

## GROUP 35B

# ANTI-LOCK BRAKING SYSTEM (ABS)

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## GENERAL DESCRIPTION

M1352000100766

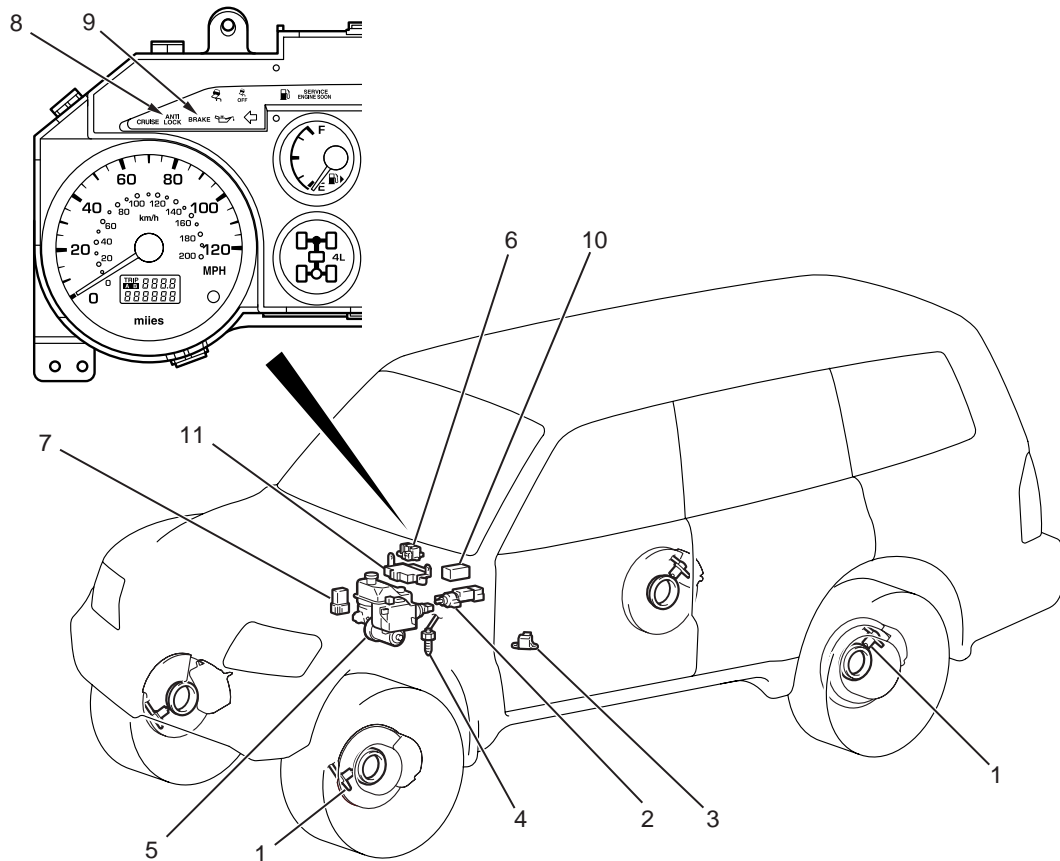
The ABS consists of components such as the ABS sensors, stoplight switch, hydraulic unit in hydraulic brake booster (HBB), HBB buzzer, M-ASTC-ECU, ABS rotor, and the ABS warning light. If a problem occurs in the system, the malfunctioning components can be identified and the trouble symptoms will be memorized by the diagnostic function.

In addition, reading of diagnostic trouble codes and data list and actuator testing are possible by using the Scan Tool.

The M-ASTC-ECU runs a self-check for three seconds upon start-up (also ignition switch ON, engine stopped). The ABS warning light should be illuminated during the self-check and turn off when the self-check completes.

ITEM	SPECIFICATION
ABS type	4-sensor, 4-channel type
ABS sensor	Magnet coil type on 4-wheels
Front ABS rotor teeth	50
Rear ABS rotor teeth	50

### CONSTRUCTION DIAGRAM



AC204969AB

- |  |                         |
|--|-------------------------|
| 1. ABS SENSOR                                      | 6. HBB BUZZER           |
| 2. STOPLIGHT SWITCH                                | 7. VALVE RELAY          |
| 3. G AND YAW RATE SENSOR                           | 8. ABS WARNING LIGHT    |
| 4. CENTER DIFFERENTIAL LOCK SWITCH                 | 9. BRAKE WARNING LIGHT  |
| 5. HYDRAULIC UNIT IN HYDRAULIC BRAKE BOOSTER (HBB) | 10. DATA LINK CONNECTOR |
|  | 11. M-ASTC-ECU          |

## SYSTEM CHECK SOUND

When starting the engine, a thudding sound can sometimes be heard coming from the engine compartment. This is a normal sound during the ABS self-check.

## ABS OPERATION SOUNDS AND SENSATIONS

During normal operation, the ABS makes several sounds that may seem unusual at first:

- A whining sound is caused by the ABS hydraulic unit motor.
- When pressure is applied to the brake pedal, the pulsation of the pedal causes a scraping sound.

- When the brakes are applied firmly, the ABS operates, rapidly applying and releasing the brakes many times per second. This repeated application and release of braking forces can cause the suspension to make a thumping sound and the tires to squeak.

## LONG STOPPING DISTANCES ON LOOSE ROAD SURFACES

When braking on loose surfaces like snow-covered or gravel roads, the stopping distance can be longer for an ABS-equipped vehicle than the stopping distance for a vehicle with a conventional brake system.

## SHOCK AT STARTING CHECK

Shock may be felt when the brake pedal is lightly pressed while driving at a low speed. This is a normal characteristic because the ABS system operation check is carried out when vehicle speed is 8 km/h (5 mph) or less.

# ABS DIAGNOSIS

## INTRODUCTION TO ABS DIAGNOSIS

The anti-lock brake system (ABS) operates differently from conventional brake systems. These differences include sounds, sensations, and vehicle performance that owners and service technicians who are not familiar with ABS may not be used to. Some operational characteristics may seem to be malfunctions, but they are simply signs of normal ABS operation. When diagnosing the ABS system, keep these operational characteristics in mind. Inform the owner of the kind of performance characteristics to expect from an ABS-equipped vehicle.

## TROUBLESHOOTING STRATEGY

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an ABS fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.

## ABS DIAGNOSTIC TROUBLE CODE DETECTION CONDITIONS

ABS diagnostic trouble codes (ABS DTCs) are set under different conditions, depending on the malfunction detected. Most ABS DTCs will only be set during vehicle operation. Some ABS DTCs will also be set during the ABS self-check immediately after the engine is started.

When you check if an ABS DTC will be displayed again after the DTC has been erased, you should duplicate the ABS DTC set conditions. Depending on the detection timing and set conditions for the specific ABS DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "ABS DTC SET CONDITIONS" for each ABS DTC that you are trying to reset.

M1352012500501

3. Check the vehicle for any ABS DTC.
4. If you cannot verify the condition and there are no ABS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-13](#).

M1352011100726

5. If you can verify the condition but there are no ABS DTCs, or the system cannot communicate with the scan tool, check that the basic brake system is operating properly.
  - If the basic brake system is not operating properly, refer to the GROUP 35A, Basic Brake System Diagnosis P.35A-6.
  - If the basic brake system is operating properly, refer to P.35B-88.
6. If there is an ABS DTC, record the number of the DTC, then erase the DTC from the memory using the scan tool.
7. Duplicate the ABS DTC set conditions to see if the same ABS DTC will set again.
  - If the same ABS DTC sets again, perform the diagnostic procedures for the DTC. Refer to P.35B-8.
  - If you cannot get the same ABS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

## TROUBLE CODE DIAGNOSIS

M1352011200723

### RETRIEVING ABS DIAGNOSTIC TROUBLE CODES

#### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

#### **CAUTION**

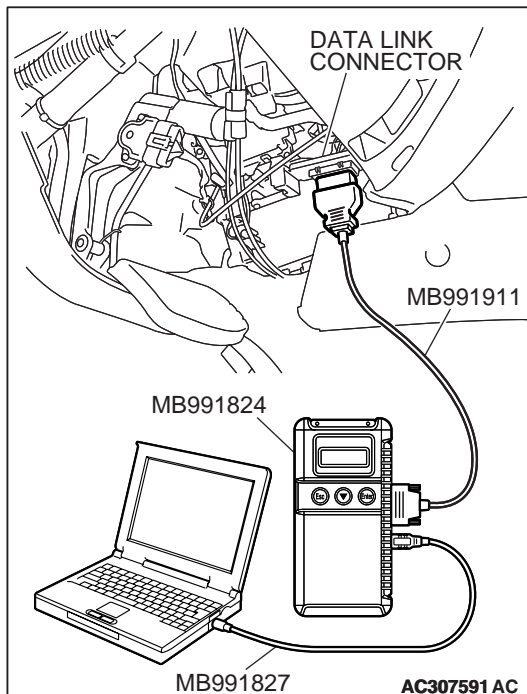
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991911 to special tool MB991824.
5. Connect special tool MB991911 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

*NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.*

7. Start the MUT-III system on the personal computer.

*NOTE: Disconnecting scan tool MB991958 is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.*



## ERASING ABS DIAGNOSTIC TROUBLE CODES

### Required Special Tools:

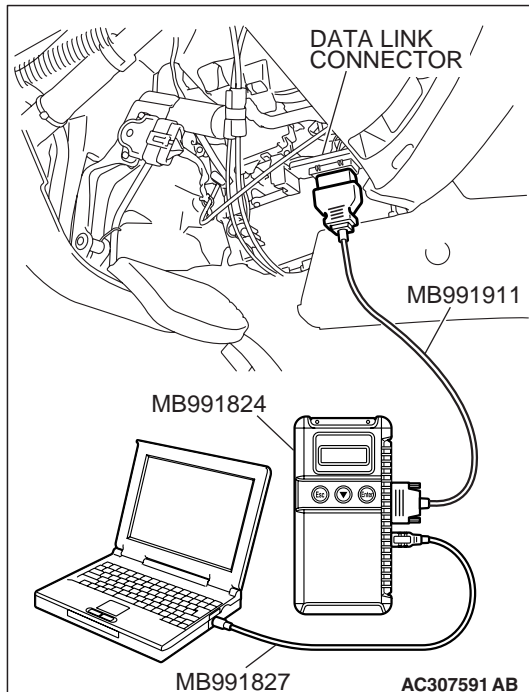
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

### **⚠ CAUTION**

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

*NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.*

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System Select."
5. Choose "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Diagnostic Trouble Code."
8. If a DTC is set, it is shown.
9. Choose "DTC erase" to erase the DTC.



## HOW TO READ DATA LIST

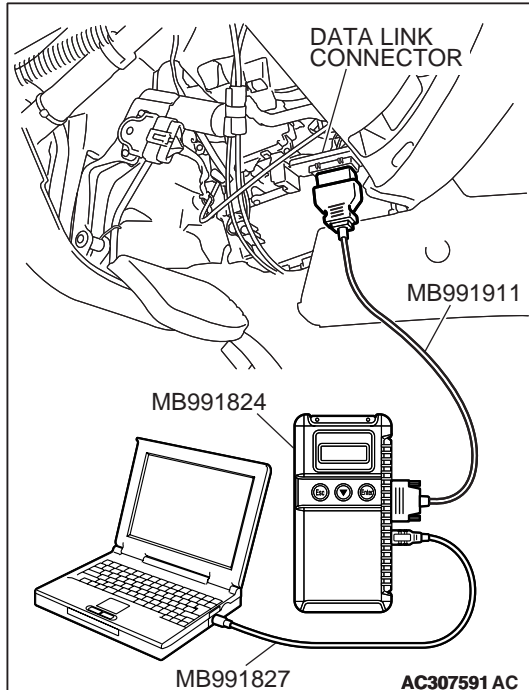
## Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
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  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

**⚠ CAUTION**

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

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.



## HOW TO PERFORM ACTUATOR TEST

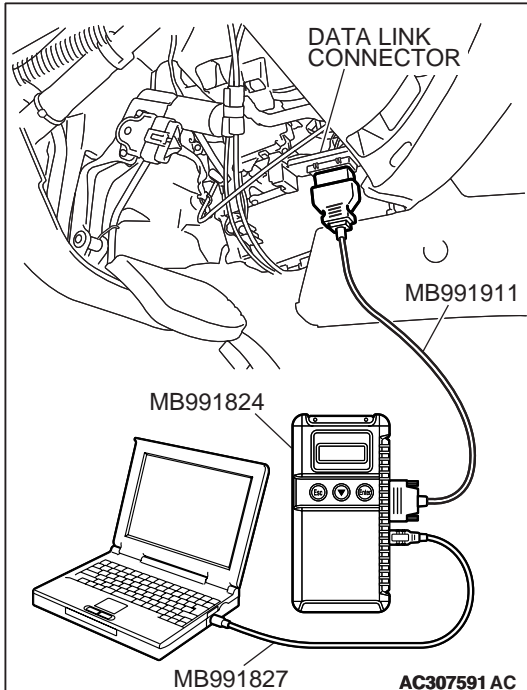
### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

### **⚠ CAUTION**

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

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "ABS" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.



**DIAGNOSTIC TROUBLE CODE CHART**

Follow the inspection chart that is appropriate for the diagnostic trouble code.

DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
11	Front right ABS sensor	Open circuit or short circuit	<a href="#">P.35B-11</a>
12	Front left ABS sensor		
13	Rear right ABS sensor		
14	Rear left ABS sensor		
16	Battery positive voltage	M-ASTC-ECU power supply voltage is extremely low or high	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-17</a> .
17	Active skid control switch	Abnormal output signal	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-9</a> .
21	Front right ABS sensor		<a href="#">P.35B-23</a>
22	Front left ABS sensor		
23	Rear right ABS sensor		
24	Rear left ABS sensor		
25	The difference diameter tire		<a href="#">P.35B-36</a>
31	Ignition switch (IG2) system	Open circuit	Refer to GROUP 35A, ABS Trouble Code Diagnosis <a href="#">P.35A-19</a> .
33	Stoplight switch system	Open circuit or ON failure	<a href="#">P.35B-41</a>
34	CAN communication system		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-15</a> .
35	PCM (engine) system	Abnormal output signal	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-17</a> .
36	Communication line with PCM (engine)		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-19</a> .
37	PCM (A/T) system	Abnormal output signal	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-17</a> .
38	Communication line with PCM (A/T)		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-19</a> .



<b>DIAGNOSTIC TROUBLE CODE NO.</b>	<b>INSPECTION ITEM</b>	<b>DIAGNOSTIC CONTENT</b>	<b>REFERENCE PAGE</b>
41	Front right control solenoid valve	If there is no response to the solenoid valve drive signal corresponding to each respective item	<a href="#">P.35B-48</a>
42	Front left control solenoid valve		
43	Rear right control solenoid valve		
44	Rear left control solenoid valve		
45	Front right select solenoid valve		
46	Front left select solenoid valve		
47	Active traction control system select solenoid valve		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-21</a> .
48	Active traction control system select solenoid valve		
51	Valve relay system	Short circuit or ON failure	<a href="#">P.35B-63</a>
52	Valve relay system	Open circuit or OFF failure	<a href="#">P.35B-68</a>
53	Pump motor	<ul style="list-style-type: none"> <li>• Seizure of the pump motor*</li> <li>• Abnormality at the current detection circuit of the M-ASTC-ECU</li> </ul>	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-24</a> .
54	Motor relay	Open circuit, short circuit or failure of the motor relay coil	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-32</a> .
55	Pump motor circuit	Pump motor energized abnormally for long period*	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-57</a> .
56	Pressure switch	Open circuit or short circuit	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-70</a> .
57	Accumulator	Accumulator low-pressure abnormality*	Refer to GROUP 35A, HBB Trouble Code Diagnosis <a href="#">P.35A-78</a> .
58	M-ASTC-ECU (Power supply drive circuit)	Pump motor drive circuit in the M-ASTC-ECU abnormality	Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU <a href="#">P.35C-207</a> ).
61	Master cylinder pressure sensor system		<a href="#">P.35B-77</a>
62	G-sensor system	Open circuit or short circuit	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-26</a> .
63	G-sensor system	Abnormal output signal	
64	G-sensor system	G sensor seized	
65	G-sensor system	Trouble in self-diagnosis	
66	Steering wheel sensor system	Trouble in self-diagnosis	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-32</a> .

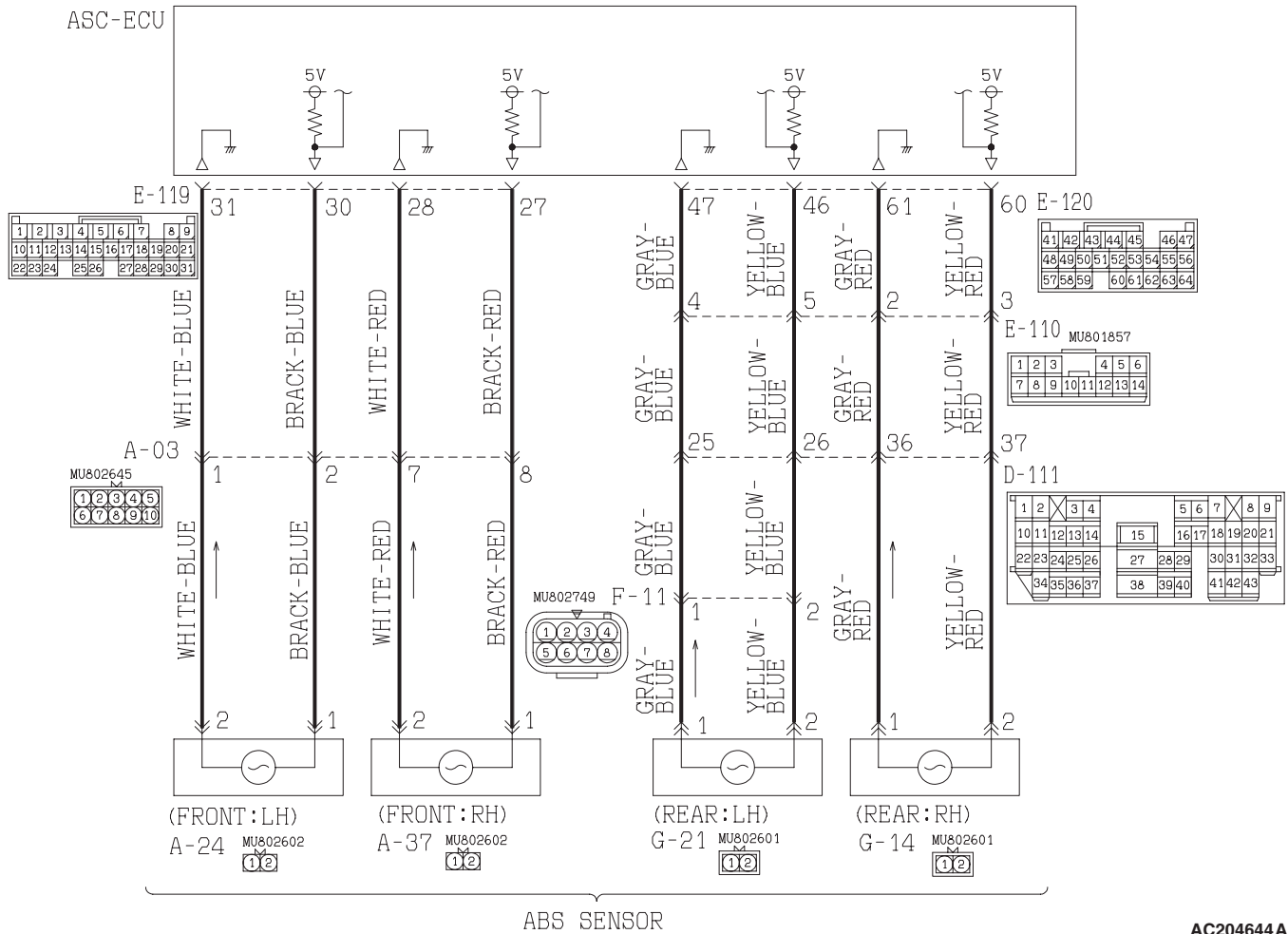
DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
67	Steering wheel sensor system	Trouble in communication line	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-40.</a>
68	Steering wheel sensor system	Abnormal output signal	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-32.</a>
71	Yaw rate sensor system	Trouble in self-diagnosis	Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-26.</a>
72	Yaw rate sensor system	Incorrectly set reference value	
73	Yaw rate sensor system	Abnormal output signal	
74	Abnormal communication of the G and yaw rate sensor		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-47.</a>
75	Center differential lock switch		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-53.</a>
76	G-sensor system		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-26.</a>
77	Yaw rate sensor system		
78	Incorrect PCM fitted		Refer to GROUP 35C, ABS Trouble Code Diagnosis <a href="#">P.35C-17.</a>
81	G sensor not initialized		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-56.</a>
82	Yaw rate sensor not initialized		
83	Steering wheel sensor not initialized		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-32.</a>
84	Transfer switch not initialized		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-57.</a>
85	Master cylinder pressure sensor not initialized		Refer to GROUP 35C, Active skid control system Trouble Code Diagnosis <a href="#">P.35C-58.</a>

*NOTE: If the trouble marked by \* has occurred, the M-ASTC-ECU sounds the buzzer continuously to inform the trouble of the driver and protects the pump motor by activating the pump motor intermittently.*

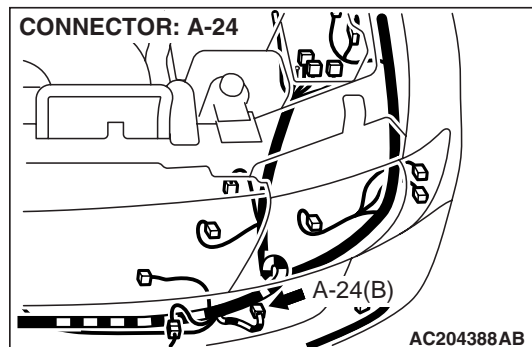
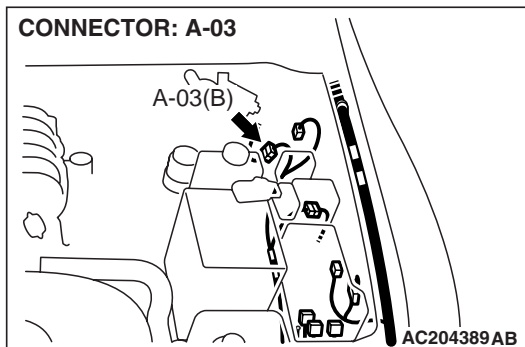
DIAGNOSTIC TROUBLE CODE PROCEDURES

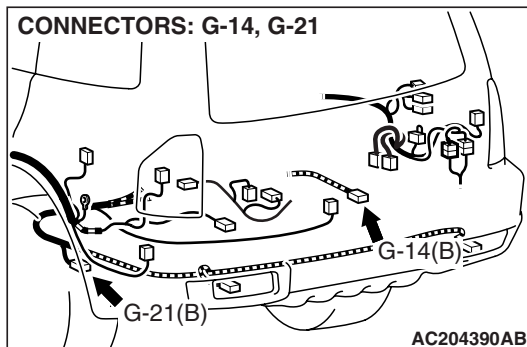
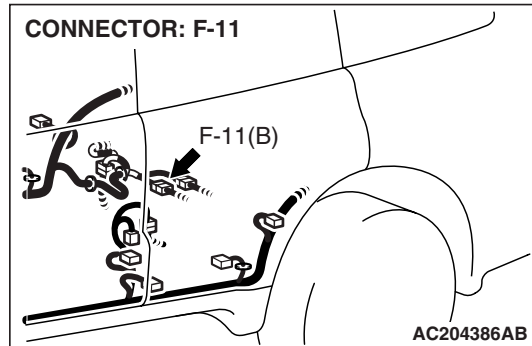
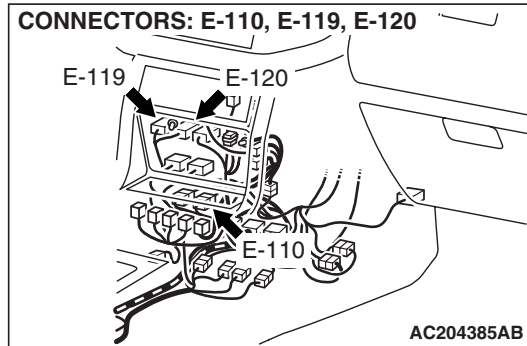
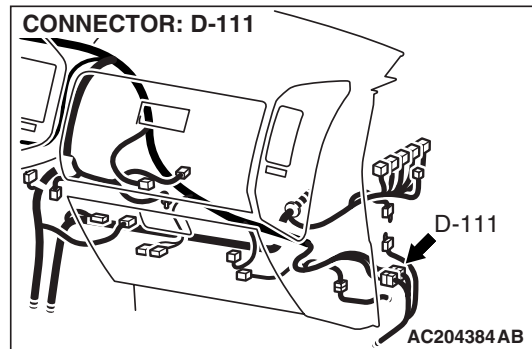
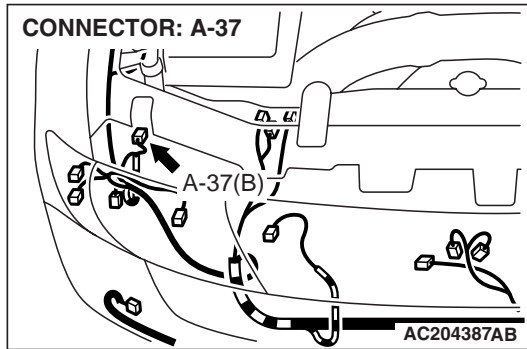
DTC 11, 12, 13, 14: ABS Sensor (Open Circuit or Short Circuit)

ABS Sensor Circuit



AC204644 AB  
W3Q06M0 1AA





### CIRCUIT OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each ABS sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the ABS sensor, and by the speed of rotation.
- The ABS sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the Mitsubishi active skid and traction control system-electronic control unit (M-ASTC-ECU).

- The ABS hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

### ABS DTC SET CONDITIONS

DTCs 11, 12, 13, 14 are output when signal is not input due to breakage of the (+) or (-) wire of one or more of the four ABS sensors.

### TROUBLESHOOTING HINTS

The most likely causes for these DTCs to set are:

- Malfunction of the ABS sensor
- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

**STEP 1. Using scan tool MB991958, check data list.**

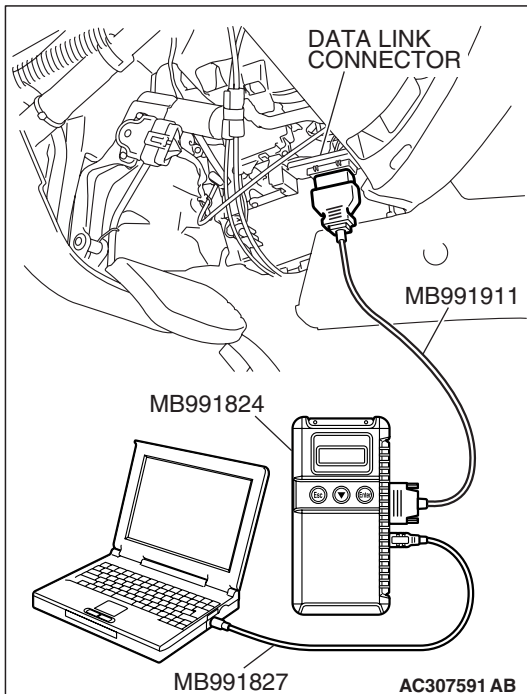
**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991958 to the data reading mode, and check the data list items by driving the vehicle.
  - Item 11 (DTC 11 is set): Front right wheel speed sensor
  - Item 12 (DTC 12 is set): Front left wheel speed sensor
  - Item 13 (DTC 13 is set): Rear right wheel speed sensor
  - Item 14 (DTC 14 is set): Rear left wheel speed sensor
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Does the speedometer indication match the scan tool indication?**

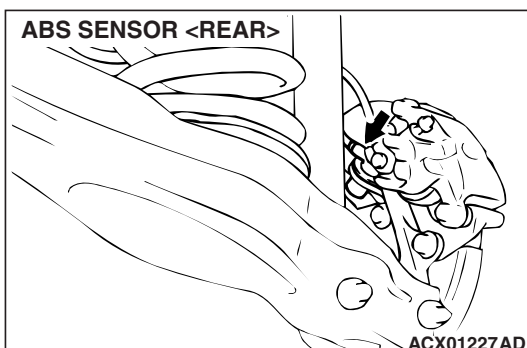
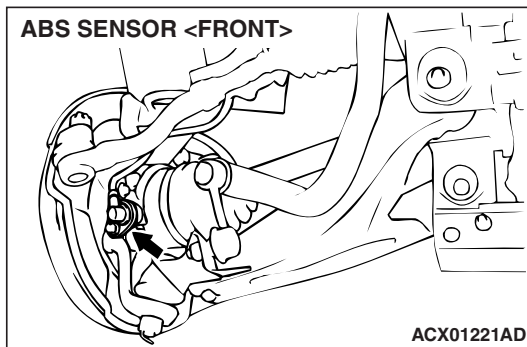
- YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).
- NO :** Go to Step 2.



**STEP 2. Check the ABS sensor installation.**

**Q: Is the ABS sensor bolted securely in place at the front knuckle or the rear knuckle?**

- YES :** Go to Step 3.
- NO :** Install it properly. Refer to [P.35B-134](#). Then go to Step 9.



**STEP 3. Inspect the ABS sensor or ABS rotor.**

Refer to P.35B-135.

**Check items:**

- ABS sensor internal resistance: 1.0 – 1.5 k $\Omega$
- Insulation between the ABS sensor body and the connector terminals
- Toothed ABS rotor check

**Q: Is the ABS sensor or ABS rotor damaged?****YES** : Replace it and then go to Step 9.**NO** : Go to Step 4.**STEP 4. Check ABS sensor circuit at the M-ASTC-ECU connectors E-119 and E-120.**

- (1) Disconnect connectors E-119, E-120 and measure at the harness side.
- (2) Measure the resistance between the M-ASTC-ECU connector E-119 terminals 30 and 31, 27 and 28 or M-ASTC-ECU connector E-120 terminals 46 and 47, 60 and 61.

**Standard Value: 1.0 – 1.5 k $\Omega$** **Q: Is the resistance between M-ASTC-ECU connector E-119 terminals 30 and 31, 27 and 28 or M-ASTC-ECU connector E-120 terminals 46 and 47, 60 and 61 within the standard value?****When resistances between all terminals are within the standard value.** : Go to Step 9.**When resistance between M-ASTC-ECU connector E-119 terminals 30 and 31 is not within the standard value.**

: Go to Step 5.

**When resistance between M-ASTC-ECU connector E-119 terminals 27 and 28 is not within the standard value.**

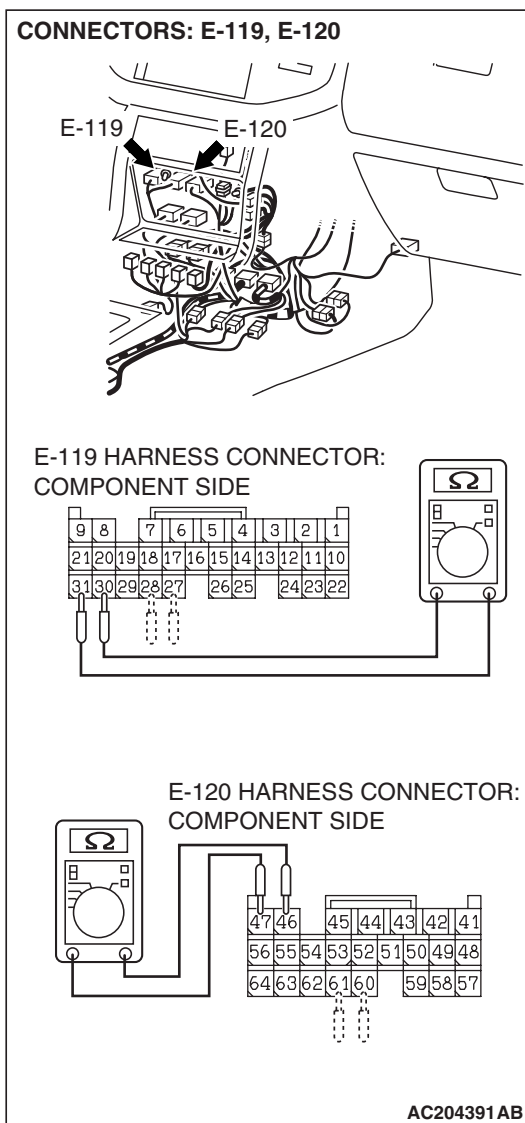
: Go to Step 6.

**When resistance between M-ASTC-ECU connector E-120 terminals 46 and 47 is not within the standard value.**

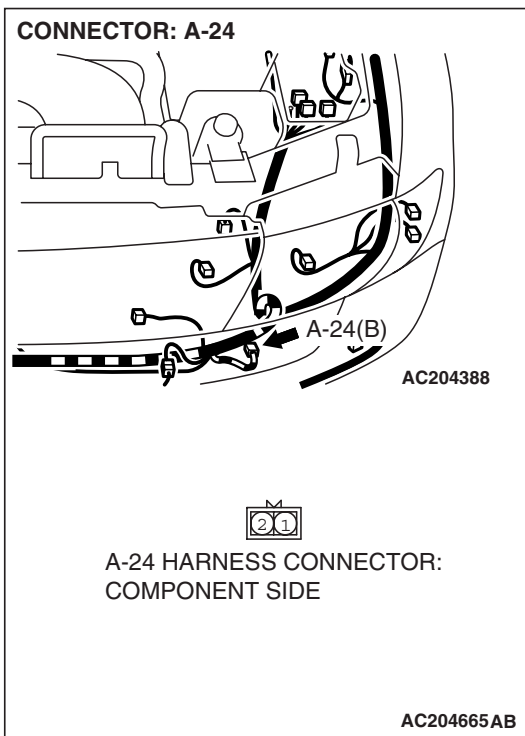
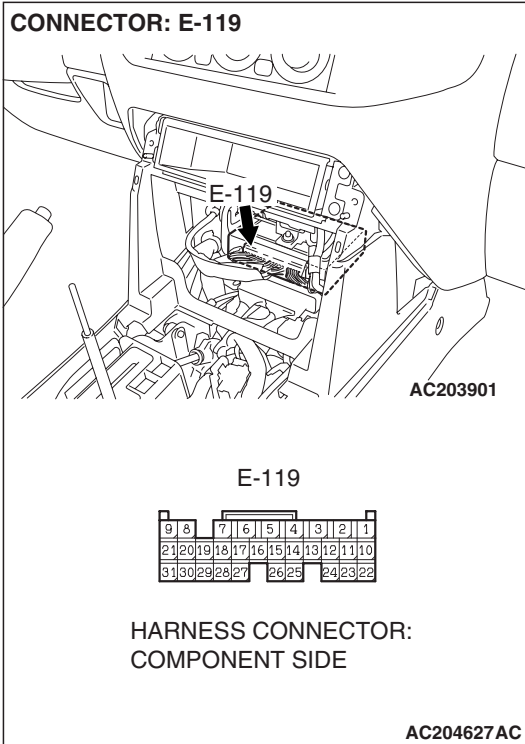
: Go to Step 7.

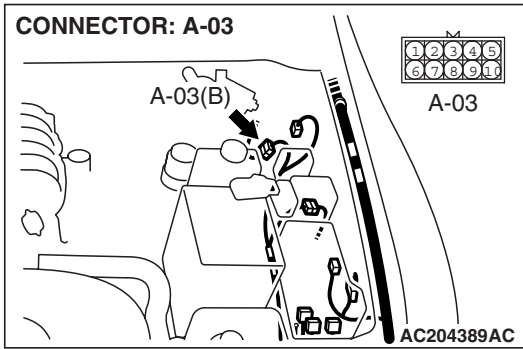
**When resistance between M-ASTC-ECU connector E-120 terminals 60 and 61 is not within the standard value.**

: Go to Step 8.



**STEP 5.** Check the harness wires between M-ASTC-ECU connector E-119 terminal 30 and ABS sensor <front: LH> connector A-24 terminal 1 or M-ASTC-ECU connector E-119 terminal 31 and ABS sensor <front: LH> connector A-24 terminal 2.





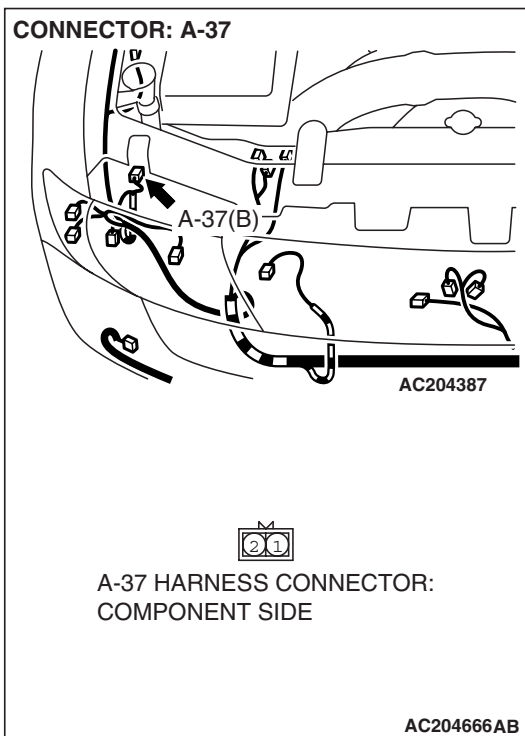
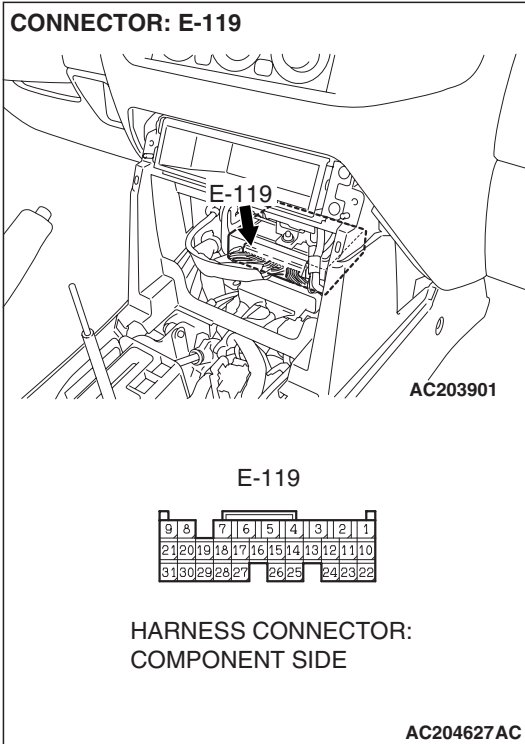
**NOTE:** Q: Is the harness wire between M-ASTC-ECU connector E-119 terminal 30 and ABS sensor <front: LH> connector A-24 terminal 1 or M-ASTC-ECU connector E-119 terminal 31 and ABS sensor <front: LH> connector A-24 terminal 2 damaged?

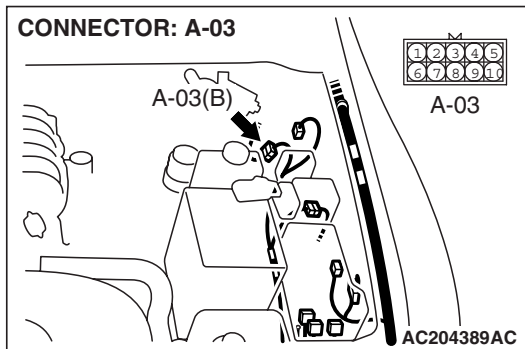
**YES :** Repair it and go to Step 9.

**NO :** Go to Step 9.



**STEP 6.** Check the harness wires between M-ASTC-ECU connector E-119 terminal 27 and ABS sensor <front: RH> connector A-37 terminal 1 or M-ASTC-ECU connector E-119 terminal 28 and ABS sensor <front: RH> connector A-37 terminal 2.





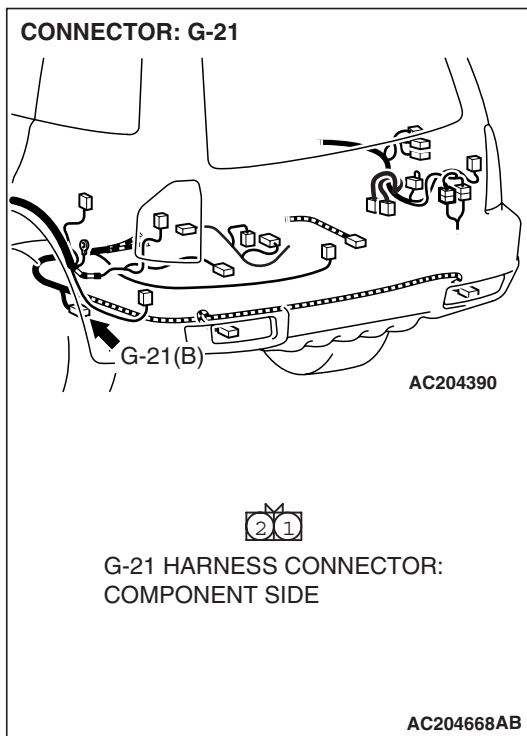
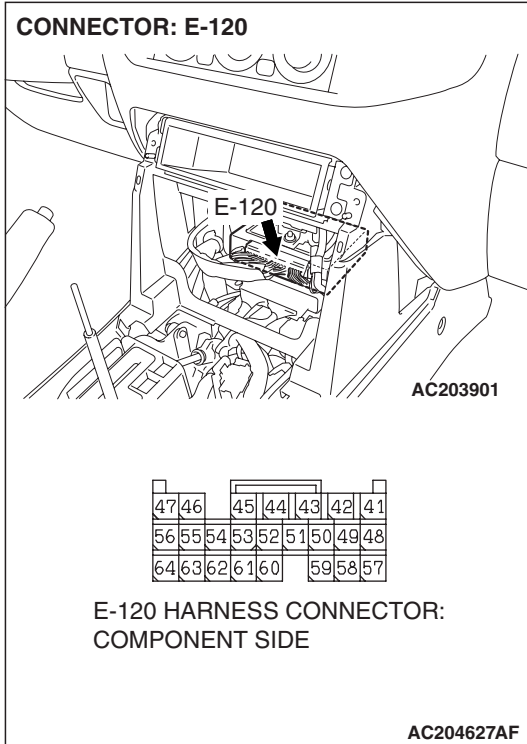
**NOTE:** After inspecting M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: RH> connector A-37, inspect the wire. If M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: RH> connector A-37 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 9.

