GROUP 35B

ANTI-LOCK BRAKING SYSTEM(ABS)

CONTENTS

GENERAL INFORMATION

M1352000100067

The ABS consists of components such as the wheel speed sensors, stoplight switch, hydraulic unit assembly (integrated with ABS-ECU), ABS rotor, ABS warning light relay 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.

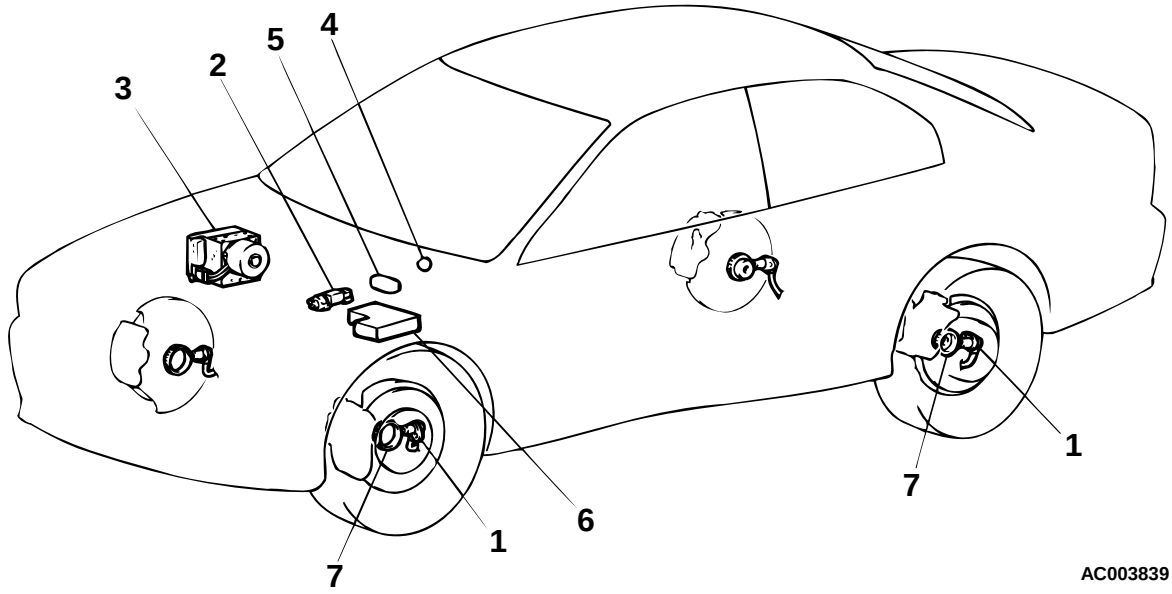
In addition, reading of diagnostic trouble codes and data list and actuator testing are possible by using the Scan Tool.

If the ABS hydraulic unit is faulty, the ABS-ECU must be replaced.

The ABS-ECU runs a self-check for 3 seconds upon start-up (also ignition switch ON, engine stopped). The ABS warning light, TCL warning light should be illuminated during the self-check and turn off when the self-check completes.

ITEMS	SPECIFICATIONS
ABS type	4-sensor, 3-channel type
Speed sensor	Magnet coil type on 4-wheels
Front ABS rotor teeth	43
Rear ABS rotor teeth	43

CONSTRUCTION DIAGRAM



1. WHEEL SPEED SENSOR
2. STOPLIGHT SWITCH
3. HYDRAULIC UNIT (INTEGRATED WITH ABS-ECU)
4. ABS WARNING LIGHT
5. DATA LINK CONNECTOR
6. ABS WARNING LIGHT RELAY
7. ABS ROTOR

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.

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- 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.

ANTI-SKID BRAKING SYSTEM (ABS) DIAGNOSIS

INTRODUCTION TO ANTI-LOCK BRAKE SYSTEM DIAGNOSIS

M1352012500062

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.

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 reset.

ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY

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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.
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.
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 DiagnosisP.35A-4.
   - If the basic brake system is operating properly, refer to P.35B-22.
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. Recreate the ABS DTC set conditions to see if the same ABS DTC will set again.

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- 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.

ABS TROUBLE CODE DIAGNOSIS

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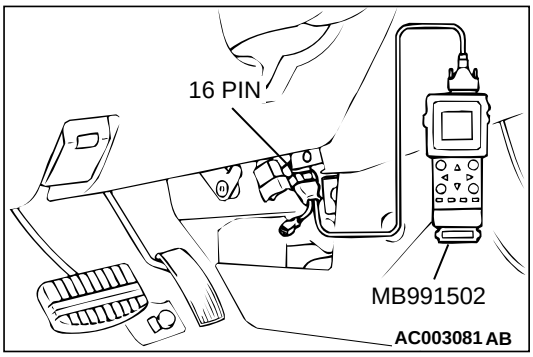
Retrieving ABS Diagnostic Trouble Codes

Using Scan Tool MB991502



Required Special Tool:

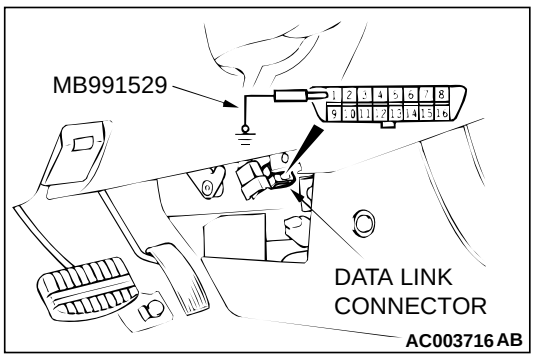
- MB991502: Scan Tool (MUT-II)

⚠ CAUTION

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

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to check for ABS diagnostic trouble codes.
4. Turn the ignition switch to the "LOOK" (OFF) position.
5. Disconnect scan tool MB991502.

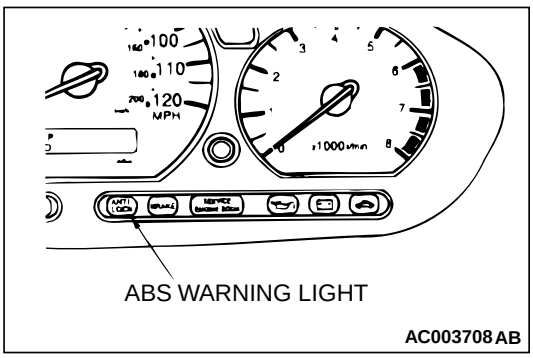
Using the ABS Warning Light and Special Tool MB991529



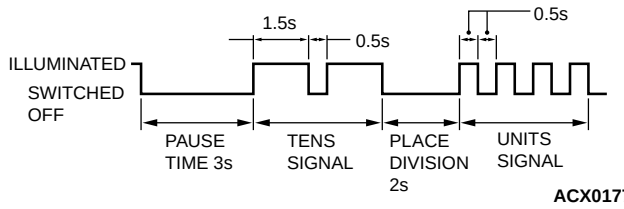
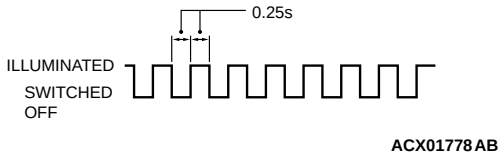
Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness

1. Use special tool MB991529 to ground number 1 terminal of the data link connector.
2. Turn the ignition switch to the "ON" position.



3. Read out a diagnostic trouble code by observing how the warning light flashes.

WHEN THE DIAGNOSTIC TROUBLE CODE NO.24 IS OUTPUT	WHEN NO DIAGNOSTIC TROUBLE CODE IS OUTPUT
 ACX01777AB	 ACX01778AB

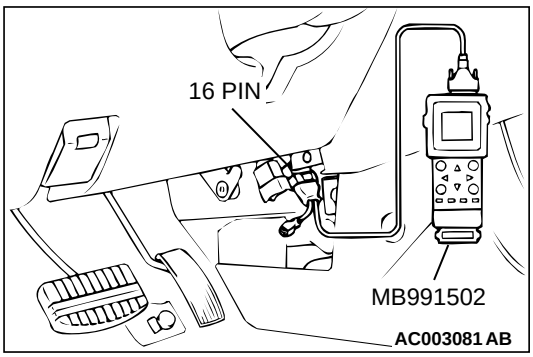
4. Disconnect special tool MB991529.

Erasing ABS Diagnostic Trouble Codes

Using Scan Tool MB991502

Required Special Tool:

- MB991502: Scan Tool (MUT-II)



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⚠ CAUTION

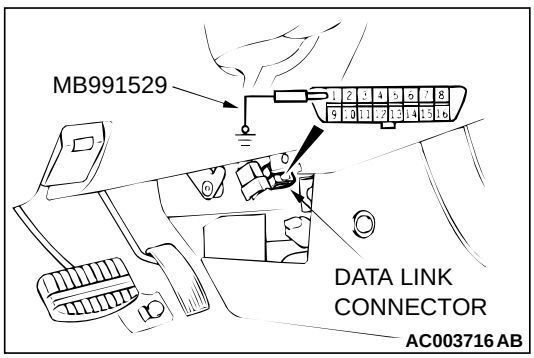
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the scan tool.

1. Connect scan tool MB991502 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Use scan tool MB991502 to erase ABS diagnostic trouble codes.
4. Turn the ignition switch to the "LOOK" (OFF) position.
5. Disconnect scan tool MB991502.

By Special Operation for Brake Pedal

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness



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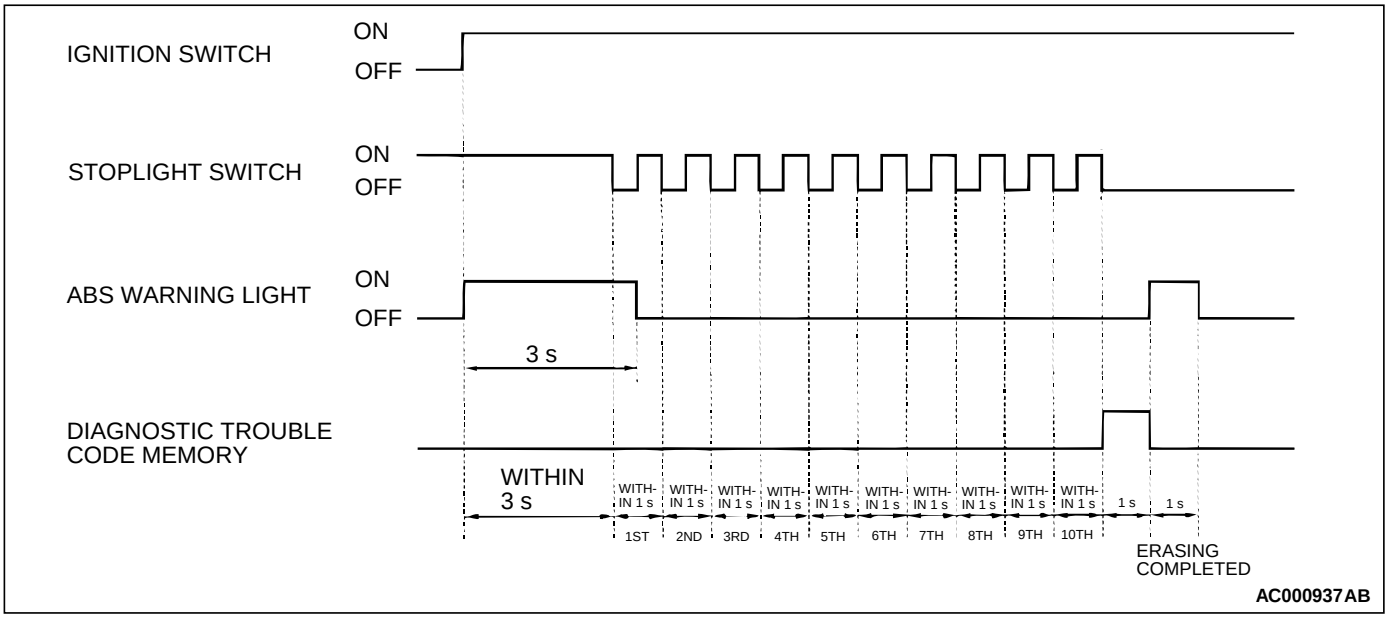
1. Use special tool MB991529 to ground number 1 terminal of the data link connector.

   NOTE: If the ABS-ECU functions have stopped due to the fail-safe function, the diagnostic trouble code cannot be erased.



2. Depress the brake pedal and hold it.
3. Turn the ignition switch to the "ON" position.
4. After turning the ignition switch to the "ON", release the pedal within three seconds. Repeat this process of pressing and releasing the brake pedal 10 continuous times.
5. Turn the ignition switch to the "LOOK" (OFF) position.
6. Disconnect special tool MB991529.

DIAGNOSTIC TROUBLE CODE CHART

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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 wheel speed sensor	Open circuit or short circuit	P.35B-8
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
16	Power supply system	ABS-ECU power supply voltage below or above the standard value. Not displayed if the voltage recovers.	Check the battery. (Refer to GROUP 54A, Battery – On-vehicle Service - Battery CheckP.54A-5)
21	Front right wheel speed sensor		P.35B-8
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
38	Stoplight switch system		P.35B-13

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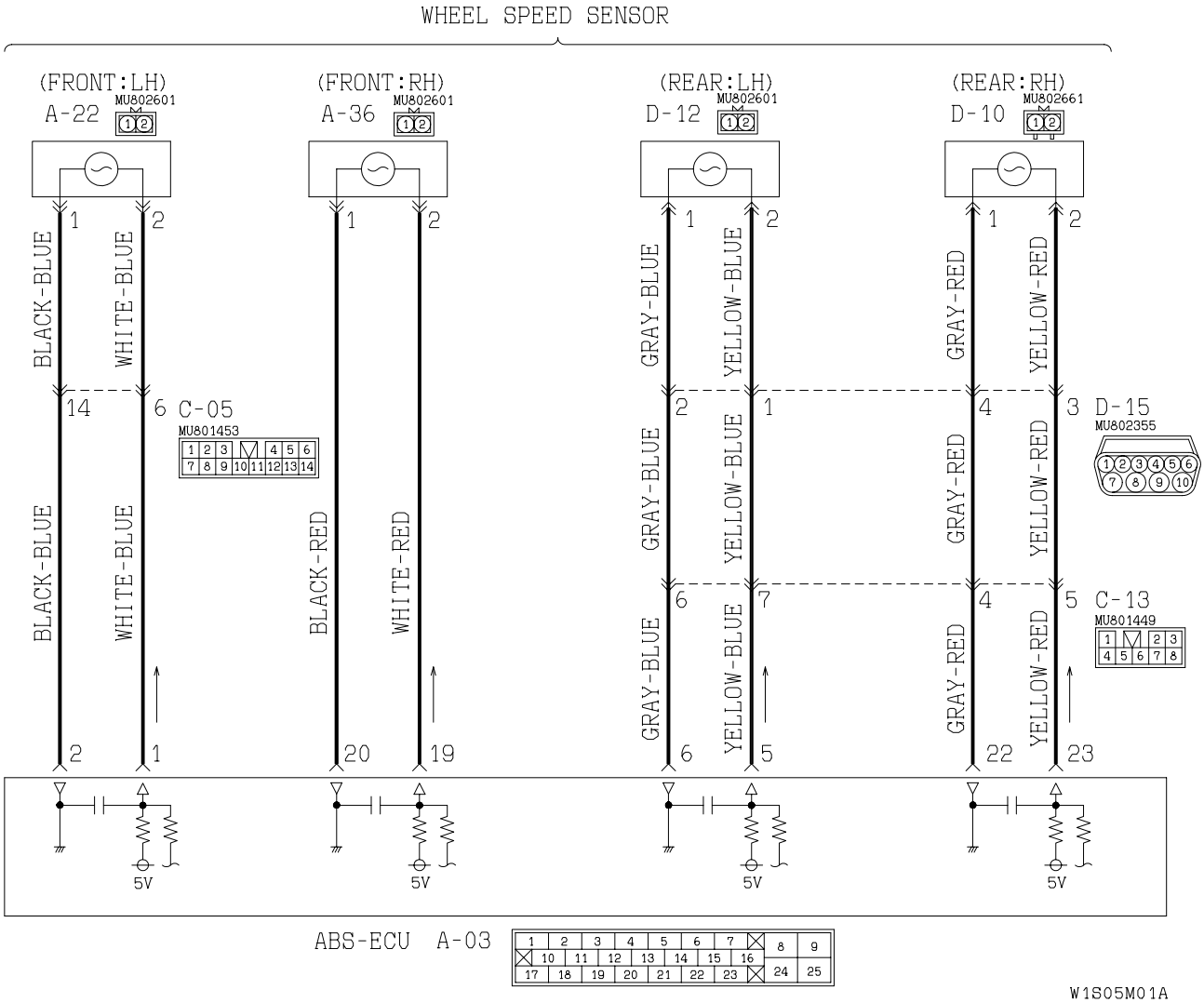
DIAGNOSTIC TROUBLE CODE NO.	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
41	Solenoid valve inside hydraulic unit	Open circuit or short circuit	P.35B-19
42	ABS-ECU		Replace the hydraulic unit (Integrated with ABS-ECU)
51	Hydraulic unit solenoid valve relay open or short circuit		P.35B-19
53	Malfunction of hydraulic unit		P.35B-19
63	ABS-ECU		Replace the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 11, 12, 13, 14: Wheel Speed Sensor (Open circuit or short circuit)
DTC 21, 22, 23, 24: Wheel Speed Sensor

