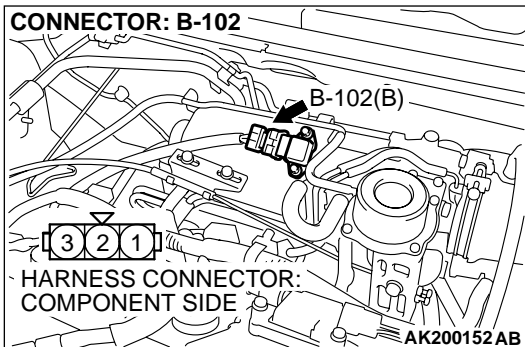
**CONNECTORS: C-116, C-118 <A/T>**

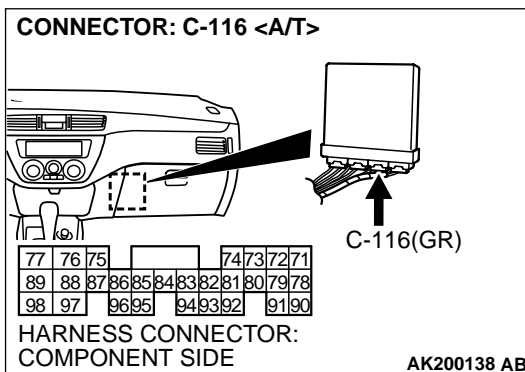
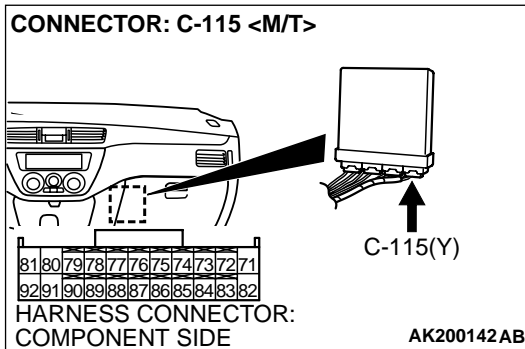
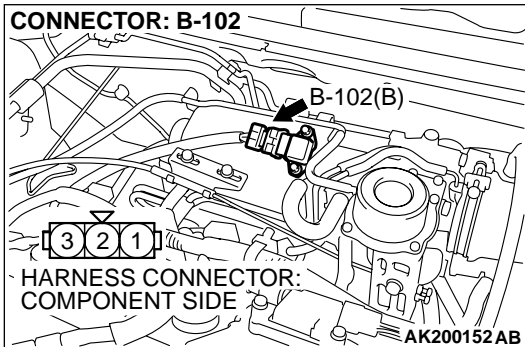
**STEP 10.** Check for harness damage between manifold differential pressure sensor connector B-102 (terminal No. 3) and ECM connector C-115 (terminal No. 81) <M/T> or PCM connector C-118 (terminal No. 46) <A/T>.

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

**YES :** Go to Step 11.

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





**STEP 11. Check for open circuit and short circuit to ground and harness damage between manifold differential pressure sensor connector B-102 (terminal No. 1) and ECM connector C-115 (terminal No. 73) <M/T> or PCM connector C-116 (terminal No. 91) <A/T>.**

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

**YES :** Replace the manifold differential pressure sensor.  
Then go to Step 12.

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

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

- (1) Carry out a test drive with the drive cycle pattern. Refer to GROUP 13A, Trouble Code Diagnosis – OBD-II Drive Cycle – Procedure 6 – Other Monitor [P.13Ab-2](#).
- (2) Check the diagnostic trouble code (DTC).