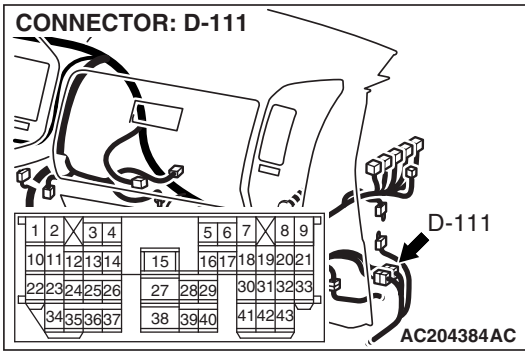
**Q: Is the harness wire between M-ASTC-ECU connector E-119 terminal 27 and ABS sensor <front: RH> connector A-37 terminal 1 or M-ASTC-ECU connector E-119 terminal 28 and ABS sensor <front: RH> connector A-37 terminal 2 damaged?**

**YES :** Repair it and then go to Step 9.

**NO :** Go to Step 9.

**STEP 7.** Check the harness wires between M-ASTC-ECU connector E-120 terminal 46 and ABS sensor <rear: LH> connector G-21 terminal 2 or M-ASTC-ECU connector E-120 terminal 47 and ABS sensor <rear: LH> connector G-21 terminal 1.



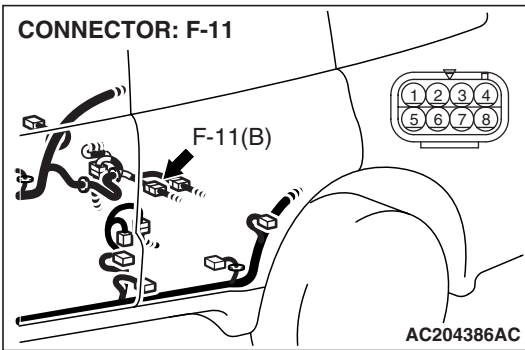
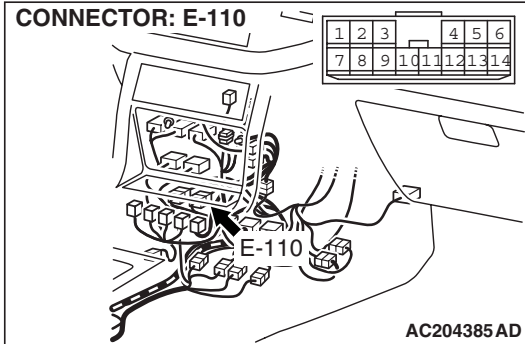


*NOTE:* After inspecting M-ASTC-ECU connector E-120, intermediate connector F-11, D-111, E-110 and ABS sensor <rear: LH> connector G-21, inspect the wire. If M-ASTC-ECU connector E-120, intermediate connector F-11, D-111, E-110 and ABS sensor <rear: LH> connector G-21 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

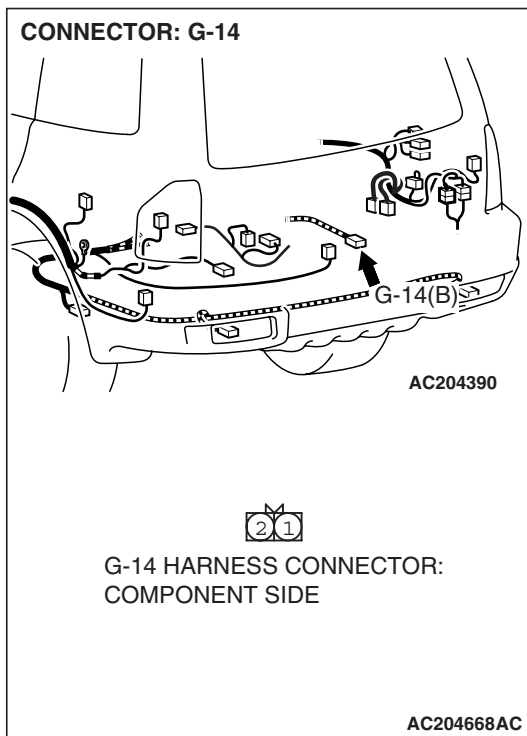
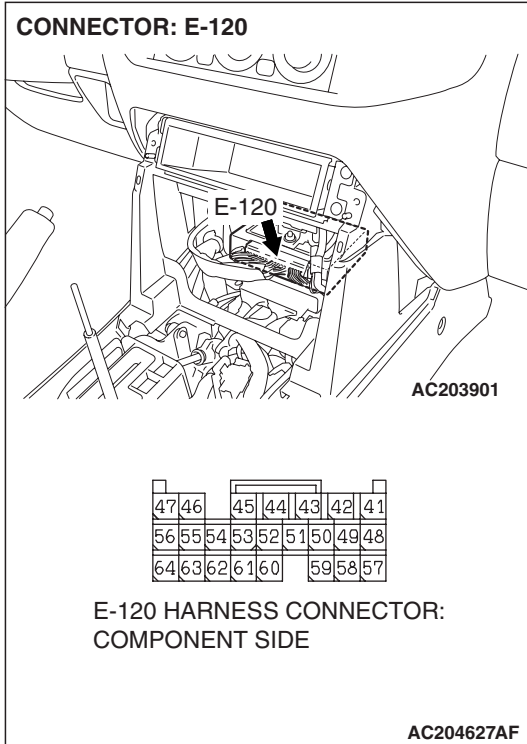
**Q: Is the harness wire between M-ASTC-ECU connector E-120 terminal 46 and ABS sensor <rear: LH> connector G-21 terminal 2 or M-ASTC-ECU connector E-120 terminal 47 and ABS sensor <rear: LH> connector G-21 terminal 1 damaged?**

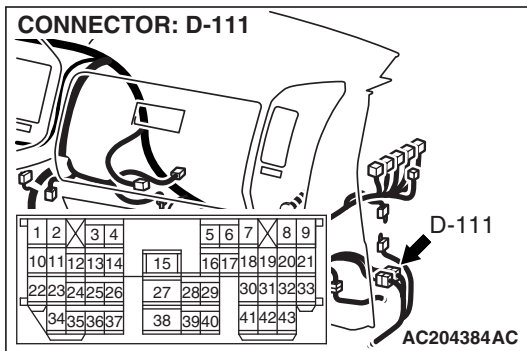
**YES :** Repair it and then go to Step 9.

**NO :** Go to Step 9.



**STEP 8.** Check the harness wires between M-ASTC-ECU connector E-120 terminal 60 and ABS sensor <rear: RH> connector G-14 terminal 2 or M-ASTC-ECU connector E-120 terminal 61 and ABS sensor <rear: RH> connector G-14 terminal 1.



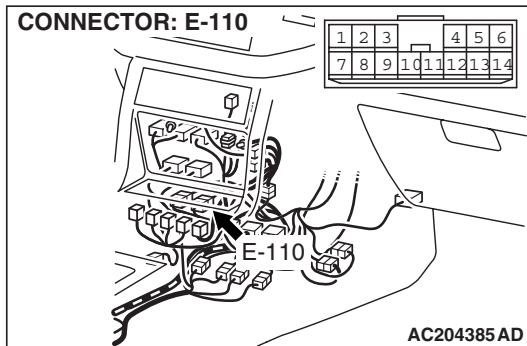


**NOTE:** After inspecting M-ASTC-ECU connector E-120, intermediate connector D-111, E-110 and ABS sensor <rear: RH> connector G-14, inspect the wire. If M-ASTC-ECU connector E-120, intermediate connector E-110, D-111 and ABS sensor <rear: RH> connector G-14 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

**Q: Is the harness wire between M-ASTC-ECU connector E-120 terminal 60 and ABS sensor <rear: RH> connector G-14 terminal 2 or M-ASTC-ECU connector E-120 terminal 61 and ABS sensor <rear: RH> connector G-14 terminal 1 damaged?**

**YES :** Repair it and then go to Step 9.

**NO :** Go to Step 9.



**STEP 9. Recheck for diagnostic trouble code.**

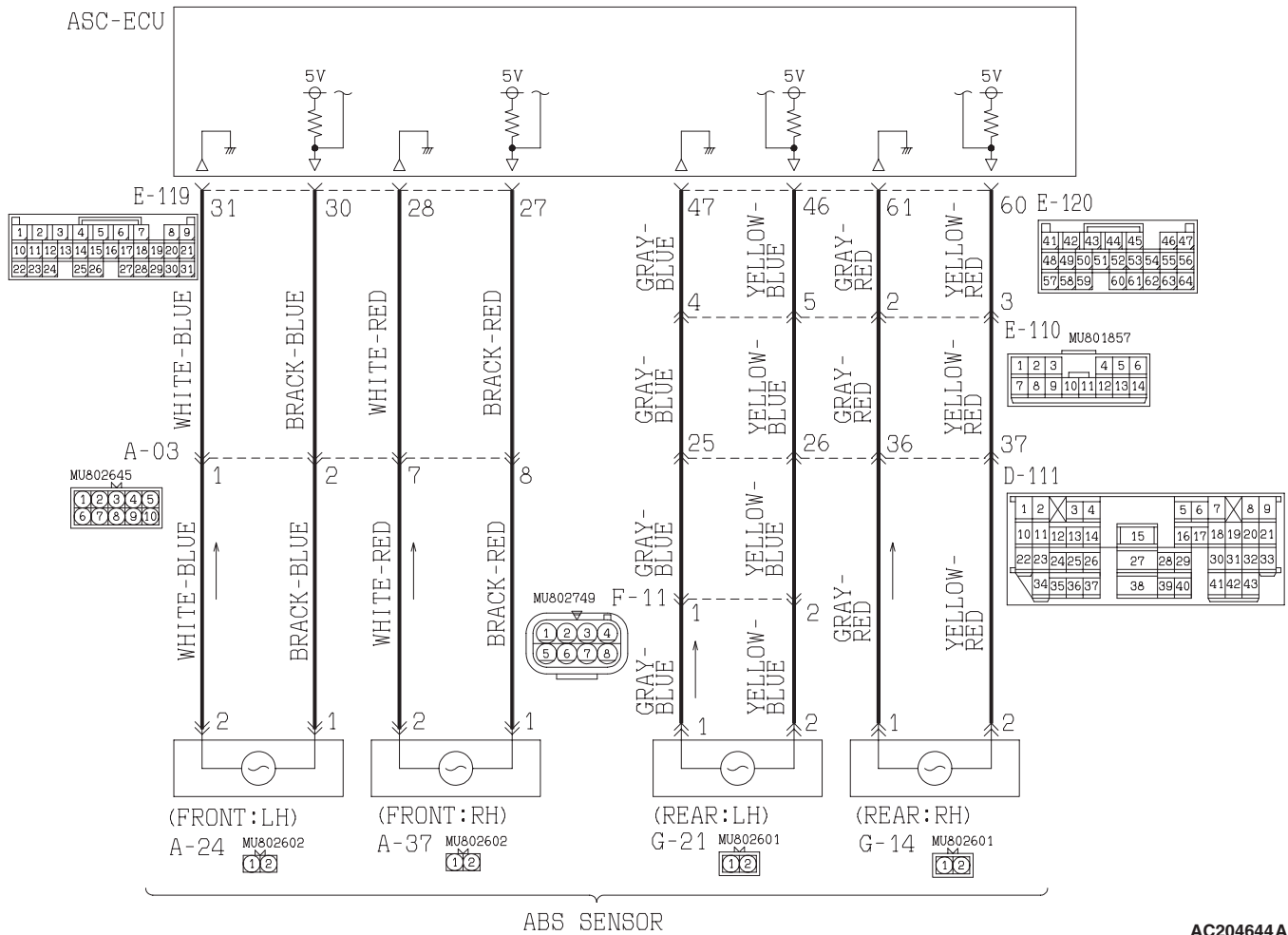
**Q: Do the DTCs 11, 12, 13 or 14 reset?**

**YES :** Go to Step 1.

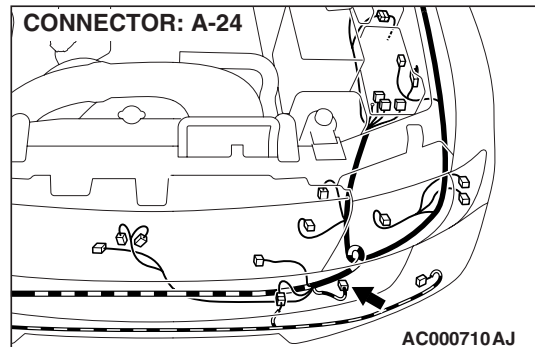
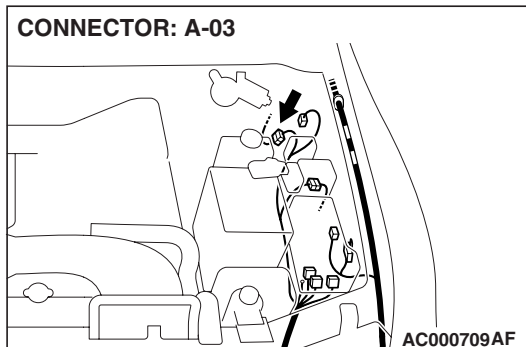
**NO :** The procedure is complete.

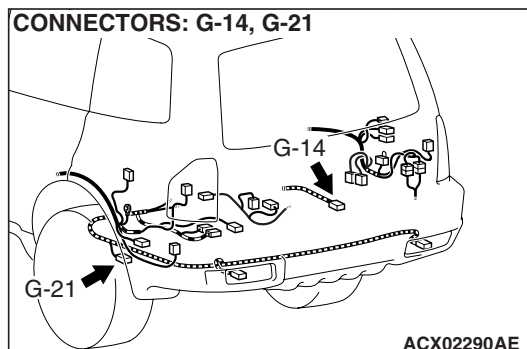
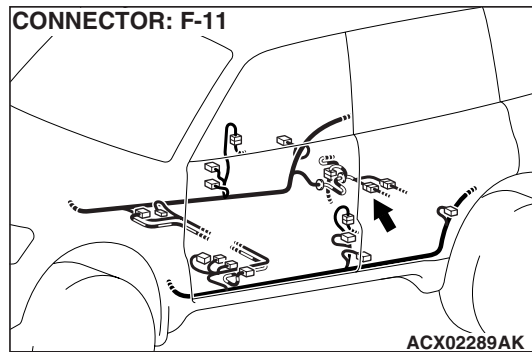
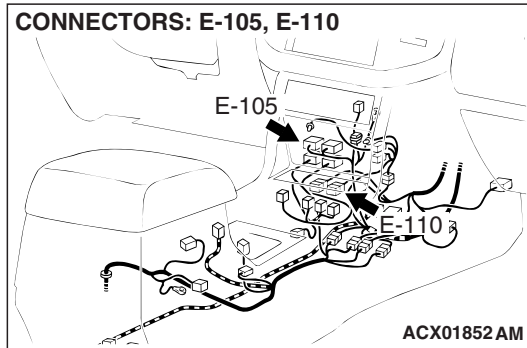
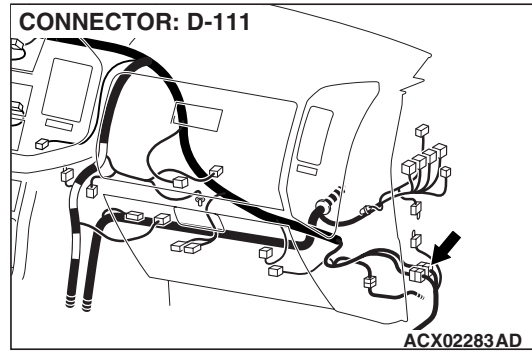
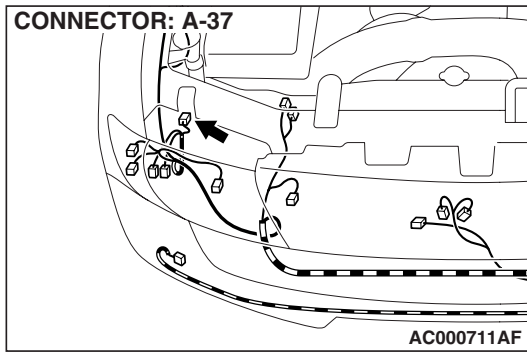
**DTC 21, 22, 23, 24: ABS Sensor**

**ABS Sensor Circuit**



**AC204644 AB**  
W3Q06M0 1AA





### CIRCUIT OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each ABS sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the ABS sensor, and by the speed of rotation.
- The ABS sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the Mitsubishi active skid and traction control system-electronic control unit (M-ASTC-ECU).
- The ABS hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

### ABS DTC SET CONDITIONS

DTCs 21, 22, 23, 24 are output in the following cases:

- Open circuit is not found but no input is received by one or more of the four ABS sensors at 10 km/h (6 mph) or more.
- Sensor output drops due to a malfunctioning sensor or warped ABS rotor.

### TROUBLESHOOTING HINTS

The most likely causes for these DTCs to set are:

- Malfunction of the ABS sensor
- Damaged wiring harness and connector
- Malfunction of the M-ASTC-ECU
- Malfunction of the ABS rotor
- Malfunction of the wheel bearing
- Excessive clearance between the sensor and ABS rotor



DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

STEP 1. Using scan tool MB991958, check data list.

**⚠ CAUTION**

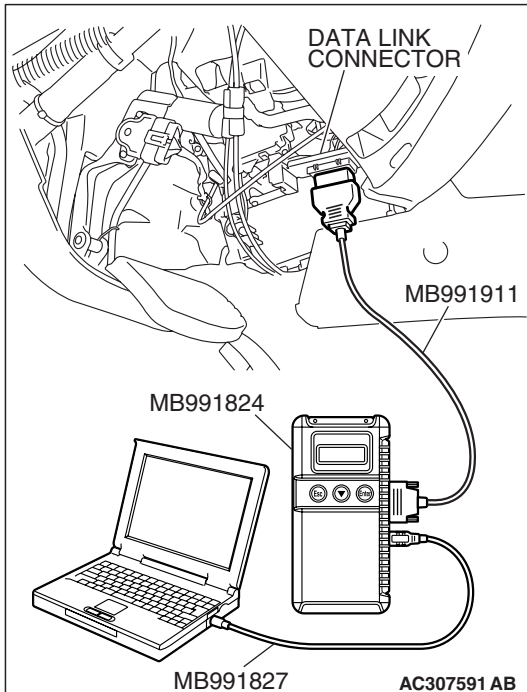
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

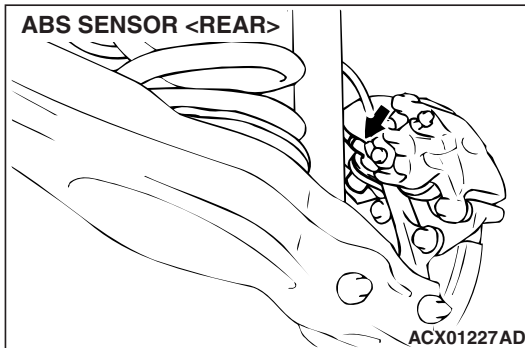
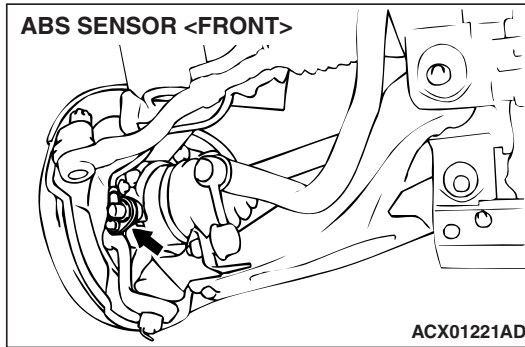
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991958 to the data reading mode, and check the data list items by driving the vehicle.
  - Item 11 (DTC 21 is set): Front right wheel speed sensor
  - Item 12 (DTC 22 is set): Front left wheel speed sensor
  - Item 13 (DTC 23 is set): Rear right wheel speed sensor
  - Item 14 (DTC 24 is set): Rear left wheel speed sensor
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Does the speedometer indication match the scan tool indication?**

**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.00-13](#).

**NO :** Go to Step 2.





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**STEP 2. Check the ABS sensor installation.**

**Q: Is the ABS sensor bolted securely in place at the front knuckle or the rear knuckle?**

**YES :** Go to Step 3.

**NO :** Install it properly. Refer to [P.35B-134](#). Then go to Step 11 .

---

**STEP 3. Inspect the ABS sensor or ABS rotor.**

Refer to [P.35B-135](#).

**Check items:**

- ABS sensor internal resistance: 1.0 – 1.5 k $\Omega$
- Insulation between the ABS sensor body and the connector terminals
- Toothed ABS rotor check

**Q: Is the ABS sensor or ABS rotor damaged?**

**YES :** Replace it and then go to Step 11.

**NO :** Go to Step 4.

**STEP 4. Check ABS sensor circuit at the M-ASTC-ECU connectors E-119 and E-120.**

- (1) Disconnect connectors E-119, E-120 and measure at the harness side.
- (2) Measure the resistance between the M-ASTC-ECU connector E-119 terminals 30 and 31, 27 and 28 or M-ASTC-ECU connector E-120 terminals 46 and 47, 60 and 61.

**Standard Value: 1.0 – 1.5 kΩ**

**Q: Is the resistance between M-ASTC-ECU connector E-119 terminals 30 and 31, 27 and 28 or M-ASTC-ECU connector E-120 terminals 46 and 47, 60 and 61 within the standard value?**

**When resistances between all terminals are within the standard value. : Go to Step 9.**

**When resistance between M-ASTC-ECU connector E-119 terminals 30 and 31 is not within the standard value.**

**: Go to Step 5.**

**When resistance between M-ASTC-ECU connector E-119 terminals 27 and 28 is not within the standard value.**

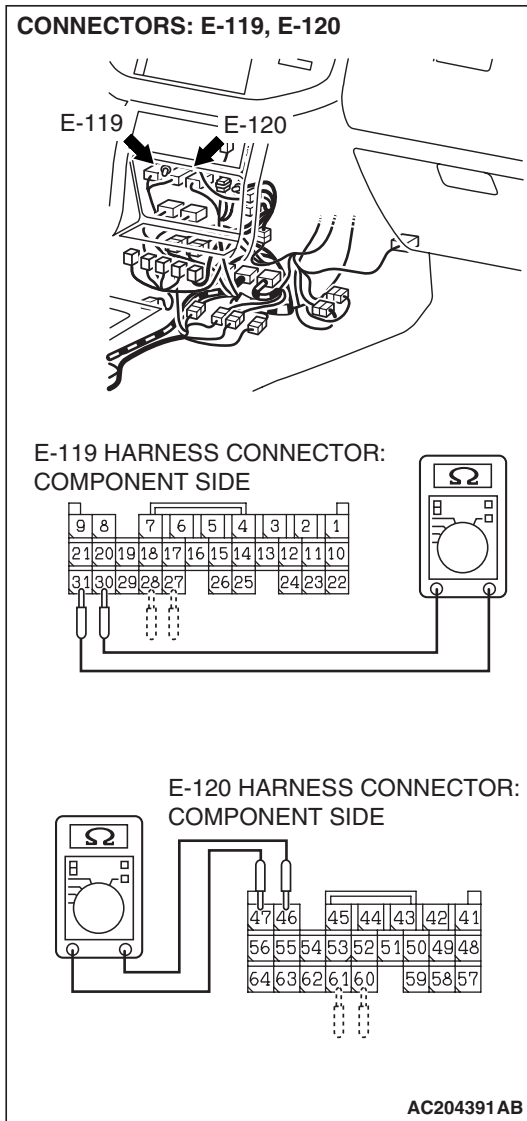
**: Go to Step 6.**

**When resistance between M-ASTC-ECU connector E-120 terminals 46 and 47 is not within the standard value.**

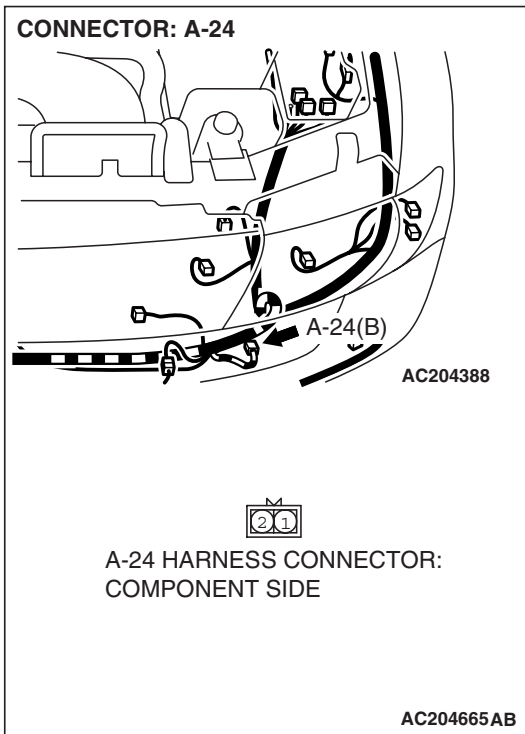
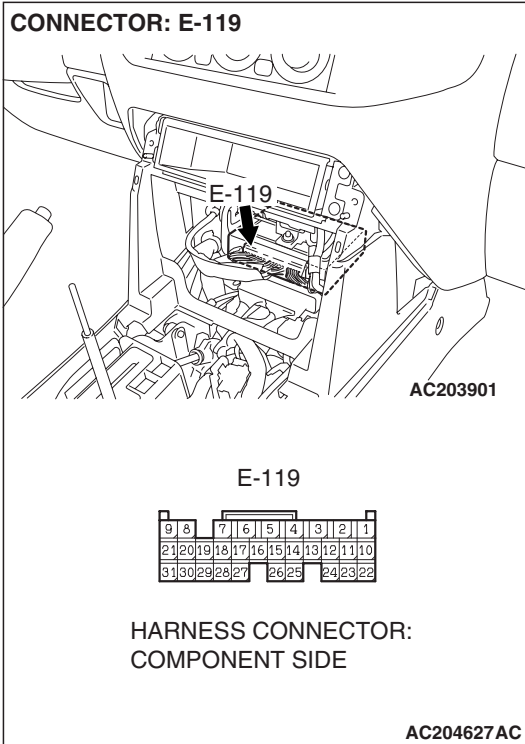
**: Go to Step 7.**

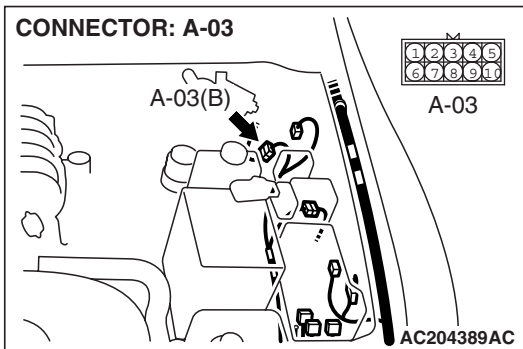
**When resistance between M-ASTC-ECU connector E-120 terminals 60 and 61 is not within the standard value.**

**: Go to Step 8.**



**STEP 5.** Check the harness wires between M-ASTC-ECU connector E-119 terminal 30 and ABS sensor <front: LH> connector A-24 terminal 1 or M-ASTC-ECU connector E-119 terminal 31 and ABS sensor <front: LH> connector A-24 terminal 2.





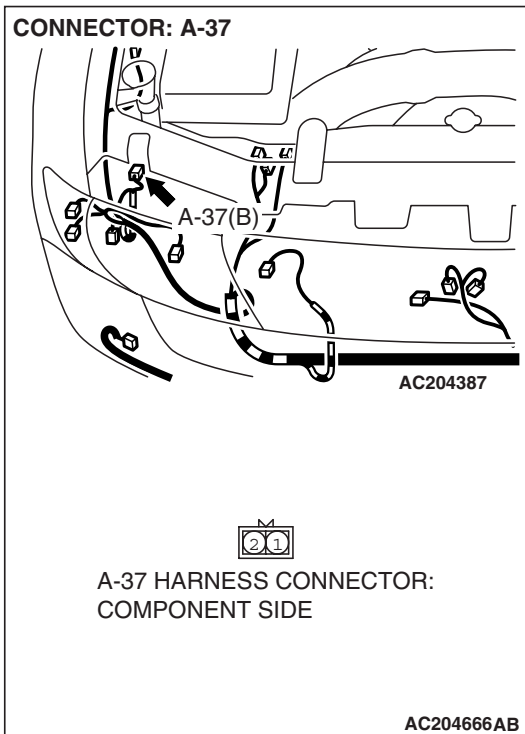
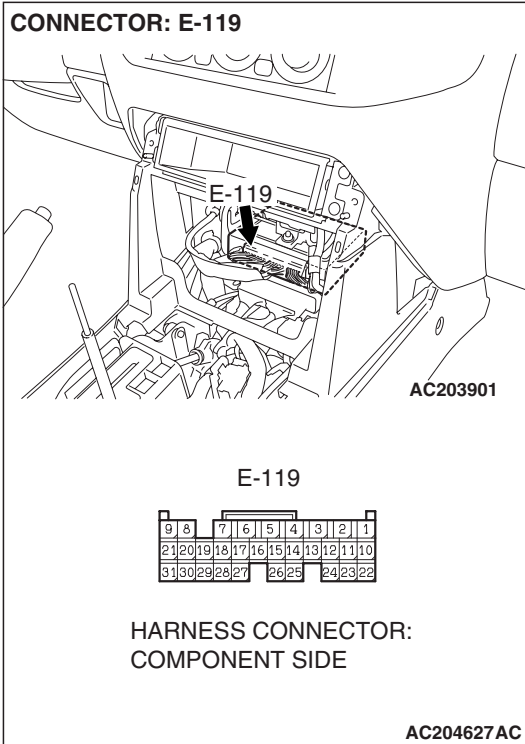
*NOTE:* After inspecting M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: LH> connector A-24, inspect the wire. If M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: LH> connector A-24 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

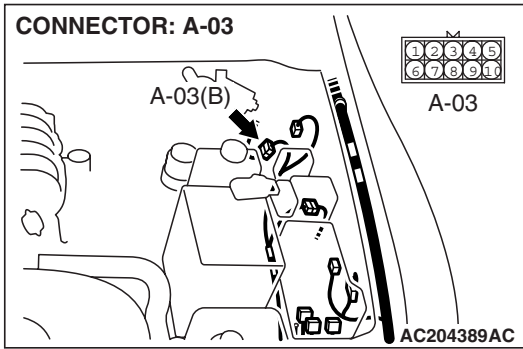
**Q: Is the harness wire between M-ASTC-ECU connector E-119 terminal 30 and ABS sensor <front: LH> connector A-24 terminal 1 or M-ASTC-ECU connector E-119 terminal 31 and ABS sensor <front: LH> connector A-24 terminal 2 damaged?**

**YES :** Repair it and go to Step 11.

**NO :** Go to Step 11.

**STEP 6.** Check the harness wires between M-ASTC-ECU connector E-119 terminal 27 and ABS sensor <front: RH> connector A-37 terminal 1 or M-ASTC-ECU connector E-119 terminal 28 and ABS sensor <front: RH> connector A-37 terminal 2.





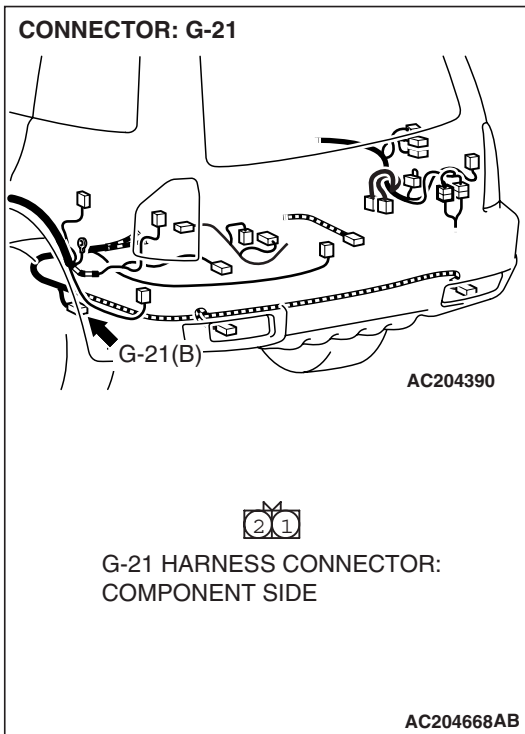
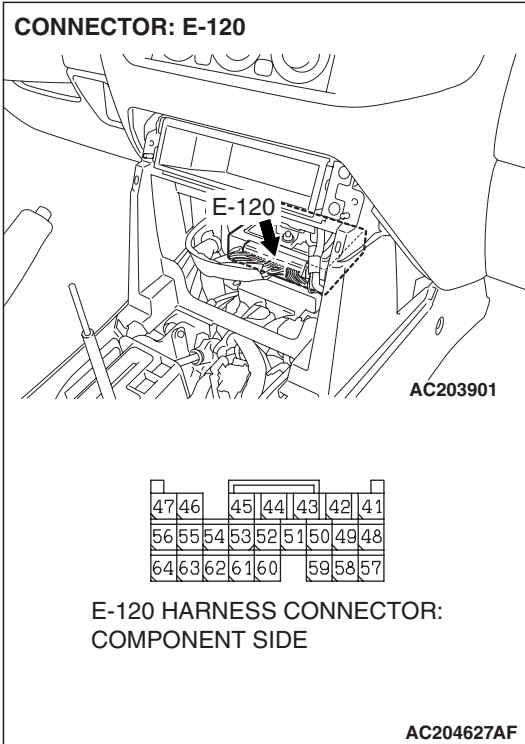
**NOTE:** After inspecting M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: RH> connector A-37, inspect the wire. If M-ASTC-ECU connector E-119, intermediate connector A-03 and ABS sensor <front: RH> connector A-37 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

**Q: Is the harness wire between M-ASTC-ECU connector E-119 terminal 27 and ABS sensor <front: RH> connector A-37 terminal 1 or M-ASTC-ECU connector E-119 terminal 28 and ABS sensor <front: RH> connector A-37 terminal 2 damaged?**

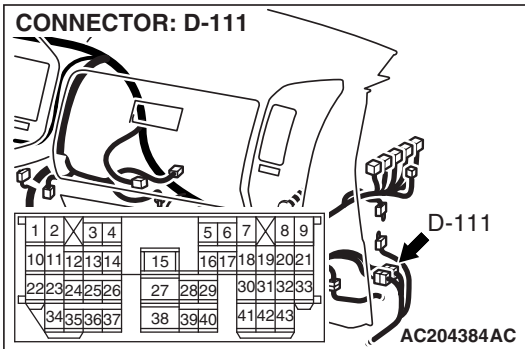
**YES :** Repair it and then go to Step 11.

**NO :** Go to Step 11.

**STEP 7.** Check the harness wires between M-ASTC-ECU connector E-120 terminal 46 and ABS sensor <rear: LH> connector G-21 terminal 2 or M-ASTC-ECU connector E-120 terminal 47 and ABS sensor <rear: LH> connector G-21 terminal 1.





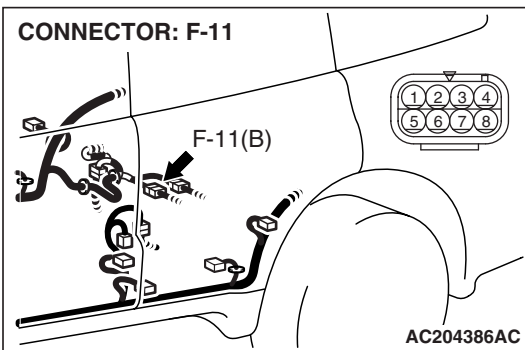
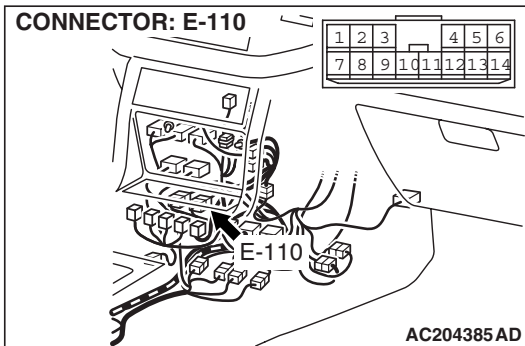


*NOTE:* After inspecting M-ASTC-ECU connector E-120, intermediate connector F-11, D-111, E-110 and ABS sensor <rear: LH> connector G-21, inspect the wire. If M-ASTC-ECU connector E-120, intermediate connector F-11, D-111, E-110 and ABS sensor <rear: LH> connector G-21 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

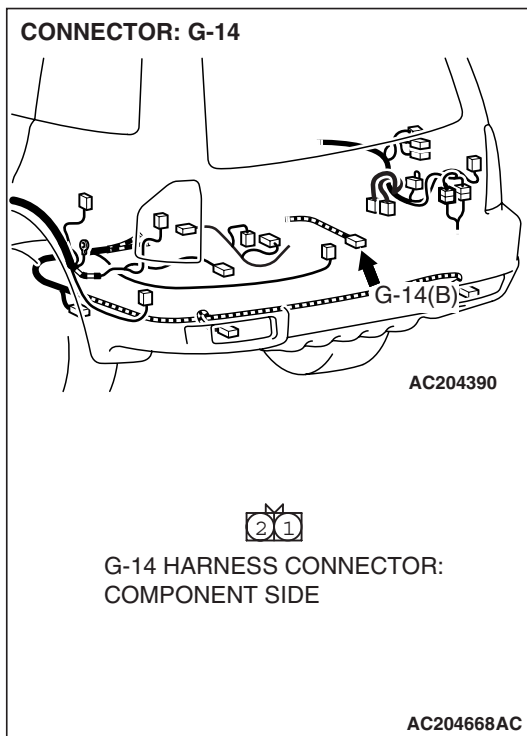
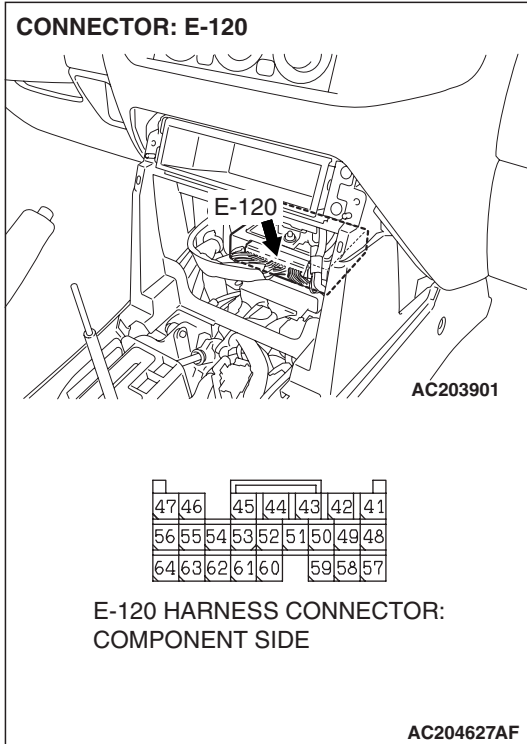
**Q:** Is the harness wire between M-ASTC-ECU connector E-120 terminal 46 and ABS sensor <rear: LH> connector G-21 terminal 2 or M-ASTC-ECU connector E-120 terminal 47 and ABS sensor <rear: LH> connector G-21 terminal 1 damaged?

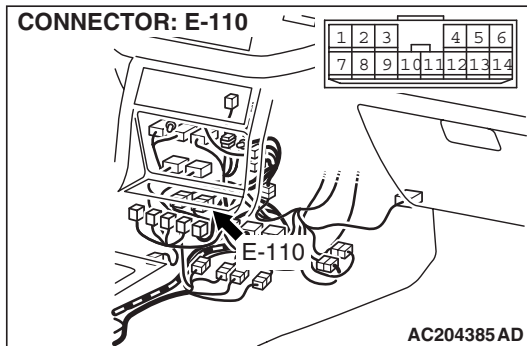
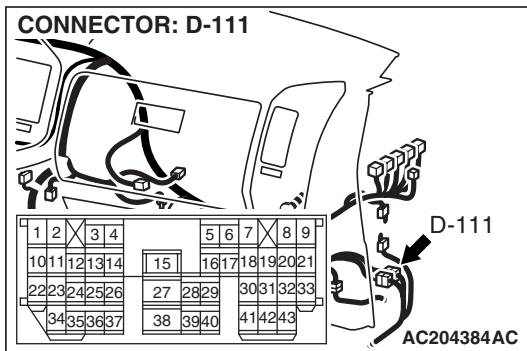
**YES :** Repair it and then go to Step 11.

**NO :** Go to Step 11.



**STEP 8.** Check the harness wires between M-ASTC-ECU connector E-120 terminal 60 and ABS sensor <rear: RH> connector G-14 terminal 2 or M-ASTC-ECU connector E-120 terminal 61 and ABS sensor <rear: RH> connector G-14 terminal 1.





**NOTE:** After inspecting M-ASTC-ECU connector E-120, intermediate connector D-111, E-110 and ABS sensor <rear: RH> connector G-14, inspect the wire. If M-ASTC-ECU connector E-120, intermediate connector E-110, D-111 and ABS sensor <rear: RH> connector G-14 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 11.

**Q: Is the harness wire between M-ASTC-ECU connector E-120 terminal 60 and ABS sensor <rear: RH> connector G-14 terminal 2 or M-ASTC-ECU connector E-120 terminal 61 and ABS sensor <rear: RH> connector G-14 terminal 1 damaged?**

**YES :** Repair it and then go to Step 11.

**NO :** Go to Step 11.

---

**STEP 9. Check the ABS sensor output voltage.**

Refer to [P.35B-128](#).

**Output Voltage:**

- When measured with a voltmeter: 42 mV or more
- When measured with oscilloscope (maximum voltage): 200 mV or more

**Q: Does the voltage meet the specification?**

**YES :** Replace the M-ASTC-ECU and then go to Step 11.

**NO :** Go to Step 10.

---

**STEP 10. Check the wheel bearing.**

Refer to GROUP 26, On-vehicle Service-Wheel Bearing Play Check <Front>[P.26-14](#) or GROUP 27, On-vehicle Service-Wheel Bearing Play Check <Rear>[P.27-13](#) . If play on the ball bearing is not within the standard value, replace the ball bearing.

**Limit Value: 0 mm (0 inch)**

**Q: Is play on the ball bearing within the standard value?**

**YES :** Go to Step 11.

**NO :** Replace it and then go to Step 11.

---

**STEP 11. Recheck for diagnostic trouble code.**

**Q: Do the DTCs 21, 22, 23 or 24 reset?**

**YES :** Go to Step 1.

**NO :** The procedure is complete.

---

**DTC 25: The Difference Diameter Tire**

---

**ABS DTC SET CONDITIONS**

DTC 25 will be set when no ABS sensor DTC is set, slowest road wheel speed is 30 km/h (19 mph) or more, and any ABS sensor output signal indicates 1.2 times faster speed than the slowest road wheel.

**TROUBLESHOOTING HINTS**

The most likely causes for these DTCs to set are:

- Too high or low tire inflation pressure
- Incorrect tire size
- Flat tire
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

---

**STEP 1. Check the tires**

- (1) Check that all four tires are the same size.
- (2) Check the inflation pressures of all the four tires. Refer to GROUP 31, On-vehicle Service [P.31-85](#).