Wheel Speed Sensor Circuit



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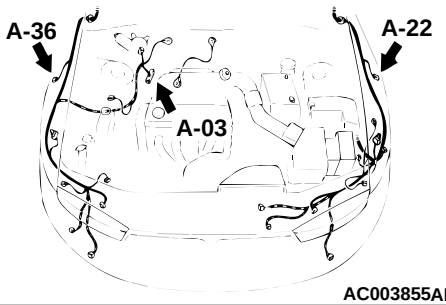
CONNECTORS: A-03, A-22, A-36



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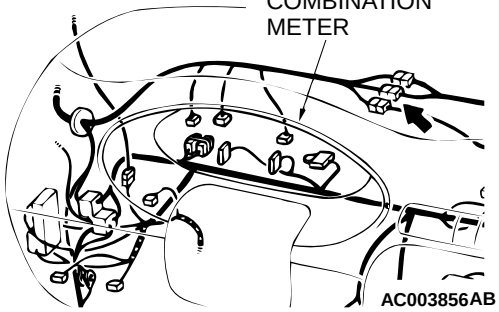
CONNECTOR: C-05



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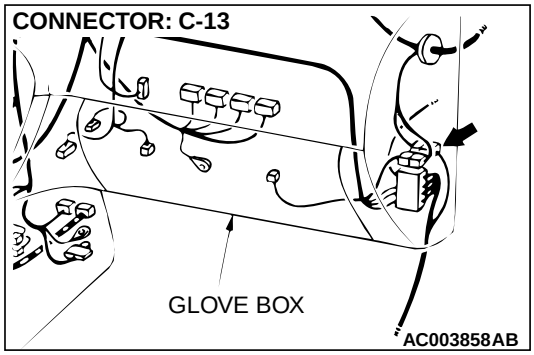
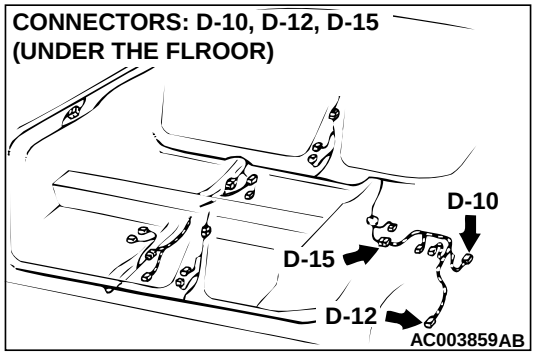




CIRCUIT OPERATION

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

DTC 11, 12, 13, 14

- Malfunction of the wheel speed sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

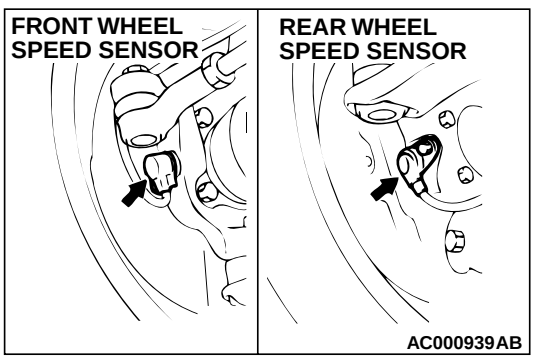
DTC 21, 22, 23, 24

- Malfunction of the wheel speed sensor
- Damaged wiring harness and connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)
- Malfunction of the ABS rotor
- Malfunction of the wheel bearing
- Excessive clearance between the sensor and ABS rotor

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the wheel speed sensor installation.

Q: Is the wheel speed sensor bolted securely in place at the front knuckle or the rear knuckle?

YES : Go to Step 2.

NO : Install it properly. Then go to Step 9. Refer to P.35B-49.

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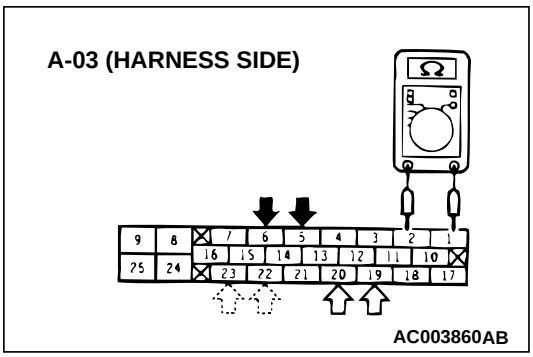


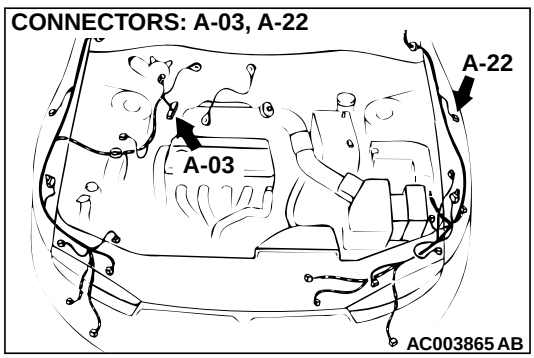
STEP 2. Check wheel speed sensor circuit at the ABS-ECU connector A-03.

(1) Disconnect connector A-03 and measure at the harness side.
(2) Measure the resistance between the ABS-ECU connector terminals 1 and 3, 5 and 6, 19 and 20, 22 and 23.

Standard Value: 1.28 – 1.92 kΩ

Q: Is the resistance between terminals 1 and 2, 5 and 6, 19 and 20, 22 and 23 within the standard value?

YES : Go to Step 6.
NO : Go to Step 3. or 4. or 5.

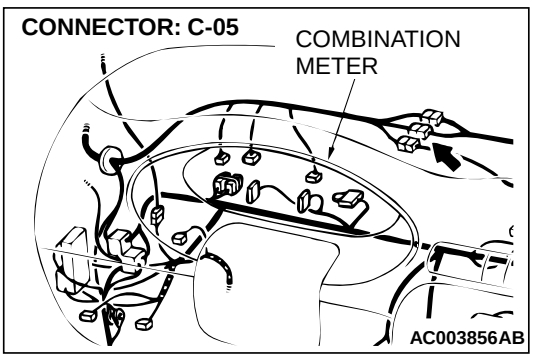


STEP 3. Check the harness wires between ABS-ECU connector A-03 and wheel speed sensor <front: LH> connector A-22.

NOTE: After inspecting intermediate connector C-05, inspect the wire. If intermediate connector C-05 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 9.

Q: Are any harness wires between ABS-ECU connector A-03 and wheel speed sensor <front: LH> connector A-22 damaged?

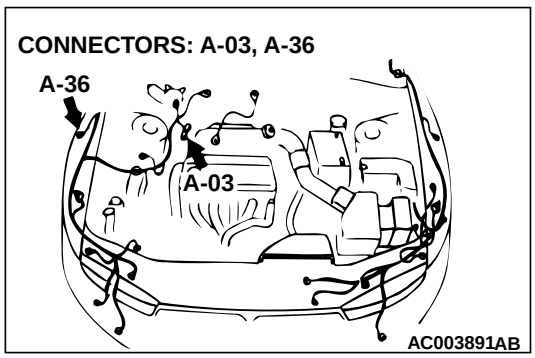
YES : Repair them and go to Step 9.
NO : Go to Step 7.



STEP 4. Check the harness wires between ABS-ECU connector A-03 and wheel speed sensor <front: RH> connector A-36.

Q: Are any harness wires between ABS-ECU connector A-03 and wheel speed sensor <front: RH> connector A-36 damaged?

YES : Repair them and then go to Step 9.
NO : Go to Step 7.



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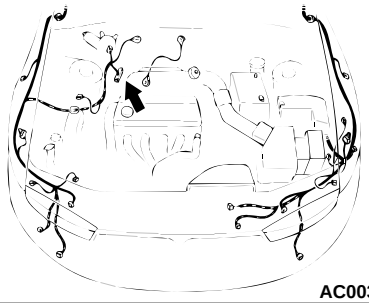
STEP 5. Check the harness wires between ABS-ECU connector A-03 and wheel speed sensor connector D-12 <rear: LH> or D-10 <rear RH>.

NOTE: After inspecting intermediate connector C-13,D-15 or D-16, inspect the wire. If intermediate connector C-13,D-15 or D-16 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 9 .

Q: Are any harness wires between ABS-ECU connector A-03 and wheel speed sensor connector D-12 <rear: LH> or D-10 <rear RH> damaged?

YES : Repair them and then go to Step 9.
NO : Go to Step 7.

CONNECTOR: A-03



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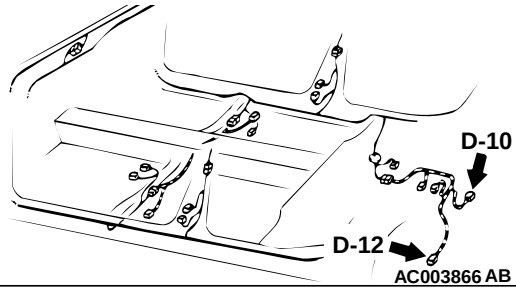
CONNECTORS: D-10, D-12 (UNDER THE FLOOR)



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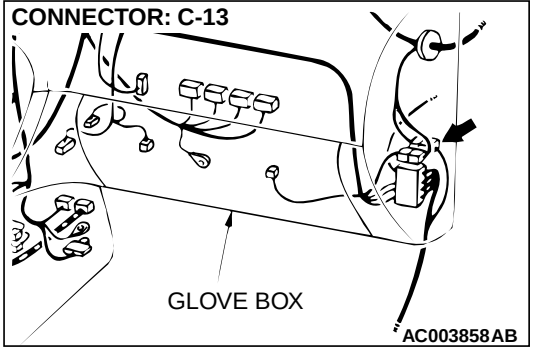
CONNECTOR: C-13



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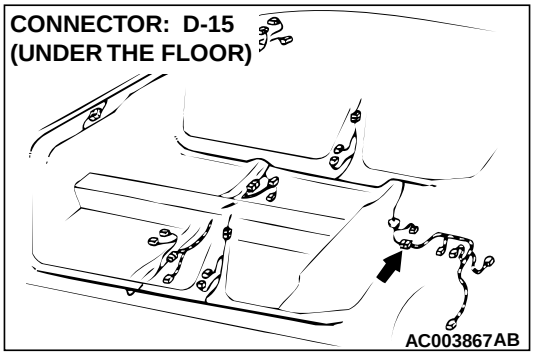
CONNECTOR: D-15 (UNDER THE FLOOR)



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STEP 6. Check the wheel speed sensor output voltage.
Refer to P.35B-42.

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 hydraulic unit (integrated with ABS-ECU) and then go to Step 9.
NO : Go to Step 7.

STEP 7. Check the wheel speed sensor or ABS rotor.
Refer to P.35B-50.If there is damaged in any of the check items, replace the wheel speed sensor.
Check items:
- Wheel speed sensor internal resistance

  Standard value: 1.28 – 1.92 kΩ
- Wheel speed sensor insulation resistance

  Standard value: 100 kΩ
- Toothed ABS rotor check

Q: Is the wheel speed sensor or ABS rotor damaged?

YES : Replace it and then go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wheel bearing.
Refer to GROUP 26, Front Hub AssemblyP.26-7.
Refer to GROUP 27, Rear Axle HubP.27-6.

Q: Is the wheel bearing damaged?

YES : Replace it and then go to Step 9.
NO : Go to Step 9.

STEP 9. Check the diagnostic trouble codes.

Q: Do the diagnostic trouble codes 11, 12, 13, 14, 21, 22, 23 and 24 reset?

YES : Go to Step 1.
NO : This diagnosis is complete.

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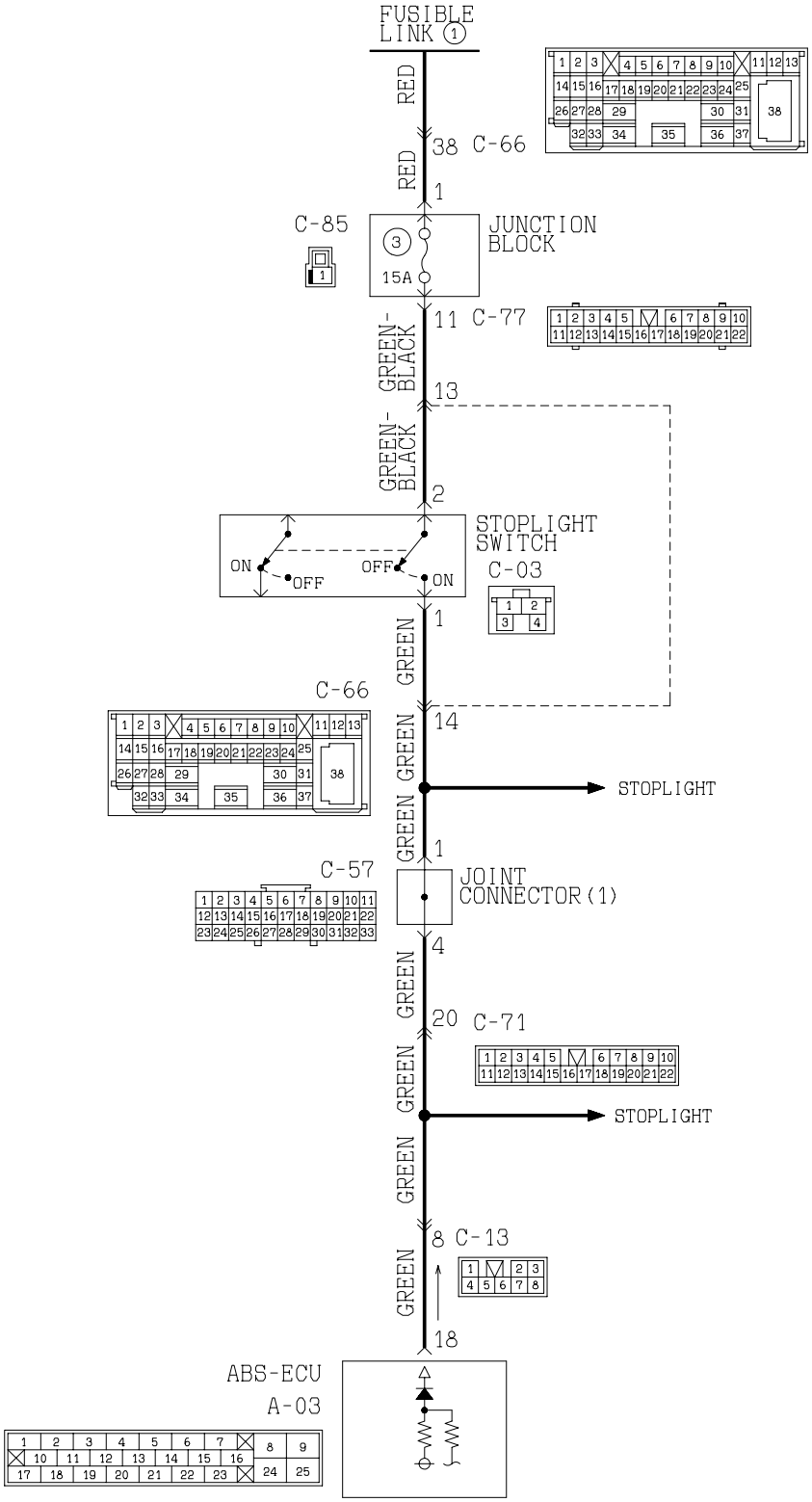
DTC 38 : Stoplight Switch System

