GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

GENERAL INFORMATION

M1352000100603

FEATURES

The 4ABS ensures directional stability and controllability during hard braking.
For vehicles with this type of ABS, 4 sensors (4 channels) are installed on front and rear wheels allowing independent left and right control.
The system has the following features:

NOTE: On vehicles with ASC, the ABS system is controlled by the TCL/ASC-ECU. For the system construction, refer to GROUP 35C, General Information P.35C-3.

- EBD (Electronic Brake-force Distribution system) control has been added to provide the ideal braking force for the rear wheels.
- Magnetic encoder for detecting wheel speed has been installed as a wheel speed sensor instead of the rotor.
- For wiring harness saving and secure data communication, CAN* bus has been adopted as a tool of communication with another ECU.

*NOTE: *: For more information about CAN (Controller Area Network), refer to GROUP 54D P.54D-9.*

EBD CONTROL

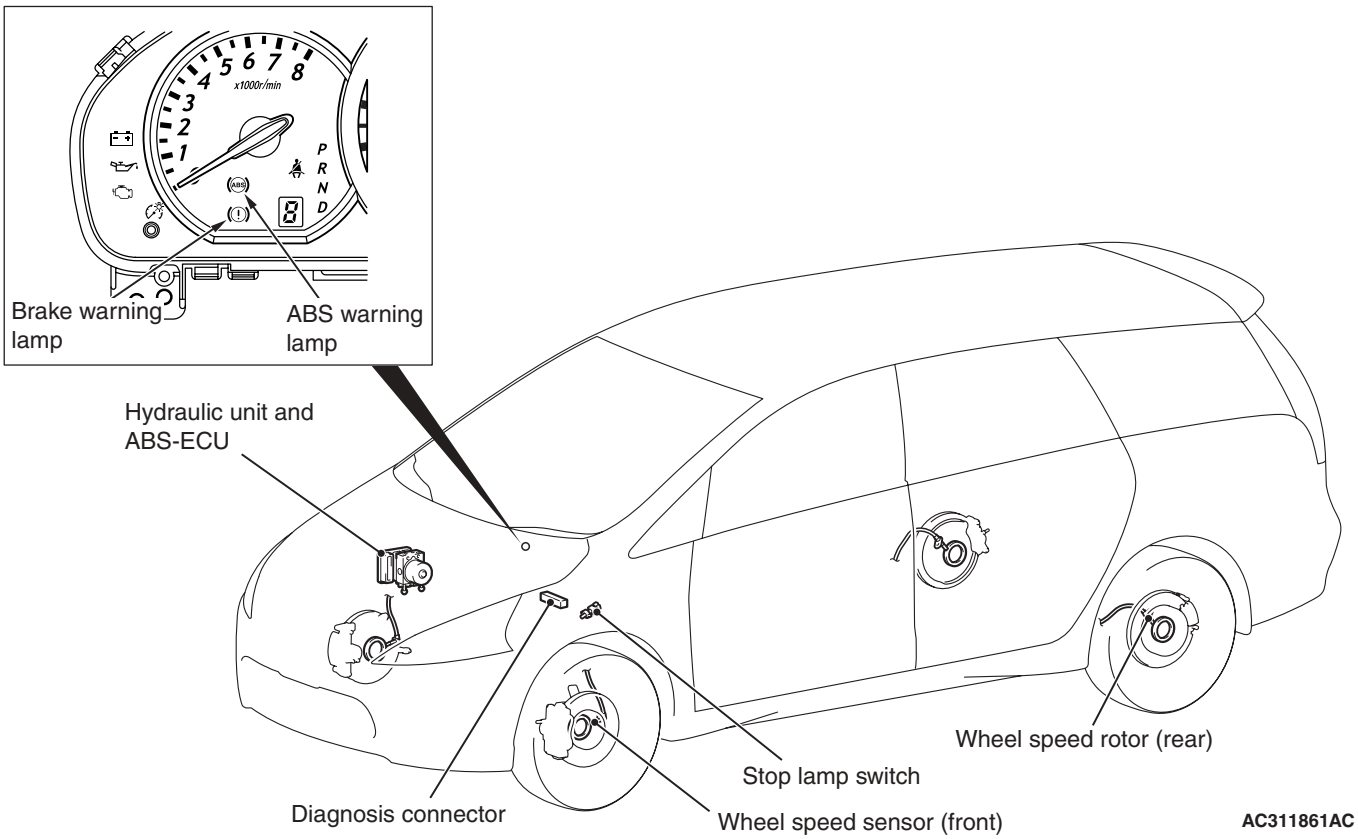
In ABS, electronic control is used so the rear wheel brake hydraulic pressure during braking is regulated by rear wheel control solenoid valves in accordance with the vehicle's rate of deceleration, and the front and rear wheel slippage which are calculated from the signals received from the various 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 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, 4-channel
No.of rotor teeth	Front	96 (N pole:48 S pole:48)
	Rear	86 (N pole:43 S pole:43)
Wheel speed sensor	Type	Semiconductor

CONSTRUCTION DIAGRAM



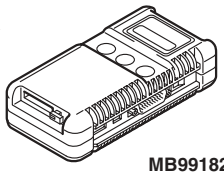
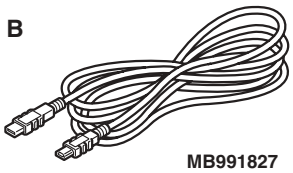
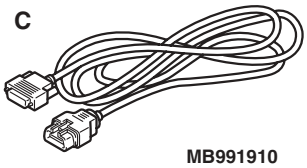
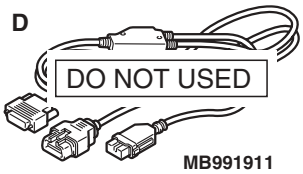
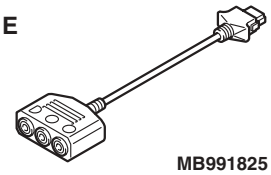
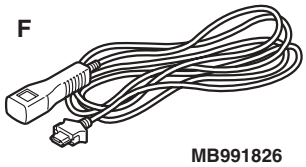
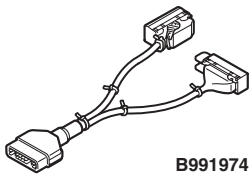
SERVICE SPECIFICATIONS

M1352000300696

Item	Standard value
Wheel speed sensor current mA	5.9 – 8.4
Wheel speed sensor insulation resistance MΩ	5 – 100

SPECIAL TOOLS

M1352000600824

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	MUT-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: MUT-III USB cable C: MUT-III main harness A (Vehicles with CAN communication system) D: MUT-III main harness B (Vehicles without CAN communication system) E: MUT-III measurement adapter F: MUT-III trigger harness	Checking the ABS **⚠ CAUTION** **MUT-III main harness A (MB991911) should be used. MUT-III main harness B should not be used for this vehicle.**
 B991974	MB991974	ABC check harness	Checking the ABS-ECU

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Troubleshooting/Inspection Service Points P.00-5.

M1352011100663

Refer to GROUP 00, How to Use

NOTES WITH REGARD TO DIAGNOSIS

M1352012600218

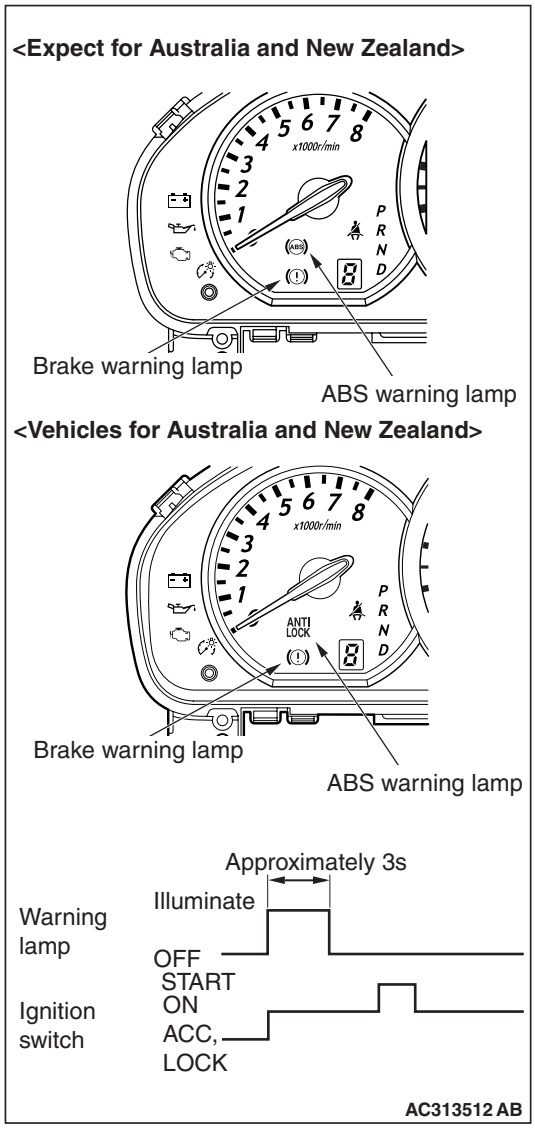
1. The ABS is a system which controls the brake pressure by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ABS operation, and do not indicate a malfunction.

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

M1352012000250



Check that the ABS warning lamp illuminates as follows.

NOTE: The brake warning lamp is used as a EBD warning lamp.

1. When the ignition switch is turned to the "ON" position, the ABS warning lamp and brake warning lamp illuminates for approximately 3 seconds and then switches off.
2. The ABS and brake warning lamps illuminate for three seconds*1 and then go out*2.

NOTE:

- **1: ABS warning lamp may stay ON until the vehicle speed reaches a few km/h. As far as the ABS-ECU stores any diagnosis code related to the ABS sensor malfunction or the motor malfunction as past trouble, the ABS-ECU continues illuminating ABS warning lamp until it verifies that the malfunction for that code is resolved (Startup check).*
- **2: Brake warning lamp does not go out when the parking brake is applied or the brake fluid level is lowered.*

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

DIAGNOSTIC FUNCTION

M1352011200831

HOW TO READ DIAGNOSIS CODE

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to read diagnosis code P.00-5.

ERASING DIAGNOSIS CODE

Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to read diagnosis code P.00-5.

DIAGNOSIS CODE CHART

M1352011300805

NOTE: For vehicles with ASC, refer to GROUP 35C, Troubleshooting P.35C-6.

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

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

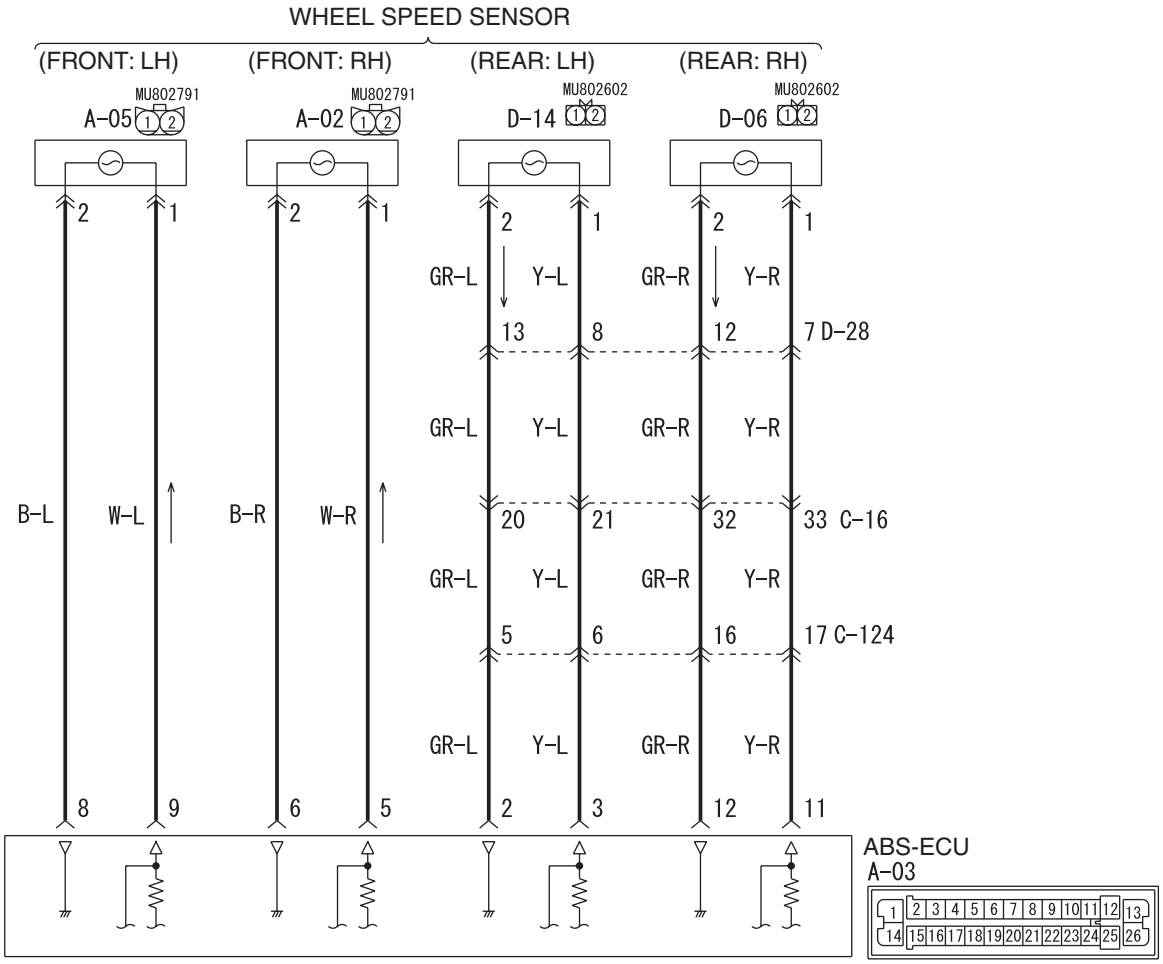
Diagnosis code No.	Inspection item	Diagnostic content	Reference page
C1200	Front right wheel speed sensor	Open circuit or short circuit	P.35B-9
C1205	Front left wheel speed sensor		
C1210	Rear right wheel speed sensor		
C1215	Rear left wheel speed sensor		

Diagnosis code No.	Inspection item	Diagnostic content	Reference page
C1201	Front right wheel speed sensor		P.35B-23
C1206	Front left wheel speed sensor		
C1211	Rear right wheel speed sensor		
C1216	Rear left wheel speed sensor		
C1226	Control solenoid valve (FR) pressure holding system		P.35B-36
C1231	Control solenoid valve (FR) decompressing system		
C1236	Control solenoid valve (FL) pressure holding system		
C1241	Control solenoid valve (FL) pressure reducing system		
C1246	Control solenoid valve (RR) pressure holding system		
C1251	Control solenoid valve (RR) pressure reducing system		
C1256	Control solenoid valve (RL) pressure holding system		
C1261	Control solenoid valve (RL) decompressing system		
C1271	Motor system		P.35B-42
C1276	Valve relay system		P.35B-47
C1607	ABS-ECU failure		P.35B-51
C1860	ABS-ECU power supply high voltage (18.0 ± 1.0 V or more)		P.35B-53
C1861	ABS-ECU power supply low voltage (9.7 ± 0.3 V or less, 8.0 ± 0.5 V or more)		P.35B-53
	ABS-ECU power supply low voltage (8.0 ± 0.5 V or below) <when vehicle stopped>		
U1073	Bus-off		P.35B-59

DIAGNOSTIC TROUBLE CODE PROCEDURES

Code No.C1200: Front Right Wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.C1205: Front Left wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.C1210: Rear Right wheel Speed Sensor (Open Circuit or Short Circuit)
Code No.C1215: Rear Left wheel Speed Sensor (Open Circuit or Short Circuit)

Wheel Speed 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

W4X35E001A

⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the Diagnosis codes (Refer to GROUP 54D, CAN bus-line diagnostic flow P.54D-9).

