

GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

GENERAL INFORMATION	35B-2	INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS	35B-30
SERVICE SPECIFICATION	35B-3	DATA LIST REFERENCE TABLE	35B-45
SPECIAL TOOLS	35B-4	ACTUATOR TEST REFERENCE TABLE ..	35B-45
		CHECK AT ABS-ECU	35B-46
TROUBLESHOOTING	35B-5	ON-VEHICLE SERVICE	35B-48
STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING	35B-5	WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT	35B-48
NOTES WITH REGARD TO DIAGNOSIS .	35B-5	HYDRAULIC UNIT CHECK	35B-49
ABS WARNING LAMP INSPECTION.	35B-5	IN THE EVENT OF A DISCHARGED BATTERY	35B-51
DIAGNOSIS FUNCTION	35B-6		
INSPECTION CHART FOR DIAGNOSIS CODE	35B-8	HYDRAULIC UNIT	35B-52
DIAGNOSTIC TROUBLE CODE PROCEDURES	35B-9	REMOVAL AND INSTALLATION	35B-52
INSPECTION CHART FOR TROUBLE SYMPTOMS	35B-29	ABS SENSOR	35B-54
		REMOVAL AND INSTALLATION	35B-54
		INSPECTION	35B-55

GENERAL INFORMATION

M1352000100700

FEATURES

The 4ABS ensures directional stability and controllability during hard braking.

This ABS uses a 4-sensor 3-channel system that controls the right and left front wheels independently of each other and controls the rear wheels simultaneously (select low control*). The basic system is the same as that of former LANCER.

NOTE: *Select low control: Control system that compares the speeds of the right and left wheels and performs the same fluid pressure control on both wheels according to the speed of the wheel that is likely to be locked.

The system has the following features:

- EBD (Electronic Brake-force Distribution system) control has been added to provide the ideal braking force for the rear wheels.
- Fail-safe function which ensures that safety is maintained
- Diagnostic function which provides improved serviceability

EBD CONTROL

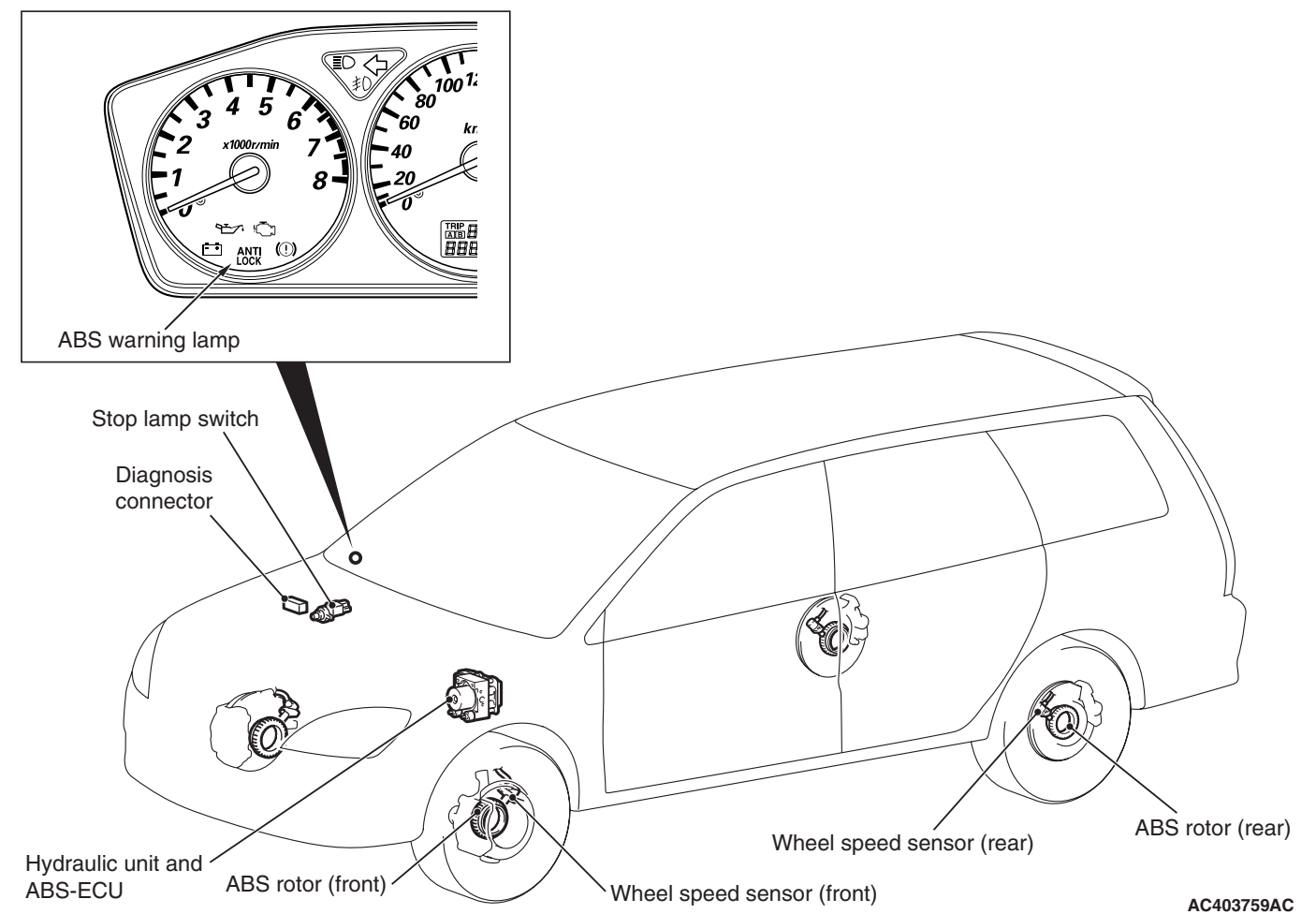
In ABS, electronic control is used so the rear wheel brake hydraulic pressure during braking is regulated by rear wheel control solenoid valves in accordance with the vehicle's rate of deceleration, and the front and rear wheel slippage which are calculated from the signals received from the various wheel speed sensors. EBD control is a control system which provides a high level of control for both vehicle braking force and vehicle stability. The system has the following features:

- Because the system provides the optimum rear wheel braking force regardless of vehicle load conditions and the condition of the road surface, the system reduces the required pedal depression force, particularly when the vehicle is heavily loaded or driven on road surfaces with high frictional coefficients.
- Because the duty placed on the front brakes is reduced, the increases in pad temperature can be controlled during front brakes application to improve the wear resistance characteristics of the pad.
- Control valves such as the proportioning valve are no required.

SPECIFICATIONS

Item		Specification
ABS control method		4-sensor, 3-channel
Number of ABS rotor teeth	Front	43
	Rear	43
Wheel speed sensor	Type	Magnet coil type
	Maximum gap between sensor and rotor mm <Non-adjustable>	0.85 <Front> 0.89 <Rear>

CONSTRUCTION DIAGRAM



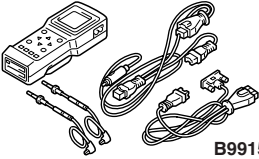
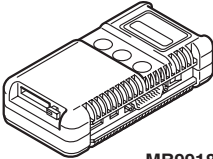
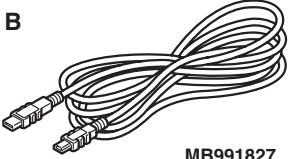

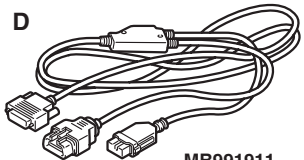
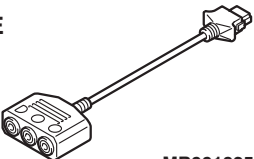
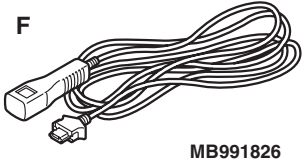

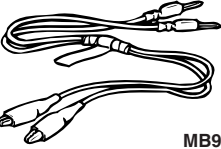
SERVICE SPECIFICATION

M1352000300759

Item	Standard value
Wheel speed sensor internal resistance kΩ	1.24 – 1.64

SPECIAL TOOLS

M1352000600910

Tool	Number	Name	Use
 B991502	MB991502	M.U.T.-II sub assembly	Checking the ABS (Diagnosis display using the M.U.T.-II)
<p>A</p>  MB991824 <p>B</p>  MB991827 <p>C</p>  MB991910 <p>D</p>  MB991911 <p>E</p>  MB991825 <p>F</p>  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle communication interface (V. C. I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles with CAN communication system) E: M.U.T.-III measurement adapter F: M.U.T.-III trigger harness	Checking the ABS (Diagnosis display using the M.U.T.-III) <div>  CAUTION M.U.T.-III main harness B (MB991911) should be used. M.U.T.-III main harness A should not be used for this vehicle. </div>
 MB991529	MB991529	Diagnosis code check harness	Checking the ABS (Diagnosis display using the ABS warning lamp)

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-9](#).

M1352011100812

NOTES WITH REGARD TO DIAGNOSIS

M1352012600263

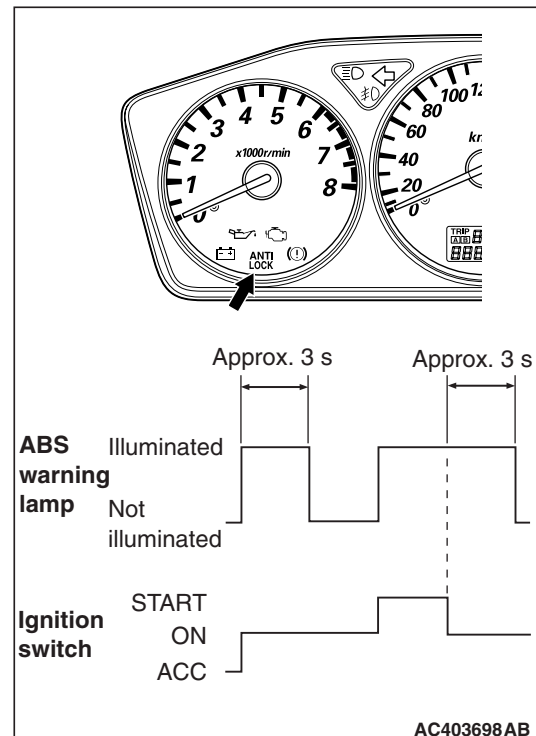
1. The ABS is a system which controls the brake pressure by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ABS operation, and do not indicate a malfunction.

Phenomenon	Explanation of phenomenon
When the engine starts, a knocking sound can be heard coming from the engine compartment.	This sound occurs as a result of system operation checking, and is not a malfunction.
<ul style="list-style-type: none"> • Sound of the motor inside the ABS hydraulic unit operation. (whine) • Sound is the generated along with vibration of the brake pedal. (scraping) • When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres) 	This is the sound of normal system operation, and is not a malfunction.
Shocks are felt if the brake pedal is depressed when driving at low speed.	This is due to system operation checking (starting-of check when the vehicle speed reaches a certain number of km/h) and is not a malfunction.

2. For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
3. Diagnosis detection condition can vary depending on the diagnosis code. Make sure that checking requirements listed in the "Comment" are satisfied when checking the trouble symptom again.

ABS WARNING LAMP INSPECTION

M1352012000313



Check that the ABS warning lamp illuminates as follows.

1. When the ignition switch is turned to the "ON" position, the ABS warning lamp illuminates for approximately 3 seconds and then switches off.

- When the ignition switch is turned to the "START" position, the ABS warning lamp remains illuminated.
- When the ignition switch is turned from the "START" position back to the "ON" position, the ABS warning lamp illuminates for approximately 3 seconds and then switches off.

NOTE: The ABS warning lamp may remain on until the vehicle reaches a speed of several km/h. This is limited to cases where diagnosis code Nos. 21 to 24, 41 to 44, or 53 to 55 have been recorded because of a previous problem occurring. In this case, the ABS-ECU keeps the warning lamp illuminated until the problem corresponding to that diagnosis code can be detected.

- If the illumination is other than the above, check the diagnosis codes.

DIAGNOSIS FUNCTION

M1352011200916

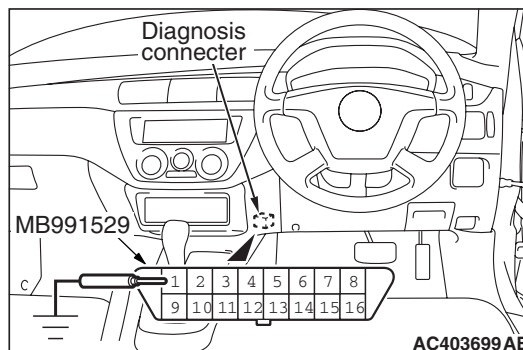
READING DIAGNOSIS CODES

WHEN USING THE M.U.T.-II/III

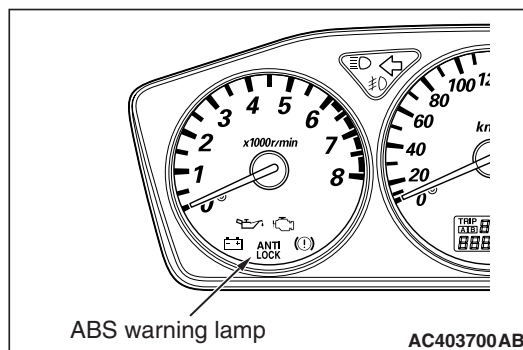
Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-9](#).

WHEN USING THE ABS WARNING LAMP

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



- Use special tool diagnosis code check harness (MB991529) to earth terminal number 1 (diagnosis control terminal) of the diagnosis connector.
- Turn the ignition switch to the "ON" position.



- Read out a diagnosis code by observing how the warning lamp flashes.

When the diagnosis code No.24 is set	When no diagnosis code is set

- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect special tool diagnosis code check harness (MB991529).

ERASING DIAGNOSIS CODES

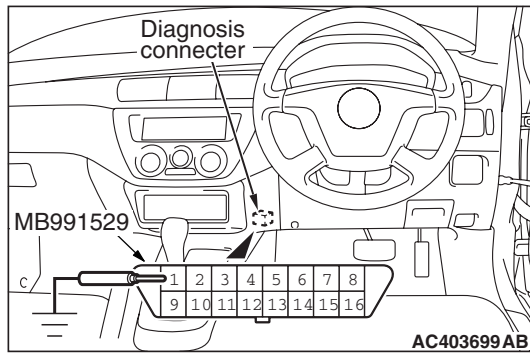
WHEN USING THE M.U.T.-II/III

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points [P.00-9](#).

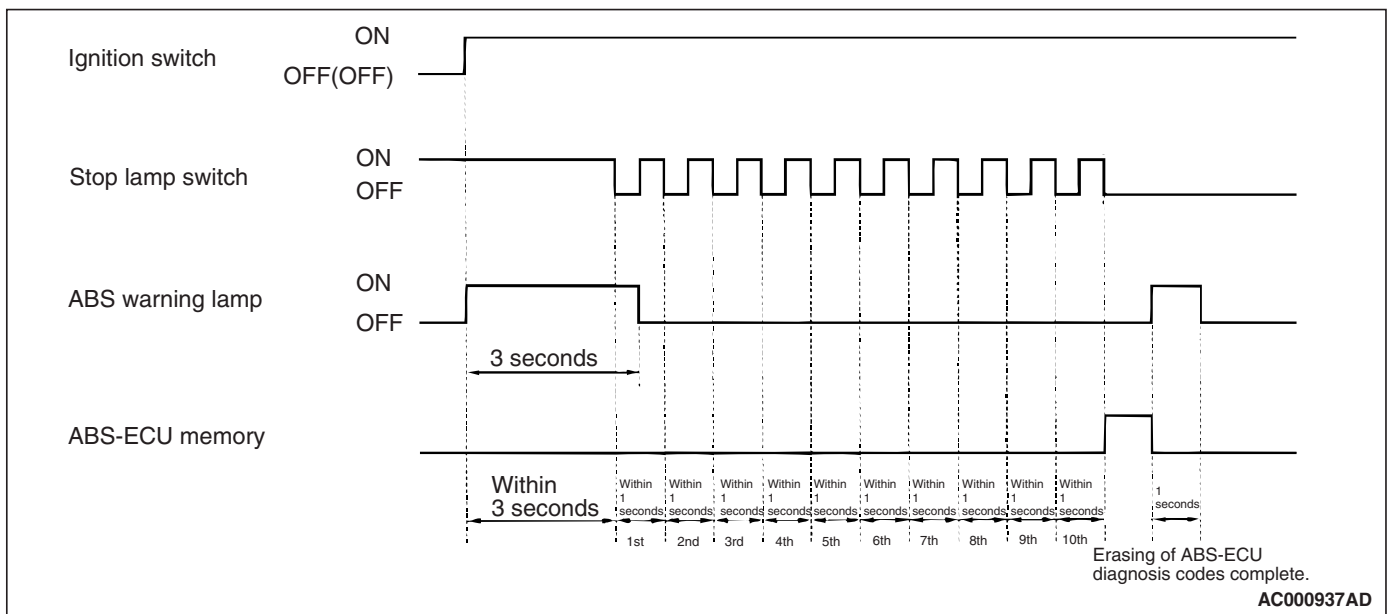
WHEN NOT USING THE M.U.T.-II/III

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

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



2. Use special tool diagnosis code check harness (MB991529) to earth terminal number 1 of the diagnosis connector.



3. Depress the brake pedal and hold it.
4. Turn the ignition switch to the "ON" position.
5. 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.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect special tool diagnosis code check harness (MB991529).

**INSPECTION CHART FOR DIAGNOSIS
CODE**

M1352011300946

Follow the inspection chart that is appropriate for the diagnosis code.

Diagnosis code No.	Inspection item	Reference page
11	Front right wheel speed sensor (Open circuit or short circuit)	P.35B-9
12	Front left wheel speed sensor (Open circuit or short circuit)	
13	Rear right wheel speed sensor (Open circuit or short circuit)	
14	Rear left wheel speed sensor (Open circuit or short circuit)	
16	ABS-ECU power supply system (ABS-ECU power supply voltage below or above the specified value)	P.35B-15
21	Front right wheel speed sensor	P.35B-17
22	Front left wheel speed sensor	
23	Rear right wheel speed sensor	
24	Rear left wheel speed sensor	
33	Stop lamp switch system	P.35B-24
41	Front right ABS solenoid valve (Open circuit or short circuit)	P.35B-27
42	Front left ABS solenoid valve (Open circuit or short circuit)	
43	Rear right ABS solenoid valve (Open circuit or short circuit)	
44	Rear left ABS solenoid valve (Open circuit or short circuit)	
51	Valve relay problem (stays on)	Replace the hydraulic unit (Integrated with ABS-ECU).
52	Valve relay problem (stays off)	P.35B-27
53	Motor relay problem (stays off)	
54	Motor relay problem (stays on)	Replace the hydraulic unit (Integrated with ABS-ECU).
55	Motor system (seized pump motor)	P.35B-27
63	<ul style="list-style-type: none"> • ABS-ECU abnormality • Improperly installed ABS-ECU 	Replace the hydraulic unit (Integrated with ABS-ECU).

NOTE: diagnosis code No.16, 52, 63

- Code No.16 is cleared from the memory by turning the ignition switch to the "ACC" position. When the system is properly reset, this code is also cleared from the memory.
- Code No.52 and 63 are cleared from the memory by turning the ignition switch to the "ACC" position.

Code No.11: Front Right Wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.12: Front Left Wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.13: Rear Right Wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.14: Rear Left Wheel Speed Sensor (Open Circuit or Short Circuit)



- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ABS-ECU.
- The hydraulic unit modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITIONS

Diagnosis codes No.11, 12, 13 and 14 are set when signal is not input due to breakage of the wires of the four wheel speed sensors.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS**STEP 1. M.U.T.-II/III data list**

Set M.U.T.-II/III to data reading mode, and check the data list items by driving the vehicle.

- Item 01: Front right wheel speed sensor
- Item 02: Front left wheel speed sensor
- Item 03: Rear right wheel speed sensor
- Item 04: Rear left wheel speed sensor

OK: The reading on the speedometer nearly matches the indication on M.U.T.-II/III, when driving.

Q: Is the wheel speed sensor input normal?

YES : 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. Inspect the wheel speed sensor.

Refer to [P.35B-55](#).