Stoplight Switch Circuit



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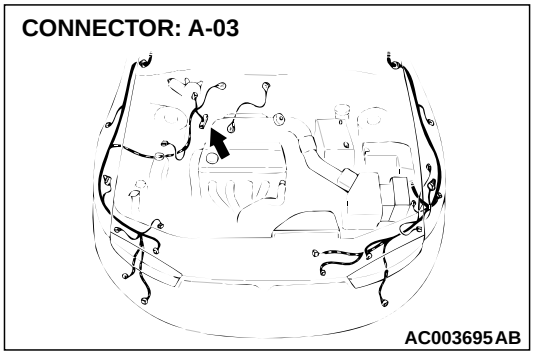
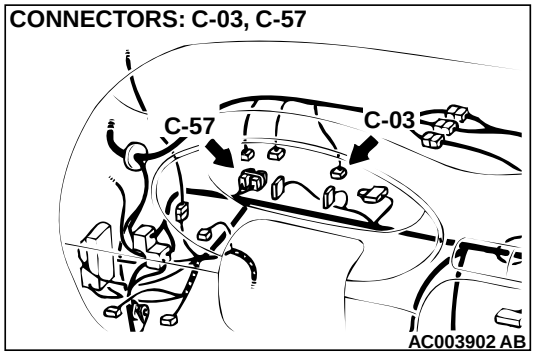
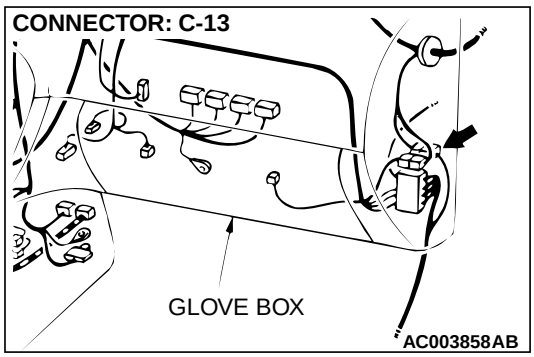
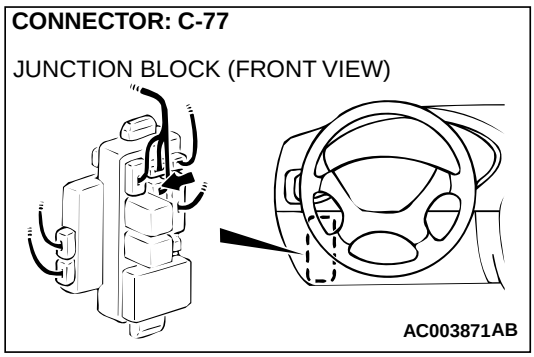
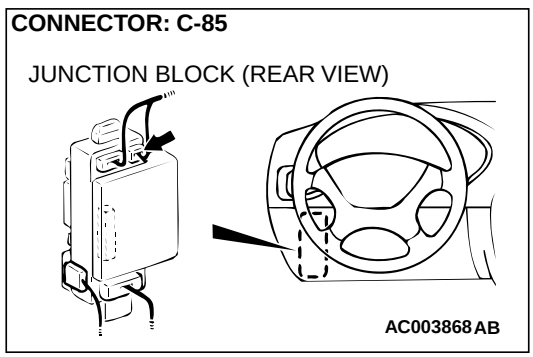
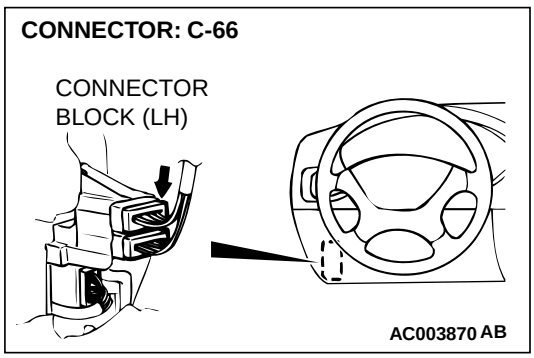


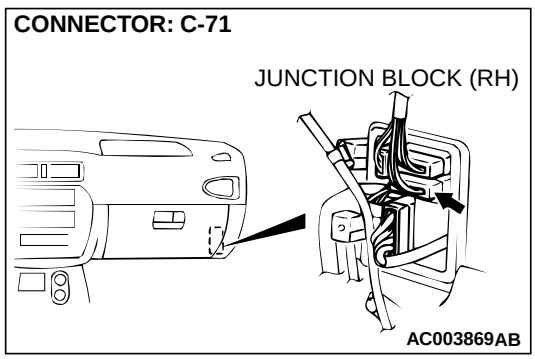












CIRCUIT OPERATION

- The ON signal when the brake pedal is pressed or the OFF signal when the brake pedal is released is input to the ABS-ECU (terminal 18).

ABS DTC SET CONDITION

Output is provided 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 ABS-ECU.

TROUBLESHOOTING HINTS

The most likely causes for DTC is to set are:

- Malfunction of the stoplight switch
- Damaged wiring harness and connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991223: Harness Set

STEP 1. Check the stoplight operation.

Q: Does the stoplight light or go out correctly?

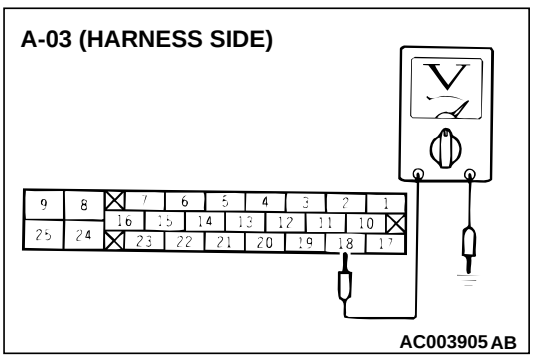
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the stoplight switch installation condition.

Q: Is the stoplight switch installed properly?

YES : Go to Step 4.
NO : Repair it and then go to Step 7.

STEP 3. Check the stoplight switch circuit at ABS-ECU connector A-03.

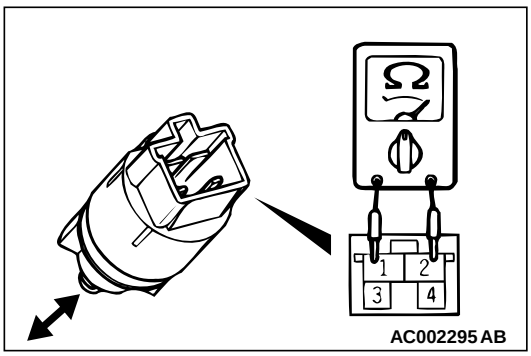


(1) Disconnect connector A-03 and measure at the harness side.
(2) Turn the stoplight switch "ON".
(3) Measure the voltage between terminal 18 and ground.

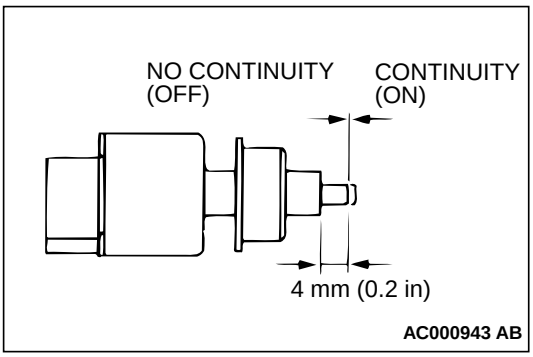
Q: Is the battery positive voltage approximately 12 volts?

YES : Replace the hydraulic unit and then go to Step 7.
NO : Go to Step 5.

STEP 4. Check the stoplight switch continuity.



(1) Remove the stoplight switch. (Refer to GROUP 35A, Brake PedalP.35A-30.)
(2) Connect an ohmmeter to the stoplight switch terminals 1 and 2, and check whether there is continuity when the plunger of the stoplight switch is pushed in and when it is released.

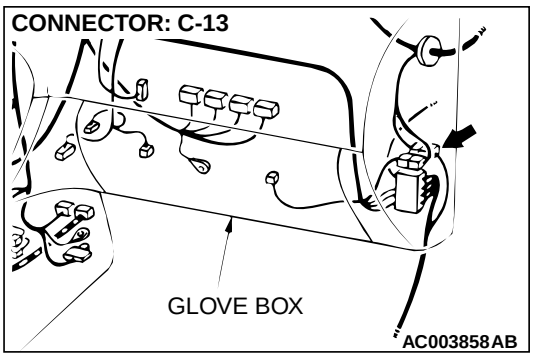


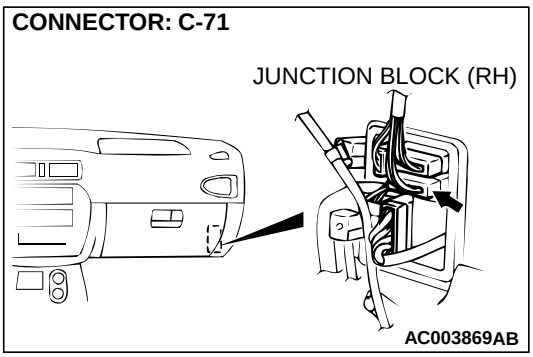
(3) The stoplight switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm (0.2 inch) from the outer case edge surface, and if there is continuity when it is released.

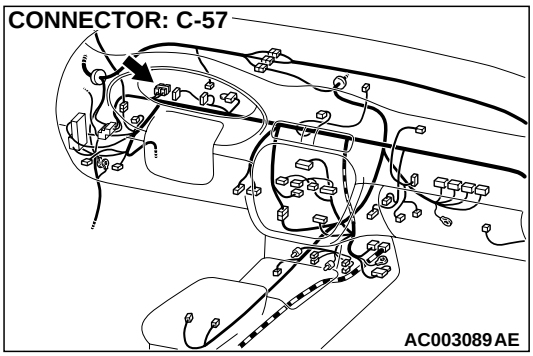
Q: Is the stoplight switch damaged?

YES : Replace it and then go to Step 7.
NO : Go to Step 6.

TSB Revision





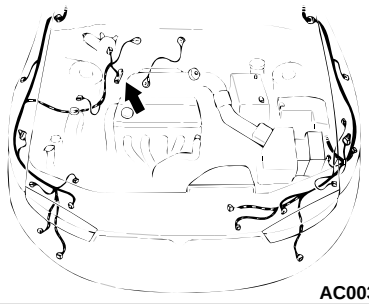


STEP 5. Check the harness wire between ABS-ECU connector A-03 and stoplight switch connector C-66.

NOTE: After inspecting intermediate connector C-13, C-57 or C-71 inspect the wire. If intermediate connector C-13, C-71 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 7.

TSB Revision

CONNECTOR: A-03



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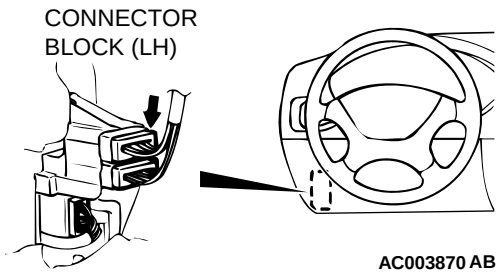
CONNECTOR: C-66



AC003870 AB

Q: Is any harness wire between ABS-ECU connector A-03 and stoplight switch connector C-66 damaged?

YES : Repair it and then go to Step 7.

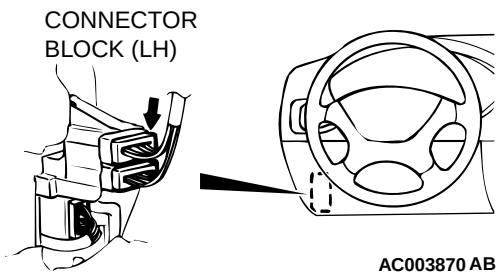
NO : No action is to be taken.

TSB Revision

STEP 6. Check the harness wire between fusible link number 2 and stoplight switch connector C-03.

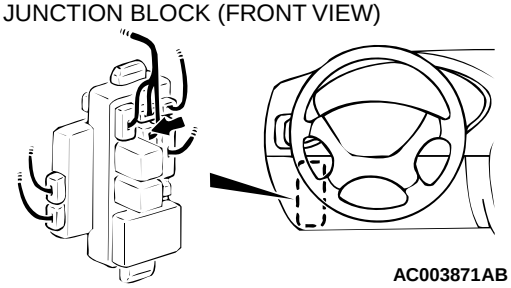
NOTE: After inspecting intermediate connector C-66, C-77, or C-85, inspect the wire. If intermediate connector C-66, C-77, or C-85 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 7.

CONNECTOR: C-66



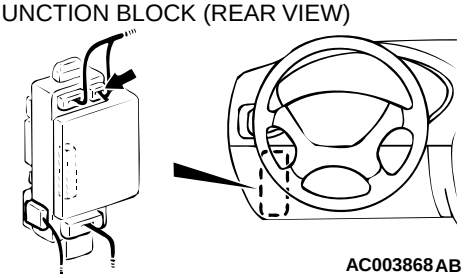
CONNECTOR: C-77

JUNCTION BLOCK (FRONT VIEW)

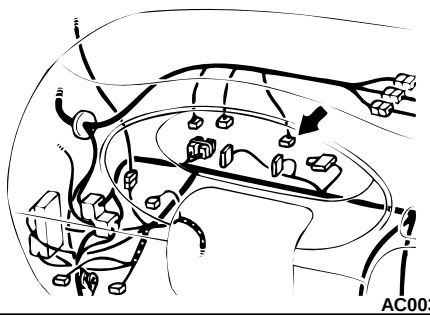


CONNECTOR: C-85

JUNCTION BLOCK (REAR VIEW)



CONNECTOR: C-03



Q: Is any harness wire between fusible link number 1 and stoplight switch connector C-03 damaged?

YES : Repair it and then go to Step 7.

NO : Check and repair the harness wire between stoplight switch and stoplight. Then go to Step7.

STEP 7. Check the diagnostic trouble codes.

Q: Does the diagnostic trouble code 38 reset?

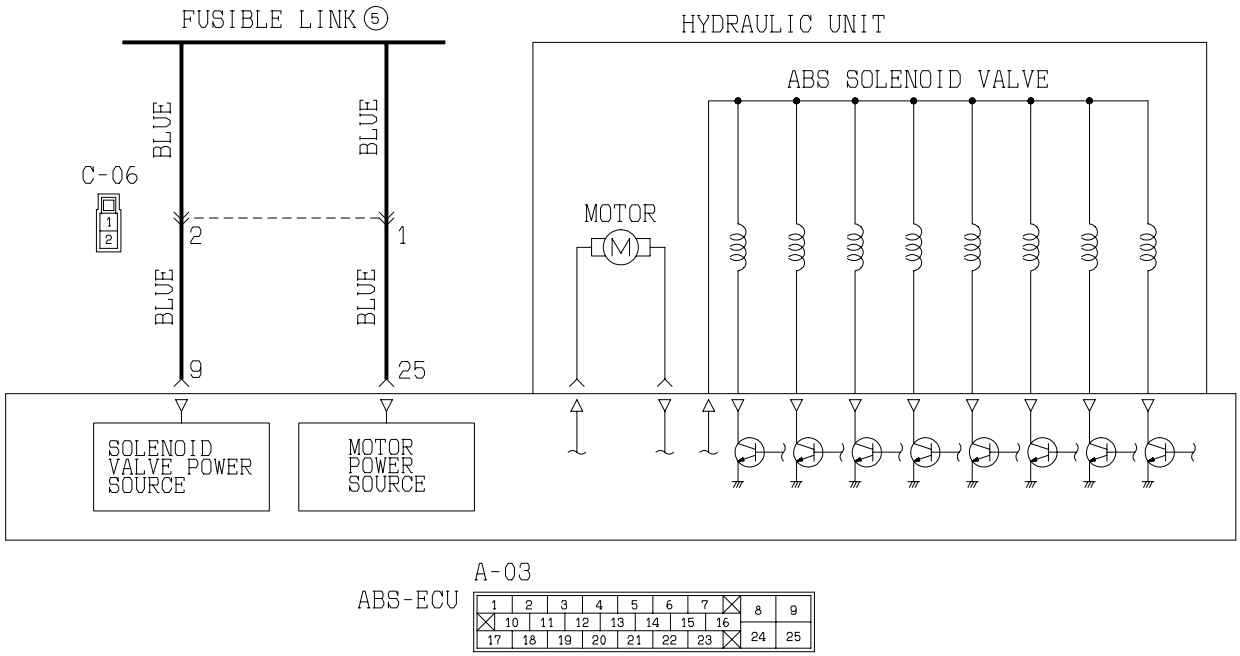
YES : Return to Step 1.

