GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

GENERAL INFORMATION

M1352000100410

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 COLT/LANCER. 4WD models are equipped with G-sensor.

*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

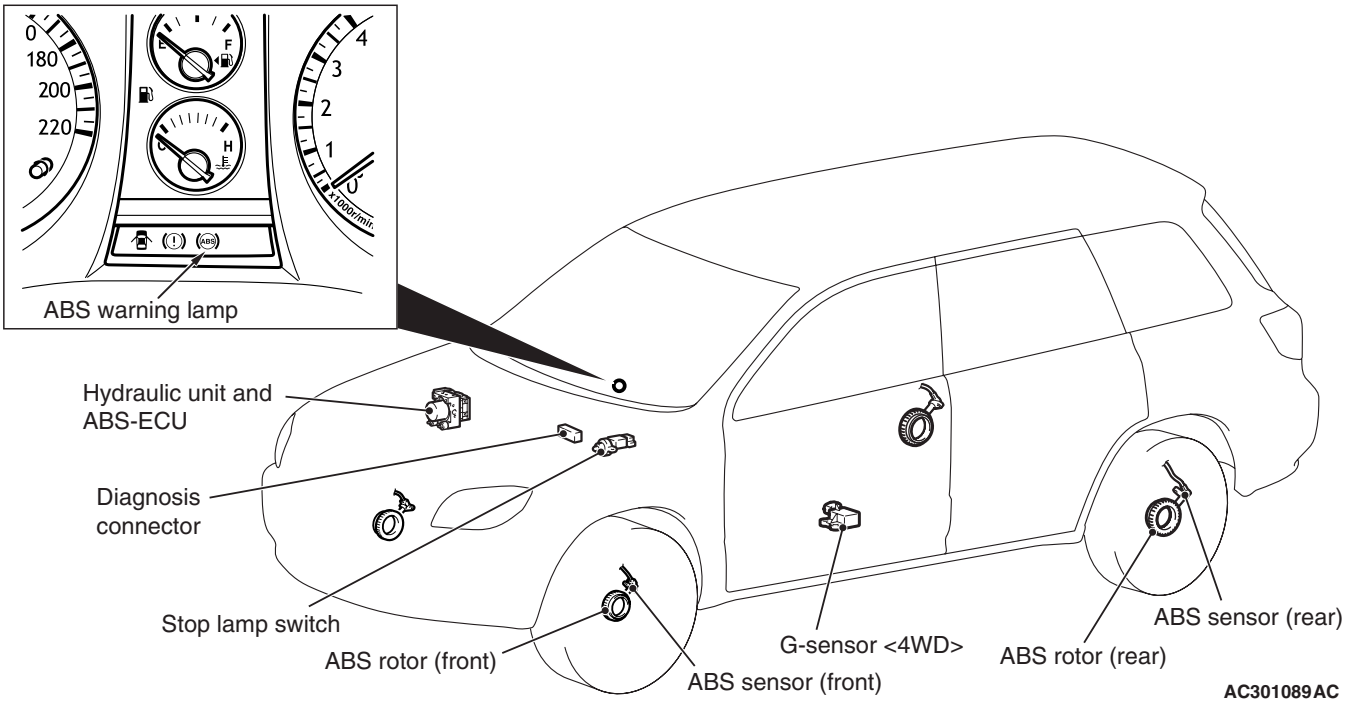
In ABS, electronic control is used so the rear wheel brake hydraulic pressure during braking is regulated by rear wheel control solenoid valves in accordance with the vehicle's rate of deceleration, and the front and rear wheel slippage which are calculated from the signals received from the various ABS 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
ABS sensor	Type	Magnet coil type
	Maximum gap between sensor and rotor mm <Non-adjustable>	0.85 <Front> 0.89 <Rear (2WD)> 0.96 <Rear (4WD)>

CONSTRUCTION DIAGRAM



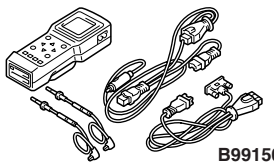
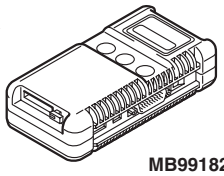
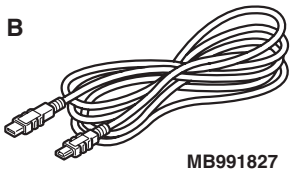
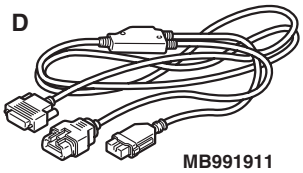
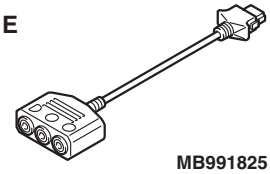
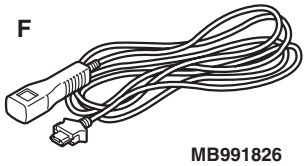
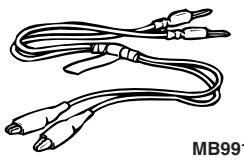
SERVICE SPECIFICATIONS

M1352000300544

Item		Standard value
ABS sensor internal resistance kΩ		1.24 – 1.64
G-sensor output voltage <4WD> V	Stationary vehicles	2.4 – 2.6
	Arrow facing downward	1.0 – 4.0

SPECIAL TOOLS

M1352000600761

Tool	Number	Name	Use
 B991502	MB991502	M.U.T.-II sub assembly	Checking the ABS (Diagnosis display using the M.U.T.-II)
A  MB991824 B  MB991827 C  DO NOT USE MB991910 D  MB991911 E  MB991825 F  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 without 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) **⚠ 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.**
 MB991529	MB991529	Diagnosis code check harness	Checking the ABS (Diagnosis display using the ABS warning lamp)

Tool	Number	Name	Use
 MB991348	MB991348	Test harness set	Checking the G-sensor <4WD>

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1352011100511

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NOTES WITH REGARD TO DIAGNOSIS

M1352012600177

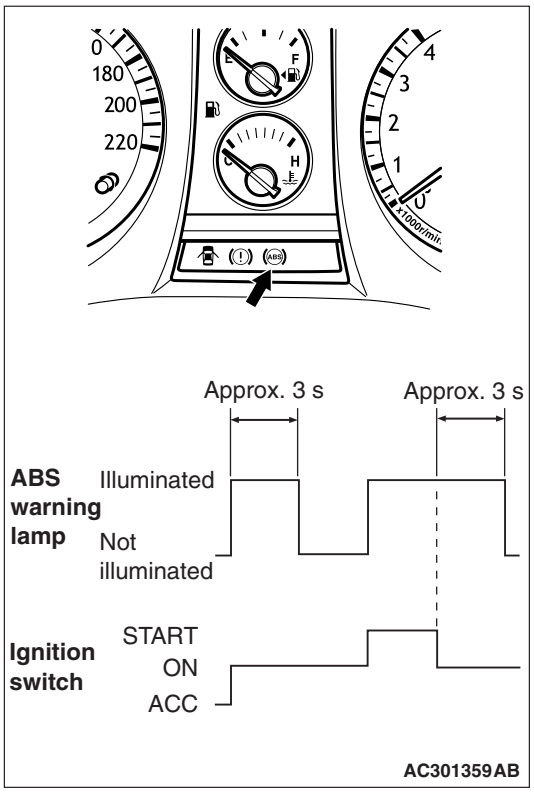
1. The ABS is a system which controls the brake pressure by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ABS operation, and do not indicate a malfunction.

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.
• 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

M1352012000197



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.
2. When the ignition switch is turned to the "START" position, the ABS warning lamp remains illuminated.
3. 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 waning 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.
4. If the illumination is other than the above, check the diagnosis codes.

DIAGNOSIS FUNCTION

M1352011200756

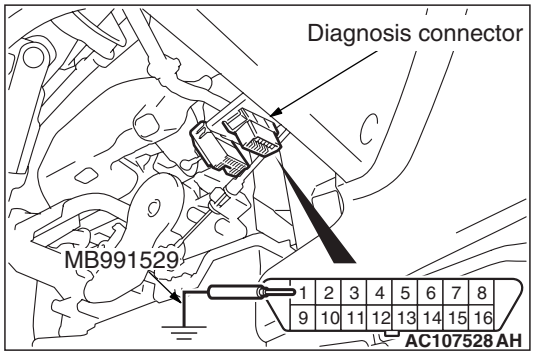
READING DIAGNOSIS CODES

When Using the M.U.T.-II/III

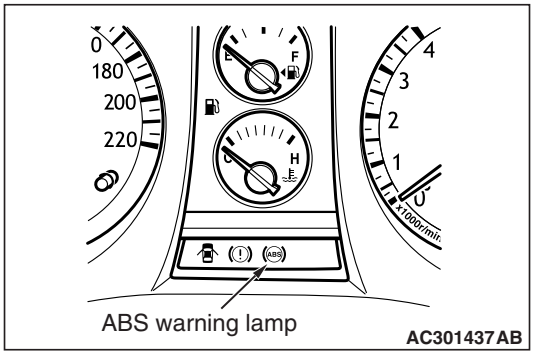
Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

When Using the ABS Warning Lamp

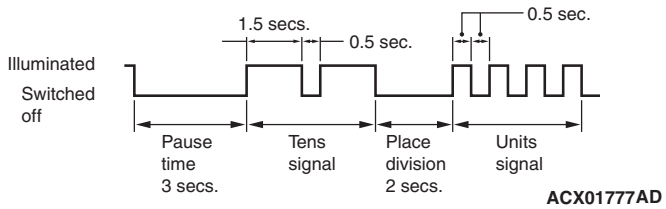
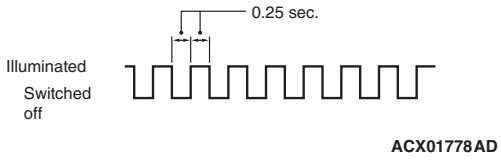
1. Turn the ignition switch to the "LOCK" (OFF) position.



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



4. 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
	

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

ERASING DIAGNOSIS CODES

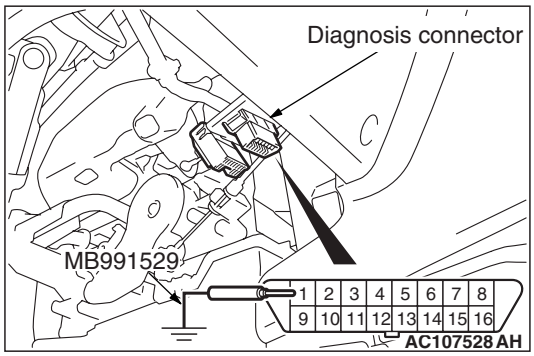
When Using the M.U.T.-II/III

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

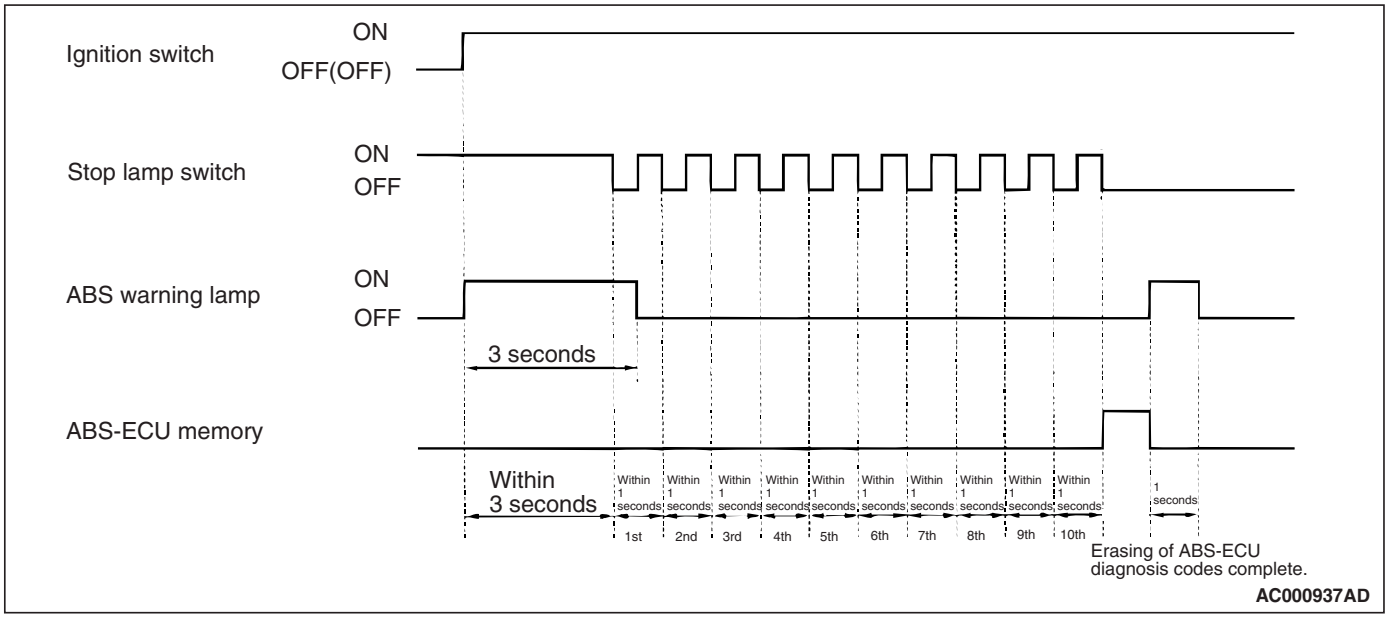
When not Using the M.U.T.-II/III

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

1. 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

M1352011300708

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

Diagnosis code No.	Inspection item	Diagnostic content	Reference page
11	Front right ABS sensor	Open circuit or short circuit	P.35B-9
12	Front left ABS sensor		
13	Rear right ABS sensor		
14	Rear left ABS sensor		
16	ABS-ECU power supply system	ABS-ECU power supply voltage below or above the specified value. Not displayed if the voltage recovers.	P.35B-15
21	Front right ABS sensor		P.35B-17
22	Front left ABS sensor		
23	Rear right ABS sensor		
24	Rear left ABS sensor		
32	G sensor system <4WD>		P.35B-24
33	Stop lamp switch system		P.35B-28
41	ABS front right solenoid valve		P.35B-32
42	ABS front left solenoid valve		
43	ABS rear right solenoid valve		
44	ABS rear left solenoid valve		
51	Valve relay problem (stays on)		Replace the hydraulic unit (Integrated with ABS-ECU).
52	Valve relay problem (stays off)		P.35B-32
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-32
63	• ABS-ECU abnormality • Improperly installed ABS-ECU <2WD>		Replace the hydraulic unit (Integrated with ABS-ECU).

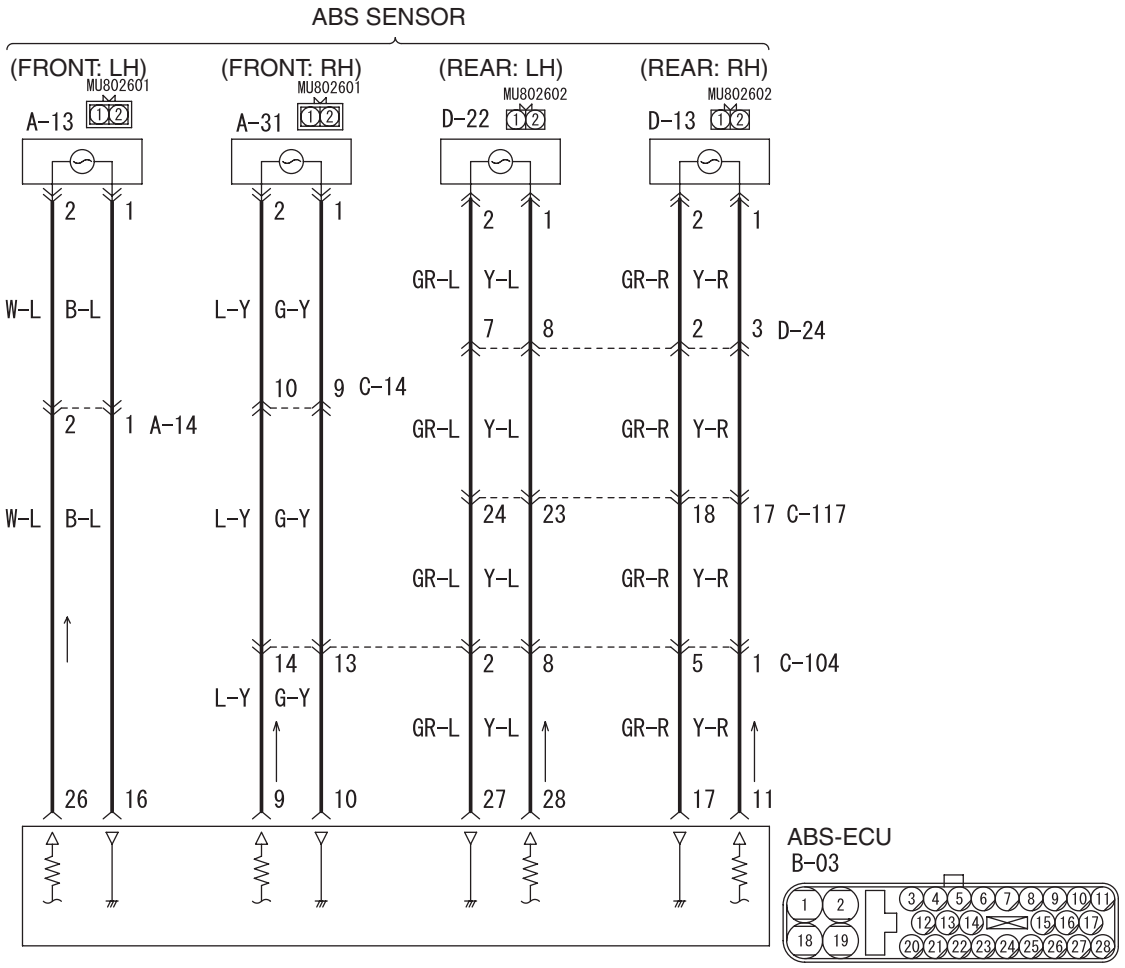
NOTE: diagnosis code No.16, 52, 63

- *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.*

DIAGNOSIS TROUBLE CODE PROCEDURES

Code No.11, 12, 13 and 14: ABS Sensor (Open Circuit or Short Circuit)

ABS Sensor 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

W3Z01E01AA
AC301686AB

OPERATION

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

PROBABLE CAUSES

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

- Malfunction of the ABS 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 ABS sensor
- Item 02: Front left ABS sensor
- Item 03: Rear right ABS sensor
- Item 04: Rear left ABS sensor

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

Q: Is the ABS 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.00-6.

NO : Go to Step 2.

STEP 2. Inspect the ABS sensor.

Refer to P.35B-58.

Check items:

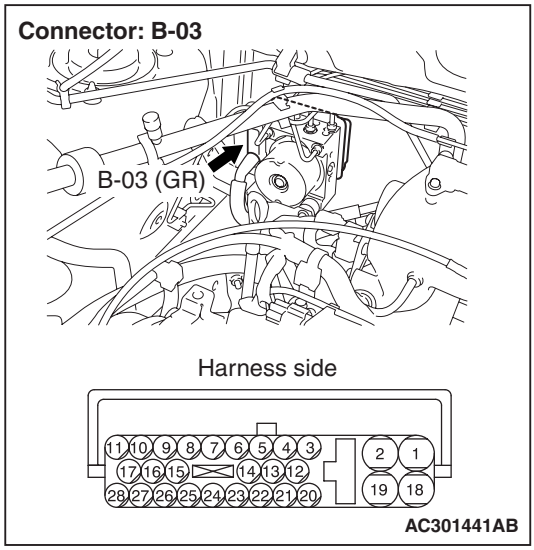
- ABS sensor internal resistance: 1.24 – 1.64 kΩ
- Insulation between the ABS sensor body and the connector terminals

Q: Is the ABS sensor damaged?