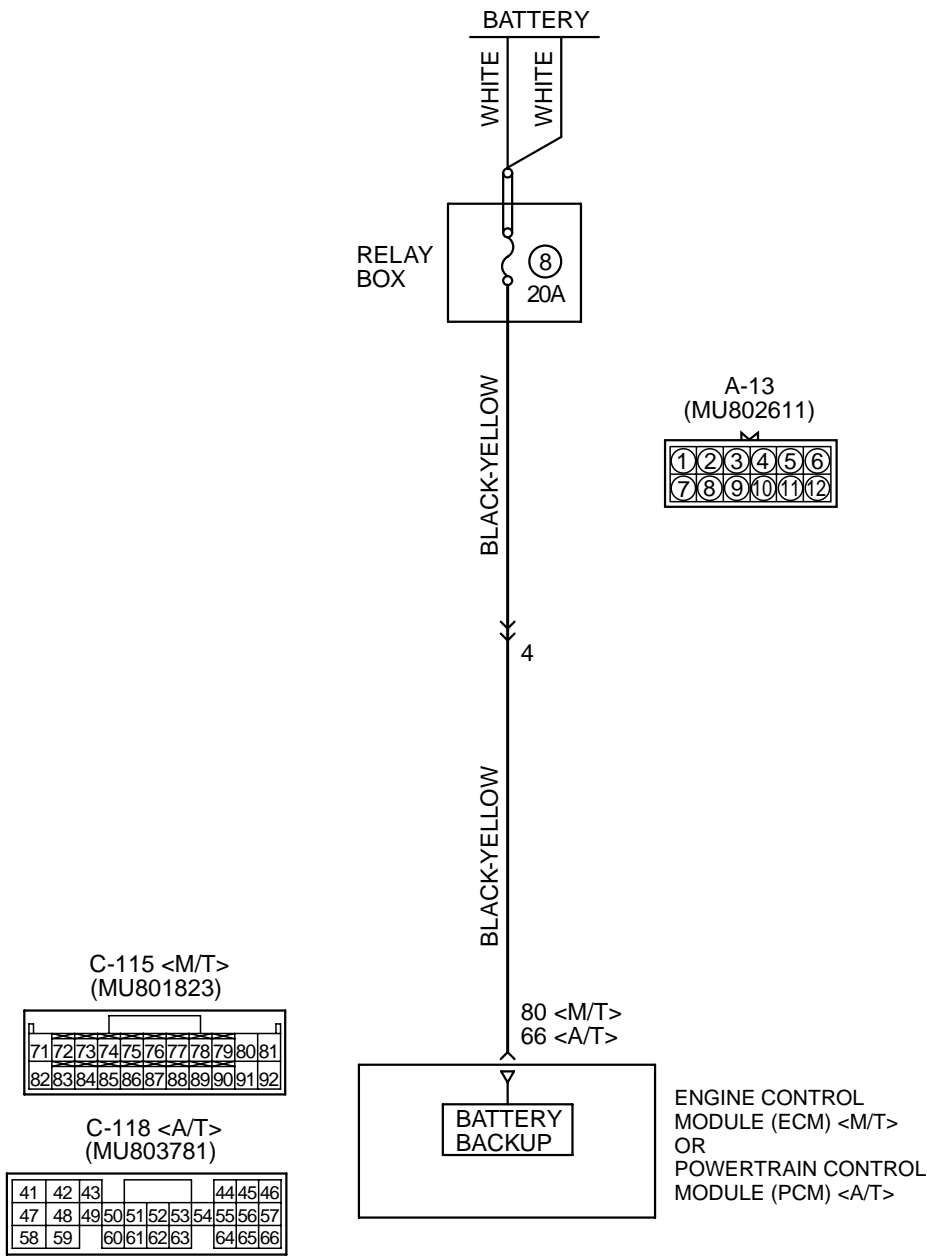
**Q: Is DTC P1400 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

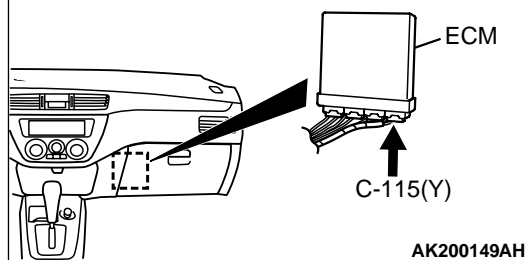
DTC P1603: Battery Backup Line Malfunction