NO : This diagnosis is complete.

TSB Revision

DTC 41 : ABS Solenoid Valve inside Hydraulic Unit (Open circuit or short circuit)
DTC 51 : Hydraulic Unit Solenoid Valve Relay Open or Short Circuit
DTC 53 : Mulfunction of Hydraulic Unit

Solenoid Valve and Motor Power Supply Circuit



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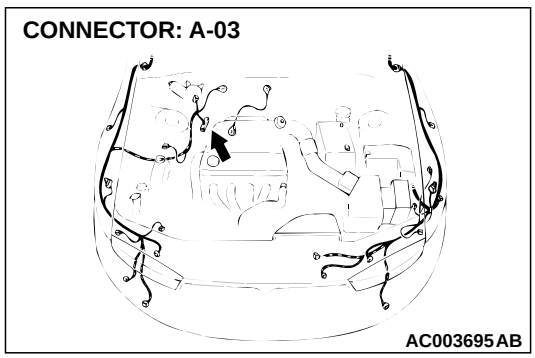
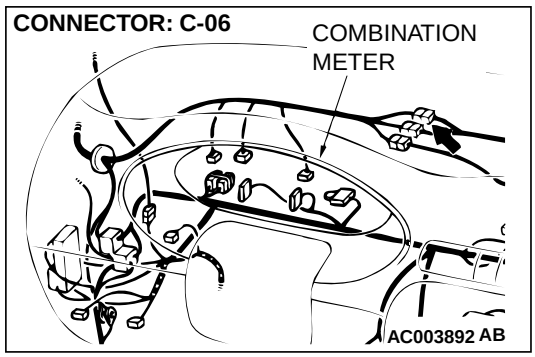




CIRCUIT OPERATION
Power is continuously supplied to the ABS-ECU through fusible link number 6 to operate the solenoid valve and motor.

ABS DTC SET CONDITIONS
These codes are displayed if the power supply circuit of solenoid valve or motor is open or shorted.

TROUBLESHOOTING HINTS
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

TSB Revision

DIAGNOSIS

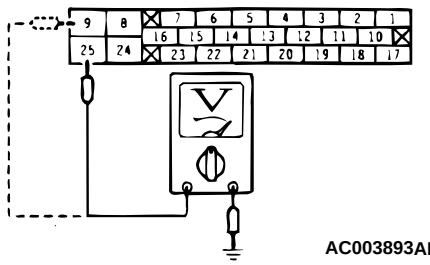
STEP 1. Check the solenoid valve or motor power supply circuit at ABS-ECU connector A-03.

(1) Disconnect connector A-03 and measure at the harness side.
(2) Measure the voltage between terminal 9 and ground or 25 and ground.

Q: Is battery positive voltage approximately 12 volts?

YES : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 3.
NO : Go to Step 2.

A-03 (HARNESS SIDE)



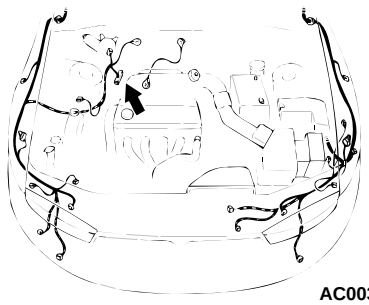
AC003893AB

STEP 2. Check the harness wire between fusible link number 5 and ABS-ECU connector A-03.

Q: Is any harness wire between fusible link number 5 and ABS-ECU connector A-02 damaged?

YES : Repair it and after inspecting intermediate connector C-06, inspect the wire. If intermediate connector C-06 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. then go to Step 3.
NO : Go to Step 3.

CONNECTOR: A-03



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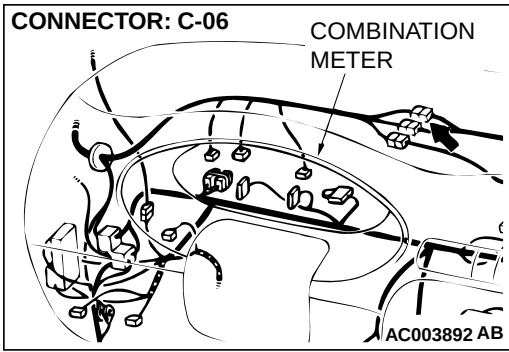
CONNECTOR: C-06



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STEP 3. Check the diagnostic trouble codes.

Q: Do the diagnostic trouble codes 41, 51 and 53 reset?

YES : Go to Step 1.
NO : This diagnosis is complete.

SYMPTOM CHART

M1352011400103

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.

TSB Revision

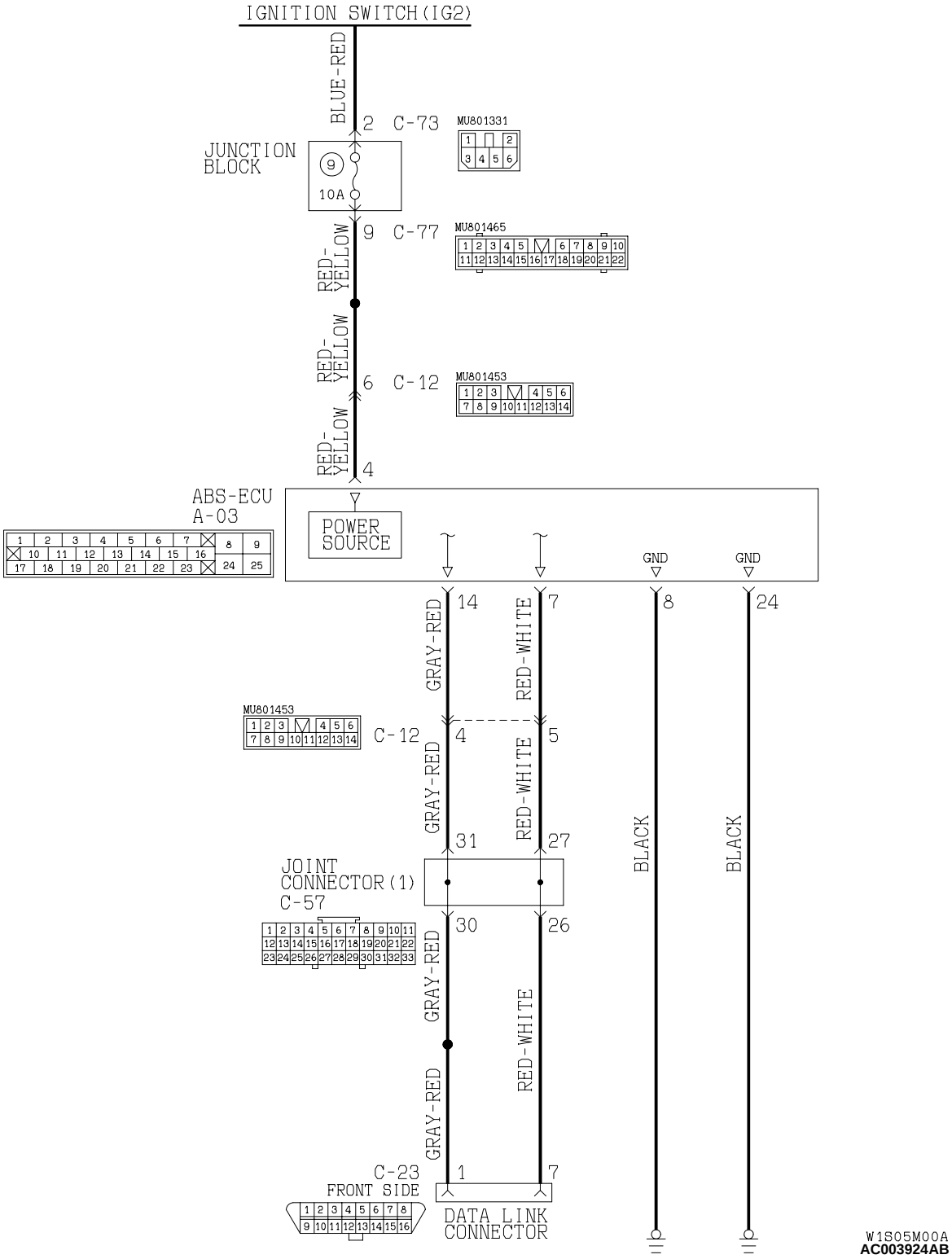
SYMPTOMS	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and the whole system is not possible.	-	13A – DiagnosisP.13A-5. 13B – DiagnosisP.13A-5.
Communication between the scan tool and the ABS-ECU is not possible.	1	P.35B-22
When the ignition key is turned to "ON" (Engine stopped), The ABS warning light does illuminate.	2	P.35B-27
The ABS warning light remains illuminated after the engine is started.	3	P.35B-31
Faulty ABS operation	4	P.35B-37

TSB Revision

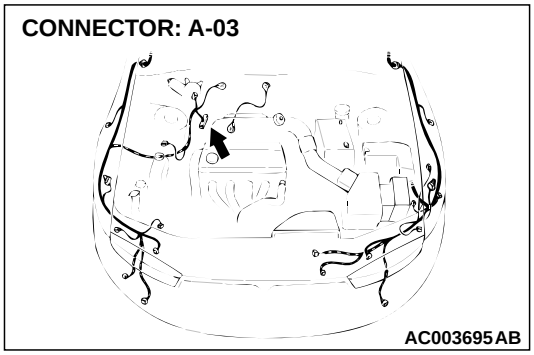
SYMPTOM PROCEDURES

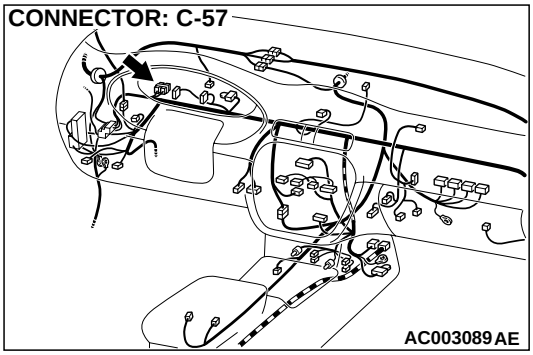
INSPECTION PROCEDURE 1: Communication with scan tool is not possible. (Communication with ABS only is not possible.)

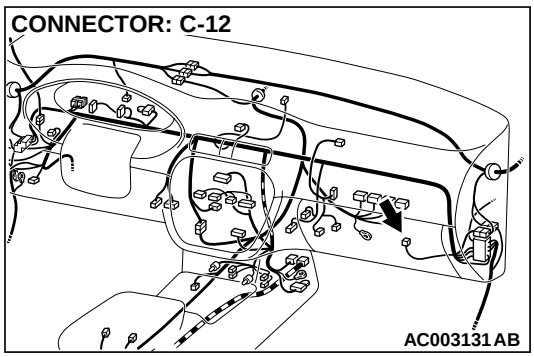
Data Link Connector Circuit

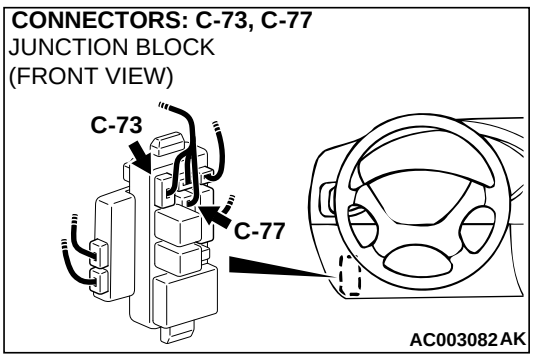


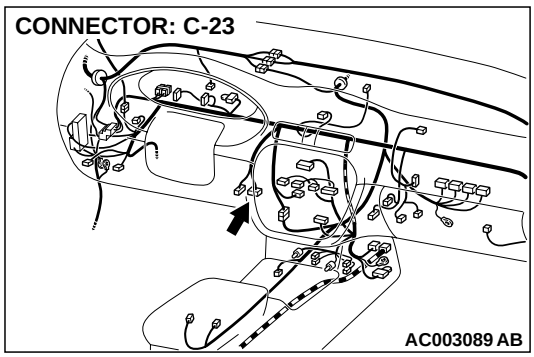
TSB Revision











CIRCUIT OPERATION

- The diagnostic output is made from the ABS-ECU (terminal 7) to the diagnostic output terminal (terminal 7) of the data link connector.
- When the data link connector's diagnostic test mode control terminal (terminal 1) is grounded, the ABS-ECU (terminal 14) will go into diagnostic mode.

TECHNICAL DESCRIPTION (COMMENT)

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

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

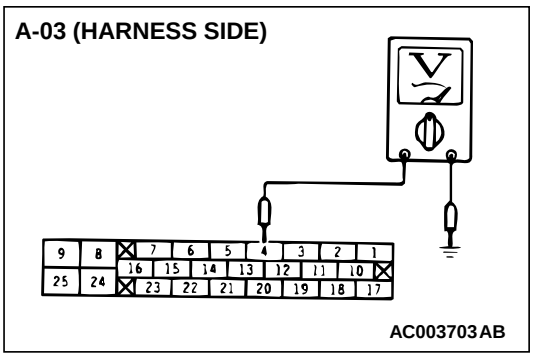
- Blown fuse
- Damaged wiring harness and connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

TSB Revision

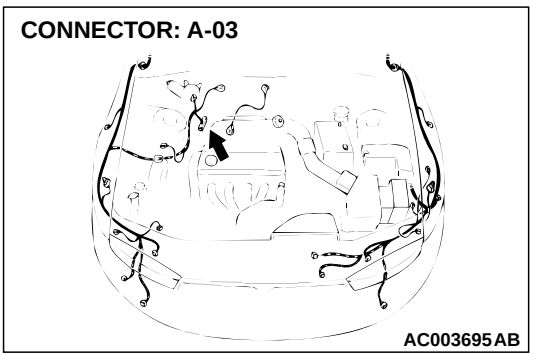


STEP 1. Check the power supply circuit at ABS-ECU connector A-03.

(1) Disconnect connector A-03 and measure at the harness side.
(2) Start the engine.
(3) Measure the voltage between terminal 4 and ground.

Q: Is voltage approximately 12 volts?

YES : Go to Step 3.
NO : Go to Step 2.

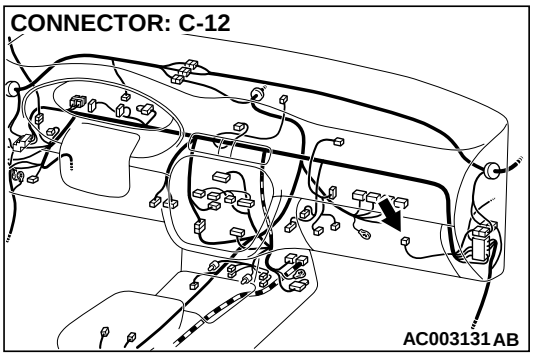


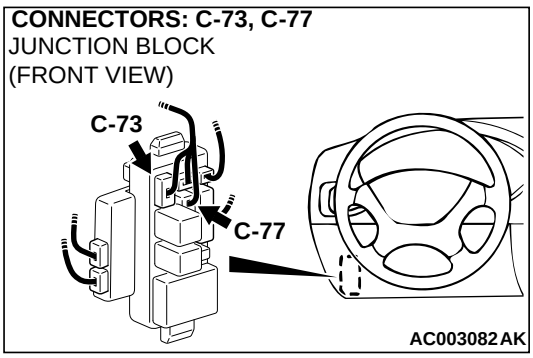
STEP 2. Check the harness wire between ignition switch (IG2) and ABS-ECU connector A-03

NOTE: After inspecting intermediate connector C-12, C-73, or C-77, inspect the wire. If intermediate connector C-12, C-73, or C-77 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 3 .

Q: Is any harness wire between ignition switch (IG2) and ABS-ECU connector A-03 damaged?

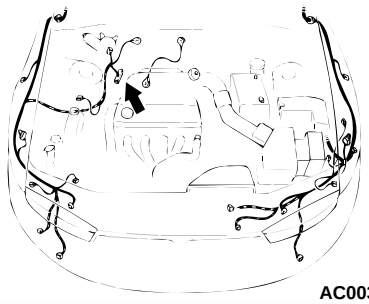
YES : Repair them and go to Step 5.
NO : Go to Step 3.