**Q: Are the tires in good condition?**

**YES** : Replace the M-ASTC-ECU, and then go to Step 2.

**NO** : Replace with a correct size tire or adjust the tire inflation pressure as necessary. Then go to Step 2.

---

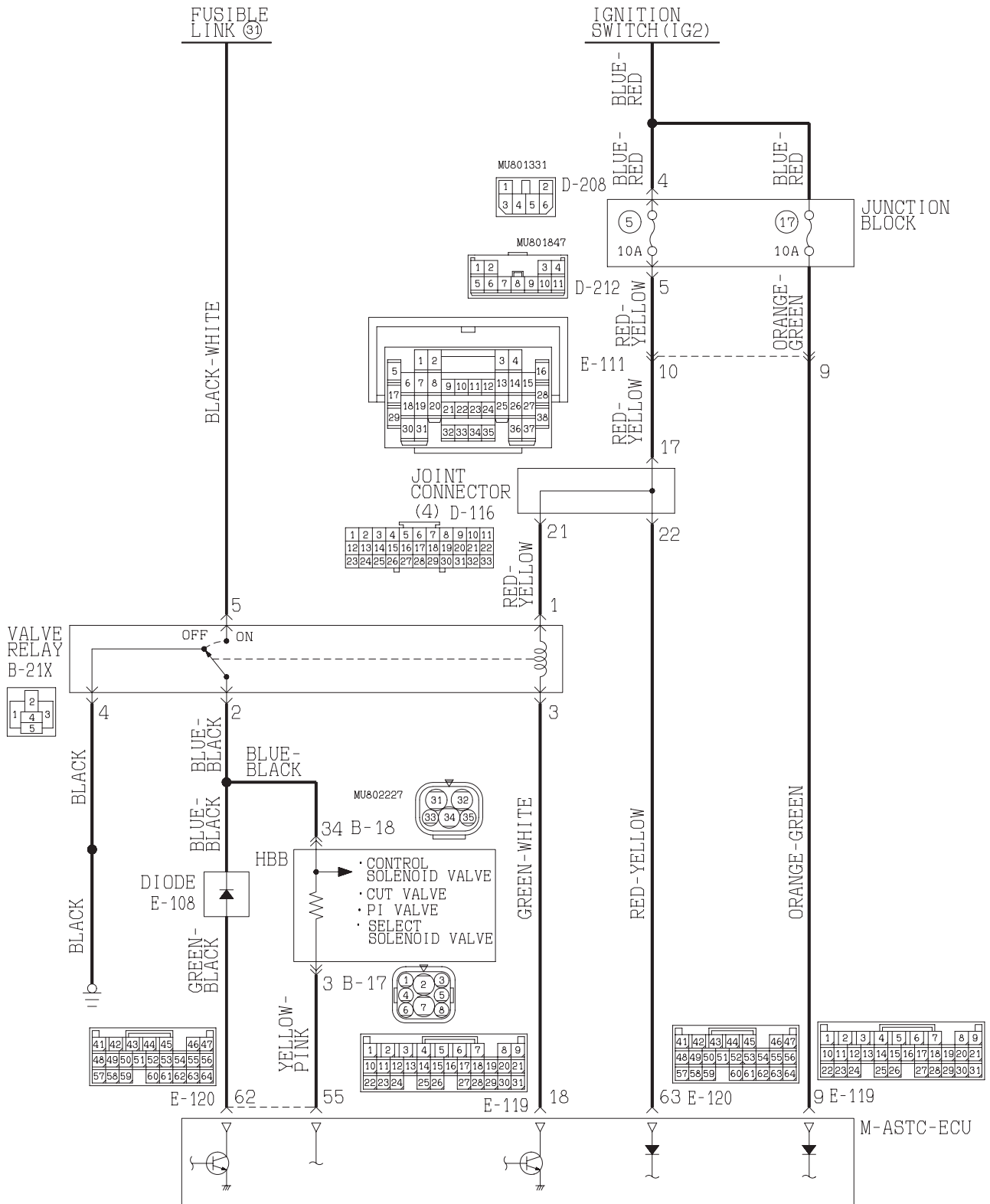
**STEP 2. Recheck for diagnostic trouble code.****Q: Do the DTC 25 reset?**

**YES** : Start over at Step 1.

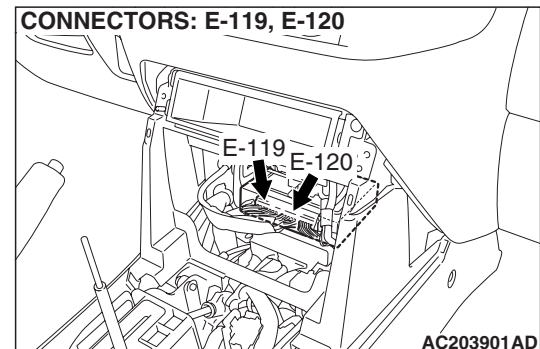
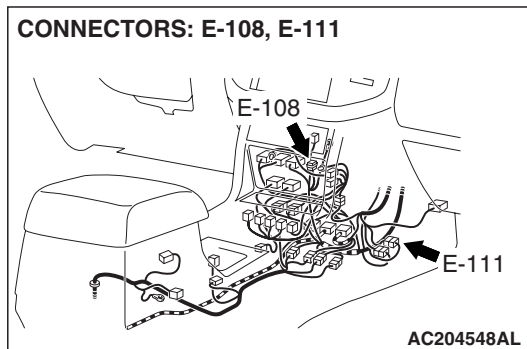
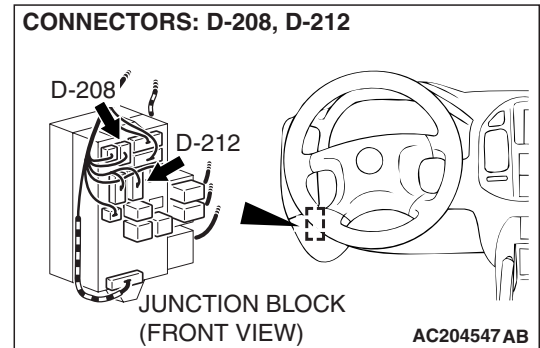
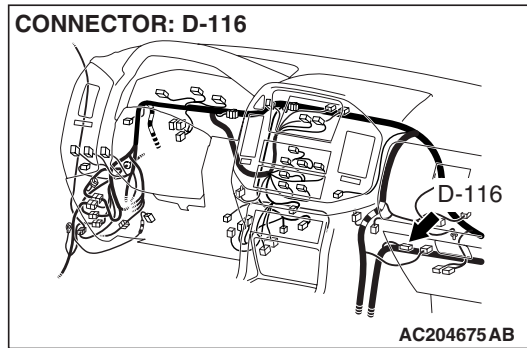
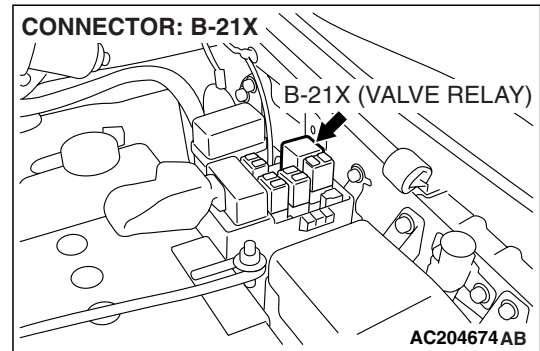
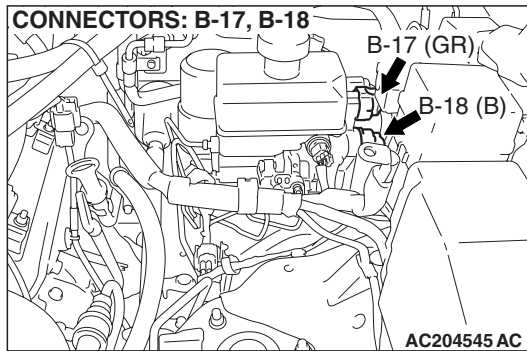
**NO** : The procedure is complete.

DTC 31: Ignition switch (IG2) (Open Circuit)

M-ASTC-ECU Power Supply Circuit



W3Q06M02AA  
AC204645AB



### CIRCUIT OPERATION

- The M-ASTC-ECU has two power supply lines. The M-ASTC-ECU power is supplied to the M-ASTC-ECU (terminal 63) from the ignition switch (IG2) through the multi-purpose fuse number 5 in the junction block and through the joint connector number 4. The other M-ASTC-ECU power is supplied to the M-ASTC-ECU (terminal 9) from the ignition switch (IG2) through the multi-purpose fuse number 17 in the junction block.
- If the ignition switch is turned to the "ON" position, the M-ASTC-ECU turns on the valve relay, and monitors the power supply voltage to the valve relay at terminal 55.

### ABS DTC SET CONDITIONS

M-ASTC-ECU always monitors the ignition switch (IG2). DTC 31 is set when the M-ASTC-ECU detects an open circuit for approximately four seconds with the ignition switch at the "ON" position.

### TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

**STEP 1. Using scan tool MB991958, read the diagnosis trouble code.**

**⚠ CAUTION**

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

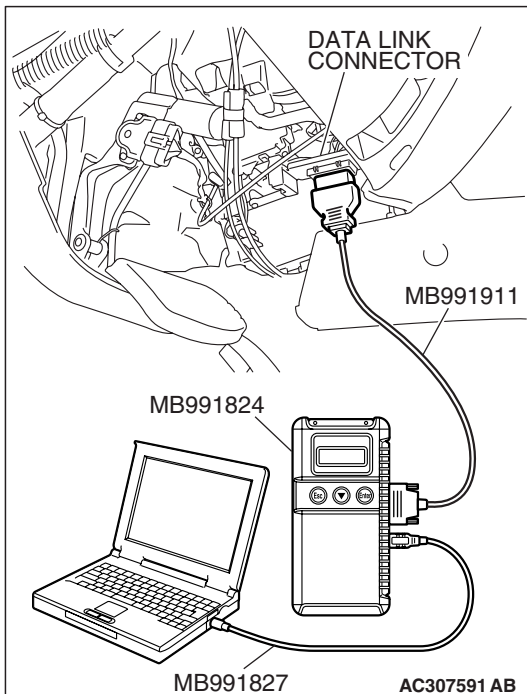
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the ABS DTC.

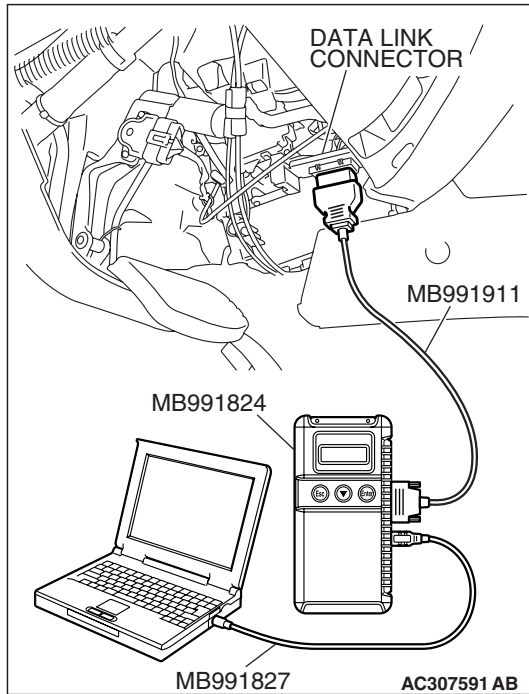
**Q: Is ABS DTC 52 set?**

**YES :** Carry out the troubleshooting regarding DTC 52.

Refer to [P.35B-68](#).

**NO :** Go to Step 2.





**STEP 2. Using scan tool MB991958, read the HBB diagnosis trouble code.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the HBB DTC.

**Q: Is HBB DTC 16 set?**

**YES :** Carry out the troubleshooting regarding HBB. Refer to GROUP 35A, HBB Diagnosis P.35A-17.

**NO :** Go to Step 3.

**STEP 3. Check the battery.**

Refer to GROUP 54A, Battery – On-vehicle Service – Battery Testing Procedure P.54A-6.

**Q: Is the battery damaged?**

**YES :** Charge or replace the battery and then go to Step 5.

**NO :** Go to Step 4.

**STEP 4. Check the charging system.**

Refer to GROUP 16, Charging System – Diagnosis P.16-3.

**Q: Is the charging system damaged?**

**YES :** Repair the Charging System and then go to Step 5.

**NO :** Replace the M-ASTC-ECU and then go to Step 5.

**STEP 5. Recheck for diagnostic trouble code.**

**Q: Does DTC 16 reset?**

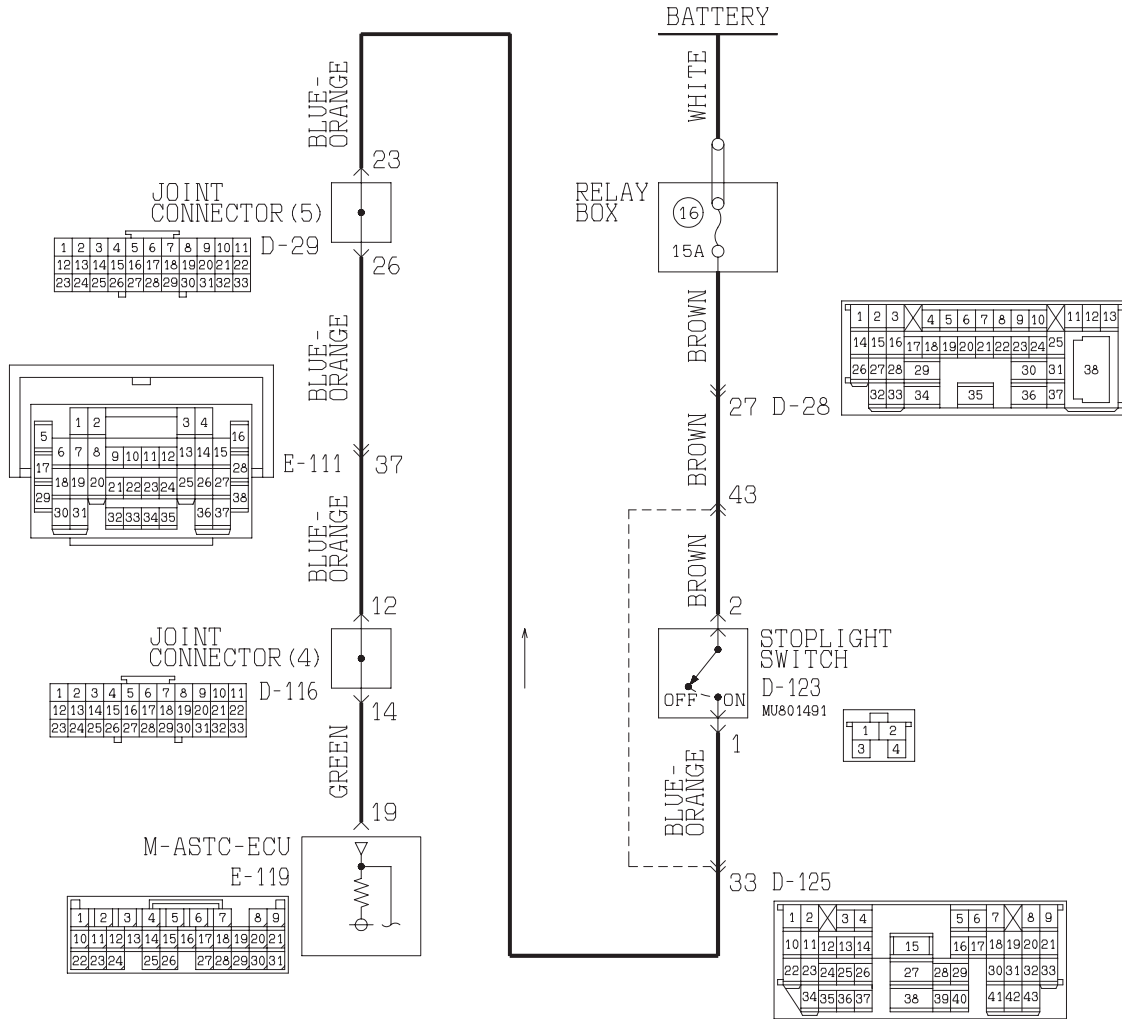
**YES :** Start over at Step 1.

**NO :** The procedure is complete.

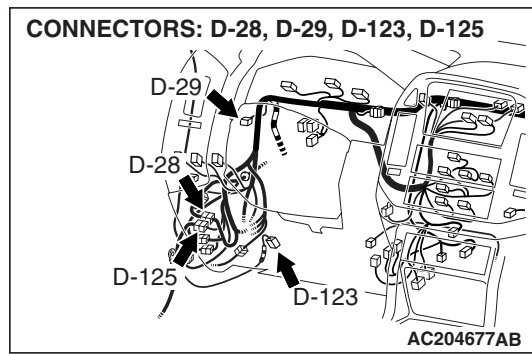
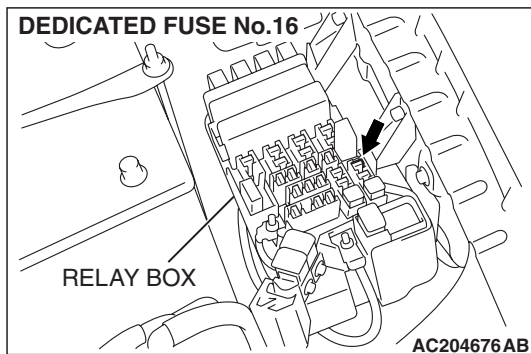


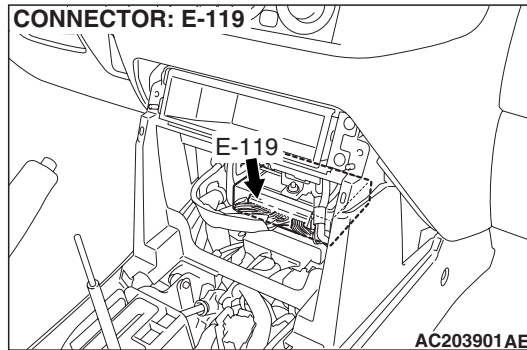
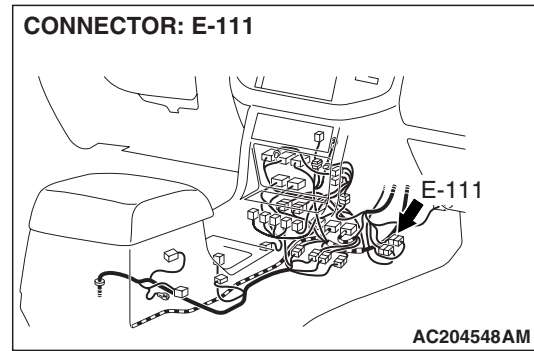
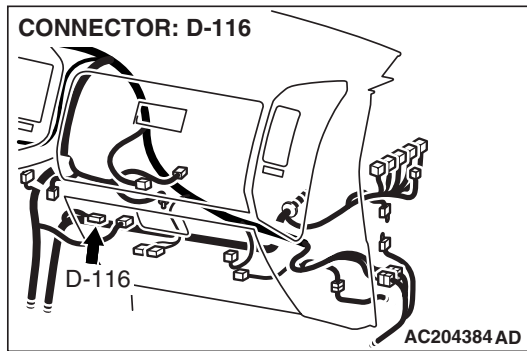
**DTC 33 : Stoplight Switch System**

**Stoplight Switch Circuit**



W3Q06M03AA  
AC204646 AB



**CIRCUIT OPERATION**

The ON signal when the brake pedal is pressed or the OFF signal when the brake pedal is released is input to the M-ASTC-ECU (terminal 19).

**ABS DTC SET CONDITION**

DTC 33 is set in the following cases:

- Stoplight switch is not operating properly and remains in ON state for more than 15 minutes.
- Stoplight switch system harness is damaged and no signal is input to M-ASTC-ECU.

**TROUBLESHOOTING HINTS**

- Malfunction of the stoplight switch
- Damaged wiring harness and connector
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

**STEP 1. Check the stoplight operation.**

**Q: Does the stoplight come on and go out correctly?**

**YES :** Go to Step 5.

**NO :** Go to Step 2.

**STEP 2. Check the stoplight switch installation condition.**

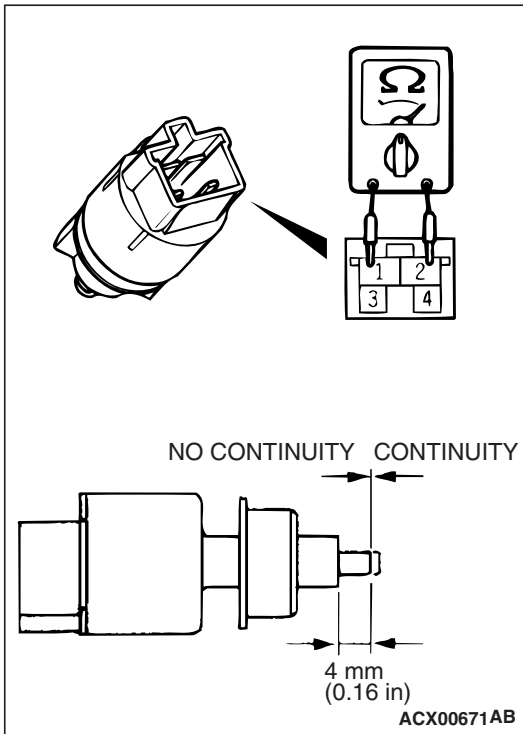
**Q: Is the stoplight switch installed properly?**

**YES :** Go to Step 3.

**NO :** Repair it and then go to Step 8.

**STEP 3. Check the stoplight switch continuity.**

- (1) Remove the stoplight switch (Refer to GROUP 35A, Brake Pedal P.35A-135).
- (2) Connect an ohmmeter between to stoplight switch connector terminals.
- (3) There should be no continuity between the terminals when the plunger is pushed in as shown. There should be continuity when it is released.



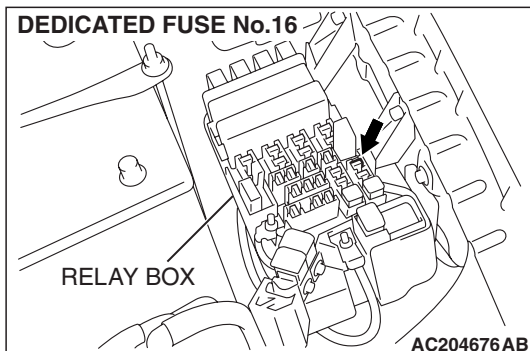
TESTER CONNECTION	PLUNGER	SPECIFIED CONDITION
1 - 2	IN	Open circuit
	OUT	Less than 2 ohms

**Q: Is the stoplight switch continuity correct?**

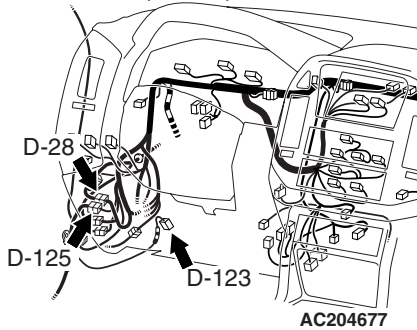
**YES :** Go to Step 4.

**NO :** Replace it and then go to Step 8.

**STEP 4. Check the harness wire between dedicated fuse number 16 and stoplight switch connector D-123 terminal 2.**



CONNECTORS: D-28, D-123, D-125



D-28

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		38	
32	33	34		35		36	37					

D-123 HARNESS CONNECTOR:  
COMPONENT SIDE

D-125

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	36	37	38	39	40	41	42	43		

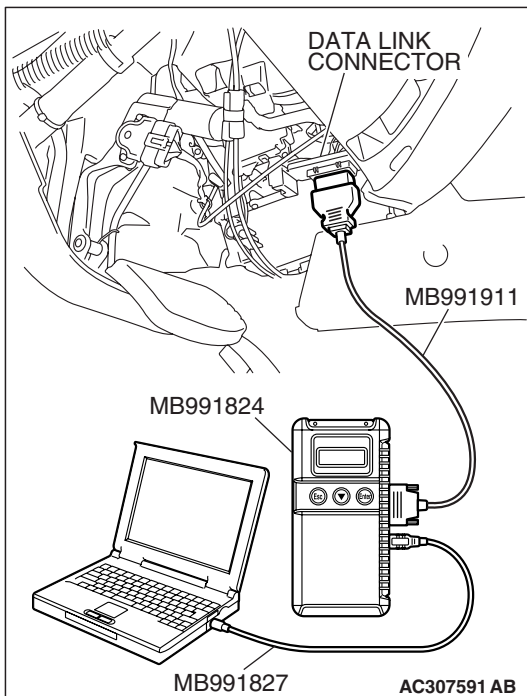
AC204701AB

**NOTE:** After inspecting intermediate connectors D-28, D-125 and stoplight switch connector D-123, inspect the wire. If intermediate connectors D-28, D-125 and stoplight switch connector D-123 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 8.

**Q:** Is the harness wire between dedicated fuse number 16 and stoplight switch connector D-123 terminal 2 damaged?

**YES :** Repair it and then go to Step 8.

**NO :** Check the harness wire between stoplight connector D-123 terminal 1 and stoplight, and repair if necessary. Then go to Step 8.



**STEP 5. Using scan tool MB991958, check data list.**

**CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine.
- (3) Set scan tool MB991958 to the data reading mode, and check the data list items by driving the vehicle.
  - Item 36: STOPLIGHT SW
    - ON with brake pedal stepped down.
    - OFF with brake pedal released.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q:** Is the stoplight switch input normal?

**YES :** It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

**NO :** Go to Step 6.

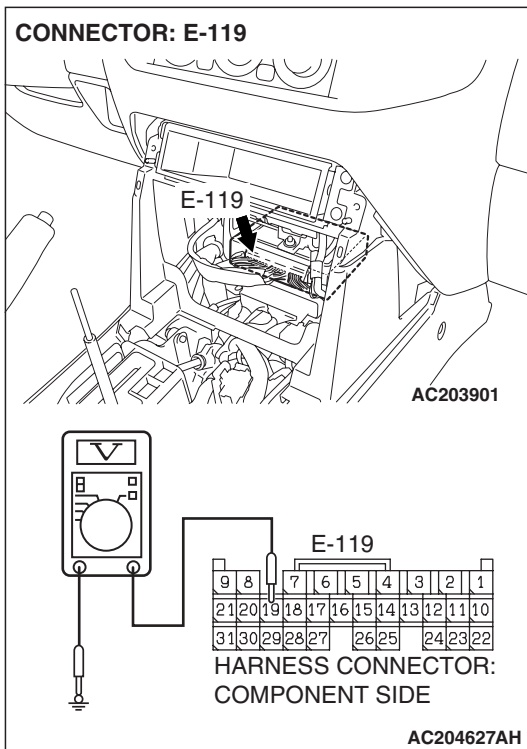
**STEP 6. Check the stoplight switch circuit at M-ASTC-ECU connector E-119.**

- (1) Disconnect connector E-119 and measure at the harness side.
- (2) Turn the stoplight switch ON.
- (3) Measure the voltage between terminal 19 and ground. It should be approximately 12 volts (battery positive voltage).

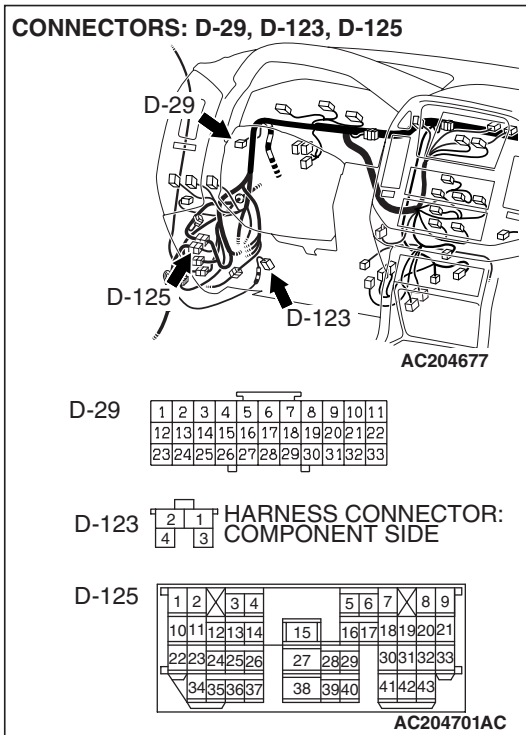
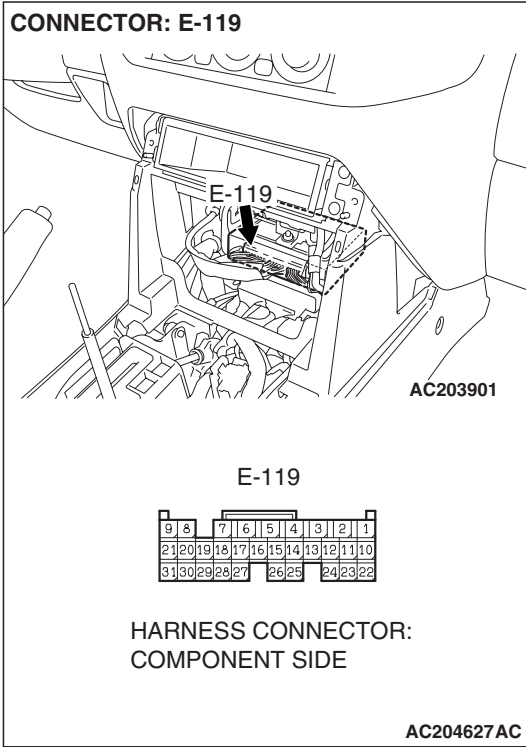
**Q: Is the voltage approximately 12 volts (battery positive voltage)?**

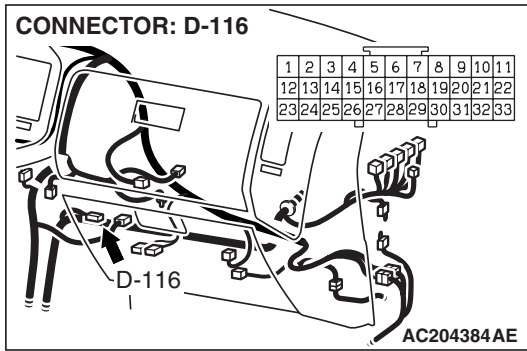
**YES :** Replace the M-ASTC-ECU and then go to Step 8.

**NO :** Go to Step 7.



**STEP 7. Check the harness wire between M-ASTC-ECU connector E-119 terminal 19 and stoplight connector D-123 terminal 1.**





**NOTE:** After inspecting joint connector D-29, D-116, intermediate connector E-111 and D-125, inspect the wire. If joint connector D-29, D-116, intermediate connector E-111 and D-125 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 8.

**Q: Is the harness wire between M-ASTC-ECU connector E-119 terminal 19 and stoplight switch connector D-123 terminal 1 damaged?**

**YES :** Repair it and then go to Step 8.

**NO :** Go to Step 8.

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**STEP 8. Recheck for diagnostic trouble code.**

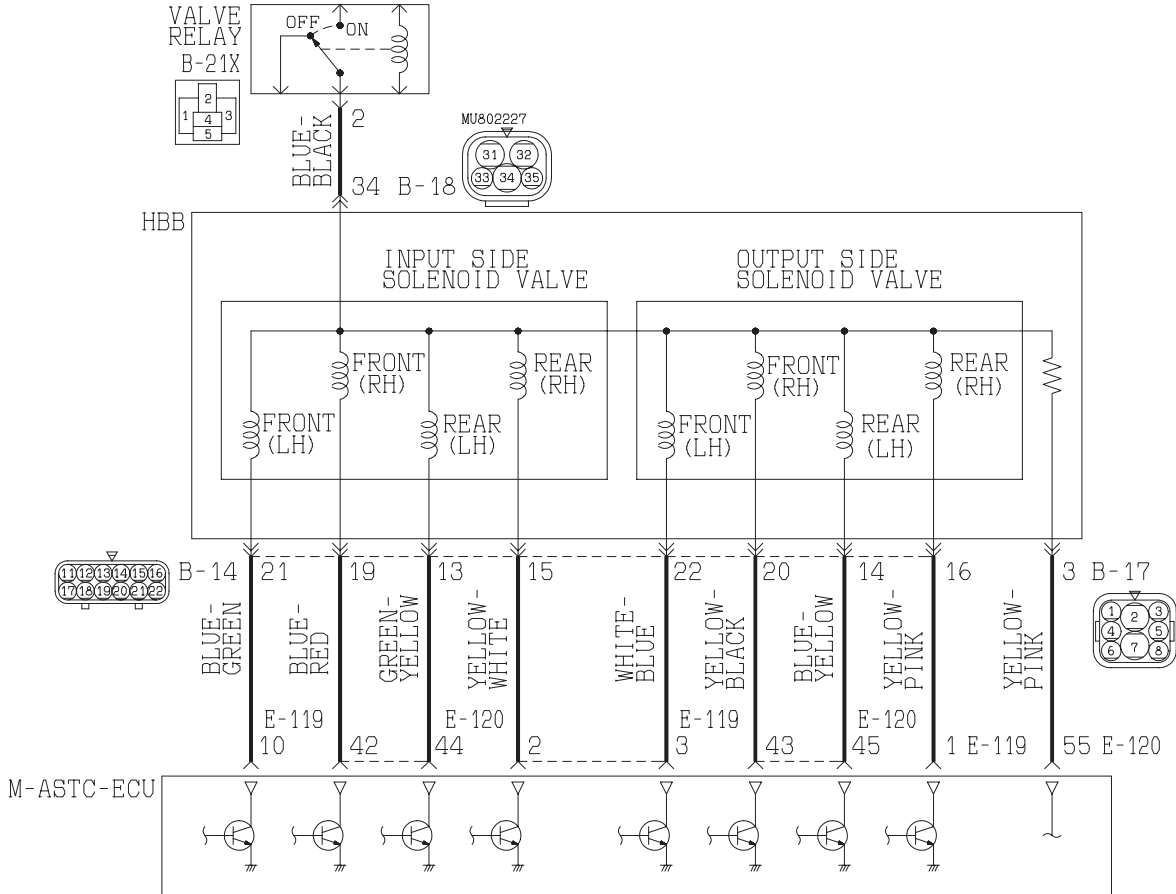
**Q: Does DTC 33 reset?**

**YES :** Return to Step 1.

**NO :** The procedure is complete.

DTC 41, 42, 43, 44: Control Solenoid Valve  
DTC 45, 46: Select Solenoid Valve

Control Solenoid Valve Circuit



E-119

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		

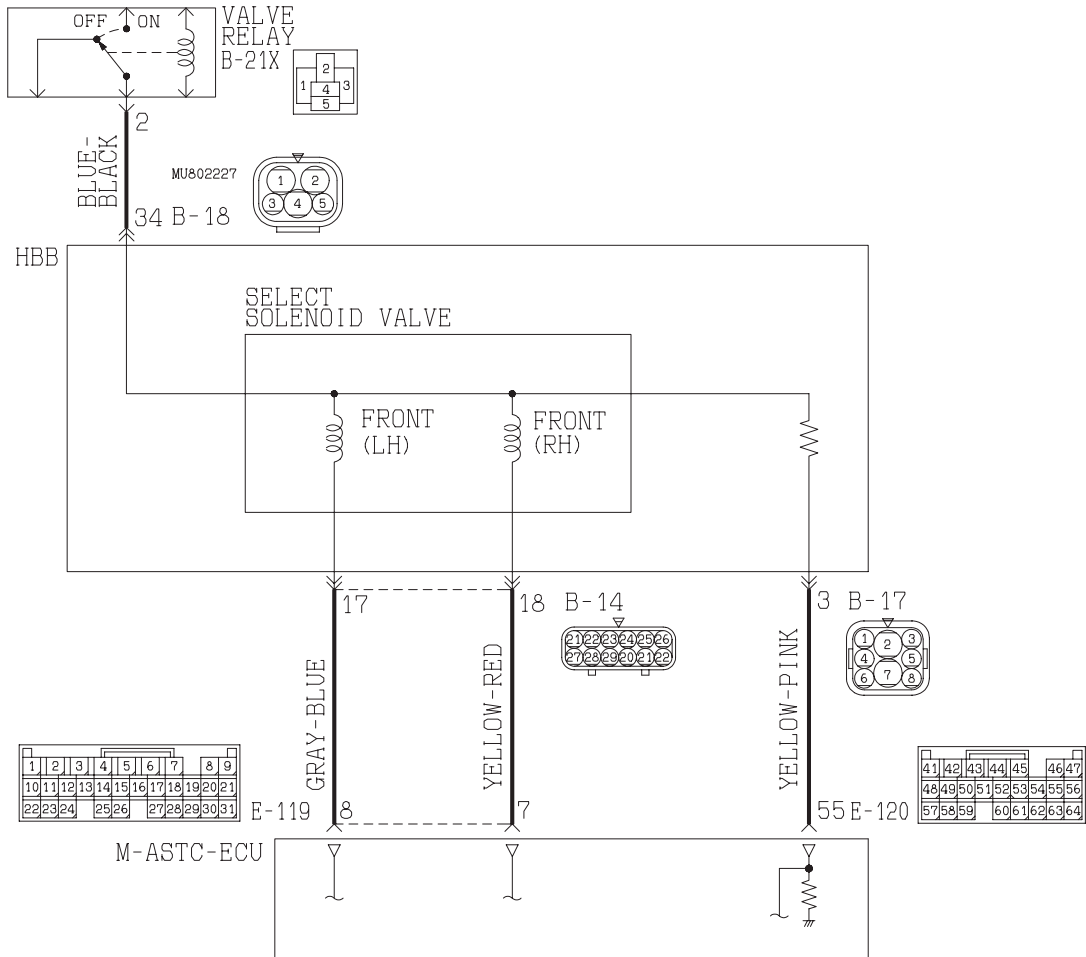
E-120

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

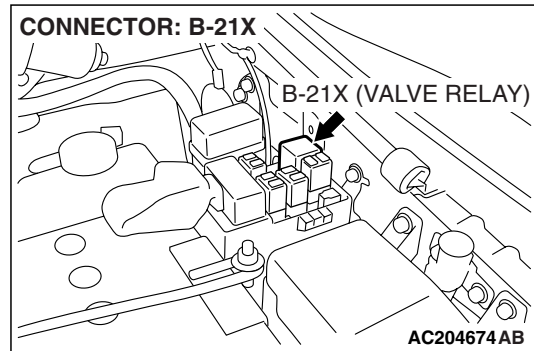
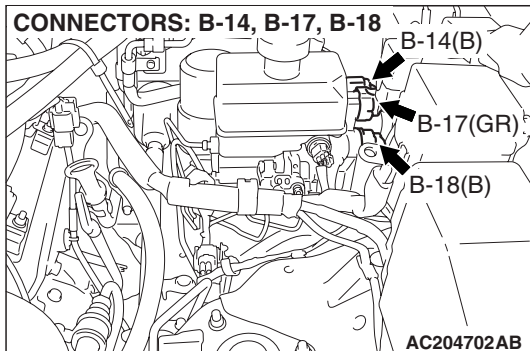
AC204647AB  
W3Q06M04AA

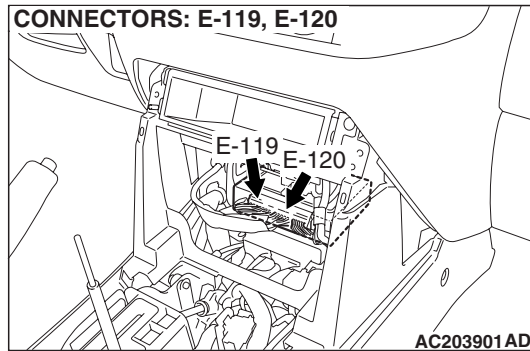


Select Solenoid Valve Circuit



AC204648AB  
W3Q06M05AA





### CIRCUIT OPERATION

As the ignition switch is turned ON, power is supplied to each solenoid valve via the valve relay. M-ASTC-ECU, by turning ON the transistor, grounds the circuit and turns the solenoid valve ON.

### ABS DTC SET CONDITIONS

The M-ASTC-ECU constantly monitors the solenoid valve drive circuits. These codes are output if the M-ASTC-ECU judges that there is an open circuit or short-circuit in a solenoid coil or harness because the solenoid valve is on but no current flows to the solenoid valve, or if current continues flowing to the solenoid valve even though the solenoid valve is off.

### TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU
- Malfunction of the hydraulic brake booster (HBB)

### DIAGNOSIS

#### Required Special Tools:

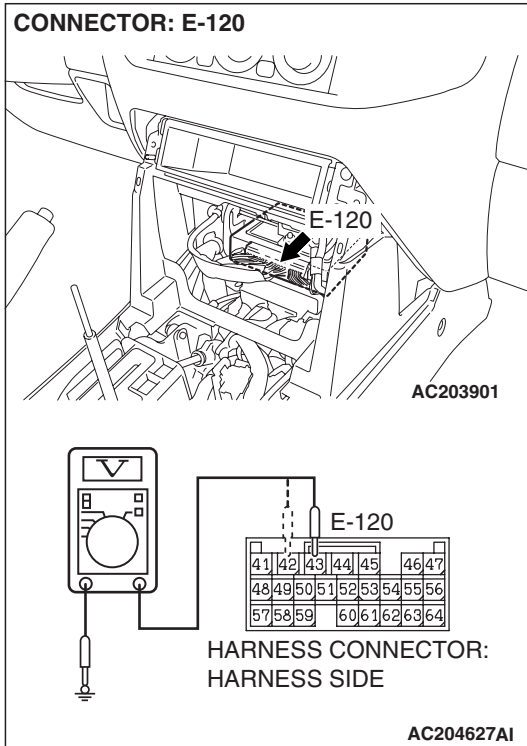
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

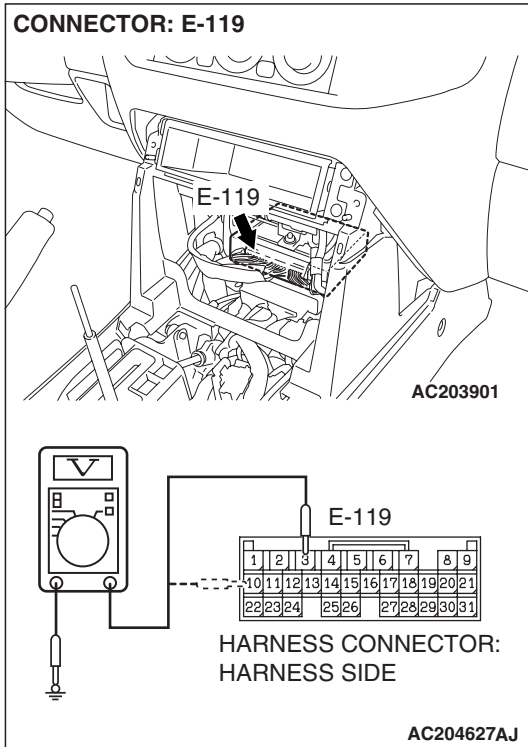
**STEP 1. Check the solenoid valve circuit at M-ASTC-ECU connector E-119 and E-120 by backprobing.**

- (1) Do not disconnect connector E-119 and E-120.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure voltage between the following terminals. It should be approximately 12 volts (battery positive voltage).