OPERATION

- Wheel speed sensor is a kind of a pulse alternator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to wheel speed.
- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS

Diagnosis codes No.C1200, C1205, 1210 and 1215 are set when signal is not input due to breakage of the wires of the four wheel speed sensors.

PROBABLE CAUSES

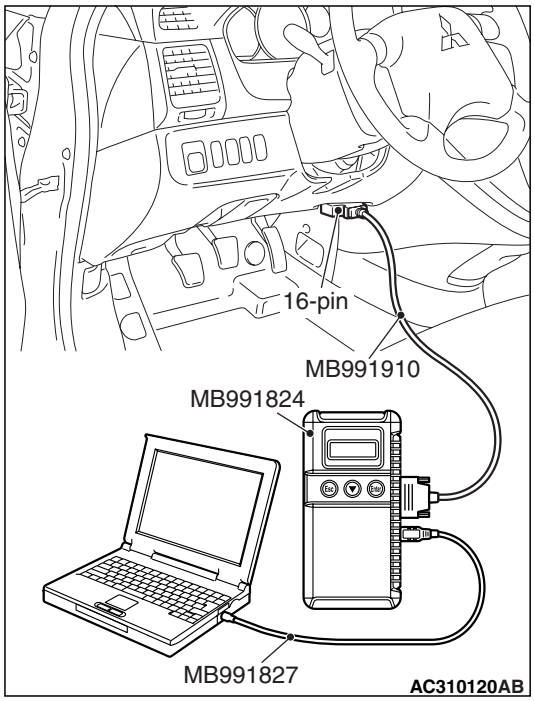
The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



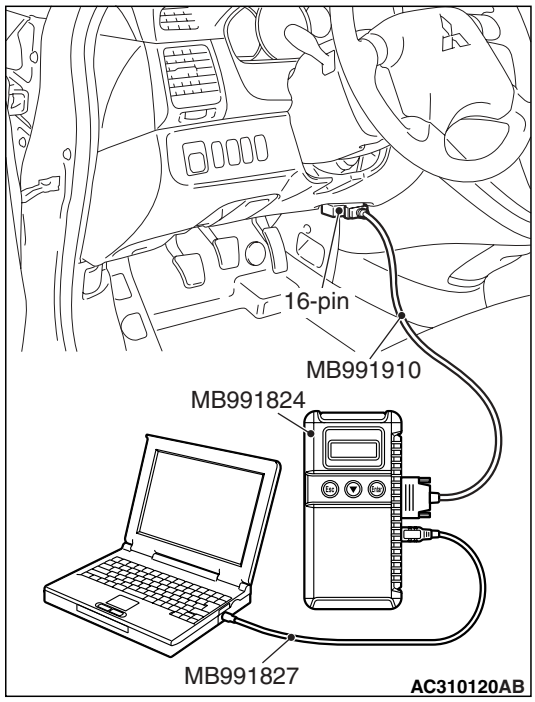
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION



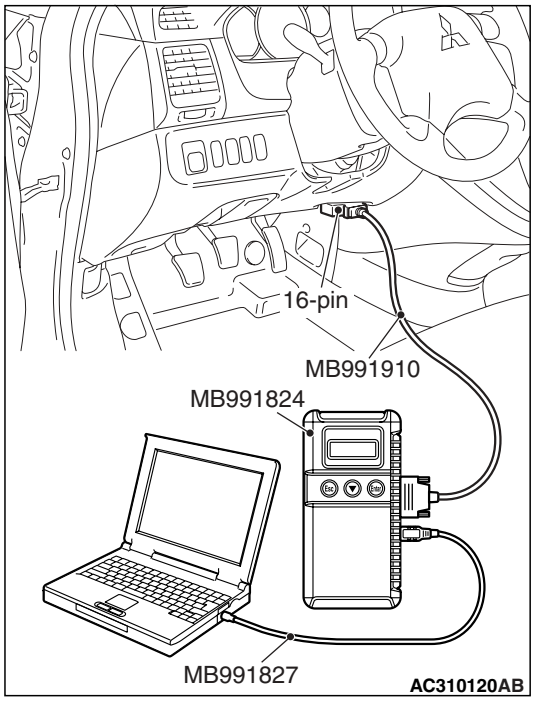
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1200, C1205, C1210 or C1215 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. MUT-III data list

⚠ CAUTION



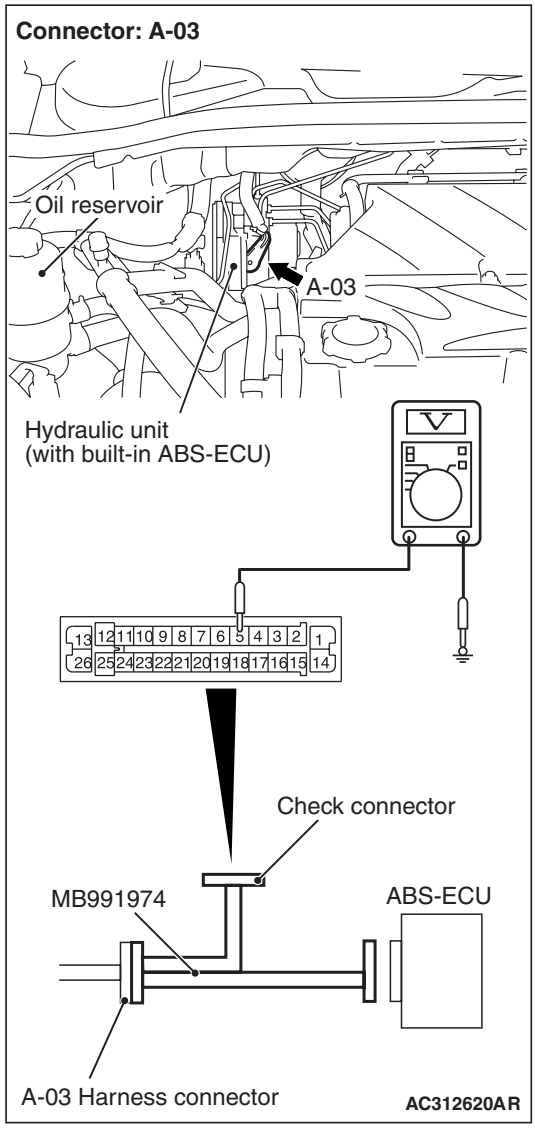
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Start the engine.
(3) Set MUT-III to the data reading mode, and check the data list items by driving the vehicle.
- Item 01 (Code No.C1200 is set): Front right wheel speed sensor
- Item 02 (Code No.C1205 is set): Front left wheel speed sensor
- Item 03 (Code No.C1210 is set): Rear right wheel speed sensor
- Item 04 (Code No.C1215 is set): Rear left wheel speed sensor

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

Q: Does the speedometer indication match the MUT-III indication?
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.
NO : Go to Step 4.

STEP 4. Voltage measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

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

(3) Measure the voltage between the relevant signal and earth terminals in the wheel speed sensor circuit and body earth.

OK: less than 1V or less

- Code No.C1200 is set: Between signal terminal 5 and body earth, and between earth terminal 6 and body earth
- Code No.C1205 is set: Between signal terminal 8 and body earth, and between earth terminal 9 and body earth
- Code No.C1210 is set: Between signal terminal 11 and body earth, and between earth terminal 12 and body earth
- Code No.C1215 is set: Between signal terminal 2 and body earth, and between earth terminal 3 and body earth

Q: Is the check result normal?

YES : Go to Step 5.

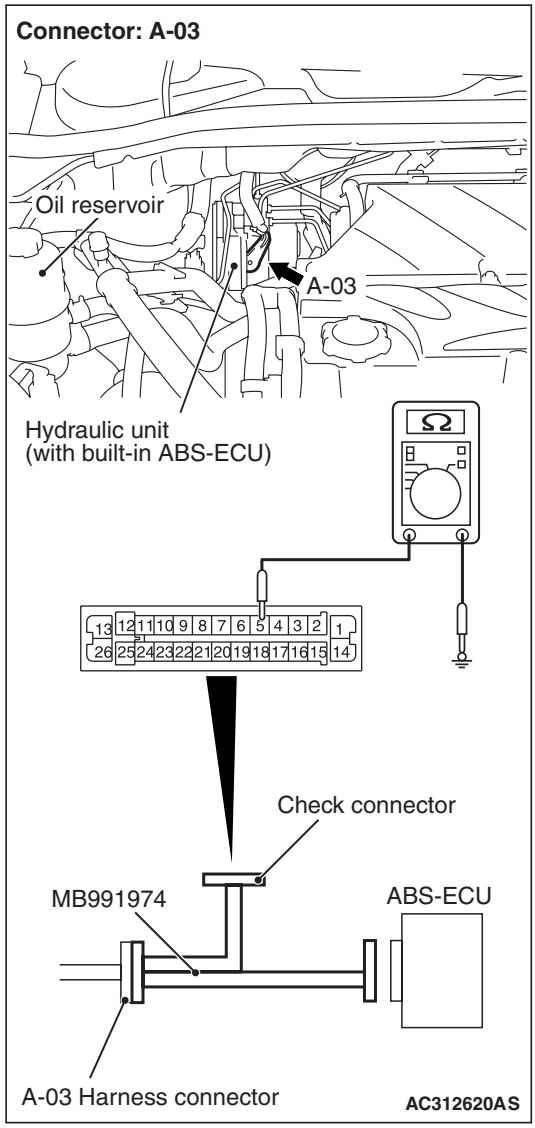
NO (When the voltage between terminal 5 or 6 and body earth measures more than 1 V) : Go to Step 6.

NO (When the voltage between terminal 8 or 9 and body earth measures more than 1 V) : Go to Step 8.

NO (When the voltage between terminal 11 or 12 and body earth measures more than 1 V) : Go to Step 10.

NO (When the voltage between terminal 2 or 3 and body earth measures more than 1 V) : Go to Step 12.

STEP 5. Resistance measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Measure the resistance between the relevant signal and earth terminals in the wheel speed sensor circuit and body earth.

OK: No continuity

- Code No.C1200 is set: Between signal terminal 5 and body earth, and between earth terminal 6 and body earth
- Code No.C1205 is set: Between signal terminal 8 and body earth, and between earth terminal 9 and body earth
- Code No.C1210 is set: Between signal terminal 11 and body earth, and between earth terminal 12 and body earth
- Code No.C1215 is set: Between signal terminal 2 and body earth, and between earth terminal 3 and body earth

Q: Is the check result normal?

YES : Go to Step 15.

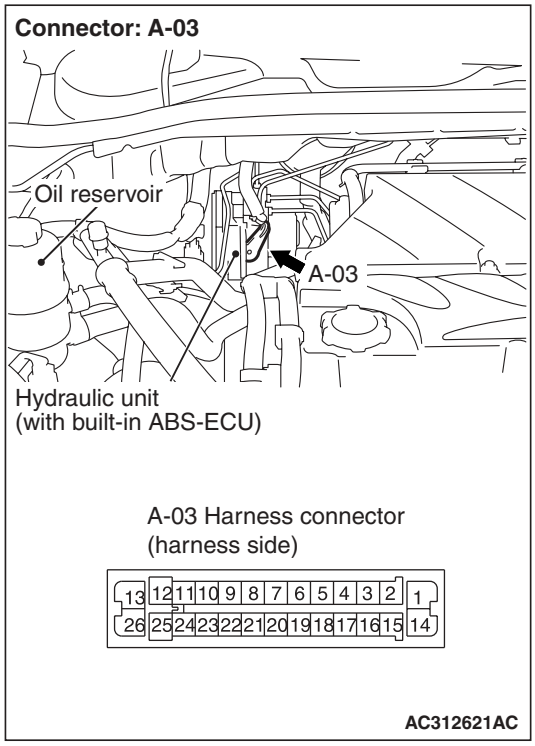
NO (Continuity exists between terminal 5 or terminal 6 and body earth) : Go to Step 6.

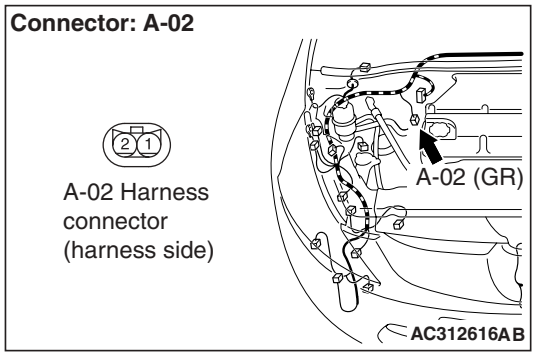
NO (Continuity exists between terminal 8 or terminal 9 and body earth) : Go to Step 8.

NO (Continuity exists between terminal 11 or terminal 12 and body earth) : Go to Step 10.

NO (Continuity exists between terminal 2 or terminal 3 and body earth) : Go to Step 12.

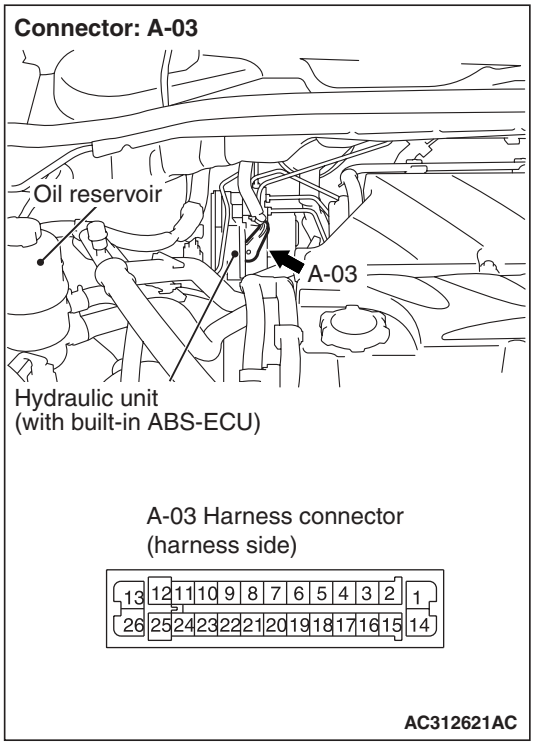
STEP 6. Check ABS-ECU connector A-03 and wheel speed sensor <front: RH> connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

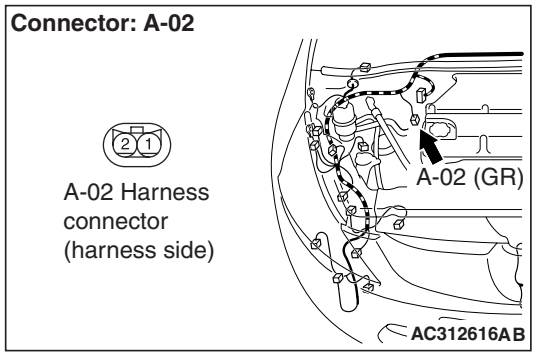




Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace the damaged component(s). Then go to Step 16.