Battery Backup Circuit

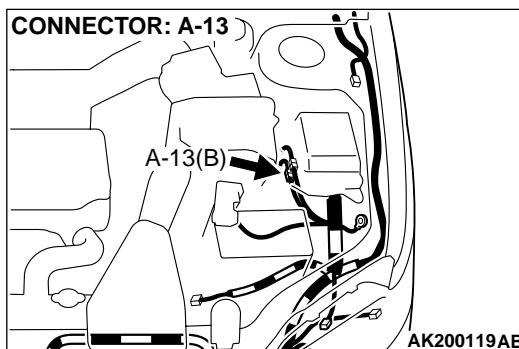


AK200386

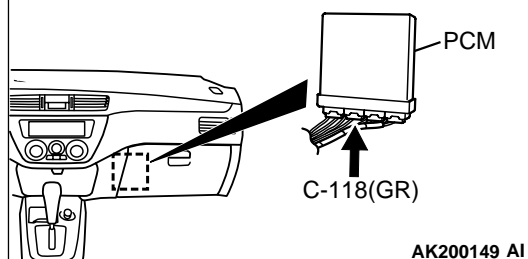
CONNECTOR: C-115 &lt;M/T&gt;



CONNECTOR: A-13



CONNECTOR: C-118 &lt;A/T&gt;

**TECHNICAL DESCRIPTION**

- The ECM <M/T> or PCM <A/T> checks the open circuit of battery backup line.

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

**DTC SET CONDITIONS****Check Conditions**

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

**Judgement Criteria**

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

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

- Open or shorted battery backup line, or loose connector.
- ECM failed. <M/T>
- PCM failed. <A/T>



**DIAGNOSIS****Required Special Tool:**

- MB991502: Scan Tool (MUT-II)

**STEP 1.** Using scan tool MB991502, read the diagnostic trouble code (DTC).

**⚠ CAUTION**

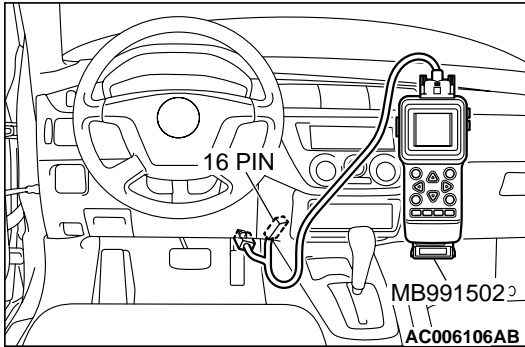
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

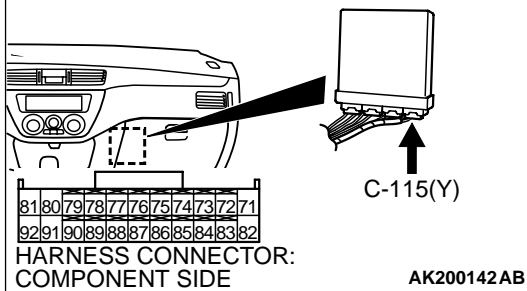
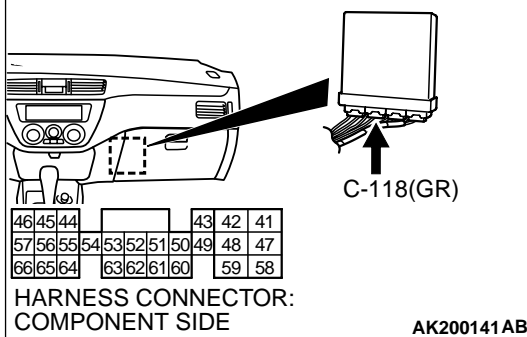
- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Erase the DTC.
- (4) Start the engine and run it at idle.
- (5) Read the DTC.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is DTC P1603 set?**

**YES :** Go to Step 2.

**NO :** The procedure is complete.

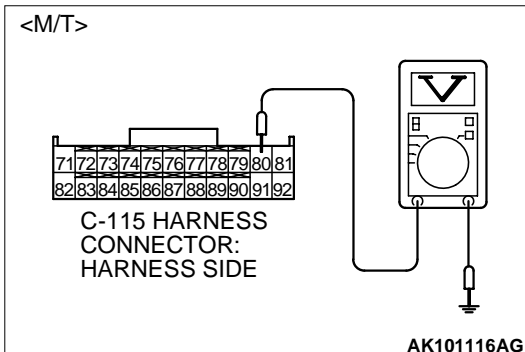


**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 2. Measure the backup power supply voltage at ECM connector C-115 <M/T> or PCM connector C-118 <A/T> by backprobing.**

- (1) Do not disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T>.