**When DTC 41 is set:**

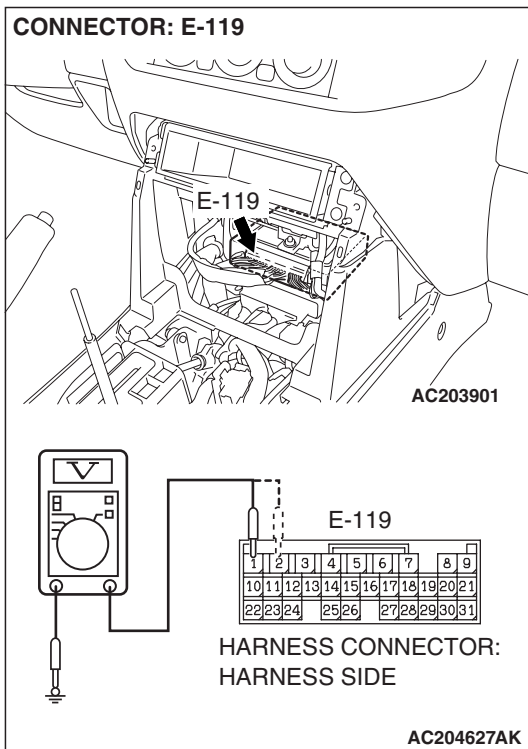
- M-ASTC-ECU connector E-120 terminal 43 and ground
- M-ASTC-ECU connector E-120 terminal 42 and ground





**When DTC 42 is set:**

- M-ASTC-ECU connector E-119 terminal 3 and ground
- M-ASTC-ECU connector E-119 terminal 10 and ground

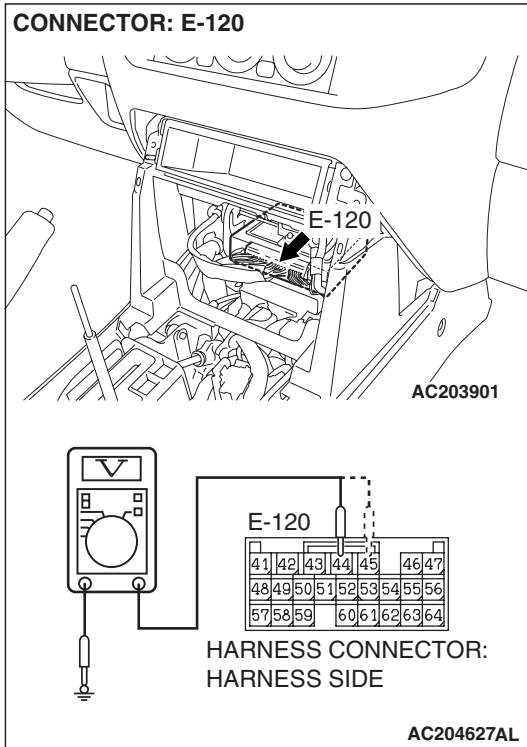


**When DTC 43 is set:**

- M-ASTC-ECU connector E-119 terminal 1 and ground
- M-ASTC-ECU connector E-119 terminal 2 and ground

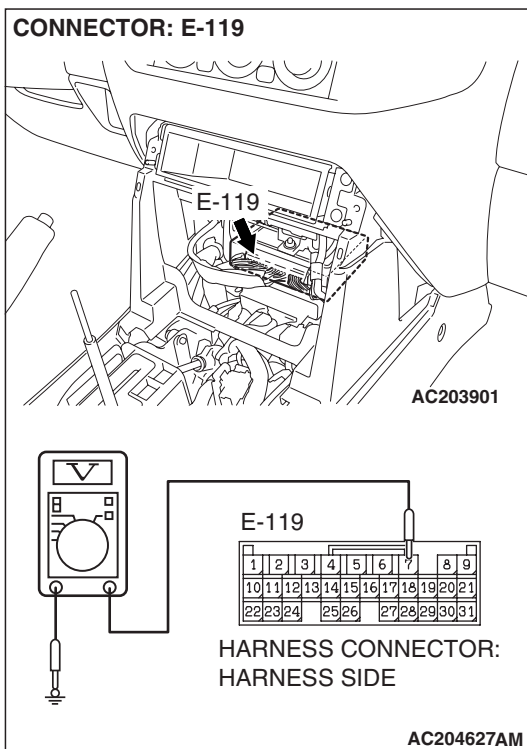
**When DTC 44 is set:**

- M-ASTC-ECU connector E-120 terminal 45 and ground
- M-ASTC-ECU connector E-120 terminal 44 and ground

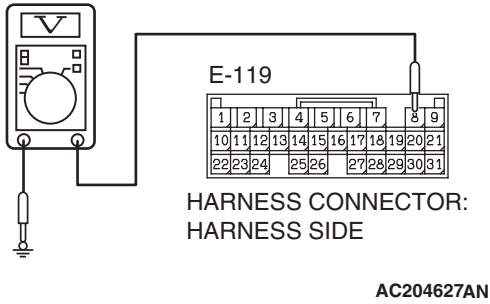
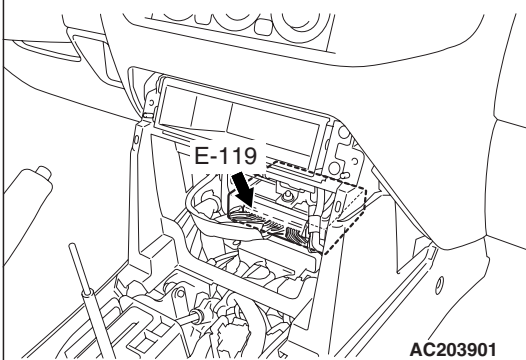


**When DTC 45 is set:**

- M-ASTC-ECU connector E-119 terminal 7 and ground



CONNECTOR: E-119



When DTC 46 is set:

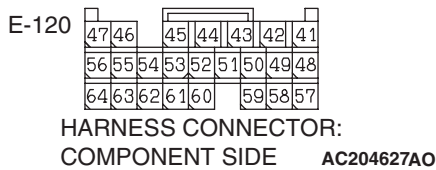
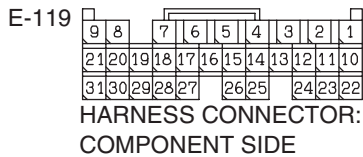
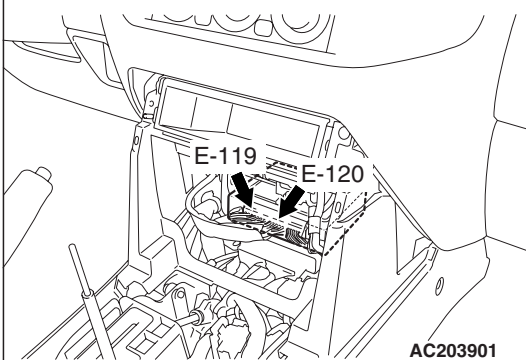
- M-ASTC-ECU connector E-120 terminal 8 and ground

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

**YES :** Go to Step 2.

**NO :** Go to Step 3.

CONNECTORS: E-119, E-120



**STEP 2. Check the M-ASTC-ECU connectors E-119 and E-120.**

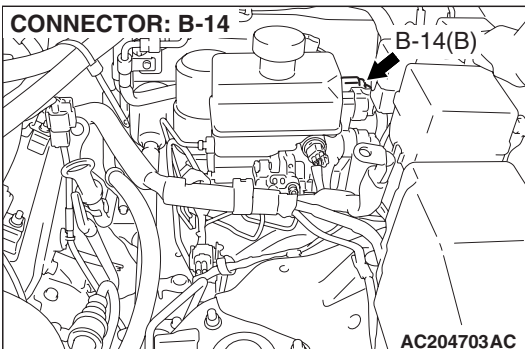
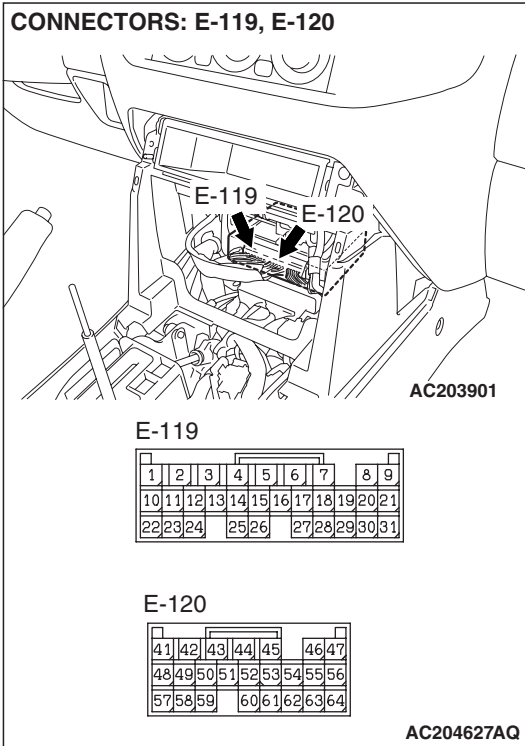
**Q: Are any of the connectors damaged?**

**YES :** Repair it and then go to Step 5. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#).

**NO :** Replace the M-ASTC-ECU and go to Step 5.

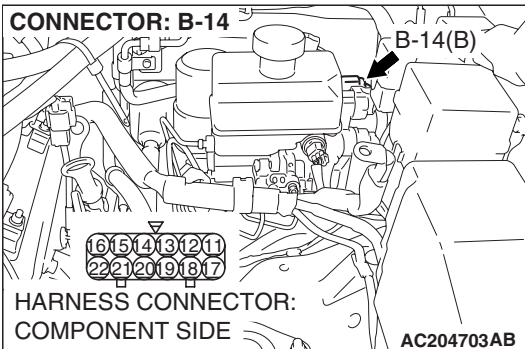
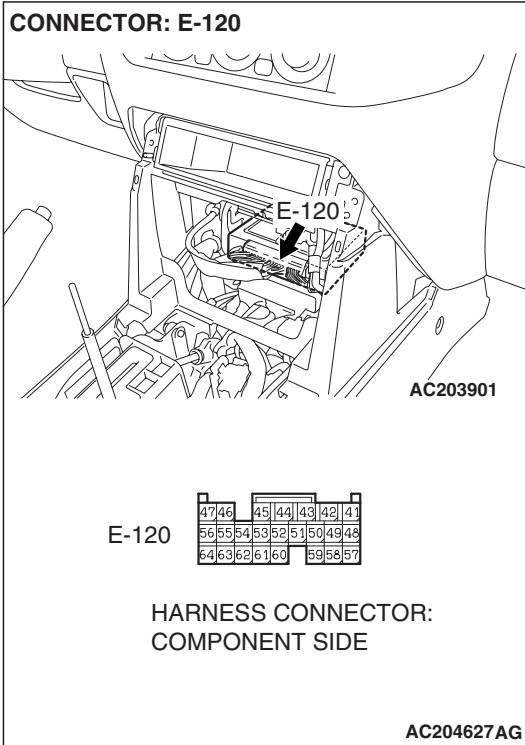
**STEP 3.** Check the harness wires between HBB connector B-14 and M-ASTC-ECU connector E-119, and HBB connector B-14 and M-ASTC-ECU connector E-120.

*NOTE:* After inspecting HBB connector B-14, M-ASTC-ECU connectors E-119 and E-120, inspect the wire. If HBB connector B-14, M-ASTC-ECU connectors E-119 and E-120 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 5.



**When DTC 41 is set:**

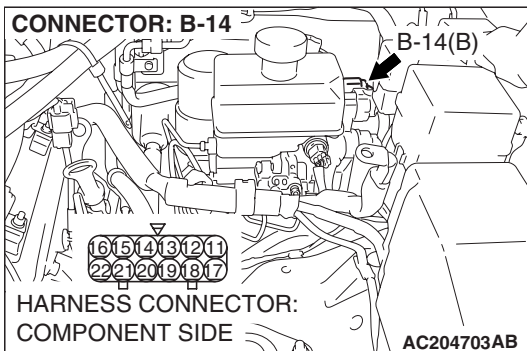
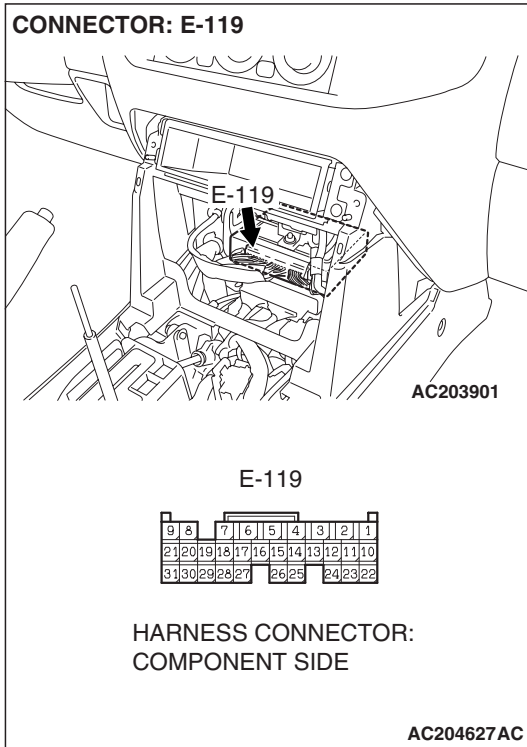
- M-ASTC-ECU connector E-120 terminal 43 and HBB connector B-14 terminal 20
- M-ASTC-ECU connector E-120 terminal 42 and HBB connector B-14 terminal 19

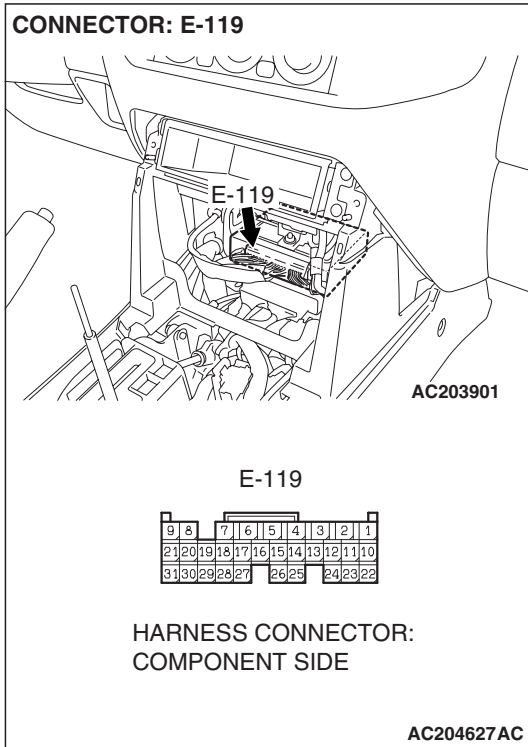




When DTC 42 is set:

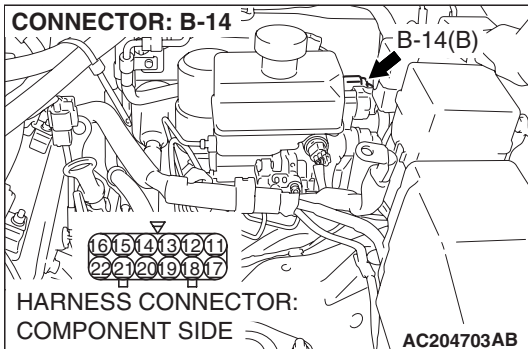
- M-ASTC-ECU connector E-119 terminal 3 and HBB connector B-14 terminal 22
- M-ASTC-ECU connector E-119 terminal 10 and HBB connector B-14 terminal 21





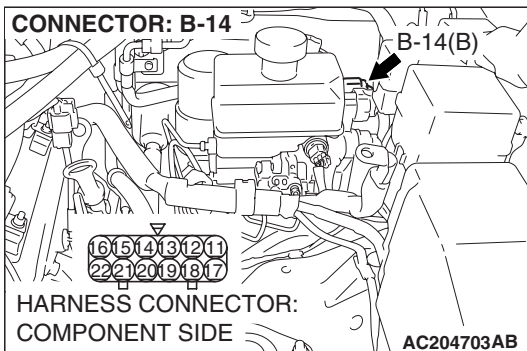
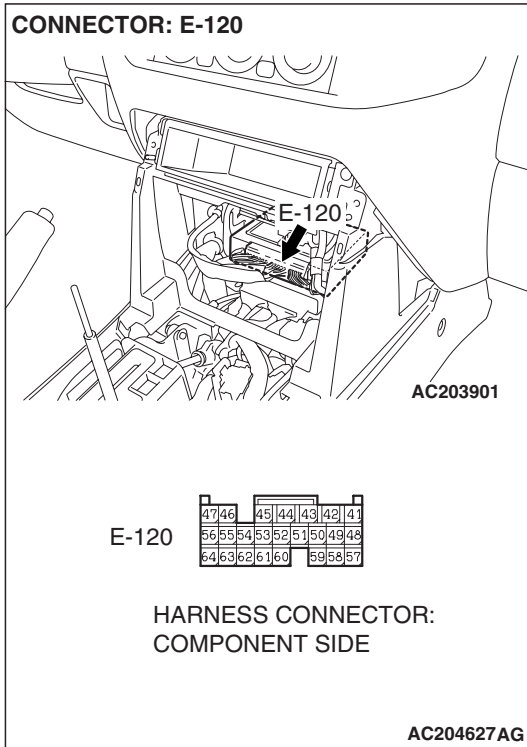
**When DTC 43 is set:**

- M-ASTC-ECU connector E-119 terminal 1 and HBB connector B-14 terminal 16
- M-ASTC-ECU connector E-119 terminal 2 and HBB connector B-14 terminal 15



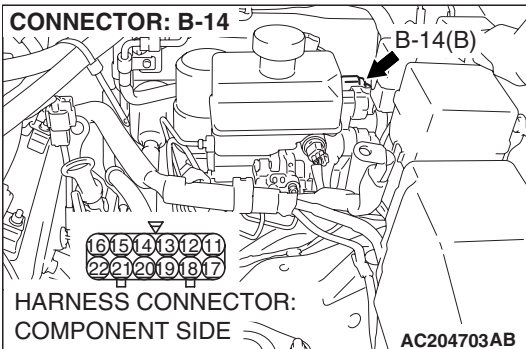
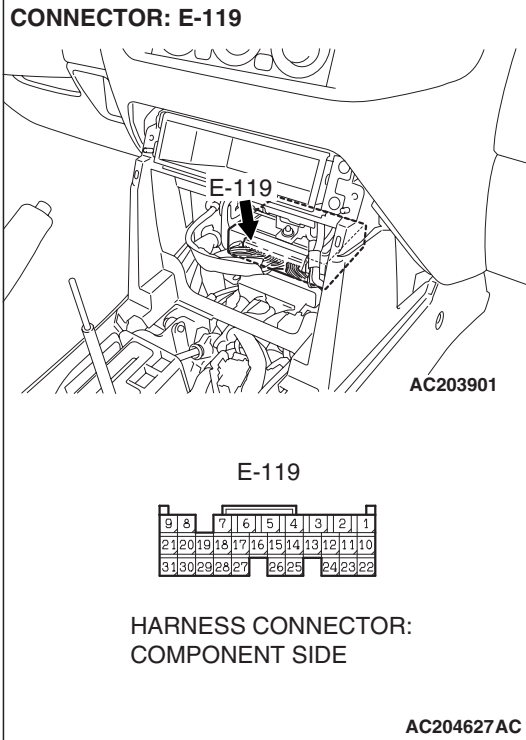
**When DTC 44 is set:**

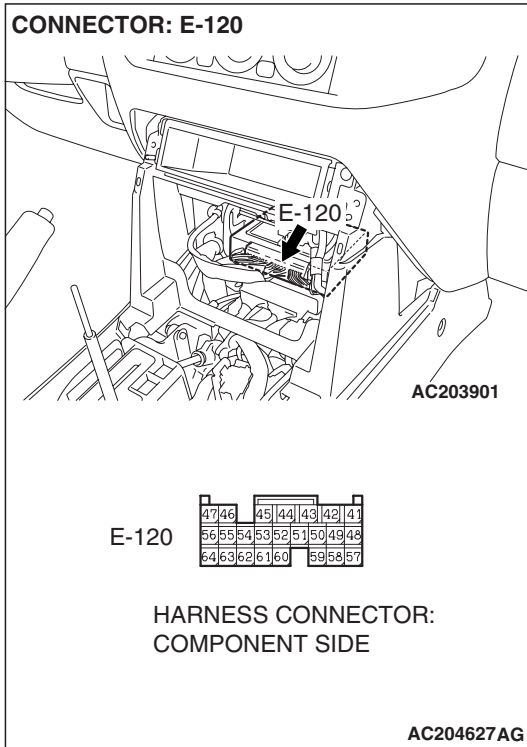
- M-ASTC-ECU connector E-120 terminal 45 and HBB connector B-14 terminal 14
- M-ASTC-ECU connector E-120 terminal 44 and HBB connector B-14 terminal 13



When DTC 45 is set:

- M-ASTC-ECU connector E-119 terminal 7 and HBB connector B-14 terminal 18





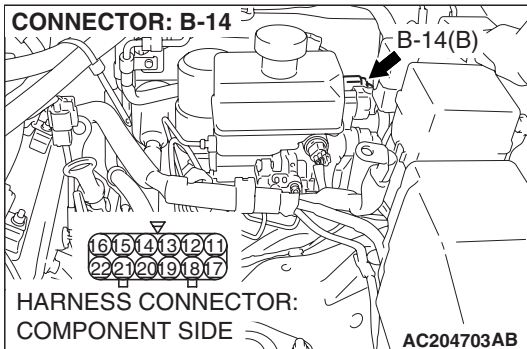
When DTC 46 is set:

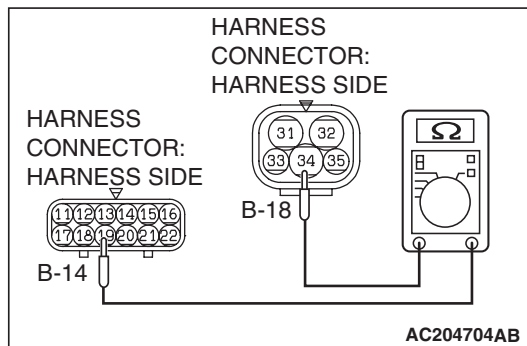
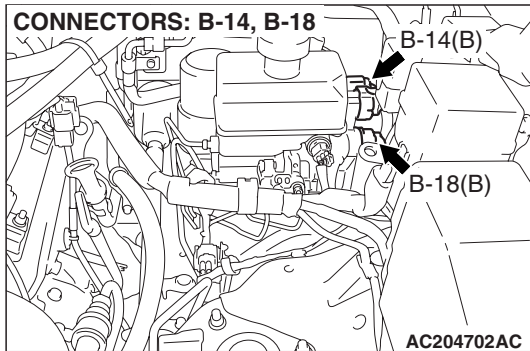
- M-ASTC-ECU connector E-120 terminal 8 and HBB connector B-14 terminal 17

**Q: Is the harness wire between HBB connector B-14 and M-ASTC-ECU connector E-119, or HBB connector B-14 and M-ASTC-ECU connector E-120 damaged?**

**YES :** Repair it and then go to Step 5.

**NO :** Go to Step 4.



**STEP 4. Check the solenoid valve**

- (1) Disconnect HBB connector B-14 and B-18, and measure at the HBB side.
- (2) Measure the resistance between the following solenoid valve terminals.

- Control solenoid valve IN (FR): Between HBB connector B-14 terminal 19 and HBB connector B-18 terminal 34
- Control solenoid valve OUT (FR): Between HBB connector B-14 terminal 20 and HBB connector B-18 terminal 34
- Control solenoid valve IN (FL): Between HBB connector B-14 terminal 21 and HBB connector B-18 terminal 34
- Control solenoid valve OUT (FL): Between HBB connector B-14 terminal 22 and HBB connector B-18 terminal 34
- Control solenoid valve IN (RR): Between HBB connector B-14 terminal 15 and HBB connector B-18 terminal 34
- Control solenoid valve OUT (RR): Between HBB connector B-14 terminal 16 and HBB connector B-18 terminal 34
- Control solenoid valve IN (RL): Between HBB connector B-14 terminal 13 and HBB connector B-18 terminal 34
- Control solenoid valve OUT (RL): Between HBB connector B-14 terminal 14 and HBB connector B-18 terminal 34
- Select solenoid valve (FR): Between HBB connector B-14 terminal 18 and HBB connector B-18 terminal 34
- Select solenoid valve (FL): Between HBB connector B-14 terminal 17 and HBB connector B-18 terminal 34

**Standard value: Control solenoid valve IN: 4.75 – 5.25  $\Omega$**

**Control solenoid valve OUT: 2.0 – 2.4  $\Omega$**

**Select solenoid valve: 3.5 – 3.9  $\Omega$**

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

**YES** : Replace the M-ASTC-ECU and go to Step 5.

**NO** : Replace the HBB master cylinder and hydraulic unit assembly. Then go to Step 5 .

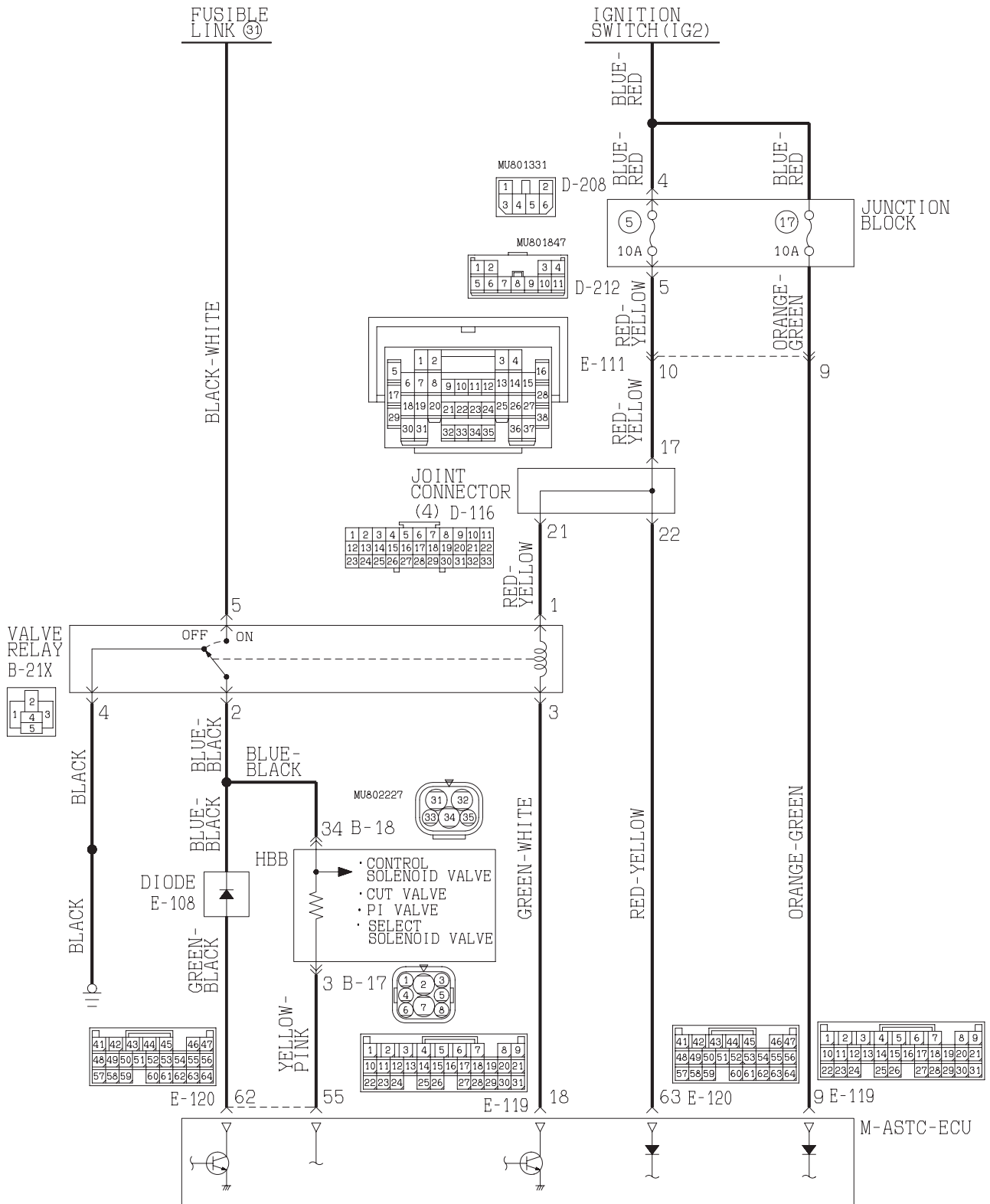
**STEP 5. Recheck for diagnostic trouble code.****Q: Do DTCs 41, 42, 43, 44, 45 and 46 reset?**

**YES** : Go to Step 1.

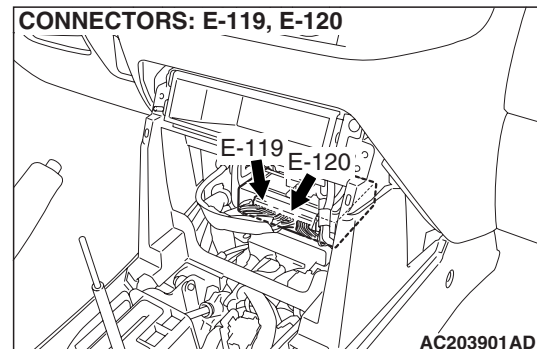
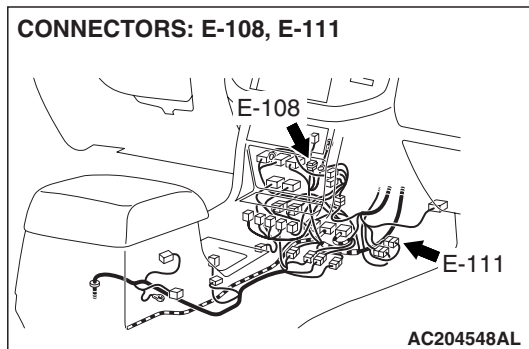
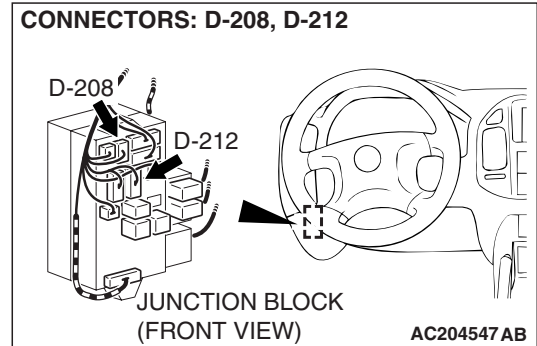
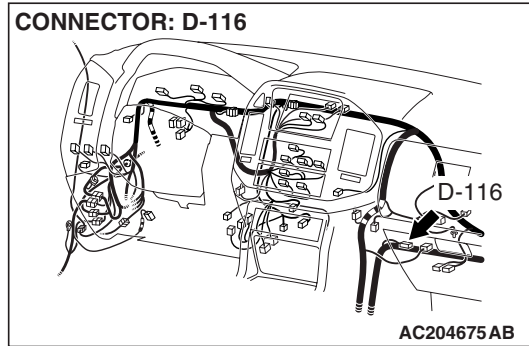
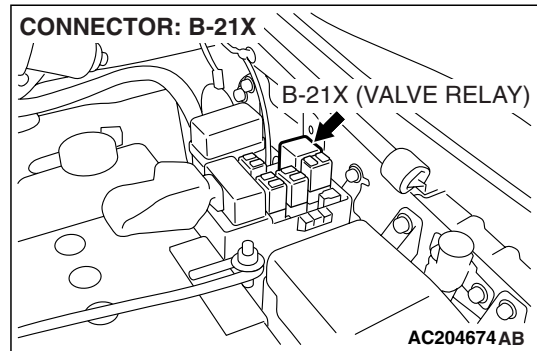
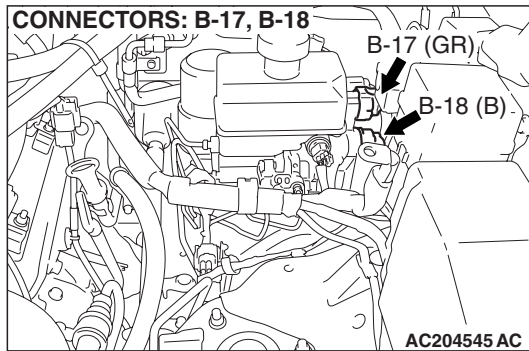
**NO** : The procedure is complete.

**DTC 51: Valve Relay System (Short Circuit or ON Failure)**

**M-ASTC-ECU Power Supply Circuit**



W3Q06M02AA  
AC204645AB



**CIRCUIT OPERATION**

As the ignition switch is turned ON, the M-ASTC-ECU drives the valve relay in a series of ON→OFF→ON with the initial check in order to inspect the valve relay for normal operation. It then maintains the valve relay always at ON and supplies power to each solenoid valve.

**ABS DTC SET CONDITIONS**

DTC 51 is set when the M-ASTC-ECU judges during the initial check when the ignition switch is turned to the ON position and the valve relay is OFF that there is a fused relay contact or a short-circuit in the valve relay drive circuit when power is being supplied to the solenoid valve.

**TROUBLESHOOTING HINTS**

- Malfunction of the valve relay
- Malfunction of the M-ASTC-ECU
- Damaged wiring harness or connector

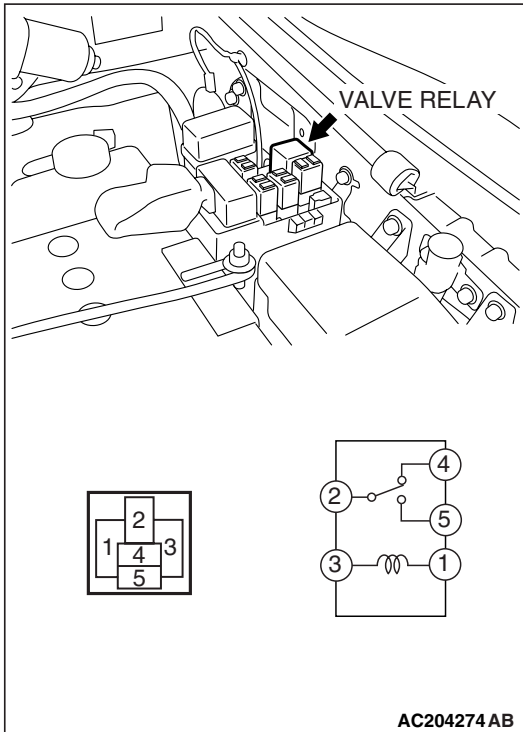


**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

**STEP 1. Check the valve relay.**

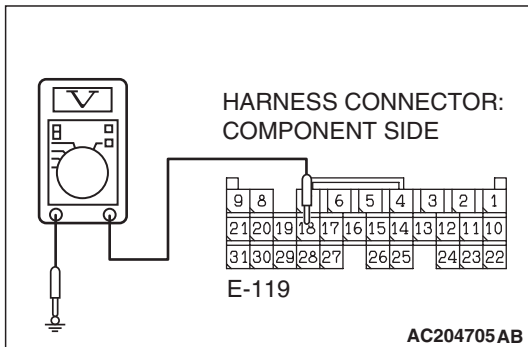
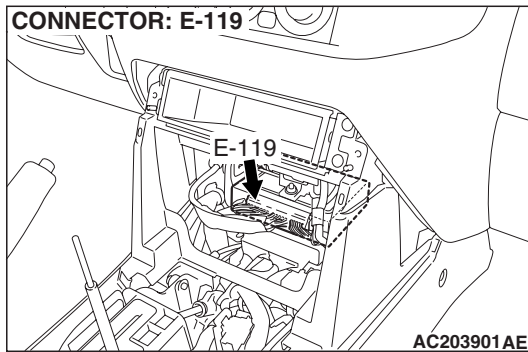


BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	2 – 4	Less than 2 ohms
	2 – 5	Open circuit
<ul style="list-style-type: none"> <li>• Connect terminal 1 to the positive battery terminal</li> <li>• Connect terminal 3 to the negative battery terminal</li> </ul>	2 – 4	Open circuit
	2 – 5	Less than 2 ohms

**Q: Is the relay damaged?**

**YES :** Replace it and go to Step 5.

**NO :** Go to Step 2.



**STEP 2. Check the valve relay circuit at M-ASTC-ECU connector E-119.**

- (1) Disconnect connector E-119 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal 18 and ground. It should be approximately 12 volts (battery positive voltage).

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

**YES :** Go to Step 3.

**NO :** Repair it because of short circuit to ground between the valve relay and M-ASTC-ECU. Then go to Step 5.

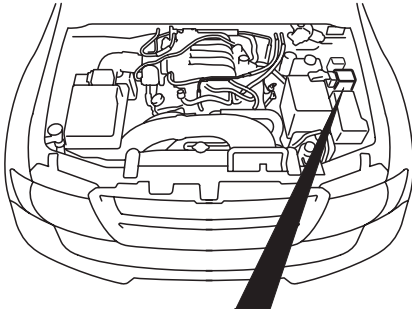
**STEP 3.** Check the harness wire between the valve relay connector B-21X terminal 2 and M-ASTC-ECU connector E-120 terminal 62.

**Q:** Is the harness wire between the valve relay connector B-21X terminal 2 and M-ASTC-ECU connector E-120 terminal 62 damaged?

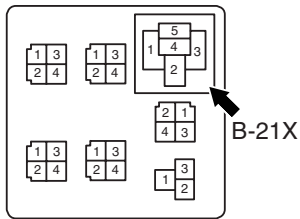
**YES :** Repair it and then go to Step 5.

**NO :** Go to Step 4.

**CONNECTOR: B-21X**

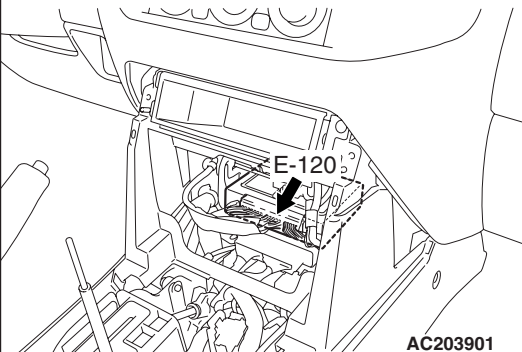


**RELAY BOX CONNECTOR**



AC204706AB

**CONNECTOR: E-120**

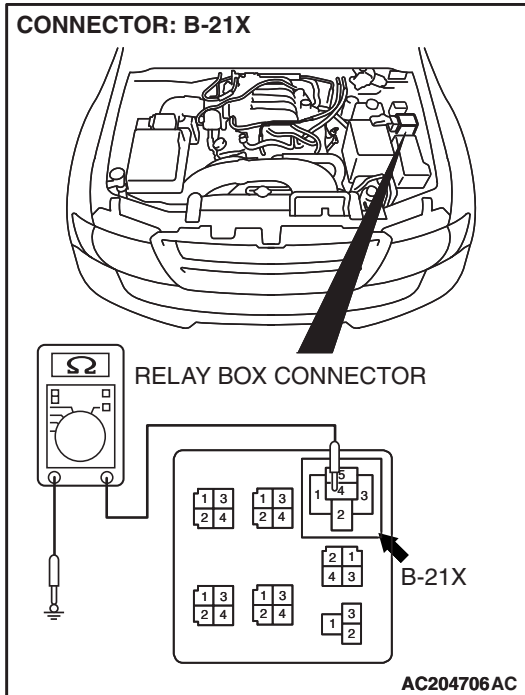


AC203901



**HARNESS CONNECTOR:  
COMPONENT SIDE**

AC204627AG



**STEP 4. Check the harness wire between the valve relay connector B-21X terminal 4 and ground.**

**Q: Is the harness wire between the valve relay connector B-21X terminal 4 and ground damaged?**

**YES :** Repair it and then go to Step 5.

**NO :** Replace the M-ASTC-ECU and go to Step 5.

**STEP 5. Recheck for diagnostic trouble code.**

**Q: Does DTC 51 reset?**

**YES :** Go to Step 1.

**NO :** The procedure is complete.

## DTC 52: Valve Relay System (Open Circuit or OFF Failure)

### VALVE RELAY CIRCUIT

Refer to [P.35B-63](#).

### CIRCUIT OPERATION

As the ignition switch is turned ON, M-ASTC-ECU drives the valve relay in a series of ON→OFF→ON with the initial check in order to inspect the valve relay for normal operation. It then maintains the valve relay always at ON and supplies power to each solenoid valve.

### ABS DTC SET CONDITIONS

DTC 52 is set if the M-ASTC-ECU judges that there is a valve relay OFF problem when the valve relay is on and power is not supplied to the solenoid valves.

### TROUBLESHOOTING HINTS

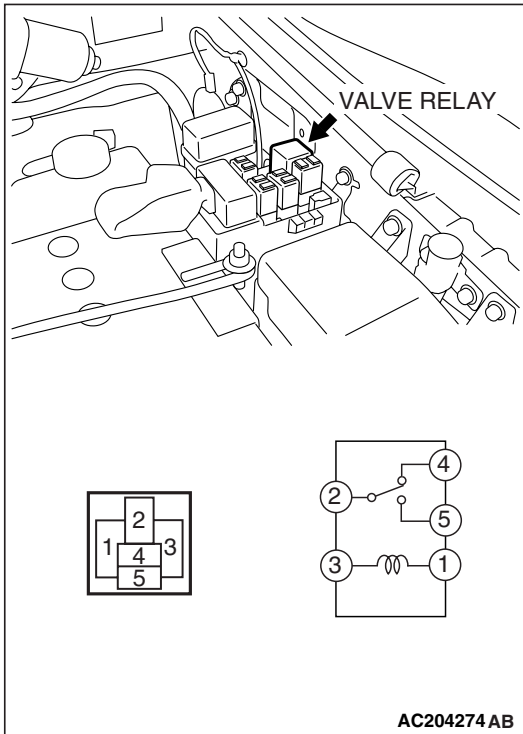
- Malfunction of the valve relay
- Malfunction of the M-ASTC-ECU
- Damaged wiring harness or connector

### DIAGNOSIS

#### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

**STEP 1. Check the valve relay.**



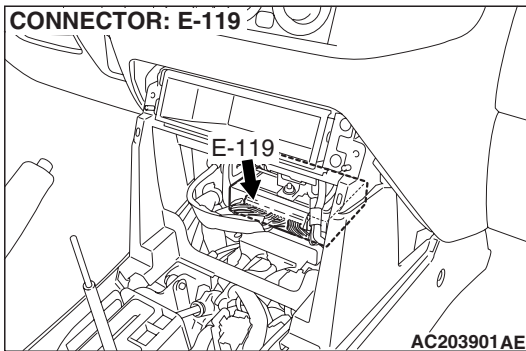
BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	2 – 4	Less than 2 ohms
	2 – 5	Open circuit
<ul style="list-style-type: none"> <li>• Connect terminal 1 to the positive battery terminal</li> <li>• Connect terminal 3 to the negative battery terminal</li> </ul>	2 – 4	Open circuit
	2 – 5	Less than 2 ohms

**Q: Is the relay damaged?**

- YES** : Replace it and go to Step 10.  
**NO** : Go to Step 2.