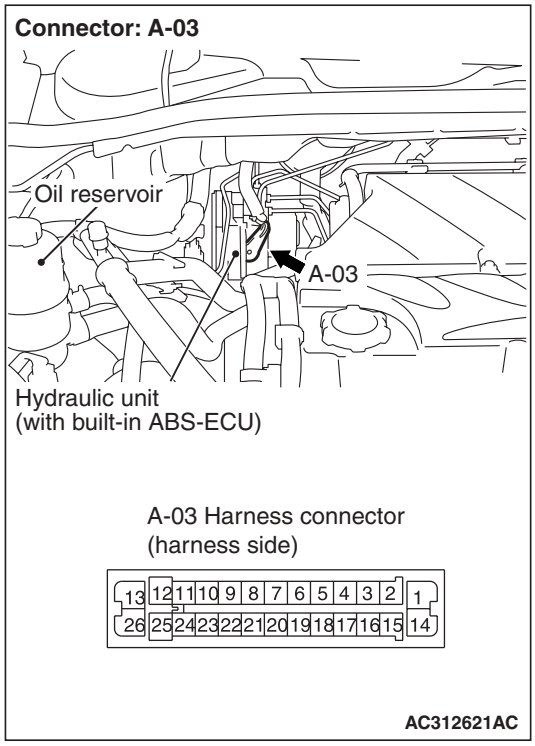
STEP 7. Check the harness wires between ABS-ECU connector A-03 (terminal 5, 6) and wheel speed sensor <front: RH> connector A-02 (terminal 1, 2).

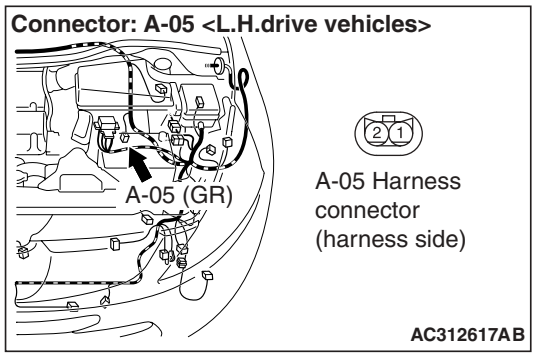


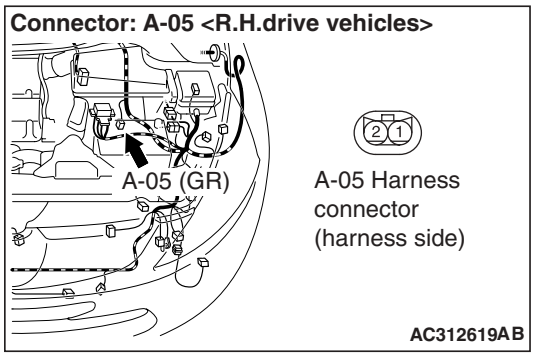


Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the wiring harness. Then go to Step 16.

STEP 8. Check ABS-ECU connector A-03 and wheel speed sensor <front: LH> connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

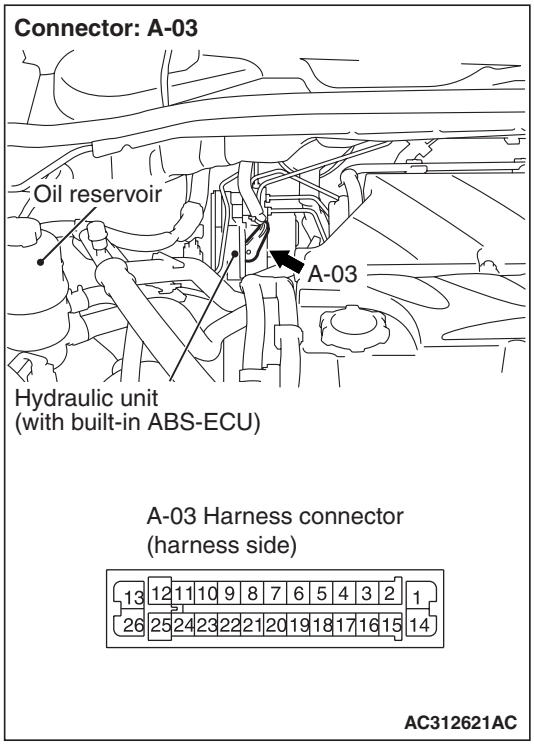


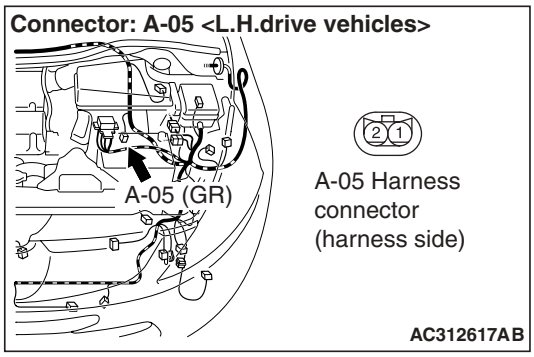


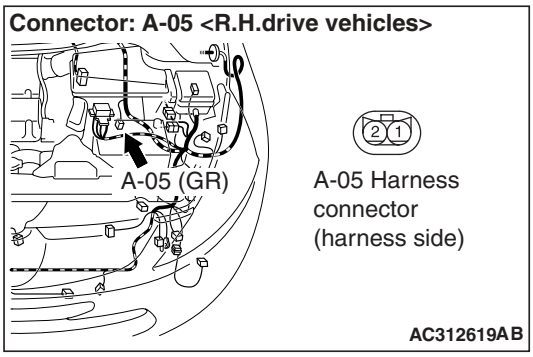


Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair or replace the damaged component(s). Then go to Step 16.

STEP 9. Check the harness wires between ABS-ECU connector A-03 (terminal 8, 9) and wheel speed sensor <front: LH> connector A-05 (terminal 2, 1).

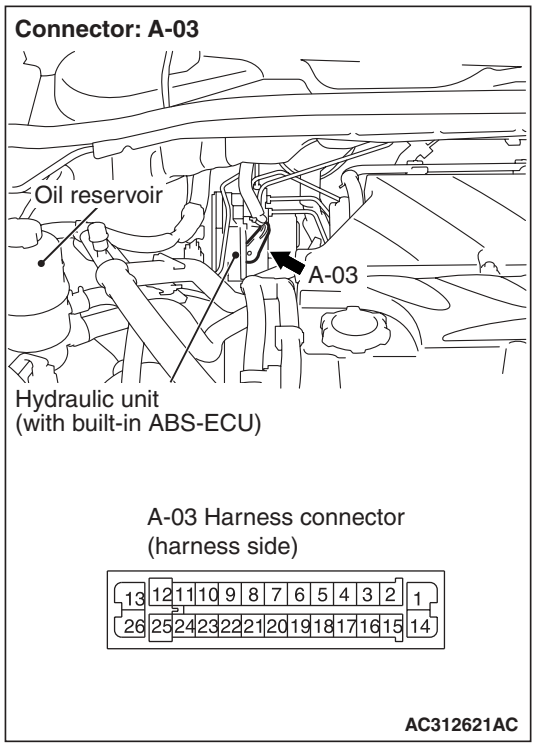


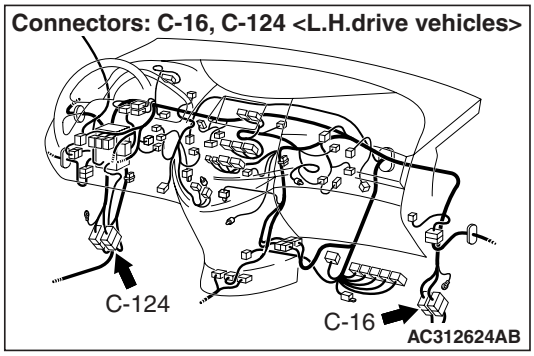


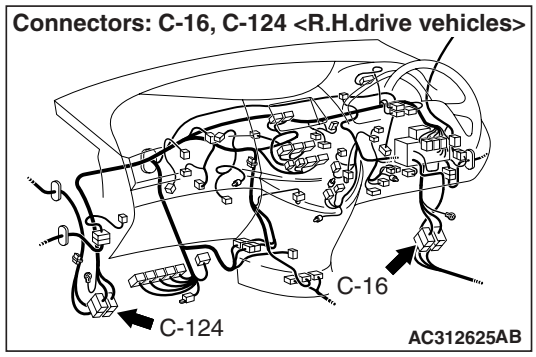


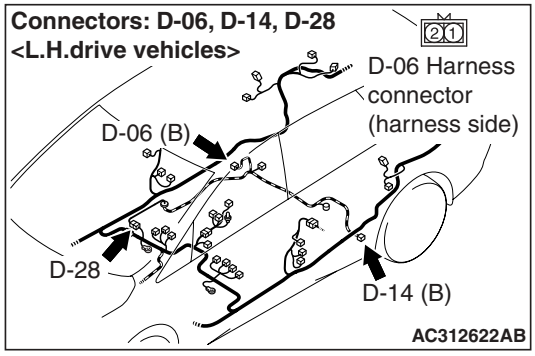
Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the wiring harness. Then go to Step 16.

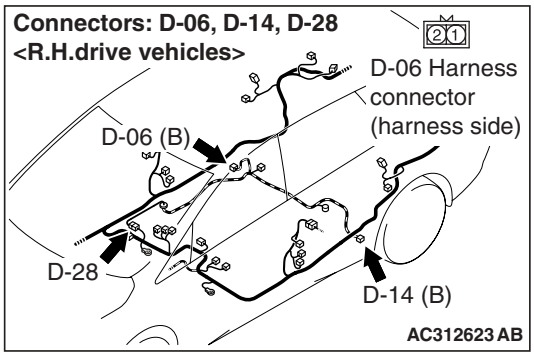
STEP 10. Check ABS-ECU connector A-03, intermediate connector C-16, C-124, D-28 and wheel speed sensor <rear: RH> connector D-06 for loose, corroded or damaged terminals, or terminals pushed back in the connector.





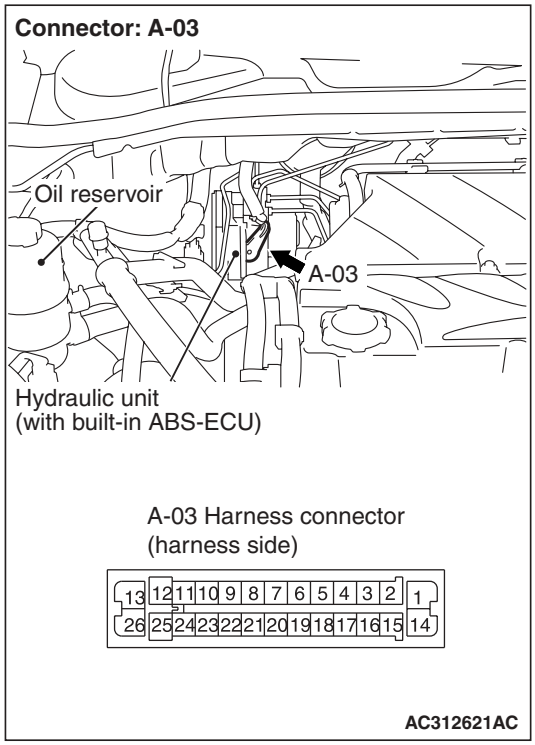


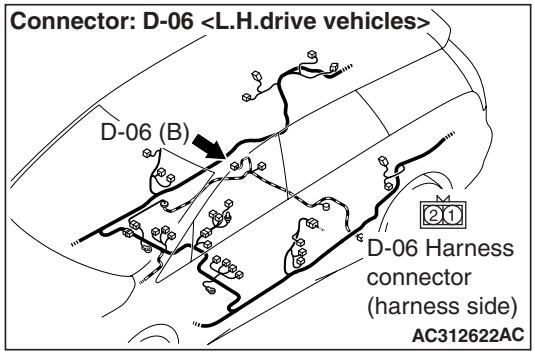


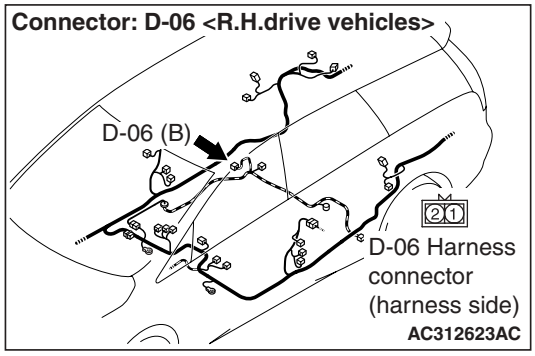


Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair or replace the damaged component(s). Then go to Step 16.

STEP 11. Check the harness wires between ABS-ECU connector A-03 (terminal 11, 12) and wheel speed sensor <rear: RH> connector D-06 (terminal 1, 2).



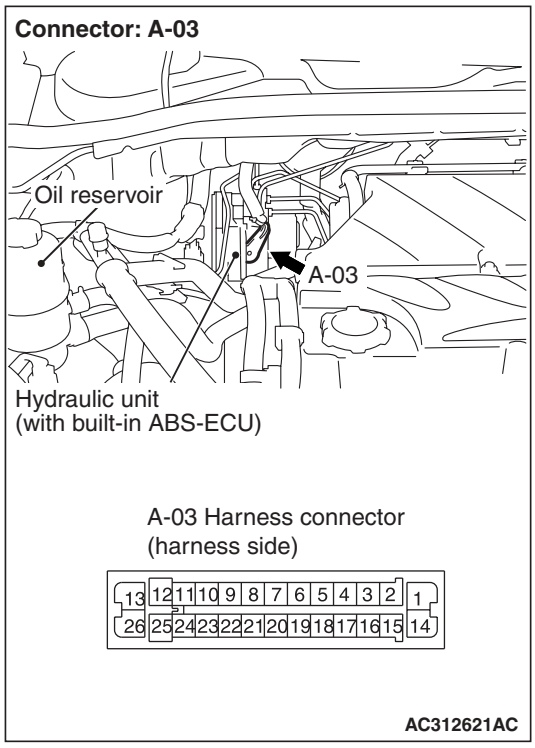


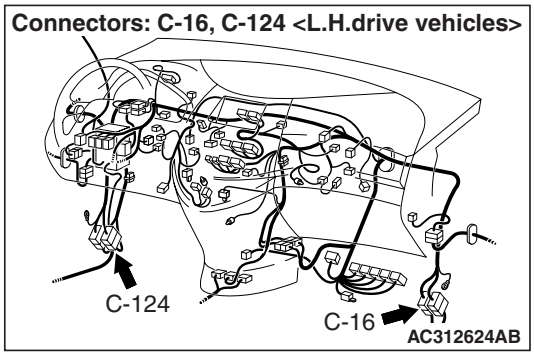


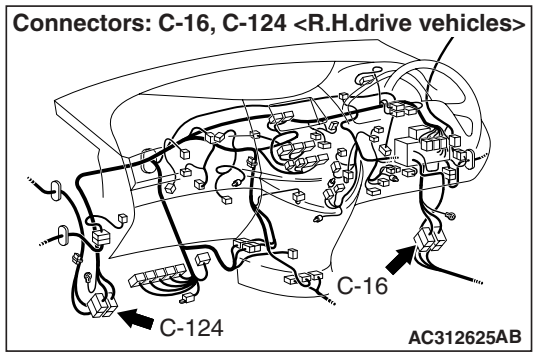
Q: Is the check result normal?