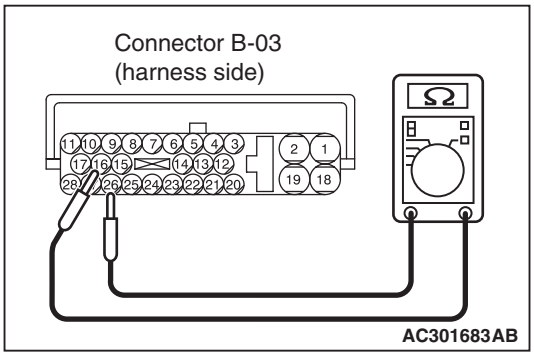
YES : Replace it and then go to Step 8.

NO : Go to Step 3.

STEP 3. Resistance measurement at ABS-ECU connector B-03.



(1) Disconnect ABS-ECU connector B-03 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 .

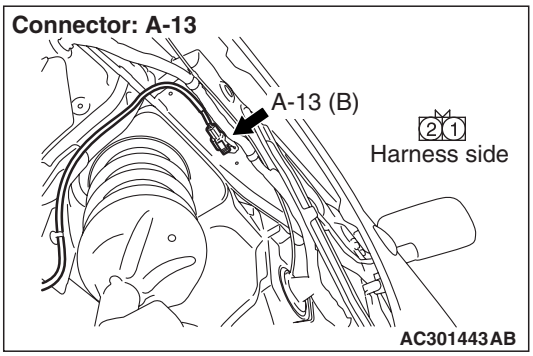
When resistance between terminals 16 and 26 is not within the standard value : Go to Step 4.

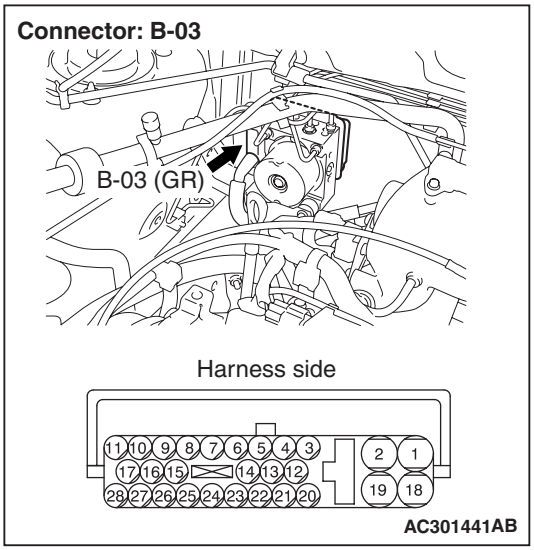
When resistance between terminals 9 and 10 is not within the standard value : Go to Step 5.

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

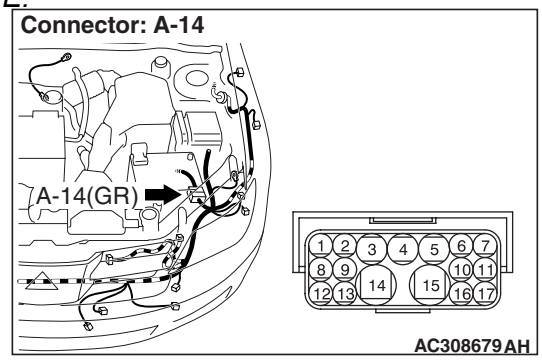
When resistance between terminals 11 and 17 is not within the standard value : Go to Step 7.

STEP 4. Check the harness wires between ABS-ECU connector B-03 (terminals 16 and 26) and ABS sensor <front: LH> connector A-13 (terminals 1 and 2).





NOTE:



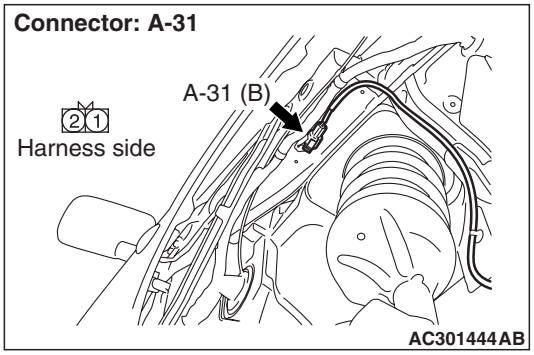
After inspecting ABS-ECU connector B-03, intermediate connector A-14 and ABS sensor <front: LH> connector A-13, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

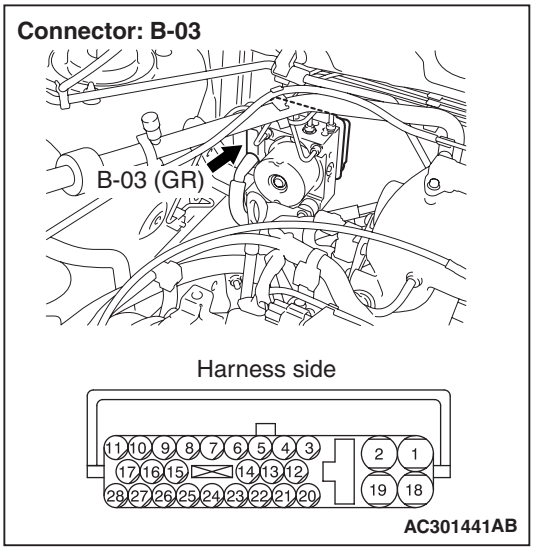
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 16 and 26) and ABS sensor <front: LH> connector A-13 (terminals 1 and 2) damaged?

YES : Repair it and go to Step 8.

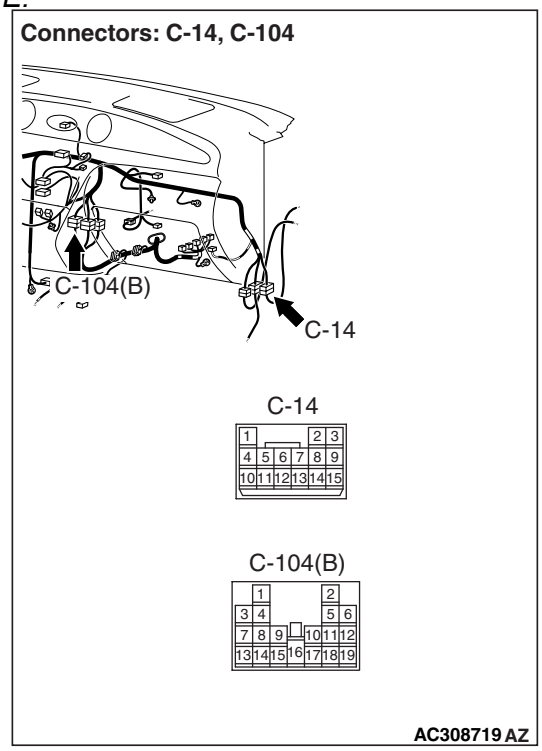
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent MalfunctionP.00-6.

STEP 5. Check the harness wires between ABS-ECU connector B-03 (terminals 10 and 9) and ABS sensor <front: RH> connector A-31 (terminals 1 and 2).





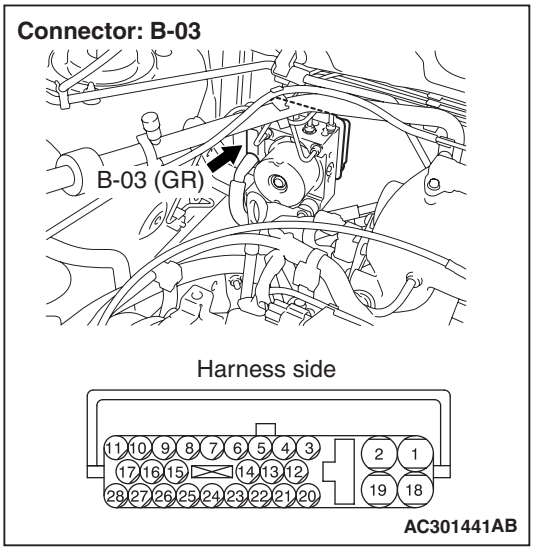
NOTE:

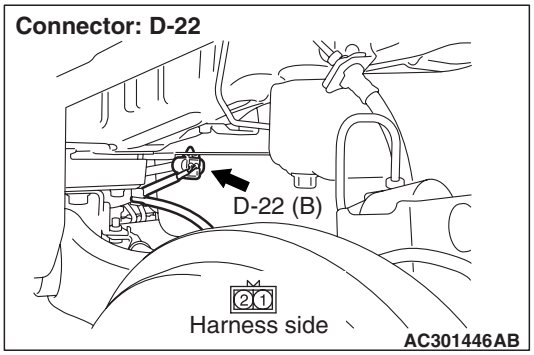


After inspecting ABS-ECU connector B-03, intermediate connectors C-14 and C-104, and ABS sensor <front: RH> connector A-31, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

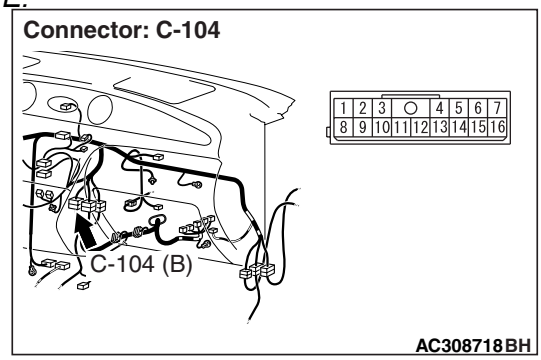
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 10 and 9) and ABS sensor <front: RH> connector A-31 (terminals 1 and 2) damaged?
YES : Repair it and go to Step 8.
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

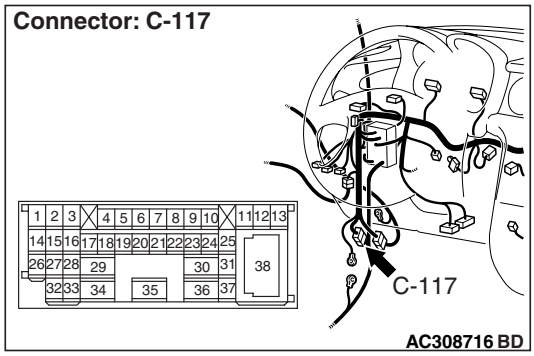
STEP 6. Check the harness wires between ABS-ECU connector B-03 (terminals 28 and 27) and ABS sensor <rear: LH> connector D-22 (terminals 1 and 2).

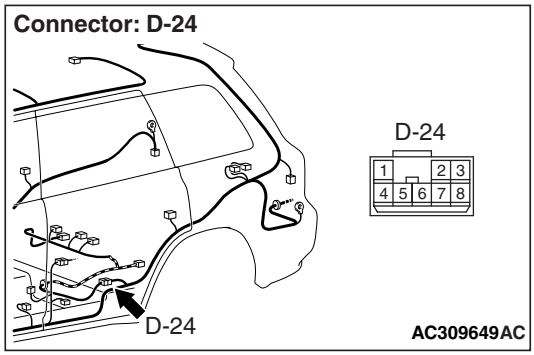




NOTE:



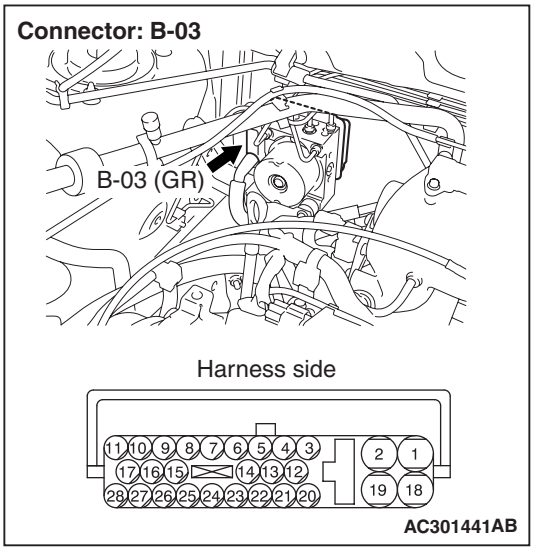


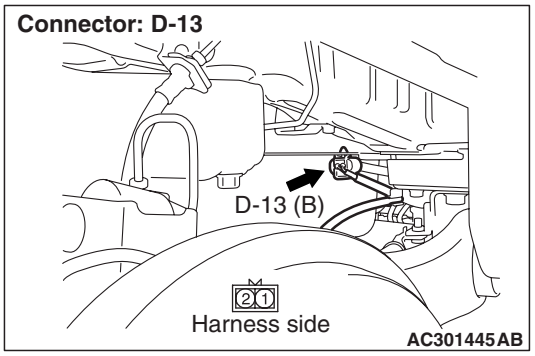


After inspecting ABS-ECU connector B-03, intermediate connectors C-104, C-117 and D-24, and ABS sensor <rear: LH> connector D-22, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

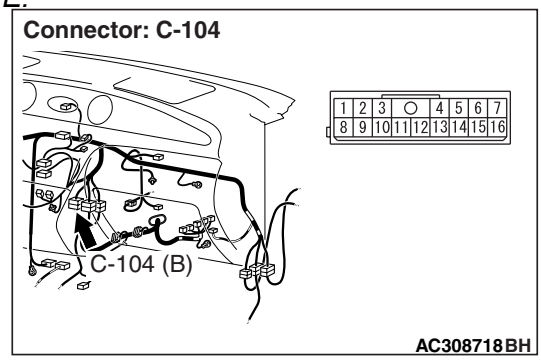
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 28 and 27) and ABS sensor <rear: LH> connector D-22 (terminals 1 and 2) damaged?
YES : Repair it and then go to Step 8.
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

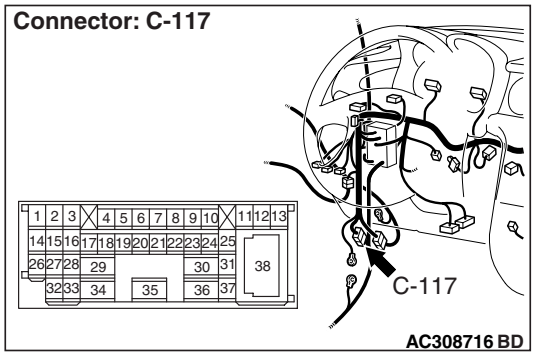
STEP 7. Check the harness wires between ABS-ECU connector B-03 (terminals 11 and 17) and ABS sensor <rear: RH> connector D-13 (terminals 1 and 2).

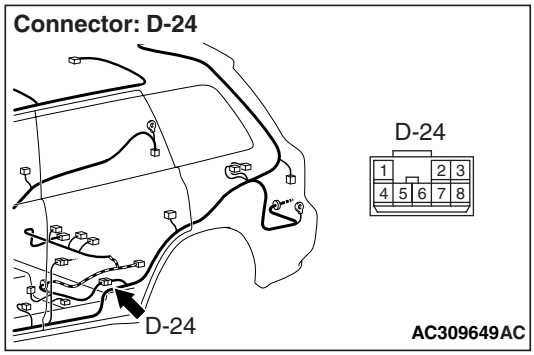




NOTE:







After inspecting ABS-ECU connector B-03, intermediate connectors C-104, C-117 and D-24, and ABS sensor <rear: RH> connector D-13, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 8.

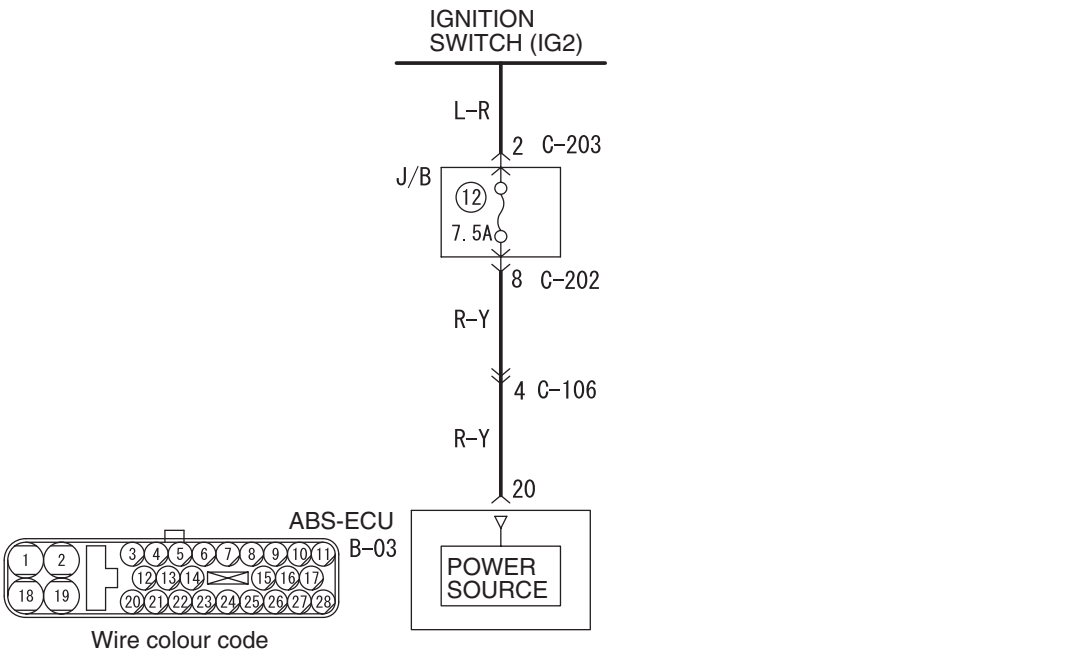
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 11 and 17) and ABS sensor <rear: RH> connector D-13 (terminals 1 and 2) damaged?
YES : Repair it and then go to Step 8.
NO : Go to Step 8.

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 or Valve Relay Power Supply Voltage below or above the Specified Value)

ABS-ECU 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

W3Z01E02AA
AC301687AB

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-7.

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.

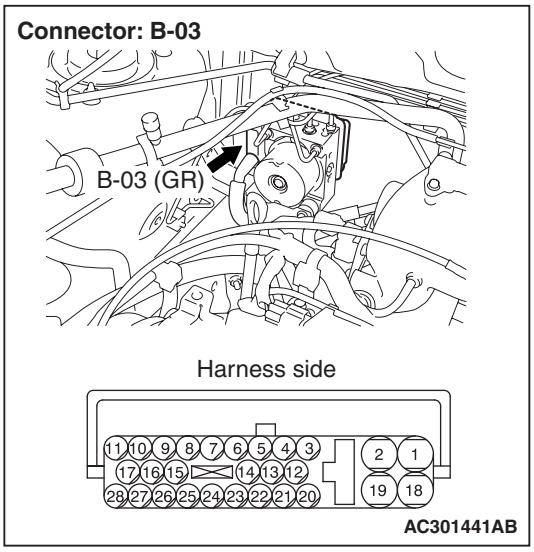
Refer to GROUP 16, Charging System – On-vehicles Service P.16-6.

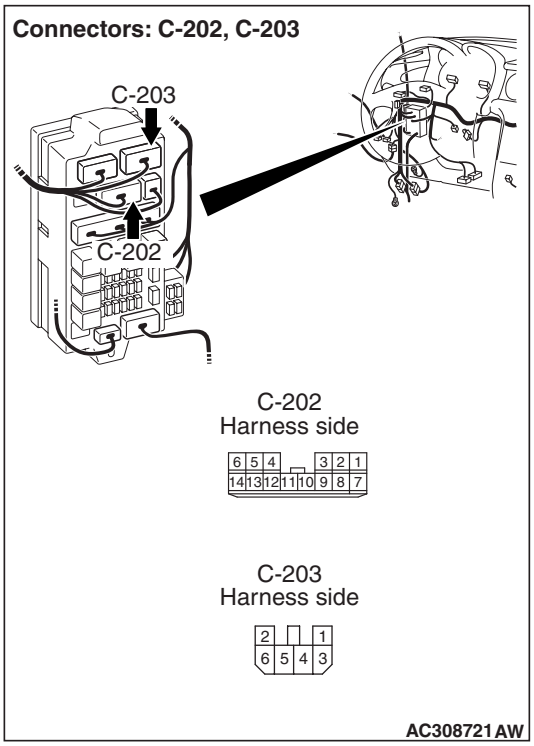
Q: Is the charging system damaged?