**STEP 2. Check the valve relay circuit at M-ASTC-ECU connector E-119 by backprobing.**

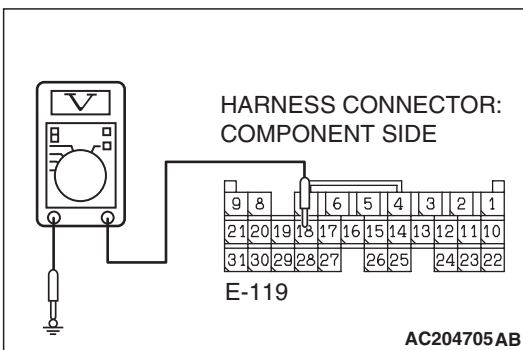
- (1) Do not disconnect connector E-119.  
(2) Turn the ignition switch to the "ON" position.

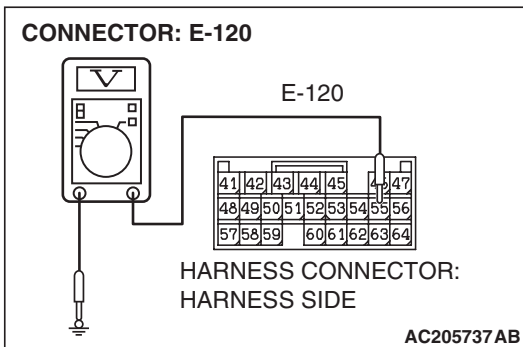
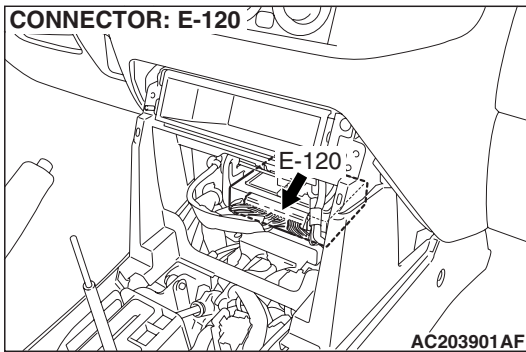


- (3) Measure the voltage between terminal 18 and ground by backprobing. It should be less than 2 volts.

**Q: Is the voltage less than 2 volts?**

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





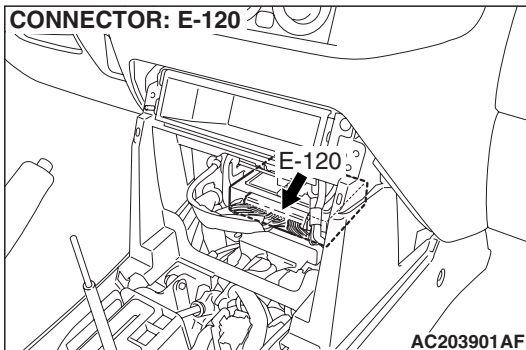
**STEP 3. Check the valve relay monitor circuit at M-ASTC-ECU connector E-120 by backprobing.**

- (1) Do not disconnect connector E-120.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal 55 and ground by backprobing. It should be approximately 12 volts (battery positive voltage).

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

- YES :** Go to Step 4.  
**NO :** Go to Step 6.

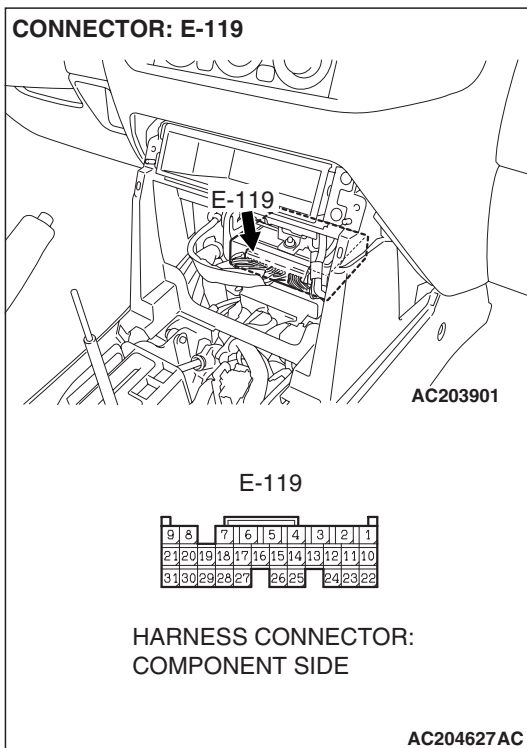
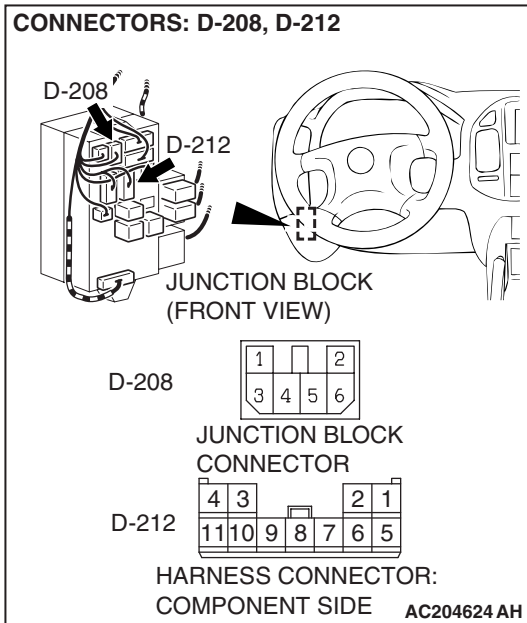


**STEP 4. Check the M-ASTC-ECU connector E-120.**

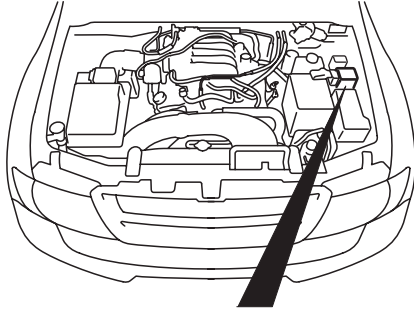
**Q: Is the connector damaged?**

- YES :** Repair it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 10.  
**NO :** Replace the M-ASTC-ECU and go to Step 10.

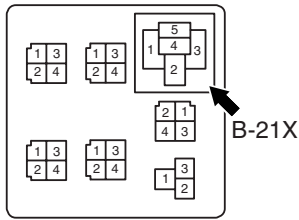
**STEP 5. Check the harness wire between ignition switch (IG2) connector D-208 terminal 4 and M-ASTC-ECU connector E-119 terminal 18.**



CONNECTOR: B-21X

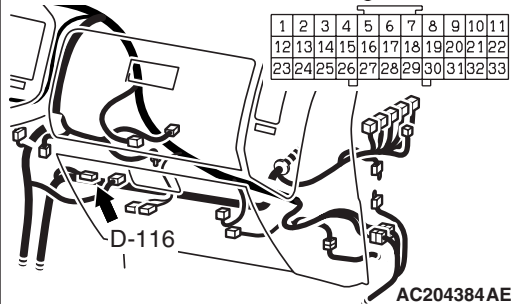


RELAY BOX CONNECTOR



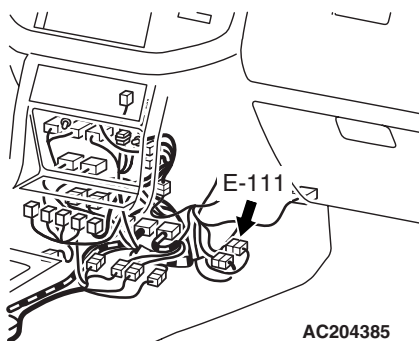
AC204706AB

CONNECTOR: D-116



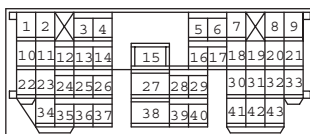
AC204384AE

CONNECTOR: E-111



AC204385

E-111



AC204673AB

**NOTE:** After inspecting ignition switch (IG2) connector D-208 and M-ASTC-ECU connector E-119, valve relay connector B-21X, joint connector D-116, junction block connectors D-208, D-212 and intermediate connector E-111, inspect the wire. If ignition switch (IG2) connector D-208 and M-ASTC-ECU connector E-106, valve relay connector B-21X, joint connector D-116, junction block connectors D-208, D-212 and intermediate connector E-111 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If the connector has been repaired or replaced, go to Step 10.

**Q: Is the harness wire between ignition switch (IG2) connector D-208 terminal 5 and M-ASTC-ECU connector E-119 terminal 18 damaged?**

**YES :** Repair it and then go to Step 10.

**NO :** Replace the M-ASTC-ECU and go to Step 10.



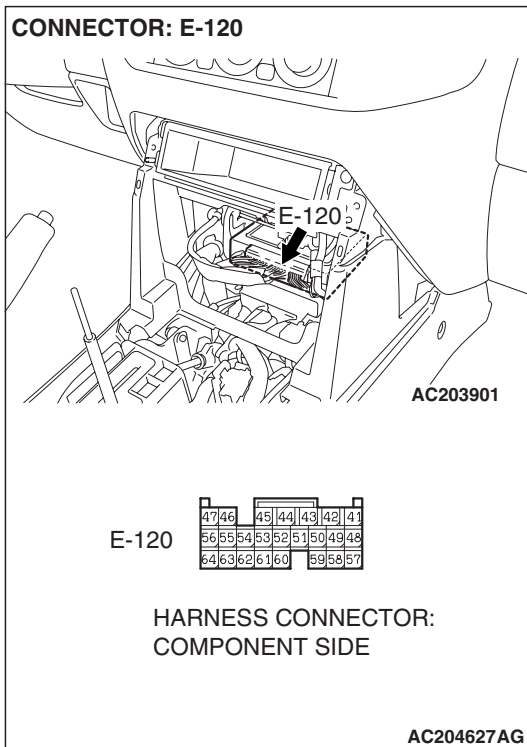
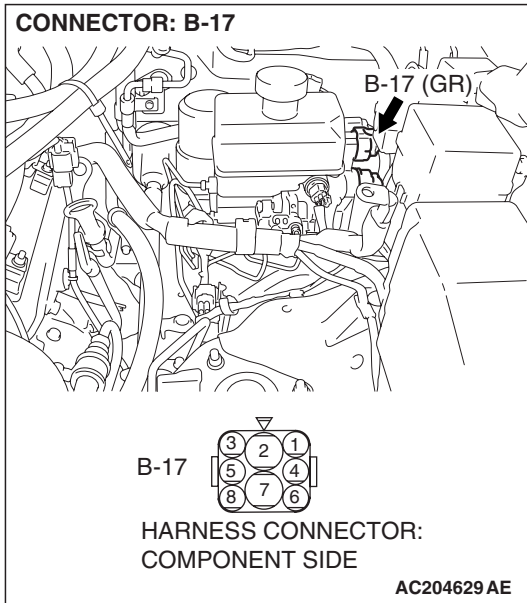
**STEP 6.** Check the harness wire between HBB connector B-17 terminal 3 and M-ASTC-ECU connector E-120 terminal 55.

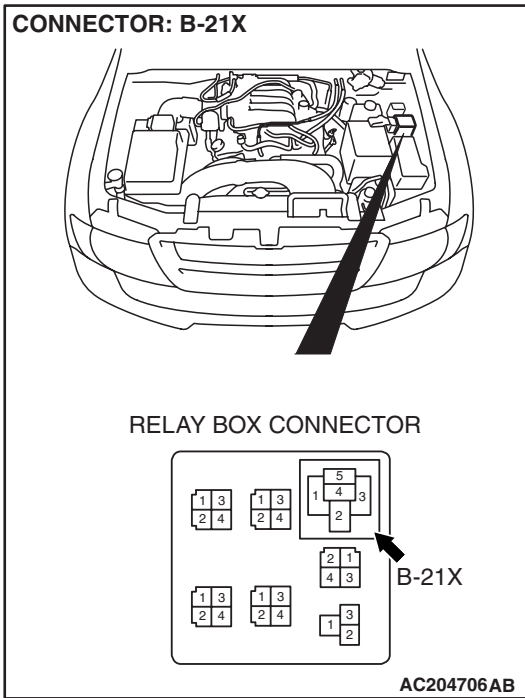
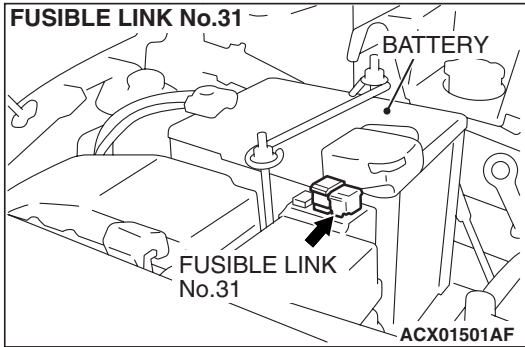
*NOTE:* After inspecting HBB connector B-17, inspect the wire. If HBB connector B-17 is damaged, repair or replace it. Refer to *GROUP 00E, Harness Connector Inspection P.00E-2*. If the connector has been repaired or replaced, go to Step 10.

**Q:** Is the harness wire between HBB connector B-17 terminal 3 and M-ASTC-ECU connector E-120 terminal 55 damaged?

**YES :** Repair it and then go to Step 10.

**NO :** Go to Step 7.





**STEP 7. Check the harness wire between fusible link number 31 and valve relay connector B-21X terminal 5.**

*NOTE: After inspecting valve relay connector B-21X, inspect the wire. If valve relay connector B-21X is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection .*

**Q: Is the harness wire between fusible link number 31 and valve relay connector B-21X terminal 5 damaged?**

**YES :** Repair it and then go to Step 10.

**NO :** Go to Step 8.

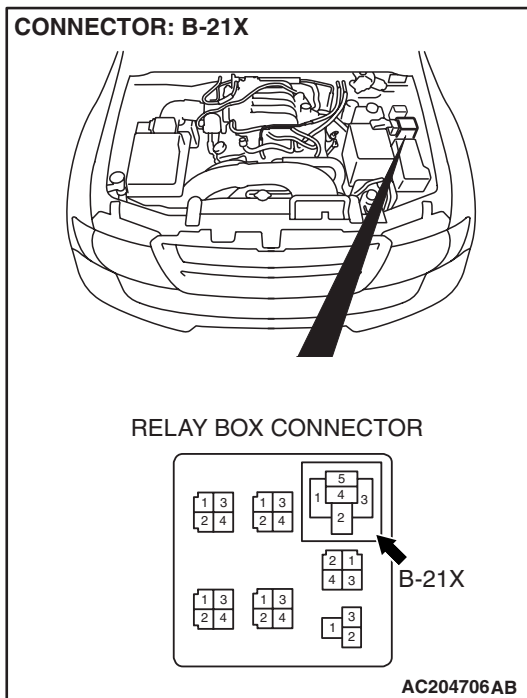
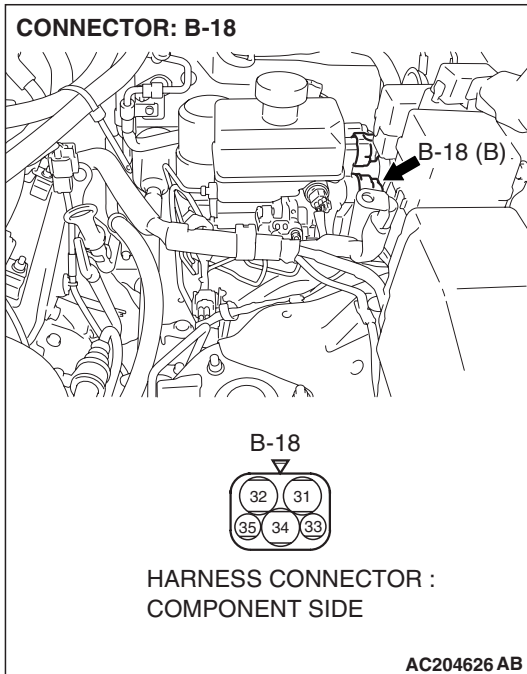
**STEP 8.** Check the harness wire between valve relay connector B-21X terminal 2 and HBB connector B-18 terminal 34.

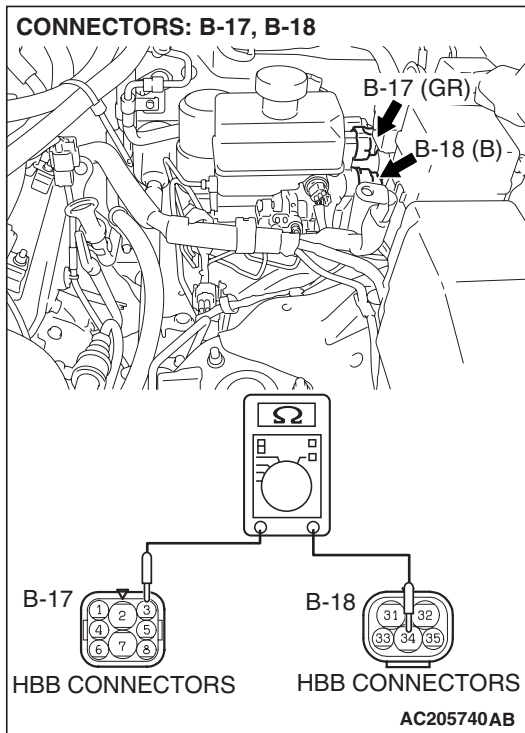
*NOTE:* After inspecting HBB connector B-18, inspect the wire. If HBB connector B-18 is damaged, repair or replace it. Refer to *GROUP 00E, Harness Connector Inspection P.00E-2*. If the connector has been repaired or replaced, go to Step 10.

**Q:** Is the harness wire between valve relay connector B-21X terminal 2 and HBB connector B-18 terminal 34 damaged?

**YES :** Repair it and then go to Step 10.

**NO :** Go to Step 9.



**STEP 9. Check the HBB.**

- (1) Disconnect HBB connector B-17 and B-18, and measure at the HBB side.
- (2) Check for continuity between HBB connector B-17 terminals 3 and HBB connector B-18 terminal 34. It should be continuity (approximately 33 ohms).

**Q: Is there continuity between HBB connector B-17 terminal 3 and HBB connector B-18 terminal 34?**

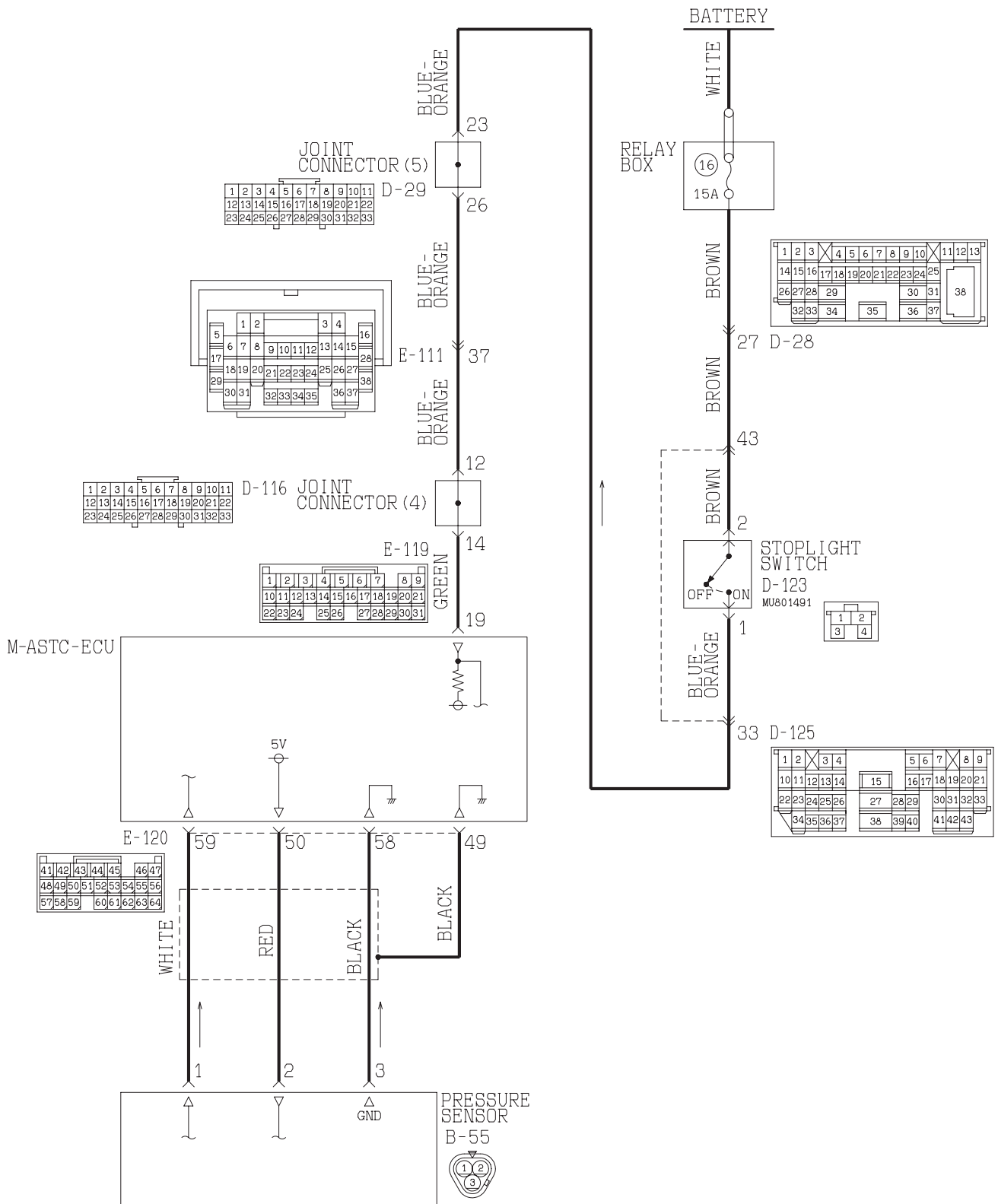
- YES :** Replace the M-ASTC-ECU and then go to Step 10.
- NO :** Replace the HBB master cylinder and hydraulic unit assembly. Then go to Step 10 .

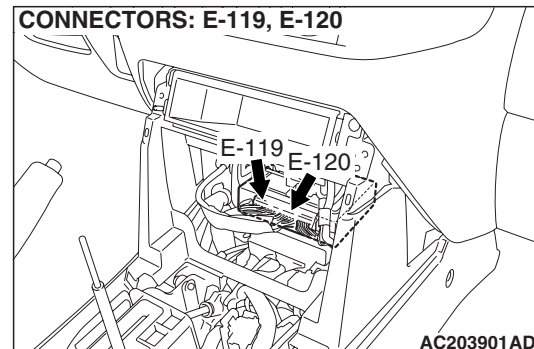
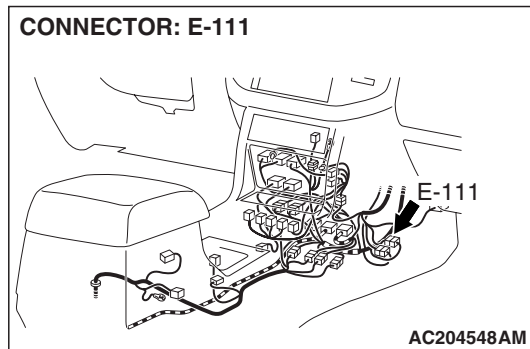
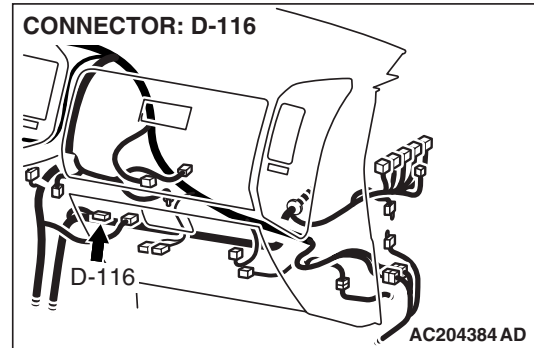
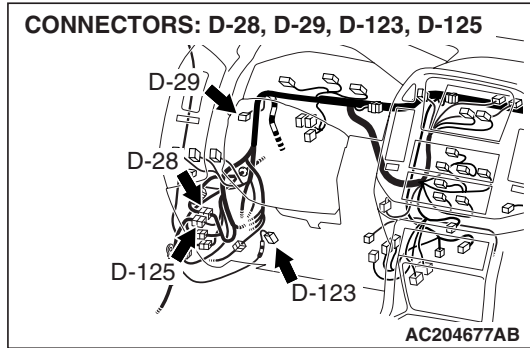
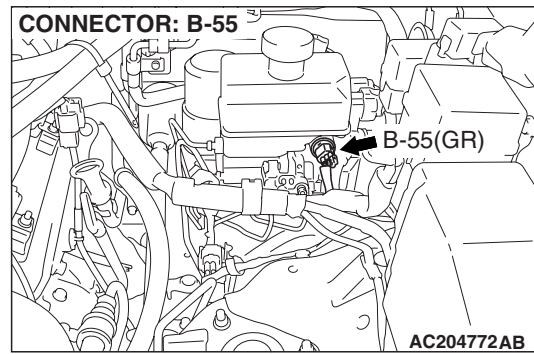
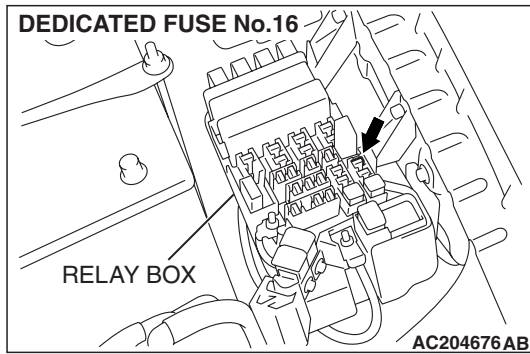
**STEP 10. Recheck for diagnostic trouble code.****Q: Does DTC 52 reset?**

- YES :** Go to Step 1.
- NO :** The procedure is complete.

**DTC 61 : Master Cylinder Pressure Sensor System**

**Master Cylinder Pressure Sensor Circuit**





### CIRCUIT OPERATION

The master cylinder pressure sensor is monitoring the brake fluid pressure to the rear wheels. The master cylinder pressure sensor sends a signal from its terminal No.1, and the M-ASTC-ECU receives the signal at its connector No.59.

### ABS DTC SET CONDITIONS

DTC 61 is set in the following case.

- When the power supply voltage is abnormally high or low
- When the master cylinder pressure sensor output signal is abnormally high or low

The system uses the stoplight switch ON/OFF signal to determine whether the master cylinder pressure sensor output voltage is normal or not. Therefore, when there is a malfunction in the stoplight switch circuit, this DTC will also be set.

### TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the master cylinder pressure sensor
- Malfunction of the stoplight switch
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

**STEP 1. Check the stoplight operation.**

**Q: Does the stoplight come on and go out correctly?**

**YES :** Go to Step 2.

**NO :** Go to Step 8.

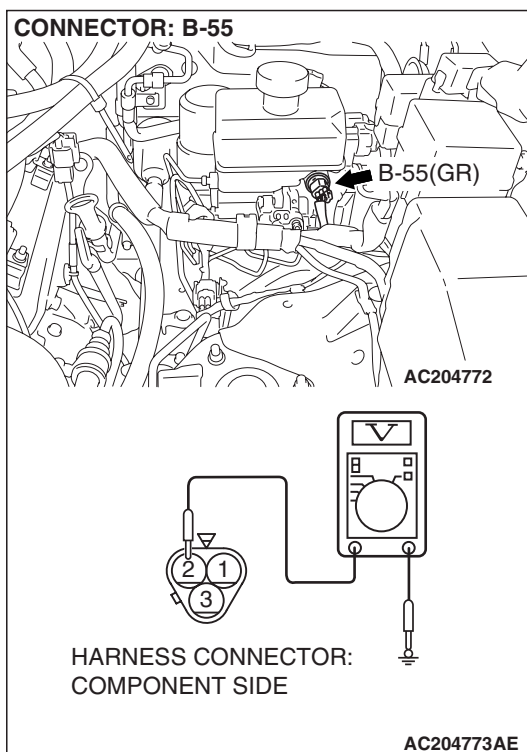
**STEP 2. Check the power supply circuit at pressure sensor connector B-55.**

- (1) Disconnect pressure sensor connector B-55, and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure voltage between terminal 2 and ground. It should be approximately 5 volts.

**Q: Is the voltage approximately 5 volts?**

**YES :** Go to Step 4.

**NO :** Go to Step 3.

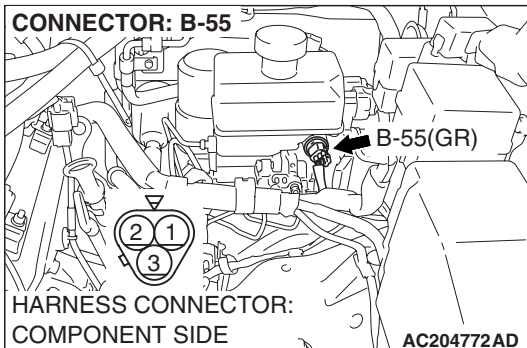
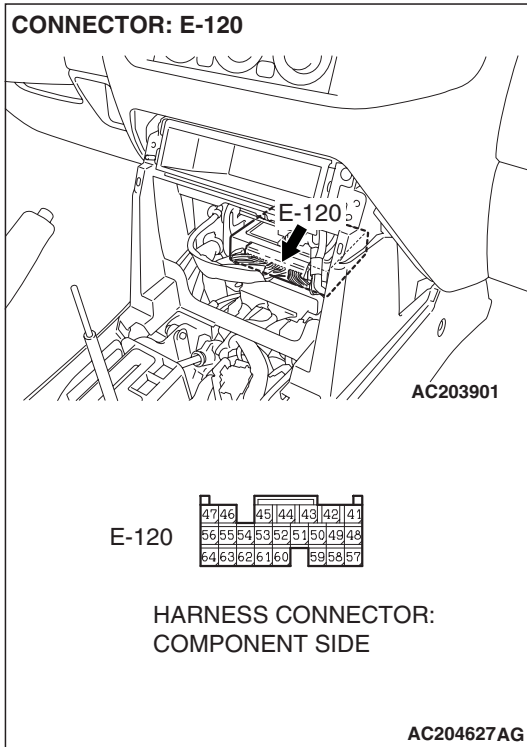


**STEP 3.** Check the harness wires between M-ASTC-ECU connector E-120 terminal 50 and pressure sensor connector B-55 terminal 2.

**Q:** Is the harness wire between M-ASTC-ECU connectors E-120 terminal 50 and pressure sensor connector B-55 terminal 2 damaged?

**YES :** Repair it and then go to Step 13.

**NO :** Replace the M-ASTC-ECU and go to Step 13.





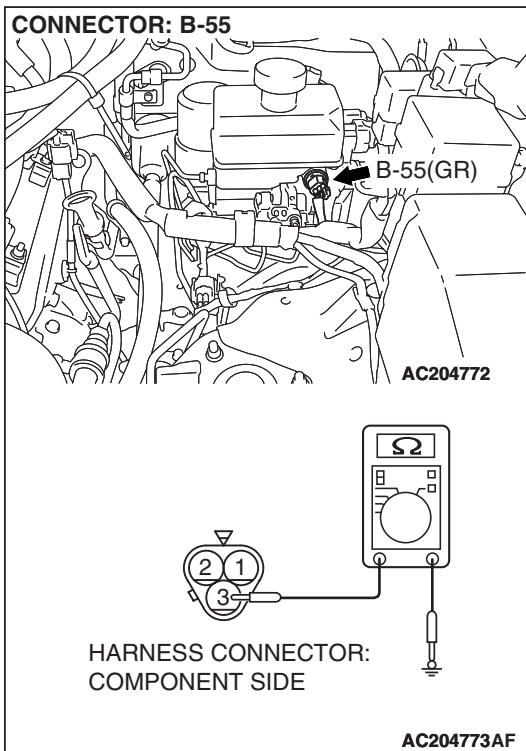
**STEP 4. Check the ground circuit at pressure sensor connector B-55.**

- (1) Disconnect the pressure sensor connector B-55, and measure at the harness side.
- (2) Measure the resistance between terminal 3 and ground. It should be less than 2 ohms.

**Q: Is there continuity between the terminal number 3 and ground?**

**YES :** Go to Step 6.

**NO :** Go to Step 5.

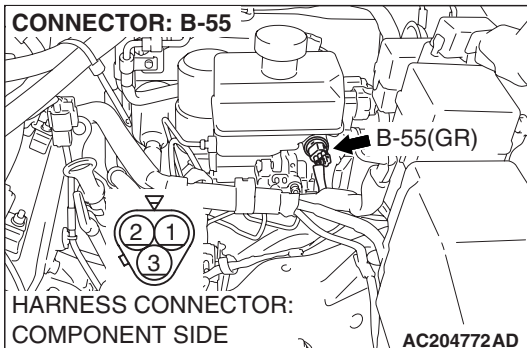
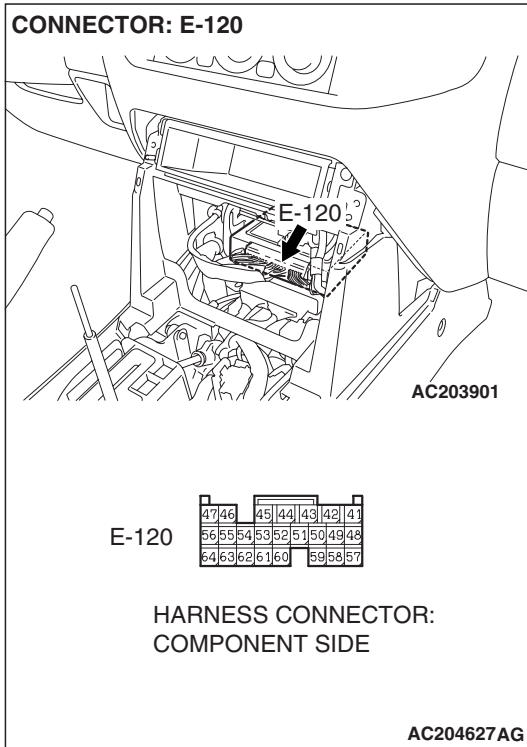


**STEP 5.** Check the harness wire between the M-ASTC-ECU connector E-120 terminal 58 and pressure sensor connector B-55 terminal 3.

**Q:** Is the harness wire between the M-ASTC-ECU connector E-120 terminal 58 and pressure sensor connector B-55 terminal 3 damaged?

**YES :** Replace it and go to Step 13.

**NO :** Replace the M-ASTC-ECU and go to Step 13.



**STEP 6. Check the sensor output voltage at M-ASTC-ECU connector E-120.**

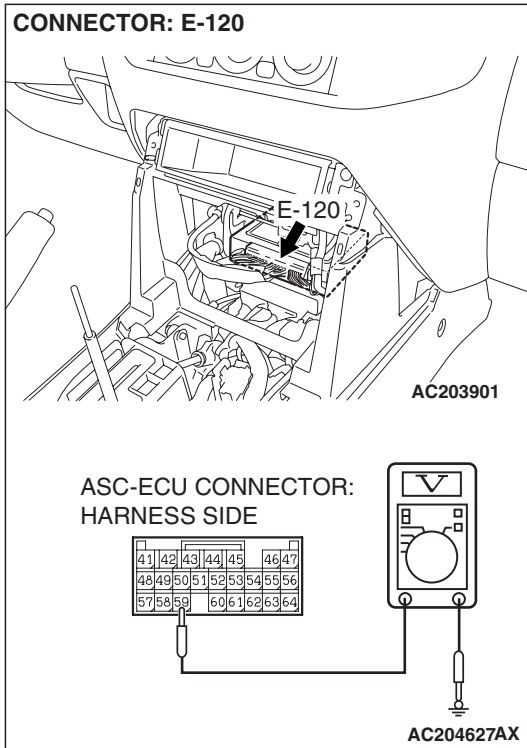
- (1) Do not disconnect the M-ASTC-ECU connector E-120.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure voltage between terminal 59 and ground.

**Standard value: 0.14 – 4.85 volts**

**Q: Is the voltage within the standard value?**

**YES :** Replace the M-ASTC-ECU and go to Step 13.

**NO :** Go to Step 7.

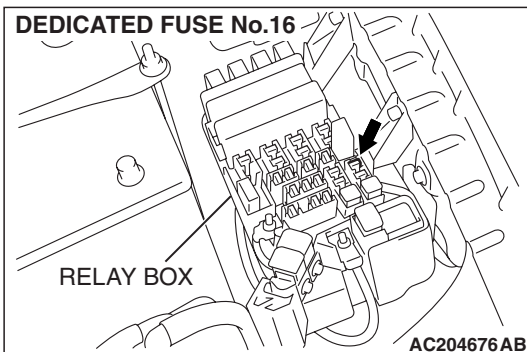
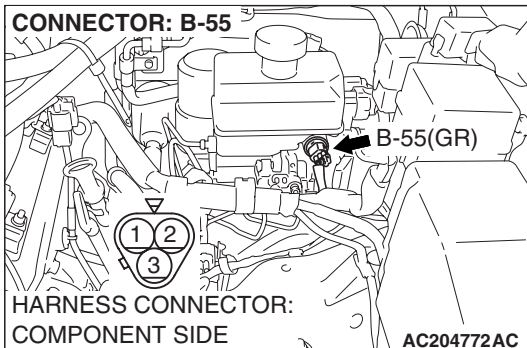
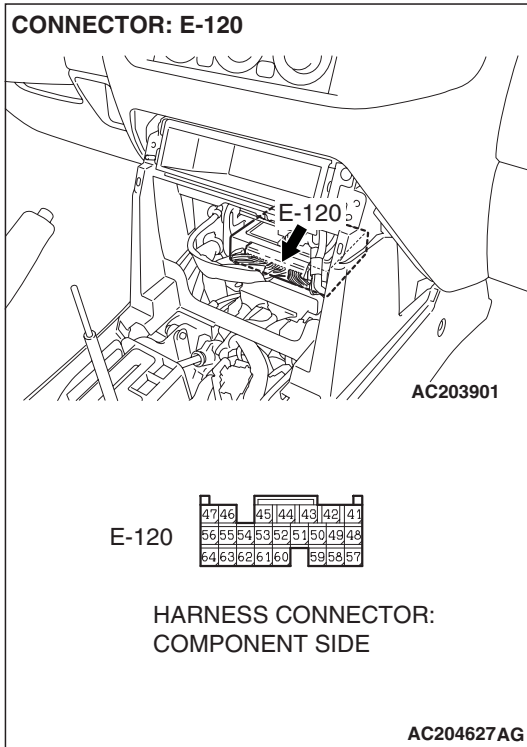


**STEP 7. Check the harness wire between the M-ASTC-ECU connector E-120 terminal 59 and pressure sensor connector B-55 terminal 1.**

**Q: Is the harness wire between the M-ASTC-ECU connector E-120 terminal 59 and pressure sensor connector B-55 terminal 1 damaged?**

**YES :** Replace it and go to Step 13.

**NO :** Replace the pressure sensor and go to Step 13.



**STEP 8. Check dedicated fuse number 16.**

**Q: Is the fuse burned out?**

**YES :** Check the harness for short circuit between dedicated fuse number 16 and the stoplights, and between the stoplight switch and M-ASTC-ECU connector E-119 (terminal No.19), and repair if necessary. Then replace the fuse and go to Step 13.

**NO :** Go to Step 9.

**STEP 9. Check the stoplight switch installation condition.**

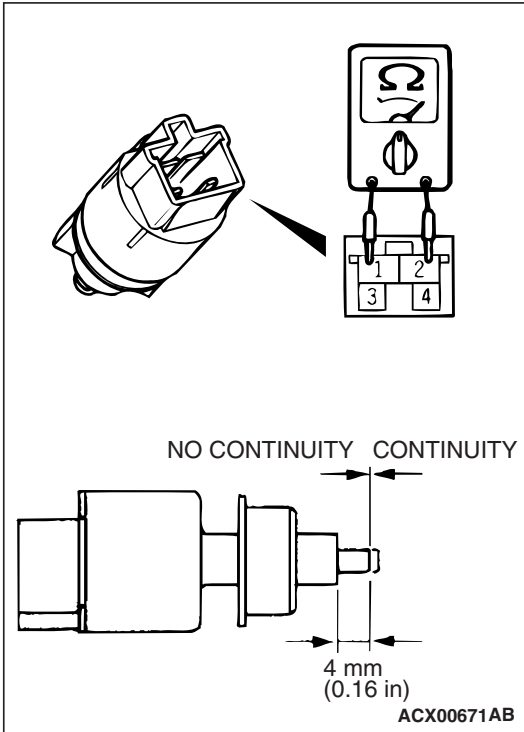
**Q: Is the stoplight switch installed properly?**

**YES :** Go to Step 10.

**NO :** Repair it and then go to Step 13.

**STEP 10. Check the stoplight switch continuity.**

- (1) Remove the stoplight switch. (Refer to GROUP 35A, Brake Pedal P.35A-135.)
- (2) Connect an ohmmeter between to stoplight switch connector terminals.
- (3) There should be no continuity between the terminals when the plunger is pushed in as shown. There should be continuity when it is released.

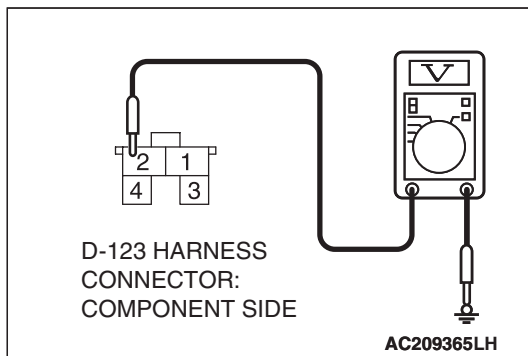
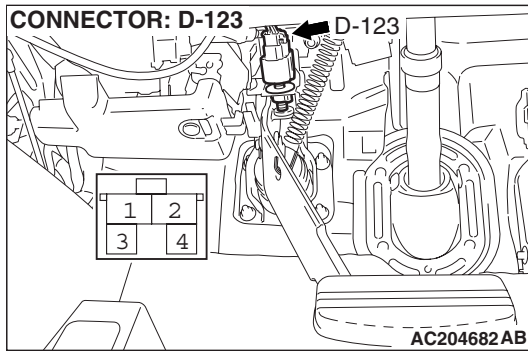


TESTER CONNECTION	PLUNGER	SPECIFIED CONDITION
1 - 2	IN	Open circuit
	OUT	Less than 2 ohms

**Q: Is the stoplight switch continuity correct?**

**YES :** Go to Step 11.

**NO :** Replace it and then go to Step 13.

**STEP 11. Check the stoplight switch connector D-133.**

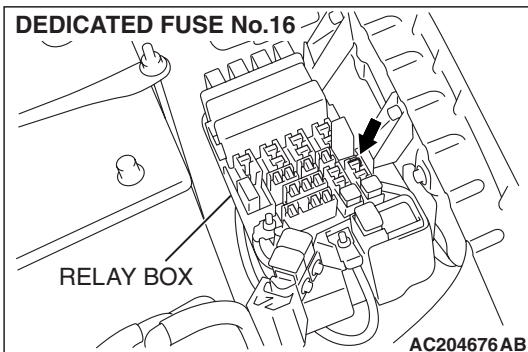
(1) Disconnect the stoplight switch connector D-133, and measure at the harness side.

(2) Measure voltage between terminal 2 and ground. It should be approximately 12 volts (battery positive voltage).