&lt;M/T&gt;



- (2) Measure the voltage between terminal No. 80 <M/T> or No. 66 <A/T> and ground by backprobing.

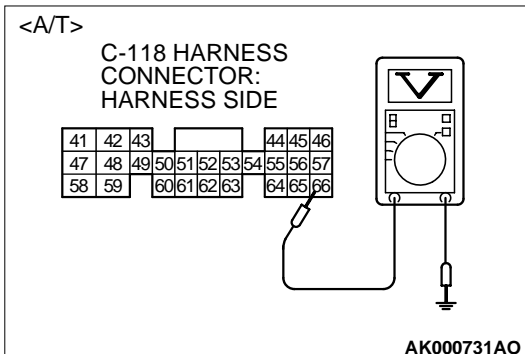
- Voltage should measure battery positive voltage.

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

**YES :** Go to Step 5.

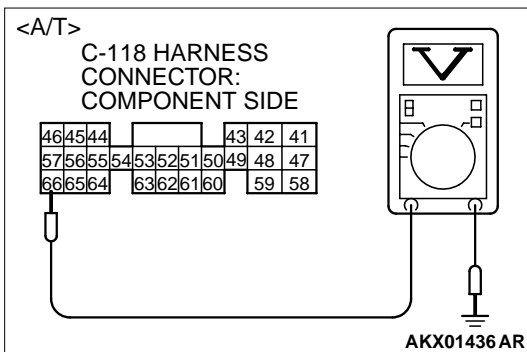
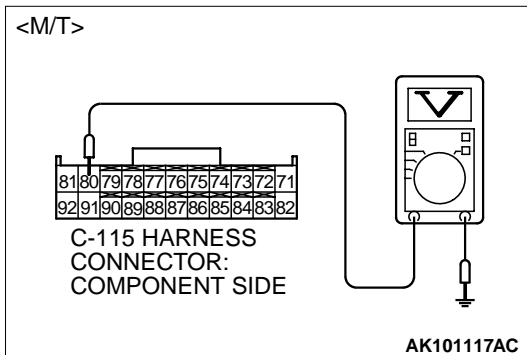
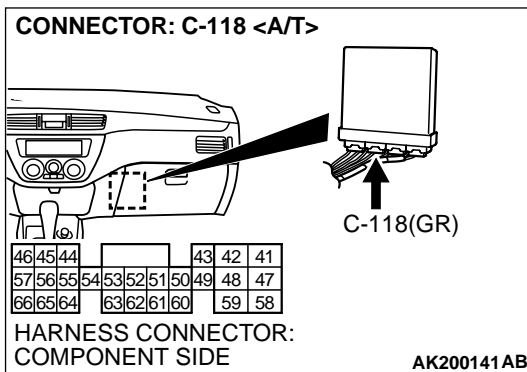
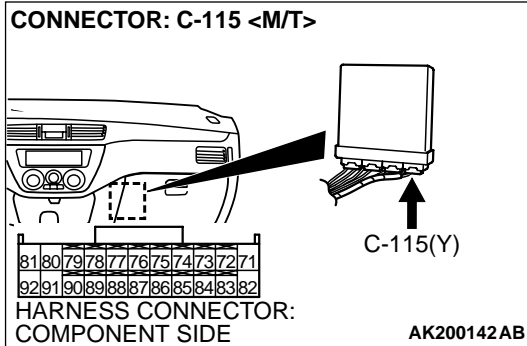
**NO :** Go to Step 3.

&lt;A/T&gt;



**STEP 3. Measure the backup power supply voltage at ECM harness side connector C-115 <M/T> or PCM harness side connector C-118 <A/T>.**

- (1) Disconnect the ECM connector C-115 <M/T> or PCM connector C-118 <A/T> and measure at the harness side.