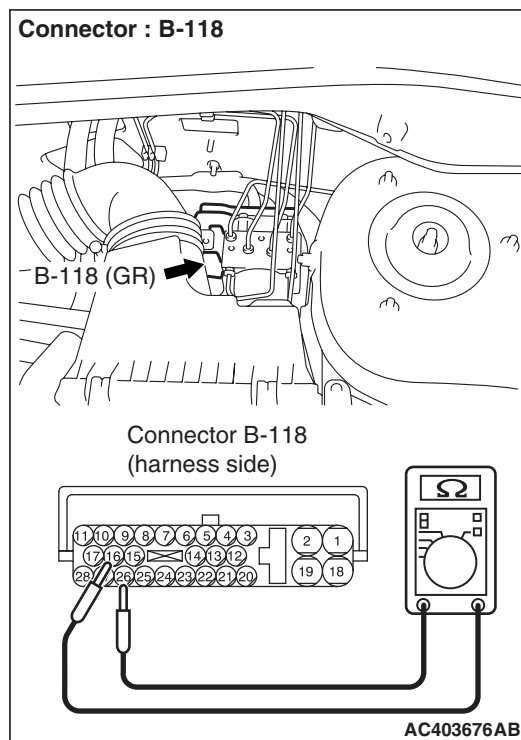
Check items:

- Wheel speed sensor internal resistance: 1.24 – 1.64 kΩ
- Insulation between the wheel speed sensor body and the connector terminals

Q: Is the wheel speed sensor damaged?

YES : Replace it and then go to Step 8.

NO : Go to Step 3.

STEP 3. Resistance measurement at ABS-ECU connector B-118

- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Measure the resistance between ABS-ECU connector terminals 16 and 26, 9 and 10, 27 and 28, or 11 and 17.

Standard Value: 1.24 – 1.64 kΩ

Q: Is the resistance between terminals 16 and 26, 9 and 10, 27 and 28, or 11 and 17 within the standard value?

When resistances between all terminals are within the standard value : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.11, 12, 13 or 14 sets, replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

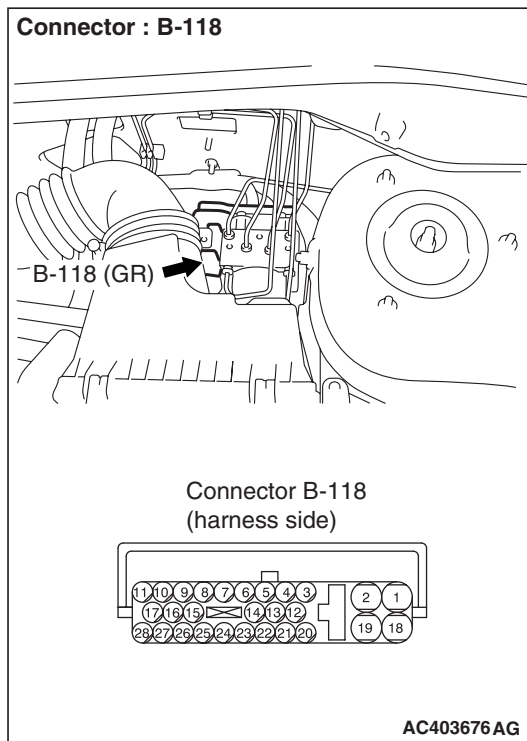
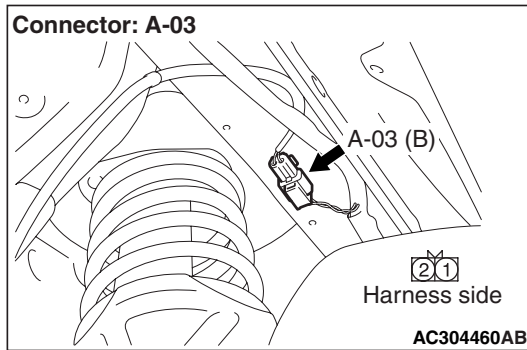
When resistance between terminals 16 and 26 is not within the standard value : Go to Step 4.

When resistance between terminals 9 and 10 is not within the standard value : Go to Step 5.

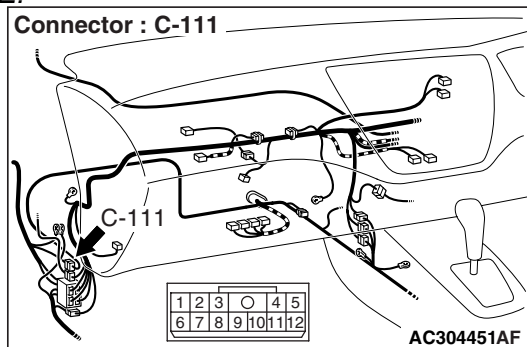
When resistance between terminals 27 and 28 is not within the standard value : Go to Step 6.

When resistance between terminals 11 and 17 is not within the standard value : Go to Step 7.

STEP 4. Check the harness wires between ABS-ECU connector B-118 (terminals 16 and 26) and wheel speed sensor <front: LH> connector A-03 (terminals 1 and 2).



NOTE:



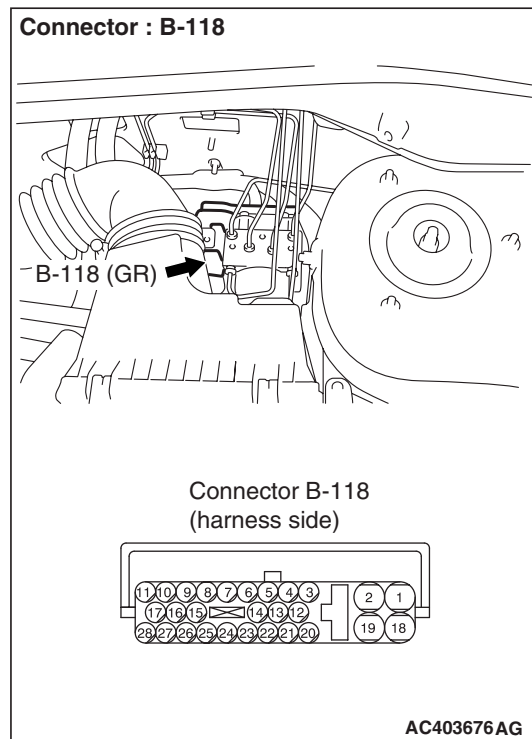
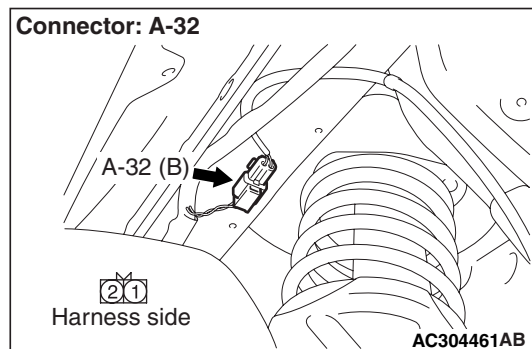
After inspecting ABS-ECU connector B-118, intermediate connector C-111 and wheel speed sensor <front: LH> connector A-03, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

Q: Is any harness wire between ABS-ECU connector B-118 (terminals 16 and 26) and wheel speed sensor <front: LH> connector A-03 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.

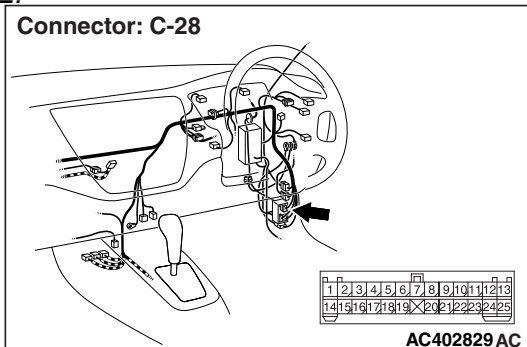
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 5. Check the harness wires between ABS-ECU connector B-118 (terminals 10 and 9) and wheel speed sensor <front: RH> connector A-32 (terminals 1 and 2).

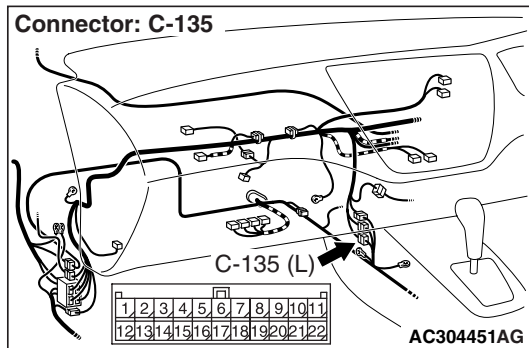


NOTE:

Connector: C-28



Connector: C-135



After inspecting ABS-ECU connector B-118, intermediate connectors C-28 and C-135, and wheel speed sensor <front: RH> connector A-32, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

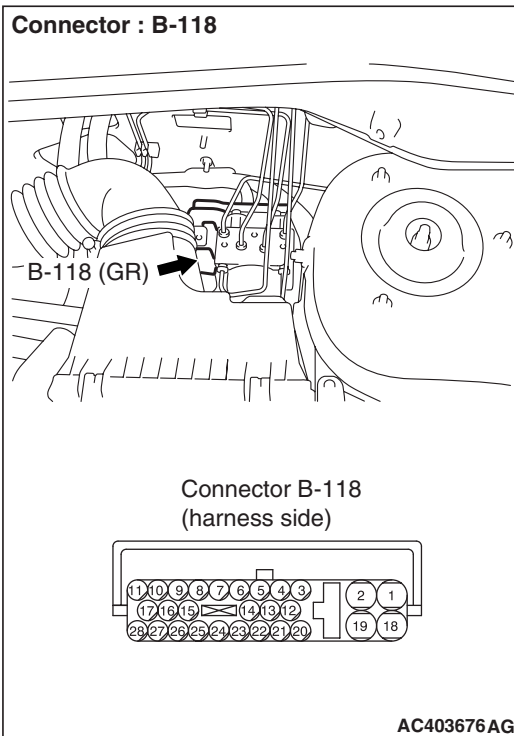
Q: Is any harness wire between ABS-ECU connector B-118 (terminals 10 and 9) and wheel speed sensor <front: RH> connector A-32 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.

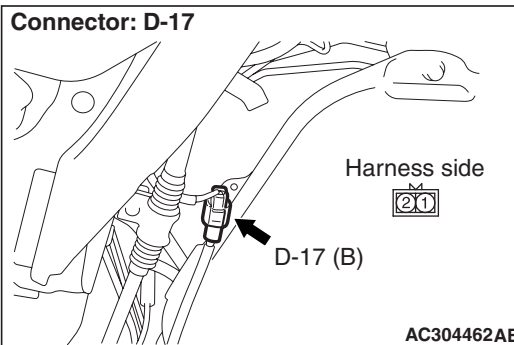
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 6. Check the harness wires between ABS-ECU connector B-118 (terminals 28 and 27) and wheel speed sensor <rear: LH> connector D-17 (terminals 1 and 2).

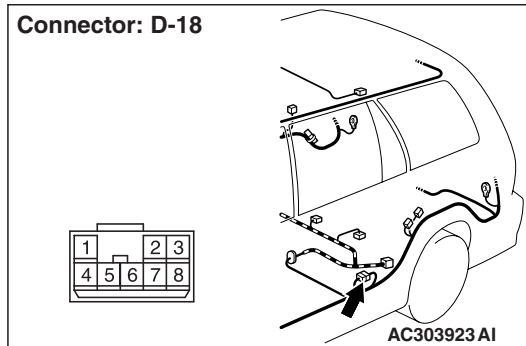
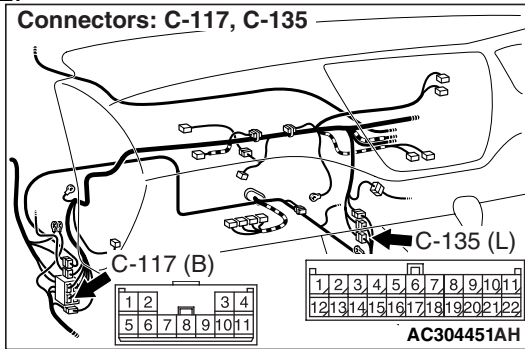
Connector : B-118



Connector: D-17



NOTE:



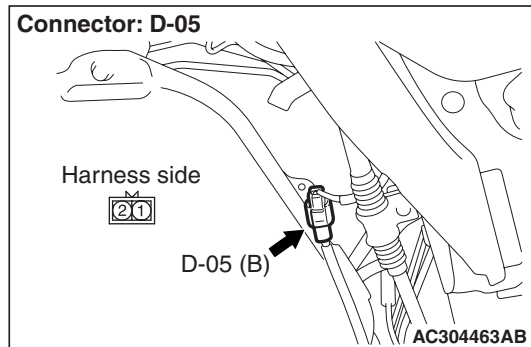
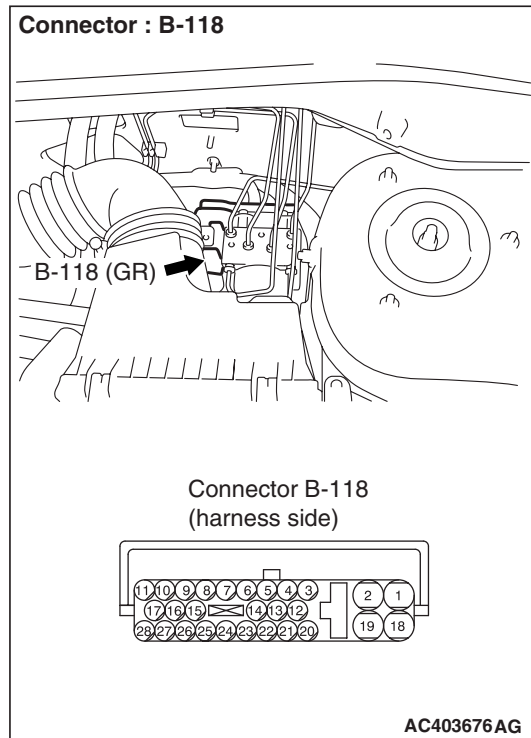
After inspecting ABS-ECU connector B-118, intermediate connectors C-117, C-135 and D-18, and wheel speed sensor <rear: LH> connector D-17, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

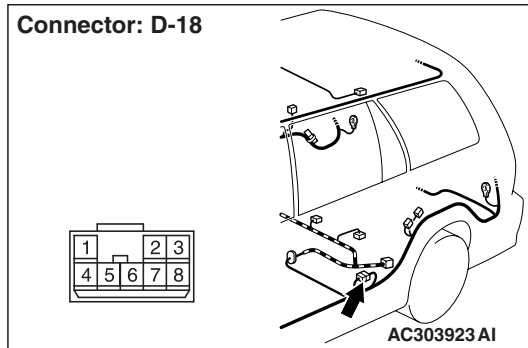
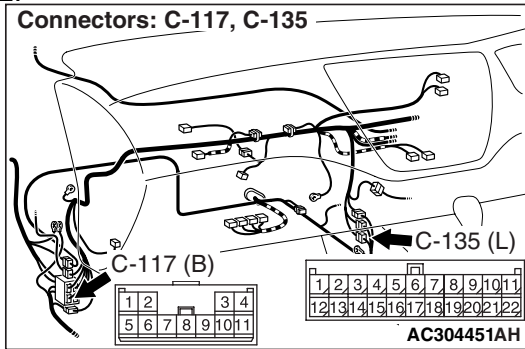
Q: Is any harness wire between ABS-ECU connector B-118 (terminals 28 and 27) and wheel speed sensor <rear: LH> connector D-17 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.

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 7. Check the harness wires between ABS-ECU connector B-118 (terminals 11 and 17) and wheel speed sensor <rear: RH> connector D-05 (terminals 1 and 2).



NOTE:

After inspecting ABS-ECU connector B-118, intermediate connectors C-117, C-135 and D-18, and wheel speed sensor <rear: RH> connector D-05, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

Q: Is any harness wire between ABS-ECU connector B-118 (terminals 11 and 17) and wheel speed sensor <rear: RH> connector D-05 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 8.

NO : Go to Step 8.

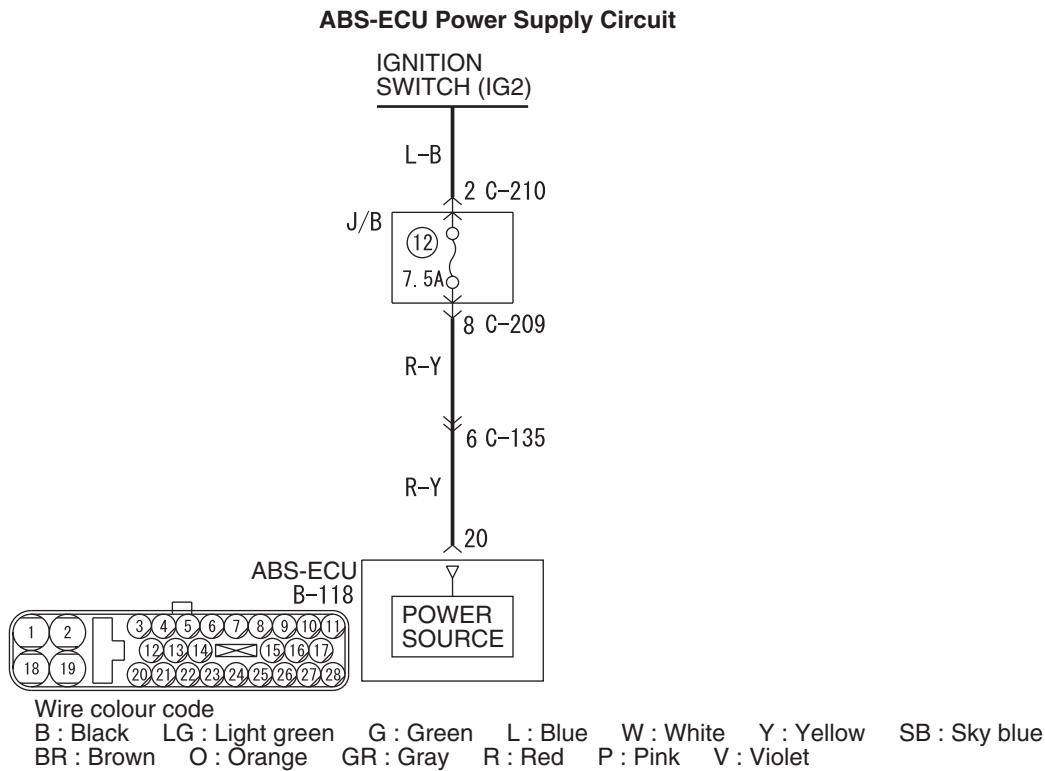
STEP 8. Check whether the diagnosis code is reset.

Q: Is diagnosis code No.11, 12, 13 or 14 set?

YES : Start over at Step 1.

NO : The procedure is complete.

Code No.16: ABS-ECU Power Supply System (ABS-ECU Power Supply Voltage below or above the Specified Value)



AC403677
W4J35E08AA

OPERATION

The ABS-ECU power is supplied to the ABS-ECU (terminal 20) from the ignition switch (IG2) through the multi-purpose fuse number 12 in the junction block.

DIAGNOSIS CODE SET CONDITIONS

Output is provided when ABS-ECU power supply voltage drops below or rises above the specified value. Output is not provided if the power supply voltage meets the specified voltage.

PROBABLE CAUSES

The most likely causes for this diagnosis code to set are:

- Malfunction of battery
- Damaged wiring harness or connector
- Malfunction of hydraulic unit and ABS-ECU

DIAGNOSIS

STEP 1. Check the battery.

Refer to GROUP 54A, Battery –On-vehicle Service – Battery Test [P.54A-5](#).

Q: Is the battery damaged?

YES : Charge or replace the battery and then go to Step 4.

NO : Go to Step 2.

STEP 2. Check the charging system.

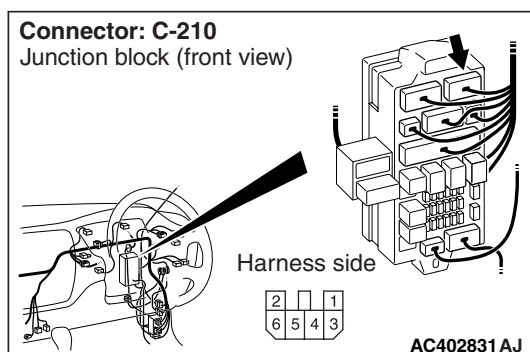
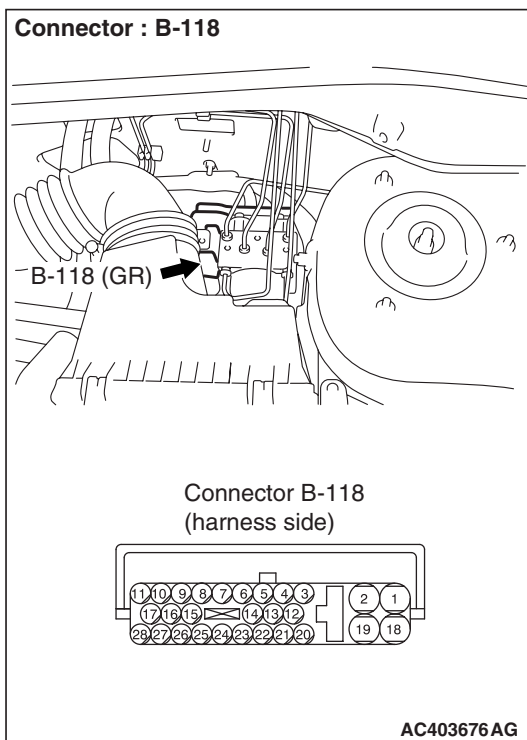
Refer to GROUP 16, Charging System –Diagnosis [P.16-4](#).