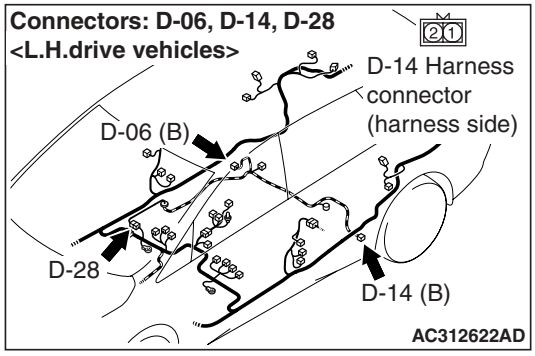
YES : Go to Step 14.
NO : Repair the wiring harness. Then go to Step 16.

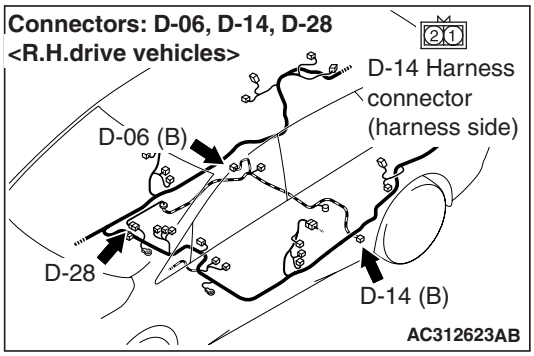
STEP 12. Check ABS-ECU connector A-03, intermediate connector C-16, C-124, D-28 and wheel speed sensor <rear: LH> connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.





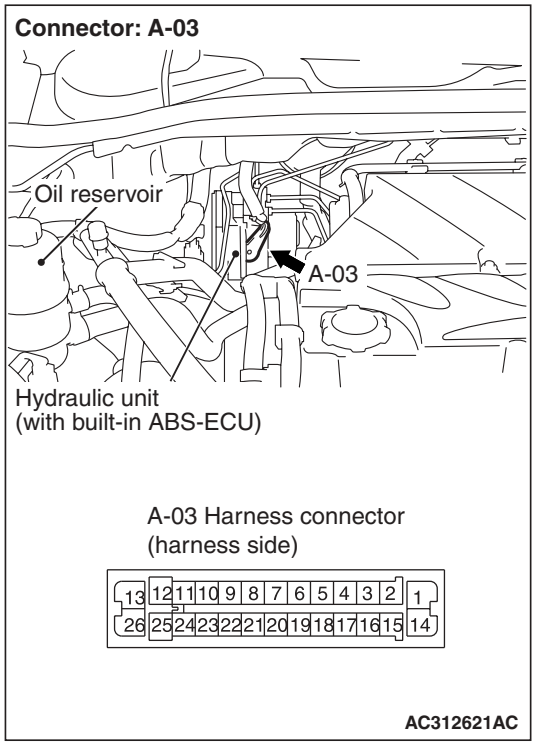


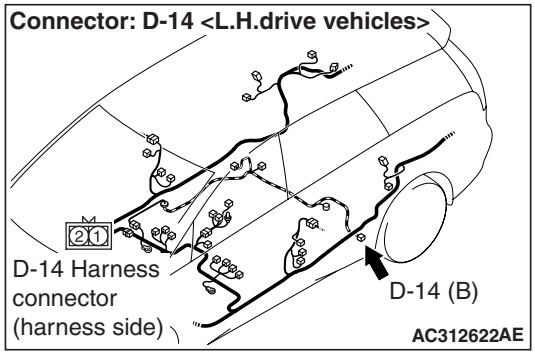


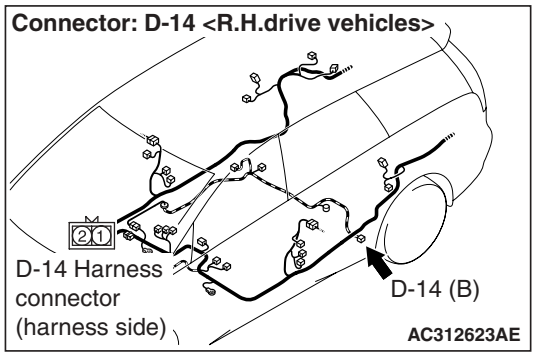


Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair or replace the damaged component(s). Then go to Step 16.

STEP 13. Check the harness wires between ABS-ECU connector A-03 (terminal 2, 3) and wheel speed sensor <rear: LH> connector D-14 (terminal 2, 1).







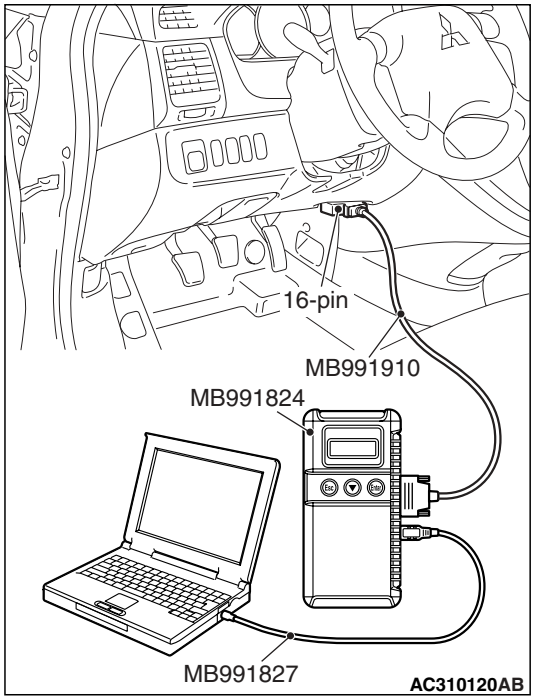
Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the wiring harness. Then go to Step 16.

STEP 14. Inspect the wheel speed sensor.
Check the wheel speed sensor relevant to the diagnosis code. For the applicable inspection procedure, refer to P.35B-81.

- When code No.C1200 is set: Front right wheel speed sensor
- When code No.C1205 is set: Front left wheel speed sensor
- When code No.C1210 is set: Rear right wheel speed sensor
- When code No.C1215 is set: Rear left wheel speed sensor

Q: Is the check result normal?
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.
NO : Replace the wheel speed sensor. Then go to Step 16.

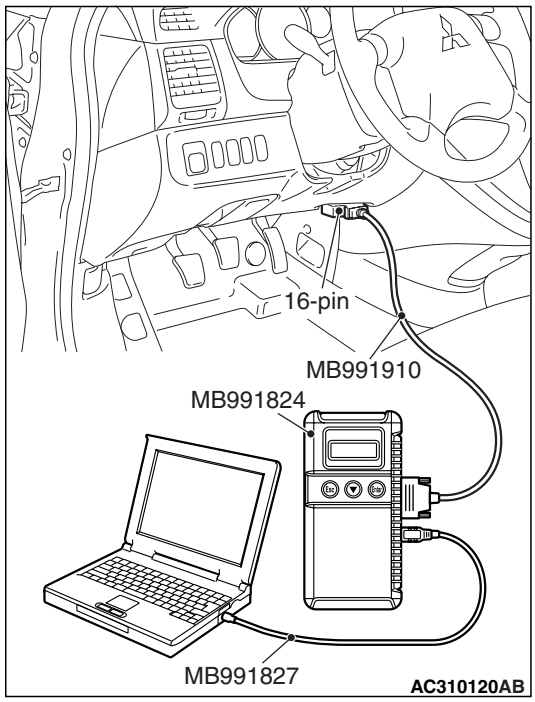
STEP 15. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is reset.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1200, C1205, C1210 or C1215 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 16.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 16. Check whether the diagnosis code is reset.

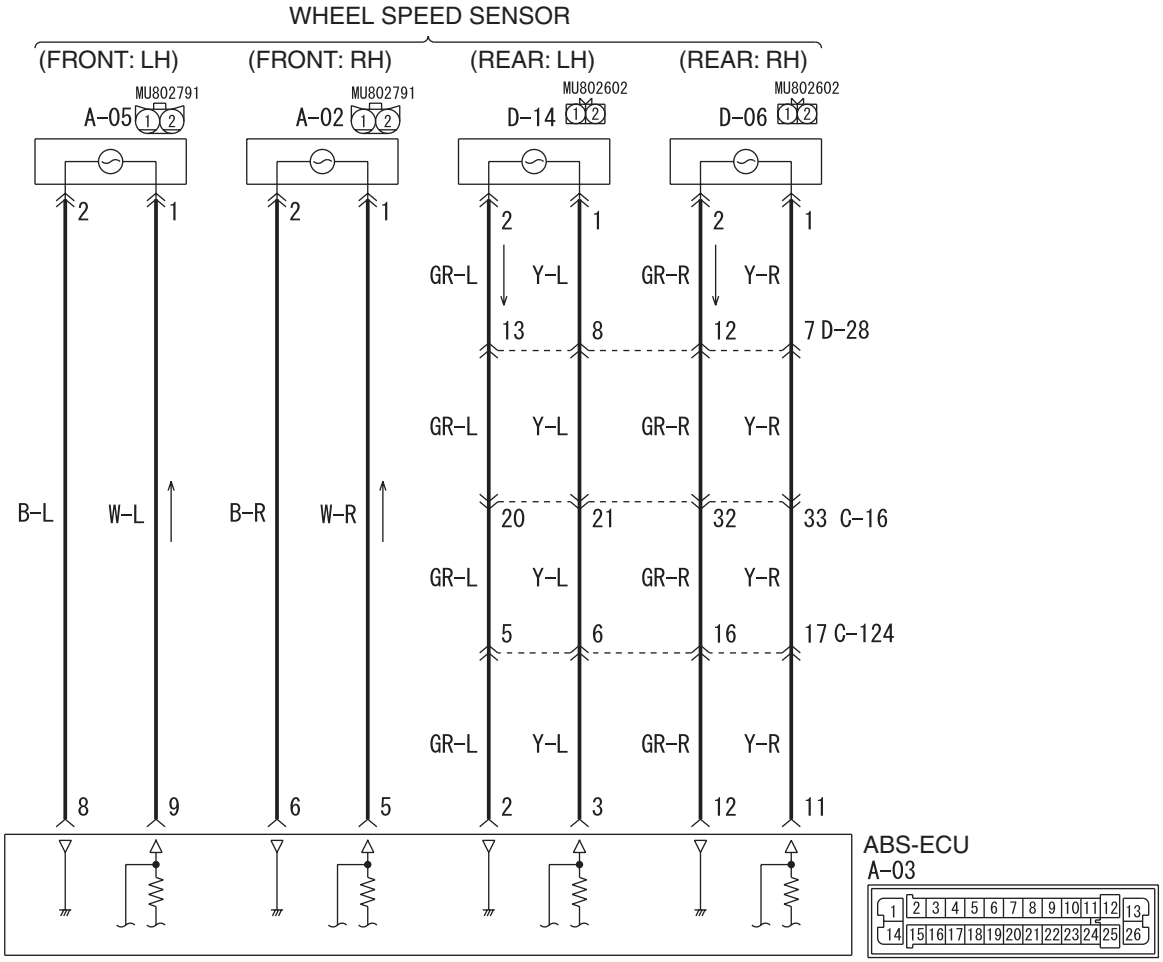


(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1200, C1205, C1210 or C1215 set?
YES : Repeat the troubleshooting from Step 1.
NO : The procedure is complete.

Code No.C1201: Front Right Wheel Speed Sensor
Code No.C1206: Front Left wheel Speed Sensor
Code No.C1211: Rear Right wheel Speed Sensor
Code No.C1216: Rear Left wheel Speed Sensor

Wheel Speed 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

W4X35E001A

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the Diagnosis codes (Refer to GROUP 54D, CAN bus-line diagnostic flow P.54D-9).

OPERATION

- Wheel speed sensor is a kind of a pulse alternator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to wheel speed.
- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU monitors the signals from each wheel speed sensor while the vehicle is being driven. If any faults below are found in these sensor signals, the ECU will set the relevant diagnosis code.

- Missing sensor signal
- Sensor signal, which will not be created under normal operation
- Significant difference among the wheel speed sensor signals

PROBABLE CAUSES

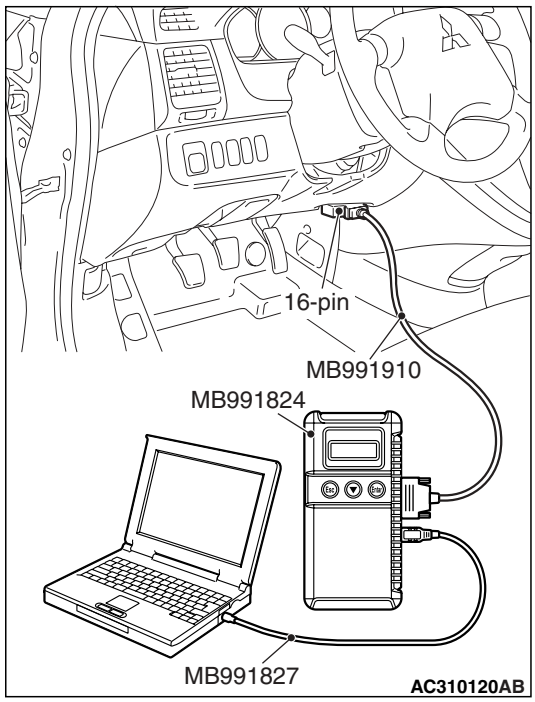
The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



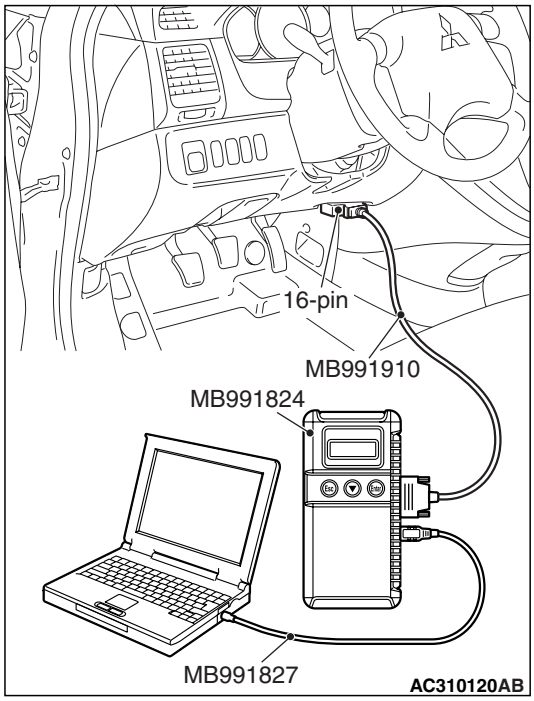
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 3
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION



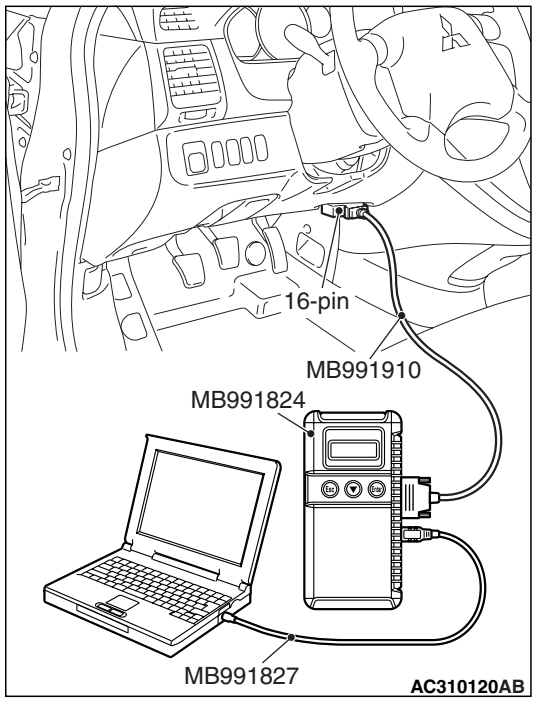
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1201, C1206, C1211 and C1216 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

Use MUT-III to check whether diagnosis codes No.C1200, C1205, C1210 and C1215 have been set simultaneously.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check whether diagnosis codes No.C1200, C1205, C1210 or C1215 have been set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is codes No.C1200, C1205, C1210 or C1215 set?