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

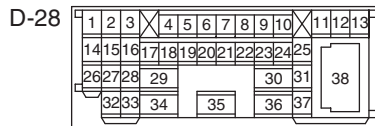
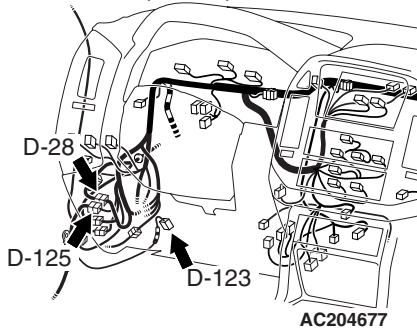
**YES :** Check the harness for open circuit between the stoplight switch and the stoplights, and repair if necessary. Then go to Step 13.

**NO :** Go to Step 12.

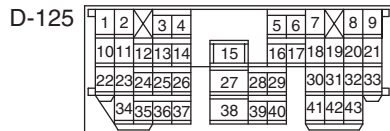


**STEP 12. Check the harness wire between dedicated fuse number 16 and stoplight switch connector D-123 terminal 2.**

CONNECTORS: D-28, D-123, D-125



AC204677



AC204701AB

**NOTE:** After inspecting intermediate connectors D-28, D-125 and stoplight switch connector D-123, inspect the wire. If intermediate connectors D-28, D-125 and stoplight switch connector D-123 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 13.

**Q:** Is the harness wire between dedicated fuse number 16 and stoplight switch connector D-123 terminal 2 damaged?

**YES :** Repair it and then go to Step 13.

**NO :** This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-13.

**STEP 13. Recheck for diagnostic trouble code.**

**Q:** Do DTC 61 reset?

**YES :** Go to Step 1.

**NO :** The procedure is complete.

**SYMPTOM CHART**

*NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.*

*NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.*

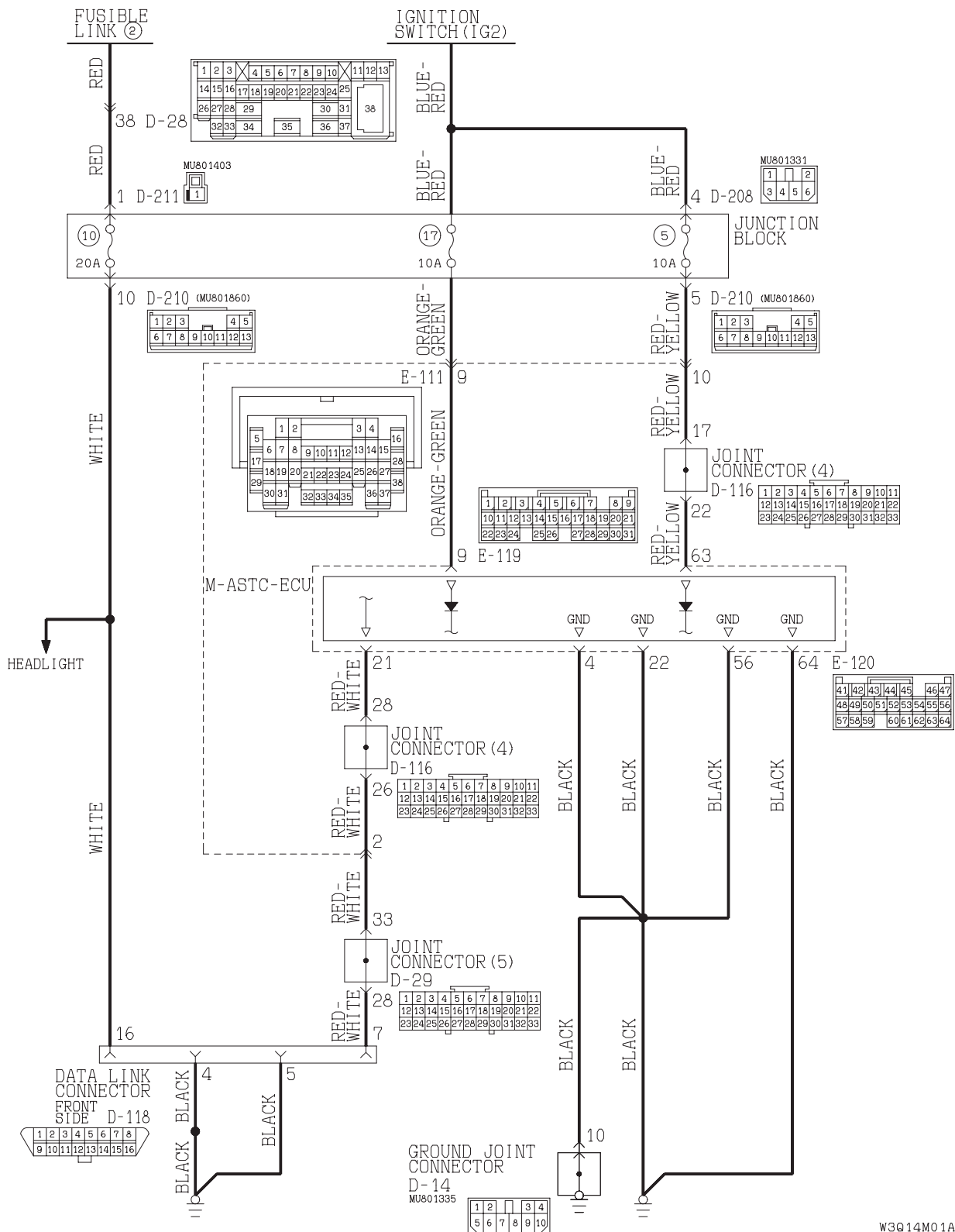
<b>SYMPTOM</b>	<b>INSPECTION PROCEDURE NO.</b>	<b>REFERENCE PAGE</b>
Communication between the scan tool and the whole system is not possible.	-	GROUP13A – Diagnosis <a href="#">P.13A-888</a>
Communication with scan tool is not possible. (Communication with ABS only is not possible.)	1	<a href="#">P.35B-89</a>
When the ignition switch is turned to the "ON" position (engine stopped or after start-up), the ABS warning light does not illuminate.	2	<a href="#">P.35B-96</a>
The ABS warning light remains illuminated after the engine is started	3	<a href="#">P.35B-105</a>
When ignition switch is turned to the "START" position, the ABS warning light does not illuminate.	4	<a href="#">P.35B-110</a>
The ABS warning light flashes twice after the ignition switch is turned to the "ON" position. The light illuminates when the ignition switch is turned the "START" position, and when the ignition switch is returned to the "ON" position, it flashes once.	5	<a href="#">P.35B-114</a>
Faulty ABS operation	6	<a href="#">P.35B-118</a>

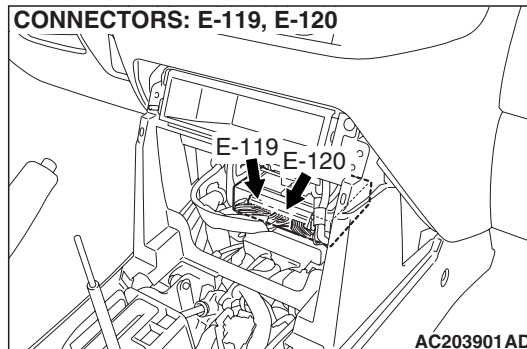
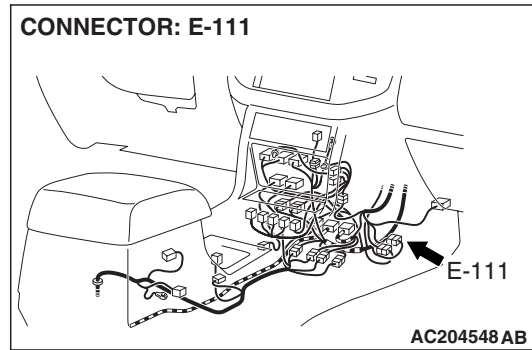
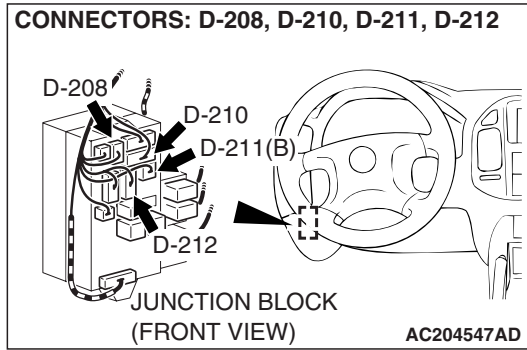
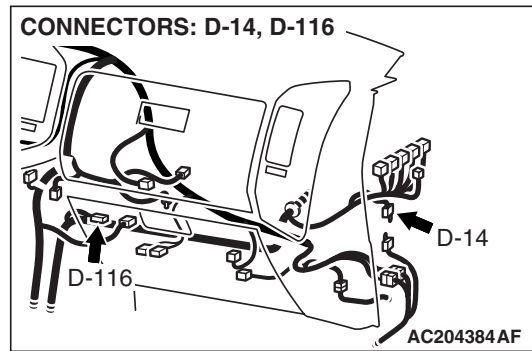
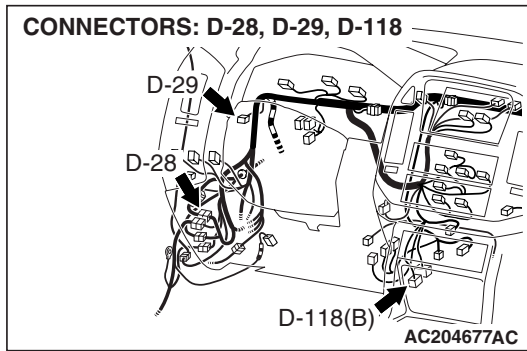


**SYMPTOM PROCEDURES**

**INSPECTION PROCEDURE 1: Communication with Scan Tool is not Possible. (Communication with ABS Only is not Possible.)**

Data Link Connector Circuit





**CIRCUIT OPERATION**

The diagnostic output is made from the M-ASTC-ECU (terminal 21) to the diagnostic output terminal (terminal 7) of the data link connector.

**TECHNICAL DESCRIPTION (COMMENT)**

When communication with the scan tool is not possible, the cause is probably an open circuit in the M-ASTC-ECU power circuit or an open circuit in the diagnostic output circuit.

**TROUBLESHOOTING HINTS**

- Blown fuse
- Damaged wiring harness and connector
- Malfunction of the M-ASTC-ECU

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

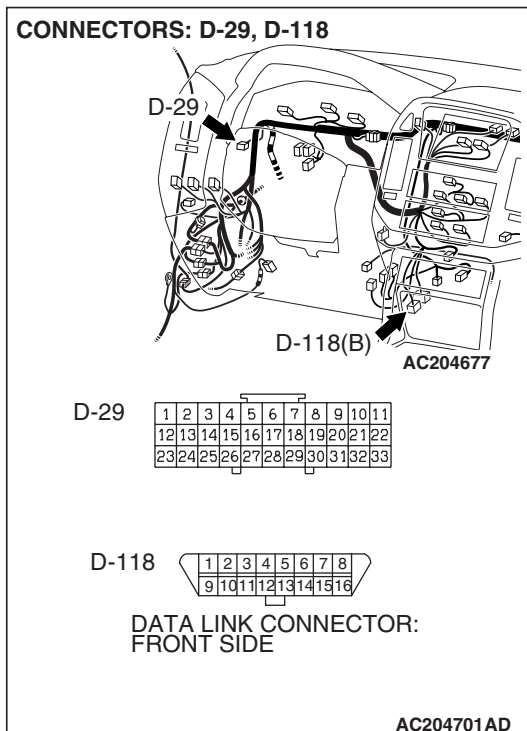
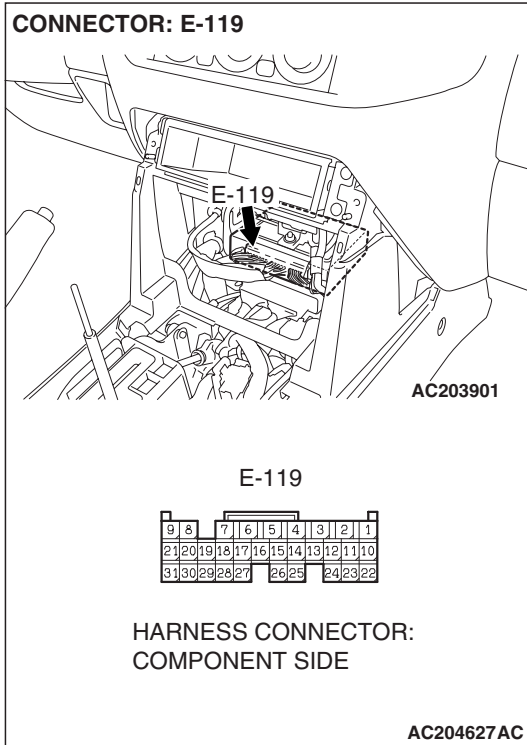
**STEP 1. Check the harness wires between M-ASTC-ECU connector E-119 terminal 21 and data link connector D-118 terminal 7.**

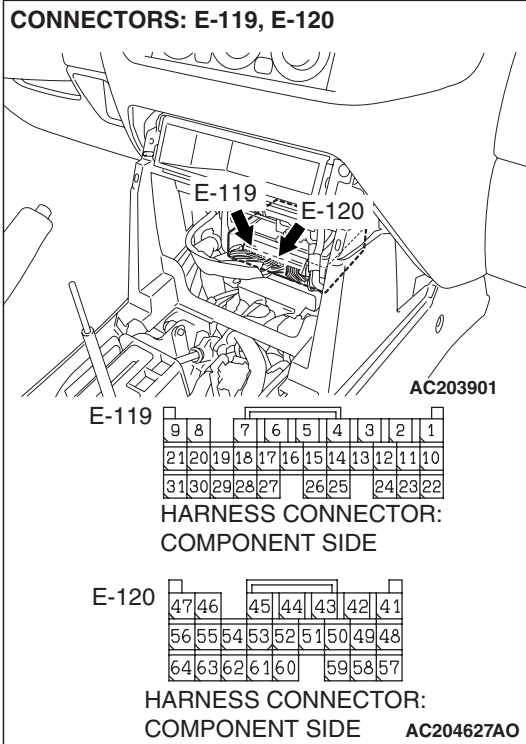
*NOTE: After inspecting M-ASTC-ECU connector E-119, joint connector D-116, intermediate connector E-111 and joint connector D-29, inspect the wire. If M-ASTC-ECU connector E-119, joint connector D-116, intermediate connector E-111 and joint connector D-29 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.*

**Q: Are the harness wires between M-ASTC-ECU connector E-119 terminal 21 and data link connector D-118 terminal 7 damaged?**

**YES :** Repair them and then go to Step 5.

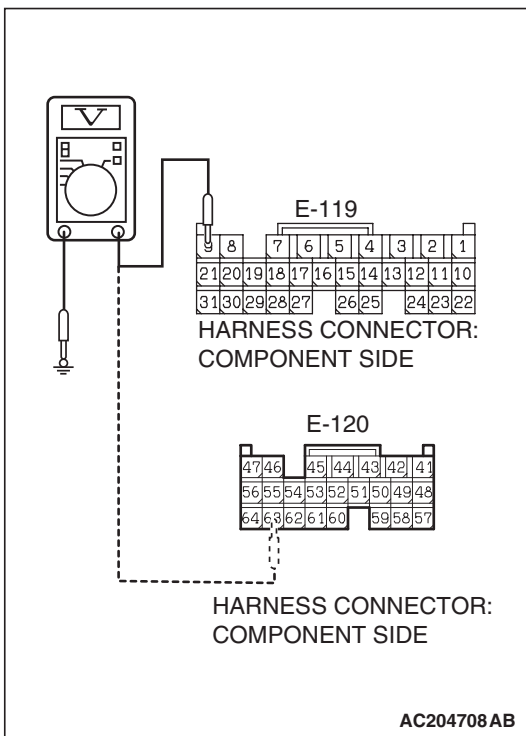
**NO :** Go to Step 2.





**STEP 2. Check the power supply circuit at M-ASTC-ECU connectors E-119 and E-120.**

- (1) Disconnect connectors E-119 and E-120, and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.



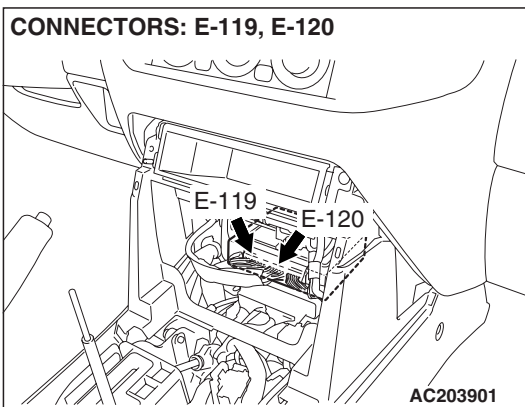
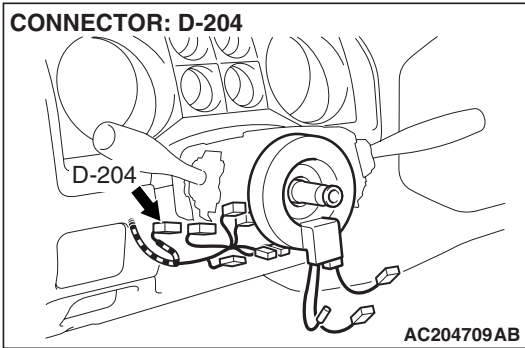
- (3) Measure the voltage between M-ASTC-ECU connector E-120 terminal 63 and ground. It should be approximately 12 volts (battery positive voltage).

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

**YES :** Go to Step 4.

**NO :** Go to Step 3.

**STEP 3.** Check the harness wire between ignition switch (IG2) connector D-204 terminal 4 and M-ASTC-ECU connectors E-119 terminal 9 and E-120 terminal 63.



E-119

9	8	7	6	5	4	3	2	1			
21	20	19	18	17	16	15	14	13	12	11	10
31	30	29	28	27	26	25	24	23	22		

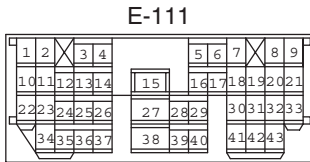
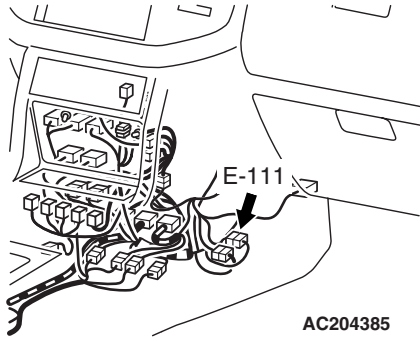
HARNESS CONNECTOR:  
COMPONENT SIDE

E-120

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

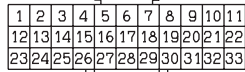
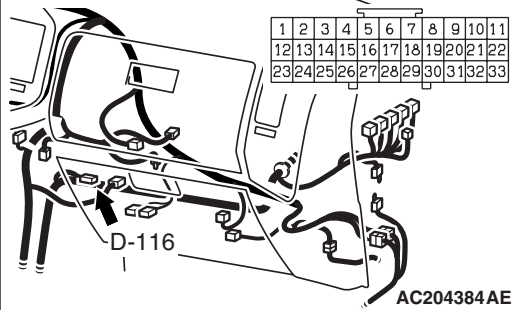
HARNESS CONNECTOR:  
COMPONENT SIDE AC204627AO

CONNECTOR: E-111



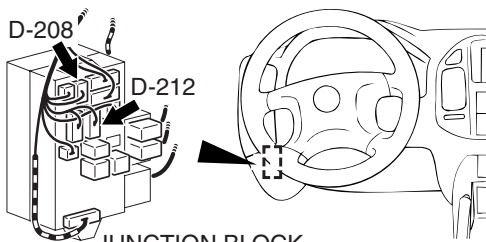
AC204673 AB

CONNECTOR: D-116

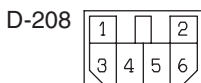


AC204384 AE

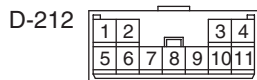
CONNECTORS: D-208, D-212



JUNCTION BLOCK  
(FRONT VIEW)



JUNCTION BLOCK CONNECTOR



JUNCTION BLOCK CONNECTOR

AC204624 AF

**NOTE:** After inspecting M-ASTC-ECU connectors E-119 and E-120, intermediate connector E-111, joint connector D-116, junction block connector D-208 and D-212, inspect the wire. If M-ASTC-ECU connectors E-119 and E-120, intermediate connector E-111, joint connector D-116, junction block connector D-208 and D-212 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

**Q: Are the harness wires between ignition switch (IG2) connector D-204 terminal 4 and M-ASTC-ECU connectors E-119 terminal 9 and E-120 terminal 63 damaged?**

**YES :** Repair them and then go to Step 5.

**NO :** Go to Step 5.

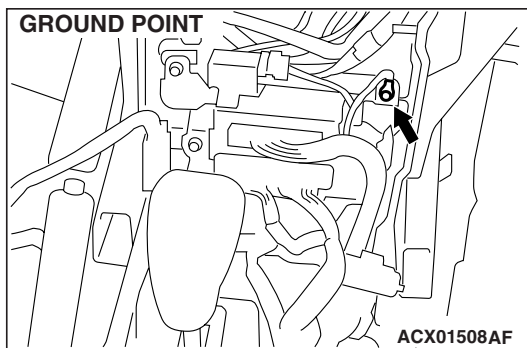
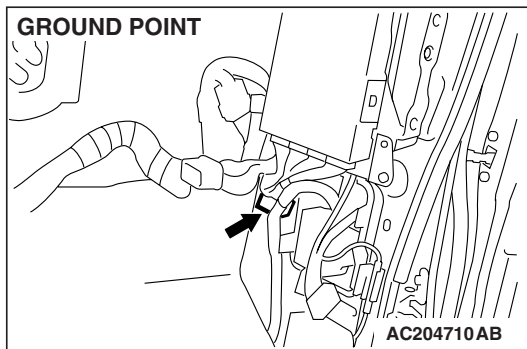
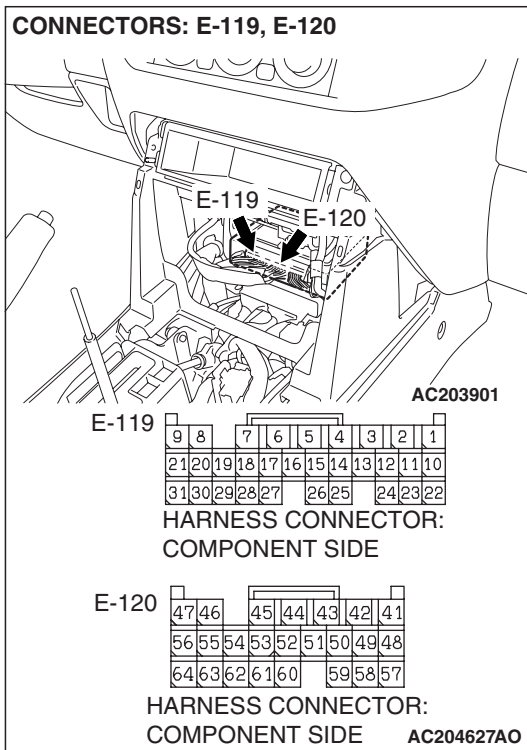
**STEP 4.** Check the wiring harnesses between M-ASTC-ECU connectors E-119 terminals 4, 22 and ground as well as between M-ASTC-ECU connectors E-120 terminals 56, 64 and ground.

*NOTE:* After inspecting M-ASTC-ECU connectors E-119 and E-120, inspect the wire. If M-ASTC-ECU connectors E-119 and E-120 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

**Q:** Are the wiring harnesses between M-ASTC-ECU connectors E-119 terminals 4, 22 and ground as well as between M-ASTC-ECU connectors E-120 terminals 56, 64 and ground damaged?

**YES :** Repair them and then go to Step 5.

**NO :** Replace the M-ASTC-ECU and go to Step 5.



**STEP 5. Retest the system**

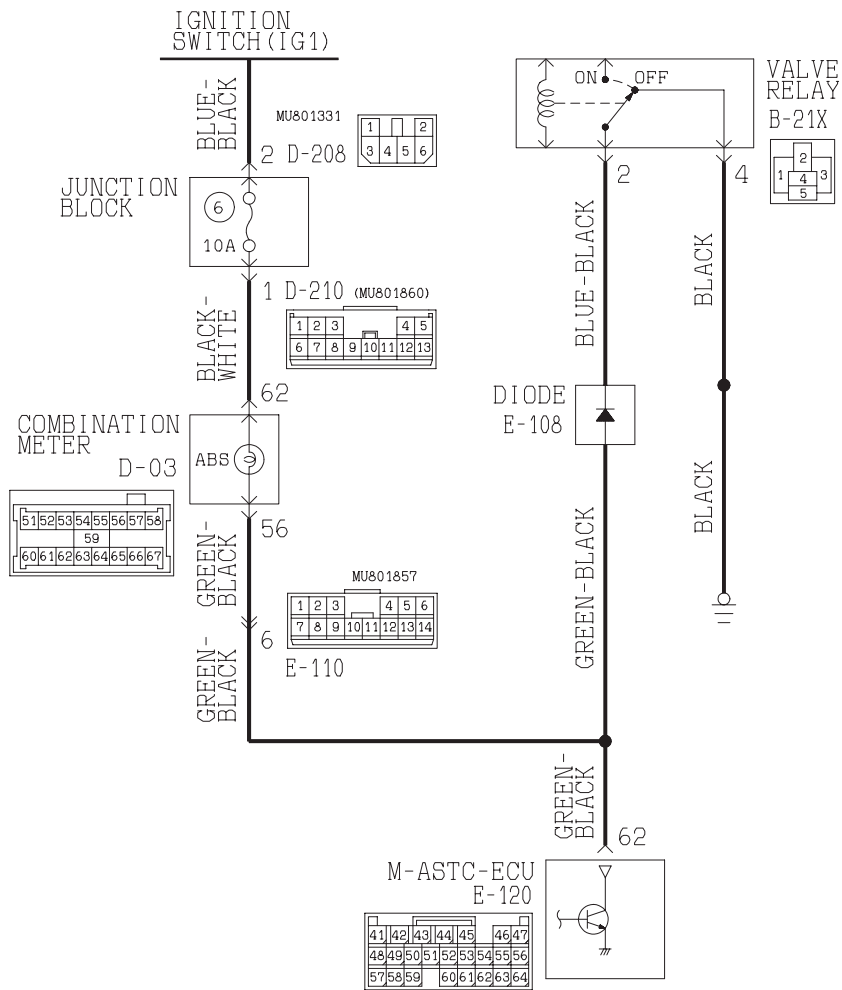
**Q: Does the scan tool communicate with the ABS system?**

**YES :** The procedure is complete.

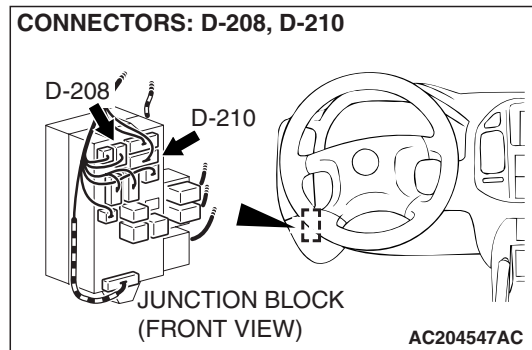
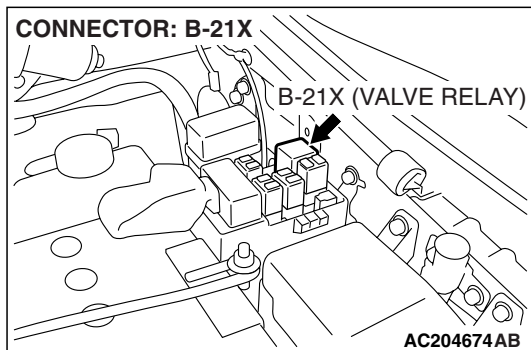
**NO :** Return to Step 1.

**INSPECTION PROCEDURE 2: When the Ignition Switch is Turned the "ON" Position (Engine Stopped or after Start-up), the ABS Warning Light does not Illuminate.**

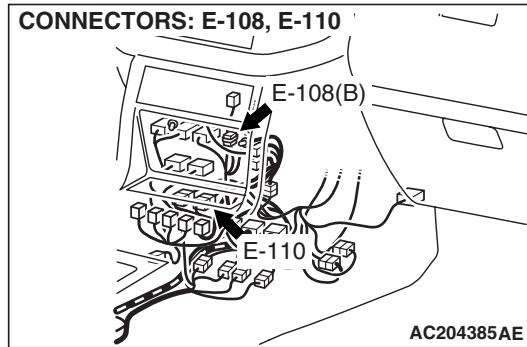
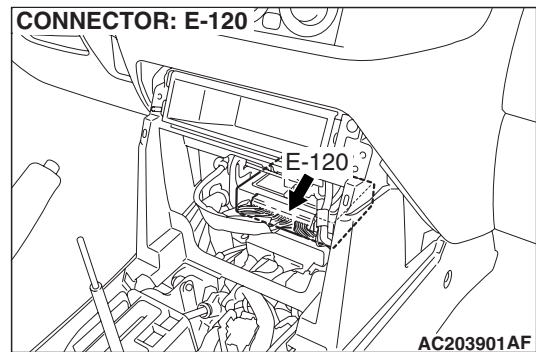
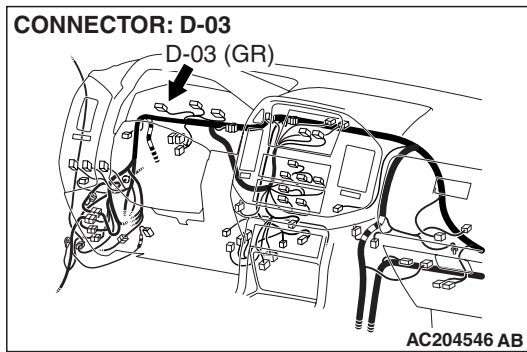
ABS Warning Light Circuit



W3014M02AA  
AC204874 AB







### CIRCUIT OPERATION

- The ABS warning light power is supplied from the ignition switch. The M-ASTC-ECU grounds the circuit to illuminate the light. The light also illuminates when the valve relay is switched to OFF.
- The M-ASTC-ECU illuminates the ABS warning light for 3 seconds while running self-check. This light can be illuminated for 3 seconds upon start-up or ignition switch to the "ON" position, engine stopped. The M-ASTC-ECU drives the valve relay in the order of OFF to ON to OFF to ON during initial check to check the valve relay.

### TECHNICAL DESCRIPTION (COMMENT)

When the M-ASTC-ECU warning light circuit is in good condition, the ABS warning light illuminates for 3 seconds when the ignition switch is turned to the "ON" position. For instance, if the ABS warning light circuit of M-ASTC-ECU is out of order, the light illumi-

nates once when the valve relay is switched to the "OFF" position during initial check. If the ABS warning light does not illuminate when the ignition switch is turned to the "ON" position, the following items are suspected to be the cause: open circuit on the light power circuit, burned out light bulb, open circuit between the ABS warning light and the M-ASTC-ECU, and open circuit between the ABS warning light and the valve relay.

### TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Burnt out ABS warning light bulb
- Malfunction of the M-ASTC-ECU

**DIAGNOSIS**

**Required Special Tool:**

- MB991223: Harness Set

**STEP 1. Check the illumination of brake warning light.**

Turn the ignition switch to the "ON" position. The brake warning light should turn on.

**Q: Does the brake warning light turn on?**

- YES :** Go to Step 2.
- NO :** Go to Step 7.

**STEP 2 Check the ABS warning light bulb.**

- (1) Remove the combination meter (Refer to GROUP 54A, Combination Meter P.54A-74).
- (2) Check the ABS warning light bulb.

**Q: Is the bulb burned out?**

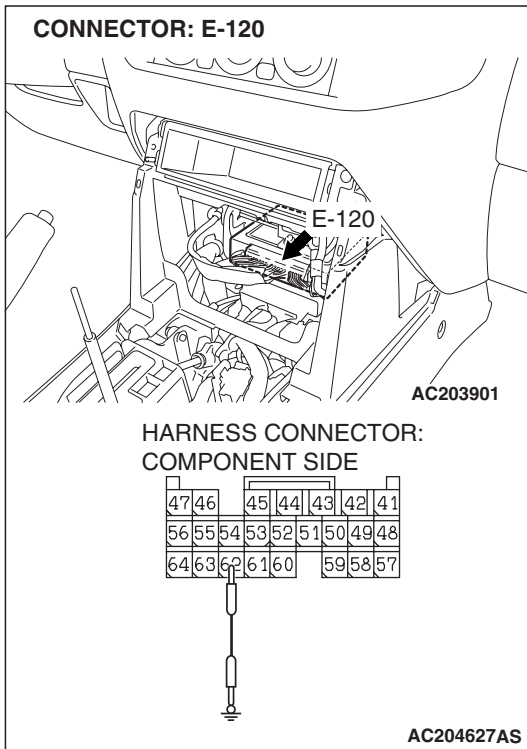
- YES :** Replace the bulb and then go to Step 10.
- NO :** Go to Step 3.

**STEP 3. Check the ABS warning light circuit at M-ASTC-ECU connector E-120.**

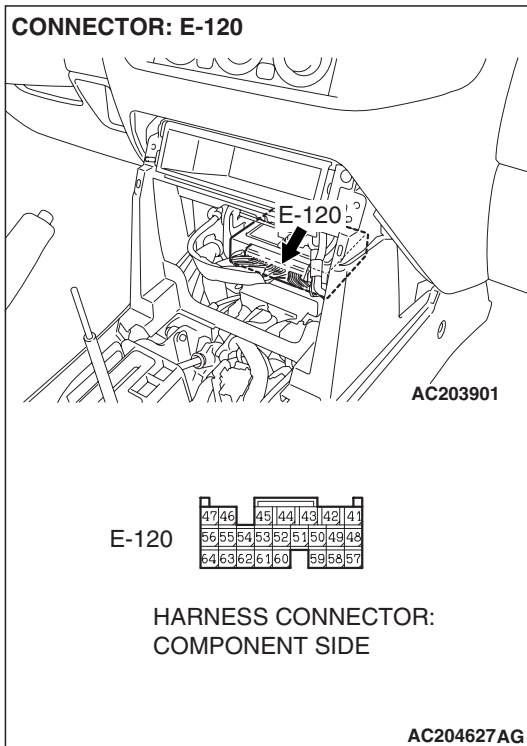
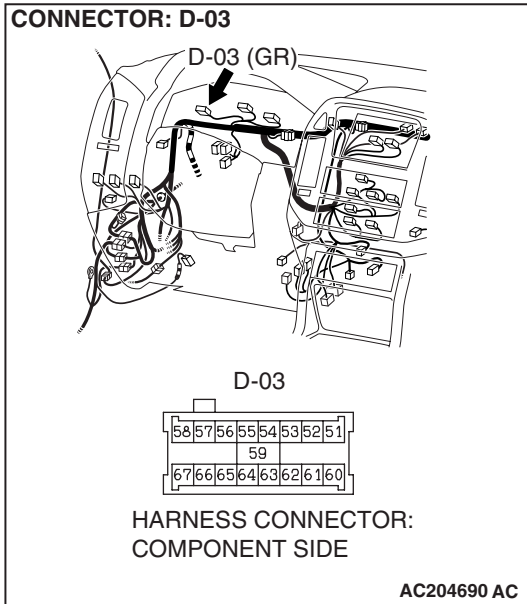
- (1) Disconnect M-ASTC-ECU connector E-120 and measure at the harness side.
- (2) Ground the terminal 62.
- (3) Turn the ignition switch to the "ON" position. The ABS warning light should turn on.

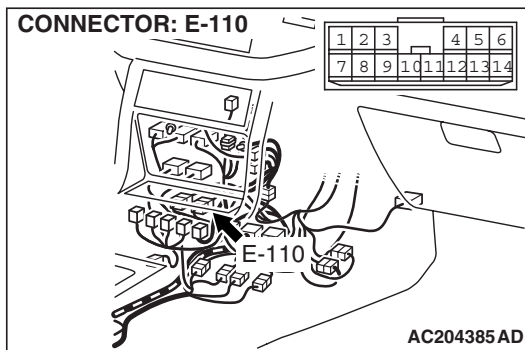
**Q: Is the ABS warning light turn on?**

- YES :** Replace the M-ASTC-ECU and then go to Step 5.
- NO :** Go to Step 4.



**STEP 4.** Check the harness wires between combination meter connector D-03 terminal 56 and M-ASTC-ECU connector E-120 terminal 62.





**NOTE:** After inspecting combination meter connector D-03, intermediate connector E-110 and M-ASTC-ECU connector E-120, inspect the wire. If combination meter connector D-03, intermediate connector E-110 and M-ASTC-ECU connector E-120 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 10.

**Q: Is the harness wire between combination meter connector D-03 terminal 56 and M-ASTC-ECU connector E-120 terminal 62 damaged?**

**YES :** Repair it and then go to Step 10.

**NO :** Replace the combination meter (printed circuit board) and go to Step 10.

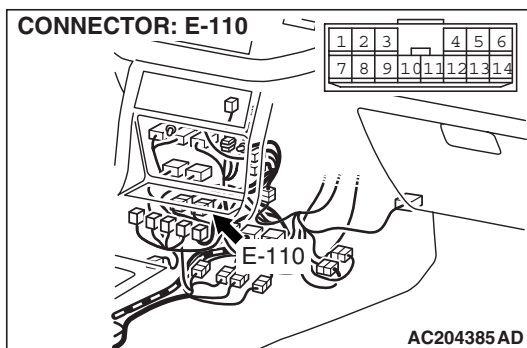
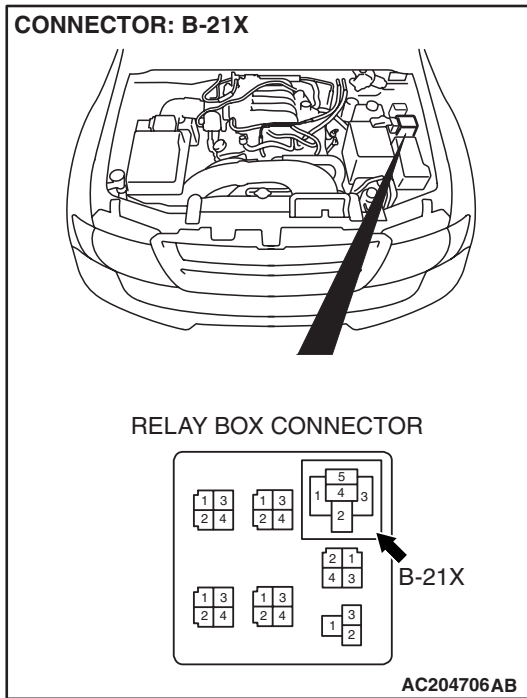
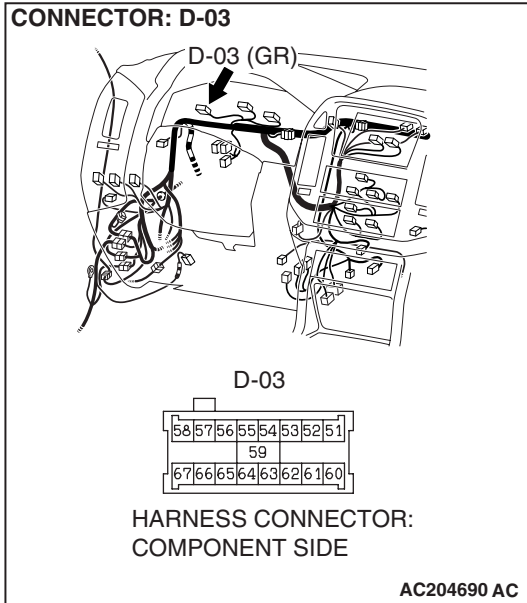
**STEP 5. Check the harness wire between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2.**

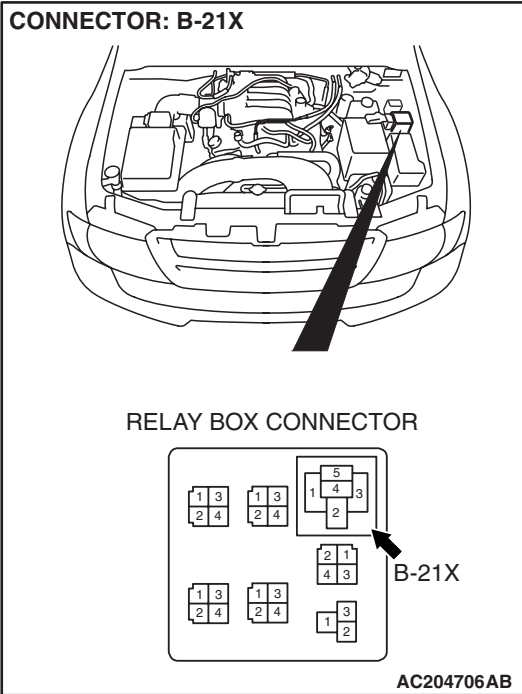
*NOTE: After inspecting valve relay connector B-21X and intermediate connector E-110, inspect the wire. If valve relay connector B-21X and intermediate connector E-110 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.*

**Q: Is the harness wire between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2 damaged?**

**YES :** Repair them and then go to Step 10.

**NO :** Go to Step 6.





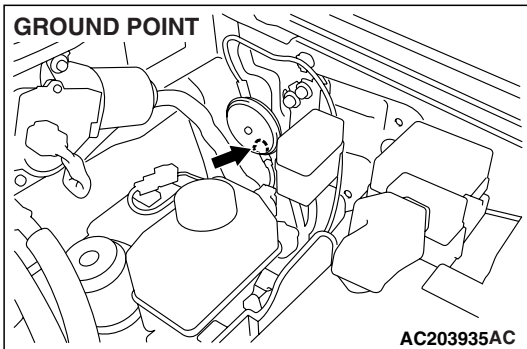
**STEP 6. Check the harness wires between valve relay connector B-21X terminal 4 and ground.**

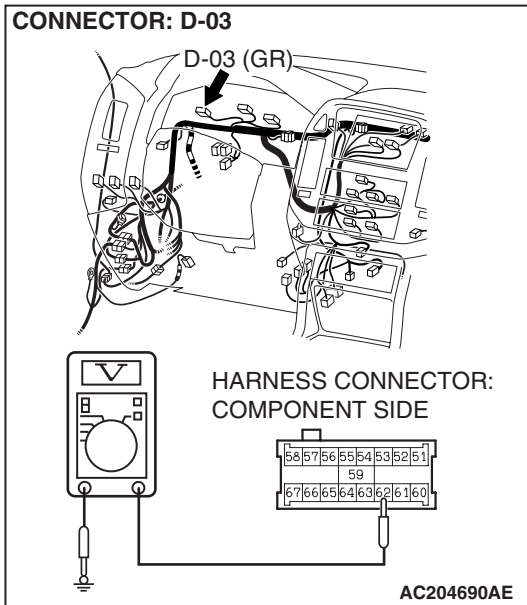
*NOTE: After inspecting valve relay connector B-21X, inspect the wire. If valve relay connector B-21X is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.*

**Q: Is the harness wire between valve relay connector B-21X terminal 4 and ground damaged?**

**YES :** Repair it and then go to Step 10.

**NO :** Go to Step 10.



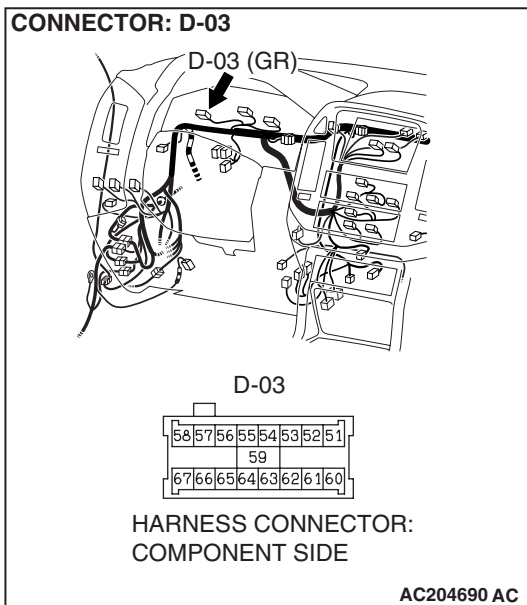


**STEP 7. Check the combination meter power supply circuit at combination meter connector D-03.**

- (1) Disconnect the combination meter connector D-03, and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 62 and ground. It should be approximately 12 volts (battery positive voltage).