TSB Revision

CONNECTOR: A-03



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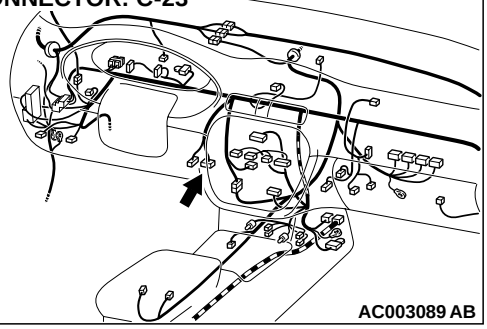
CONNECTOR: C-23



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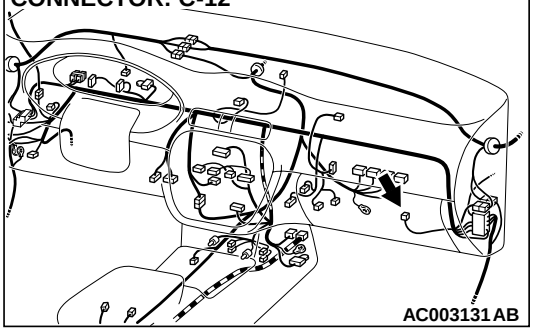
CONNECTOR: C-12



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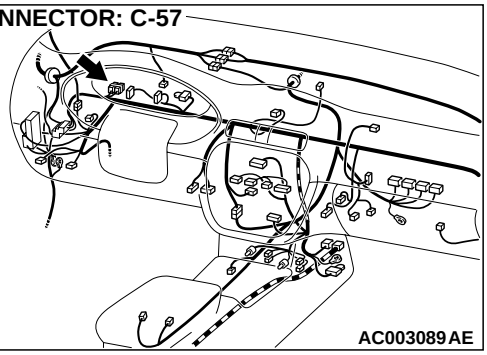
CONNECTOR: C-57



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STEP 3. Check the harness wire between ABS-ECU connector A-03 and data link connector C-23.

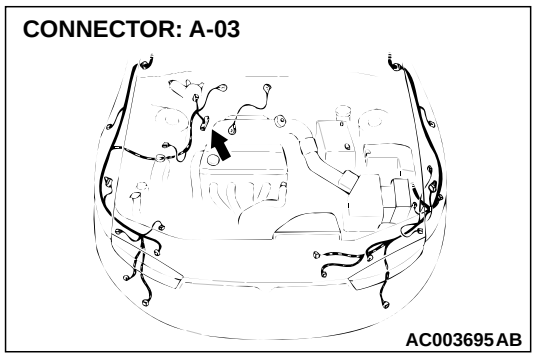
NOTE: After inspecting intermediate connector C-12 or C-57, inspect the wire. If intermediate connector C-12 or C-57 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 4.

Q: Is any harness wire between ABS-ECU connector A-03 and data link connector C-23 damaged?

YES : Repair them and go to Step 5.

NO : Go to Step 4.

TSB Revision



STEP 4. Check the harness wires between ABS-ECU connector A-03 and ground.

Q: Are any harness wires between ABS-ECU connector A-03 and ground damaged?

YES : Repair them and then go to Step 5.

NO : Go to Step 5.

STEP 5. Check symptoms

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

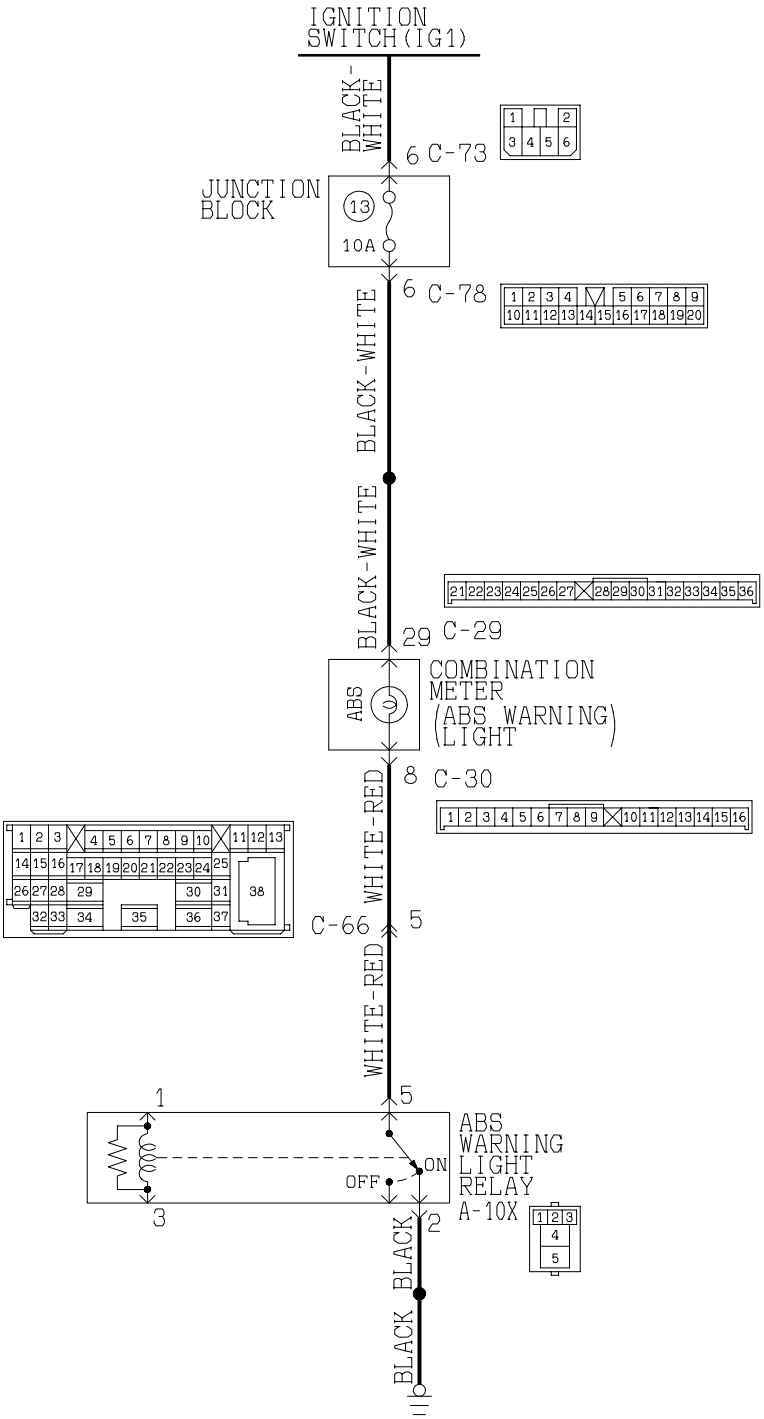
YES : This diagnosis is complete.

NO : Return to Step 1.

TSB Revision

INSPECTION PROCEDURE 2: When the ignition switch is turned "ON" (engine stopped), the ABS warning light does not illuminate.

ABS Warning Light Power Supply and Ground Circuit



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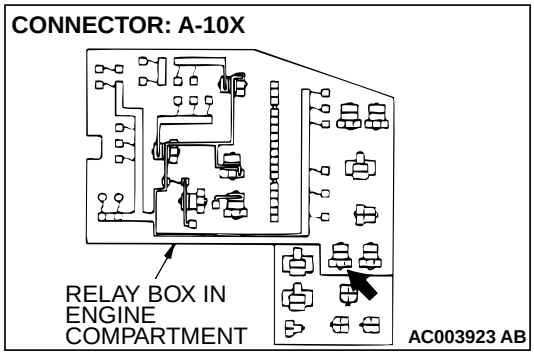
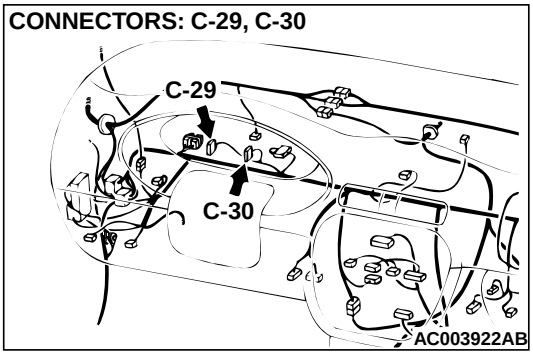
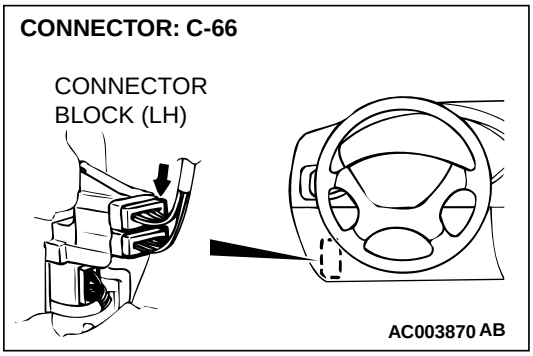
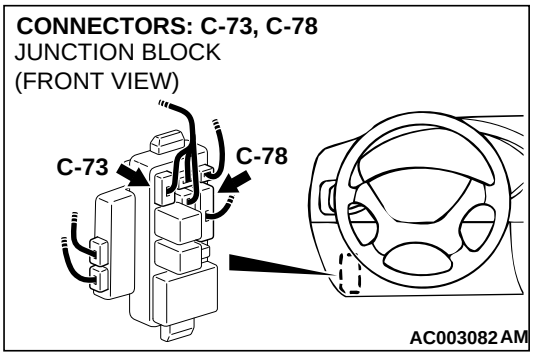
TSB Revision









CIRCUIT OPERATION

The ABS warning light power is supplied from the ignition switch.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be: an open circuit in the ABS warning light power supply circuit, a blown ABS warning light bulb or ABS warning light relay.

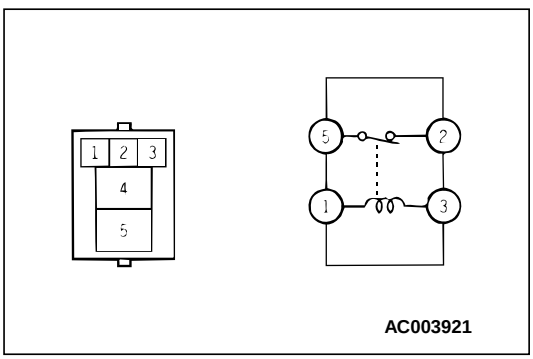
TROUBLESHOOTING HINTS (The most likely causes for this condition:)

- Blown fuse
- Damaged wring harness or connector
- Burnt out ABS warning light bulb
- Malfunction of the ABS warning light relay

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set



STEP 1. Check the ABS warning light relay continuity.

(1) Remove the ABS warning light relay.
(2) Check the continuity between terminal number 1 and number 3 and between terminal number 5 and number 2 at the ABS warning light relay.

Q: Is the ABS warning light relay continuity?

YES : Go to Step 2.
NO : Replace the ABS warning light and then go to Step 7.

TSB Revision

STEP 2. Check the ABS warning light relay continuity.

(1) Remove the ABS warning light relay.
(2) Apply the positive terminal to the number 3 terminal, and then check the continuity between the number 5 terminal and the number 2 terminal.

Q: Is the ABS warning light relay continuity?

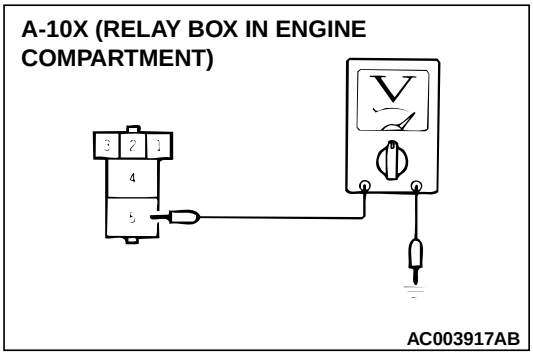
YES : Replace the ABS warning light and then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the power supply circuit at the ABS warning light relay connector A-10X.

(1) Start the engine.
(2) Measure at the relay box in engine compartment side the voltage between the terminal 5 and ground.

Q: Is the voltage approximately 12 Volts?

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

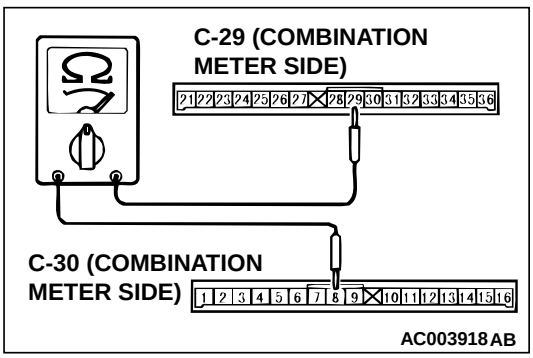


STEP 4. Check the combination meter (ABS warning light) continuity.

(1) Remove the combination meter. (Refer to GROUP 54, Combination Meter.)
(2) Check the continuity between terminal number 29 (combination meter side connector C-29) and number 8 (combination meter side connector C-30).

Q: Is the combination meter (ABS warning light) relay continuity?

YES : Replace the printed circuit board or ABS warning light bulb then go to Step,7.
NO : Go to Step 6.

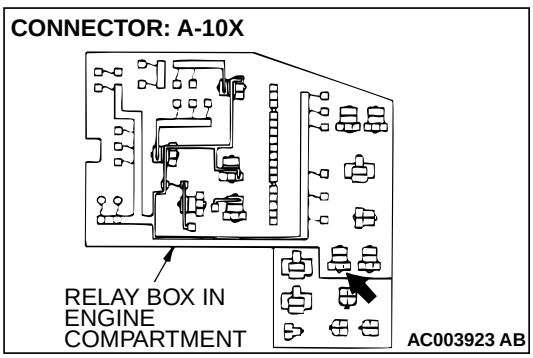


STEP 5. Check the harness wire between ABS warning light relay connector A-10X and ground.

The continuity should exist between terminal 2 or connector A-10X and ground.

Q: Are any harness wire between ABS warning light relay connector A-10X and ground damage?

YES : Repair the harness wire then go to Step 7.
NO : Go to Step 5.



TSB Revision

STEP 6. Check the harness wire between ABS warning light relay connector A-10X and combination meter connector C-30 or check the harness wire between ignition switch (IG1) and combination meter connector C-29.

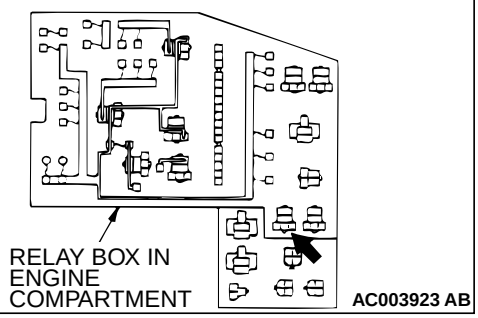
NOTE: After inspecting intermediate connector C-66, C-73 or C-78 inspect the wire. If intermediate connector C-66,C-73 or C-78 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 7.

Q: Are any harness wire between ABS warning light relay connector A-10X and combination meter connector C-30 or check the harness wire between ignition switch (IG1) and combination meter connector C-29 damage?

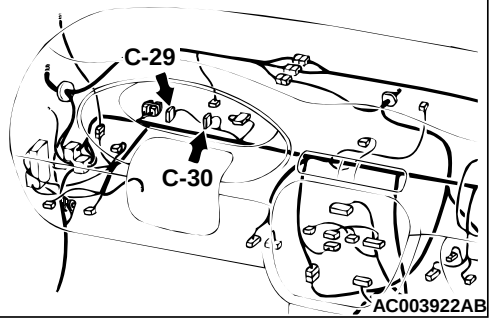
YES : Repair the harness wire then go to Step 7.

NO : Go to Step 5.