YES : Carry out diagnosis relevant to diagnosis codes No.C1200, C1205, C1210 or C1215 (Refer to P.35B-9).
NO : Go to Step 4.

STEP 4. Check the installation condition of the wheel speed sensors.

For the wheel speed sensor, which the diagnosis code indicates, check whether the sensor or its mounting bolts are loosened.

- Code No.C1201 is set: Front right wheel speed sensor
- Code No.C1206 is set: Front left wheel speed sensor
- Code No.C1211 is set: Rear right wheel speed sensor
- Code No.C1216 is set: Rear left wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 5.
NO : Reinstall the wheel speed sensor correctly. Then go to Step 15.

STEP 5. Check the wheel speed sensor after it is removed from the vehicle.

Check the wheel speed sensor, which the diagnosis code indicates (Refer to P.35B-81).

- Code No.C1201 is set: Front right wheel speed sensor
- Code No.C1206 is set: Front left wheel speed sensor
- Code No.C1211 is set: Rear right wheel speed sensor
- Code No.C1216 is set: Rear left wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 6.
NO : Replace the wheel speed sensor. Then go to Step 15.

STEP 6. Check the wheel bearing for looseness.

NOTE: If the wheel bearing is loose, the gap between the wheel speed sensor and rotor may become excessive. Check the wheel bearing, which diagnosis code indicates, for looseness.

- Code No.C1201 is set: Check the front right wheel bearing (Refer to GROUP 26, On-vehicle service – Hub axial play check P.26-6).
- Code No.C1206 is set: Check the front left wheel bearing (Refer to GROUP 26, On-vehicle service – Hub axial play check P.26-6).
- Code No.C1211 is set: Check the rear right wheel bearing (Refer to GROUP 27, On-vehicle service – Wheel bearing axial play check P.27-3).
- Code No.C1216 is set: Check the rear left wheel bearing (Refer to GROUP 27, On-vehicle service – Wheel bearing axial play check P.27-3).

Q: Is the check result normal?

YES : Go to Step 7.

NO (front hub axial play is not within the standard value) : Replace the front hub assembly (Refer to GROUP 26, Front axle hub assembly P.26-8). Then go to Step 15.

NO (rear wheel bearing axial play is not within the standard value) : Replace the rear hub assembly (Refer to GROUP 27, Rear axle hub assembly P.27-5). Then go to Step 15.

STEP 7. Check the vehicle speed detection encoder.

Check the vehicle speed detection encoder, which diagnosis code indicates, for foreign material or deformation.

- Code No.C1201 is set: Front right wheel speed sensor
- Code No.C1206 is set: Front left wheel speed sensor
- Code No.C1211 is set: Rear right wheel speed sensor
- Code No.C1216 is set: Rear left wheel speed sensor

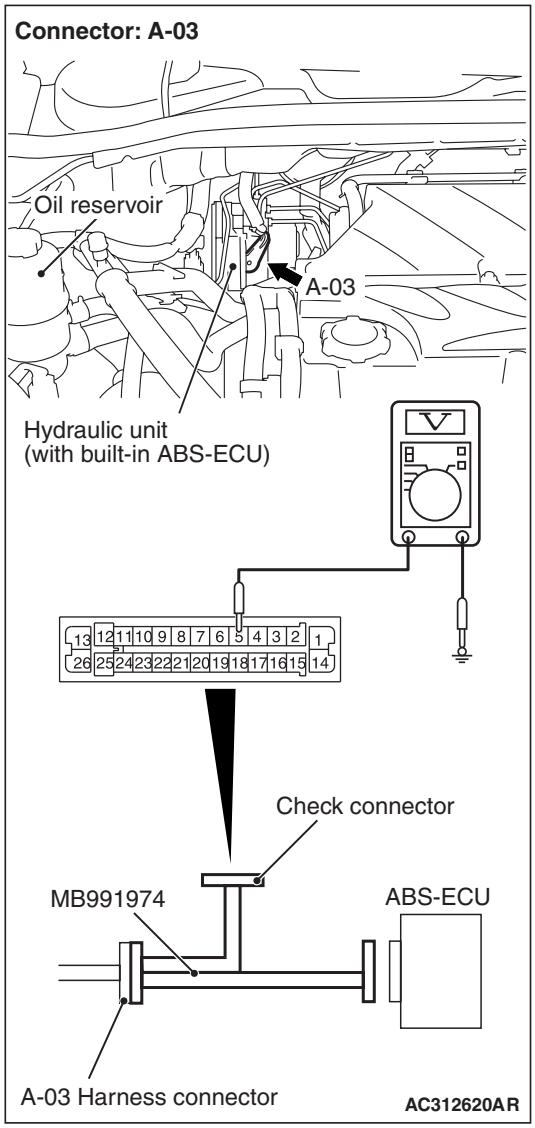
Q: Is the check result normal?

YES : Go to Step 8.

NO (front hub axial play is not within the standard value) : If the vehicle speed detection encoder is contaminated with foreign material, clean it. If the front hub assembly is deformed, replace it (Refer to GROUP 26, Front axle hub assembly P.26-8). Then go to Step 15.

NO (rear wheel bearing axial play is not within the standard value) : If the vehicle speed detection encoder is contaminated with foreign material, clean it. If the rear axle hub assembly is deformed, replace it (Refer to GROUP 27, Rear axle hub assembly P.27-5). Then go to Step 15.

STEP 8. Voltage measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

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

(3) Measure the voltage between the relevant signal and earth terminals in the wheel speed sensor circuit and body earth.

OK: Less than 1V

- Code No.C1201 is set: Between signal terminal 5 and body earth, and between earth terminal 6 and body earth
- Code No.C1206 is set: Between signal terminal 8 and body earth, and between earth terminal 9 and body earth
- Code No.C1211 is set: Between signal terminal 11 and body earth, and between earth terminal 12 and body earth
- Code No.C1216 is set: Between signal terminal 2 and body earth, and between earth terminal 3 and body earth

Q: Is the check result normal?

YES : Go to Step 9.

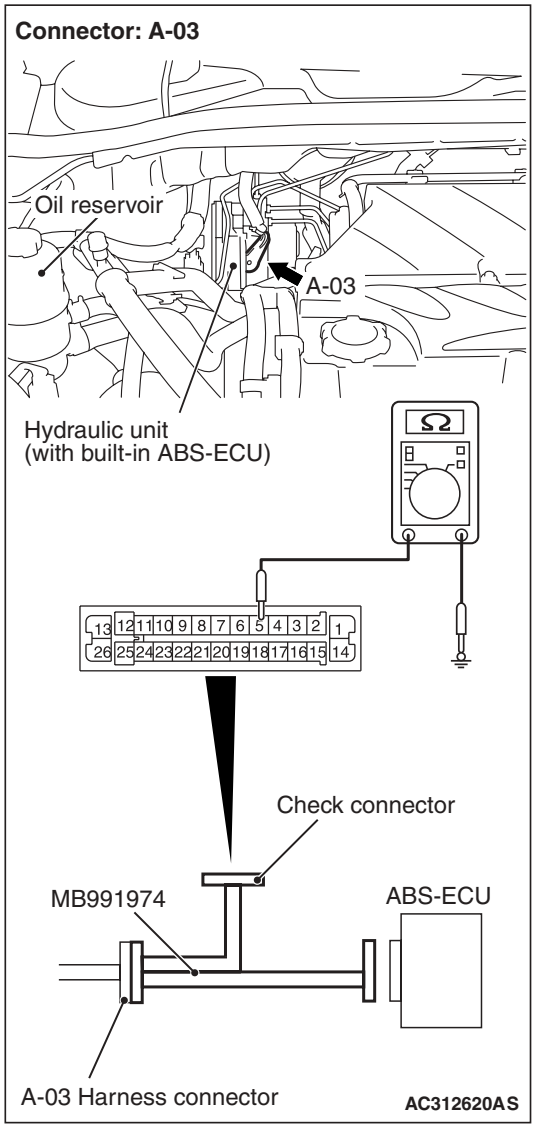
NO (When the voltage between terminal 5 or 6 – and body earth measures more than 1 V) : Go to Step 10.

NO (When the voltage between terminal 8 or 9 – and body earth measures more than 1 V) : Go to Step 11.

NO (When the voltage between terminal 11 or 12 – and body earth measures more than 1 V) : Go to Step 12.

NO (When the voltage between terminal 2 or 3 – and body earth measures more than 1 V) : Go to Step 13.

STEP 9. Resistance measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Measure the resistance between the relevant signal and earth terminals in the wheel speed

sensor circuit and body earth.

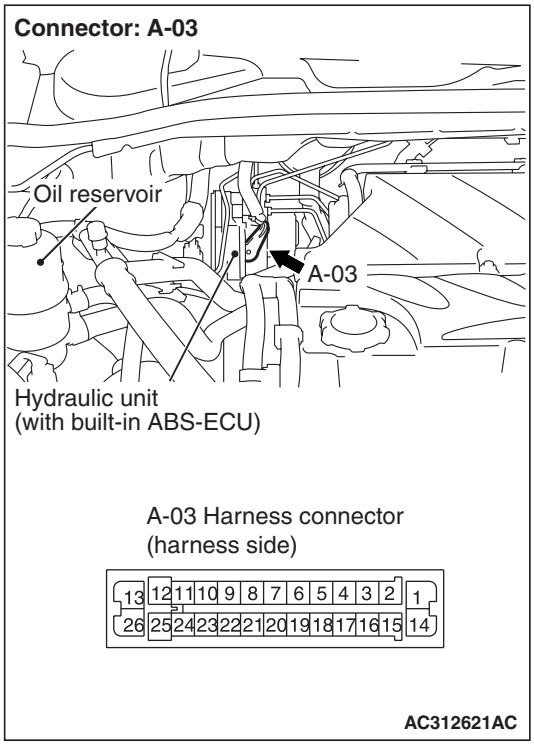
OK: No continuity

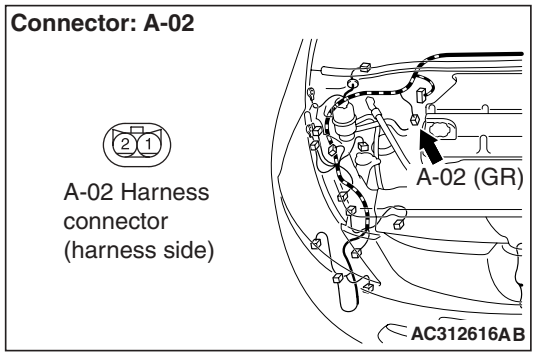
- Code No.C1201 is set: Between signal terminal 5 and body earth, and between earth terminal 6 and body earth
- Code No.C1206 is set: Between signal terminal 8 and body earth, and between earth terminal 9 and body earth
- Code No.C1211 is set: Between signal terminal 11 and body earth, and between earth terminal 12 and body earth
- Code No.C1216 is set: Between signal terminal 2 and body earth, and between earth terminal 3 and body earth

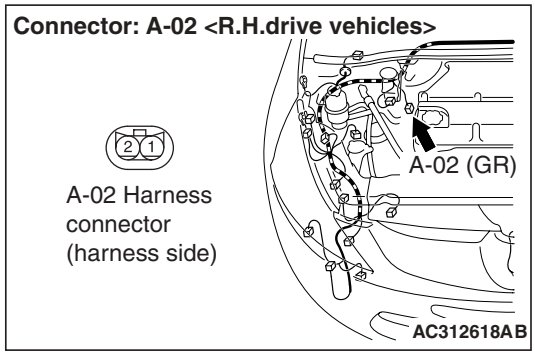
Q: Is the check result normal?

YES (Continuity exists between terminal 5 or terminal 6 and body earth) : Go to Step 10.
YES (Continuity exists between terminal 8 or terminal 9 and body earth) : Go to Step 11.
YES (Continuity exists between terminal 11 or terminal 12 and body earth) : Go to Step 12.
YES (Continuity exists between terminal 2 or terminal 3 and body earth) : Go to Step 13.
NO : Go to Step 14.

STEP 10. Check ABS-ECU connector A-03 and wheel speed sensor <front: RH> connector A-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.





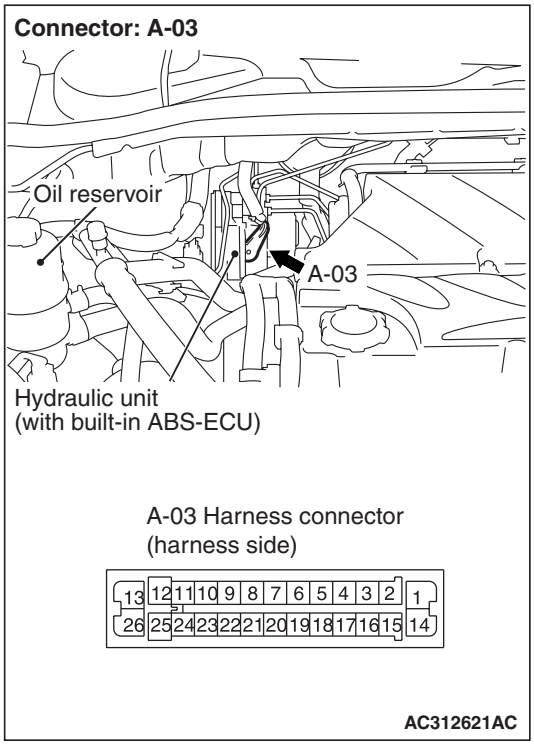


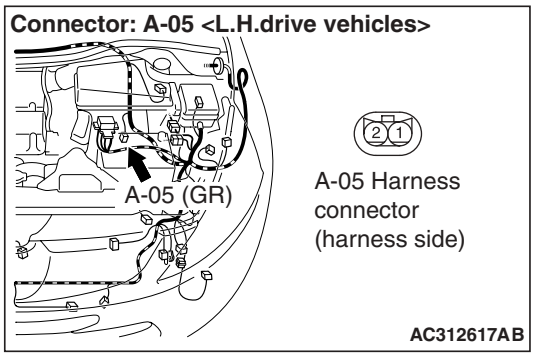
Q: Is the check result normal?

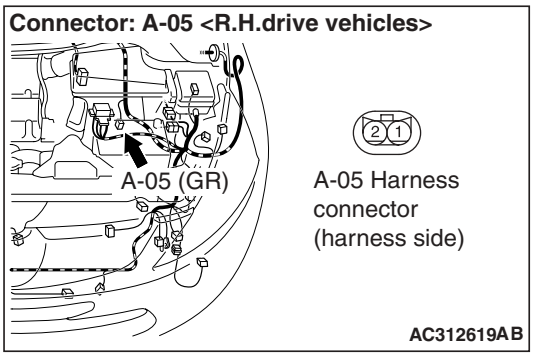
YES : Open or short circuit may be present in the front right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-03 (terminals 5 and 6) and front right wheel speed sensor A-02 (terminals 1 and 2). Then go to Step 15.

NO : Repair or replace the damaged component(s). Then go to Step 15.

STEP 11. Check ABS-ECU connector A-03 and wheel speed sensor <front: LH> connector A-05 for loose, corroded or damaged terminals, or terminals pushed back in the connector.