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

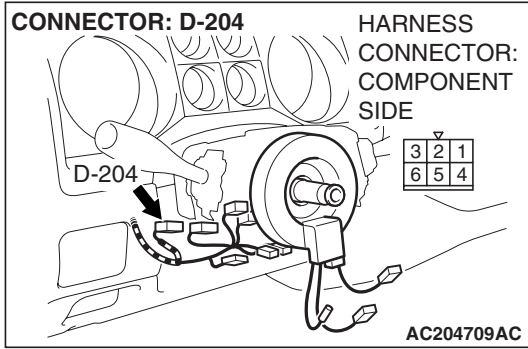
- YES :** Go to Step 8.  
**NO :** Go to Step 9.



**STEP 8. Check the combination meter connector D-03.**

**Q: Is the connector damaged?**

- YES :** Repair it and then go to Step 10.  
**NO :** Replace the combination meter (printed circuit board) and go to Step 10.



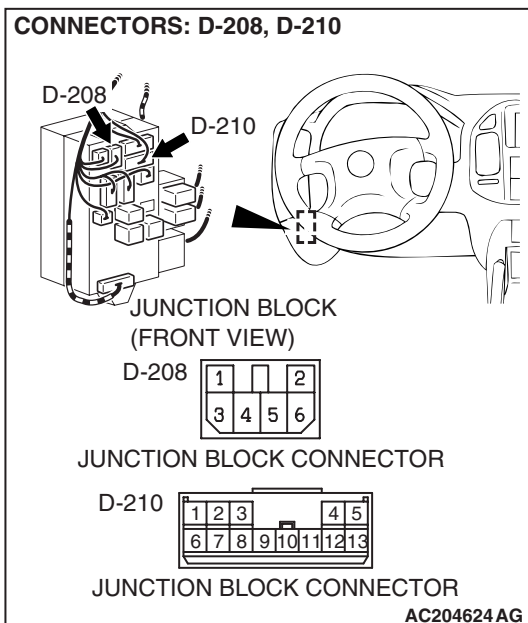
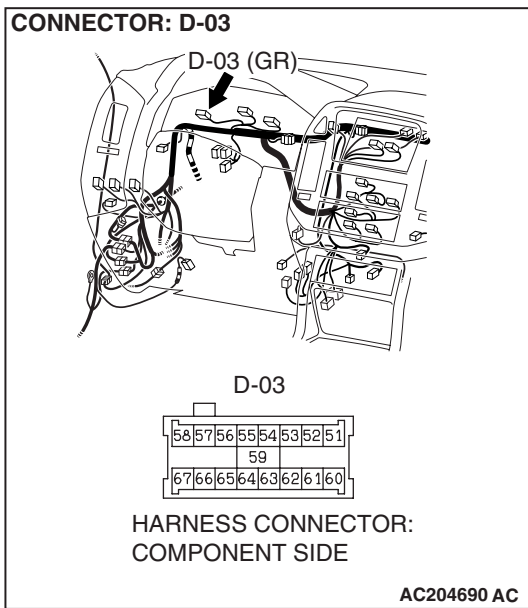
**STEP 9.** Check the harness wires between ignition switch (IG1) connector D-204 terminal 2 and combination meter connector D-03 terminal 62.

*NOTE:* After inspecting junction block connectors D-208 and D-210, inspect the wire. If junction block connectors D-208 and D-210 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 10.

**Q:** Is the harness wire between ignition switch (IG1) connector D-204 terminal 2 and combination meter connector D-03 terminal 62 damaged?

**YES :** Repair it and then go to Step 10.

**NO :** Go to Step 10.





**STEP 10. Retest the system.**

**Q: Does the ABS warning light illuminate for 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon start-up?**

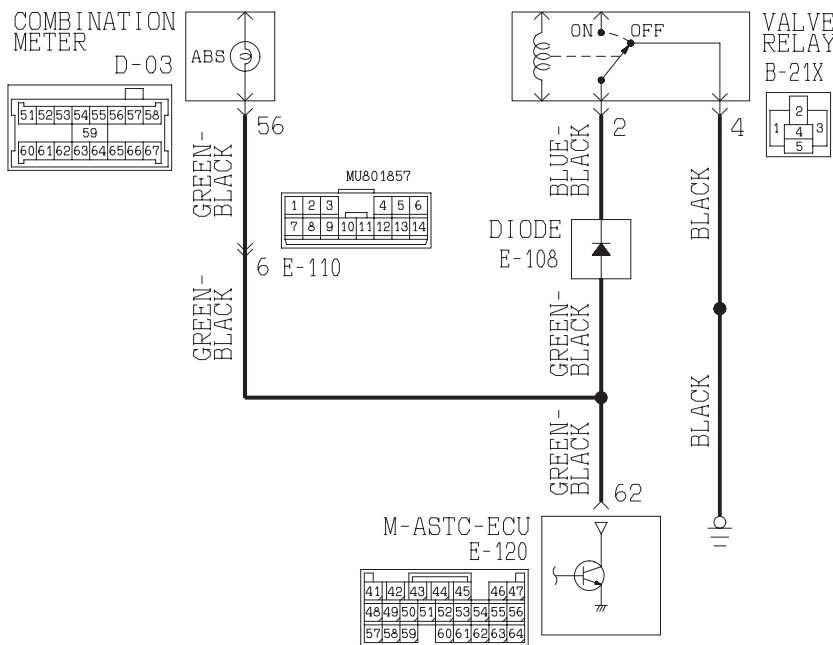
**YES :** The procedure is complete.

**NO :** Return to Step 1.

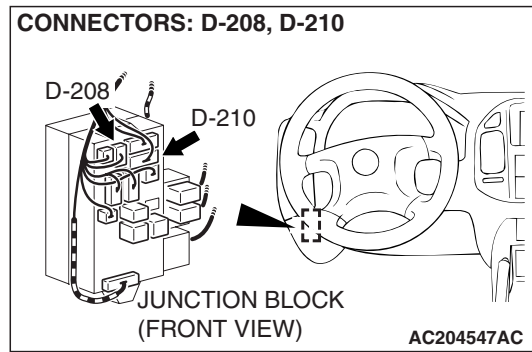
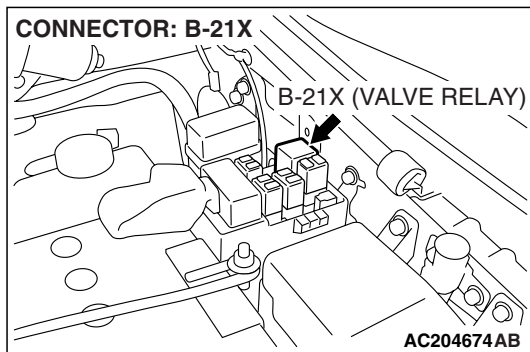
**INSPECTION PROCEDURE 3: The ABS Warning Light Remains Illuminated after the Engine is Started.**

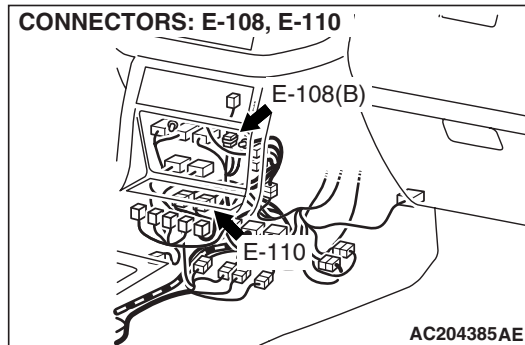
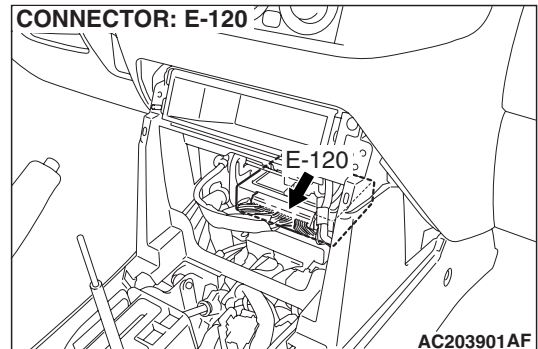
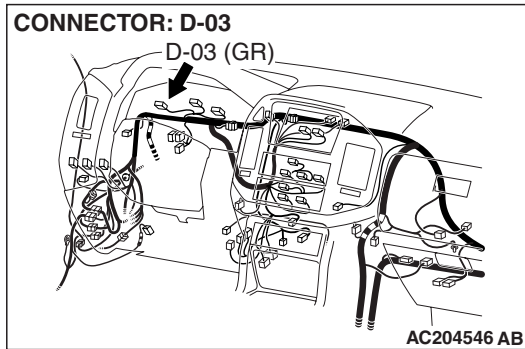
*NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (M-ASTC-ECU power supply is normal) and no diagnostic trouble code outputs.*

**ABS Warning Light Circuit**



W3Q14M03AA  
AC204875AB





### CIRCUIT OPERATION

The ABS warning light power is supplied from the ignition switch. The M-ASTC-ECU grounds the circuit to illuminate the light. The light also illuminates when the valve relay is switched to OFF.

### TECHNICAL DESCRIPTION (COMMENT)

The short circuit of ABS warning light circuit is considered to be the cause. The failure of valve relay OFF can be suspected as the cause, but in this case DTC 52 would be output.

### TROUBLESHOOTING HINTS

- Damaged wiring harness
- Malfunction of M-ASTC-ECU

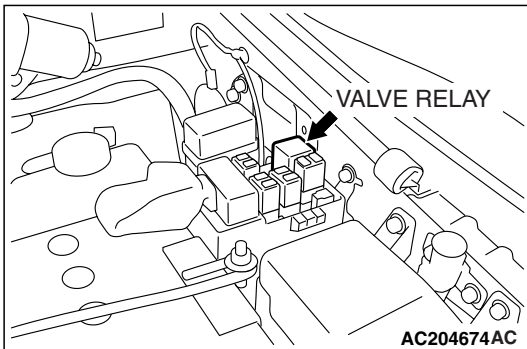
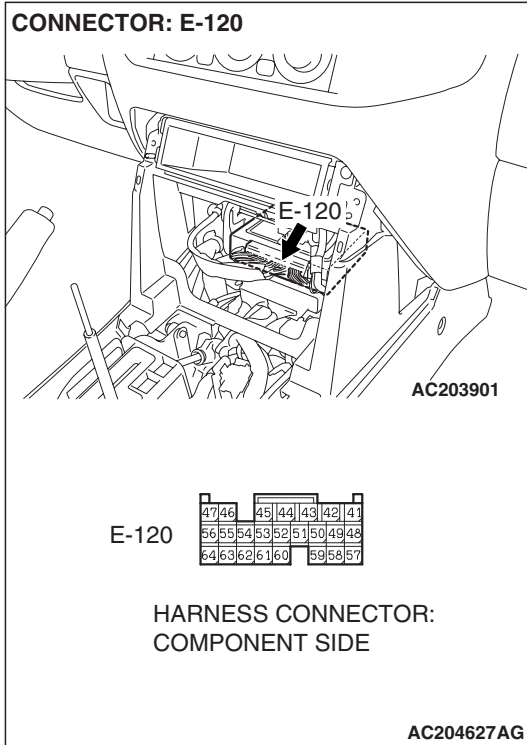
DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

**STEP 1. Check the ABS warning light circuit at M-ASTC-ECU connector E-120.**

- (1) Disconnect M-ASTC-ECU connector E-120.



- (2) Remove the valve relay.

- (3) Turn the ignition switch to the "ON" position. The ABS warning light goes out.

**Q: Does the ABS warning light go out?**

**YES** : Replace the M-ASTC-ECU and then go to Step 4.

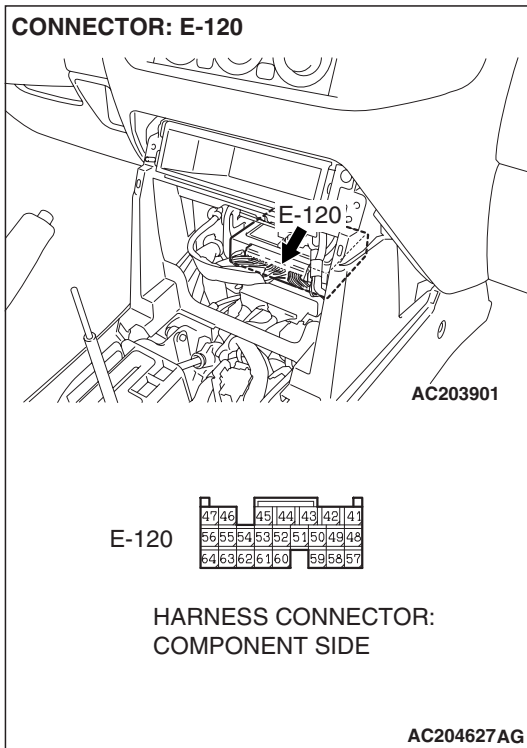
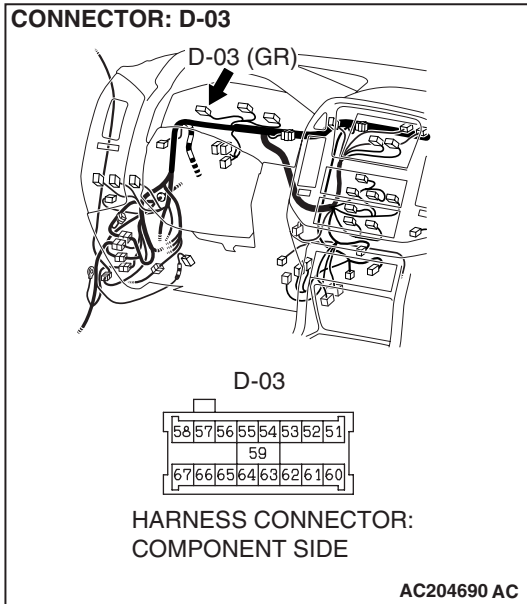
**NO** : Go to Step 2.

**STEP2.** Check the harness wire between combination meter connector D-03 terminal 56 and M-ASTC-ECU connector E-120 terminal 62.

**Q:** Is the harness wire between combination meter connector D-03 terminal 62 and M-ASTC-ECU connector E-120 terminal 62 damaged?

**YES :** Repair it and then go to Step 4.

**NO :** Go to Step 3.

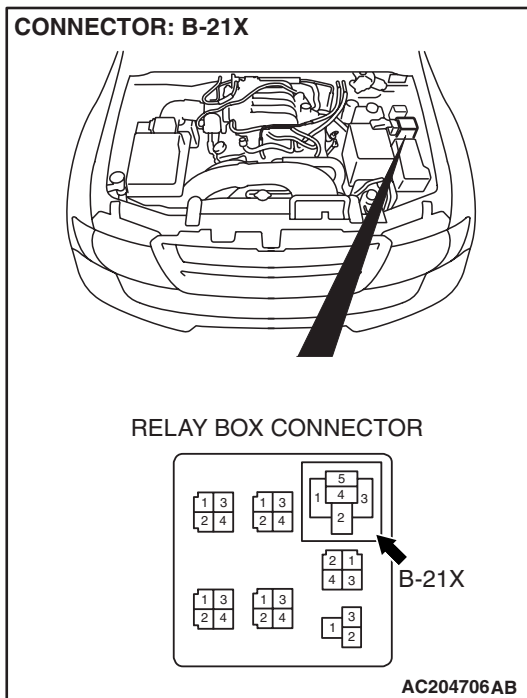
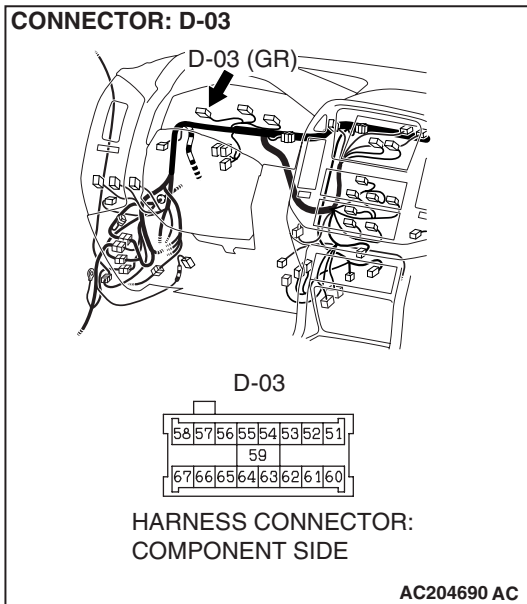


**STEP 3. Check the harness wires between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2.**

**Q: Is the harness wire between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2 damaged?**

**YES :** Repair it and then go to Step 4.

**NO :** Replace the combination meter (printed circuit board) and go to Step 4.



**STEP 4. Retest the system.**

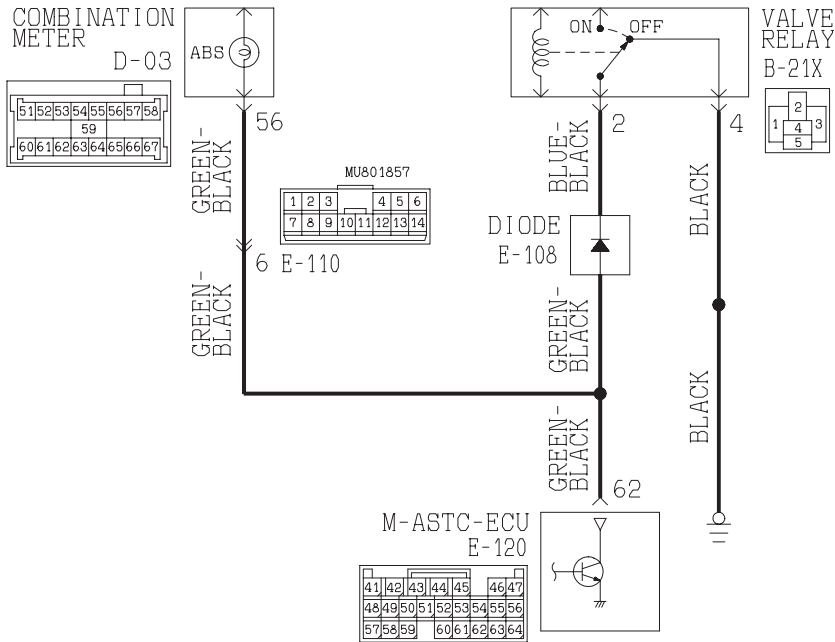
**Q: Does the ABS warning light turn off 3 seconds after start-up?**

**YES :** The procedure is complete.

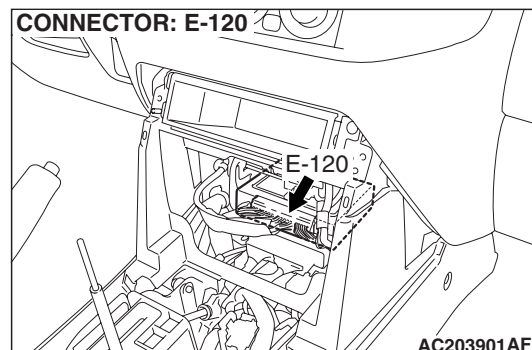
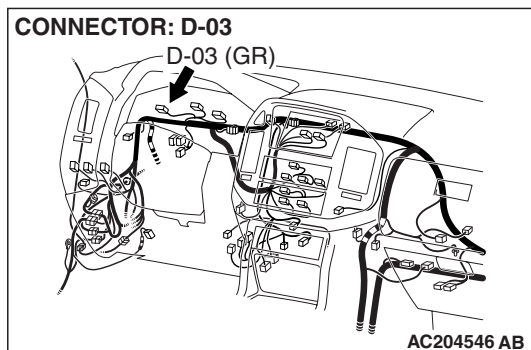
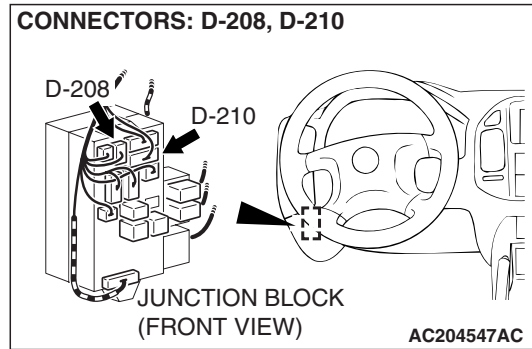
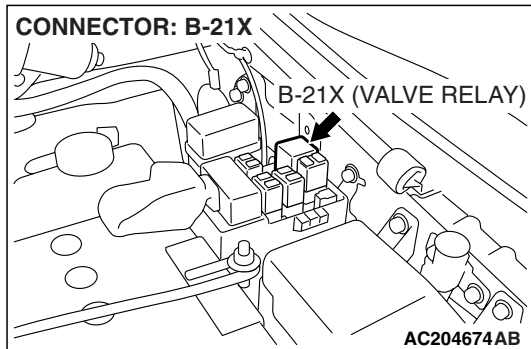
**NO :** Return to Step 1.

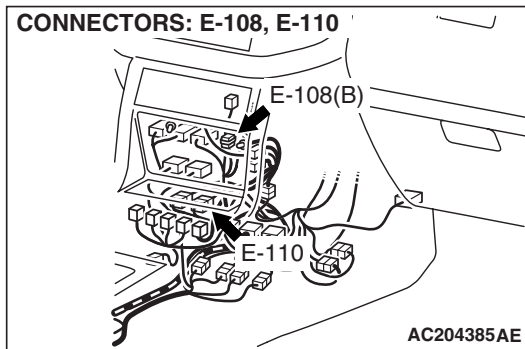
**INSPECTION PROCEDURE 4: When Ignition Switch is Turned to the "START" Position, the ABS Warning Light does not Illuminate.**

ABS Warning Light Circuit



W3Q14M03AA  
AC204875AB





**CIRCUIT OPERATION**

The ABS warning light power is supplied from the ignition switch. The M-ASTC-ECU grounds the circuit to illuminate the light. The light also illuminates when the valve relay is switched to OFF.

**TECHNICAL DESCRIPTION (COMMENT)**

The M-ASTC-ECU uses the power supply which is turned off when the ignition switch is turned to "START" position. The ABS warning light uses the power supply which is not turned off when the ignition switch is turned to the "START" position. Accord-

ingly, when the ignition switch is turned to the "START" position, the power supply to the M-ASTC-ECU is turned off and the valve relay is also turned off. So, when the ABS warning light does not illuminate at this time, the light illumination circuit in the valve relay system is defective.

**TROUBLESHOOTING HINTS (The most likely causes for this condition):**

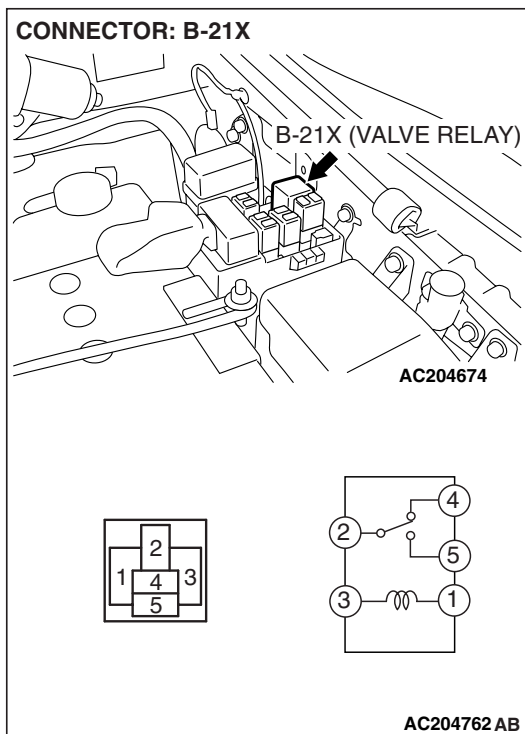
- Damaged wiring harness
- Malfunction of valve relay
- Malfunction of M-ASTC-ECU

**DIAGNOSIS**

**Required Special Tool:**

- MB991223: Harness Set

**STEP 1. Check the valve relay.**

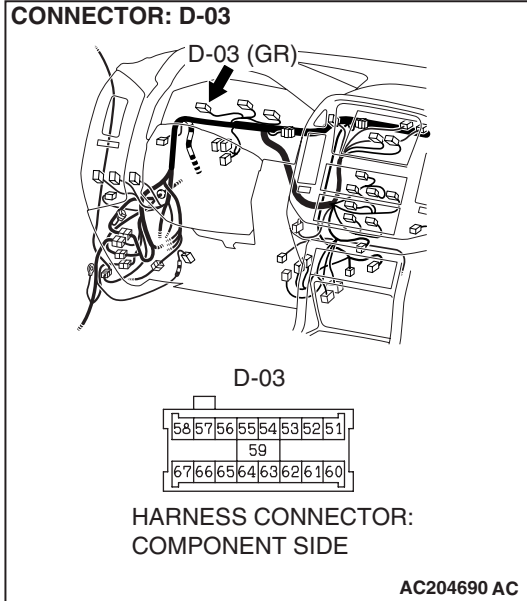


BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	2 - 4	Less than 2 ohms
<ul style="list-style-type: none"> <li>• Connect terminal 1 to the positive battery terminal</li> <li>• Connect terminal 3 to the negative battery terminal</li> </ul>		Open circuit

**Q: Is the relay damaged?**

**YES :** Replace the part. Then go to Step 4.

**NO :** Go to Step 2.



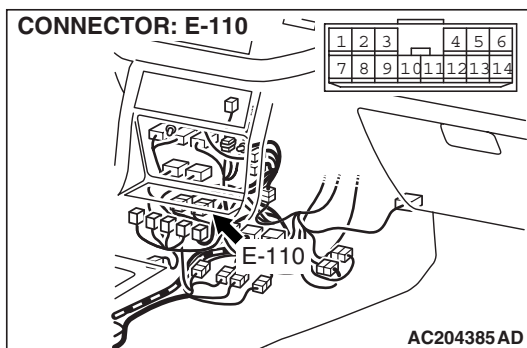
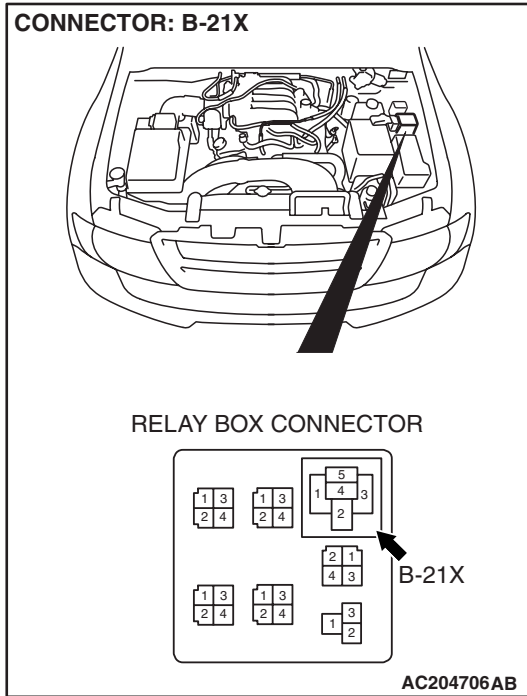
**STEP 2.** Check the harness wire between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2.

*NOTE: After inspecting valve relay connector B-21X and intermediate connector E-110, inspect the wire. If valve relay connector B-21X and intermediate connector E-110 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.*

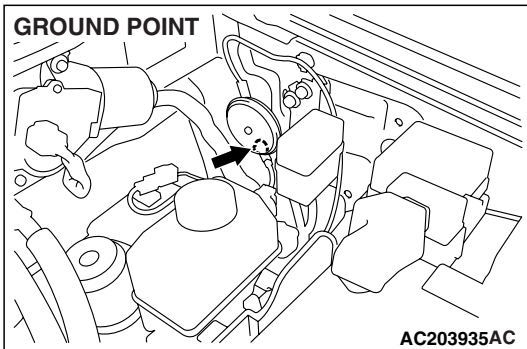
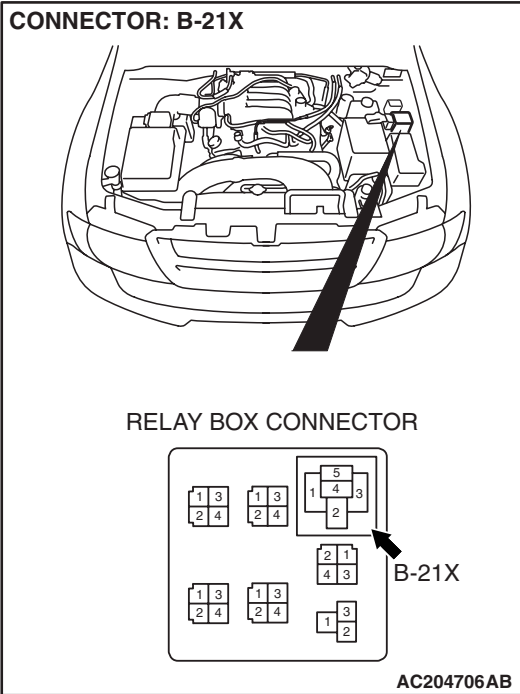
**Q: Is the harness wire between combination meter connector D-03 terminal 56 and valve relay connector B-21X terminal 2 damaged?**

**YES :** Repair it and then go to Step 4.

**NO :** Go to Step 3.







**STEP 3. Check the harness wire between valve relay connector B-21X terminal 4 and ground.**

*NOTE: After inspecting valve relay connector B-21X, inspect the wire. If valve relay connector B-21X is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.*

**Q: Is the harness wire between valve relay connector B-21X terminal 4 and ground damaged?**

**YES :** Repair it and then go to Step 4.

**NO :** This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-13.

**STEP 4. Retest the system.**

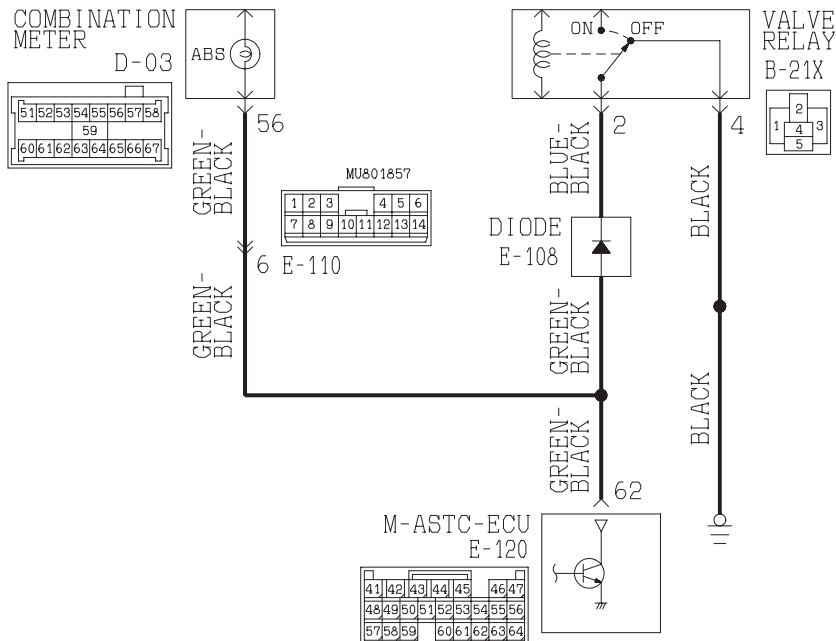
**Q: Does the ABS warning light illuminate when the ignition switch is turned to the "START" position?**

**YES :** The procedure is complete.

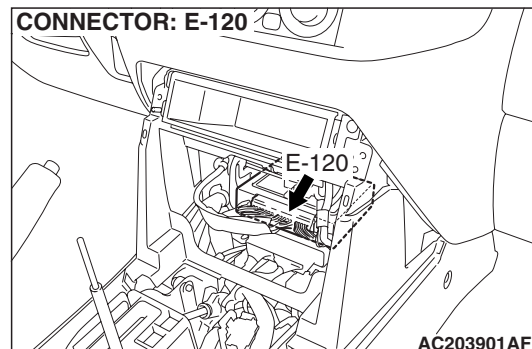
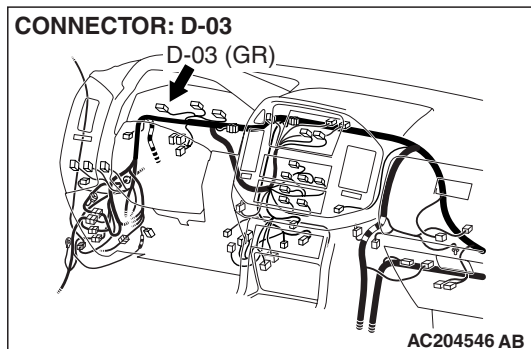
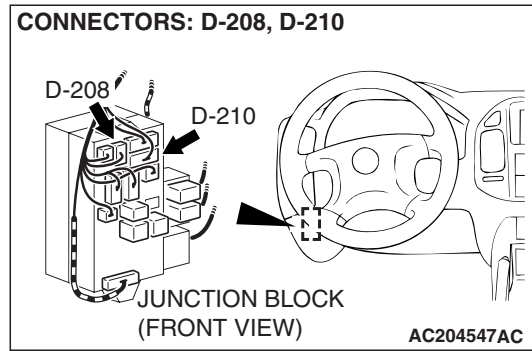
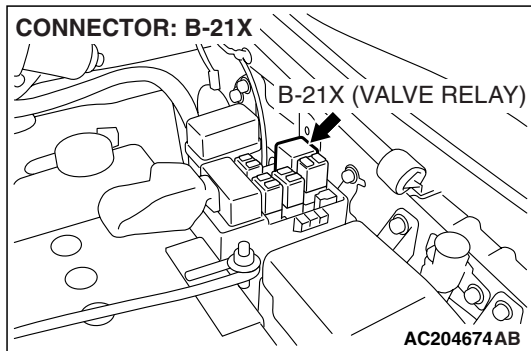
**NO :** Return to Step 1.

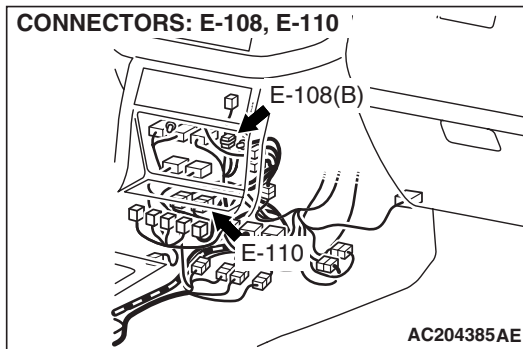
**INSPECTION PROCEDURE 5: The ABS Warning Light Flashes Twice after the Ignition Switch is Turned to the "On" Position. The Light Illuminates When the Ignition Switch is Turned to the "Start" Position, and When the Ignition Switch is Returned to the "On" Position, it Flashes Once.**

ABS Warning Light Circuit



W3Q14M03AA  
AC204875AB





### CIRCUIT OPERATION

- The ABS warning light power is supplied from the ignition switch. The M-ASTC-ECU grounds the circuit to illuminate the light. The light also illuminates when the valve relay is switched to OFF.
- The M-ASTC-ECU illuminates the ABS warning light for three seconds while running self-check. This light can be illuminated for three seconds upon start-up or ignition switch to the "ON" position, engine stopped. The M-ASTC-ECU drives the valve relay in the order of OFF to ON to OFF to ON during initial check to check the valve relay.

### TECHNICAL DESCRIPTION (COMMENT)

The M-ASTC-ECU causes the ABS warning light to illuminate during the initial check (three seconds). During the initial check, the valve relay turns from off to on, off and back to on again, and if there is an open circuit in the harness between the M-ASTC-ECU and the ABS warning light, the light will illuminate only when the valve relay is OFF because of a valve relay test, etc.

### TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

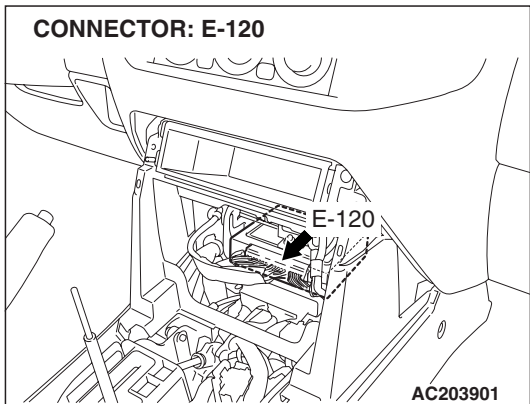
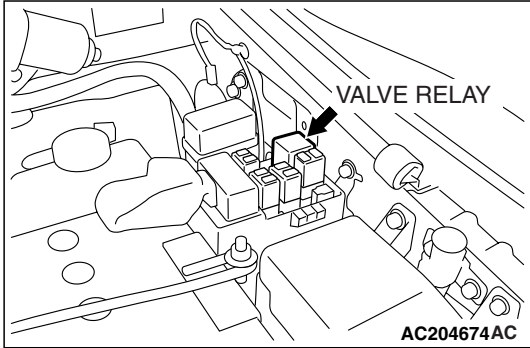
**DIAGNOSIS**

**Required Special Tool:**

- MB991223: Harness Set

**STEP 1. Check the ABS warning light circuit at M-ASTC-ECU connector E-120.**

(1) Remove the valve relay.



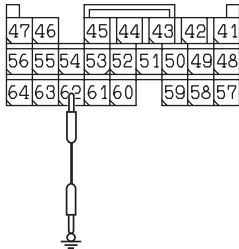
- (2) Disconnect M-ASTC-ECU connector E-120 and measure at the harness side.
- (3) Ground the terminal 62.
- (4) Turn the ignition switch to the "ON" position. The ABS warning light should turn on.

**Q: Is the ABS warning light turn on?**

**YES :** Replace the M-ASTC-ECU. Then go to Step 3.

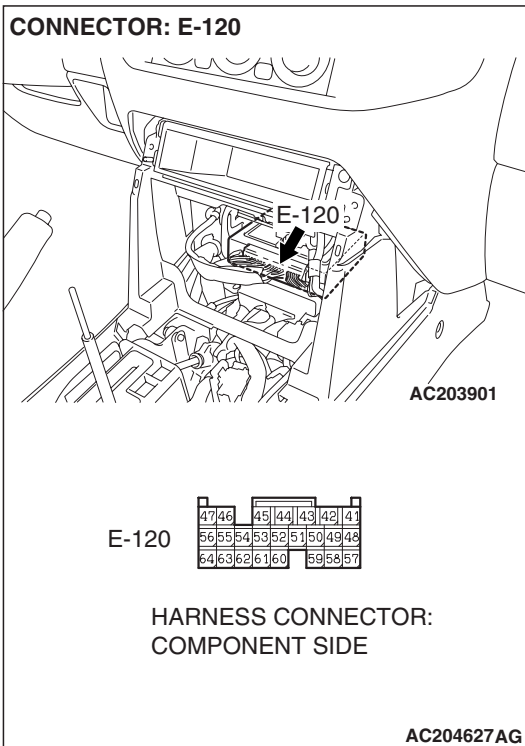
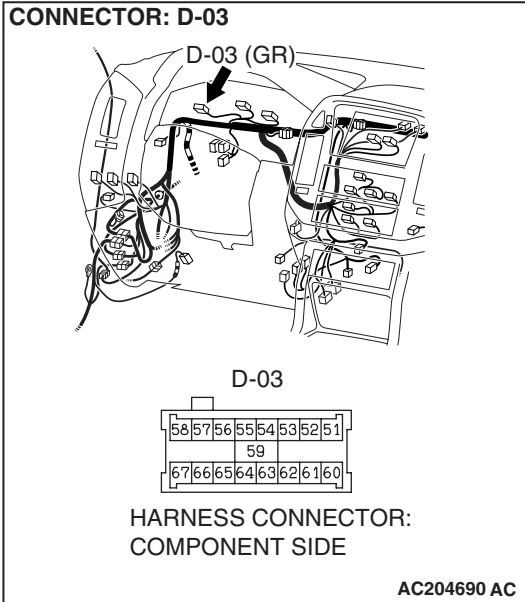
**NO :** Go to Step 2.

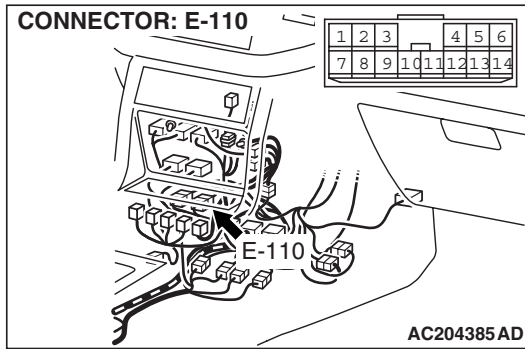
**HARNESS CONNECTOR:  
COMPONENT SIDE**



AC204627AS

**STEP 2. Check the harness wires between combination meter connector D-03 terminal 56 and M-ASTC-ECU connector E-120 terminal 62.**





**NOTE:** After inspecting M-ASTC-ECU connector E-106, inspect the wire. If M-ASTC-ECU connector E-106 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). Then go to Step 3.

**Q: Is the harness wire between combination meter connector D-03 terminal 56 and M-ASTC-ECU connector E-106 terminal 62 damaged?**

**YES :** Repair it and then go to Step 3.

**NO :** This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

**STEP 3. Retest the system.**

**Q: Does the ABS warning light illuminate for 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon start-up?**

**YES :** The procedure is complete.

**NO :** Return to Step 1.

## INSPECTION PROCEDURE 6: Faulty ABS Operation

### TECHNICAL DESCRIPTION (COMMENT)

The cause depends on driving and road surface conditions, so diagnosis may be difficult. However, if no diagnostic trouble code is displayed, carry out the following inspection.

### TROUBLESHOOTING HINTS

- Malfunction of the hydraulic brake booster (HBB)

### DIAGNOSIS

#### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

#### STEP 1. Check the HBB hydraulic unit.

Check the operation of HBB hydraulic unit. Refer to [P.35B-131](#).