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

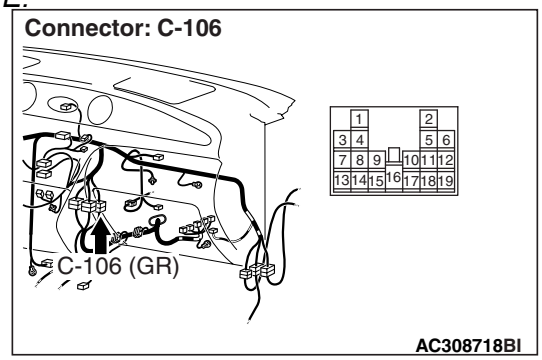
NO : Go to Step 3.

STEP 3. Check the harness wire between junction block connector C-203 terminal 2 and ABS-ECU connector B-03 terminal 20.





NOTE:



After inspecting ABS-ECU connector B-03, intermediate connector C-106, and junction block connector C-202 and C-203, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 4.

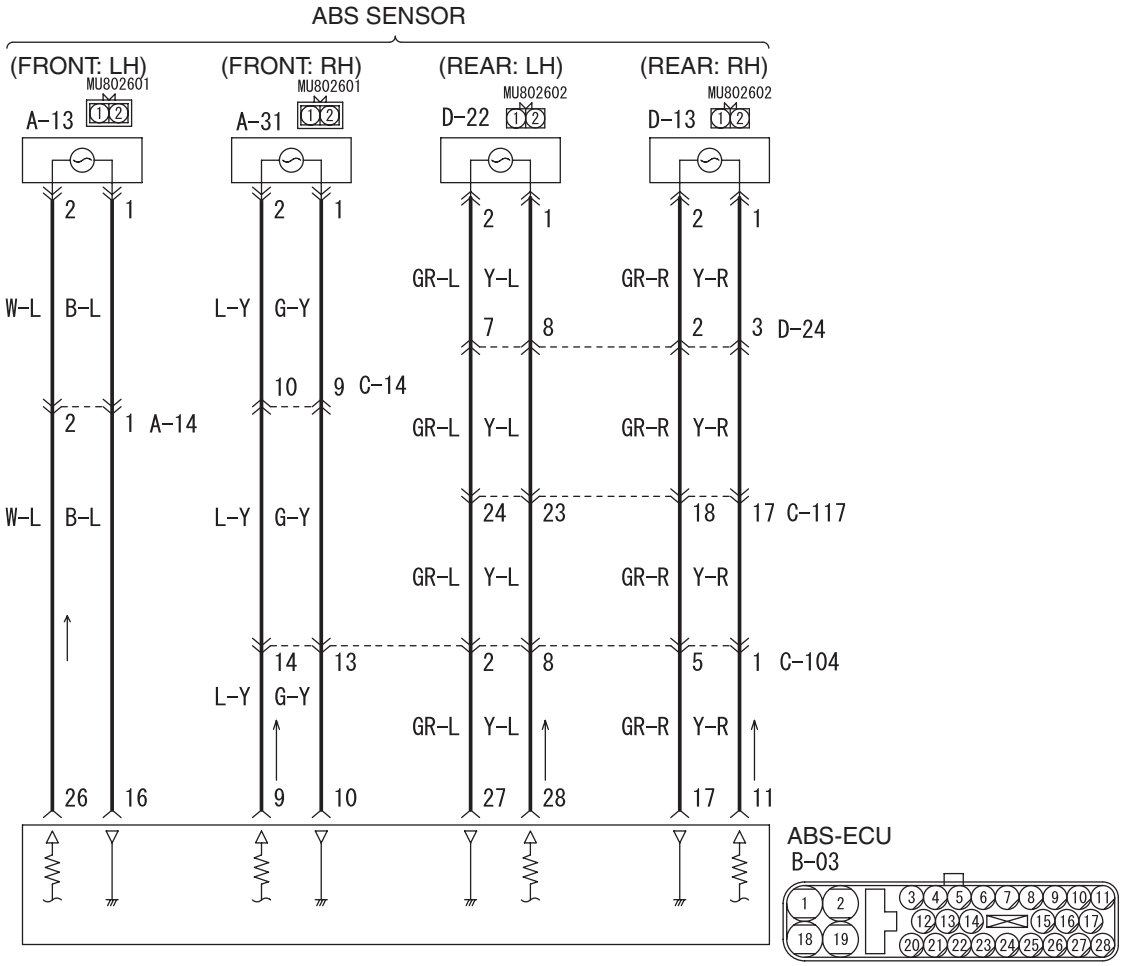
Q: Is the harness wire between junction block connector C-203 terminal 2 and ABS-ECU connector B-03 terminal 20 damaged?
YES : Repair it and go to Step 4.
NO : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.16 sets, replace the hydraulic unit (integrated 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.00-6.

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, 22, 23, 24: ABS Sensor

ABS Sensor 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

W3Z01E01AA
AC301686AB

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each ABS sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the ABS sensor, and by the speed of rotation.
- The ABS sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the 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 ABS sensors at 10 km/h or more.
- ABS sensor output drops due to a malfunctioning ABS sensor or warped ABS rotor.

PROBABLE CAUSES

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

- Malfunction of the ABS 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 ABS 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 ABS sensor
- Item 02: Front left ABS sensor
- Item 03: Rear right ABS sensor
- Item 04: Rear left ABS sensor

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

Q: Is the ABS 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.00-6.

NO : Go to Step 2.

STEP 2. Check the ABS sensor installation.

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

YES : Go to Step 3.

NO : Install it properly (Refer to P.35B-57) and go to Step 11 .

STEP 3. Inspect the ABS sensor and ABS rotor.

Refer to P.35B-58.

Check items:

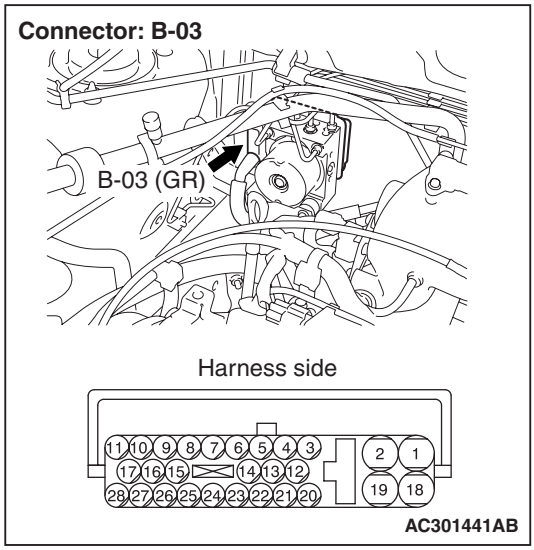
- ABS sensor internal resistance: 1.24 – 1.64 kΩ
- Insulation between the ABS sensor body and the connector terminals
- Toothed ABS rotor check

Q: Is the ABS sensor or ABS rotor damaged?

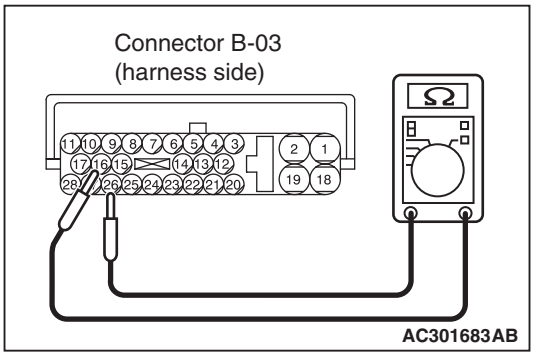
YES : Replace it and then go to Step 11.

NO : Go to Step 4.

STEP 4. Resistance measurement at the ABS-ECU connector B-03.



(1) Disconnect ABS-ECU connector B-03 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 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 : Go to Step 9.

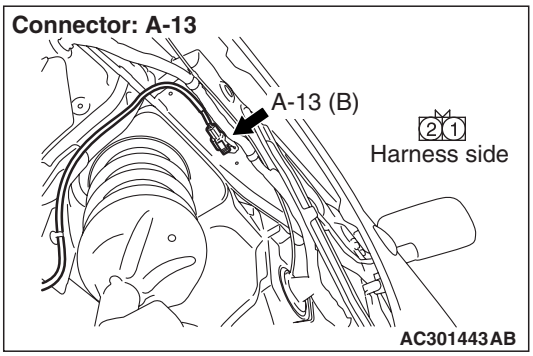
When resistance between terminals 16 and 26 is not within the standard value : Go to Step 5.

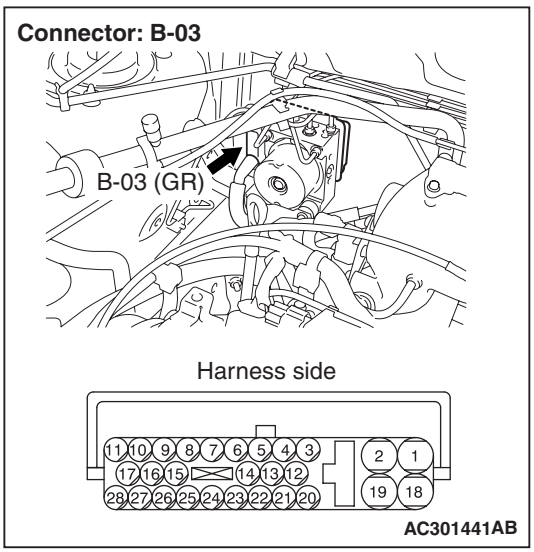
When resistance between terminals 9 and 10 is not within the standard value : Go to Step 6.

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

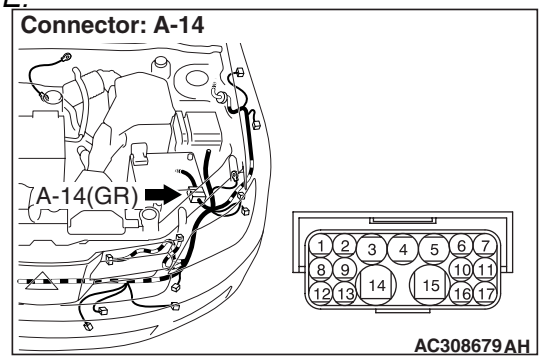
When resistance between terminals 11 and 17 is not within the standard value : Go to Step 8.

STEP 5. Check the harness wires between ABS-ECU connector B-03 (terminals 16 and 26) and ABS sensor <front: LH> connector A-13 (terminals 1 and 2).





NOTE:



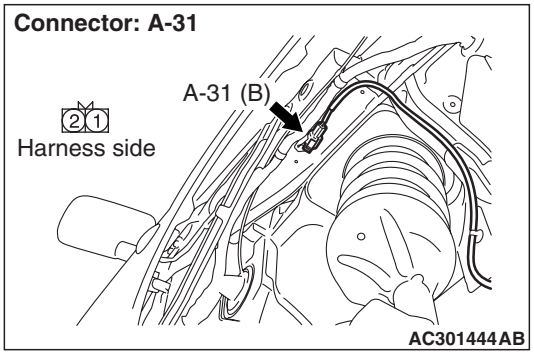
After inspecting ABS-ECU connector B-03, intermediate connector A-14 and ABS sensor <front: LH> connector A-13, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

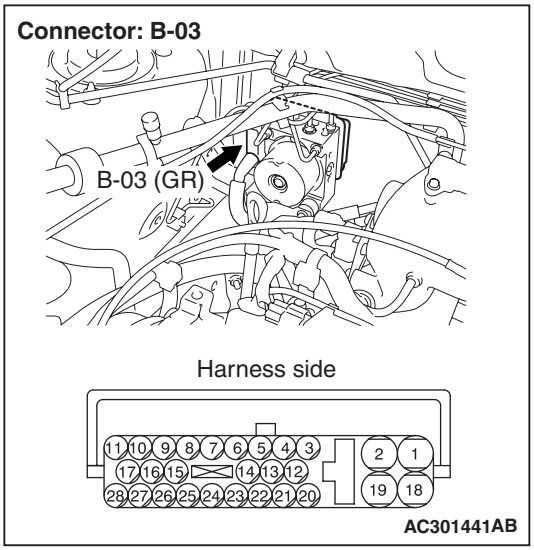
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 16 and 26) and ABS sensor <front: LH> connector A-13 (terminals 1 and 2) damaged?

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.00-6.

STEP 6. Check the harness wires between ABS-ECU connector B-03 (terminals 10 and 9) and ABS sensor <front: RH> connector A-31 (terminals 1 and 2).





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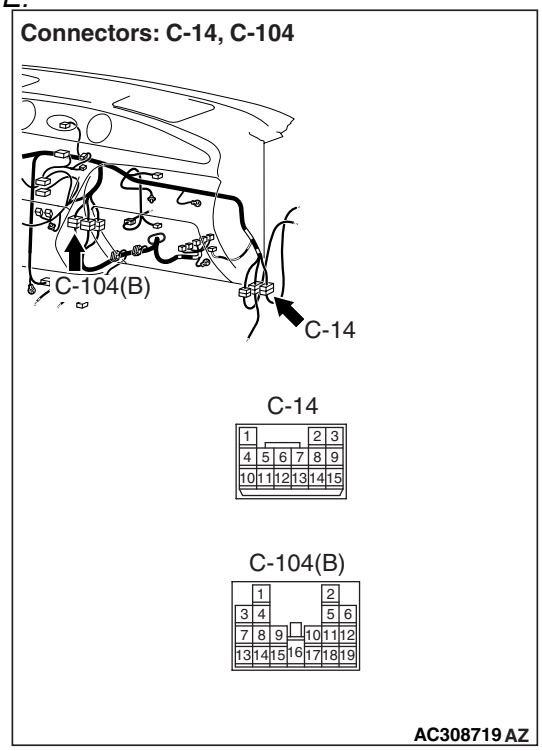
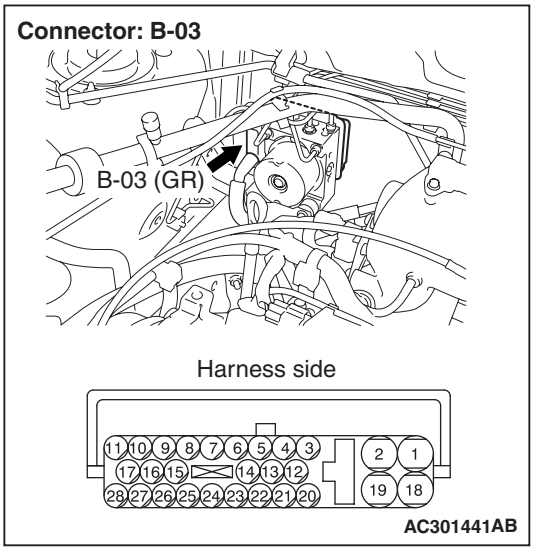
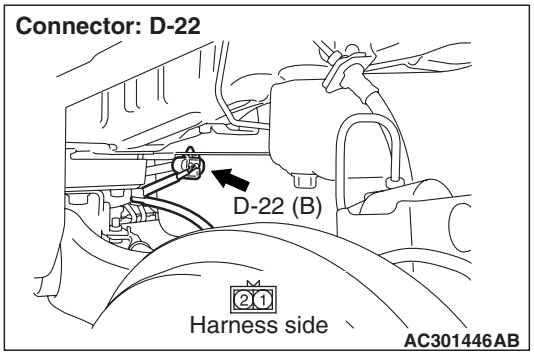


After inspecting ABS-ECU connector B-03, intermediate connectors C-14 and C-104, and ABS sensor <front: RH> connector A-31, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

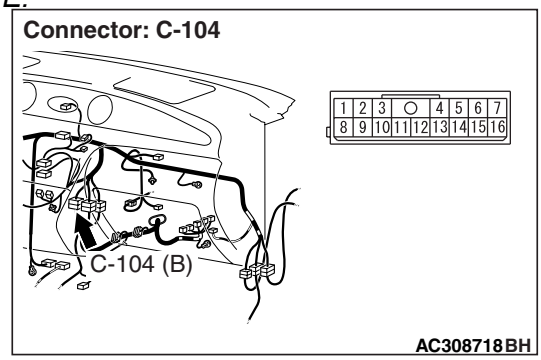
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 10 and 9) and ABS sensor <front: RH> connector A-31 (terminals 1 and 2) damaged?
YES : Repair it and go to Step 11.
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

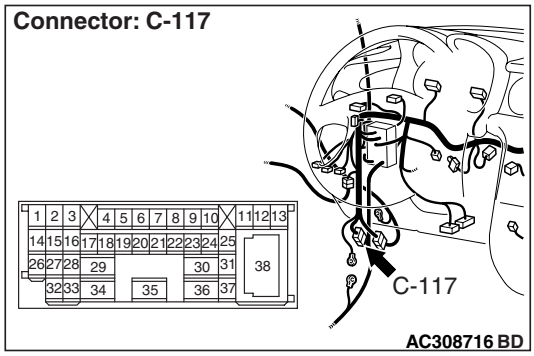
STEP 7. Check the harness wires between ABS-ECU connector B-03 (terminals 28 and 27) and ABS sensor <rear: LH> connector D-22 (terminals 1 and 2).

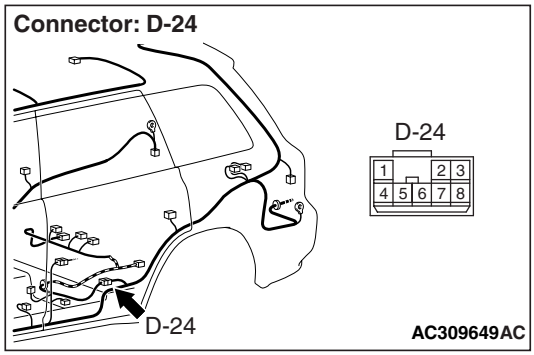




NOTE:



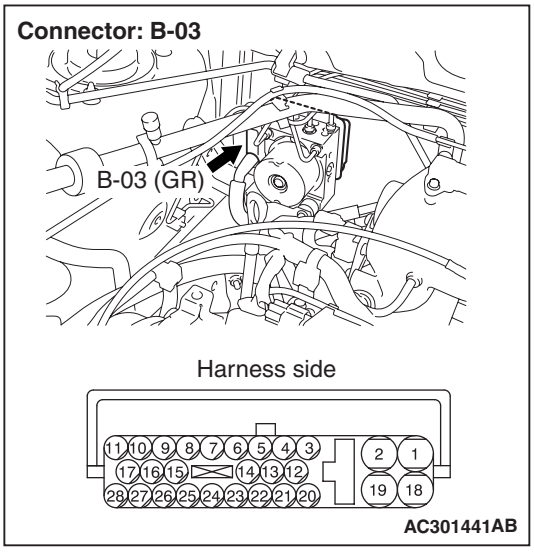


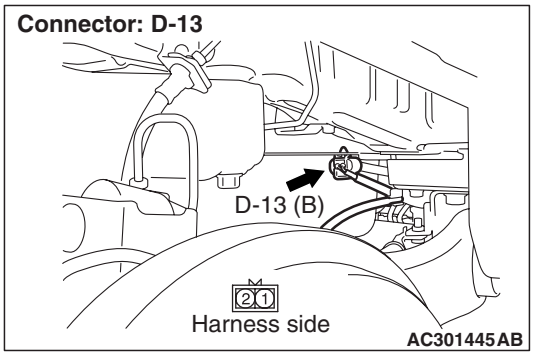


After inspecting ABS-ECU connector B-03, intermediate connectors C-104, C-117 and D-24, and ABS sensor <rear: LH> connector D-22, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 11.