Q: Is the charging system damaged?

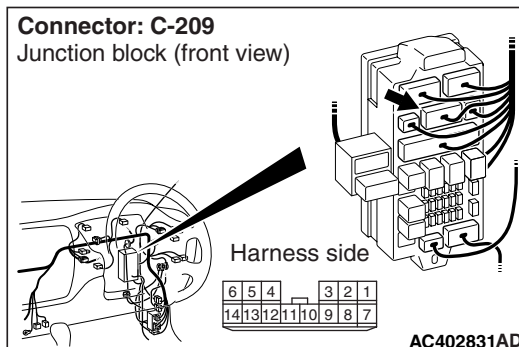
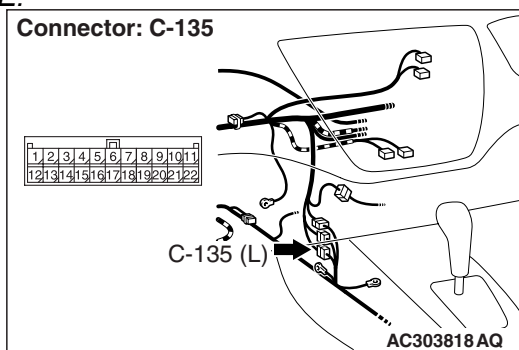
YES : Repair the Charging System and then go to Step 4.

NO : Go to Step 3.

STEP 3. Check the harness wire between junction block connector C-210 terminal 2 and ABS-ECU connector B-118 terminal 20.



NOTE:



After inspecting ABS-ECU connector B-118, intermediate connector C-135, and junction block connector C-209 and C-210, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 4.

Q: Is the harness wire between junction block connector C-210 terminal 2 and ABS-ECU connector B-118 terminal 20 damaged?

YES : Repair it and then go to Step 4.

NO : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.16 sets, replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 4 . If diagnosis code No.16 is not set, then an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunction [P.00-13](#).

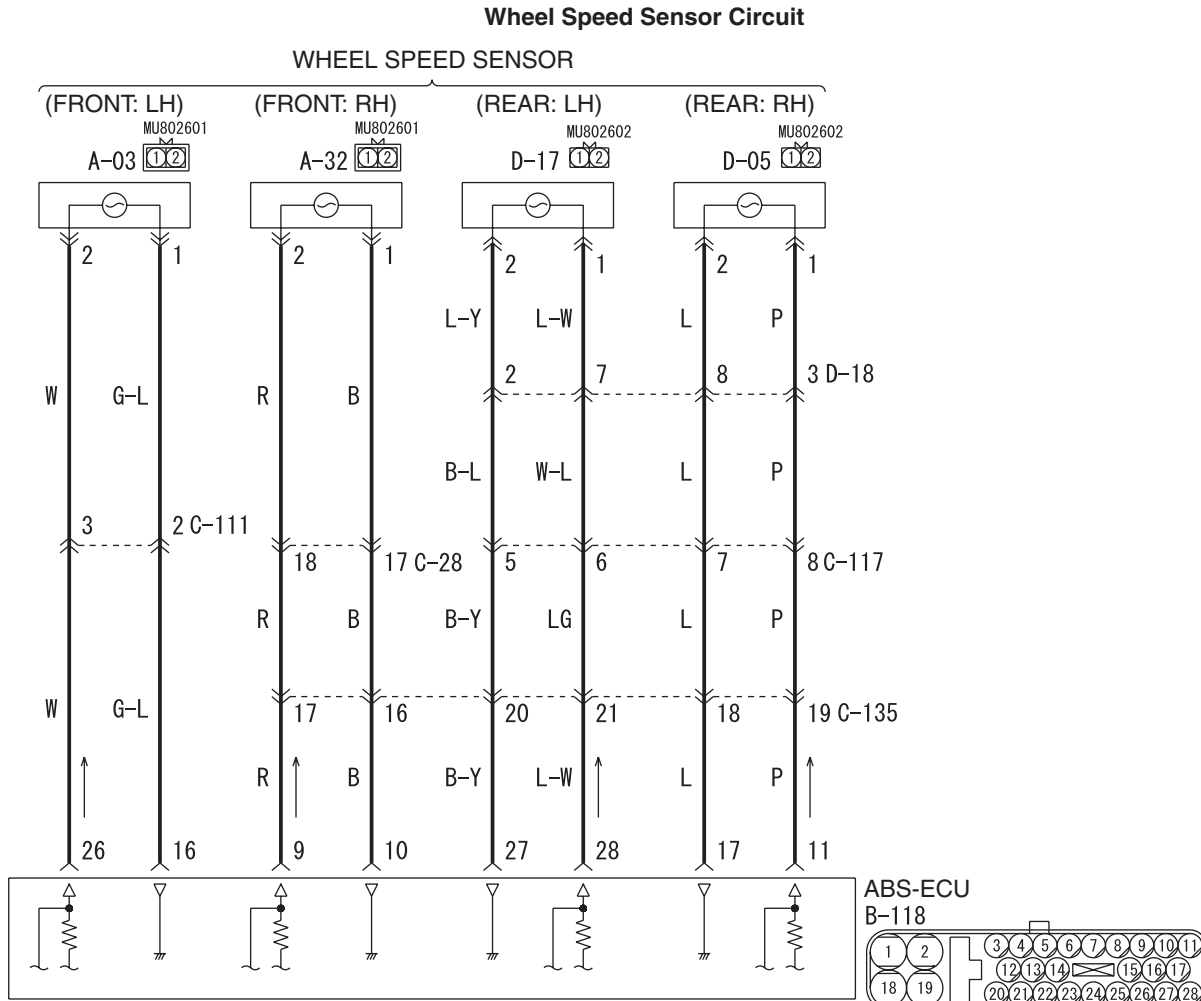
STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code No.16 set?

YES : Start over at Step 1.

NO : The procedure is complete.

Code No.21: Front Right Wheel Speed Sensor
Code No.22: Front Left Wheel Speed Sensor
Code No.23: Rear Right Wheel Speed Sensor
Code No.24: Rear Left Wheel Speed Sensor



Wire colour code

B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
 BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W4J35E09AA

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

DIAGNOSIS CODE SET CONDITIONS

Diagnosis codes No.21, 22, 23 and 24 are set 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 or more.
- Wheel speed sensor output drops due to a malfunctioning wheel speed sensor or warped ABS rotor.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS**STEP 1. M.U.T.-II/III data list**

Set M.U.T.-II/III to data reading mode, and check the data list items by driving the vehicle.

- Item 01: Front right wheel speed sensor
- Item 02: Front left wheel speed sensor
- Item 03: Rear right wheel speed sensor
- Item 04: Rear left wheel speed sensor

OK: The reading on the speedometer nearly matches the indication on M.U.T.-II/III, when driving.

Q: Is the wheel speed sensor input normal?

YES : 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 wheel speed sensor installation.

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

YES : Go to Step 3.

NO : Install it properly (Refer to [P.35B-54](#)) and go to Step 11.

STEP 3. Inspect the wheel speed sensor and ABS rotor.

Refer to [P.35B-55](#).

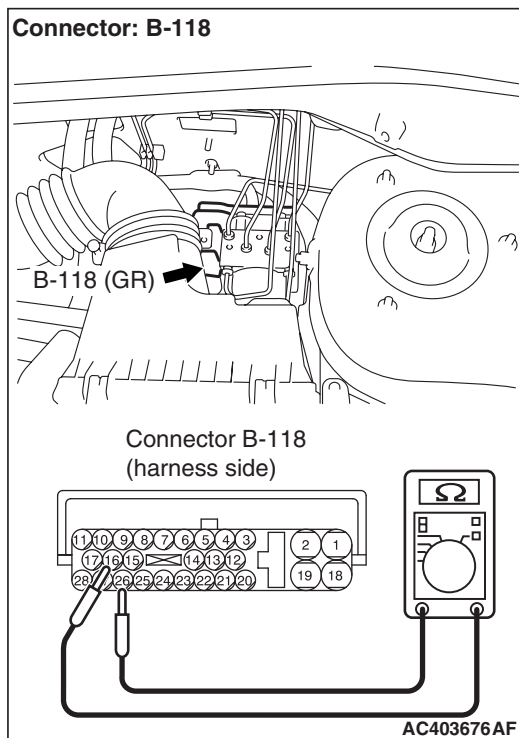
Check items:

- Wheel speed sensor internal resistance: 1.24 – 1.64 k Ω
- Insulation between the wheel speed sensor body and the connector terminals
- Toothed ABS rotor check

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

YES : Replace it and then go to Step 11.

NO : Go to Step 4.

STEP 4. Resistance measurement at the ABS-ECU connector B-118.

- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Measure the resistance between ABS-ECU connector terminals 16 and 26, 9 and 10, 11 and 17, or 27 and 28.

Standard Value: 1.24 – 1.64 k Ω

Q: Is the resistance between terminals 16 and 26, 9 and 10, 27 and 28, or 11 and 17 within the standard value?

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

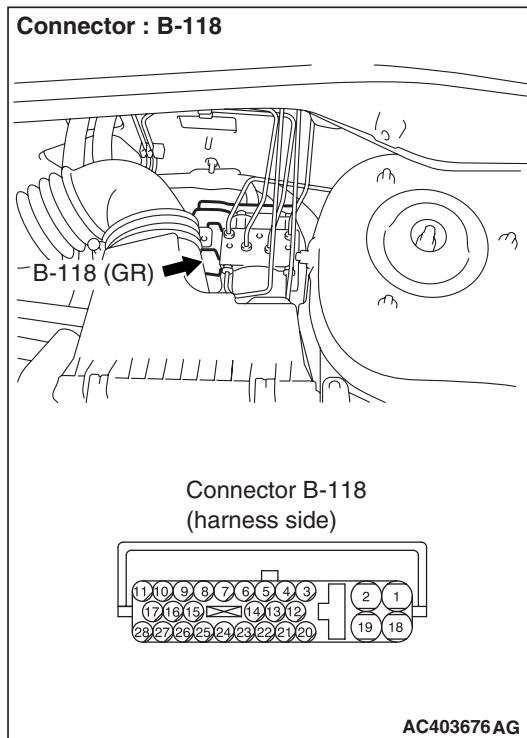
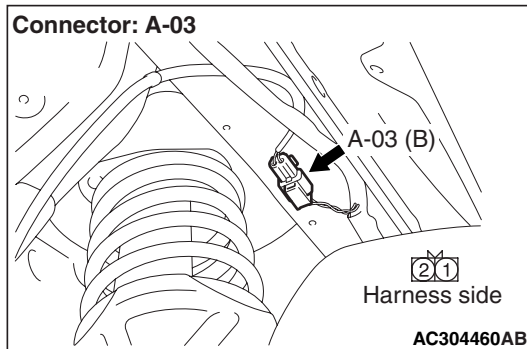
When resistance between terminals 16 and 26 is not within the standard value : Go to Step 5.

When resistance between terminals 9 and 10 is not within the standard value : Go to Step 6.

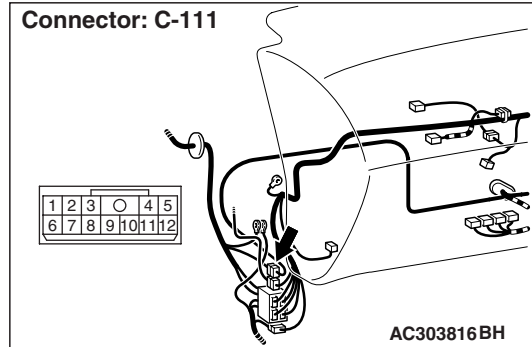
When resistance between terminals 27 and 28 is not within the standard value : Go to Step 7.

When resistance between terminals 11 and 17 is not within the standard value : Go to Step 8.

STEP 5. Check the harness wires between ABS-ECU connector B-118 (terminals 16 and 26) and wheel speed sensor <front: LH> connector A-03 (terminals 1 and 2).



NOTE:



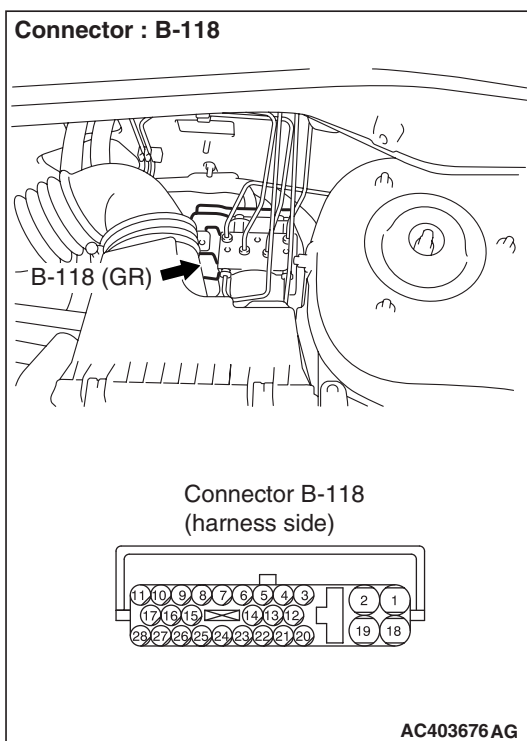
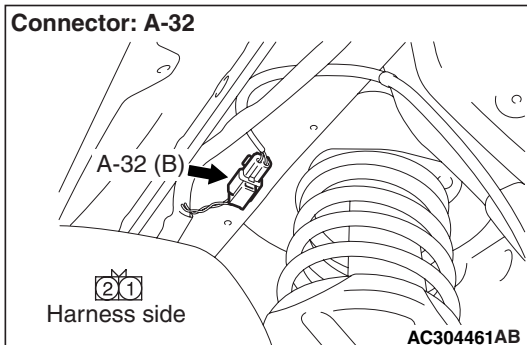
After inspecting ABS-ECU connector B-118, intermediate connector C-111 and wheel speed sensor <front: LH> connector A-03, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

Q: Is any harness wire between ABS-ECU connector B-118 (terminals 16 and 26) and wheel speed sensor <front: LH> connector A-03 (terminals 1 and 2) damaged?

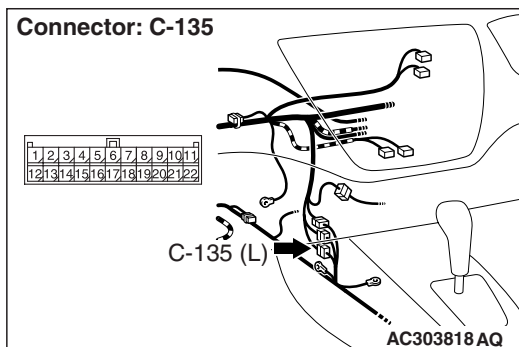
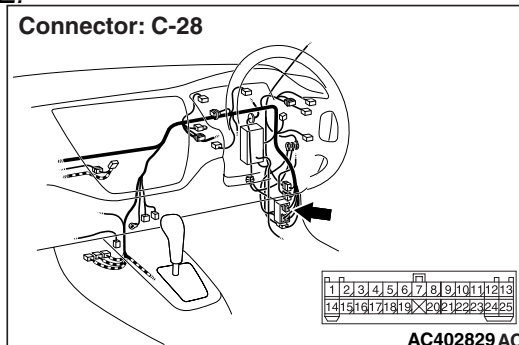
YES : Repair it and then go to Step 11.

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 6. Check the harness wires between ABS-ECU connector B-118 (terminals 10 and 9) and wheel speed sensor <front: RH> connector A-32 (terminals 1 and 2).



NOTE:



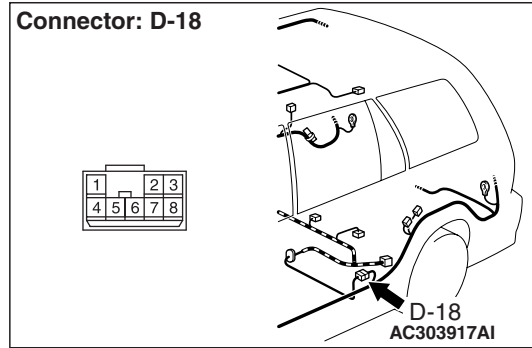
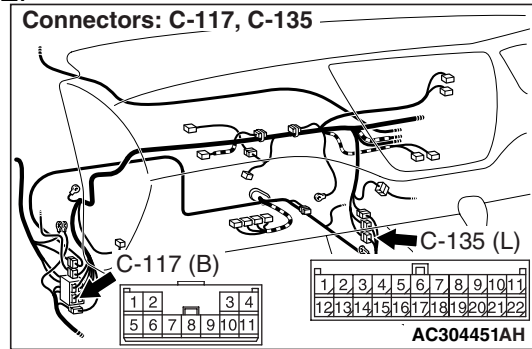
After inspecting ABS-ECU connector B-118, intermediate connectors C-28, C-135 and wheel speed sensor <front: RH> connector A-32, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

Q: Is any harness wire between ABS-ECU connector B-118 (terminals 10 and 9) and wheel speed sensor <front: RH> connector A-32 (terminals 1 and 2) damaged?

YES : Repair it and go to Step 11.

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](#).

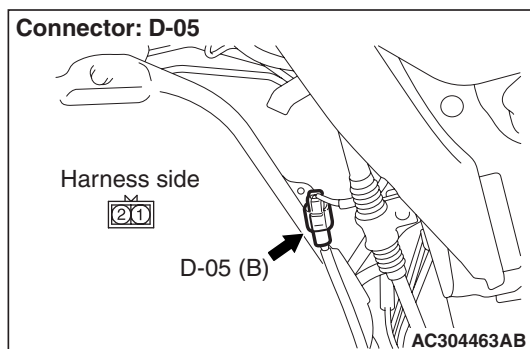
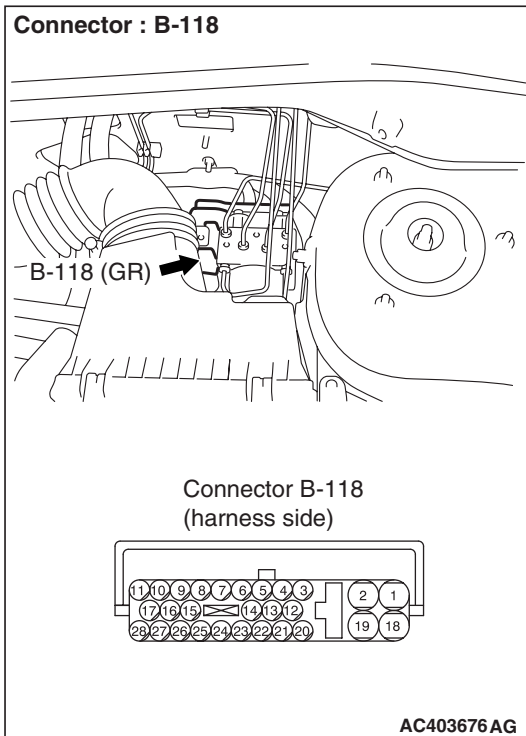
NOTE:



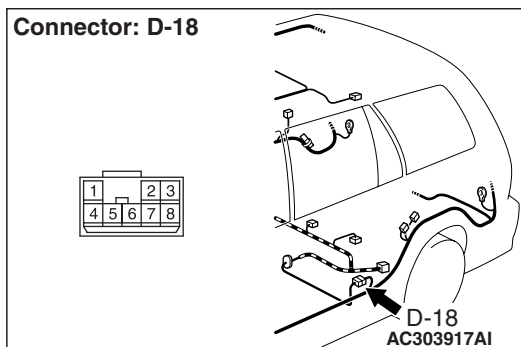
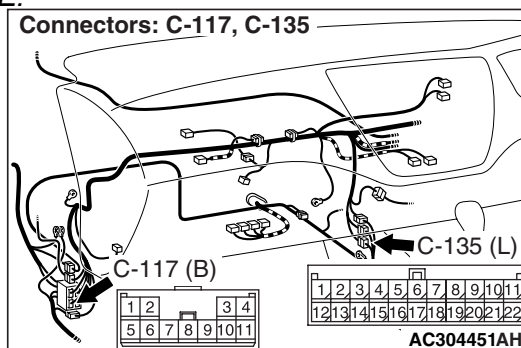
Q: Is any harness wire between ABS-ECU connector B-118 (terminals 28 and 27) and wheel speed sensor <rear: LH> connector D-17 (terminals 1 and 2) damaged?