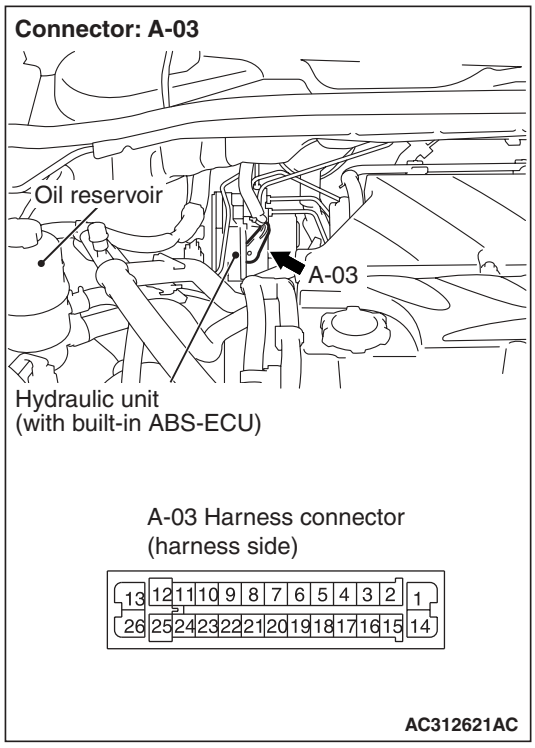


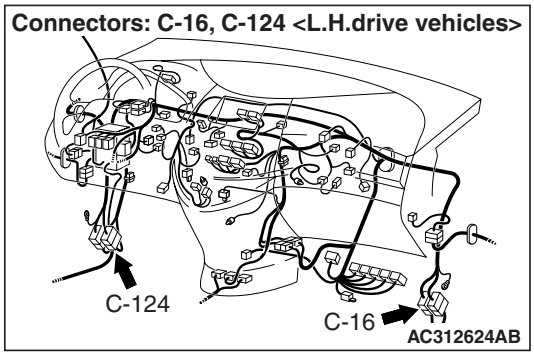
Q: Is the check result normal?

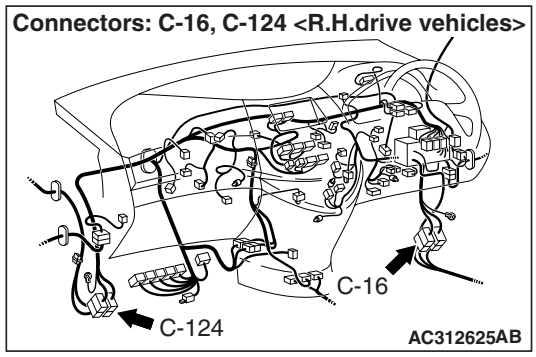
YES : Open or short circuit may be present in the front right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-03 (terminals 8 and 9) and front left wheel speed sensor A-05 (terminals 2 and 1). Then go to Step 15.

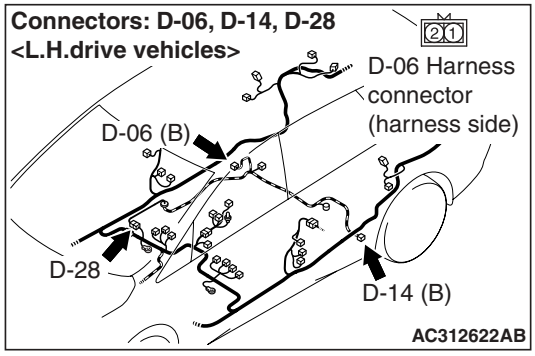
NO : Repair or replace the damaged component(s). Then go to Step 15.

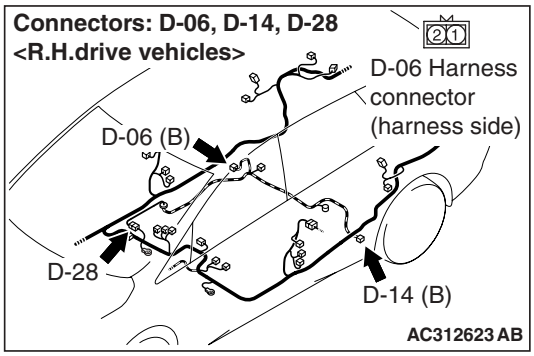
STEP 12. Check ABS-ECU connector A-03, intermediate connector C-16, C-124, D-28 and wheel speed sensor <rear: RH> connector D-06 for loose, corroded or damaged terminals, or terminals pushed back in the connector.









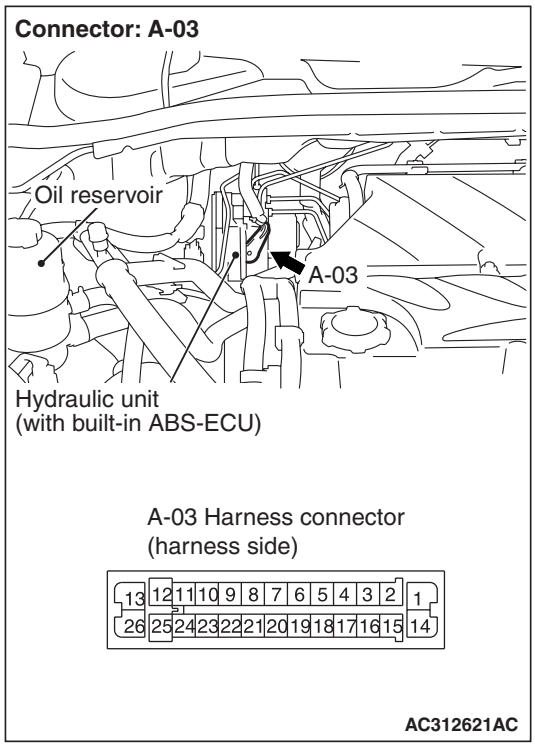


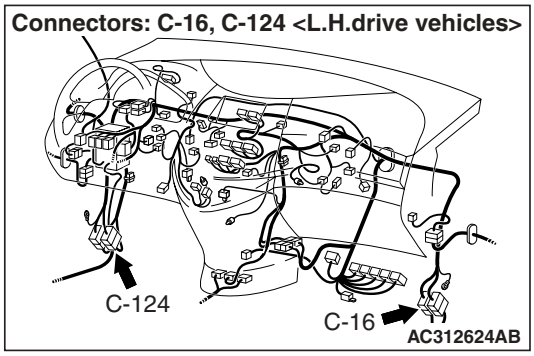
Q: Is the check result normal?

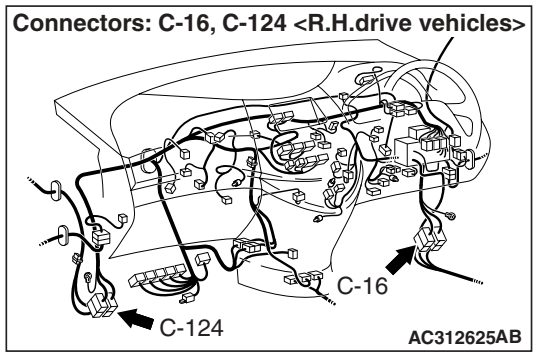
YES : Open or short circuit may be present in the rear right wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-03 (terminals 11 and 12) and rear right wheel speed sensor D-06 (terminals 1 and 2). Then go to Step 15.

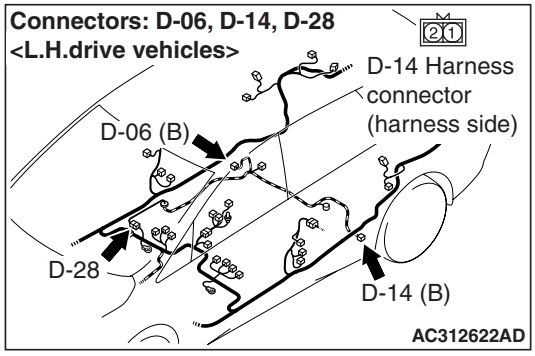
NO : Repair or replace the damaged component(s). Then go to Step 15.

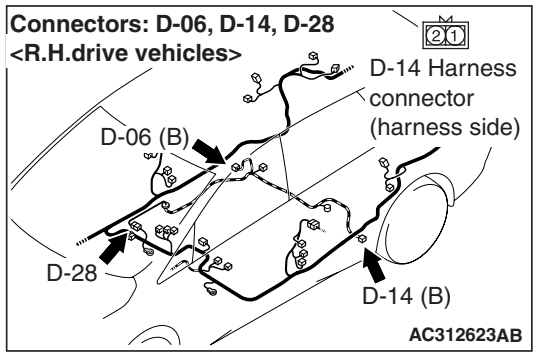
STEP 13. Check ABS-ECU connector A-03, intermediate connector C-16, C-124, D-28 and wheel speed sensor <rear: LH> connector D-14 for loose, corroded or damaged terminals, or terminals pushed back in the connector.









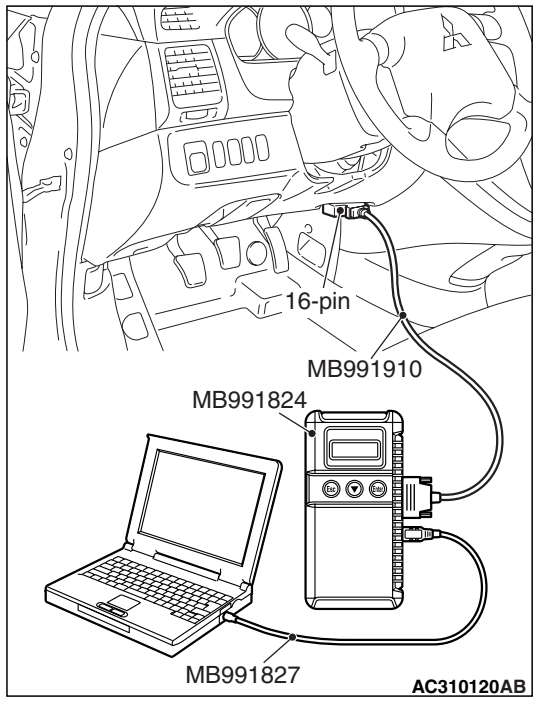


Q: Is the check result normal?

YES : Open or short circuit may be present in the rear left wheel speed sensor circuit. Repair the wiring harness between ABS-ECU connector A-03 (terminals 2 and 3) and rear left wheel speed sensor D-14 (terminals 2 and 1). Then go to Step 15.

NO : Repair or replace the damaged component(s). Then go to Step 15.

STEP 14. Check whether the diagnosis code is reset.



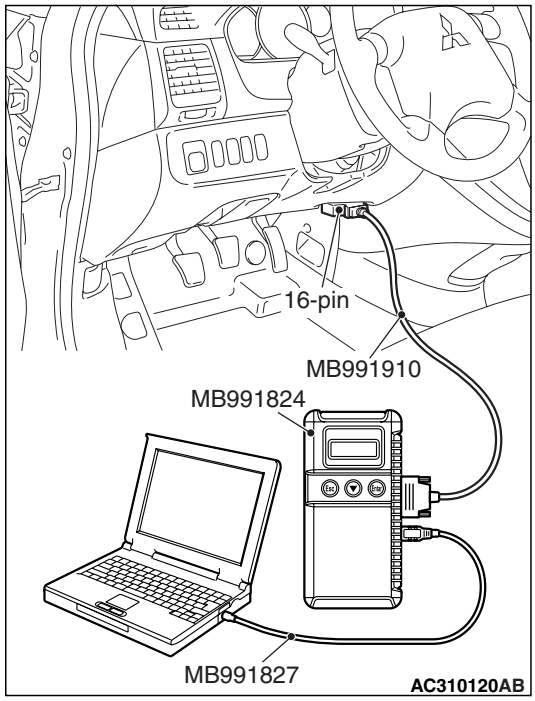
Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1201, C1206, C1211 or C1216 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 15.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 15. Check whether the diagnosis code is reset.

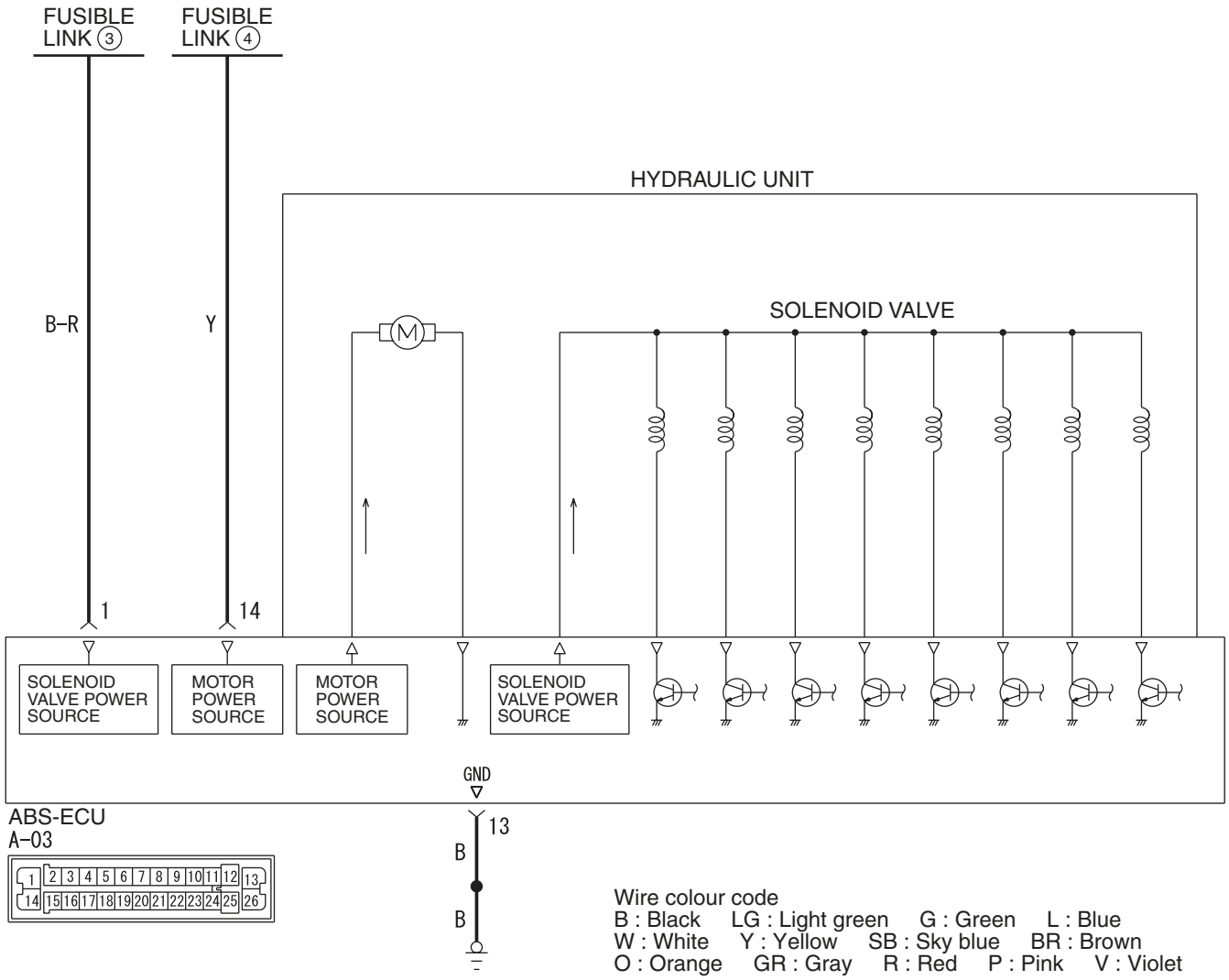


Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1201, C1206, C1211 or C1216 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1226: Control solenoid valve (FR) pressure holding system
Code No.C1236: Control solenoid valve (FL) pressure holding system
Code No.C1246: Control solenoid valve (RR) pressure holding system
Code No.C1256: Control solenoid valve (RL) pressure holding system
Code No.C1231: Control solenoid valve (FR) decompressing system
Code No.C1241: Control solenoid valve (FL) pressure reducing system
Code No.C1251: Control solenoid valve (RR) pressure reducing system
Code No.C1261: Control solenoid valve (RL) decompressing system