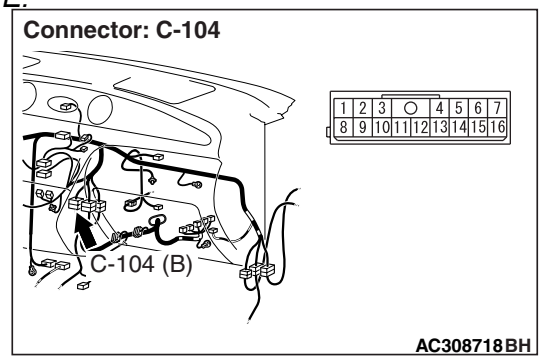
Q: Is any harness wire between ABS-ECU connector B-03 (terminals 28 and 27) and ABS sensor <rear: LH> connector D-22 (terminals 1 and 2) damaged?
YES : Repair it and then go to Step 11.
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

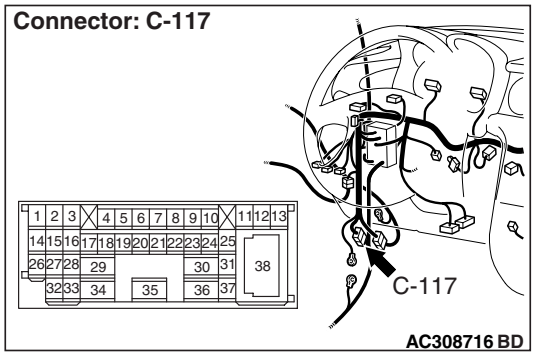
STEP 8. Check the harness wires between ABS-ECU connector B-03 (terminals 11 and 17) and ABS sensor <rear: RH> connector D-13 (terminals 1 and 2).

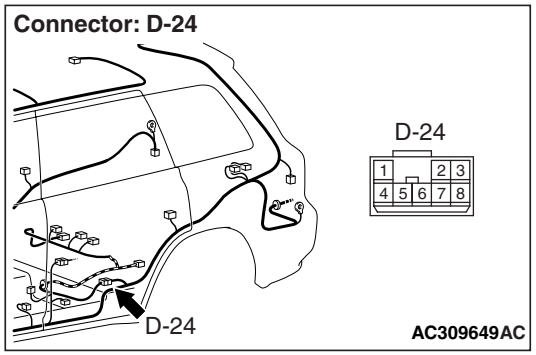




NOTE:







After inspecting ABS-ECU connector B-03, intermediate connectors C-104, C-117 and D-24, and ABS sensor <rear: RH> connector D-13, 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-03 (terminals 11 and 17) and ABS sensor <rear: RH> connector D-13 (terminals 1 and 2) damaged?
YES : Repair it and then go to Step 11.
NO : Go to Step 11.

STEP 9. Check the ABS sensor output voltage.

Refer to P.35B-50.

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.26-8.
<Rear (2WD)>: Refer to GROUP 27A, On-vehicle Service – Wheel Bearing Axial Play Check P.27A-4.
<Rear (4WD)>: Refer to GROUP 27B, On-vehicle Service – Wheel Bearing Axial Play Check P.27B-8.

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.

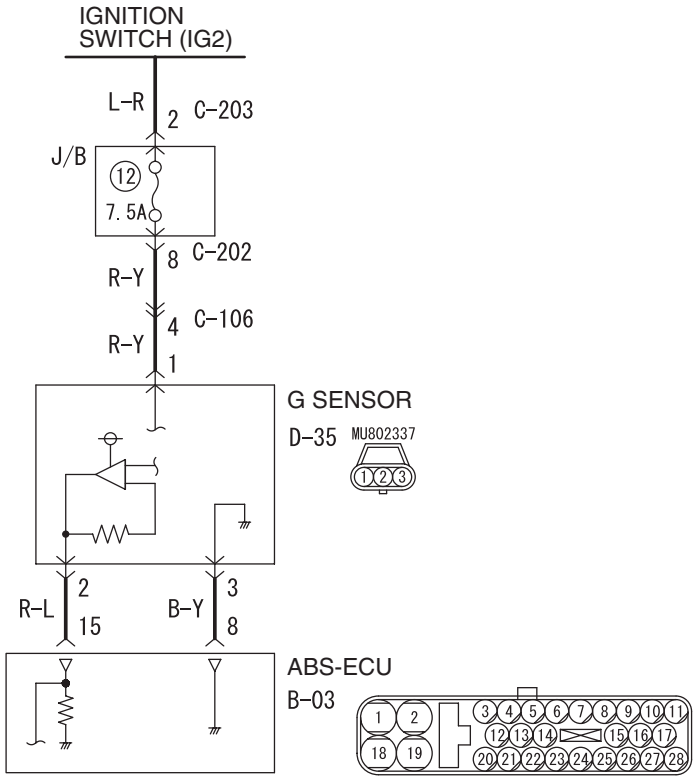
Q: Is diagnosis codes No.21, 22, 23 or 24 set?

YES : Start over at Step 1.

NO : The procedure is complete.

Code No.32 G-sensor System <4WD>

G-sensor 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

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AC301688 AD

OPERATION

The G-sensor detects the acceleration level in the forward/reverse direction of the vehicle, converts the signals into voltage signals and then sends that signal to the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS

This code is set in the following case.

- When the G-sensor output is 1.0V or lower or 4.0V or higher (disconnected G-sensor or G-sensor short circuit)
- If the G-sensor output power does not change (G-sensor output fastening).

PROBABLE CAUSES

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

- Malfunction of the G-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

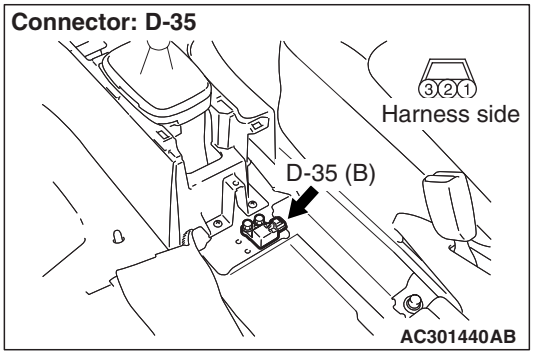
Set M.U.T.-II/III to data reading mode, and check the data list item.

- Item 32: G-sensor

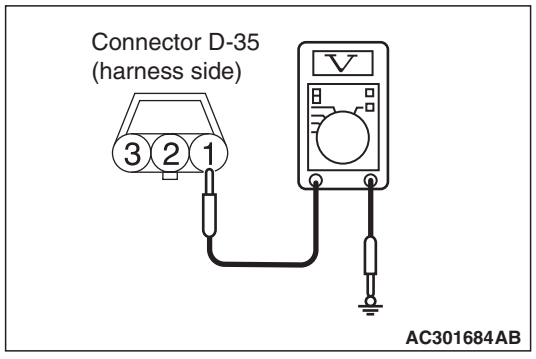
OK:
When vehicle is stationary (level): 2.4 – 2.6 V
When vehicle is being driven: 1.0 – 4.0 V

Q: Is the G-sensor input normal?
YES : This malfunctions is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 2.

STEP 2. Voltage measurement at the G-sensor connector D-35.



(1) Disconnect G-sensor connector D-35, and check at the harness side.
(2) Turn the ignition switch to the "ON" position.

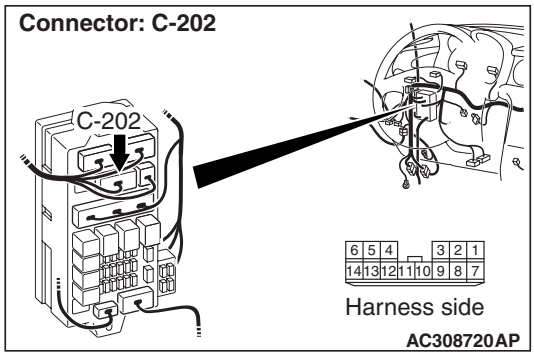


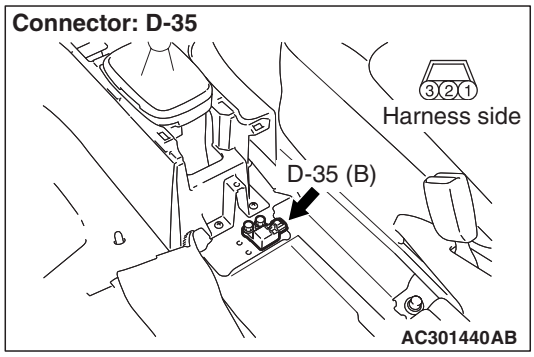
(3) Measure the voltage between terminal 1 and earth.

OK: System voltage

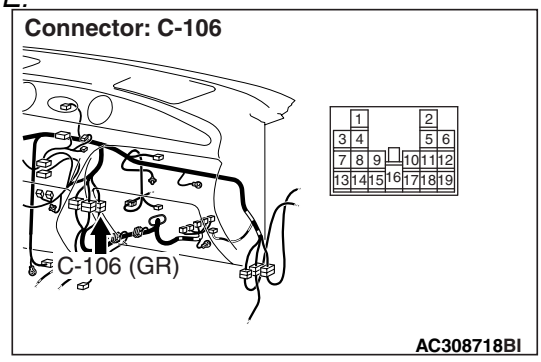
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the harness wire between junction block connector C-202 terminal 8 and G-sensor connector D-35 terminal 1.





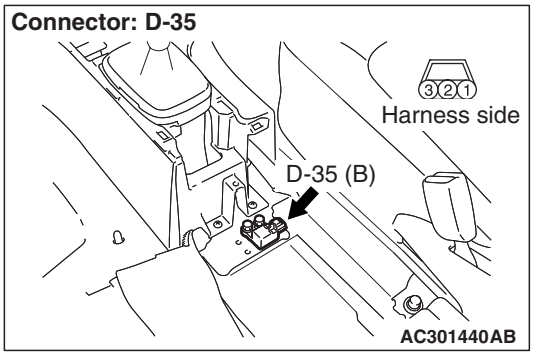
NOTE:



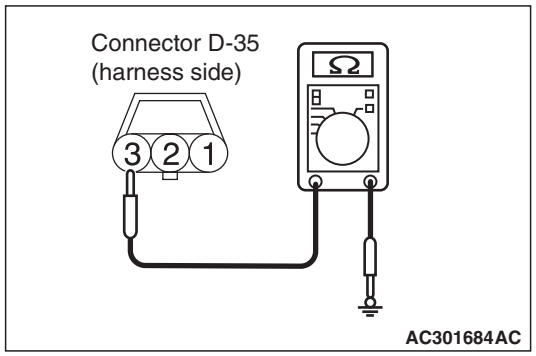
After inspecting the junction block connector C-202, intermediate connector C-106, and G-sensor connector D-35, inspect the wire. If any of these connector is damaged, repair or replace it. Then go to Step 8.

Q: Is the harness wire between junction block connector C-202 terminal 8 and G-sensor connector D-35 terminal 1 damaged?
YES : Repair it and go to Step 8.
NO : This malfunctions is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.

STEP 4. Resistance measurement at the G-sensor connector D-35.



(1) Disconnect G-sensor connector D-35, and check at the harness side.

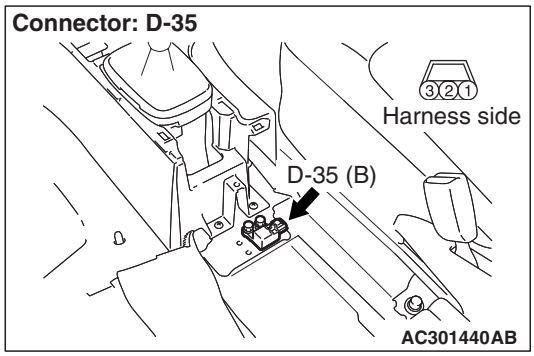


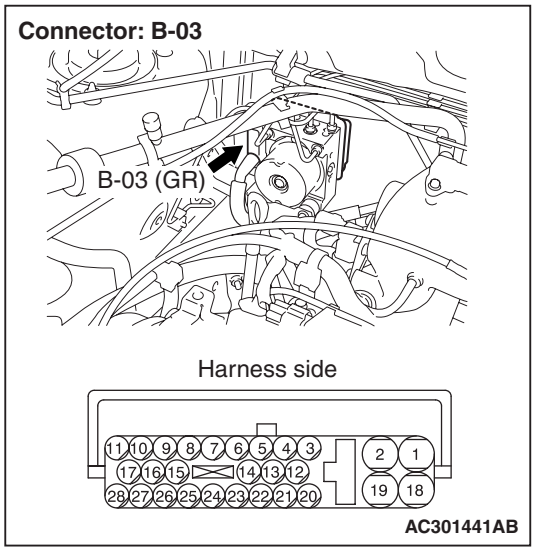
(2) Measure the resistance between terminal 3 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

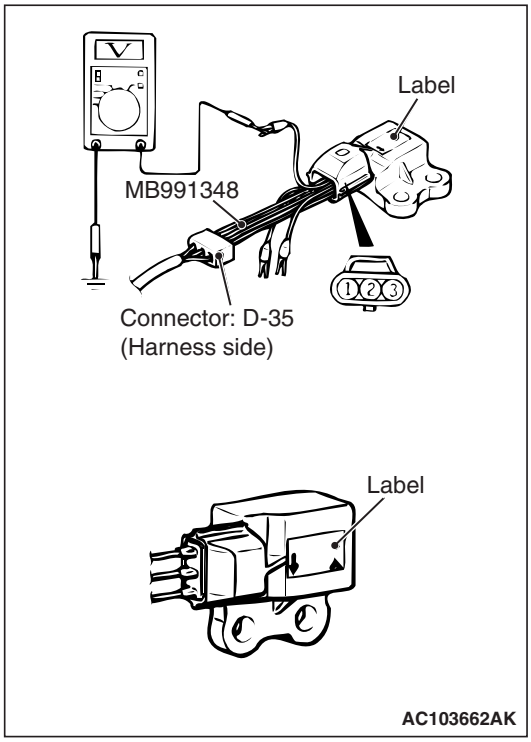
STEP 5. Check the harness wire between G-sensor connector D-35 terminal 3 and ABS-ECU connector B-03 terminal 8.





Q: Is the harness wire between G-sensor connector D-35 terminal 3 and ABS-ECU connector B-03 terminal 8 damaged?
YES : Repair it and go to Step 8.
NO : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.32 sets, replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 8 .

STEP 6. Check G-sensor output voltage.

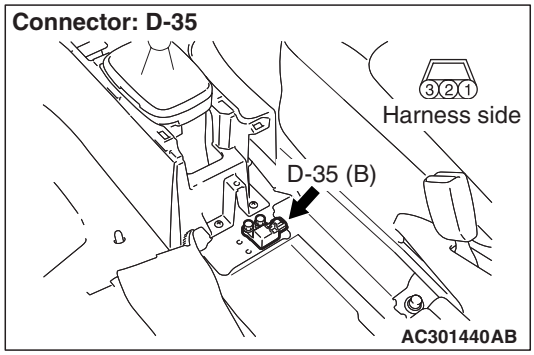


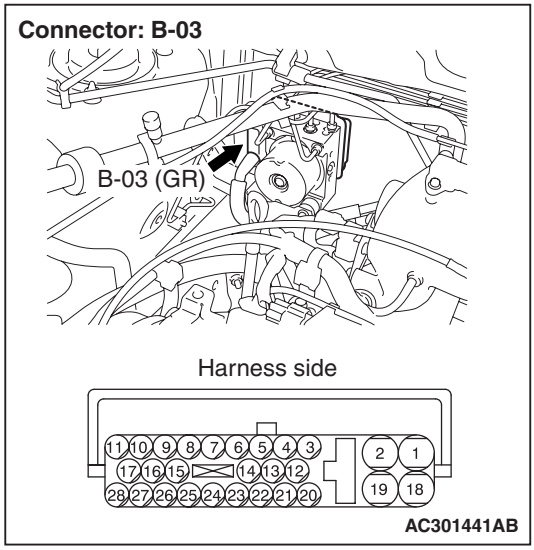
(1) Disconnect G-sensor connector D-35, and connect special tool harness set (MB991348) between the disconnected connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 2 and earth.

OK:
When vehicle is stationary (level): 2.4 – 2.6 V
When vehicle is being driven: 1.0 – 4.0 V

Q: Is G-sensor output voltage normal?
YES : Go to Step 7.
NO : Replace the G-sensor and go to Step 8.

STEP 7. Check the harness wire between G-sensor connector D-35 terminal 2 and ABS-ECU connector B-03 terminal 15.





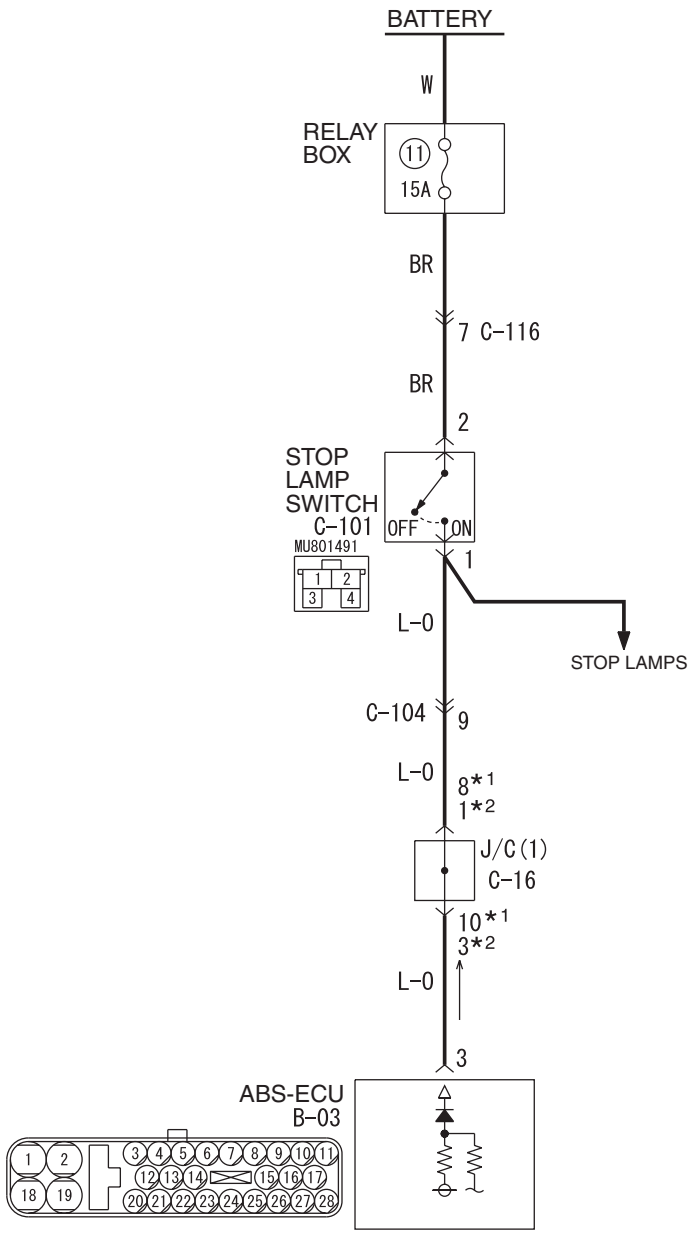
Q: Is the harness wire between G-sensor connector D-35 terminal 2 and ABS-ECU connector B-03 terminal 15 damaged?
YES : Repair it and go to Step 8.
NO : Erase the diagnosis code memory, and recheck if any diagnosis code sets. If diagnosis code No.32 sets, replace the hydraulic unit (integrated with ABS-ECU) and then go to Step 8 .

STEP 8. Check whether the diagnosis code is reset.

Q: Is diagnosis code No.32 set?
YES : Start over at Step 1.
NO : The procedure is complete.

Code No.33 : Stop Lamp Switch System

Stop Lamp Switch Circuit



NOTE
*1: 2000
*2: 2400

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

W4Z35E00AA

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.

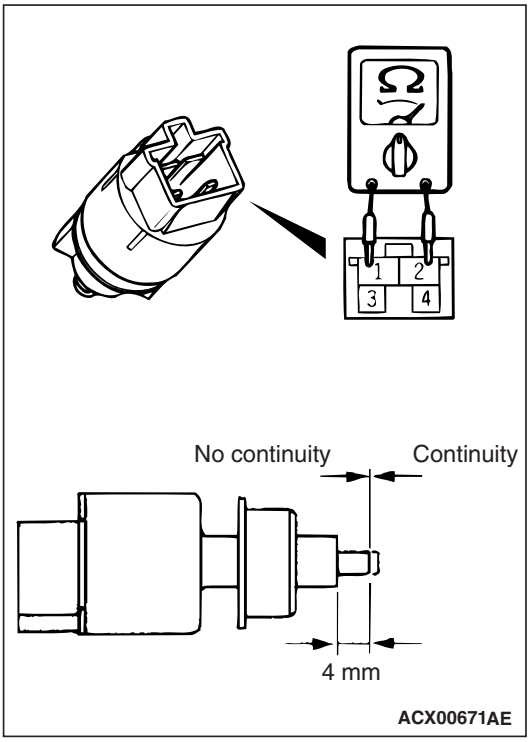
Q: Does the stop lamp come on and go out correctly?
YES : Go to Step 4.
NO : Go to Step 2.