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 8. Check the harness wires between ABS-ECU connector B-118 (terminals 11 and 17) and wheel speed sensor <rear: RH> connector D-05 (terminals 1 and 2).



NOTE:



After inspecting ABS-ECU connector B-118, intermediate connectors C-117, C-135 and D-18, and wheel speed sensor <rear: RH> connector D-05, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

Q: Is any harness wire between ABS-ECU connector B-118 (terminals 11 and 17) and wheel speed sensor <rear: RH> connector D-05 (terminals 1 and 2) damaged?

YES : Repair it and then go to Step 11.

NO : Go to Step 11.

STEP 9. Check the wheel speed sensor output voltage.

Refer to [P.35B-48](#).

Output Voltage:

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

Q: Does the voltage meet the specification?

YES : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.21, 22, 23 or 24 sets, replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 11.

NO : Go to Step 10.

STEP 10. Check the wheel bearing.

<Front>: Refer to GROUP 26, On-vehicle Service –
Wheel Bearing Axial Play Check [P.26-7](#).

<Rear>: Refer to GROUP 27, On-vehicle Service –
Wheel Bearing Axial Play Check [P.27-3](#).

Q: Is the check result normal?

YES : Go to Step 11.

NO : Replace it and then go to Step 11.

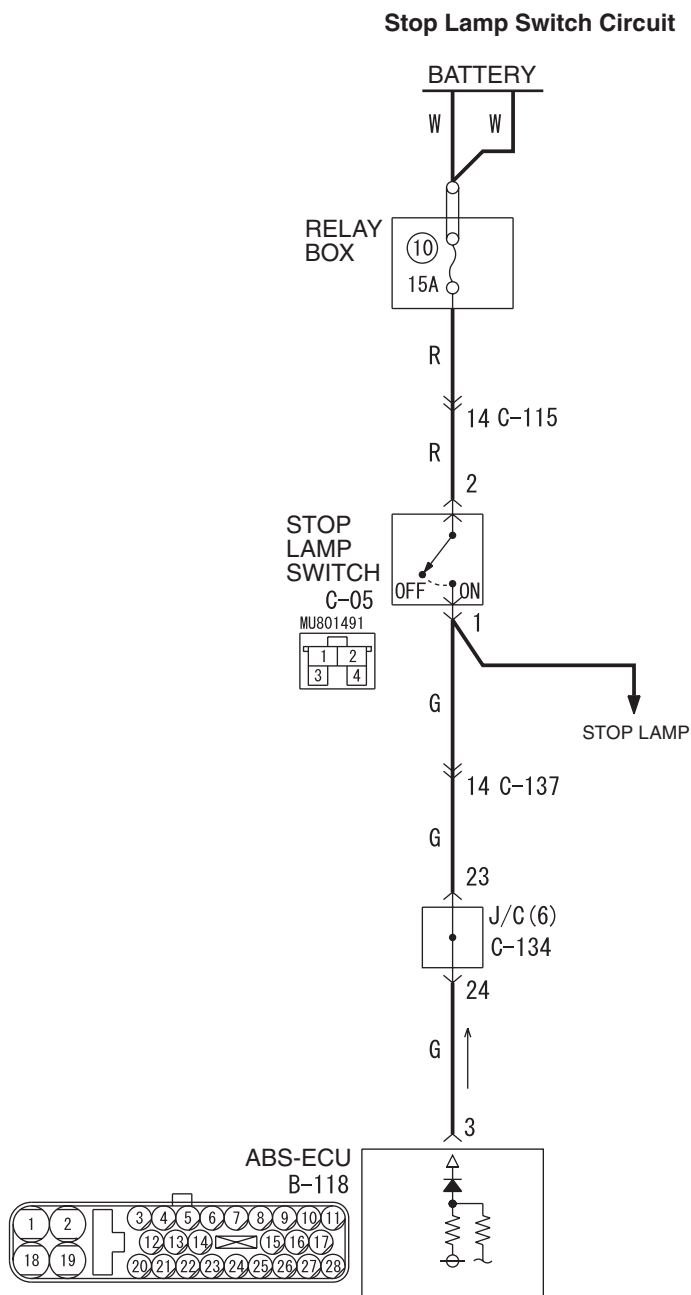
STEP 11. Check whether the diagnosis code is reset.

Q: Is diagnosis codes No.21, 22, 23 or 24 set?

YES : Start over at Step 1.

NO : The procedure is complete.

Code No.33 : Stop Lamp Switch System

AC403679
W4J35E06AA**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 3).

DIAGNOSIS CODE SET CONDITIONS

Diagnosis code No.33 is set in the following cases:

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

PROBABLE CAUSES

The most likely causes for this diagnosis code to set are:

- Malfunction of the stop lamp switch
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

STEP 1. Check the stop lamp operation.

Q: Does the stop lamp come on and go out correctly?

YES : Go to Step 4.

NO : Go to Step 2.

STEP 2. Check the stop lamp switch installation condition.

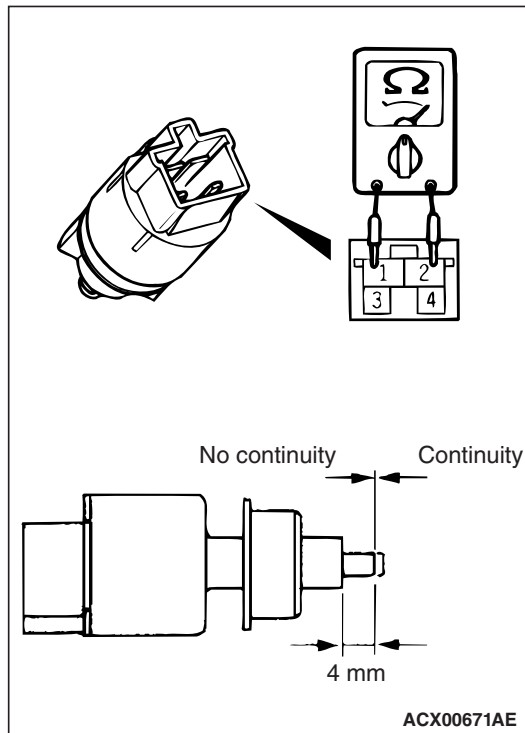
Q: Is the stop lamp switch installed properly?

YES : Go to Step 3.

NO : Repair it and then go to Step 7.

STEP 3. Check the stop lamp switch continuity.

(1) Remove the stop lamp switch (Refer to GROUP 35A, Brake Pedal [P.35A-12](#)).



(2) Connect an ohmmeter to stop lamp switch terminals 1 and 2, and check whether there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.

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

Q: Is the stop lamp switch continuity correct?

YES : Check the stop lamp circuit and repair and then go to Step 7.

NO : Replace the stop lamp switch and then go to Step 7.

STEP 4. M.U.T.-II/III data list

Set M.U.T.-II/III to data reading mode, and check the data list item.

- Item 36: Stop lamp switch

OK:

Brake pedal stepped down: ON

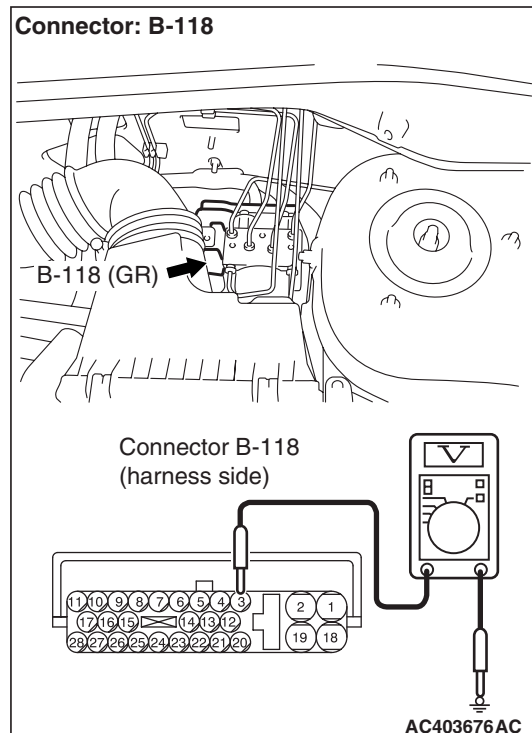
Brake pedal released: OFF

Q: Is the stop lamp switch input normal?

YES : 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 5.

STEP 5. Voltage measurement at ABS-ECU connector B-118.



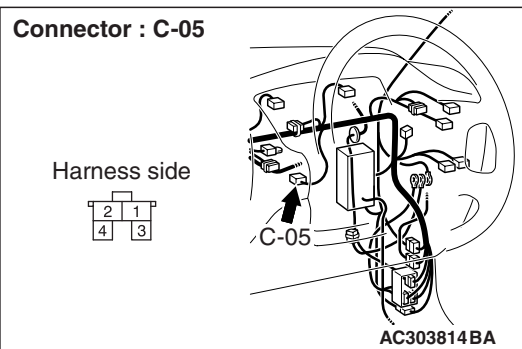
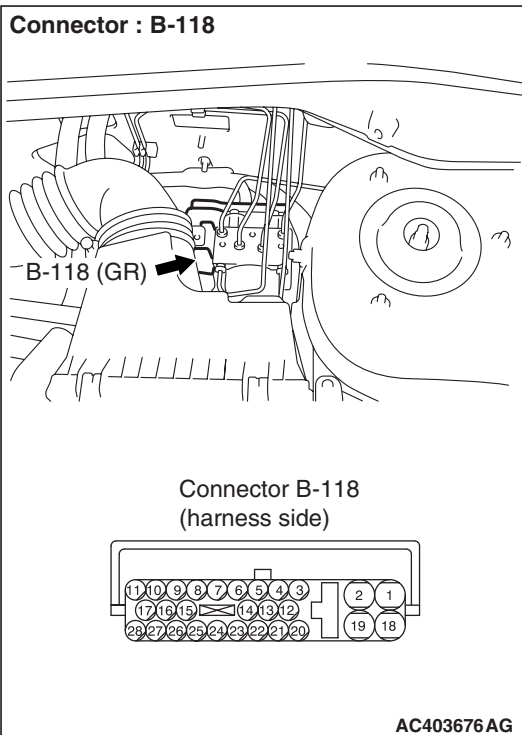
(1) Disconnect ABS-ECU connector B-118 and measure at the harness side.

- (2) Depress the brake pedal to turn on the stop lamp switch.
- (3) Measure the voltage between terminal 3 and earth.

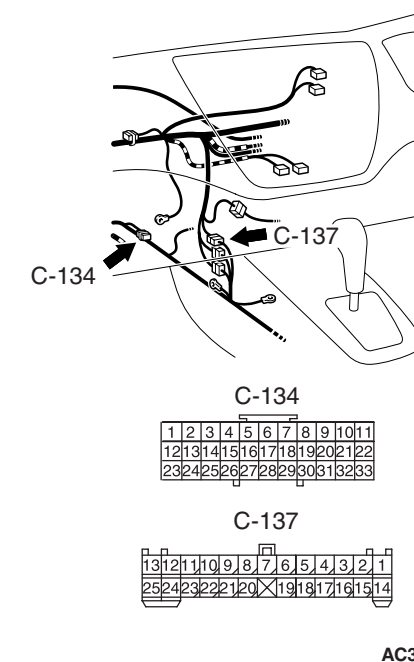
OK: System voltage**Q: Is the check result normal?**

YES : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.33 set, replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 7.

NO : Go to Step 6.

STEP 6. Check the harness wire between ABS-ECU connector B-118 terminal 3 and stop lamp switch connector C-05 terminal 1.
**NOTE:**

Connectors: C-134, C-137



After inspecting ABS-ECU connector B-118, intermediate connectors C-134, C-137 and stop lamp switch connector C-05, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 7.

Q: Is the harness wire between ABS-ECU connector B-118 terminal 3 and stop lamp switch connector C-05 terminal 1 damaged?

YES : Repair it and then go to Step 7.

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](#).

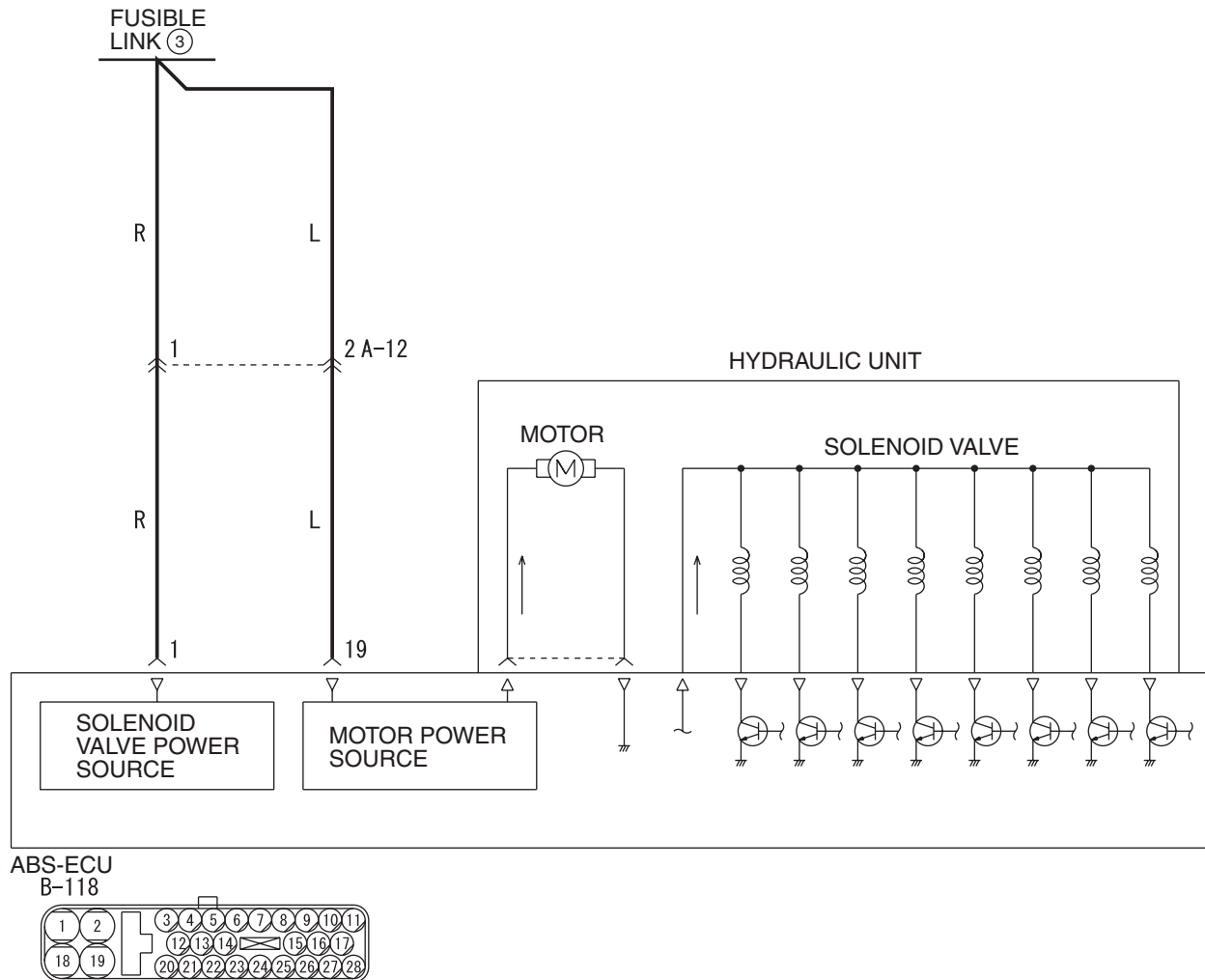
STEP 7. Check whether the diagnosis code is reset.
Q: Is diagnosis code No.33 set?

YES : Start over at Step 1.

NO : The procedure is complete.

Code No.41: Front Right ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit)
Code No.42: Front Left ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit)
Code No.43: Rear Right ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit)
Code No.44: Rear Left ABS Solenoid Valve inside Hydraulic Unit (Open Circuit or Short Circuit)
Code No.52: Valve Relay Problem (Stays off)
Code No.53: Motor Relay Problem (Stays off)
Code No.55: Motor System (Seized Pump Motor)

Solenoid Valve and Motor power Supply Circuit



Wire colour code
 B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
 BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

W4J35E00AA

OPERATION

Power is continuously supplied to the ABS-ECU through fusible link number 3 to operate the solenoid valve and motor.

DIAGNOSIS CODE SET CONDITIONS

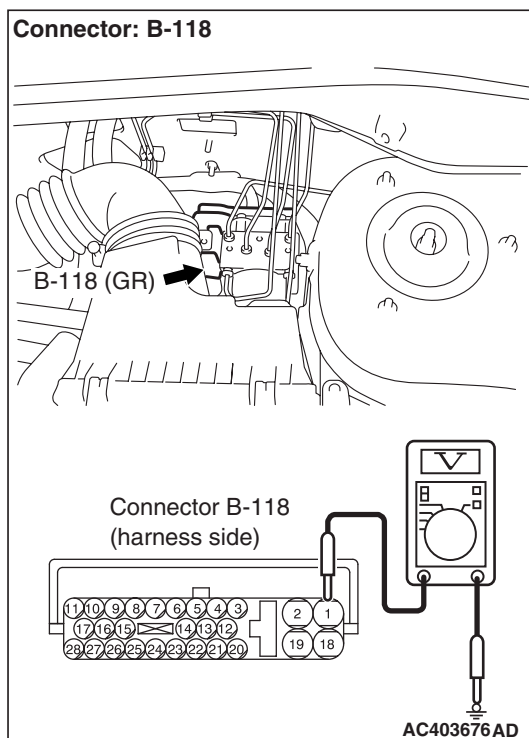
These codes are set if the power supply circuit of solenoid valve or motor is open or shorted.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

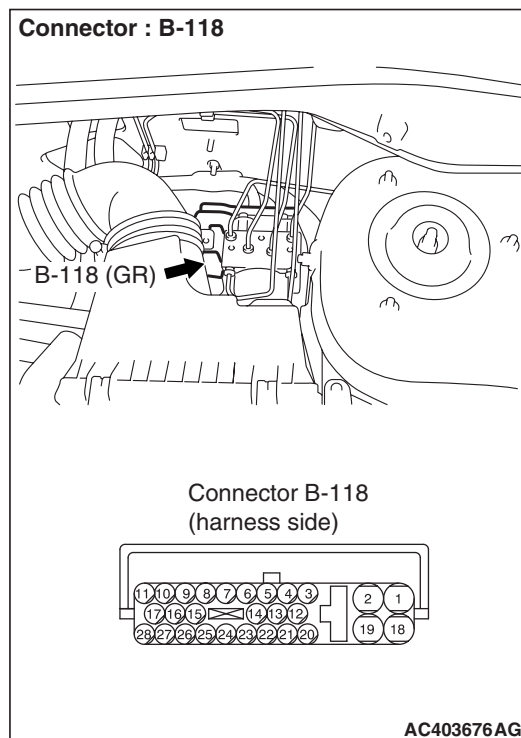
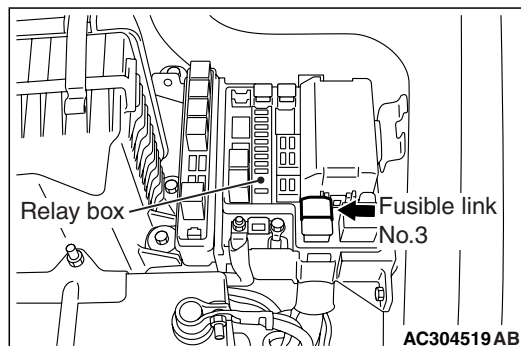
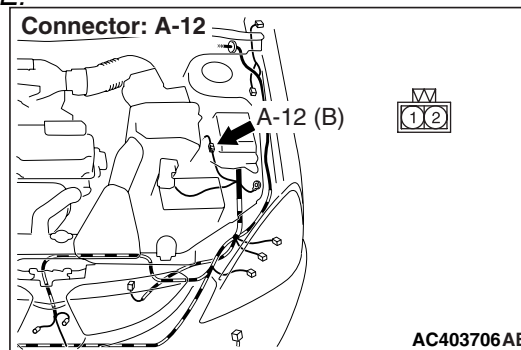
STEP 1. Voltage measurement at ABS-ECU connector B-118.

- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Measure the voltage between terminal 1 and earth, and 19 and earth.

OK: System voltage**Q: Is the check result normal?**

YES : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.41, 42, 43, 44, 52, 53, or 55 set, replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 3. If diagnosis code No.41, 42, 43, 44, 52, 53, or 55 is not set, an intermittent malfunction is suspected. 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 harness wires between fusible link number 3 and ABS-ECU connector B-118 (terminals 1 and 19).**NOTE:**

After inspecting intermediate connector A-12, inspect the wire. If the connector is damaged, repair or replace it. Then go to Step 3.

Q: Is any harness wire between fusible link number 3 and ABS-ECU connector B-118 (terminal 1 and 19) 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. Check whether the diagnosis code is reset.

Q: Is diagnosis code No.41, 42, 43, 44, 52, 53 or 55 set?

YES : Start over at Step 1.

NO : The procedure is complete.

INSPECTION CHART FOR TROUBLE SYMPTOMS

M1352011400909

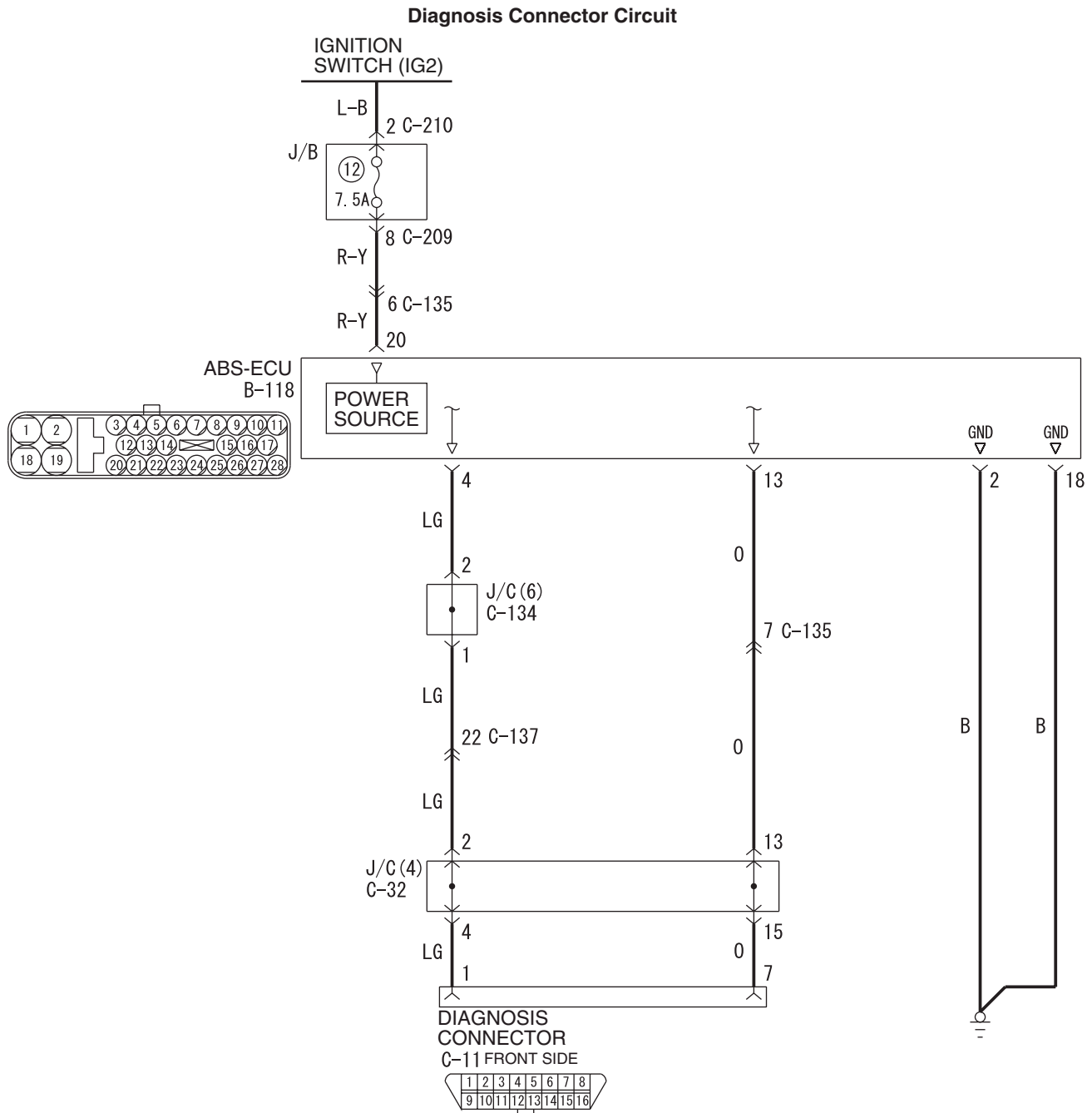
NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem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

Trouble symptoms	Inspection procedure No.	Reference page
Communication between M.U.T.-II/III and the whole system is not possible.	–	GROUP 13A, Diagnosis P.13A-208
Communication between M.U.T.-II/III and the ABS-ECU is not possible.	1	P.35B-30
When the ignition switch is turned to the "ON" position (Engine stopped), the ABS warning lamp does not illuminate.	2	P.35B-34
The ABS warning lamp remains illuminated after the engine is started.	3	P.35B-40
Faulty ABS operation	4	P.35B-45

INSPECTION PROCEDURE FOR
TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1: Communication between M.U.T.-II/III and the ABS-ECU is not Possible.



Wire colour code

B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
 BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

OPERATION

- The diagnostic output is made from the ABS-ECU (terminal 13) to the diagnosis output terminal (terminal 7) of the diagnosis connector.
- When the diagnosis connector's diagnosis test mode control terminal (terminal 1) is earthed, the ABS-ECU (terminal 4) will go into diagnosis mode.

COMMENT ON TROUBLE SYMPTOM

When communication with the M.U.T.-II/III 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.

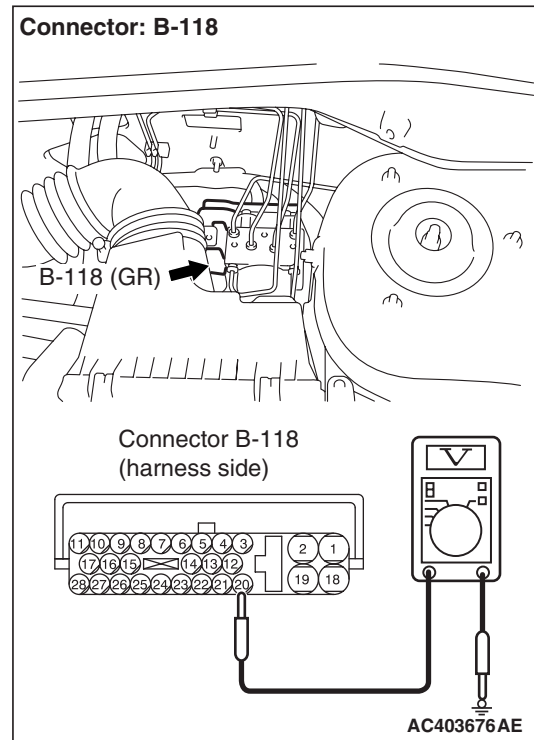
PROBABLE CAUSES

The most likely causes for this case are:

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

DIAGNOSIS

STEP 1. Voltage measurement at ABS-ECU connector B-118.



- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Start the engine.
- (3) Measure the voltage between terminal 20 and earth.

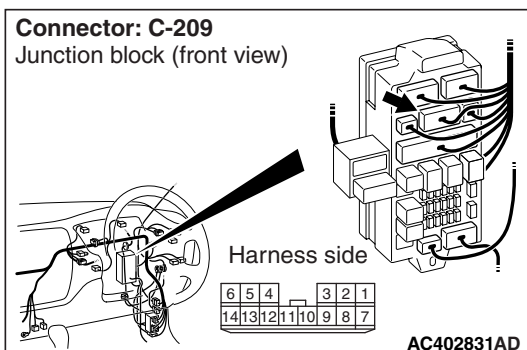
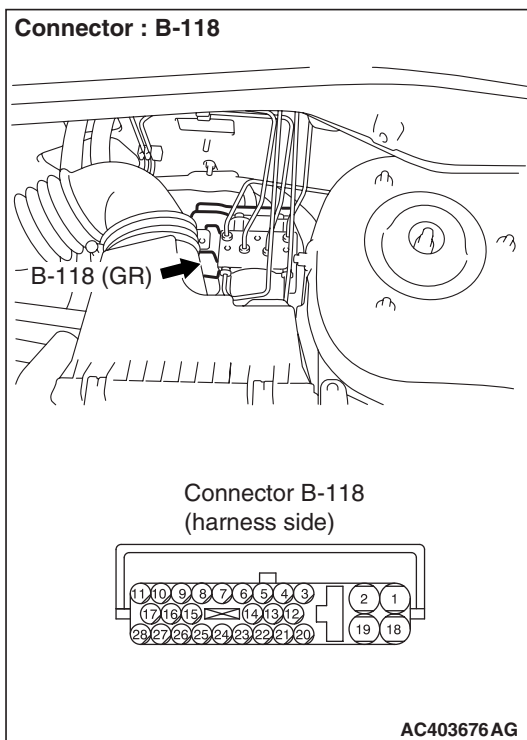
OK: System voltage

Q: Is the check result normal?

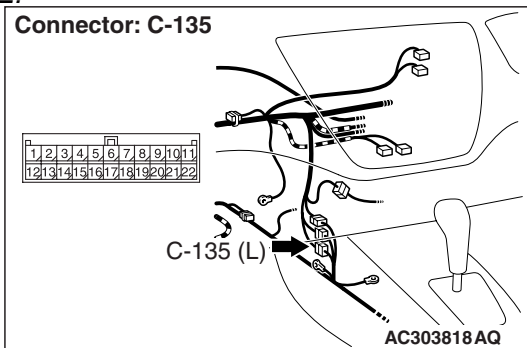
YES : Go to Step 3.

NO : Go to Step 2.

STEP 2. Check the harness wire between junction block connector C-209 terminal 8 and ABS-ECU connector B-118 terminal 20.



NOTE:



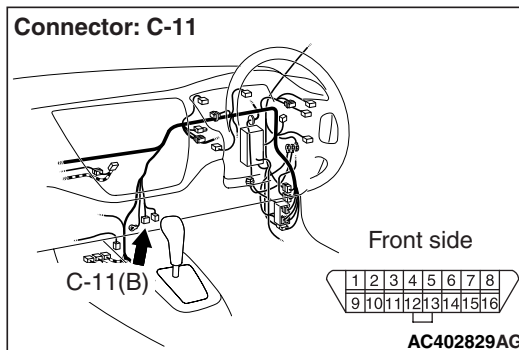
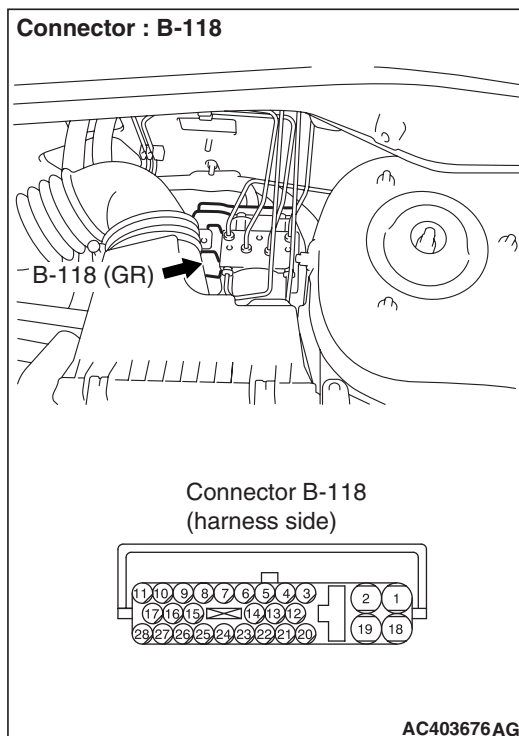
After inspecting ABS-ECU connector B-118, junction block connector C-209 and intermediate connector C-135, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 5.

Q: Is the harness wire between junction block connector C-209 terminal 8 and ABS-ECU connector B-118 terminal 20 damaged?

YES : Repair it and go to Step 5.

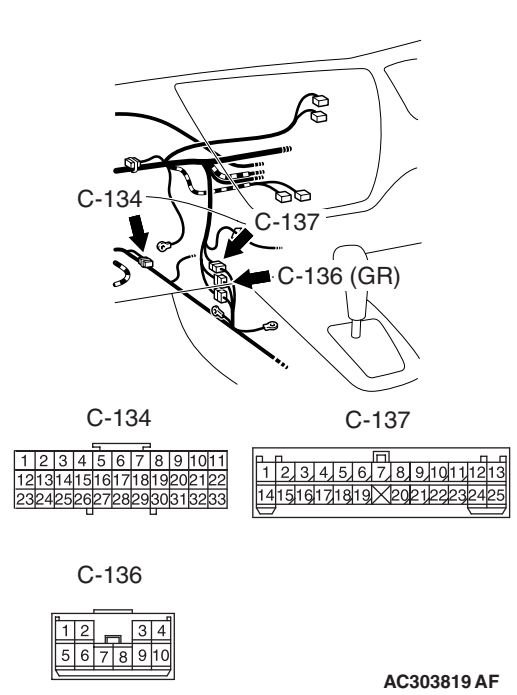
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-13.

STEP 3. Check the harness wires between ABS-ECU connector B-118 (terminals 4 and 13) and diagnosis connector C-11 (terminals 1 and 7).

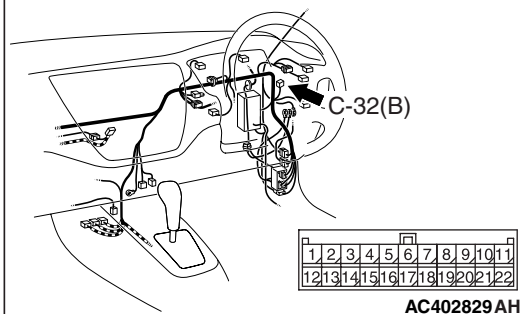


NOTE:

Connectors: C-134, C-136, C-137



Connector: C-32



After inspecting ABS-ECU connector B-118, diagnosis connector C-11, and intermediate connectors C-134, C-135, C-137 and C-32, inspect the wires. If any of these connectors is damaged, repair or replace it. Then go to Step 5.

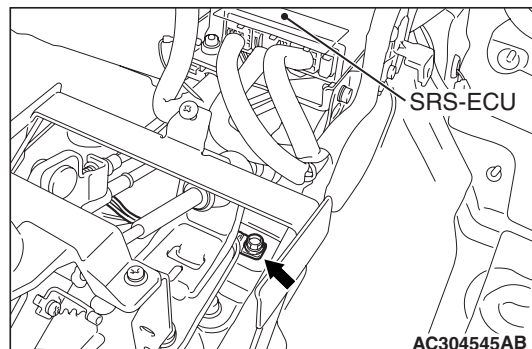
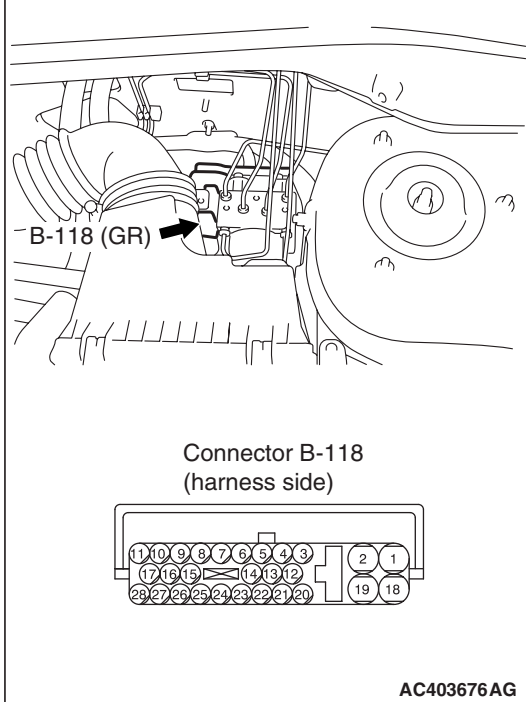
Q: Is any of the harness wires between ABS-ECU connector B-118 (terminals 4 and 13) and diagnosis connector C-11 (terminals 1 and 7) damaged?

YES : Repair it and go to Step 5.

NO : Go to Step 4.

STEP 4. Check the harness wires between ABS-ECU connector B-118 (terminals 2 and 18) and earth (No.15).

Connector : B-118



Q: Is any of the harness wires between ABS-ECU connector B-118 (terminals 2 and 18) and earth (No.15) damaged?

YES : Repair it and then go to Step 5.

NO : Retest the system. If the malfunction persists, replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 5. If the malfunction is not reproduced, then a intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-13.

STEP 5. Retest the system.

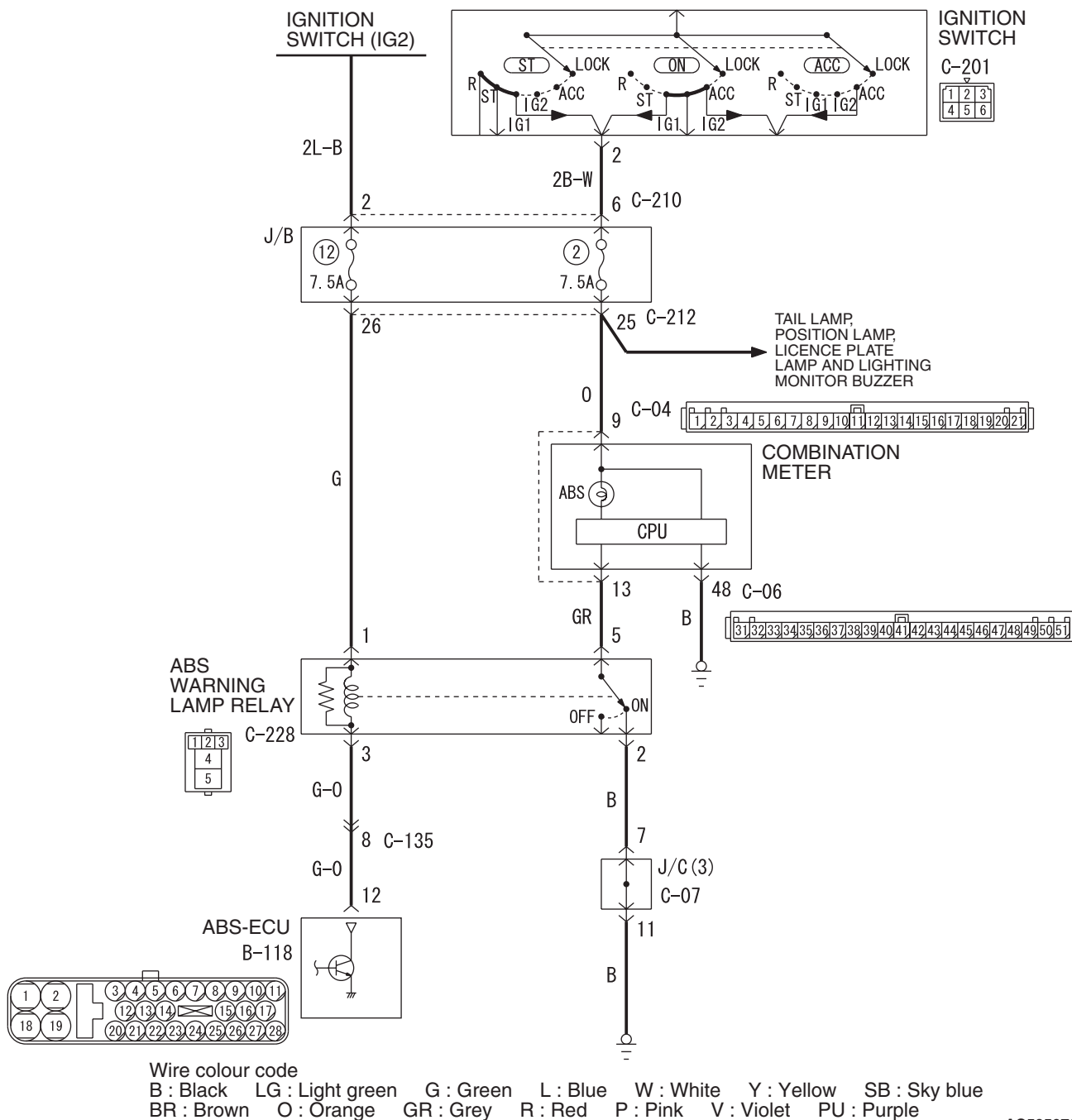
Q: Does the M.U.T.-II/III communicate with the ABS system?