**Q: Does HBB hydraulic unit operate normally?**

**YES :** Intermittent malfunction of the vehicle speed sensor is assumed to be the cause. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction [P.00-13](#). Then go to Step 2.

**NO :** Replace the HBB master cylinder and hydraulic unit assembly and go to Step 2.

**STEP 2. Retest the system.**

**Q: Do the brakes operate normally?**

**YES :** The procedure is complete.

**NO :** Return to Step 1.

**DATA LIST REFERENCE TABLE**

M1352011500865

The following items can be read by the scan tool from the M-ASTC-ECU input data.

<b>MUT-III SCAN TOOL DISPLAY*</b>	<b>ITEM NO.</b>	<b>CHECK ITEM</b>	<b>CHECKING REQUIREMENTS</b>		<b>NORMAL VALUE</b>
ACCUM SW(PH)	77	Accumulator switch (PH)	Accumulator fluid pressure reduces to less than approx. 16.1 MPa		ON
			Accumulator fluid pressure reaches approx. 18.3 MPa		OFF
ACCUM SW(PL)	76	Accumulator switch (PL)	Accumulator fluid pressure reduces to approx. 10.8 MPa or less.		ON
APS	16	Accelerator pedal position sensor	Ignition switch: ON	Release the accelerator pedal	905 – 1,165 mV
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke
				Depress the accelerator pedal fully	4,035 mV or more
C/D LOCK SW	83	Center differential lock detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4HLc or 4LLc	ON
				Transfer shift lever position: 2H or 4H	OFF
M-ASTC OFF SW	37	Active skid control switch	Set the active skid control switch to the neutral position		OFF
			Turn the active skid control switch to the OFF position		ON
M-ASTC ON SW	38	Active skid control switch	Set the active skid control switch to the neutral position		OFF
			Turn the active skid control switch to the ON position		ON
BATT. VOLTAGE	31	M-ASTC-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage		6.5 – 22.3 V
ENGINE SPEED	17	Engine speed	Drive the vehicle		The scan tool and the tachometer readings are approximately the same

MUT-III SCAN TOOL DISPLAY*	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
EN. TYPE/ DESTN	28	Engine model and destination	–	6G75 NAS
FR SNSR	11	Front right ABS sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FL SNSR	12	Front left ABS sensor		
G SENS VOLT 1	22	Output 1 from G sensor	Drive the vehicle	-14.7 – 14.7 m/s <sup>2</sup>
G SENS VOLT 2	23	Output 2 from G sensor		
G SENSOR VOLT	19	Output from G sensor (longitudinal acceleration)		
G S(LATERAL)	20	Output from G sensor (lateral acceleration)		
IDLE POS. SW	75	Closed throttle position switch	Do not depress the accelerator pedal	ON
			Depress the accelerator pedal	OFF
TR SWITCH	26	Transmission range switch	Drive the vehicle	The shift lever position indicator and the scan tool readings are equal
M/C PRESS. SNSR	24	Master cylinder pressure sensor	When depressing gradually the brake pedal, the output value will change.	Approximately 0.5 - 4.5 V
MOTOR RLY	79	Motor relay	Motor relay is operating	ON
			Motor relay is not operating	OFF
RR SNSR	13	Rear right ABS sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
RL SNSR	14	Rear left ABS sensor		
SHIFT POSIT.	27	Shift position	Drive the vehicle	The shift lever position indicator and the scan tool readings are equal
ST ANGLE	32	Steering wheel angle	Steering wheel angle	deg (approximately the same as actual steering wheel angle)
STOPLIGHT SW	36	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF
T/F MODE	30	Transfer position	Drive the vehicle.	the same as actual transfer position



<b>MUT-III SCAN TOOL DISPLAY*</b>	<b>ITEM NO.</b>	<b>CHECK ITEM</b>	<b>CHECKING REQUIREMENTS</b>		<b>NORMAL VALUE</b>
T/F 2H SW	80	2H detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H	ON
				Transfer shift lever position: Other than 2H	OFF
T/F 2/4H SW	81	2WD/4WD detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 2H or 4H	ON
				Transfer shift lever position: 4HLc or 4LLc	OFF
T/F 4H SW	82	4H detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4H or 4HLc	ON
				Transfer shift lever position: 2H or 4LLc	OFF
T/F 4L SW	84	4LLc detection switch	Ignition switch: ON Transmission range: N	Transfer shift lever position: 4LLc	ON
				Transfer shift lever position: Other than 4LLc	OFF
VALVE RLY	78	Valve relay	Valve relay is operating		ON
			Valve relay is not operating		OFF
YAW RATE SNSR	21	Yaw rate sensor	Ignition switch: ON	–	-95 – 95 deg/s

## ACTUATOR TEST REFERENCE

M1352011600635

**⚠ CAUTION**

When performing the item No.09 [AIR BLEEDING (1)] consecutively, keep the interval of 20 seconds or more between respective bleeding operations.

The scan tool activates the following actuators for testing.

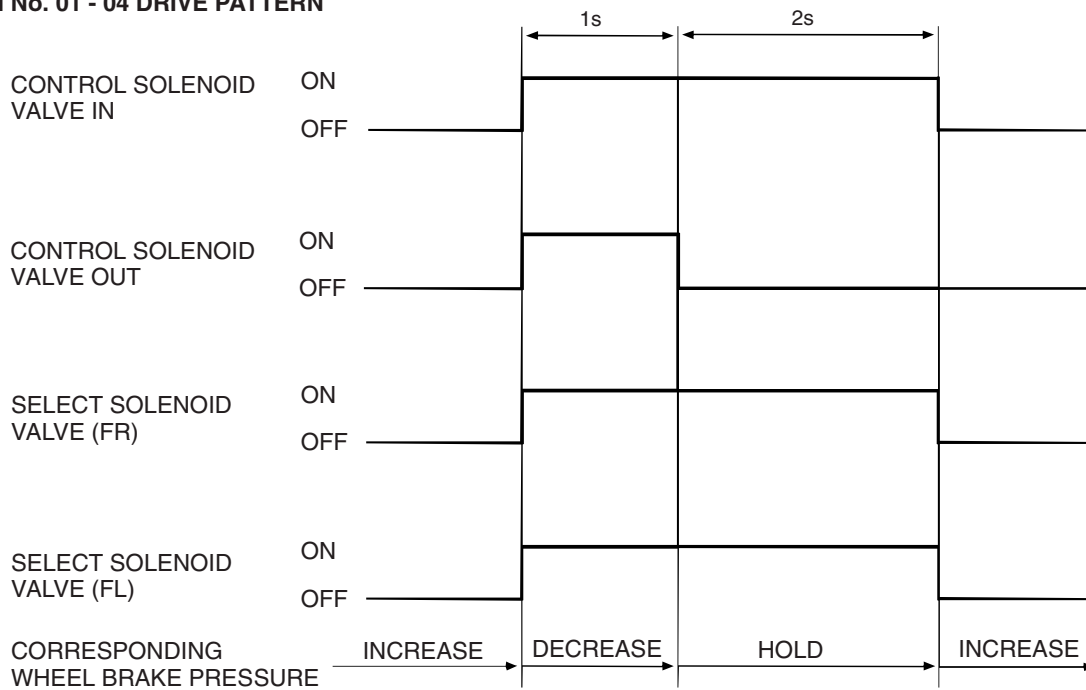
*NOTE: If the M-ASTC-ECU is inoperative, actuator testing cannot be carried out.*

*NOTE: Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h (6 mph), forced actuation will be canceled.*

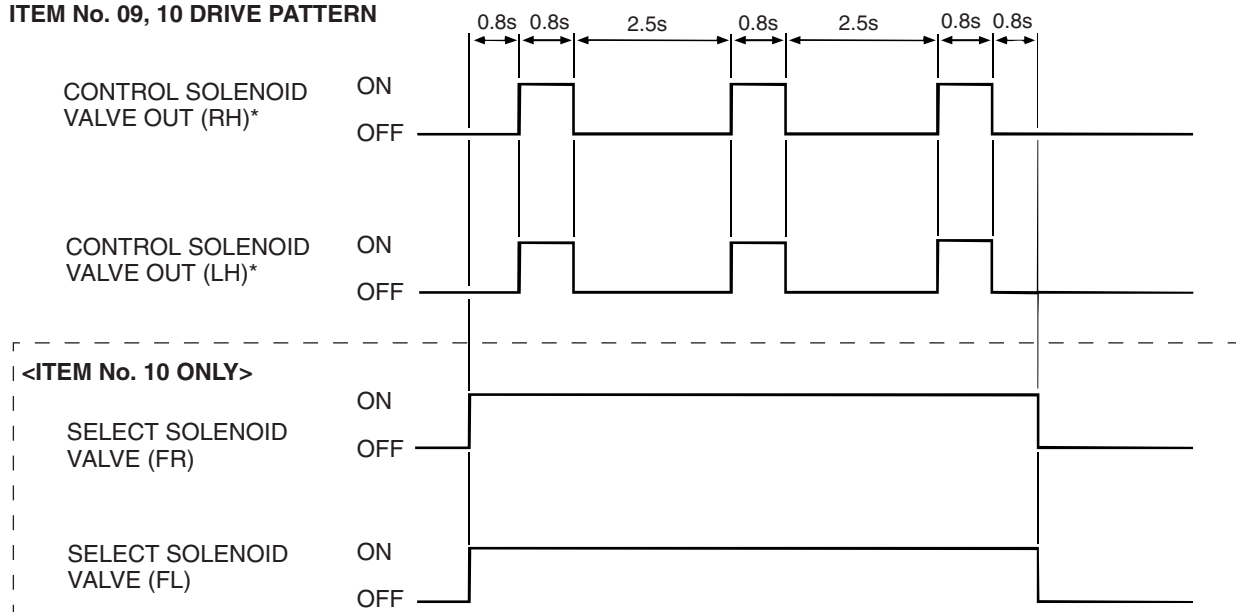
## ACTUATOR TEST SPECIFICATIONS

MUT-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	PARTS TO BE ACTIVATED	Activation when the system fails
FR ABS VALVE	01	Solenoid valve for front-right wheel	HBB select solenoid valves and control solenoid valves for the respective channel	Disabled
FL ABS VALVE	02	Solenoid valve for front-left wheel		
RR ABS VALVE	03	Solenoid valve for rear-right wheel		
RL ABS VALVE	04	Solenoid valve for rear-left wheel		
ABS AIR B.1	09	Air bleeding (1)	HBB select solenoid valves and control solenoid valve OUT (FR, FL)	Disabled
ABS AIR B.2	10	Air bleeding (2)	HBB control solenoid valve OUT (RR, RL)	Disabled

**ITEM No. 01 - 04 DRIVE PATTERN**



**ITEM No. 09, 10 DRIVE PATTERN**



**NOTE**

\*: WHEN CARRYING OUT ITEM No. 09, THE FRONT WHEELS ARE DRIVEN, AND WHEN CARRYING OUT ITEM No. 10 THE REAR WHEELS ARE DRIVEN.

ACX01113AC

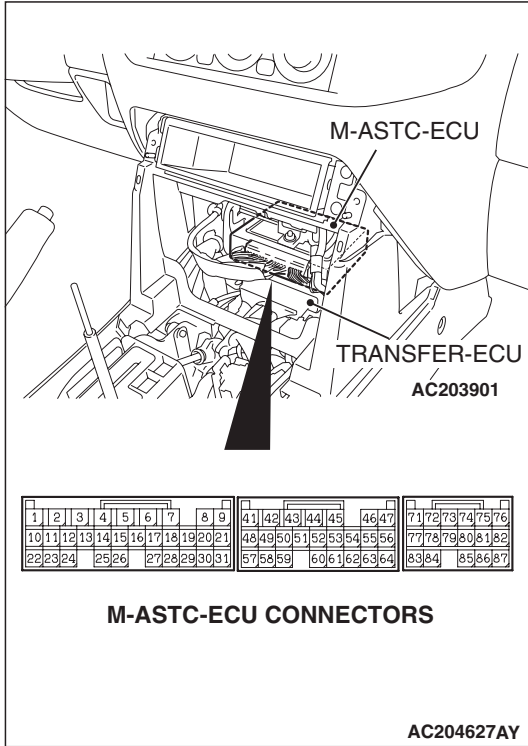
**CHECK AT M-ASTC-ECU**

**TERMINAL VOLTAGE CHECK CHART**

*NOTE: There are two ECUs with the same shape inside the floor console, one above the other. The upper ECU is the M-ASTC-ECU. The lower ECU is the transfer-ECU.*

*NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned "ON." The M-ASTC-ECU performs the initial check during that period.*

1. Measure the voltages between terminals (4), (12), (56) or (64) (ground terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations.



CONNECTOR TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT	NORMAL CONDITION
1	Control solenoid valve OUT (Rear right wheel)	Ignition switch: ON	Battery positive voltage
2	Control solenoid valve IN (Rear right wheel)	Ignition switch: ON	Battery positive voltage
3	Control solenoid valve OUT (Front left wheel)	Ignition switch: ON	Battery positive voltage
5	PI valve	Ignition switch: ON	Battery positive voltage
6	Cut valve	Ignition switch: ON	Battery positive voltage
7	Select solenoid valve (Front right wheel)	Ignition switch: ON	Battery positive voltage
8	Select solenoid valve (Front left wheel)	Ignition switch: ON	Battery positive voltage
10	Control solenoid valve IN (Front left wheel)	Ignition switch: ON	Battery positive voltage
19	Stoplight switch input	Stoplight switch: ON	Battery positive voltage
		Stoplight switch: OFF	2 V or less

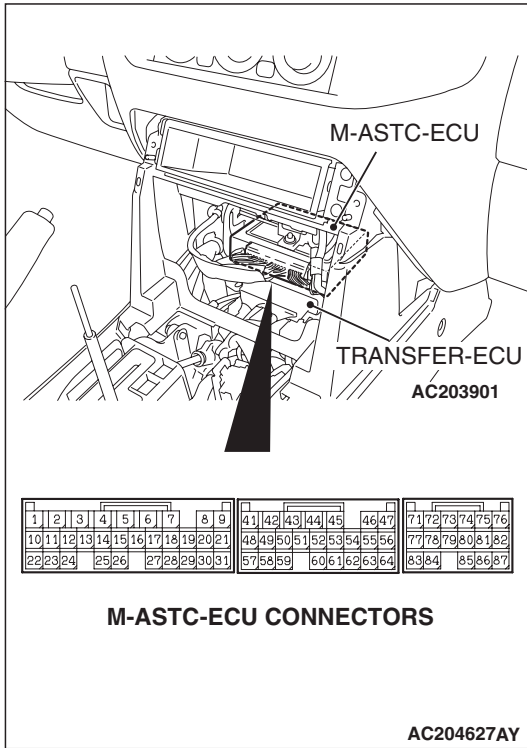
<b>CONNECTOR TERMINAL NO.</b>	<b>SIGNAL</b>	<b>CHECKING REQUIREMENT</b>		<b>NORMAL CONDITION</b>
24	M-ASTC-ECU power supply	Ignition switch: ON		Battery positive voltage
42	Control solenoid valve IN (Front right wheel)	Ignition switch: ON		Battery positive voltage
43	Control solenoid valve OUT (Front right wheel)	Ignition switch: ON		Battery positive voltage
44	Control solenoid valve IN (Rear left)	Ignition switch: ON		Battery positive voltage
45	Control solenoid valve OUT (Rear light wheel)	Ignition switch: ON		Battery positive voltage
50	Pressure sensor power supply	Ignition switch: ON		Approximately 5 V
55	Valve relay monitor	Ignition switch: ON		Battery positive voltage
59	Pressure sensor	Ignition switch: ON		Approximately 0.14 – 4.85 V
62	ABS warning light output	Ignition switch: ON	When light is switched off	Battery positive voltage
			When light is illuminated	2 V or less
74	Active skid control system operation warning light output	Ignition switch: ON	When light is switched off	Battery positive voltage
			When light is illuminated	2 V or less
75	2WD/4WD detection switch input	Ignition switch: ON	Transfer selector lever position: 2H, 4H	Battery positive voltage
			Transfer selector lever position: 4HLc, 4LLc	2 V or less
76	4LLc detection switch input	Ignition switch: ON	Transfer selector lever position: 4LLc	Battery positive voltage
			Transfer selector lever position: 2H, 4H, 4HLc	2 V or less
80	Center differential lock switch input	Ignition switch: ON	Transfer selector lever position: 2H, 4H	Battery positive voltage
			Transfer selector lever position: 4HLc, 4LLc	2 V or less
81	Brake warning light output	Ignition switch: ON	When light is switched off	2 V or less
			When light is illuminated	Battery positive voltage

CONNECTOR TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
86	2WD detection switch input	Ignition switch: ON	Transfer selector lever position: 2H	Battery positive voltage
			Transfer selector lever position: 4H, 4HLc, 4LLc	2 V or less
87	4H detection switch input	Ignition switch: ON	Transfer selector lever position: 2H, 4LLc	Battery positive voltage
			Transfer selector lever position: 4H, 4HLc	2 V or less

**RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS**

*NOTE: There are two ECUs with the same shape inside the floor console, one above the other. The upper ECU is the M-ASTC-ECU and has a blue connector. The lower ECU is the transfer-ECU and has a green connector.*

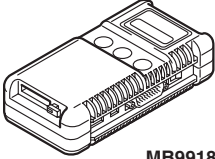
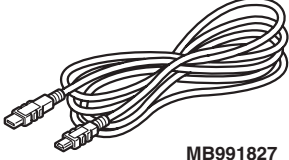

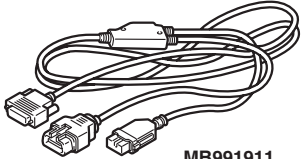
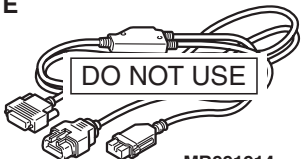
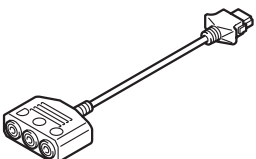


1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the M-ASTC-ECU.
2. Check between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustration.

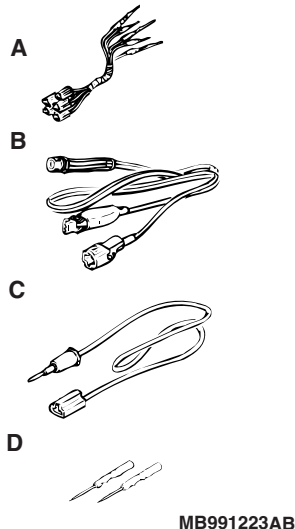


CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
30 – 31	Front-left ABS sensor	1.0 – 1.5 kΩ
60 – 61	Rear-right ABS sensor	1.0 – 1.5 kΩ
46 – 47	Rear-left ABS sensor	1.0 – 1.5 kΩ
27 – 28	Front-right ABS sensor	1.0 – 1.5 kΩ
4 – body ground	Ground	Less than 2 ohms
22 – body ground	Ground	Less than 2 ohms
56 – body ground	Ground	Less than 2 ohms
64 – body ground	Ground	Less than 2 ohms

**SPECIAL TOOLS**

M1352000600727

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826</p> <p>MB991958</p>	<p>MB991958</p> <p>A: MB991824</p> <p>B: MB991827</p> <p>C: MB991910</p> <p>D: MB991911</p> <p>E: MB991914</p> <p>F: MB991825</p> <p>G: MB991826</p> <p>MUT-III sub assembly</p> <p>A: Vehicle communication interface (V.C.I.)</p> <p>B: MUT-III USB cable</p> <p>C: MUT-III main harness A (Vehicles with CAN communication system)</p> <p>D: MUT-III main harness B (Vehicles without CAN communication system)</p> <p>E: MUT-III main harness C (for Daimler Chrysler models only)</p> <p>F: MUT-III measurement adapter</p> <p>G: MUT-III trigger harness</p>	<p>MB991824-KIT</p> <p><i>NOTE: G: MB991826</i></p> <p><i>MUT-III trigger harness is not necessary when pushing V.C.I ENTER key</i></p>	<p>Checking diagnostic trouble codes</p> <p><b>CAUTION</b></p> <p><b>MUT-III main harness B (MB991911) should be used. MUT-III main harness A and C should not be used for this vehicle.</b></p>
 <p>MB991348</p>	<p>MB991348</p> <p>Test harness set</p>	<p>MB991496-OD</p>	<p>For checking of G and yawrate sensor</p>

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
 <p>MB991223AB</p>	<p>MB991223 Harness set A:MB991219 Inspection harness</p>	<p>MB991223 MB991709-01</p>	<p>ABS sensor output voltage measurement</p>

## ON-VEHICLE SERVICE

### ABS SENSOR OUTPUT VOLTAGE CHECK

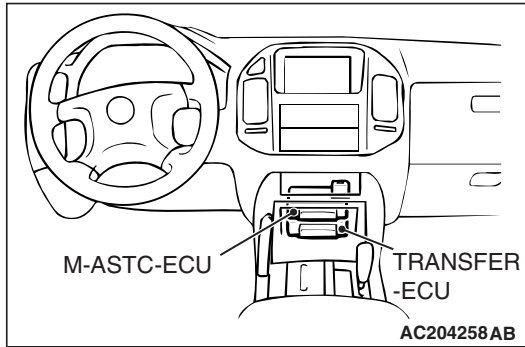
M1352001600333

**Required Special Tool:**

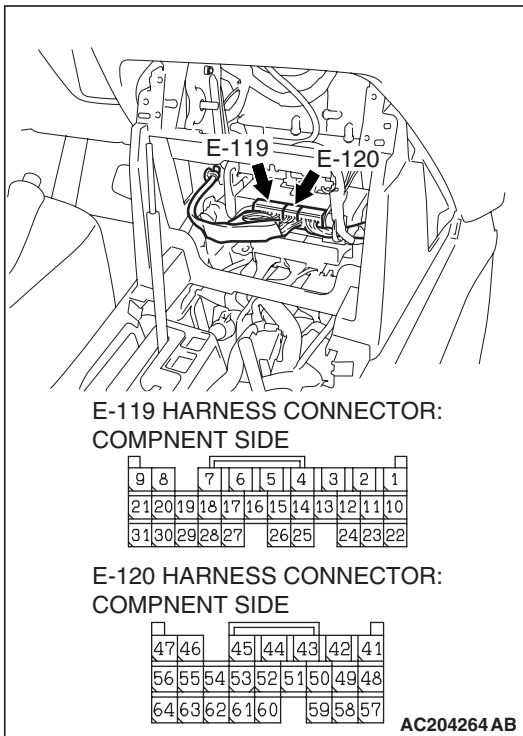
- MB991219: Inspection Harness

*NOTE: Two ECUs of the same type are situated up and down in a row at the inner part of the floor console. The upper side ECU is the M-ASTC-ECU. The lower side ECU is the transfer ECU.*

1. Lift up the vehicle and release the parking brake.







2. Disconnect the M-ASTC-ECU connector, and then use special tool MB991219 to measure the output voltage at the harness side connector.

TERMINAL NO.			
Front left	Front right	Rear left	Rear right
30	27	46	60
31	28	47	61

3. Manually turn the wheel to be measured 1/2 to 1 turn/second. Measure the output voltage with a voltmeter or oscilloscope.

**Output voltage:**

- Minimal voltmeter reading: 42 mV
- Maximum voltmeter reading: 300 mV
- Minimal oscilloscope reading: 120 mV
- Maximum oscilloscope reading: 600 mV

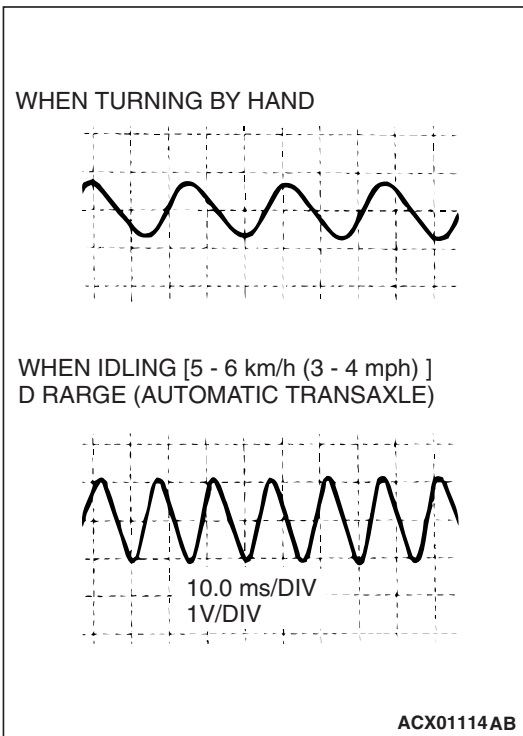
**Probable causes of low output voltage**

- ABS sensor pole piece-to-ABS rotor clearance too large
- Faulty ABS sensor

*NOTE: Check the connection of the sensor harness and connector before using the oscilloscope.*

4. To observe the waveform with an oscilloscope: Start the engine, move the transfer selector lever to the "4H" position and the transmission selector lever to "D" range, and then spin the wheel.

*NOTE: The output waveform is low when the wheel speed is low. Similarly, it will be higher as the wheel speed increases. Waveform may also be observed by driving the vehicle.*



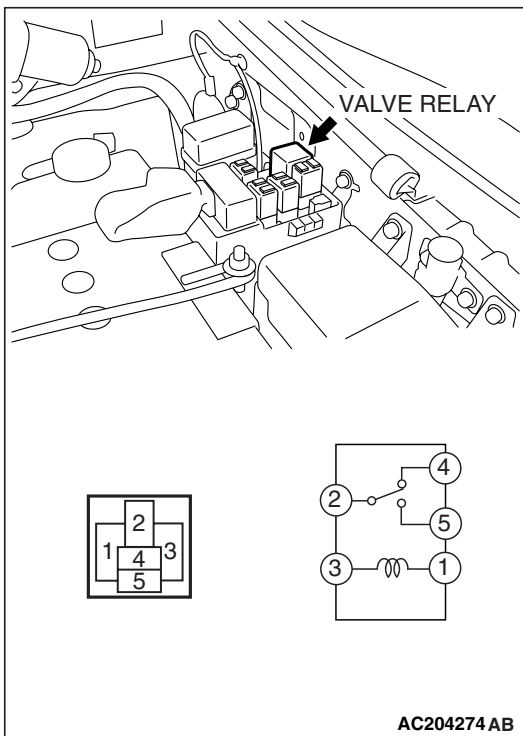
POINTS IN WAVEFORM MEASUREMENT

SYMPTOM	PROBABLE CAUSES	REMEDY
Too small or zero waveform amplitude	Faulty ABS sensor	Replace sensor
Waveform amplitude fluctuates excessively (This is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in ABS sensor	Replace sensor
	Open circuit in harness	Repair harness
	Incorrectly mounted ABS sensor	Mount correctly
	ABS rotor with missing or damaged teeth	Replace ABS rotor

*NOTE: The ABS sensor cable moves in relation to motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads but it functions normally when driving on smooth roads. It is recommended to observe sensor output voltage waveform also under special conditions, such as driving on a rough road.*

ABS VALVE RELAY CHECK

M1352010900127



BATTERY VOLTAGE	TESTER CONNECTION	SPECIFIED CONDITION
Not applied	2 – 4	Less than 2 ohms
	2 – 5	Open circuit
<ul style="list-style-type: none"> <li>• Connect terminal 1 to the positive battery terminal</li> <li>• Connect terminal 3 to the negative battery terminal</li> </ul>	2 – 4	Open circuit
	2 – 5	Less than 2 ohms

## HYDRAULIC BRAKE BOOSTER (HBB) HYDRAULIC UNIT CHECK

M1352001700589

### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: Vehicle Communication Interface (V.C.I.)
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B

### **CAUTION**

- **The roller of the braking force tester and the tire should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.

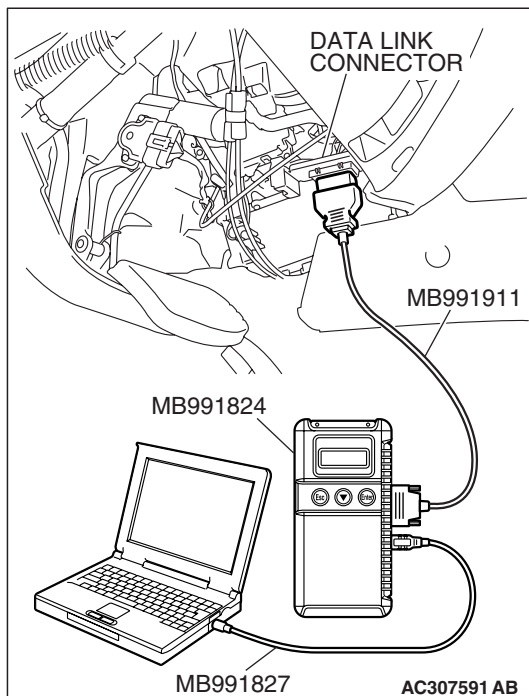
### **CAUTION**

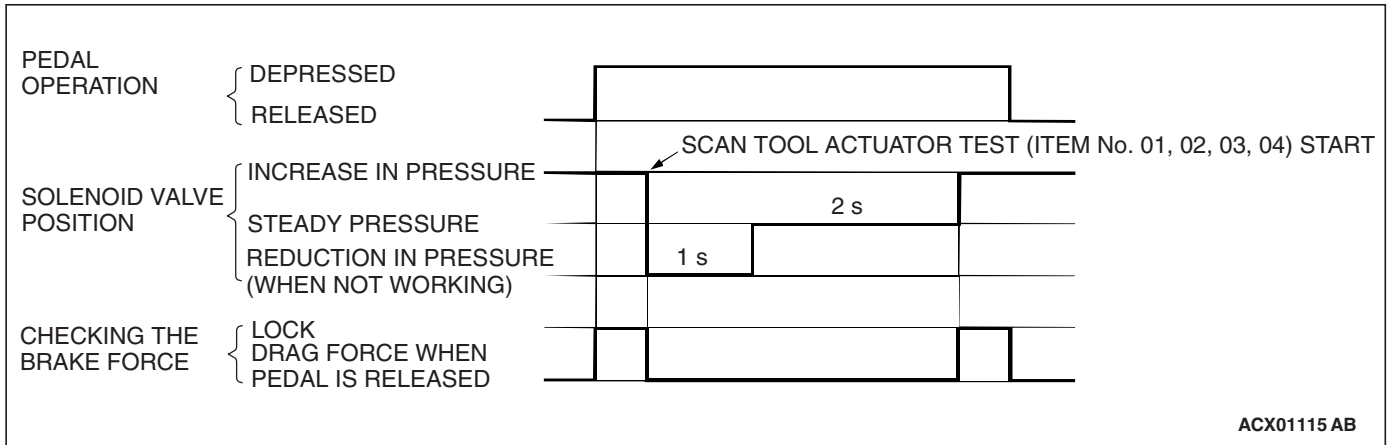
**To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**

3. Turn the ignition switch to the "LOCK" (OFF) position and set scan tool MB991958 as shown in the illustration.
4. After checking that the selector lever is in neutral, start the engine.
5. Use scan tool MB991958 to force-drive the actuator.  
*NOTE: The ABS system will switch to the scan tool mode and the ABS warning light will illuminate.*  
*NOTE: When the ABS has been interrupted by the fail-safe function, scan tool MB991958 actuator testing cannot be used.*
6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the brake drag force instead of 2 when the actuator is force-driven. The result should be as shown in the diagram above.

**Front wheel: 785 – 981 N (176 – 220 lb)**

**Rear wheel: 785 – 981 N (176 – 220 lb)**





7. If the result of inspection is abnormal, repair according to the Diagnosis Table below.

**Diagnosis Table**

NO.	OPERATION	NORMAL CONDITION	ABNORMAL CONDITION	PROBABLE CAUSE	REMEDY
01	1. Depress brake pedal to lock wheel. 2. Using scan tool MB991958, select the wheel to be checked and force the actuator to operate. 3. Turn the selected wheel manually to check the change of brake force.	Brake force releases for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than hydraulic brake booster (HBB)	Check and clean brake line
02				Clogged HBB	Replace HBB
03			Brake force is not released	Incorrect HBB brake tube connection	Connect correctly
04				HBB solenoid valve not functioning correctly	Replace HBB

8. After inspection, disconnect the scan tool immediately after turning the ignition switch to the "LOCK" (OFF) position.

## SOLENOID VALVE CHECK

M1352010700123

Measure the resistance between the following solenoid valve terminals.

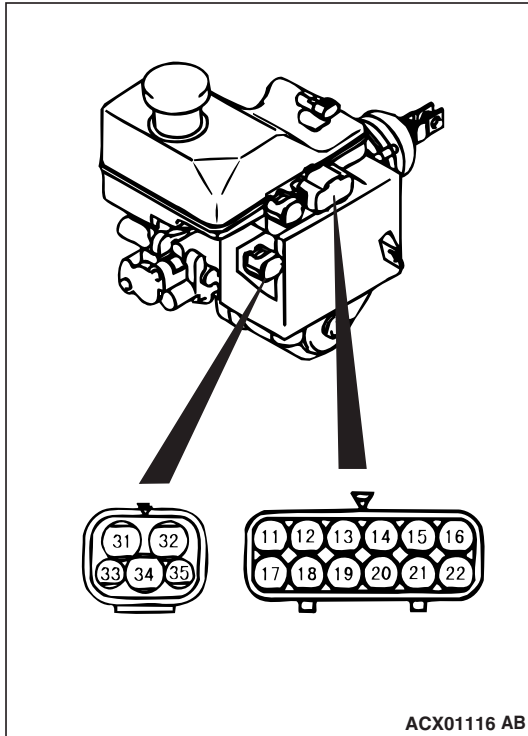
- Control solenoid valve IN (FR): Between terminals (19) – (34)
- Control solenoid valve OUT (FR): Between terminals (20) – (34)
- Control solenoid valve IN (FL): Between terminals (21) – (34)
- Control solenoid valve OUT (FL): Between terminals (22) – (34)
- Control solenoid valve IN (RR): Between terminals (15) – (34)
- Control solenoid valve OUT (RR): Between terminals (16) – (34)
- Control solenoid valve IN (RL): Between terminals (13) – (34)
- Control solenoid valve OUT (RL): Between terminals (14) – (34)
- Select solenoid valve (FR): Between terminals (18) – (34)
- Select solenoid valve (FL): Between terminals (17) – (34)

### Standard value:

**Control solenoid valve IN: 4.75 – 5.25  $\Omega$**

**Control solenoid valve OUT: 2.0 – 2.4  $\Omega$**

**Select solenoid valve: 3.5 – 3.9  $\Omega$**



## IN THE EVENT OF A DISCHARGED BATTERY

Refer to GROUP 35C – On-vehicle Service [P.35C-206](#).

M1352003500365

# ABS CONTROL UNIT

## REMOVAL AND INSTALLATION

Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#).

M1352009800074

**WHEEL SPEED SENSOR****REMOVAL AND INSTALLATION**

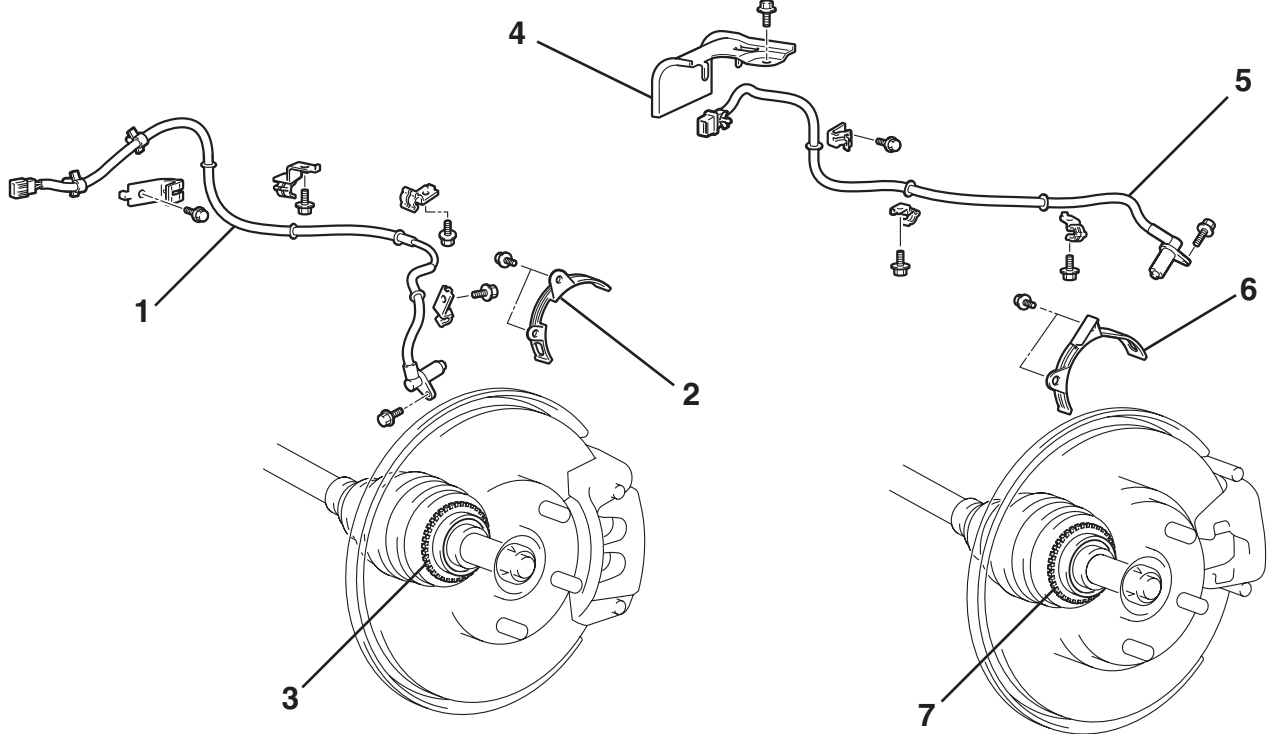
M1352008300827

**Post-installation Operation**

- ABS Sensor Output Voltage Measurement (Refer to P.35B-128).

&lt;FRONT&gt;

&lt;REAR&gt;



AC204256AB

&lt;&lt;A&gt;&gt;

**FRONT WHEEL SENSOR  
REMOVAL STEPS**

1. FRONT ABS SENSOR
2. FRONT ABS ROTOR PROTECTOR
3. FRONT ABS ROTOR WITH DRIVESHAFT (REFER TO GROUP 26, DRIVESHAFT P.26-24.)
4. HEAT PROTECTOR

&lt;&lt;B&gt;&gt;

**REAR WHEEL SENSOR  
REMOVAL STEPS**

5. REAR ABS SENSOR
6. REAR ABS ROTOR PROTECTOR
7. REAR ABS ROTOR WITH DRIVESHAFT (REFER TO GROUP 27, DRIVESHAFT P.27-19.)

*NOTE: The front and rear ABS rotors are integrated with the drive shaft and cannot be disassembled.*

## REMOVAL SERVICE POINTS

### <<A>> FRONT ABS SENSOR REMOVAL

1. Remove the three splash shield clips and the two bolts shown in the illustration, and then disconnect the front ABS sensor connector.

#### ⚠ CAUTION

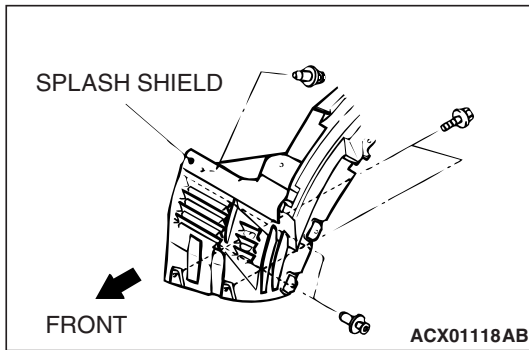
Be careful when handling the projection at the tip of the ABS sensor and the toothed edge of the ABS rotor so as not to damage them by contacting other parts.

2. Remove the front ABS sensor.

### <<B>> REAR ABS SENSOR REMOVAL

#### ⚠ CAUTION

Be careful when handling the projection at the tip of the ABS sensor and the toothed edge of the ABS rotor so as not to damage them by contacting other parts.



## INSPECTION

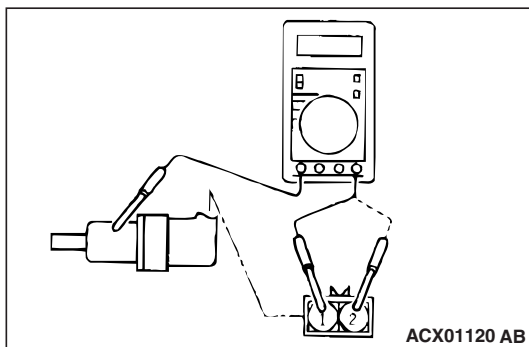
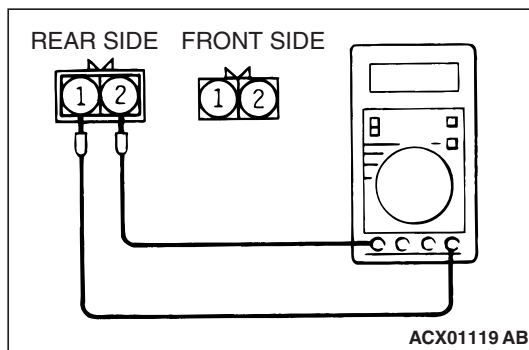
M1352008400318

### ABS SENSOR CHECK

1. Check whether any metallic foreign material has adhered to the projection at the ABS sensor tip. Remove any foreign material. Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

*NOTE: The projection can become magnetized due to the magnet inside the ABS sensor, causing foreign material to easily adhere to it. The projection may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.*

2. Measure the resistance between the ABS sensor terminals.  
**Standard value: 1.0 – 1.5 kΩ**
3. If the internal resistance of the ABS sensor is not within the standard value, replace it with a new ABS sensor.



4. Remove all connections from the ABS sensor. The circuit should be open between terminals (1) and (2) and the body of the ABS sensor. If the circuit is not open, replace with a new ABS sensor.

5. Check the ABS sensor cable for breakage, damage or disconnection. Replace with a new one if a problem is found.

*NOTE: When checking for cable damage, remove the cable clamp part from the body and then gently bend and pull the cable near the clamp.*

**TOOTHED ABS ROTOR CHECK**

Check whether the ABS rotor teeth are broken or deformed. Replace the driveshaft UJ assembly for the front side or the driveshaft BJ assembly for the rear side, respectively, if the teeth are damaged or deformed.

**G-SENSOR****REMOVAL AND INSTALLATION**

Refer to GROUP 35C, G and Yaw Rate Sensor  
[P.35C-209](#).

M1352010100154

**SPECIFICATIONS****SERVICE SPECIFICATIONS**

M1352000300793

ITEM		STANDARD VALUE
Control solenoid valve resistance $\Omega$	IN	4.75 – 5.25
	OUT	2.0 – 2.4
Select solenoid valve resistance $\Omega$		3.5 – 3.9
ABS sensor internal resistance $k\Omega$		1.0 – 1.5