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

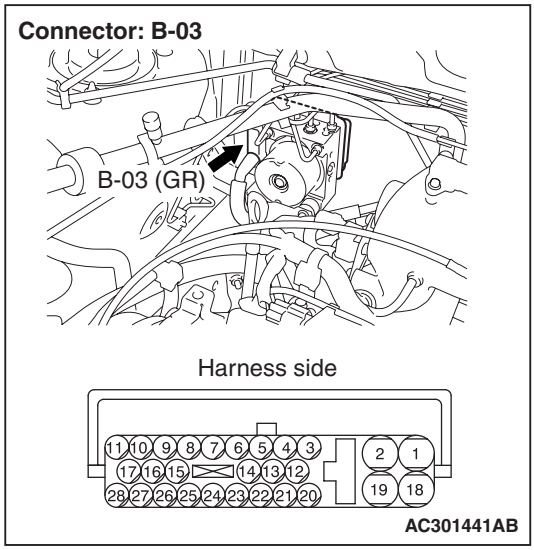
  OK:
  Brake pedal stepped down: ON
  Brake pedal released: OFF

Q: Is the stop lamp switch input normal?

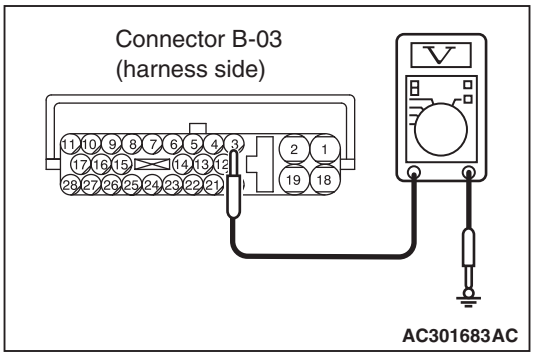
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

NO : Go to Step 5.

STEP 5. Voltage measurement at the ABS-ECU connector B-03.



(1) Disconnect ABS-ECU connector B-03 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.

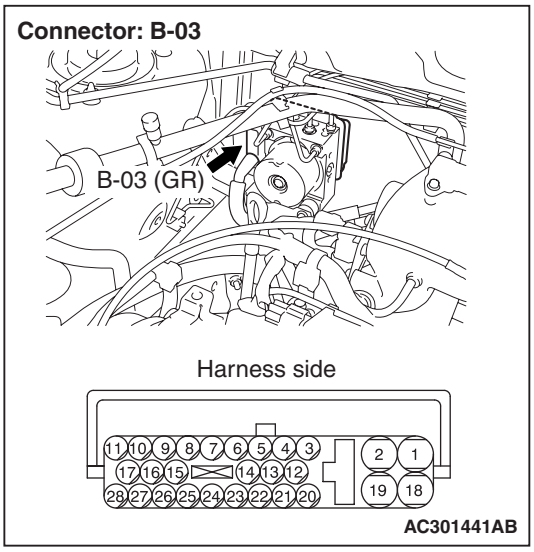
OK: System voltage

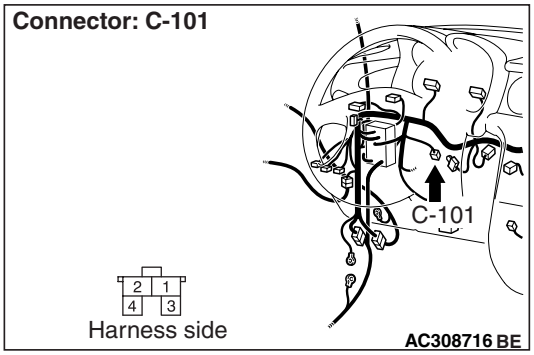
Q: Is the check result normal?

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.

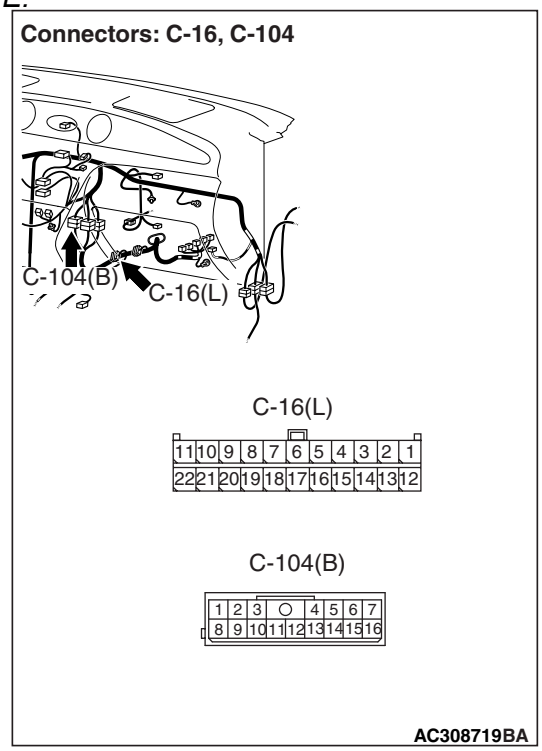
NO : Go to Step 6.

STEP 6. Check the harness wire between ABS-ECU connector B-03 terminal 3 and stop lamp switch connector C-101 terminal 1.





NOTE:



After inspecting ABS-ECU connector B-03, intermediate connectors C-16 and C-104, and stop lamp switch connector C-101, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 7.

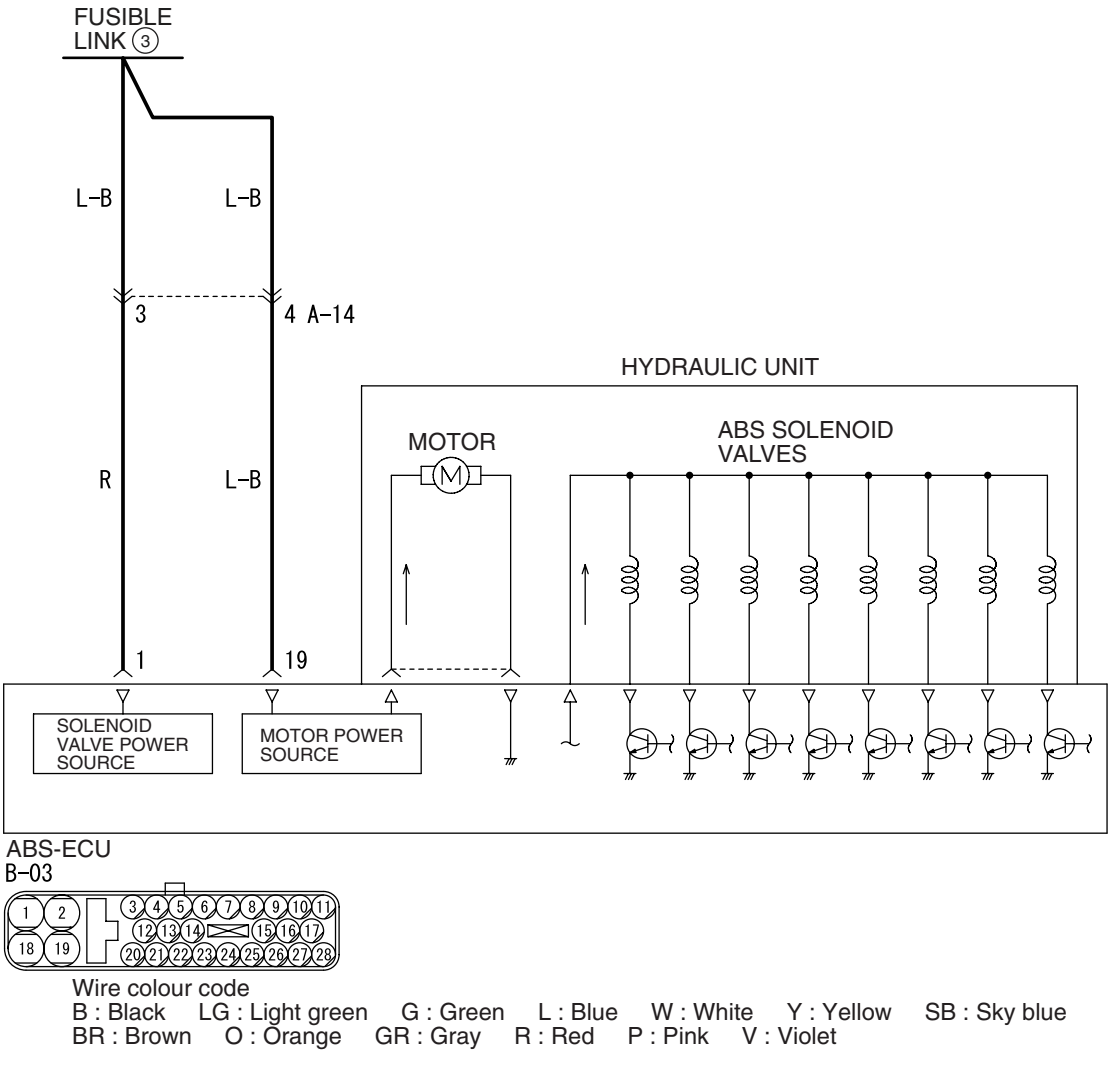
Q: Is the harness wire between ABS-ECU connector B-03 terminal 3 and stop lamp switch connector C-101 terminal 1 damaged?
YES : Repair it and then go to Step 7.
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

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, 42, 43, and 44: 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

W3Z01E05AA
AC301690AB

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.

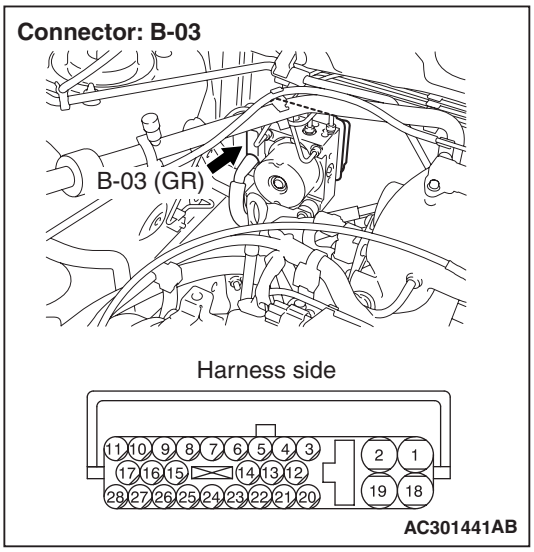
PROBABLE CAUSES

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

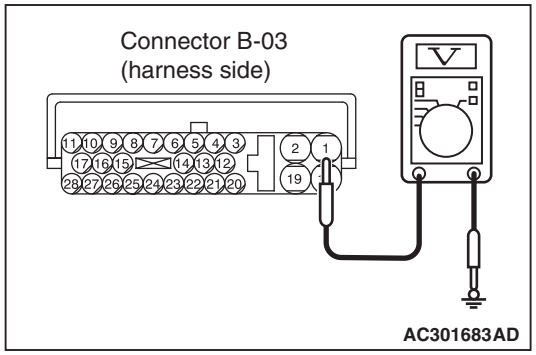
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

STEP 1. Voltage measurement at the ABS-ECU connector B-03.



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



(2) Measure the voltage between terminal 1 and earth, and 19 and earth.

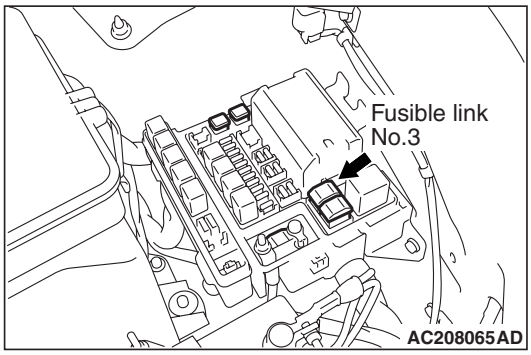
OK: System voltage

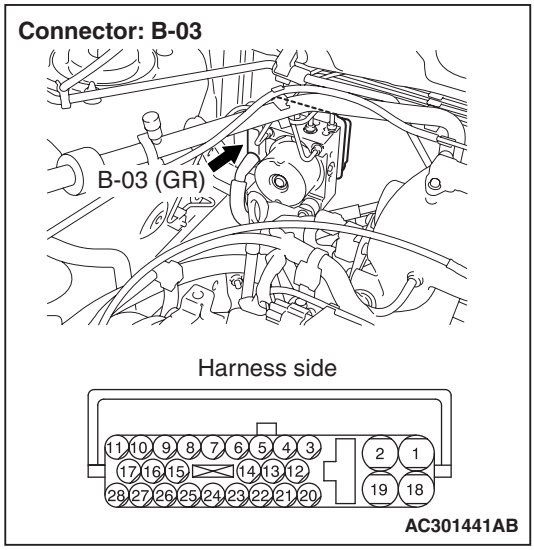
Q: Is the check result normal?

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.00-6.

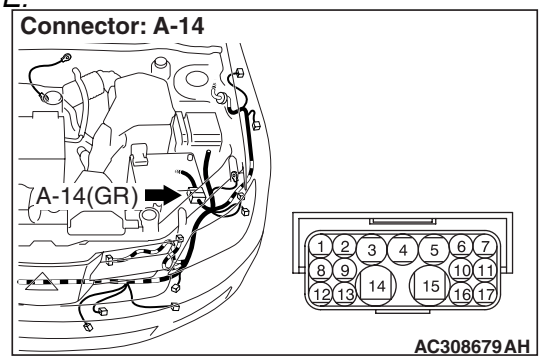
NO : Go to Step 2.

STEP 2. Check the harness wires between fusible link number 3 and ABS-ECU connector B-03 (terminals 1 and 19).





NOTE:



After inspecting intermediate connector A-14, 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-03 (terminal 1 and 19) damaged?

YES : Repair it and 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.00-6.

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

M1352011400857

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.

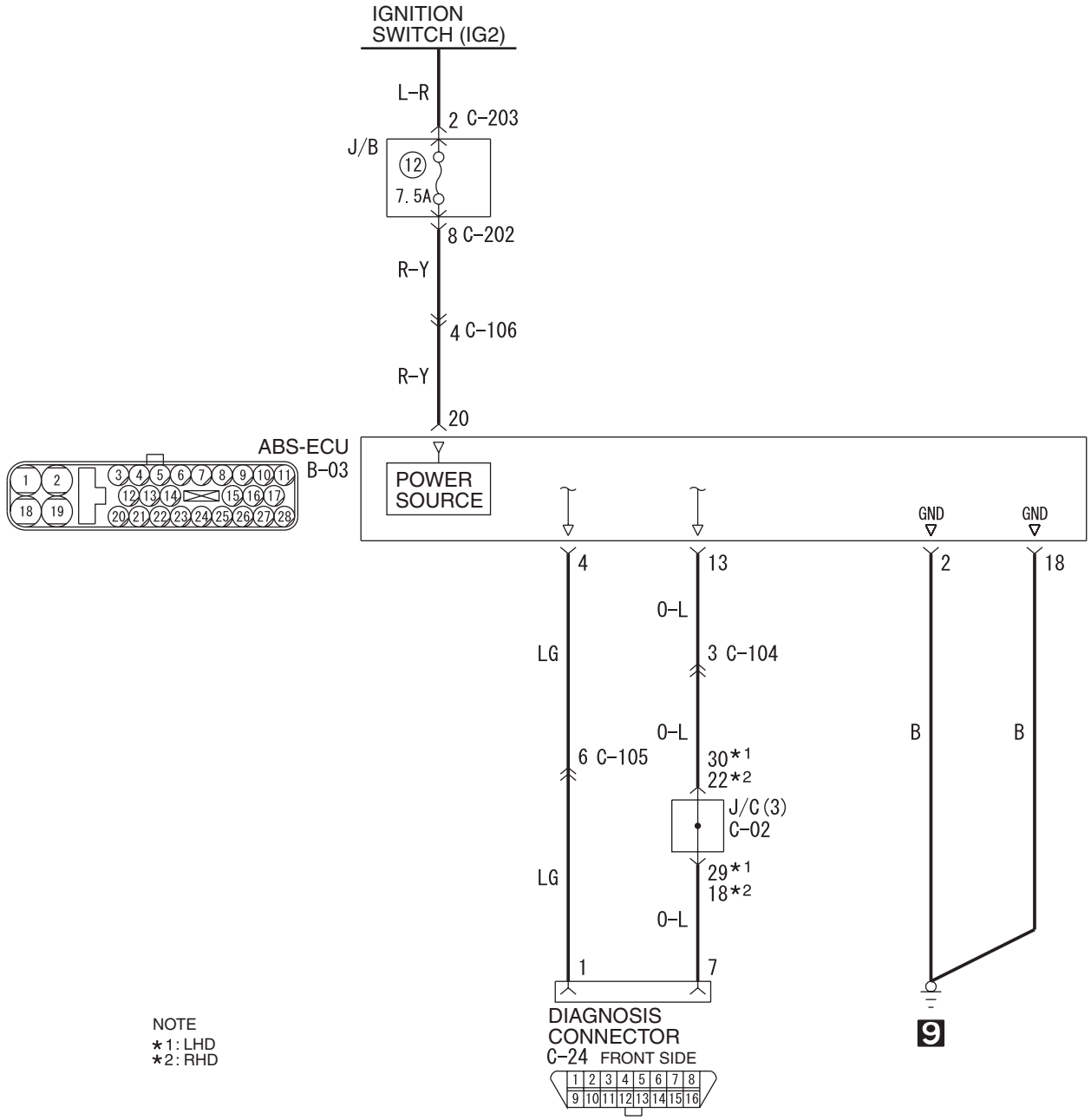
NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

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-182 <2000-Non-Turbo> GROUP 13B, Diagnosis P.13B-252 <2000-Turbo> GROUP 13C, Diagnosis P.13C-282 <2400>
Communication between M.U.T.-II/III and the ABS-ECU is not possible.	1	P.35B-35
When the ignition switch is turned to the "ON" position (Engine stopped), the ABS warning lamp does not illuminate.	2	P.35B-40
The ABS warning lamp remains illuminated after the engine is started.	3	P.35B-44
Faulty ABS operation	4	P.35B-46

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

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

Diagnosis Connector 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

W4Z35E02AA

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 grounded, 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.

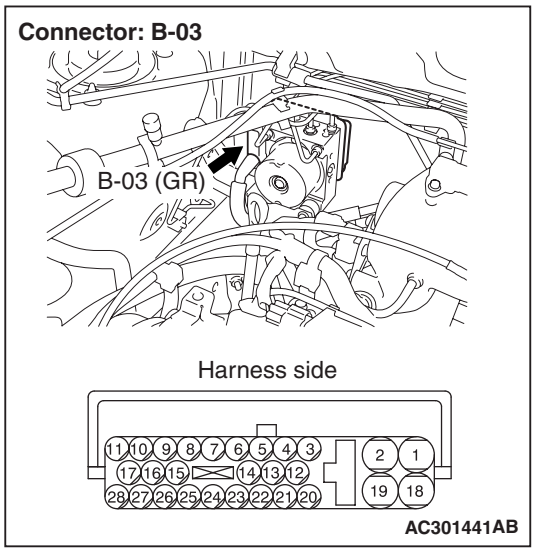
PROBABLE CAUSES

The most likely causes for this case are:

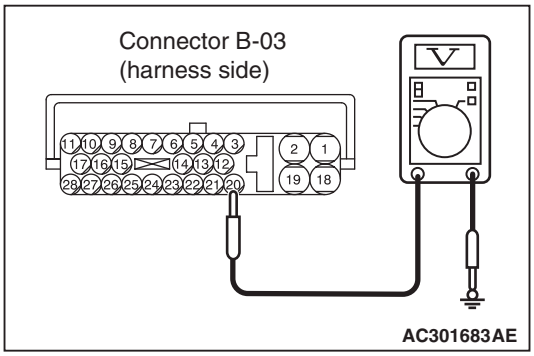
- Blown fuse
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (Integrated with ABS-ECU)

DIAGNOSIS

STEP 1. Voltage measurement at the ABS-ECU connector B-03.