Solenoid Valve and Motor Power Supply Circuit



W4X35E018A

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

OPERATION

- The ABS-ECU contains the power supply circuit (terminal 1) for the solenoid valve. The solenoid valve is energized by the valve relay, which is incorporated in the ABS-ECU.
- The valve relay, which is incorporated in the ABS-ECU, is always energizing the solenoid valve unless the initial check is in progress when the ignition switch is turned on.
- The ABS-ECU activates the solenoid valve by turning on its driving transistor.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- The solenoid valve is not energized even after the ABS-ECU has turned on the driving transistor (Open circuit is present in the power supply circuit to the ABS-ECU solenoid valve, or the valve relay has failed).
- The solenoid valve is not energized even after the ABS-ECU has turned on the driving transistor (Open circuit is present in the solenoid valve circuit inside the ABS-ECU, or the valve relay has failed).
- After the ABS-ECU has turned off the driving transistor, the solenoid valve still remains energized (short in the solenoid valve circuit).
- When a solenoid valve failure is detected

PROBABLE CAUSES

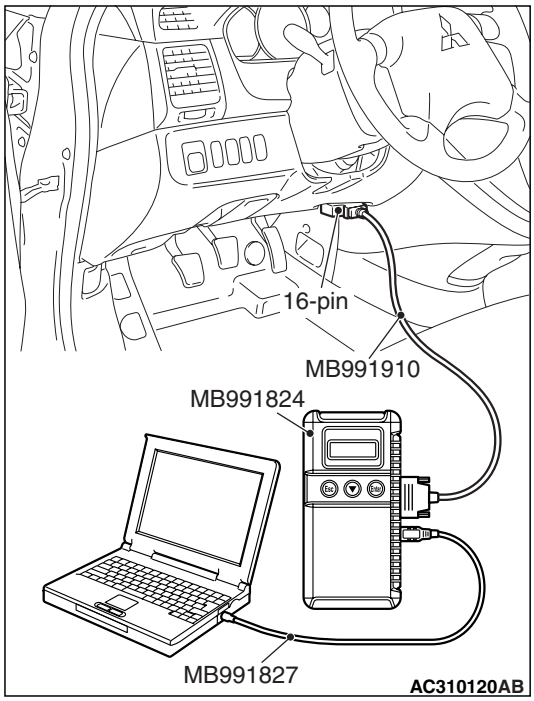
The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics.

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

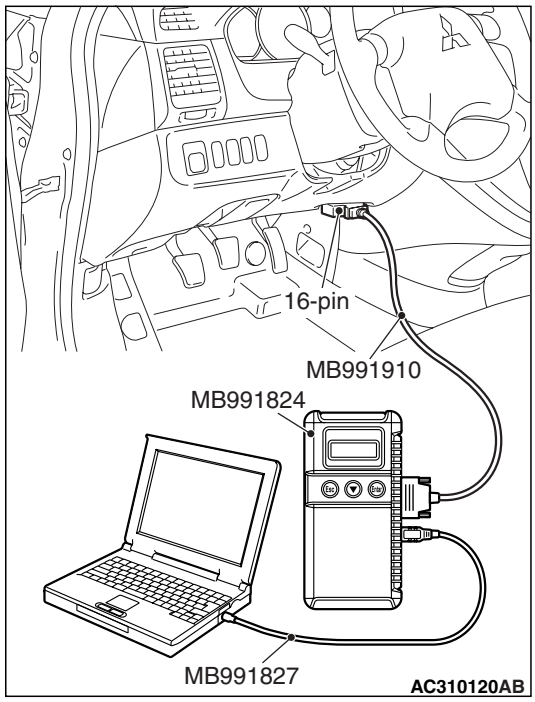
Q: Is the check result?

YES : Go to Step 3.

NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION

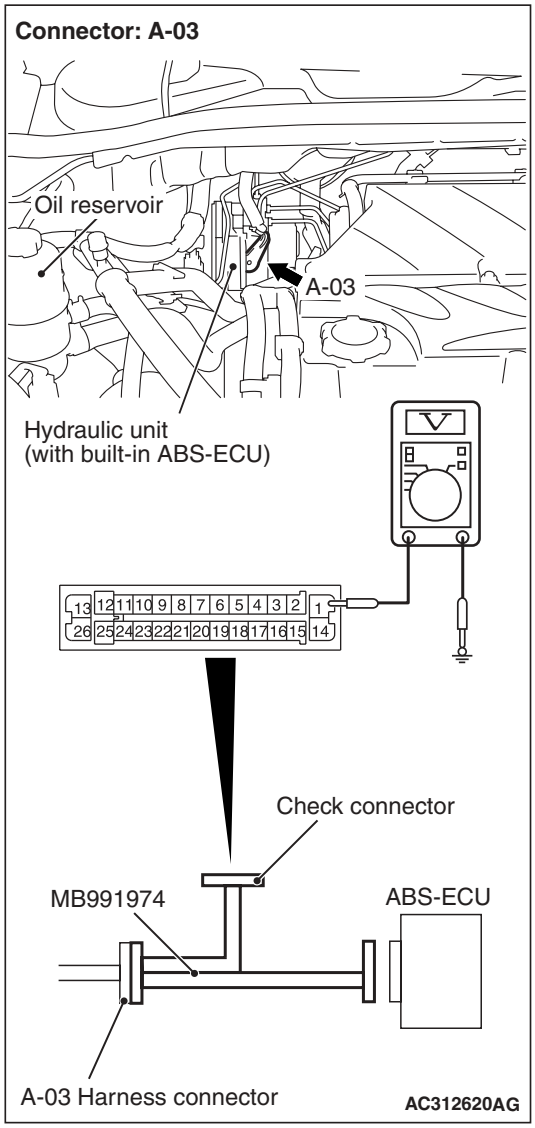


Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Voltage measurement at ABS-ECU connector A-03.

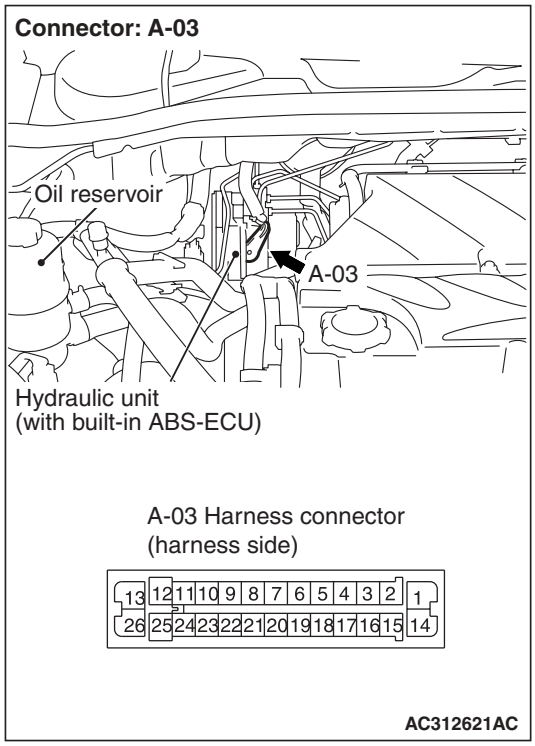


(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.
NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 1 and earth.

OK: System voltage

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

STEP 4. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

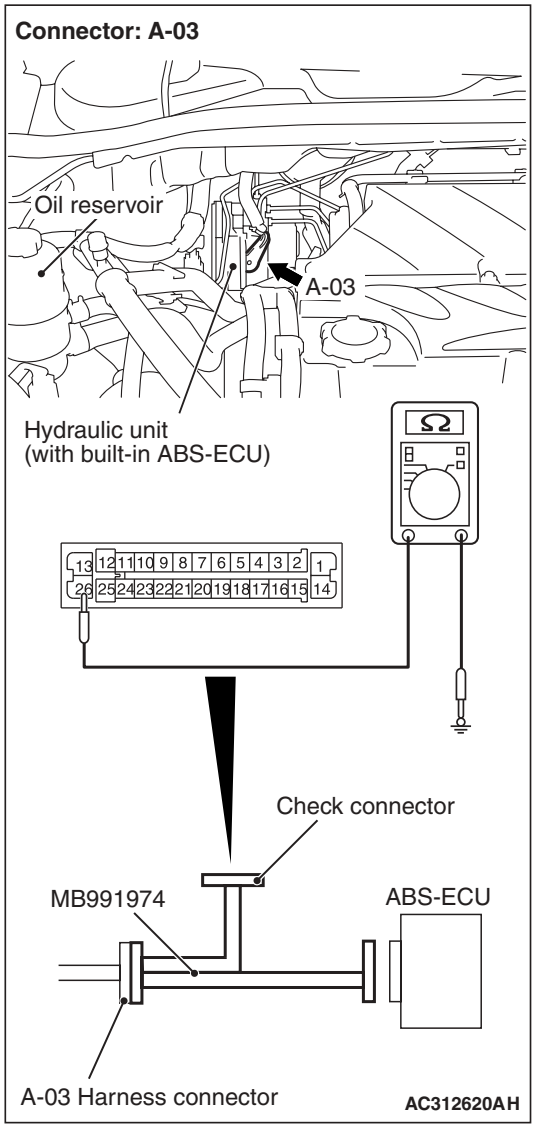


Q: Is the check result normal?

YES : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 1 and fusible link No.3. Then go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 5. Resistance measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Measure the resistance between terminal 26 and earth.

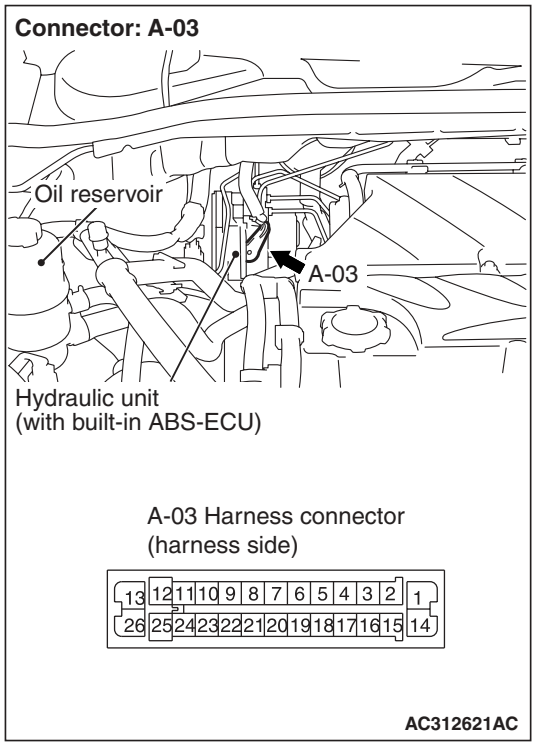
OK: 2 ohm or less

Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

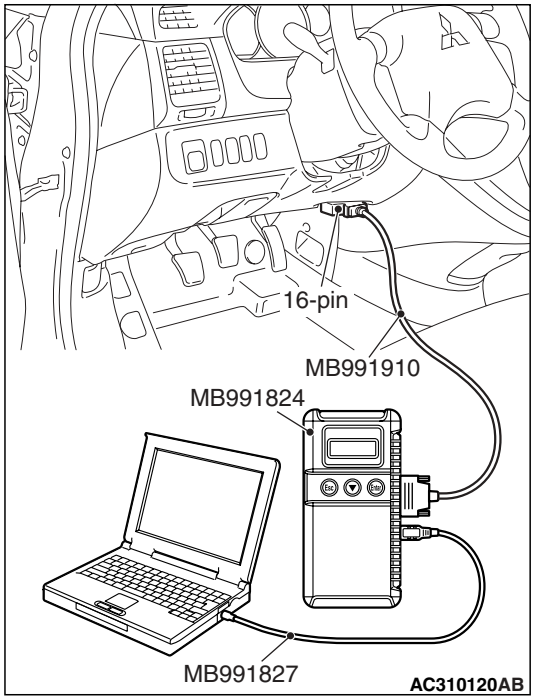


Q: Is the check result normal?

YES : An open circuit may be present in the earth circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 1 and the body earth. Then go to Step 8 .

NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 7. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.

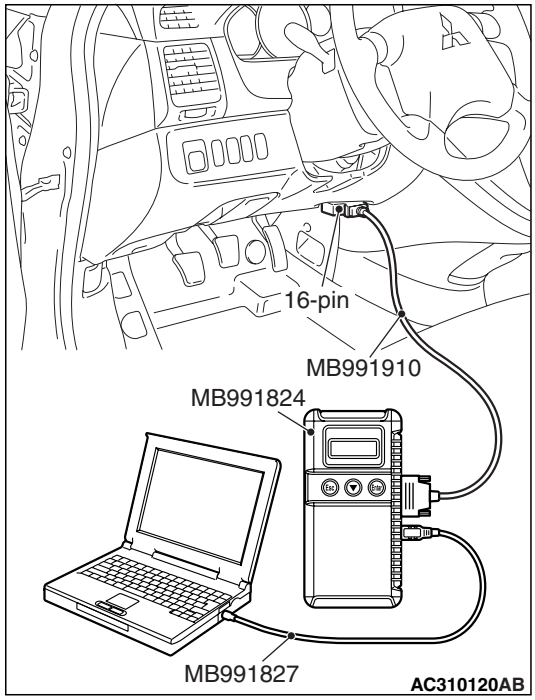
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 8. Check whether the diagnosis code is reset.