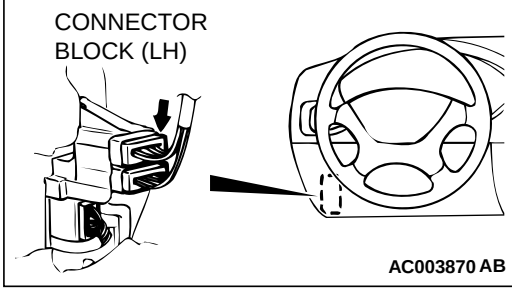
CONNECTOR: A-10X



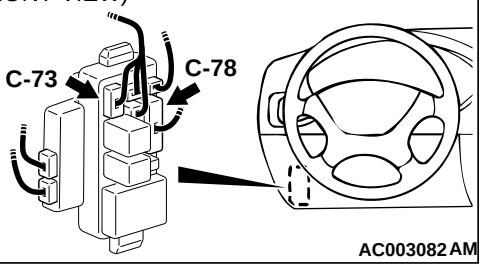
CONNECTORS: C-29, C-30



CONNECTOR: C-66



CONNECTORS: C-73, C-78
JUNCTION BLOCK
(FRONT VIEW)



TSB Revision

STEP 7. Check symptoms

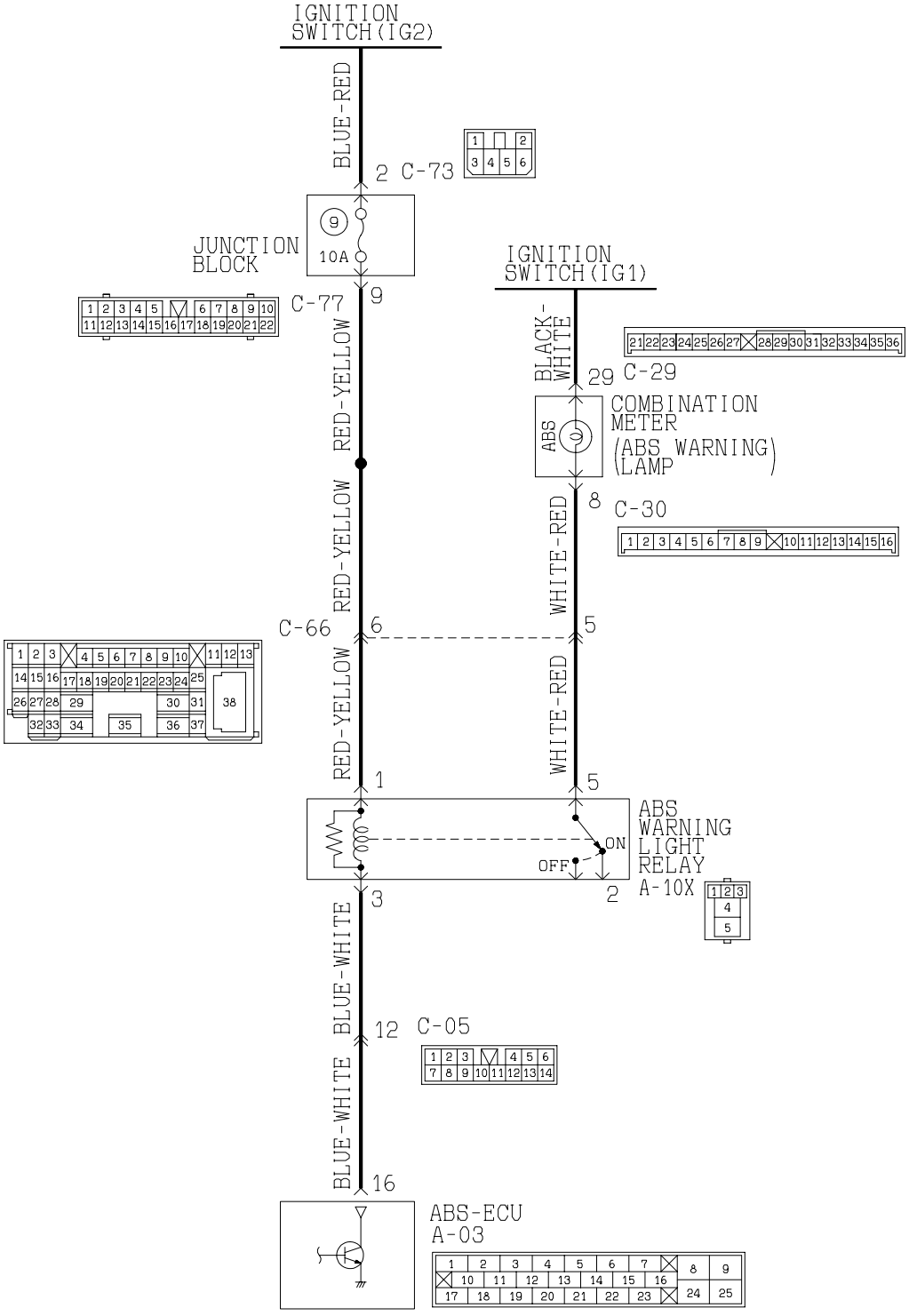
Q: Does the ABS warning light illuminate for 3 seconds when the ignition switch is turned to the "ON" position with engine stopped or upon start-up?

YES : This diagnosis 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 (ABS-ECU power supply is normal) and no diagnostic trouble code outputs.

ABS Warning Light Power Supply Circuit



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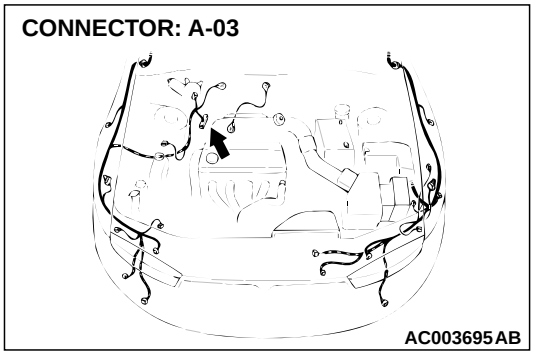
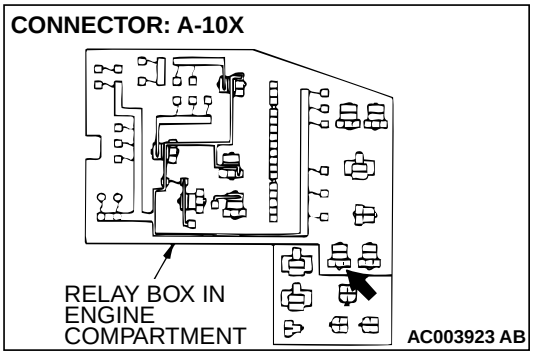
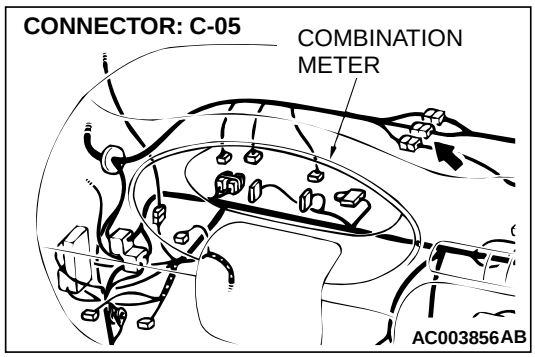
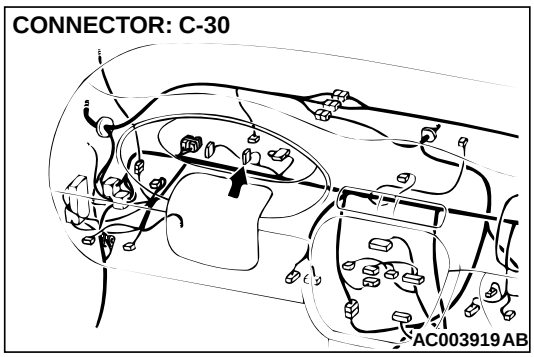
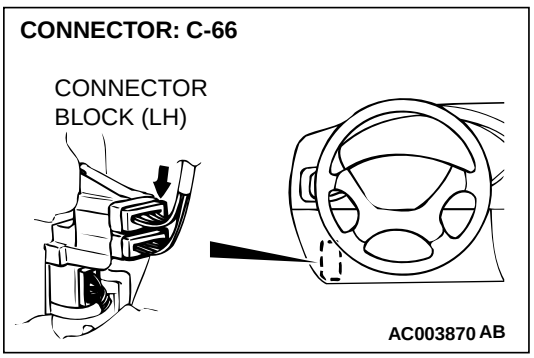
TSB Revision

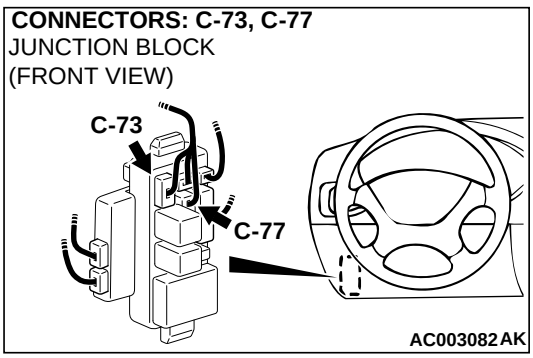












CIRCUIT OPERATION

- The ABS-ECU controls the continuity to the ABS warning light by turning the power transistor in the unit "ON" and "OFF" to turn the ABS warning relay "ON" and "OFF".

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably an ABS warning light relay hydraulic unit (integrated with ABS-ECU) malfunction.

TROUBLESHOOTING HINTS

The mostlikely causes for this case:

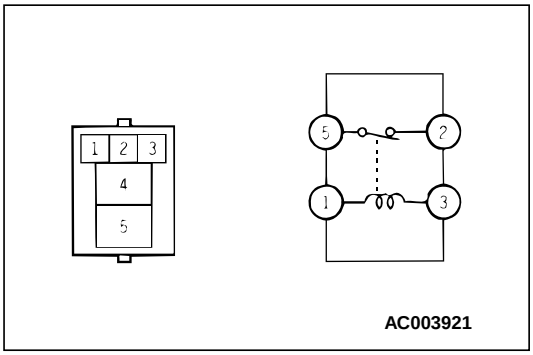
- Damaged wiring harness
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Malfunction of the ABS warning light relay

DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

TSB Revision



STEP 1. Check the ABS warning light relay continuity.

(1) Remove the ABS warning light relay.
(2) Check the continuity between terminal number 1 and number 3 and between terminal number 5 and number 2 at the ABS warning light relay.

Q: Is the ABS warning light relay continuity?

YES : Go to Step 2.
NO : Replace the ABS warning light and then go to Step 7.

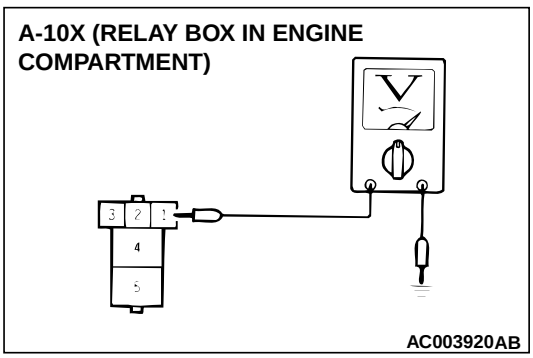
STEP 2. Check the ABS warning light relay continuity.

(1) Remove the ABS warning light relay.
(2) Apply the positive terminal of the battery to the No. 1 terminal and the negative terminal to the No. 3 terminal, and then check the continuity between the No. 5 terminal and the No. 2 terminal.

Q: Is the ABS warning light relay continuity?

YES : Replace the ABS warning light and then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the power supply circuit at the ABS warning light relay connector A-10X.



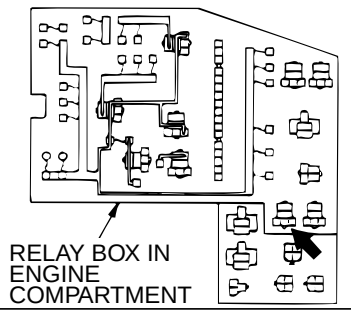
(1) Start the engine.
(2) Measure at the relay box in engine compartment side the voltage between the terminal 1 and ground.

Q: Is the voltage approximately 12 volts?

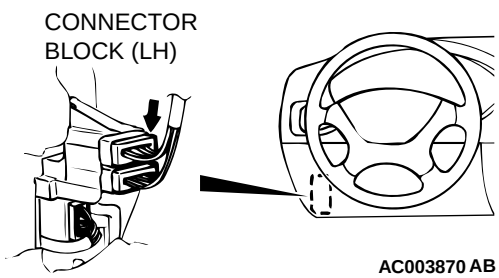
YES : Go to Step 5
NO : Go to Step 4.

TSB Revision

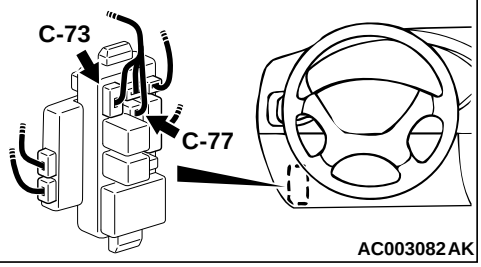
CONNECTOR: A-10X



CONNECTOR: C-66



CONNECTORS: C-73, C-77
JUNCTION BLOCK
(FRONT VIEW)



STEP 4. Check the harness wire between ignition switch (IG2) and ABS warning light relay connector A-10X.

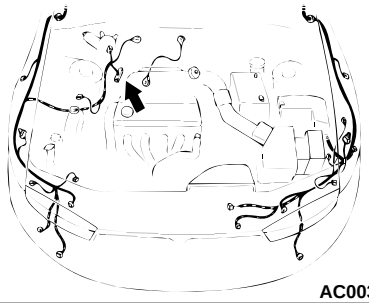
NOTE: After inspecting intermediate connector C-66, C-73 or C-77 inspect the wire. If intermediate connector C-66, C-73 or C-77 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 7.

Q: Are any harness wire between the ignition switch (IG1) and ABS warning light relay connector A-10X damage?

YES : Go to Step 5.

NO : Repair the harness wire and then go to Step 7.

CONNECTOR: A-03



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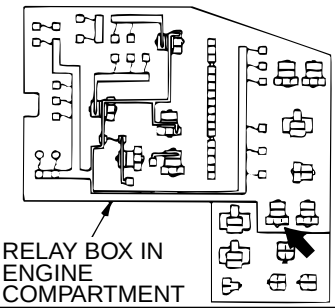
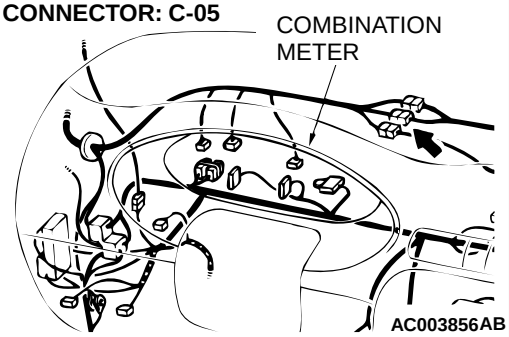
CONNECTOR: A-10X



AC003923 AB

CONNECTOR: C-05



AC003856AB

STEP 5. Check the harness wire between ABS-ECU connector A-03 and ABS warning light relay connector A-10X.

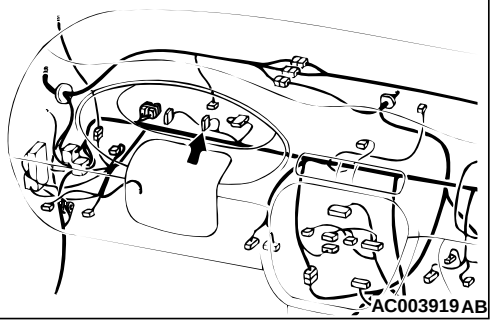
NOTE: After inspecting intermediate connector C-05, inspect the wire. If intermediate connector C-05, is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector InspectionP.00E-2. If the connector has been repaired or replaced, go to Step 7.

Q: Are any harness wire between the ABS-ECU connector A-03 and ABS warning light relay connector A-10X damage?

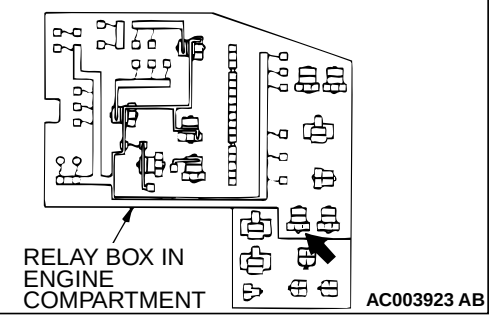
YES : Repair the harness wire and then go to Step 7.
NO : Go to Step 6.

TSB Revision

CONNECTOR: C-30



CONNECTOR: A-10X



STEP 6. Check the harness wire between combination meter connector C-30 and ABS warning light relay connector A-10X.

(1) Remove the combination meter. (Refer to GROUP 54A, Combination MeterP.54A-65.)

(2) Check the harness wire between combination meter of connector C-30 terminal 8 and ABS warning light relay connector A-10X terminal 5.

Q: Are any harness wire between the combination meter connector A-30 and ABS warning light relay connector A-10X damage?

YES : Replace the ABS-ECU then go to Step 7.
NO : Repair the harness wire and then go to Step 7.

STEP 7. Check symptoms

Q: Does the ABS warning light remain illuminated after the engine is started?

YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 4 , 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

The most likely cause for this case:

- Malfunction of the hydraulic unit

DIAGNOSIS

Check the hydraulic unit.

- Refer to P.35B-43. If the hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1352011500070

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

TSB Revision

MUT-II SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENTS	NORMAL VALUE
ECU VOLTAGE	16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9 – 16 V
FR SNSR	11	Front-right wheel speed sensor	Drive the vehicle	Vehicle speeds displayed on the speedometer and scan tool are identical.
FL SNSR	12	Front-left wheel speed sensor		
RR SLSR	13	Rear-right wheel speed sensor		
RL SNSR	14	Rear-left wheel speed sensor		
STOPLIGHT SW	36	Stoplight switch	Depress the brake pedal.	ON
			Release the brake pedal.	OFF

ACTUATOR TEST REFERENCE TABLE

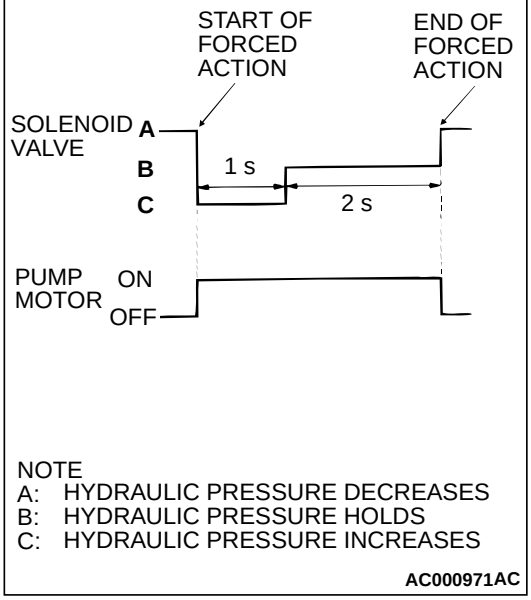
M1352011600055

The scan tool activates the following actuators for testing.

NOTE: If the ABS-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.

ACTIVATION PATTERN



NOTE
A: HYDRAULIC PRESSURE DECREASES
B: HYDRAULIC PRESSURE HOLDS
C: HYDRAULIC PRESSURE INCREASES

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ACTUATOR TEST SPECIFICATIONS

NO.	ITEM	PARTS TO BE ACTIVATED
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

CHECK AT ABS-ECU

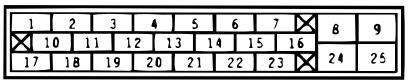
M1352011800071

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (8) and (24) (ground terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

TSB Revision

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



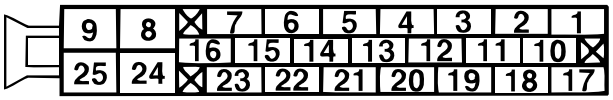
AC003648

CONNECTOR TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
4	ABS-ECU power supply	Ignition switch: "ON"		Battery positive voltage
		Ignition switch: "START"		Approximately 0 V
7	Scan tool	Connect the scan tool		Serial communication with scan tool
		Do not connect the scan tool		1 V or less
9	Solenoid valve power supply	Always		Battery positive voltage
14	Input from diagnostic indication selection	Connect the scan tool		Approximately 0 V
		Do not connect the scan tool		Approximately 12 V
16	Output to ABS warning light relay control	Ignition switch: "ON"	The light is switch off.	1 V or less
			The light is illuminated.	Battery positive voltage
18	Input from stoplight switch	Stoplight switch: "ON"		Battery positive voltage
		Stoplight switch: "OFF"		Approximately 0 V
25	Motor power supply	Always		Battery positive voltage

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

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

TSB Revision

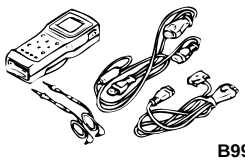
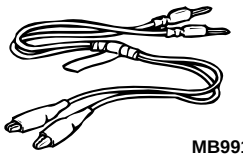
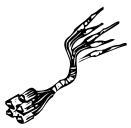
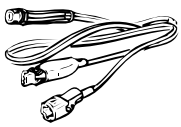
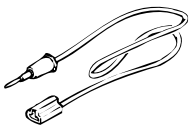


AC003647

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
1 – 2	Front-left wheel speed sensor	1.28 – 1.92 kΩ
22 – 23	Rear-right wheel speed sensor	1.28 – 1.92 kΩ
19 – 20	Front-right wheel speed sensor	1.28 – 1.92 kΩ
5 – 6	Rear-left wheel speed sensor	1.28 – 1.92 kΩ
8 – body ground	Solenoid valve ground	Continuity
24 – body ground	Motor ground	Continuity

SPECIAL TOOLS

M1352000600051

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool	MB991496-OD	For checking of ABS (Diagnostic trouble code display when using the scan tool)
 MB991529	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available.	For checking of ABS (Diagnostic trouble code display when using the ABS warning light)
A     MB991223 AH	MB991223 Harness set A:MB991219 Inspection harness	MB991223 MB991709-01	Wheel speed sensor output voltage measurement

ON-VEHICLE SERVICE

BLEEDING

M1352001500046

⚠ CAUTION

Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid:
Conforming to DOT 3 or DOT 4

MASTER CYLINDER BLEEDING

Refer to GROUP 35A – On-vehicle Service – BleedingP.35A-21.

TSB Revision

BRAKE LINE BLEEDING

⚠ CAUTION

For vehicles with ABS, be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the hydraulic unit.

Refer to GROUP 35A – On-vehicle Service – BleedingP.35A-21.

WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT

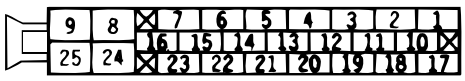
M1352001600054

Required Special Tool:

- MB991219: Inspection Harness

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then use special tool MB991219 to measure the output voltage at the harness side connector.

ABS-ECU CONNECTOR (HARNESS SIDE)



AC004008AB

TERMINAL NO.			
Front left	Rear right	Front right	Front right
1	23	19	5
2	22	20	6

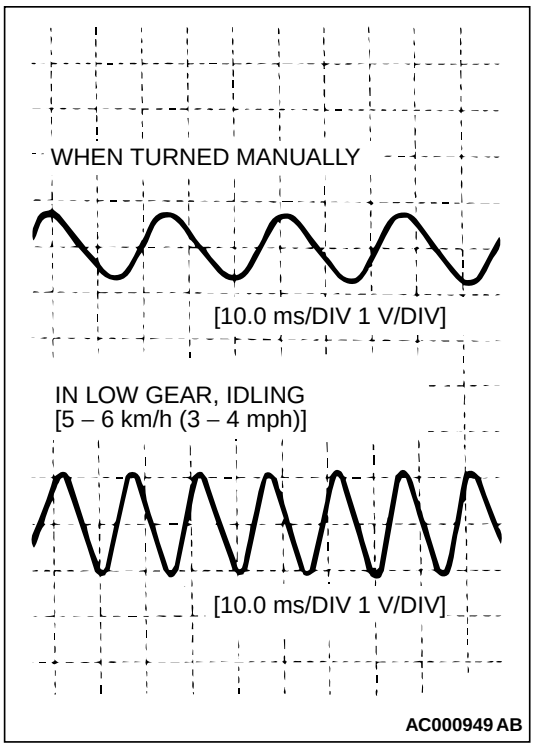
3. Manually turn the wheel to be measured 1/2 to 1 turn/second. Measure the output voltage with a voltmeter or oscilloscope.

Output voltage:

- **When measured with voltmeter: 42 mV or more**
- **When measured with oscilloscope (maximum voltage): 120 mV or more**

Probable causes of low output voltage

- **Wheel speed sensor pole piece-to-ABS rotor clearance too large**
- **Faulty wheel speed sensor**



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

4. To observe the waveform with an oscilloscope:
   - Front Wheels: Shift into low gear and drive the wheels.
   - Rear Wheels: Turn the wheels manually at a constant speed

   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 wheel speed sensor	Replace sensor
	Incorrect pole piece-to-ABS rotor clearance	Adjust clearance
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 wheel speed sensor	Replace sensor
	Open circuit in harness	Repair harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	ABS rotor with missing or damaged teeth	Replace ABS rotor

NOTE: The wheel speed 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.

HYDRAULIC UNIT CHECK

M1352001700051

Required Special Tool:
- MB991502: Scan Tool (MUT-II)

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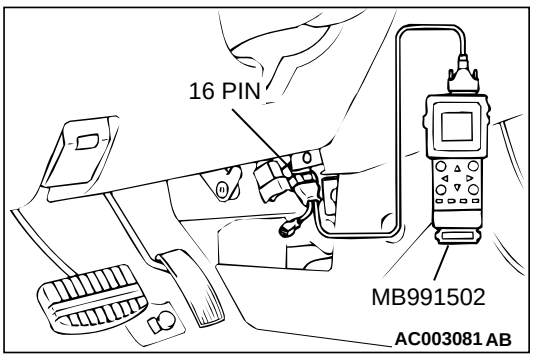
⚠ CAUTION

- **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

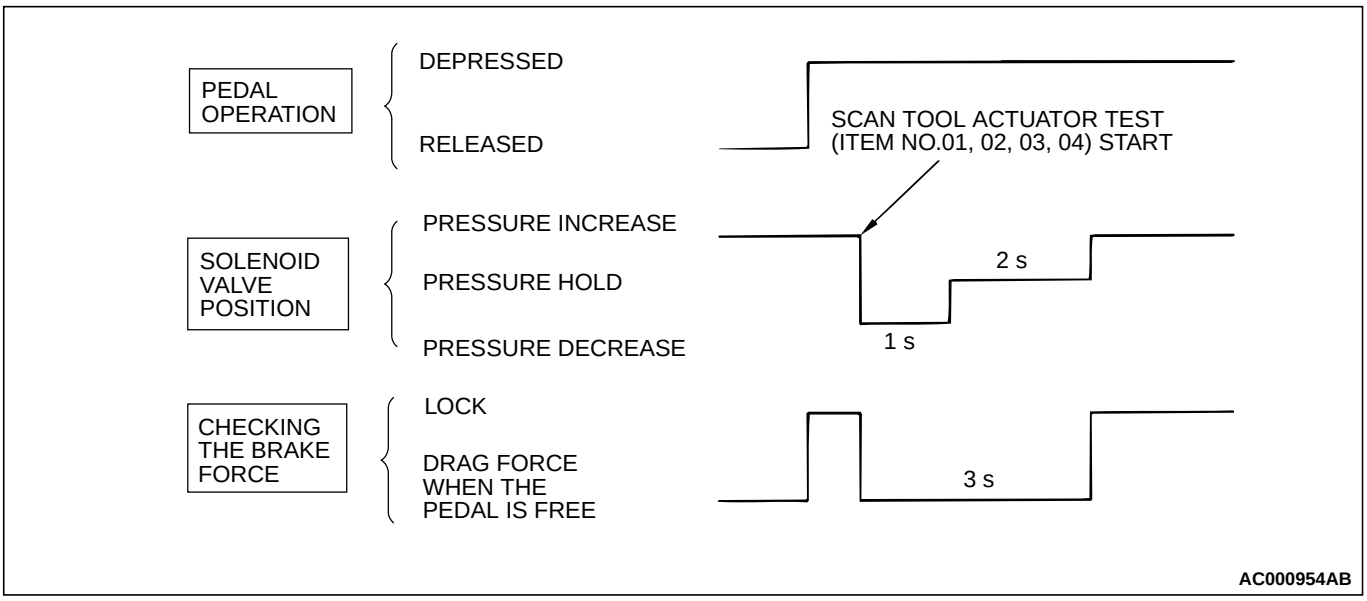
To prevent damage to scan tool MB991502, always turn the ignition switch to the "LOOK" (OFF) position.



3. Turn the ignition switch to the "LOCK" (OFF) position and set scan tool MB1502 as shown in the illustration.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.
5. Use scan tool MB991502 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 MB991502 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 ins

Front wheel	785 – 981 N (176 – 220 lb)
Rear wheel	588 – 784 N (132 – 176 lb)

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The result should be as shown in the diagram above.

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

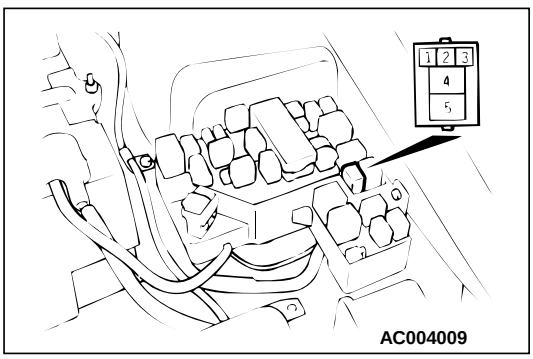
Diagnosis Table

NO.	OPERATION	NORMAL CONDITION	ABNORMAL CONDITION	PROBABLE CAUSE	REMEDY
01	1. Depress brake pedal to lock wheel. 2. Using scan tool MB991502, 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 released for three locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than hydraulic unit	Check and clean brake line
02				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
03			Brake force is not released	Incorrect hydraulic unit brake tube connection	Connect correctly
04				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly

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

ABS WARNING LIGHT RELAY CHECK

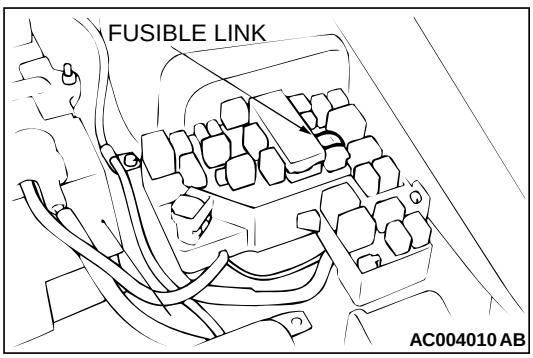
M1352010900053



1. Remove the ABS warning light relay.
2. Check continuity between the number 1 terminal and the number 3 terminal, and between the number 5 terminal and the number 2 terminal. Confirm that there is continuity.
3. Apply the positive terminal of the battery to the number 1 terminal and the negative terminal to the number 3 terminal to check the continuity between the number 5 terminal and number 2 terminal. Confirm that there is no continuity.

DISCHARGED BATTERY

M1352003500064



The ABS system consumes a large amount of battery current for its self-check function. If the battery is completely discharged and booster cables are used to start the engine, the engine must be allowed to idle for a few minutes to recharge. If the battery does not recharge, the engine may misfire or stall. To prevent this condition,

- allow the engine to idle for a few minutes before driving the vehicle, or

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- temporarily disable the ABS system by removing the fusible link for the ABS circuit. The ABS warning light will illuminate when the ABS fusible link is removed. After the battery is recharged, reinstall the ABS fusible link and check that the ABS warning light is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

REMOVAL AND INSTALLATION

M1352004000040

Refer to GROUP 35A, Master Cylinder and Brake BoosterP.35A-31.

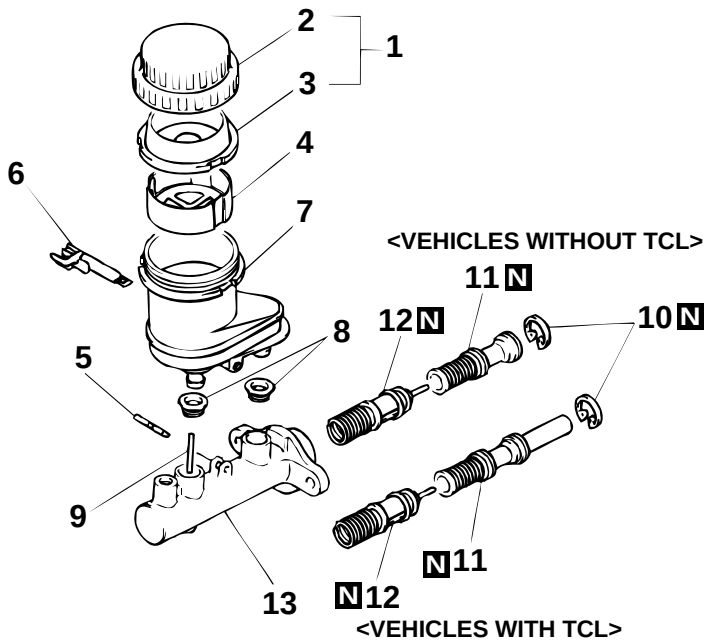
MASTER CYLINDER

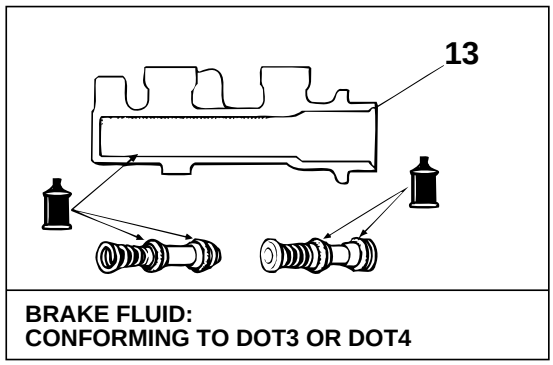
M1352004500045

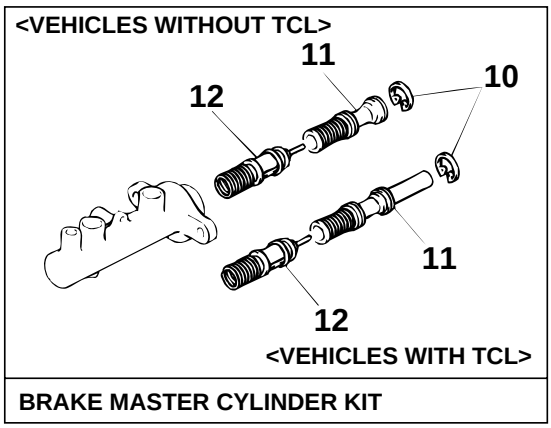
DISASSEMBLY AND ASSEMBLY

⚠ CAUTION

Do not disassemble the primary and secondary piston assemblies.