(1) Disconnect ABS-ECU connector B-03 and measure at the harness side.
(2) Start the engine.

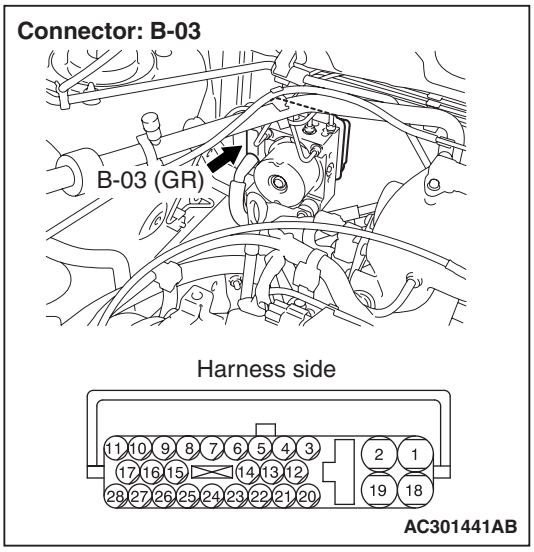


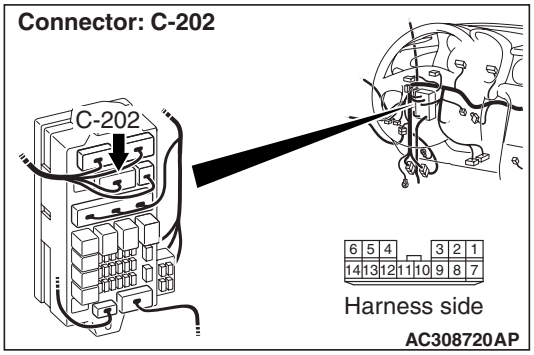
(3) Measure the voltage between terminal 20 and earth.

OK: System voltage

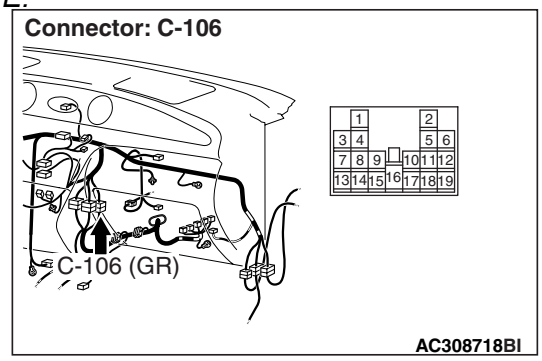
Q: Is the check result normal?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the harness wire between junction block connector C-202 terminal 8 and ABS-ECU connector B-03 terminal 20.





NOTE:



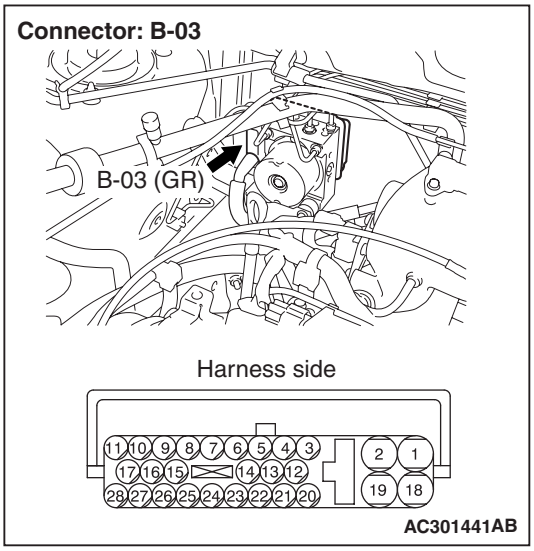
After inspecting ABS-ECU connector B-03, junction block connector C-202 and intermediate connector C-106, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 5.

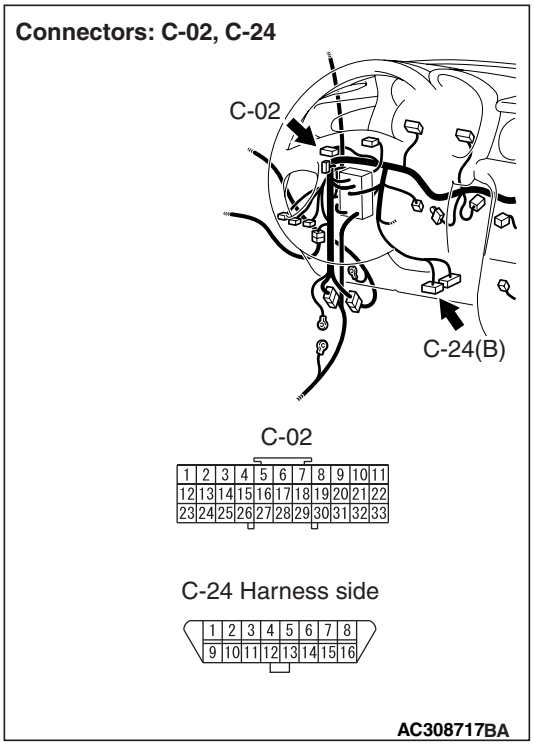
Q: Is the harness wire between junction block connector C-202 terminal 8 and ABS-ECU connector B-03 terminal 20 damaged?

YES : Repair it and go to Step 5.

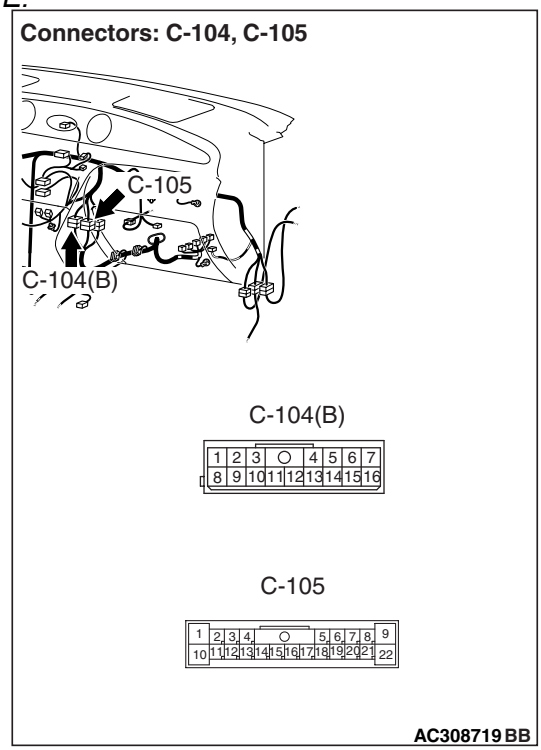
NO : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

STEP 3. Check the harness wires between ABS-ECU connector B-03 (terminals 4 and 13) and diagnosis connector C-24 (terminals 1 and 7).





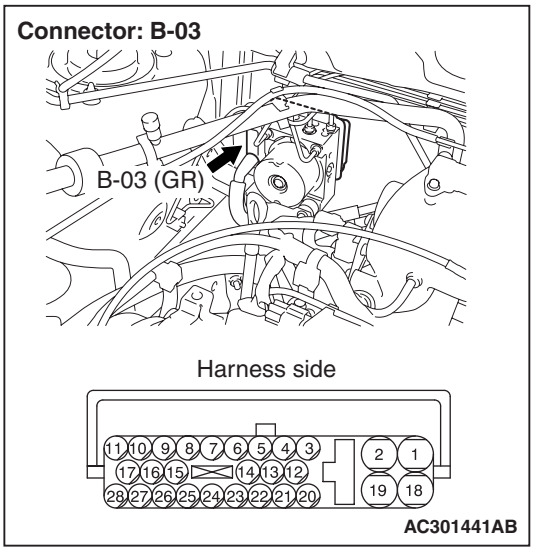
NOTE:

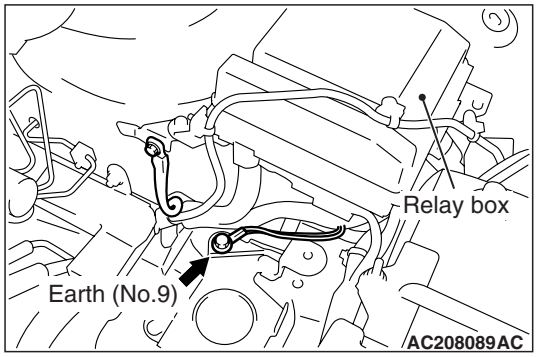


After inspecting ABS-ECU connector B-03, diagnosis connector C-24, and intermediate connectors C-02, C-104 and C-105, inspect the wires. If any of these connectors is damaged, repair or replace it. Then go to Step 5.

Q: Is any of the harness wires between ABS-ECU connector B-03 (terminals 4 and 13) and diagnosis connector C-24 (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-03 (terminals 2 and 18) and earth (No.9).





Q: Is any of the harness wires between ABS-ECU connector B-03 (terminals 2 and 18) and earth (No.9) damaged?

YES : Repair it and then go to Step 5.

NO : Check the troubleshooting condition. To reproduce the troubleshooting state replace the hydraulic unit (integrated with ABS-ECU).Then go to Step 5. If the state of failure 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.00-6.

STEP 5. Retest the system.

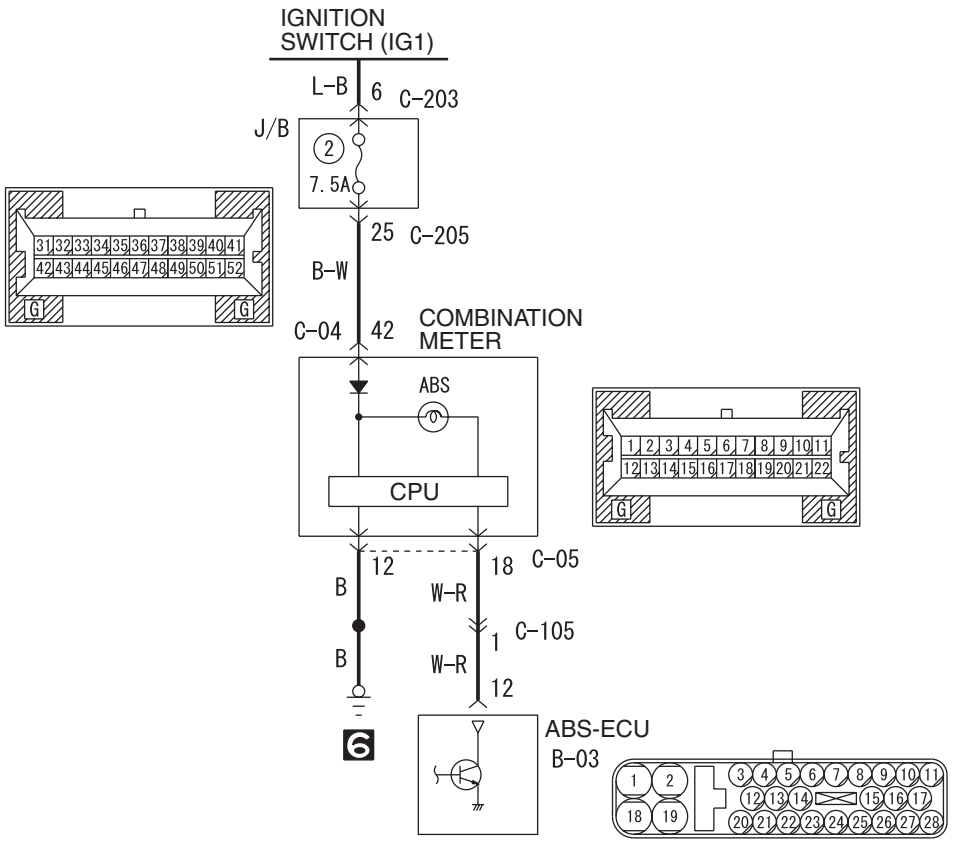
Q: Does the M.U.T.-II/III communicate with the ABS system?

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



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

AC605306
W4Z35E03AA

OPERATION

- The ABS warning lamp is lit up by transistor control in the ABS-ECU. However, the relationship of the reverse circuit movement in the combination meter will vary from usual in terms of transistor ON/OFF and ABS warning lamp ON/OFF, in that the ABS warning lamp will lamp up when the transistor is turned OFF for this circuit. This is how the ABS warning lamp lights up even when the ABS-ECU connector is connected improperly or if the ABS-ECU function has terminated.
- The ABS-ECU also lights up the ABS warning lamp during the initial check (approximately 3 seconds) when the ignition switch is turned to the "ON" position in addition to when the system is malfunctioning.

COMMENT ON TROUBLE SYMPTOM

Possible causes include the combination meter power circuit, disconnected earth circuit, dead lamp bulb, or short circuited ABS warning lamp.

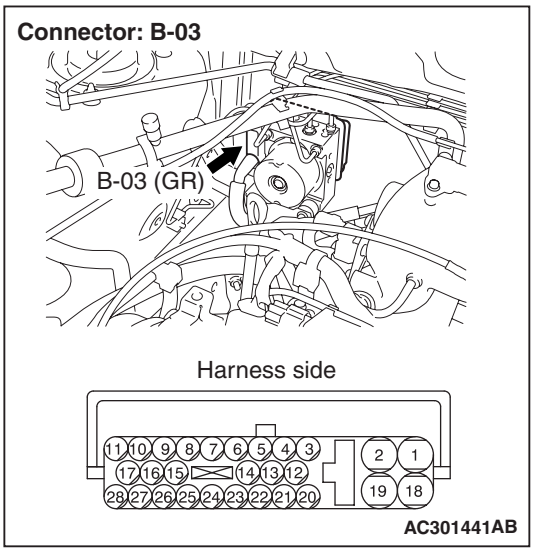
PROBABLE CAUSES

The most likely causes for this case are:

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

DIAGNOSIS

STEP 1. Check the ABS warning lamp circuit at ABS-ECU connector B-03.



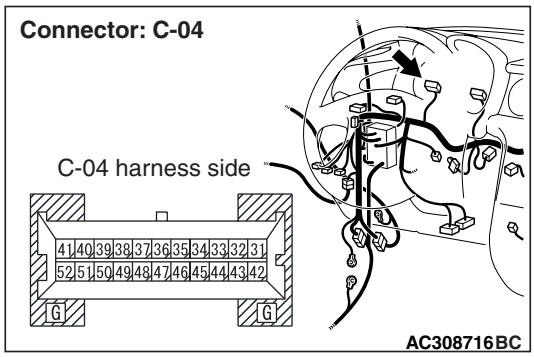
(1) Disconnect ABS-ECU connector B-03.
(2) Turn the ignition switch to the "ON" position.

Q: Does the ABS warning lamp illuminate?
YES : To check and reproduce the state of malfunction replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 7. If the malfunction is not reproduced, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-6.
NO : Go to Step 2.

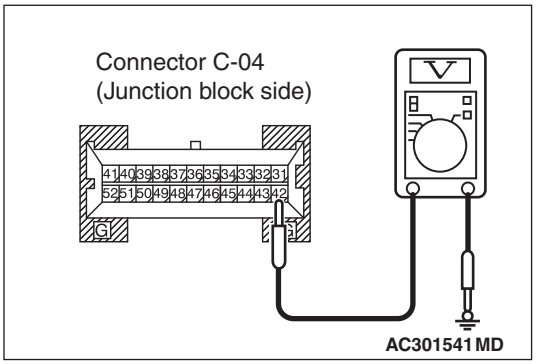
STEP 2. Check the ABS warning lamp bulb.
(1) Remove the combination meter (Refer to GROUP 54A, Combination Meter P.54A-60).
(2) Check the ABS warning lamp bulb.

Q: Is the bulb burned out?
YES : Replace the bulb and then go to Step 7.
NO : Go to Step 3.

STEP 3. Voltage measurement at the combination meter connector C-04.



(1) Disconnect connector C-04, and check at the harness side.
(2) Turn the ignition switch to the "ON" position.

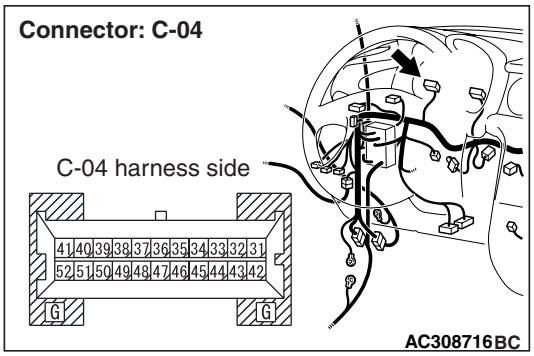


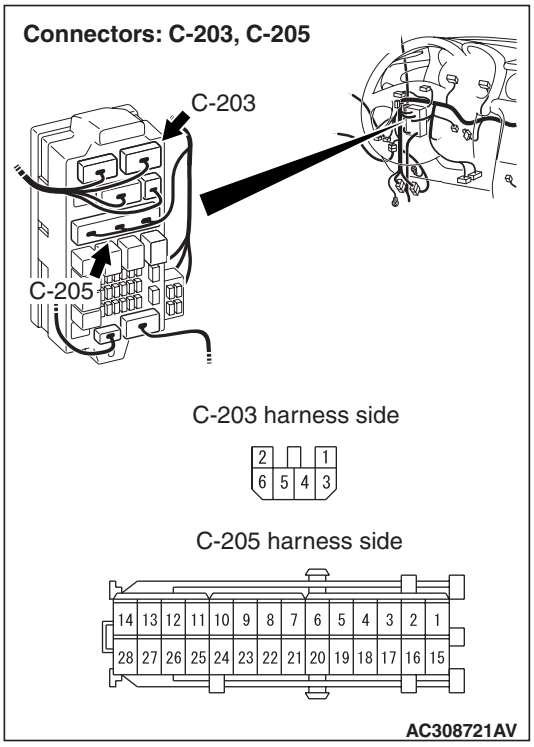
(3) Measure the voltage between terminal 42 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the harness wire between junction block connector C-203 terminal 6 and combination meter C-04 terminal 42.

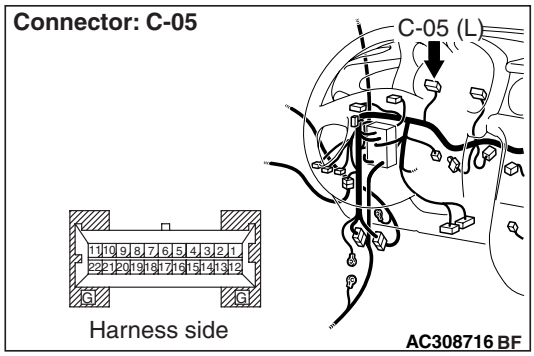


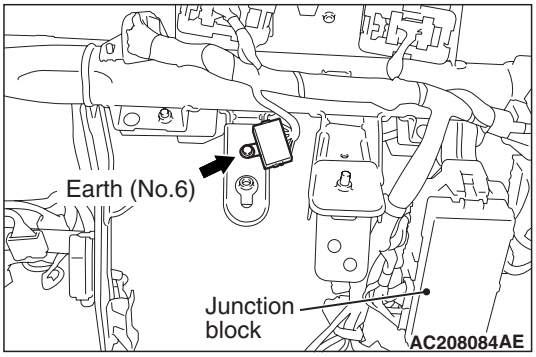


NOTE: After inspecting junction block connectors C-203 and C-205, and combination meter connector C-04, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 7.

Q: Is the harness wire between junction block connector C-203 terminal 6 and combination meter C-04 terminal 42 damaged?
YES : Repair the harness wire and 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.00-6.