YES : The procedure is complete.

NO : Start over at Step 1.

INSPECTION PROCEDURE 2: When the Ignition Key is Turned to the "ON" position (Engine Stopped), the ABS Warning Lamp does not Illuminate.

ABS Warning Lamp Circuit



AC505076

OPERATION

- ## OPERATION
- The ABS warning lamp power is supplied from the ignition switch. The ABS-ECU grounds the circuit to illuminate the lamp.
 - The ABS-ECU illuminates the ABS warning lamp for 3 seconds while running self-check. This lamp can be illuminated for 3 seconds upon start-up or when the ignition switch is turned to the "ON" position with engine stopped.

- When the ABS-ECU connector is disconnected, the circuit is grounded to illuminate the lamp by the ABS warning lamp relay ON operation.
- The ABS-ECU controls the continuity to the ABS warning lamp by turning the power transistor in the unit "OFF" and "ON" to turn the ABS warning lamp relay "ON" and "OFF", respectively.

COMMENT ON TROUBLE SYMPTOM

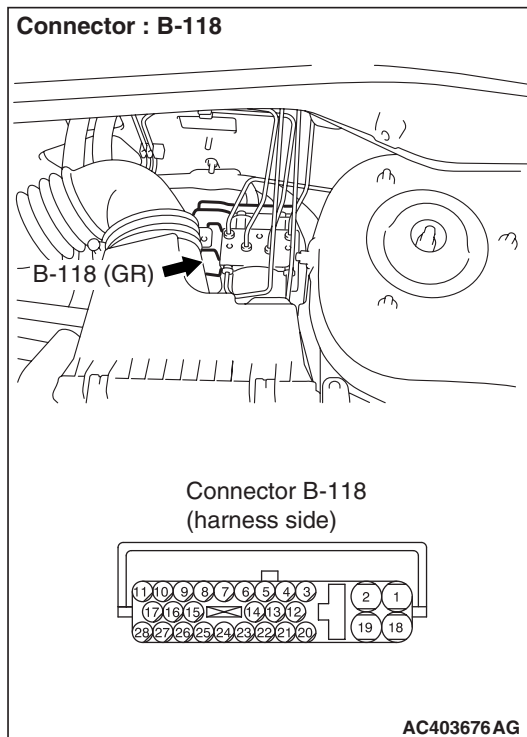
The cause may be: an open circuit in the ABS warning lamp power supply circuit, a blown ABS warning lamp bulb, or a short circuit to earth between the ABS warning lamp and the ABS-ECU.

PROBABLE CAUSES

The most likely causes for this case are:

- Blown fuse
- Damaged wiring harness or connector
- Burnt out ABS warning lamp bulb
- Malfunction of the ABS warning lamp relay
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

STEP 1. Check the ABS warning lamp relay circuit at ABS-ECU connector B-118.

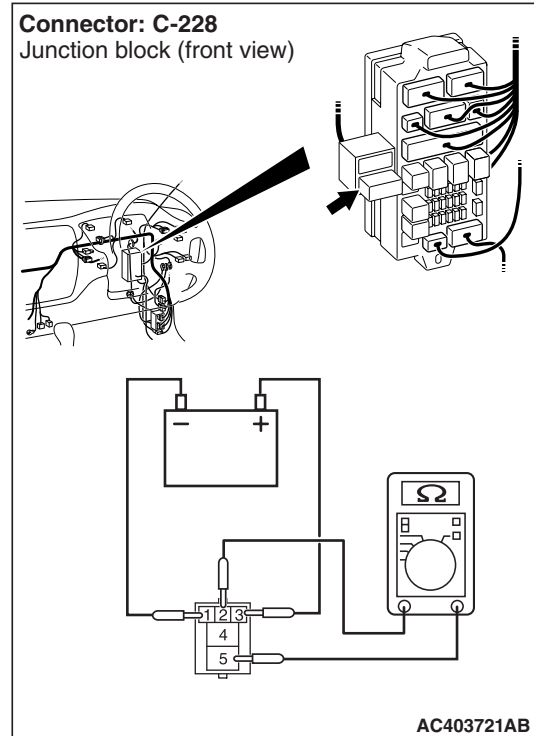


- (1) Disconnect ABS-ECU connector B-118.
- (2) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning lamp illuminate?

- YES** : Replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 11.
- NO** : Go to Step 2.

STEP 2. Check the ABS warning lamp relay.

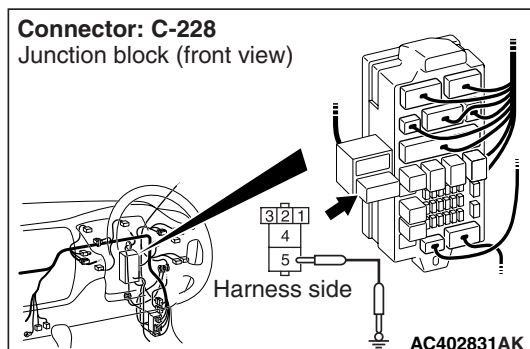


- (1) Remove the ABS warning lamp relay.
- (2) Check for continuity between terminals 2 – 5 when battery positive voltage (approximately 12 volts) is applied between terminals 1 – 3.

Battery voltage	Tester connection	Specified condition
No applied	2 – 5	Less than 2 ohms
<ul style="list-style-type: none"> • Connect terminal 1 to the positive battery terminal • Connect terminal 3 to earth 	2 – 5	Open circuit

Q: Is the ABS warning lamp relay normal?

- YES** : 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. Check the ABS warning lamp circuit at ABS warning lamp relay connector C-228.

- (1) Disconnect ABS warning lamp relay connector C-228 and measure at the harness side.
- (2) Earth terminal 5.
- (3) Turn the ignition switch to the "ON" position, and then ABS warning lamp should turn on.

Q: Does the warning lamp turn on?

YES : Go to Step 7.

NO : Go to Step 4.

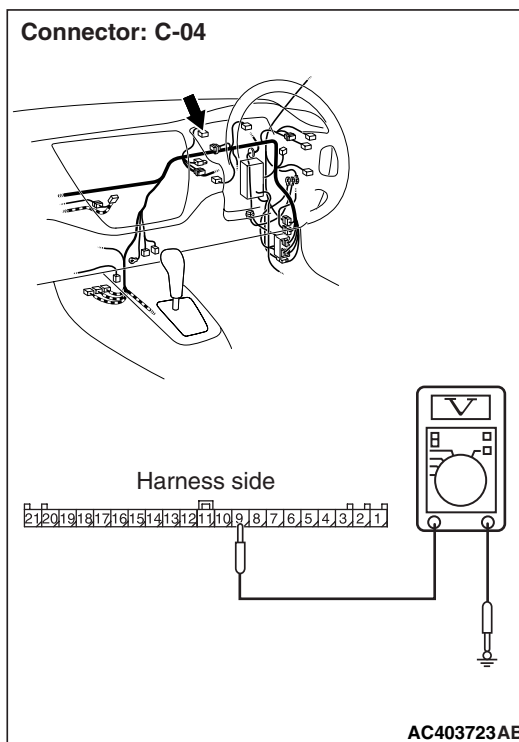
STEP 4 Check the ABS warning lamp bulb.

- (1) Remove the combination meter (Refer to GROUP 54A, Combination Meter [P.54A-53](#)).
- (2) Check the ABS warning lamp bulb.

Q: Is the bulb burned out?

YES : Replace the bulb and then go to Step 11.

NO : Go to Step 5.

STEP 5. Check the combination meter power supply circuit.

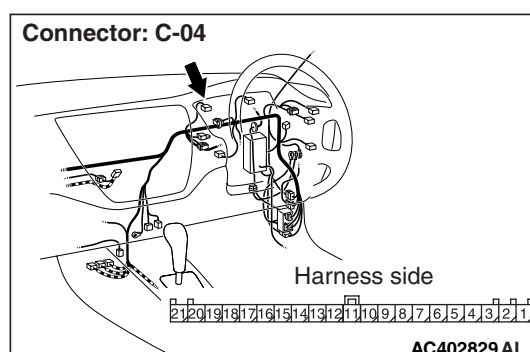
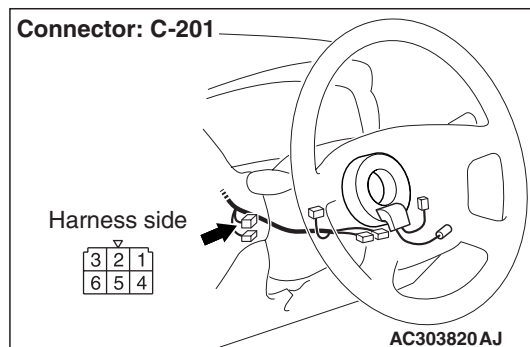
- (1) Disconnect combination meter connector C-04, and check at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 9 and earth. It should be battery positive voltage (approximately 12 volts).

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

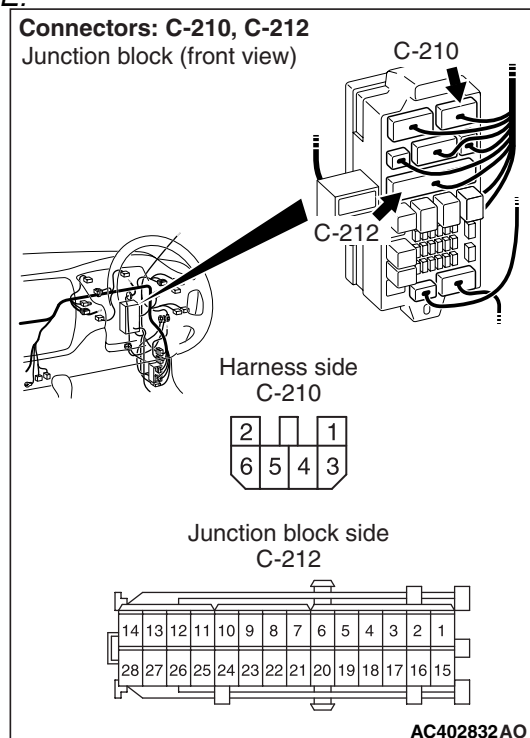
YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the harness wire between the ignition switch (IG1) connector C-201 terminal 2 and the combination meter connector C-04 terminal 9.



NOTE:



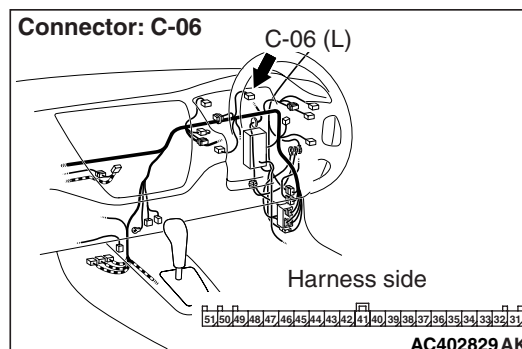
After inspecting combination meter connector C-04, ignition switch connector C-201, and intermediate connectors C-210 and C-212, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

Q: Is the harness wire between the ignition switch (IG1) connector C-201 terminal 2 and the combination meter connector C-04 terminal 9 damaged?

YES : Go to Step 11.

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 7. Check the harness wire between combination meter connector C-06 terminal 48 and earth.

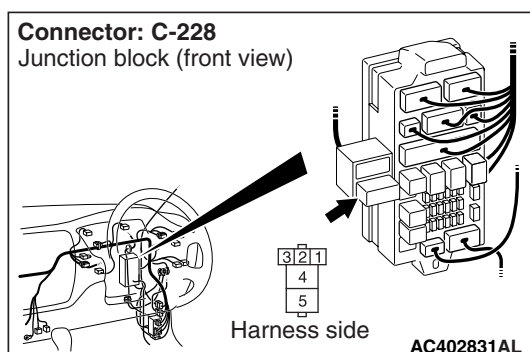
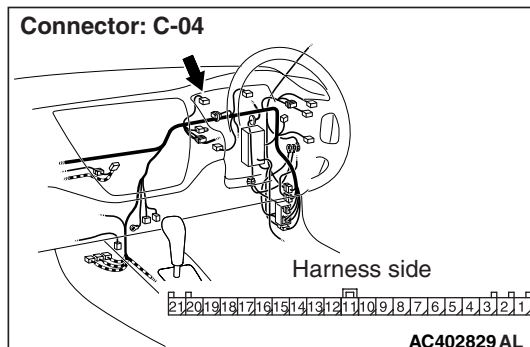


Q: Is the harness wire between combination meter connector C-06 terminal 48 and earth damaged?

YES : Go to Step 8.

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 8. Check the harness wire between combination meter connector C-04 terminal 13 and ABS warning lamp relay connector C-228 terminal 5.

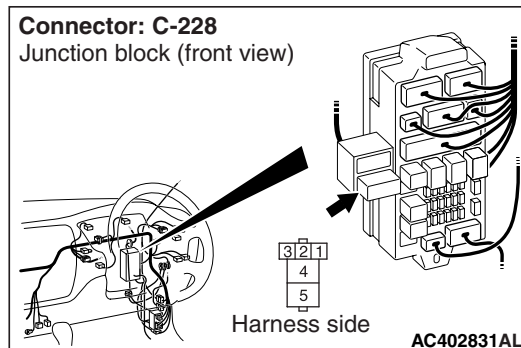


Q: Is the harness wire between combination meter connector C-04 terminal 13 and ABS warning lamp relay connector C-228 terminal 5 damaged?

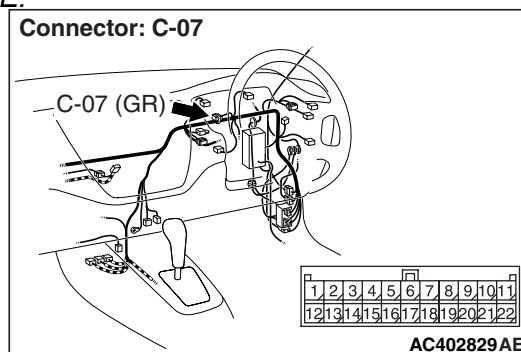
YES : Go to Step 11.

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 9. Check the harness wire between the ABS warning lamp relay connector C-228 terminal 2 and earth.



NOTE:



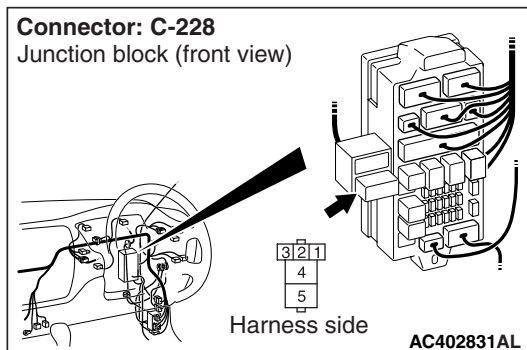
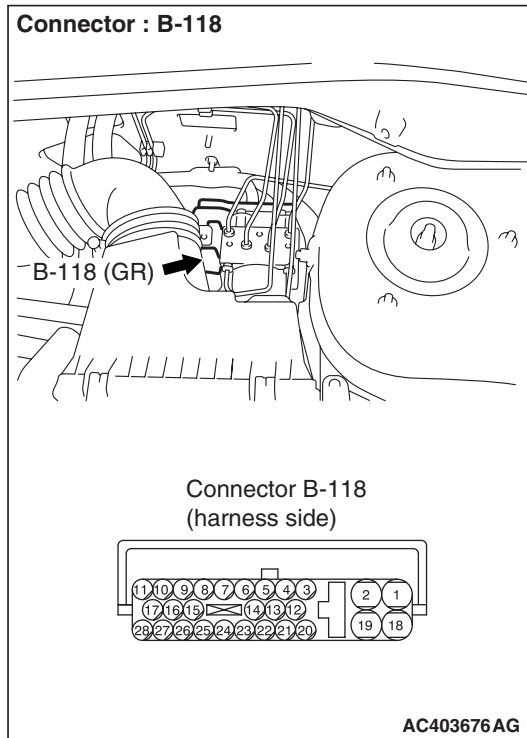
After inspecting ABS warning lamp relay connector C-228 and intermediate connector C-07, inspect the wire. If ABS warning lamp relay connector C-228 or intermediate connector C-07 is damaged, repair or replace it. Then go to Step 11.

Q: Is the harness wire between ABS warning lamp relay connector C-228 terminal 2 and earth damaged?

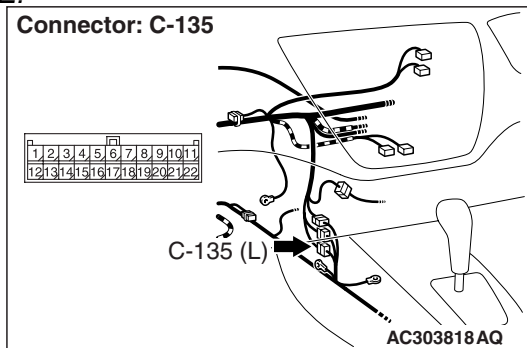
YES : Go to Step 11.

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 10. Check the harness wire between ABS-ECU connector B-118 terminal 12 and ABS warning lamp relay connector C-228 terminal 3.



NOTE:



After inspecting ABS warning lamp relay connector C-228, ABS-ECU connector B-118 and intermediate connector C-135, inspect the wire. If ABS warning lamp relay connector C-228, ABS-ECU connector B-118 or intermediate connector C-135 is damaged, repair or replace it. Then go to Step 11.

Q: Is the harness wire between ABS-ECU connector B-118 terminal 12 and ABS warning lamp relay connector C-228 terminal 3 damaged?

YES : Go to Step 11.

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 11. Retest the system.

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

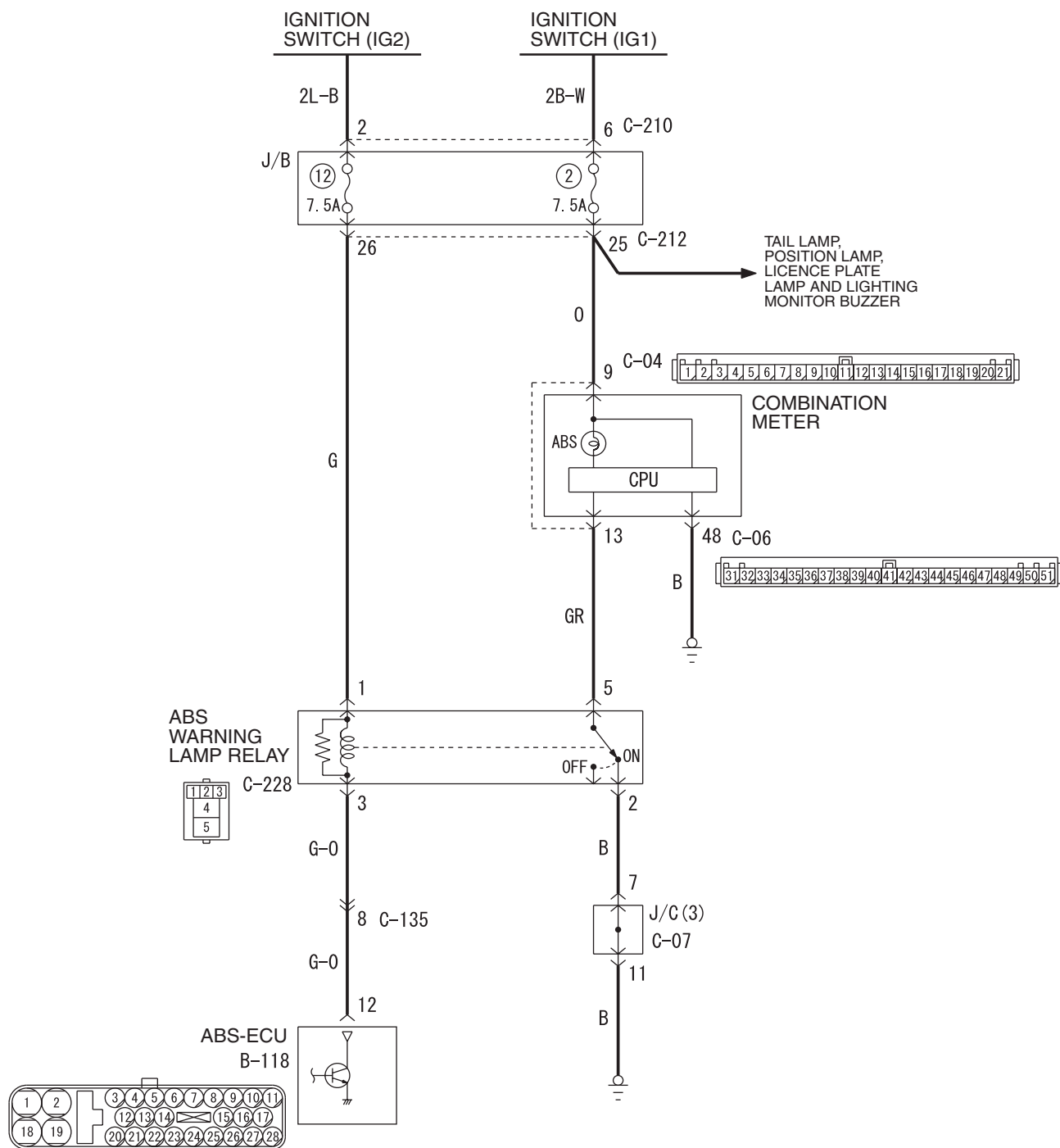
YES : The procedure is complete.