AC000955AC

DISASSEMBLY STEPS

1. RESERVOIR CAP ASSEMBLY
2. RESERVOIR CAP
3. DIAPHRAGM
4. FILTER
5. SPRING PIN
6. BRAKE FLUID LEVEL SENSOR
7. RESERVOIR

<<A>>

DISASSEMBLY STEPS (Continued)

8. RESERVOIR SEAL
9. PIN
10. PISTON STOPPER RING
11. PRIMARY PISTON ASSEMBLY
12. SECONDARY PISTON ASSEMBLY
13. MASTER CYLINDER BODY

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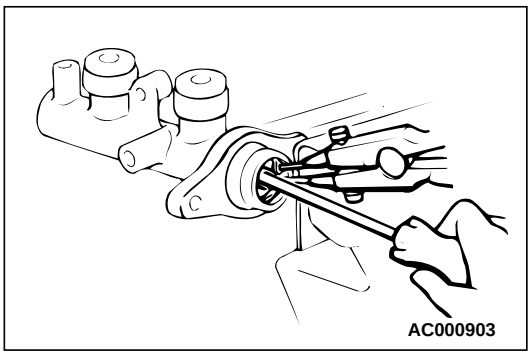
AC000903

DISASSEMBLY SERVICE POINT

<<A>> PISTON STOPPER RING DISASSEMBLY

While depressing the piston, remove the piston stopper ring.

INSPECTION

M1352004600042

- Check the inner surface of the master cylinder body for corrosion or pitting.
- Check the primary and secondary pistons for corrosion, scoring, wear or damage.
- Check the diaphragm for cracks and wear.

HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352008600044

NOTE: The ABS-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Filling • Bake Line Bleeding (Refer to P.35B-41.)

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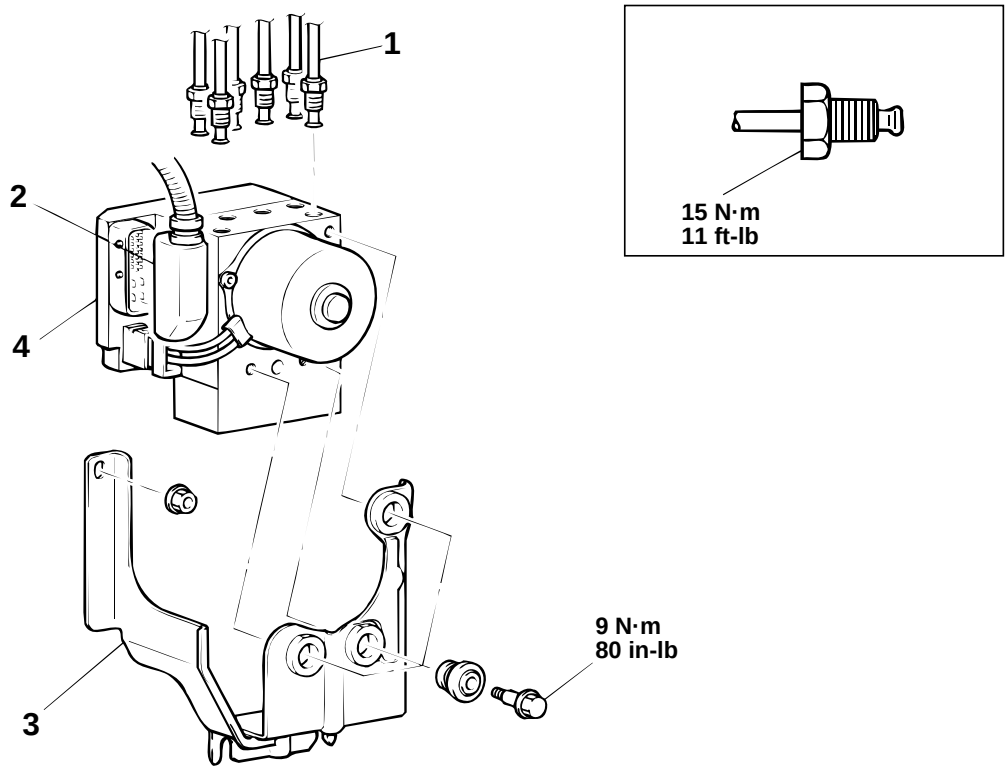
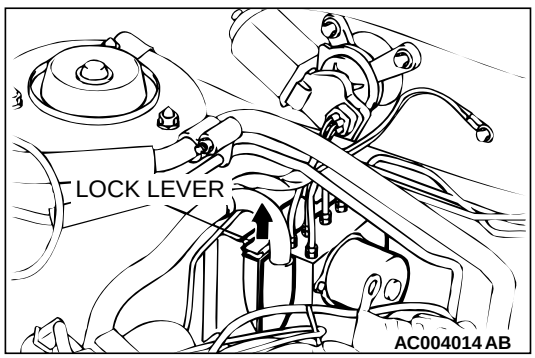


REMOVAL STEPS

>>A<< 1. BRAKE TUBE
<<A>> 2. HARNESS CONNECTOR

REMOVAL STEPS (Continued)

3. BRACKET ASSEMBLY
<<B>> 4. HYDRAULIC UNIT



REMOVAL SERVICE POINTS

<<A>> HARNESS CONNECTOR REMOVAL

Pull the lock lever in the direction shown in the illustration, and remove the harness.

<<B>> HYDRAULIC UNIT REMOVAL

⚠ ***WARNING***

The hydraulic unit is heavy. Use care when removing it.

⚠ **CAUTION**

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**

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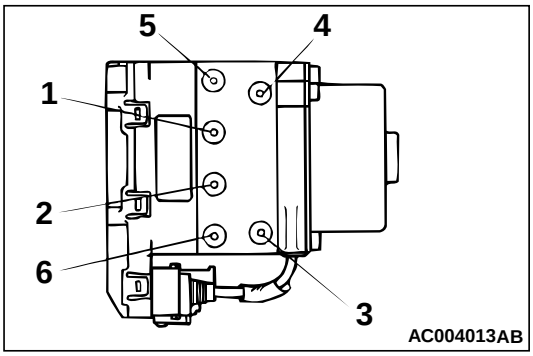


INSTALLATION SERVICE POINT

>>A<< BRAKE TUBE INSTALLATION

Connect the tubes to the hydraulic unit as shown in the illustration.

1. To the proportioning valve (rear brake: LH)
2. To the proportioning valve (rear brake: RH)
3. From the master cylinder (primary)
4. From the master cylinder (secondary)
5. To the front brake (RH)
6. To the front brake (LH)

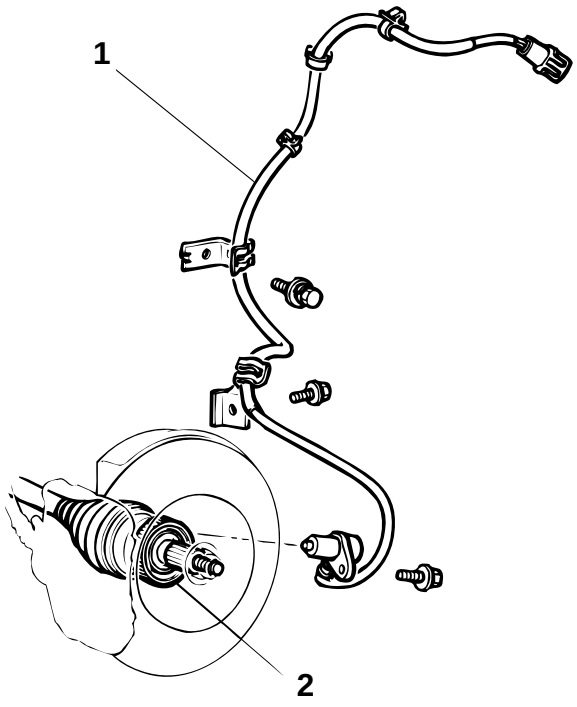
WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

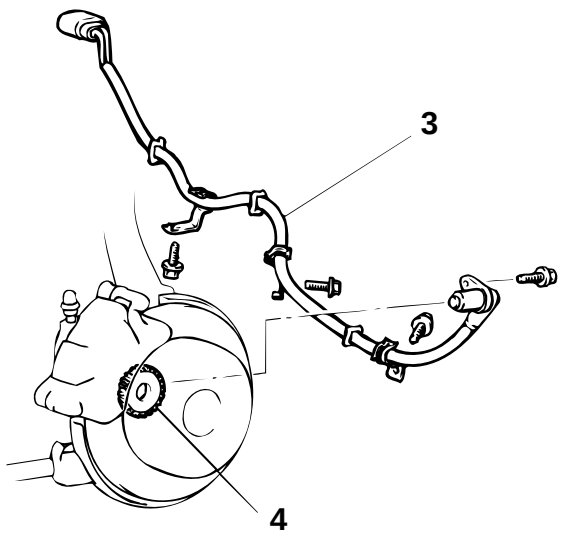
M1352008300054

Post-installation Operation
- Wheel Speed Sensor Output Voltage Measurement (Refer to P.35B-42.)

<FRONT>



<REAR>



AC000959 AB

<<A>> >>A<< 1. FRONT SPEED SENSOR
2. FRONT ABS ROTOR WITH DRIVESHAFT (REFER TO GROUP 26, DRIVESHAFTP.26-11.)

<<A>> **>>A<<** 3. REAR SPEED SENSOR
4. REAR ABS ROTOR (REFER TO GROUP 27, REAR AXLE HUBP.27-6.)

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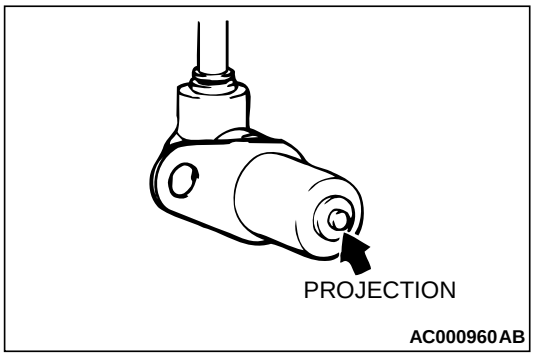
REMOVAL SERVICE POINT

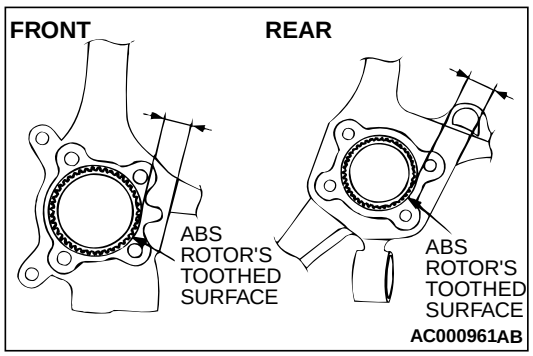


<<A>> FRONT SPEED SENSOR/REAR SPEED SENSOR REMOVAL

⚠ CAUTION

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

INSTALLATION SERVICE POINT



>>A<< FRONT SPEED SENSOR/REAR SPEED SENSOR INSTALLATION

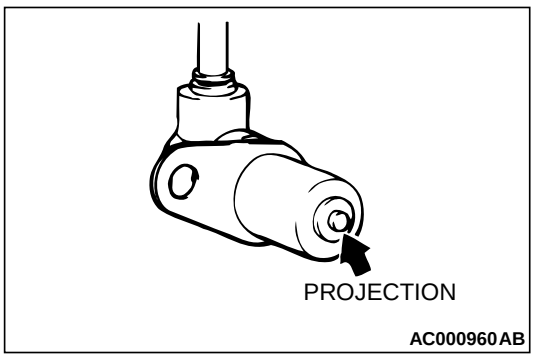
The clearance between the wheel speed sensor and the ABS rotor's toothed surface is not adjustable, but measure the distance between the sensor installation surface and the ABS rotor's toothed surface.

Standard value: 28.2 – 28.5 mm (11.10 – 11.22 inches)

INSPECTION

M1352008400051

Speed Sensor Check

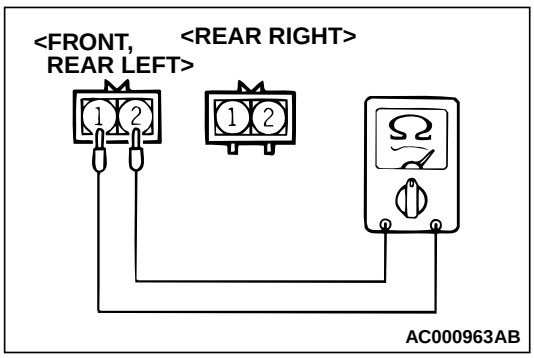


1. Check whether any metallic foreign material has adhered to the projection at the speed sensor tip. Remove any foreign material. Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

   NOTE: The projection can become magnetized due to the magnet inside the speed 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 speed sensor terminals.

   Standard value: 1.28 – 1.92 kΩ



3. If the internal resistance of the speed sensor is not within the standard value, replace it with a new speed sensor.

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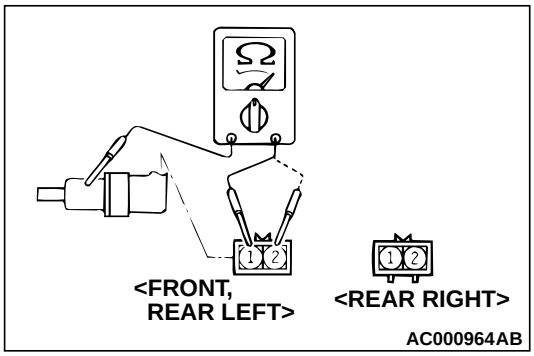


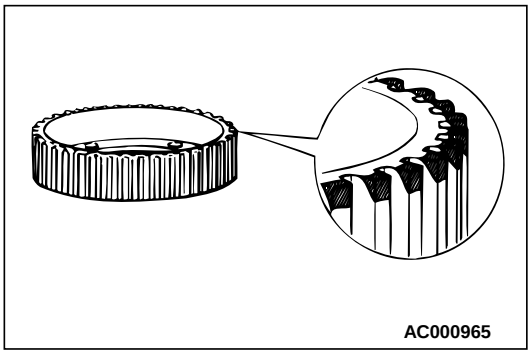
4. Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

   Standard value: 100 kΩ or more

5. If the speed sensor insulation resistance is not within the standard value range, replace it with a new speed sensor.
6. Check the speed 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 driveshafts assembly for the front side or the ABS rotor for the rear side, respectively, if the teeth are damaged or deformed.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1352012400065

ITEMS	SPECIFICATIONS
Brake tube flare nut	15 N·m (11 ft-lb)
Hydraulic unit bracket bolt	9 N·m (80 in-lb)

SERVICE SPECIFICATIONS

M1352000300050

ITEMS	STANDARD VALUE
Wheel speed sensor internal resistance kΩ	1.28 – 1.92
Wheel speed sensor insulation resistance kΩ	100 or more
Distance between wheel speed sensor installation surface and ABS rotor tooth top mm (in)	28.2 – 28.5 (11.10 – 11.22)

NOTES