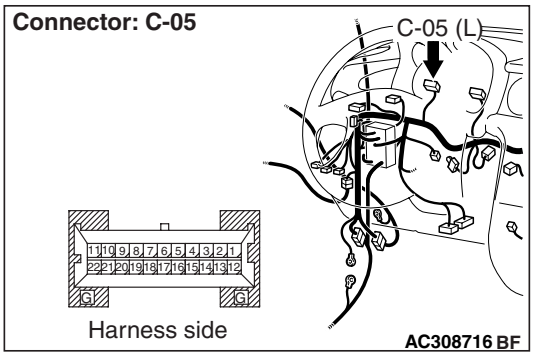
STEP 5. Check the harness wire between the combination meter connector C-05 terminal 12 and earth (No.6).

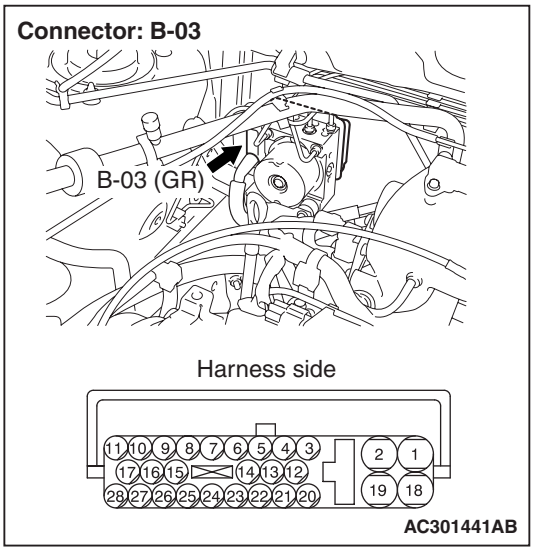




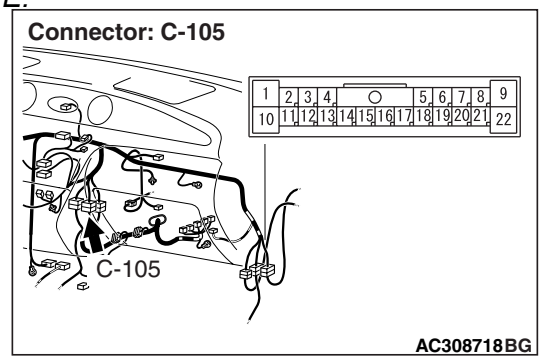
Q: Is the harness wire between combination meter connector C-05 terminal 12 and earth (No.6) damaged?
YES : Repair the harness wire and go to Step 7.
NO : Go to Step 6.

STEP 6. Check the harness wire between the combination meter connector C-05 terminal 18 and ABS-ECU connector B-03 terminal 12.





NOTE:



After inspecting combination meter connector C-05, ABS-ECU connector B-03 and intermediate connector C-105, 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 the combination meter connector C-05 terminal 18 and ABS-ECU connector B-03 terminal 12 damaged?
YES : Repair the harness wire and go to Step 7.
NO : Replace the combination meter and go to Step 7.

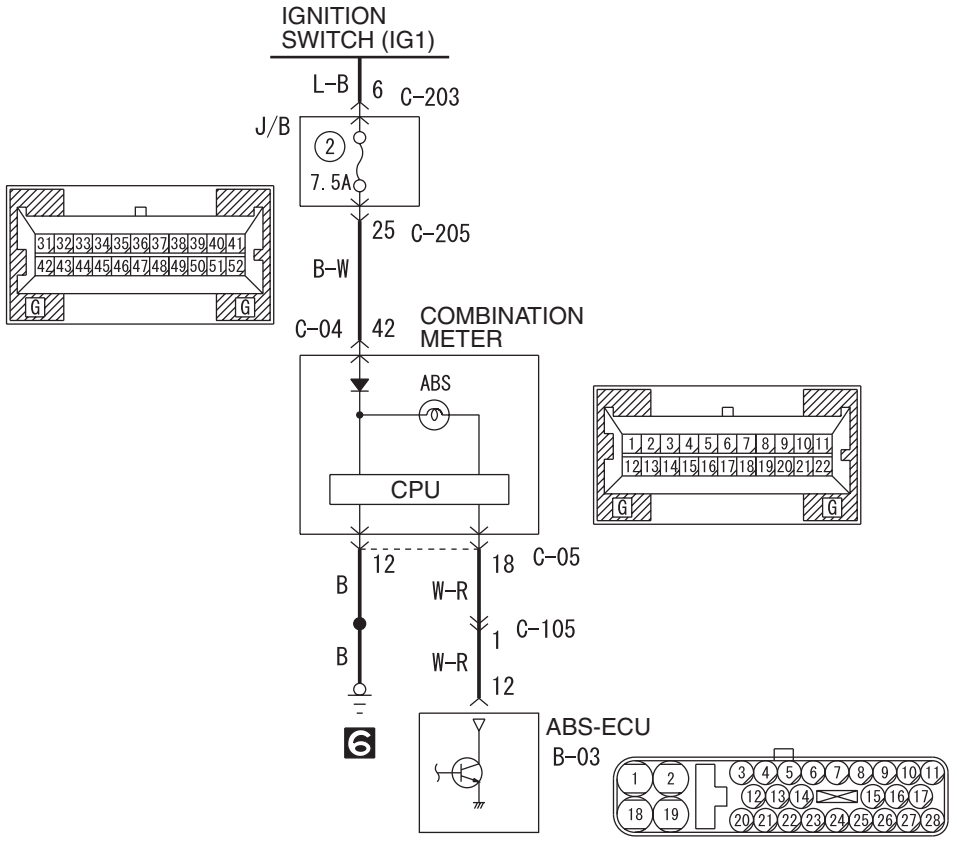
STEP 7. Retest the system.

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 : Start over at 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 : Gray R : Red P : Pink V : Violet

AC605306
W4Z35E03AA

OPERATION

Refer to P.35B-40.

COMMENT ON TROUBLE SYMPTOM

Disconnected ABS warning lamp output line of ABS-ECU is suspected.

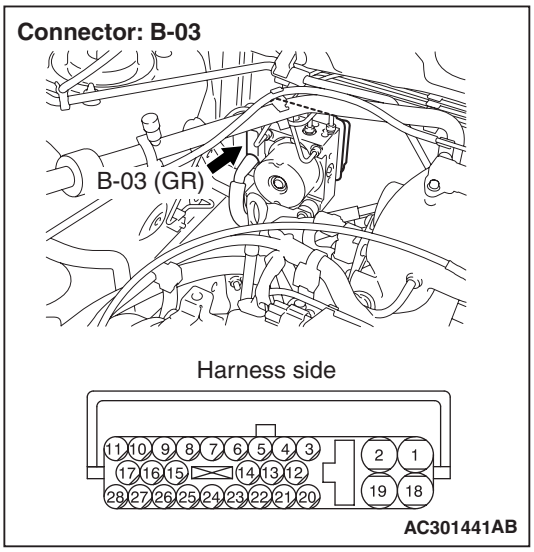
PROBABLE CAUSES

The most likely causes for this case are:

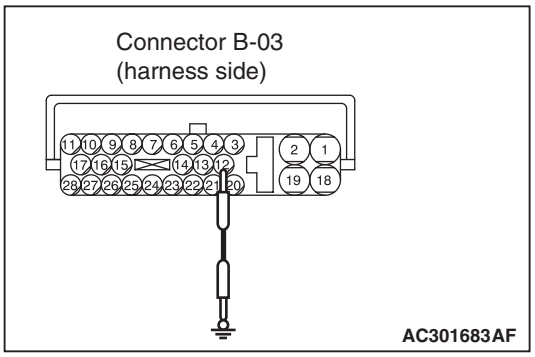
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Malfunction of the combination meter

DIAGNOSIS

STEP 1. Check the ABS warning lamp circuit at ABS-ECU connector B-03.



(1) Disconnect ABS-ECU connector B-03.



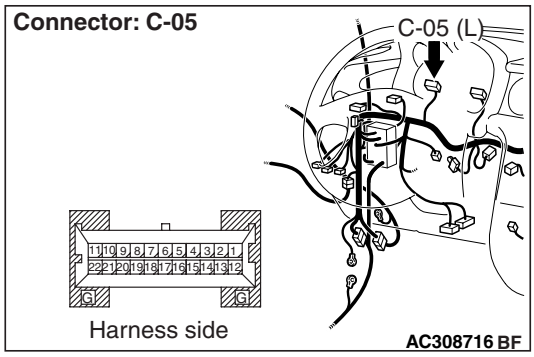
(2) Connect ABS-ECU connector B-03 terminal number 12 to earth.
(3) Turn the ignition switch to the "ON" position.

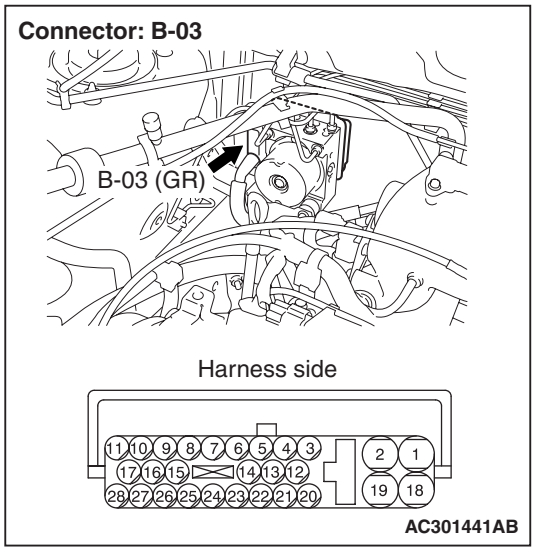
Q: Does the ABS warning lamp go off?

YES : To check and reproduce the state of malfunction replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 3. If the malfunction is not reproduced, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope With Intermittent Malfunction P.00-6.

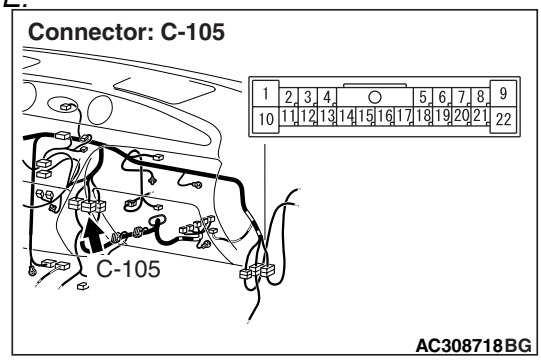
NO : Go to Step 2.

STEP 2. Check the harness wire between the combination meter connector C-05 terminal 18 and ABS-ECU connector B-03 terminal 12.





NOTE:



After inspecting combination meter connector C-05, ABS-ECU connector B-03 and intermediate connector C-105, inspect the wire. If any of these connectors is damaged, repair or replace it. Then go to Step 3.

Q: Is the harness wire between combination meter connector C-05 terminal 18 and ABS-ECU connector B-03 terminal 12 damaged?

YES : Repair the harness wire and then go to Step 3.

NO : Replace the combination meter (printed circuit board) and then go to Step 3.

STEP 3. Retest the system.

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

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-52). If the hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1352011500661

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 valve
11	Front-right ABS sensor	Perform a test run	Vehicle speeds displayed on the speedometer and M.U.T.-II/III are identical.
12	Front-left ABS sensor		
13	Rear-right ABS sensor		
14	Rear-left ABS sensor		
21	ABS-ECU power supply voltage	Ignition switch: ON	10 – 16 V
32	G-sensor <4WD>	• Ignition switch: ON • When vehicle is parked on a level surface.	2.4 – 2.6 V
		When vehicle is accelerated	4.0 – 1.0 V
		When vehicle is decelerated	1.0 – 4.0 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 REFERENCE TABLE

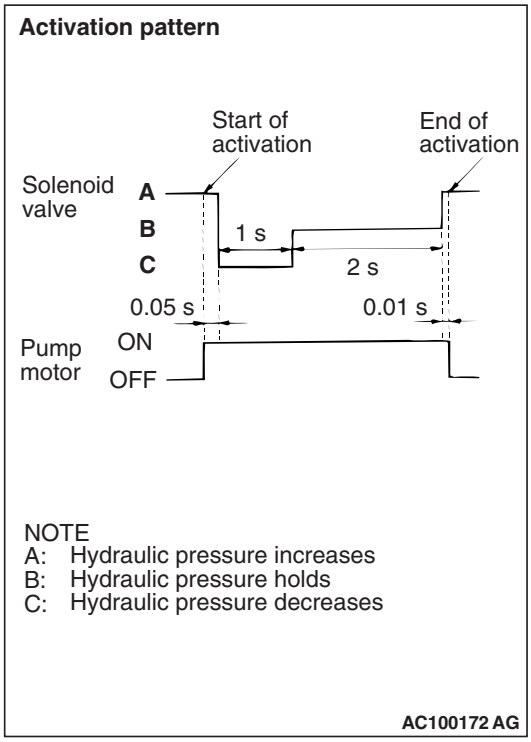
M1352011600679

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.

ACTUATOR TEST SPECIFICATIONS

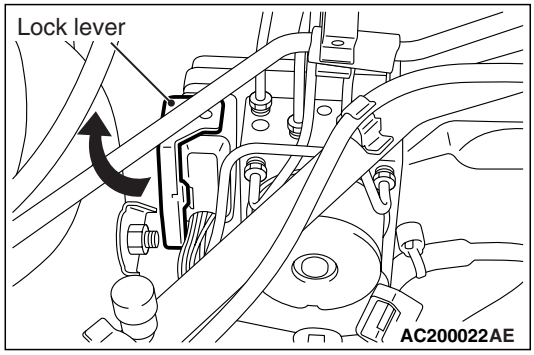


No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

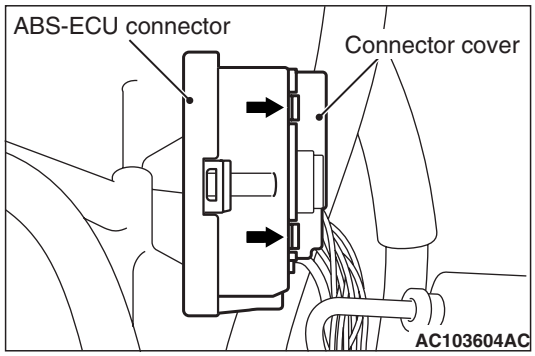
CHECK AT ABS-ECU

M1352011800640

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

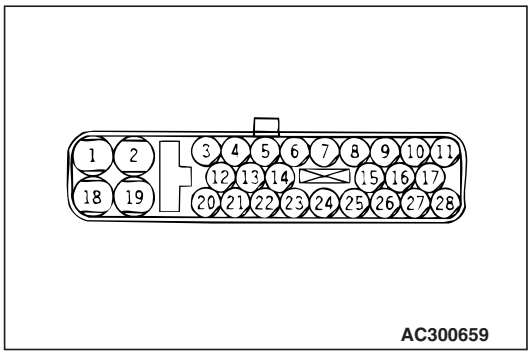


1. Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the ABS-ECU connector.



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

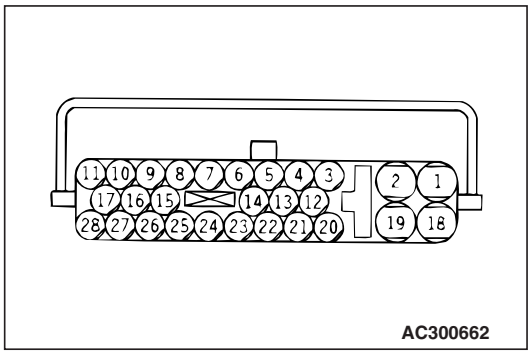


1. Measure the voltages between earth terminal (2) or (18) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

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
8	G-sensor earth <4WD>	Always		Approximately 0 V
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
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
15	G-sensor input <4WD>	• Ignition switch: "ON" • Horizontal state of vehicle		2.4 – 2.6 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



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

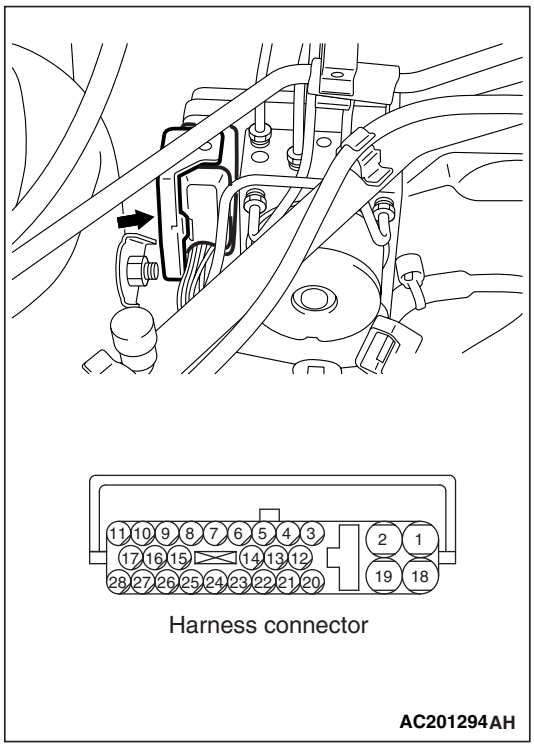
ABS-ECU terminal No.	Signal	Normal condition
9 – 10	Front-right ABS sensor	1.24 – 1.64 kΩ
11 – 17	Rear-right ABS sensor	1.24 – 1.64 kΩ
16 – 26	Front-left ABS sensor	1.24 – 1.64 kΩ
27 – 28	Rear-left ABS sensor	1.24 – 1.64 kΩ
2 – body earth	Earth	Continuity (2 Ω or less)
18 – body earth	Earth	Continuity (2 Ω or less)

ON-VEHICLE SERVICE

ABS SENSOR OUTPUT VOLTAGE MEASUREMENT

M1352001600485

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

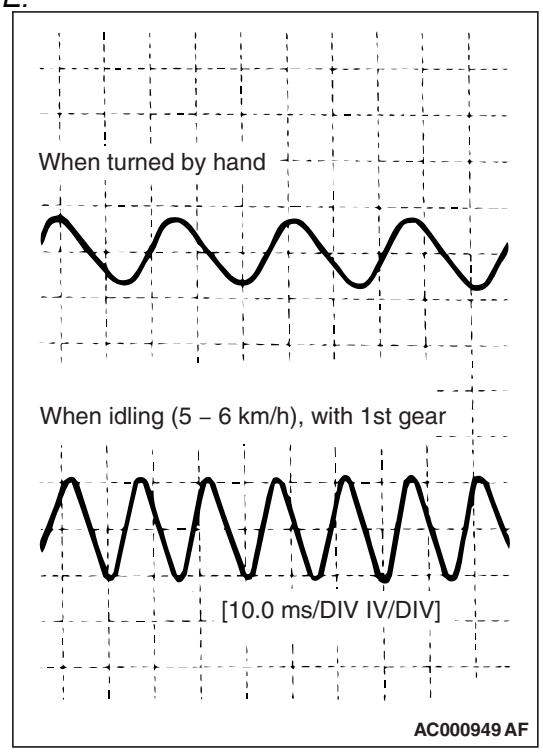
Output voltage:
42 mV or higher when measured using a multimeter
120 mVP-P or higher when measured using a oscilloscope

3. If the output voltage is lower than that given above, the cause may be the following, so check or replace the ABS sensor if necessary.
   - ABS sensor pole piece-to-ABS rotor clearance too large
   - Faulty ABS sensor

WAVE PATTERN INSPECTION USING AN OSCILLOSCOPE

After checking the connection of the ABS sensor harness and the connector, take a reading of the output voltage wave patterns for each ABS sensor using an oscilloscope as follows.
Start the engine, the transmission shift lever to 1st gear, 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 ABS sensor or excessive gap between it and the ABS rotor	Replace ABS 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 ABS sensor	Replace ABS sensor
	Open circuit in harness	Repair harness wire
	Incorrectly mounted ABS sensor	Mount ABS sensor correctly
	ABS rotor with missing or damaged teeth	Replace ABS rotor

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

HYDRAULIC UNIT CHECK

M1352001700620

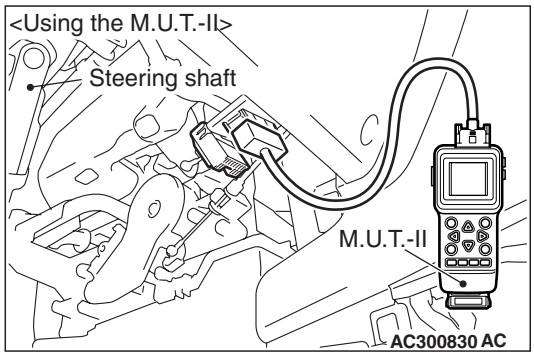
⚠ CAUTION

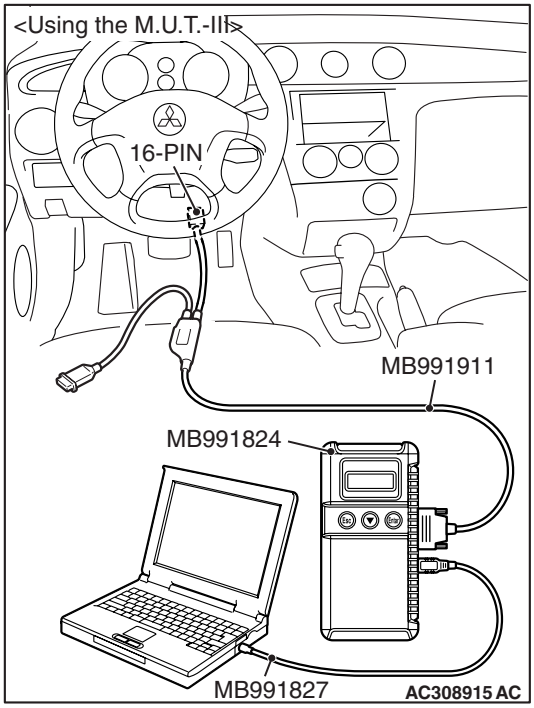
- **The roller of the braking force tester and the tyre should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

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.