NO : Return to Step 1.

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

NOTE: This diagnosis procedure is limited to cases where communication with the M.U.T.-II/III is possible (ABS-ECU power supply is normal) and no diagnosis code outputs.

ABS Warning Lamp Circuit



Wire colour code

B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

OPERATION

Refer to P.35B-34.

COMMENT ON TROUBLE SYMPTOM

The cause is probably the ABS-ECU malfunction.

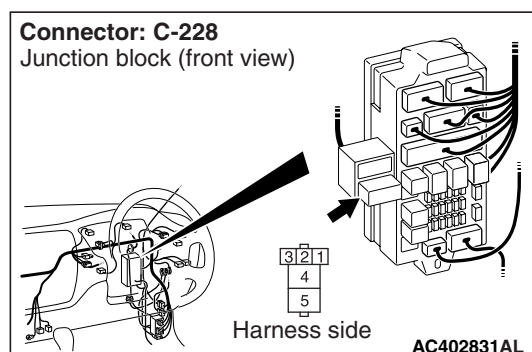
PROBABLE CAUSES

The most likely causes for this case are:

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

DIAGNOSIS

STEP 1. Check the wiring harness between the ABS warning lamp relay and the ABS warning lamp.



(1) Disconnect ABS warning lamp relay connector C-228.

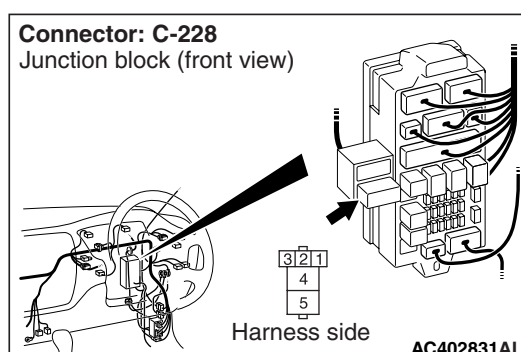
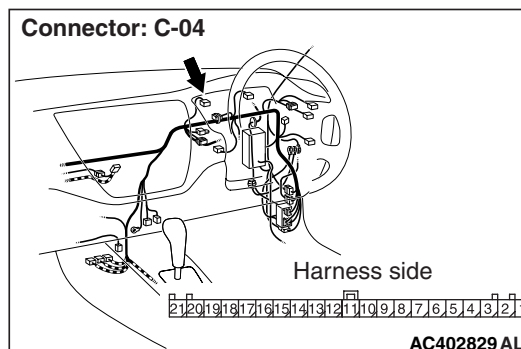
(2) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning lamp illuminate?

YES : Go to Step 2.

NO : Go to Step 3.

STEP 2. Check the harness wire between combination meter connector C-04 terminal 13 and ABS warning lamp relay connector C-228 terminal 5.

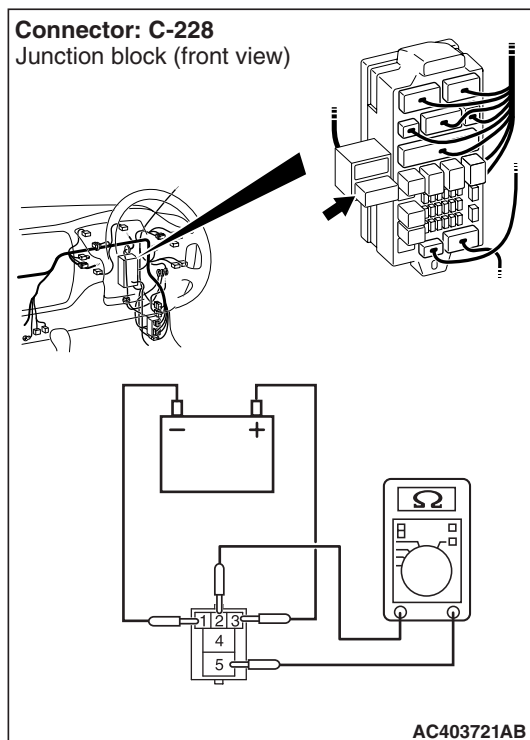


NOTE: After inspecting combination meter connector C-04 and ABS warning lamp relay connector C-228, inspect the wire. If combination meter connector C-04 or ABS warning lamp relay connector C-228 is damaged, repair or replace it. Then go to Step 8.

Q: Is the harness wire between combination meter connector C-04 and ABS warning lamp relay connector C-228 damaged?

YES : Repair the harness wire and then go to Step 8.

NO : Replace the combination meter (printed circuit board) and then go to Step 8.

STEP 3. Check the ABS warning lamp relay.

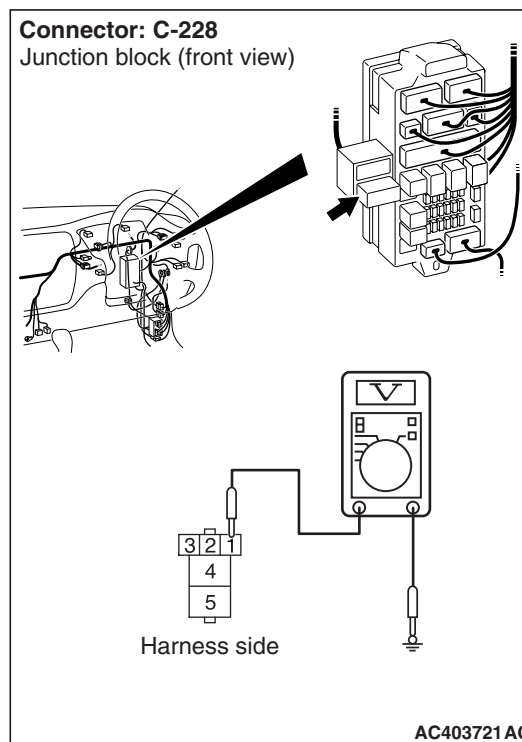
- (1) Remove the ABS warning lamp relay.
- (2) Check for continuity between terminals 2 – 5 when battery voltage is applied between terminals 1 – 3.

Battery voltage	Tester connection	Specified condition
No applied	2 – 5	Less than 2 ohms
<ul style="list-style-type: none"> Connect terminal 1 to the positive battery terminal Connect terminal 3 to earth 	2 – 5	Open circuit

Q: Is the ABS warning lamp relay in good condition?

YES : Go to Step 4.

NO : Replace it and then go to Step 8.

STEP 4. Check the ABS warning lamp relay power supply circuit.

- (1) Disconnect ABS warning lamp relay connector C-228 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 1 and earth. It should be approximately 12 volts (battery positive voltage).

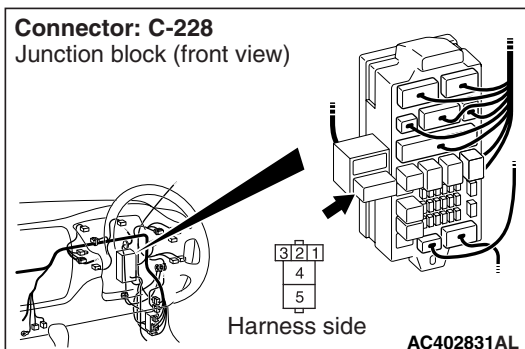
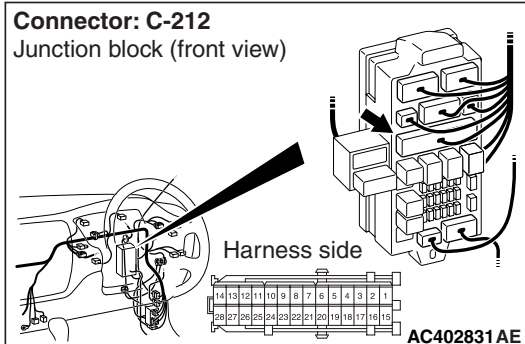
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Check the harness wire between junction block connector C-212 terminal 26 and the ABS warning lamp relay connector C-228 terminal 1.

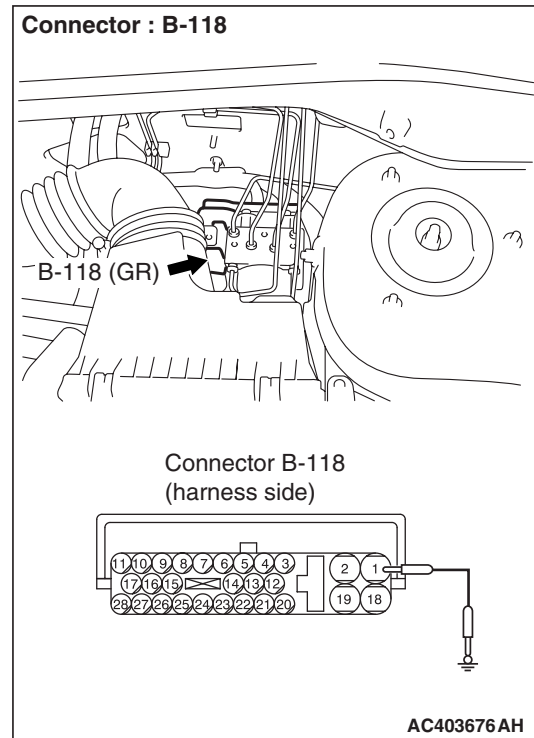
NOTE:



After inspecting junction block connector C-212 and ABS warning lamp relay connector C-228, inspect the wire. If junction block connector C-212 or ABS warning lamp relay connector C-228 is damaged, repair or replace it. Then go to Step 8.

Q: Is the harness wire between junction block connector C-212 terminal 26 and ABS warning lamp relay connector C-228 terminal 1 damaged?
YES : Repair the harness wire and then go to Step 8.
NO : Go to Step 8.

STEP 6. Check the ABS warning lamp circuit at ABS-ECU connector B-118.

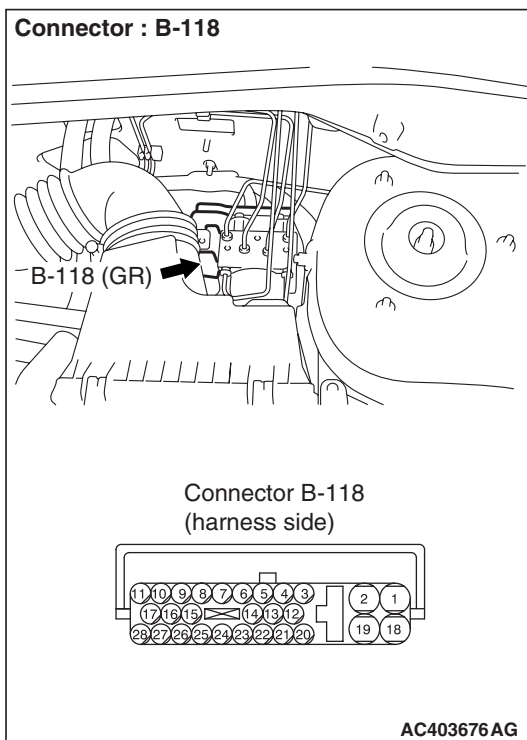


- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Connect ABS-ECU connector B-118 terminal 12 to earth.
- (3) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning lamp go off?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-52](#)). Then go to Step 8.
NO : Go to Step 7.

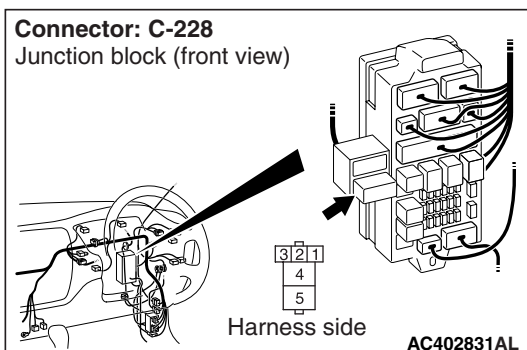
STEP 7. Check the harness wire between ABS-ECU connector B-118 terminal 12 and ABS warning lamp relay connector C-228 terminal 3.



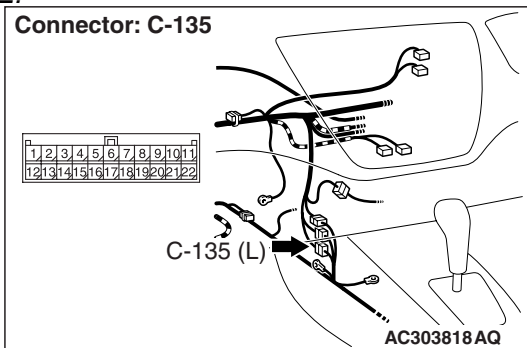
Q: Is the harness wire between ABS-ECU connector B-118 terminal 12 and ABS warning lamp relay connector C-228 terminal 3 damaged?
YES : Repair it and then go to Step 8.
NO : Go to Step 8.

STEP 8. Retest the system.

Q: Does the ABS warning lamp turn off in 3 seconds after start-up?
YES : The procedure is complete.
NO : Return to Step 1.



NOTE:



After inspecting ABS warning lamp relay connector C-228, ABS-ECU connector B-118 and intermediate connector C-135, inspect the wire. If ABS warning lamp relay connector C-228, ABS-ECU connector B-118 or intermediate connector C-135 is damaged, repair or replace it. Then go to Step 8.

INSPECTION PROCEDURE 4: Faulty ABS Operation

COMMENT ON TROUBLE SYMPTOM

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

PROBABLE CAUSES

The most likely cause for this case is:

- Malfunction of the hydraulic unit

DIAGNOSIS

Check the hydraulic unit (Refer to [P.35B-49](#)). If the hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1352011500810

The following items can be read by the M.U.T.-II/III from the ABS-ECU input data.

When the system is normal.

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and M.U.T.-II/III are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
21	ABS-ECU power supply voltage	Ignition switch: ON	10 – 16 V
36	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

When the ABS-ECU shut off ABS operation.

When the diagnosis system stops the ABS-ECU, the M.U.T.-II/III display data will be unreliable.

ACTUATOR TEST SPECIFICATIONS

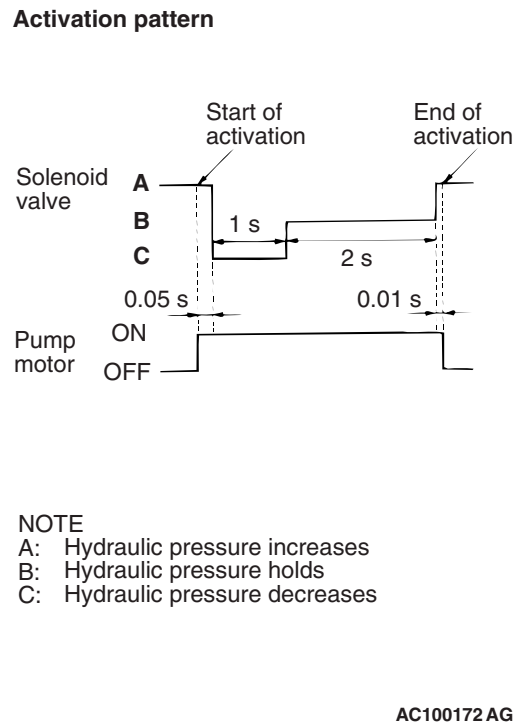
ACTUATOR TEST REFERENCE TABLE

M1352011600806

The M.U.T.-II/III activates the following actuators for testing.

NOTE: If the ABS-ECU runs down, actuator testing cannot be carried out.

NOTE: Actuator testing is only possible when the vehicle is stationary.

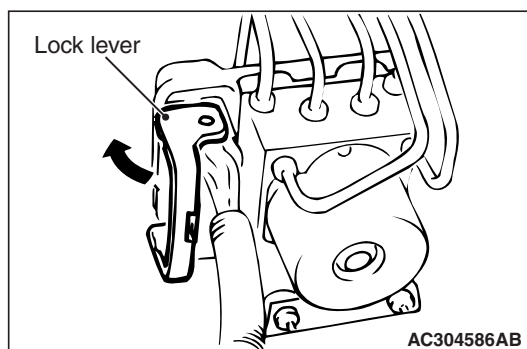


No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

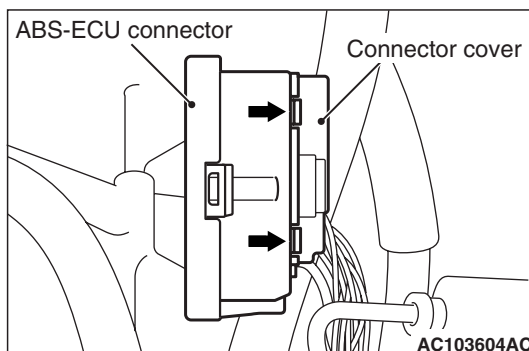
CHECK AT ABS-ECU

M1352011800800

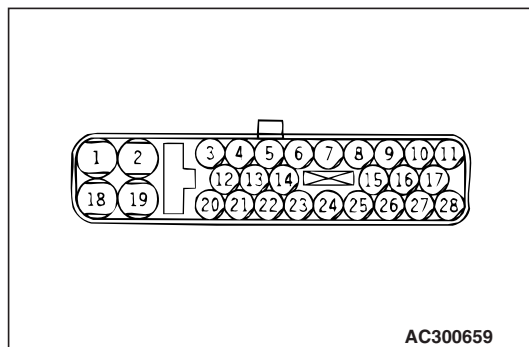
Use the following steps to remove the connector cover and measure the terminal voltage.



1. Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the ABS-ECU connector.



2. Insert the flat-tipped screwdriver to the aperture (arrow area as shown in the illustration) between ABS-ECU connector and connector cover to disengage the claw and remove the connector cover.

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between earth terminal (2) or (18) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

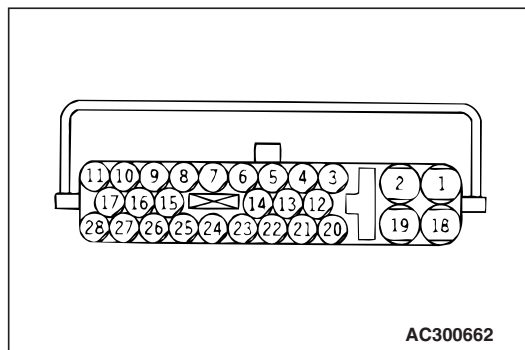
NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned to the "ON" position. The ABS-ECU performs the initial check during that period.

Terminal No.	Check item	Checking requirements		Normal condition
1	Solenoid valve power supply	Always		System voltage
3	Stop lamp switch input	Stop lamp switch: "ON"		System voltage
		Stop lamp switch: "OFF"		Approximately 0 V
4	Diagnosis changeover input	When the M.U.T.-II/III is connected		Approximately 0 V
		When the M.U.T.-II/III is not connected		System voltage
12	ABS-ECU warning lamp transistor output	Ignition switch: "ON"	When the lamp is switched off	Approximately 0 V
			When the lamp is illuminated	System voltage

Terminal No.	Check item	Checking requirements	Normal condition
13	M.U.T.-II/III	When the M.U.T.-II/III is connected	Serial communication with M.U.T.-II/III
		When the M.U.T.-II/III is not connected	Approximately 0 V
19	Motor power supply	Always	System voltage
20	ABS-ECU power supply	Ignition switch: "ON"	System voltage
		Ignition switch: "START"	Approximately 0 V

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

2. Check the resistance and continuity between the terminals indicated in the table below.
3. The terminal layout is shown in the illustration.