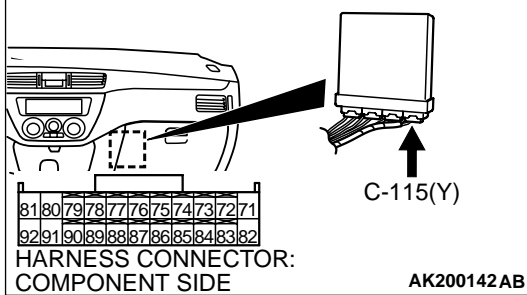
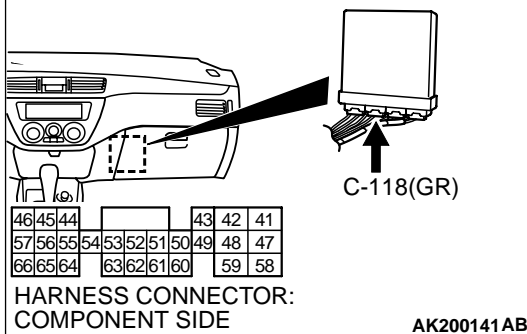
- (2) Measure the voltage between terminal No. 80 <M/T> or No. 66 <A/T> and ground.

- Voltage should measure battery positive voltage.

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

**YES :** Go to Step 4.

**NO :** Check connector A-13 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector are in good condition, repair harness wire between relay box (fuse ) and ECM connector C-115 <M/T> (terminal No. 80) or PCM connector C-118 <A/T> (terminal No. 66) because of open circuit or short circuit to ground. Then go to Step 6.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**

**STEP 4. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Check connector A-13 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector are in good condition, repair harness wire between relay box (fuse ) and ECM connector C-115 <M/T> (terminal No. 80) or PCM connector C-118 <A/T> (terminal No. 66) because of harness damage. Then go to Step 6.

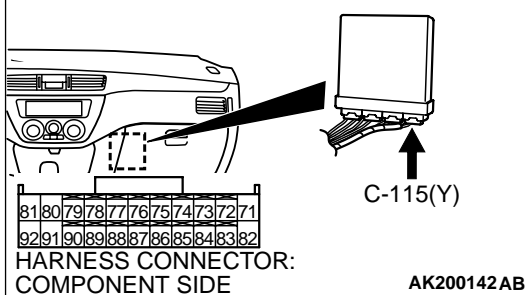
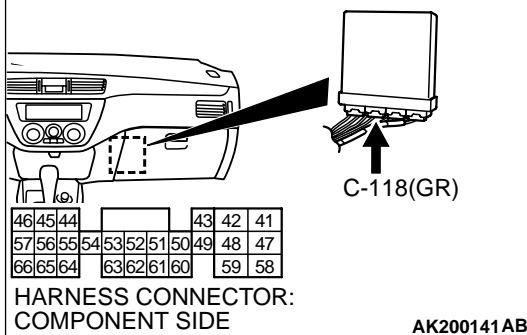
**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

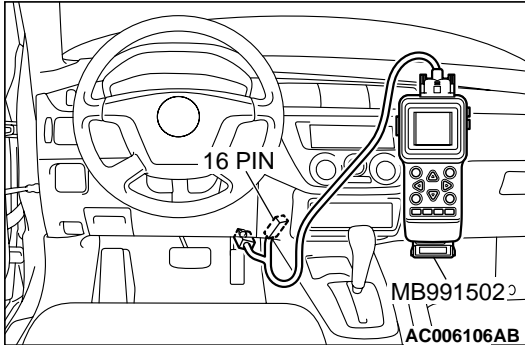
**STEP 5. Check connector C-115 at ECM <M/T> or connector C-118 at PCM <A/T> for damage.**

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

**YES :** Replace the ECM or PCM. Then go to Step 6.

**NO :** Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 6.

**CONNECTOR: C-115 <M/T>****CONNECTOR: C-118 <A/T>**



**STEP 6.** Using scan tool MB991502, read the diagnostic trouble code (DTC).

**⚠ CAUTION**

To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502.

- (1) Connect scan tool MB991502 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is DTC P1603 set?**

**YES :** Repeat the troubleshooting.

**NO :** The procedure is complete.

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## NOTES