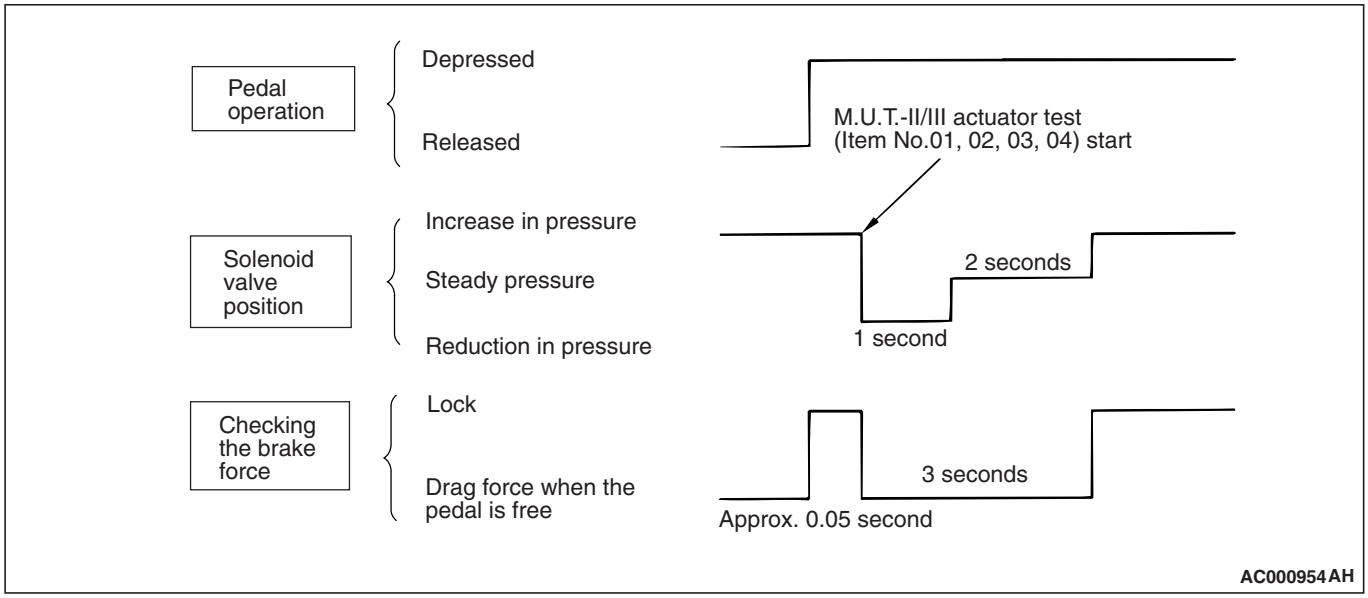




3. Turn the ignition switch to the "LOCK" (OFF) position and set the M.U.T.-II/III as shown in the illustration.
4. After checking that the shift lever is in neutral, start the engine.
5. Use the M.U.T.-II/III to force-drive the actuator.

   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 VALBE 02 FL VALBE 03 RR VALBE 04 RL VALBE	• 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

M1352003500495

⚠ ***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.

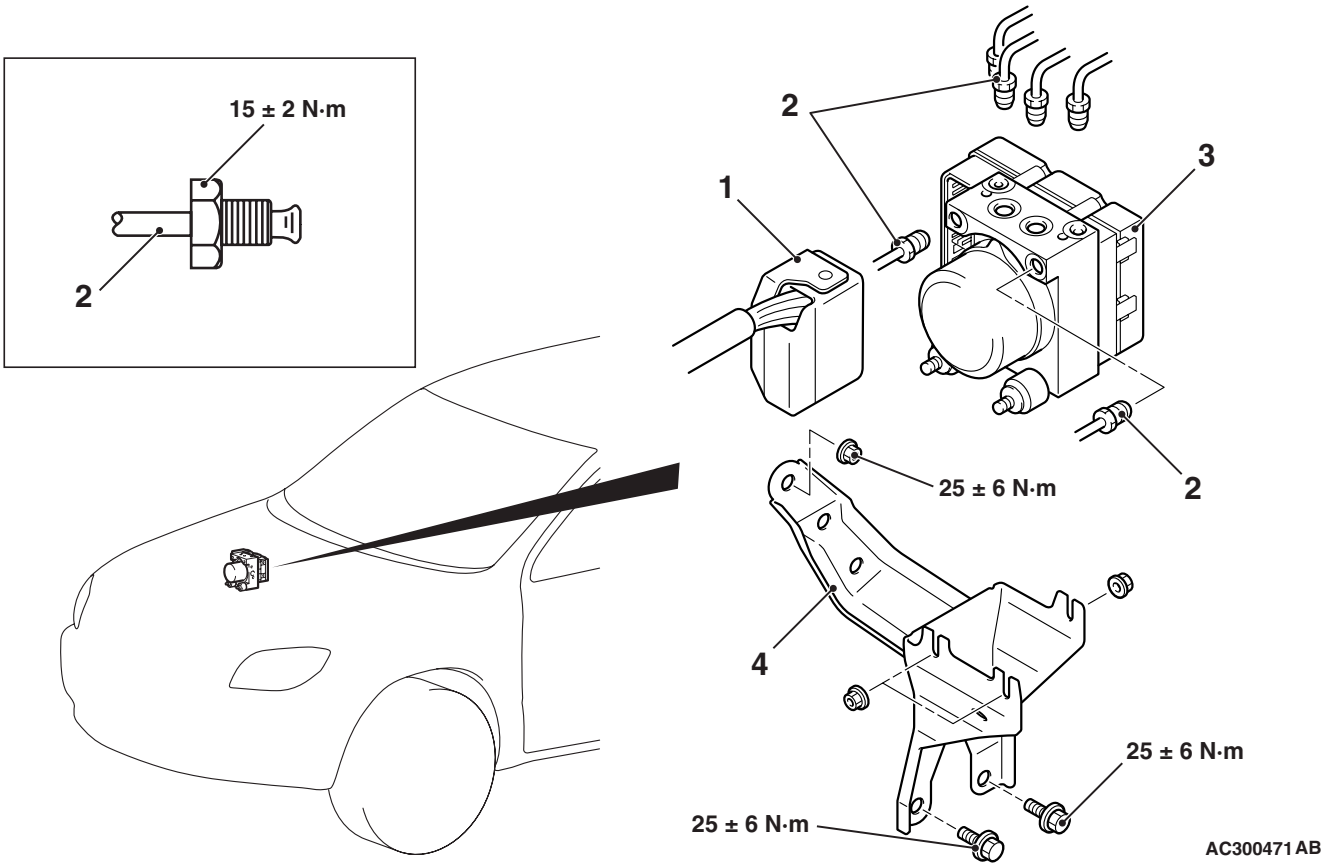
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352008600732

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 GROUP 35A, On-vehicle Service – Bleeding P.35A-7.) • Hydraulic Unit Check (Refer to P.35B-52.)



Removal steps

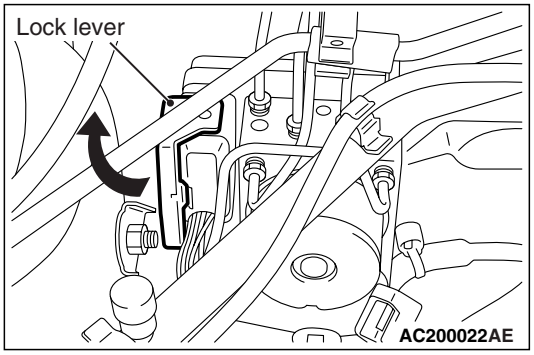
<<**A**>> 1. Harness connector
>>**A**<< 2. Brake pipe connection

Removal steps (Continued)

<<**B**>> 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.

<<B>> HYDRAULIC UNIT AND ABS-ECU REMOVAL

⚠ ***WARNING***

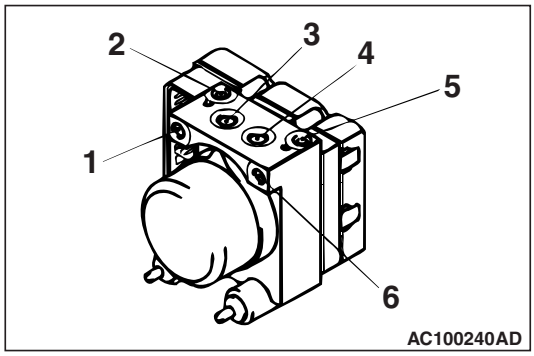
The hydraulic unit is heavy. Use care when removing it.

⚠ **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 pipes to the hydraulic unit assembly 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

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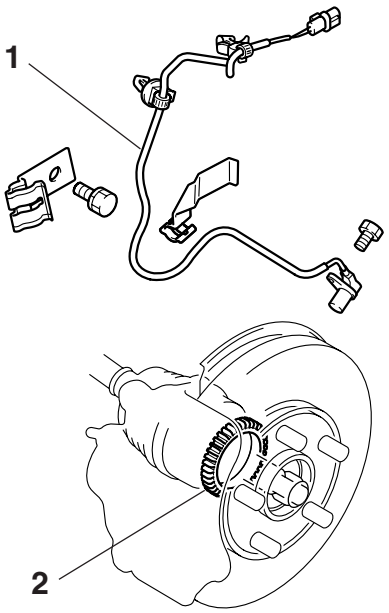
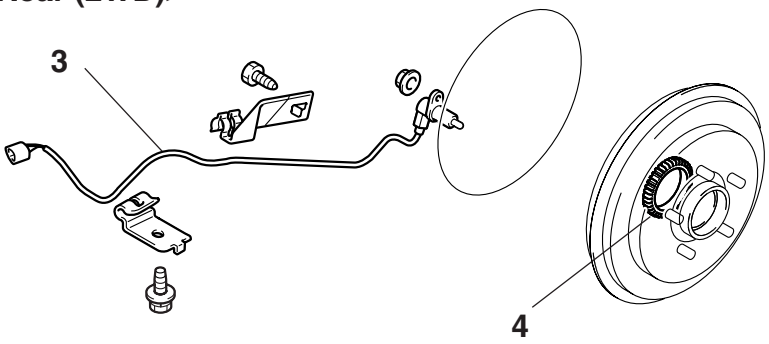
Post-installation Operation
- ABS Sensor Output Voltage Measurement (Refer to P.35B-50).

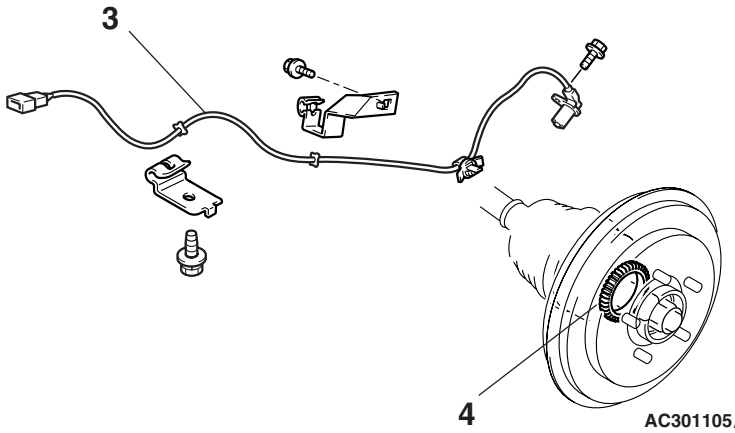
<Front>



<Rear (2WD)>



<Rear (4WD)>



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Front ABS sensor removal steps

<<A>>
1. Front ABS sensor
2. Front ABS rotor (Refer to GROUP 26, Driveshaft P.26-20).

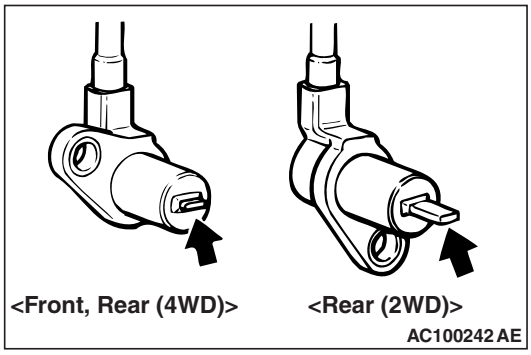
Rear ABS sensor removal steps

<<A>>
3. Rear ABS sensor
4. Rear ABS rotor (Refer to GROUP 27A, Rear Hub Assembly P.27A-5 for 2WD, or GROUP 27B, Driveshaft P.27B-13 for 4WD).

REMOVAL SERVICE POINT

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

⚠ CAUTION



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

INSPECTION

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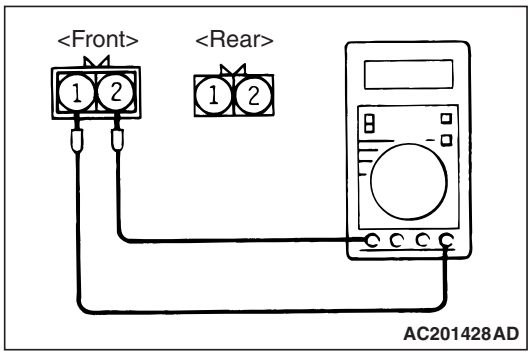
ABS SENSOR CHECK

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

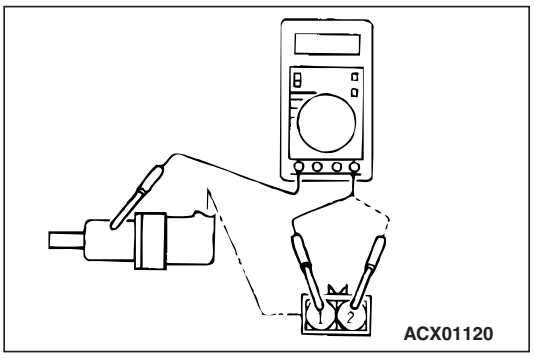
   NOTE: The projection can become magnetized due to the magnet inside the ABS sensor, causing foreign material to easily adhere to it. The projection may not be able to correctly sense the wheel rotation speed if foreign matter is on it or if it is damaged.



2. Measure the resistance between the ABS sensor terminals.

   Standard value: 1.24 – 1.64 kΩ

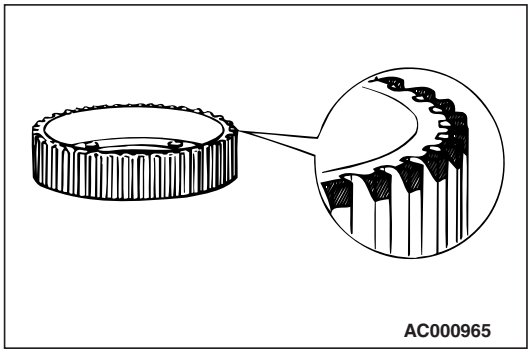
3. If the internal resistance of the ABS sensor is not within the standard value, replace it with a new ABS sensor.



4. Remove all connections from the ABS sensor. The circuit should be open between terminals (1) and (2) and the body of the ABS sensor. If the circuit is not open, replace with a new ABS sensor.
5. Check the ABS sensor cable for breakage, damage or disconnection. Replace with a new one if a problem is found.

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

TOOTHED ABS ROTOR CHECK



Check whether the ABS rotor teeth are broken or deformed. Replace the BJ assembly of the driveshaft, or the ABS rotor (2WD-rear side), respectively, if the teeth are damaged or deformed.

G-SENSOR

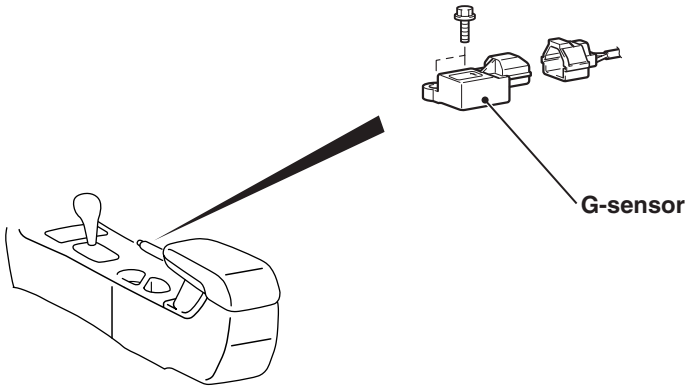
REMOVAL AND INSTALLATION

M1352010100251

⚠ CAUTION

Do not drop or apply a shock on the G-sensor.

Pre-removal and Post-installation Operation
- Rear Floor Console Assembly Removal and Installation (Refer to GROUP 52A, Floor Console Assembly P.52A-8).



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INSPECTION

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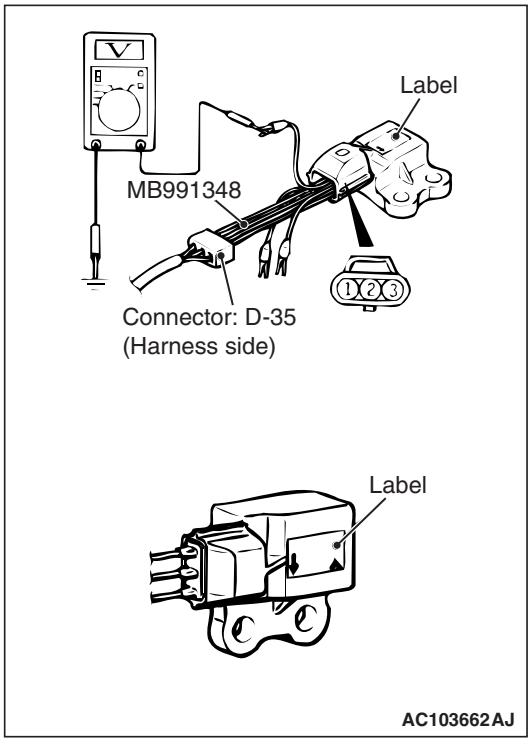
G-SENSOR CHECK



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1. Disconnect the G-sensor connector and connect special tool Test Harness Set (MB991348), between the disconnected connectors.
2. Turn the ignition switch to the "ON" position, and then read the voltage between terminals number 2 and number 3.

   Standard Value: 2.4 – 2.6 V
3. With special tool Test Harness Set (MB991348) connected, rotate so that the arrow faces straight down. Read output voltage between terminals number 2 and number 3.

   Standard Value: 1.0 – 4.0 V
4. If the voltage deviates from the standard value, make sure that nothing is wrong with the power supply wire and earth wire and then replace the G-sensor.

NOTES