1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the ABS-ECU connectors before checking resistance and continuity.

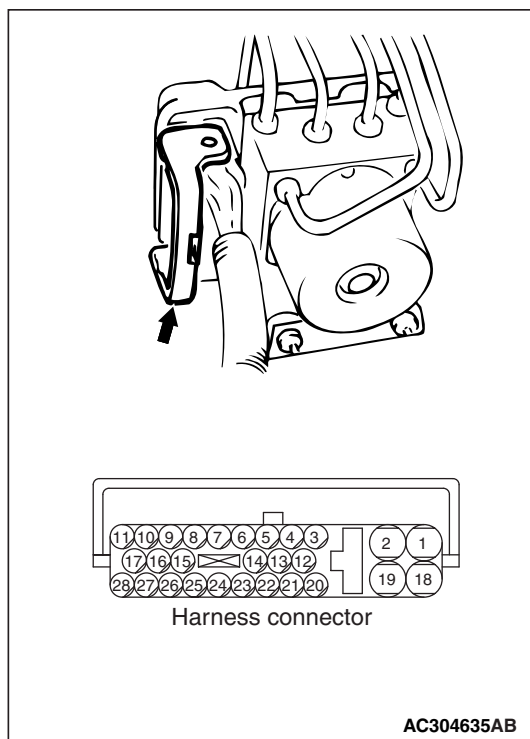
ABS-ECU terminal No.	Signal	Normal condition
9 – 10	Front-right wheel speed sensor	1.24 – 1.64 k Ω
11 – 17	Rear-right wheel speed sensor	1.24 – 1.64 k Ω
16 – 26	Front-left wheel speed sensor	1.24 – 1.64 k Ω
27 – 28	Rear-left wheel speed sensor	1.24 – 1.64 k Ω
2 – body earth	Earth	Less than 2 Ω
18 – body earth	Earth	Less than 2 Ω

ON-VEHICLE SERVICE

WHEEL SPEED SENSOR OUTPUT
VOLTAGE MEASUREMENT

M1352001600689

Lift up the vehicle and release the parking brake.



1. Disconnect the ABS-ECU connector, and measure the output voltage at the harness side connector.
2. Manually turn the wheel to be measured 1/2 to 1 turn/second. Measure the output voltage with a voltmeter or oscilloscope.

TERMINAL NO.

Front left	Front right	Rear left	Rear right
16	9	27	11
26	10	28	17

Output voltage:

42 mV or higher when measured using a multi-meter

120 mVP-P or higher when measured using a oscilloscope

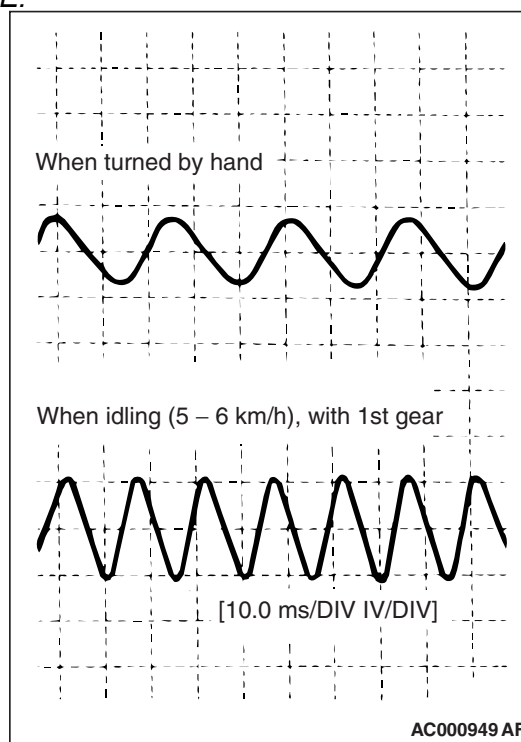
3. If the output voltage is lower than that given above, the cause may be the following, so check or replace the wheel speed sensor if necessary.

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

WAVE PATTERN INSPECTION USING AN OSCILLOSCOPE

After checking the connection of the wheel speed sensor harness and the connector, take a reading of the output voltage wave patterns for each wheel speed sensor using an oscilloscope as follows. Start the engine, the transmission shift lever to 1st gear <M/T> or selector lever to D range <A/T>, and then spin the wheel.

NOTE:



- You can also take a reading of the wave pattern by actually driving the vehicle in this condition.
- The output voltage will be lower when the wheel speed is lower, and will become higher as the wheel speed becomes higher.

POINTS IN WAVEFORM MEASUREMENT

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor or excessive gap between it and the ABS rotor	Replace wheel speed 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 assembly
	Faulty ABS-ECU earth	Repair harness wires
Noisy or disturbed waveform	Open circuit in wheel speed sensor	Replace wheel speed sensor
	Open circuit in harness	Repair harness wire
	Incorrectly mounted wheel speed sensor	Mount wheel speed sensor 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

M1352001700772

CAUTION

- The roller of the braking force tester and the tyre 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.

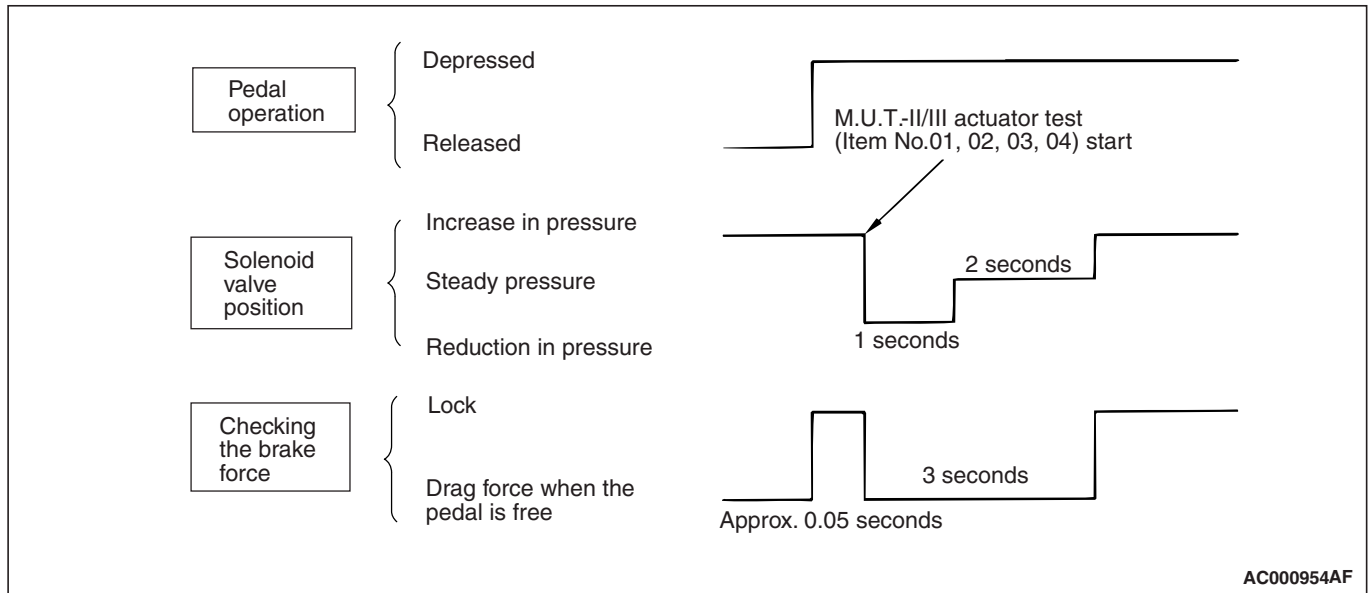
CAUTION

To prevent damage to M.U.T.-II/III, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the M.U.T.-II/III.

3. Turn the ignition switch to the "LOCK" (OFF) position and set the M.U.T.-II/III as shown in the illustration.
4. After checking that the shift lever is in neutral, start the engine.
5. Use the M.U.T.-II/III to force-drive the actuator.

NOTE: The ABS system will switch to the M.U.T.-II/III mode and the ABS warning lamp will illuminate.

NOTE: When the ABS has been interrupted by the fail-safe function, the M.U.T.-II/III 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 inspected in step 2 when the actuator is force-driven. The result should be as shown in the diagram above.

Front wheel	785 – 981 N
Rear wheel	588 – 784 N

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

Diagnosis Table					
M.U.T.-II/III Display	Operation	Inspection result	Judgment	Probable cause	Remedy
01 FR VALVE 02 FL VALVE 03 RR VALVE 04 RL VALVE	<ul style="list-style-type: none"> Depress brake pedal to lock wheel. Using the M.U.T.-II/III, select the wheel to be checked and force the actuator to operate. Turn the selected wheel manually to check the change of brake force. 	Brake force is released for three seconds after wheels have been locked.	Normal	—	—
		Wheel does not lock when brake pedal is depressed.	Abnormal	Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
		Brake force is not released		Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly

8. After inspection, disconnect the M.U.T.-II/III immediately after turning the ignition switch to the "LOCK" (OFF) position.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500666

WARNING

If the ABS is not operating, the vehicle posture will be unstable during braking, Do not drive the vehicle with the ABS-ECU connector disconnected or with the ABS not operating for any other reason.

If the engine is started using a booster cable when the battery is completely flat, and the vehicle is then driven without waiting for the battery to be recharged, the engine may misfire and it may not be possible to drive the vehicle. This is because the ABS consumes a large amount of current when carrying out its initial checks. If this happens, recharge the battery fully.

HYDRAULIC UNIT

REMOVAL AND INSTALLATION

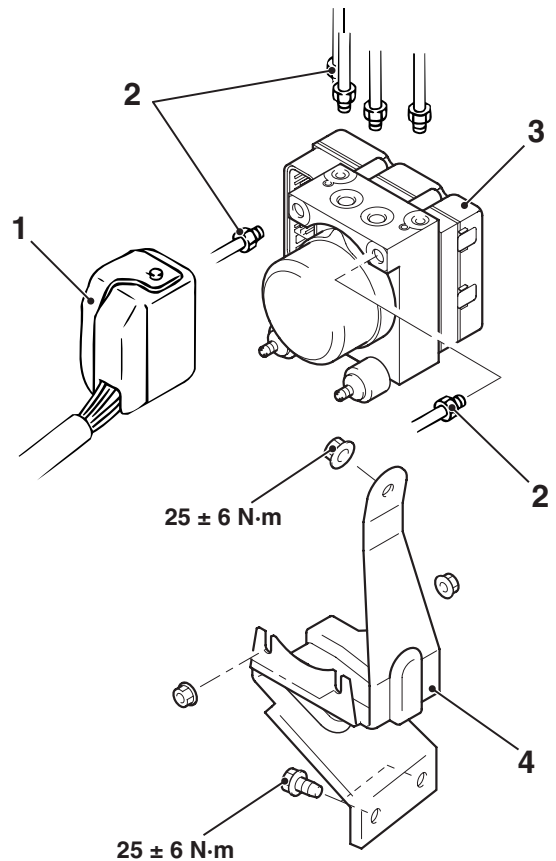
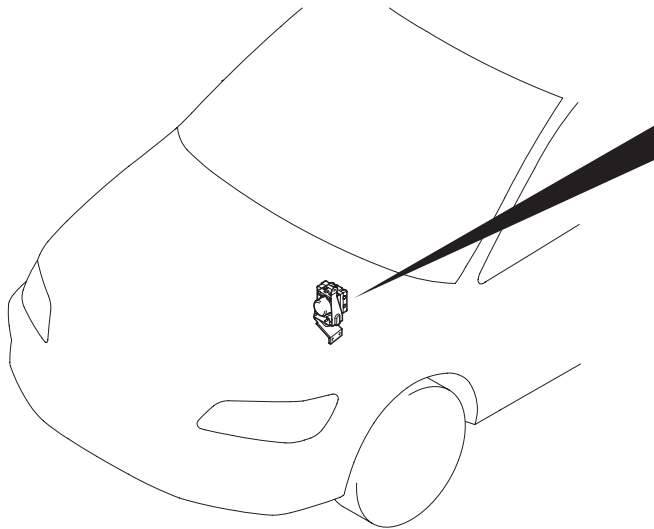
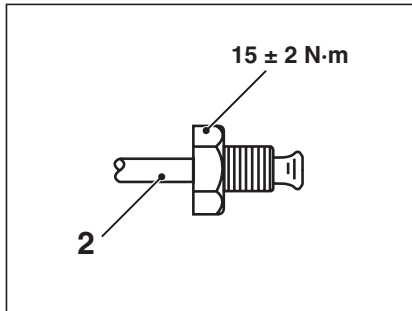
M1352008600602

*NOTE: The ABS-ECU is integrated in the hydraulic unit.***Pre-removal Operation**

- Brake Fluid Draining
- Air Intake Hose and Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-3).

Post-installation Operation

- Brake Fluid Filling
- Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service –Bleeding P.35A-6).
- Hydraulic Unit Check (Refer to P.35B-49).
- Air Intake Hose and Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-3).



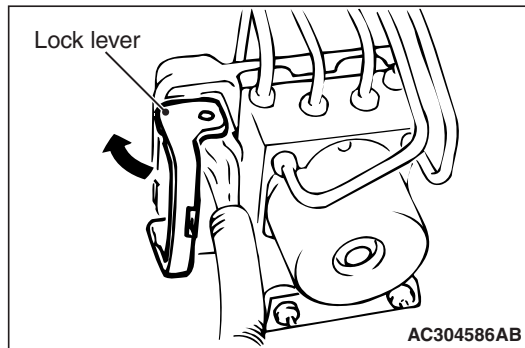
AC304421AB

Removal steps

- <<A>> 1. Harness connector
 >>A<< 2. Brake pipe connection
 <> 3. Hydraulic unit and ABS-ECU
 4. Hydraulic unit bracket assembly

REMOVAL SERVICE POINTS

<<A>> HARNESS CONNECTOR DISCONNECTION



Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the harness connector.

<> HYDRAULIC UNIT AND ABS-ECU REMOVAL

WARNING

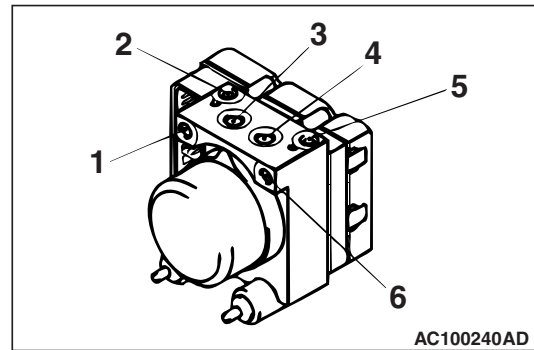
The hydraulic unit is heavy. Use care when removing it.

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.

INSTALLATION SERVICE POINT

>>A<< BRAKE PIPE CONNECTION



Connect the brake pipes to the hydraulic unit as shown in the illustration.

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

ABS SENSOR

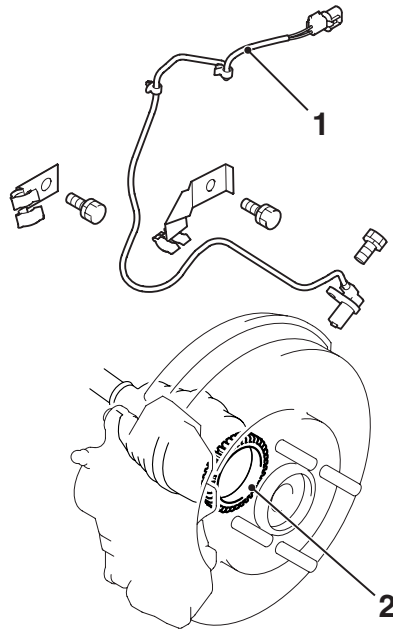
REMOVAL AND INSTALLATION

M1352020700102

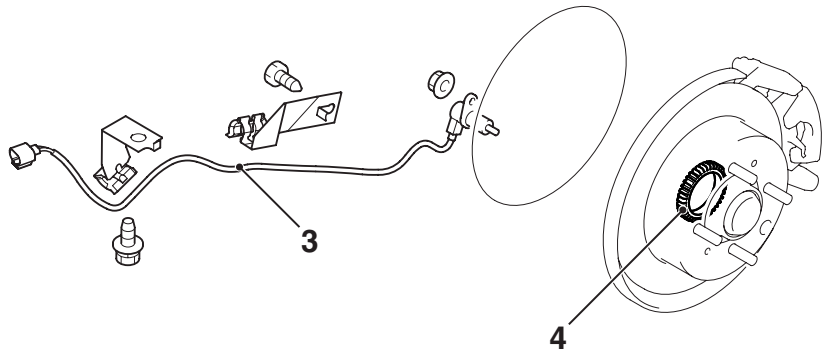
Post-installation Operation

- Wheel speed sensor Output Voltage Measurement (Refer to P.35B-48).

<Front>



<Rear>



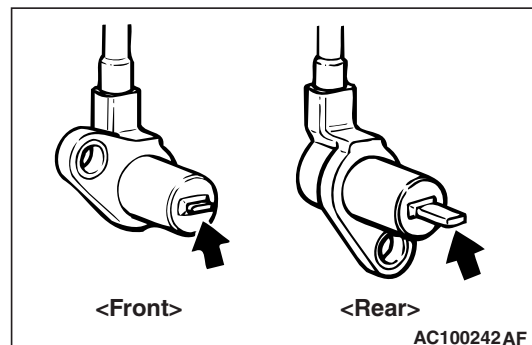
AC304419AB

Front wheel speed sensor removal steps

- <<A>>
1. Front wheel speed sensor
 2. Front ABS rotor (Refer to GROUP 26, Driveshaft P.26-18).

Rear wheel speed sensor removal steps

- <<A>>
3. Rear wheel speed sensor
 4. Rear ABS rotor (Refer to GROUP 27, Rear Hub Assembly P.27-5).

REMOVAL SERVICE POINT**<<A>> FRONT WHEEL SPEED SENSOR/REAR WHEEL SPEED SENSOR REMOVAL****CAUTION**

AC100242AF

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

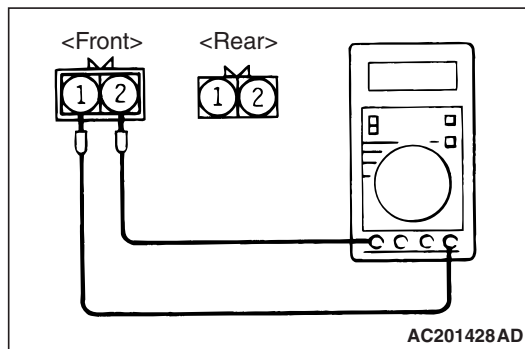
INSPECTION

M1352020800091

WHEEL SPEED SENSOR CHECK

1. Check whether any metallic foreign material has adhered to the projection at the wheel 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.

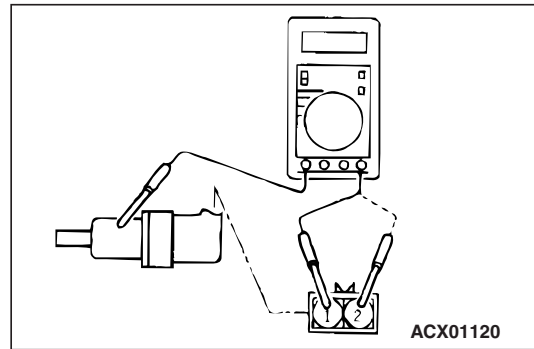
NOTE: The projection can become magnetized due to the magnet inside the wheel speed sensor, causing foreign material to easily adhere to it. The projection may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.



2. Measure the resistance between the wheel speed sensor terminals.

Standard value: 1.24 – 1.64 k Ω

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

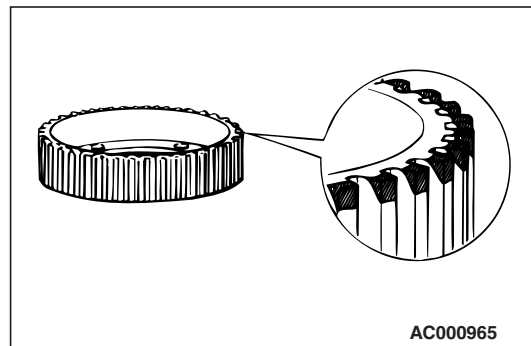


4. Remove all connections from the wheel speed sensor. The circuit should be open between terminals (1) and (2) and the body of the wheel speed sensor. If the circuit is not open, replace with a new wheel speed sensor.

5. Check the wheel 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 BJ assembly of the drive-shaft, or the ABS rotor (rear side), respectively, if the teeth are damaged or deformed.