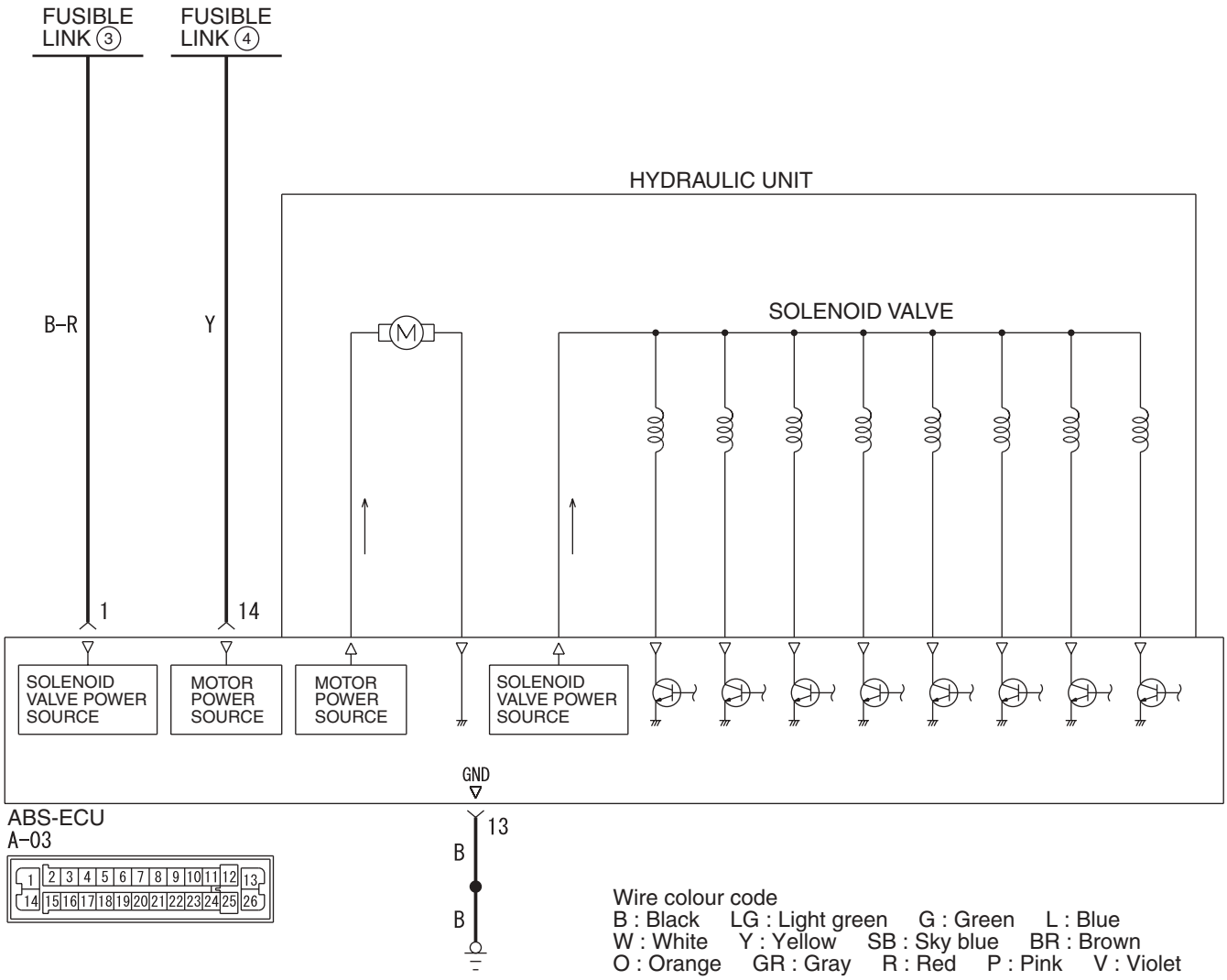


Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256 or C1261 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C1271: Motor drive circuit (Abnormal power supply voltage)

Solenoid Valve and Motor Power Supply Circuit



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⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the Diagnosis codes (Refer to GROUP 54D, CAN bus-line diagnostic flow P.54D-9).

OPERATION

- The ABS-ECU contains the power supply circuit (terminal 14) for the pump motor. The pump motor is energized by the motor switch, which is incorporated in the ABS-ECU.
- The pump motor switch, which is incorporated in the ABS-ECU, is always off unless the motor solenoid valve check is activated when the vehicle is started.
- The ABS-ECU activates the pump motor by turning on the ECU built-in pump motor switch when the ABS is working.

DIAGNOSIS CODE SET CONDITIONS

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

- This code is set if the pump motor power supply voltage is abnormally low for long time when the pump motor does not operate.
- This code is set if the pump motor voltage is abnormally high for long time when the pump motor does not operate.
- This code is set if the pump motor switch voltage drop indicates high value when the pump motor operates.

- If code No.C1860 or C1861 is not set and the pump motor power supply voltage is not normal when the pump motor operates, the ECU determines that the pump motor is defective, and sets this diagnosis code.

PROBABLE CAUSES

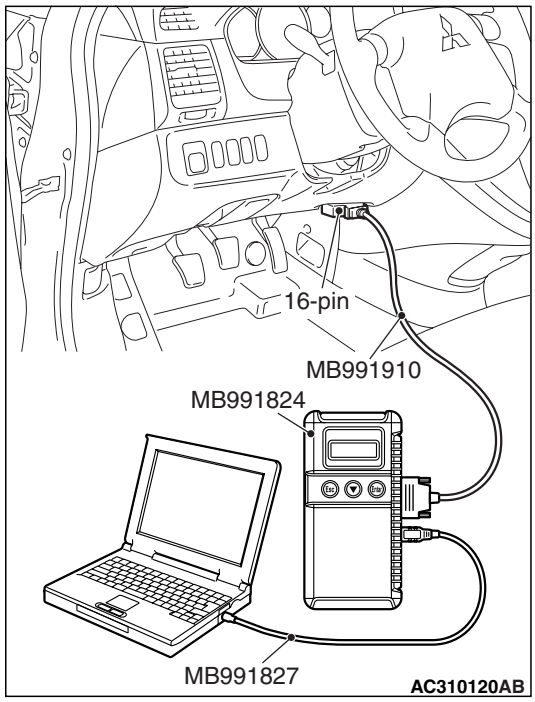
The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



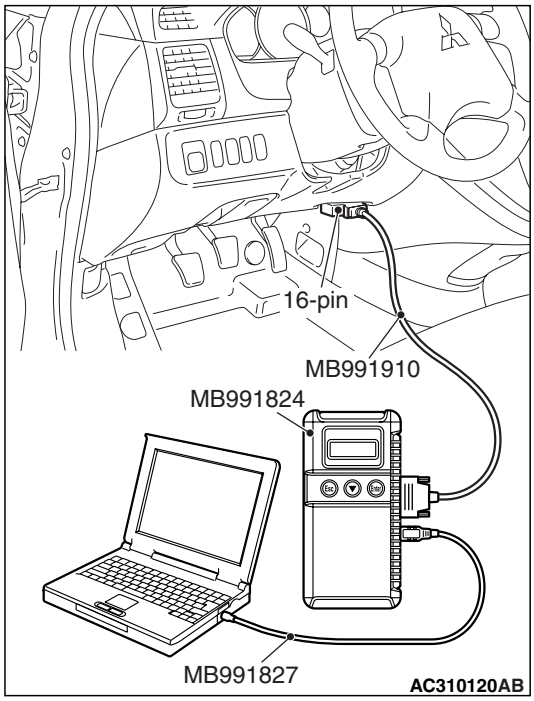
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION

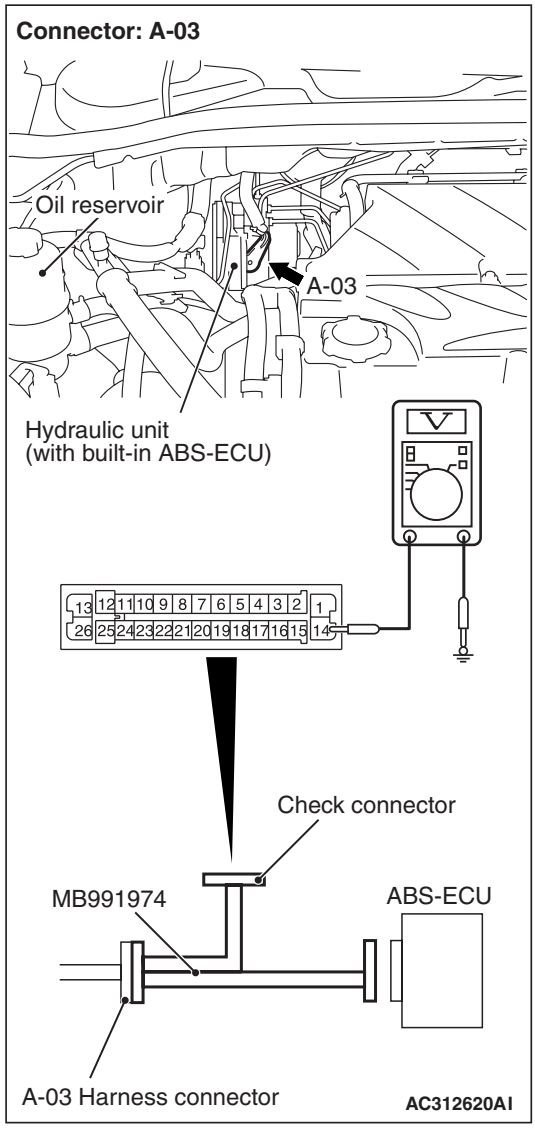


Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1271 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Voltage measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.
NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

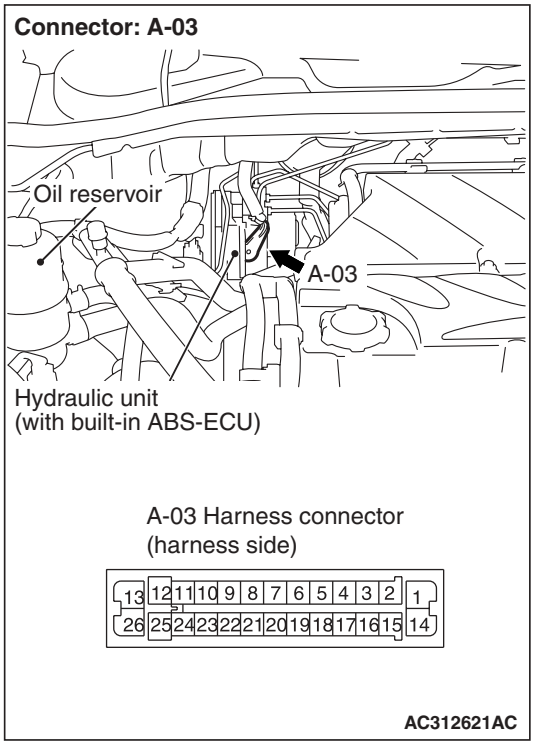
(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal 14 and earth.

OK: System voltage

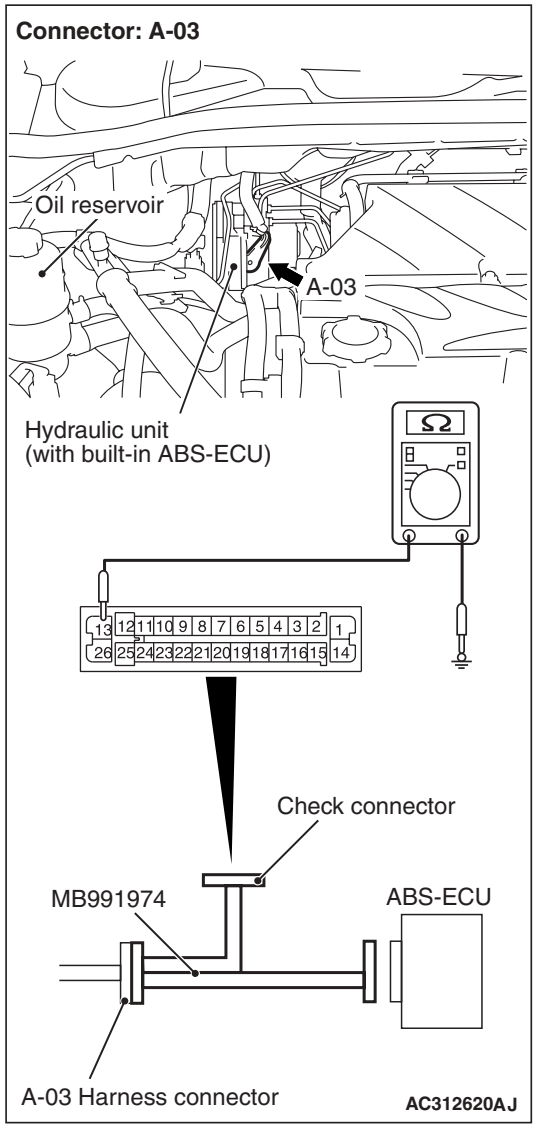
Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Is the check result normal?
YES : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 14 and fusible link No.4. Then go to Step 8.
NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 5. Resistance measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Measure the resistance between terminal 13 and earth.

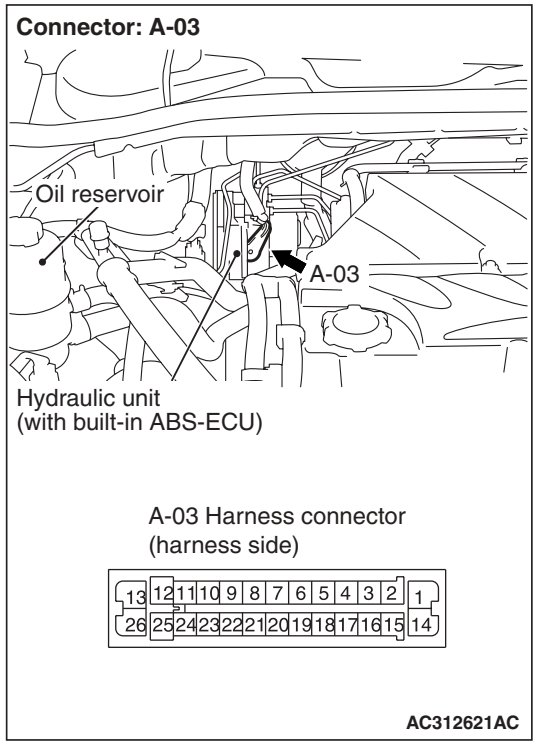
OK: 2 ohm or less

Q: Is the result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

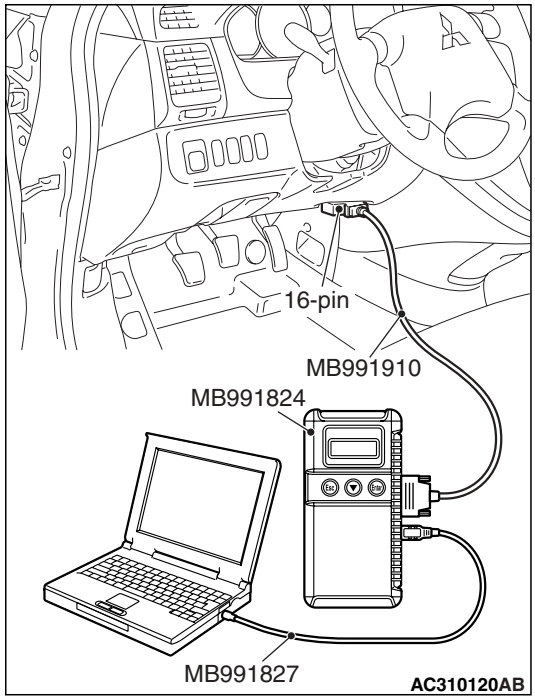


Q: Is the result normal?

YES : An open circuit may be present in the earth circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 13 and the body earth. Then go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 7. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.

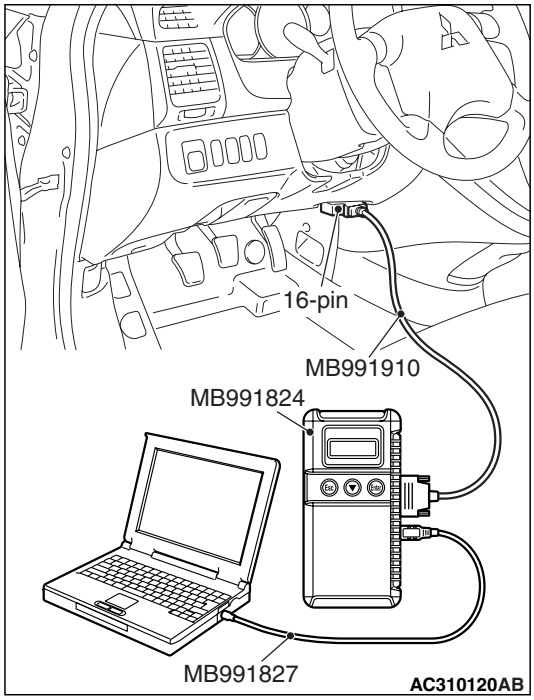
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1271 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 8. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

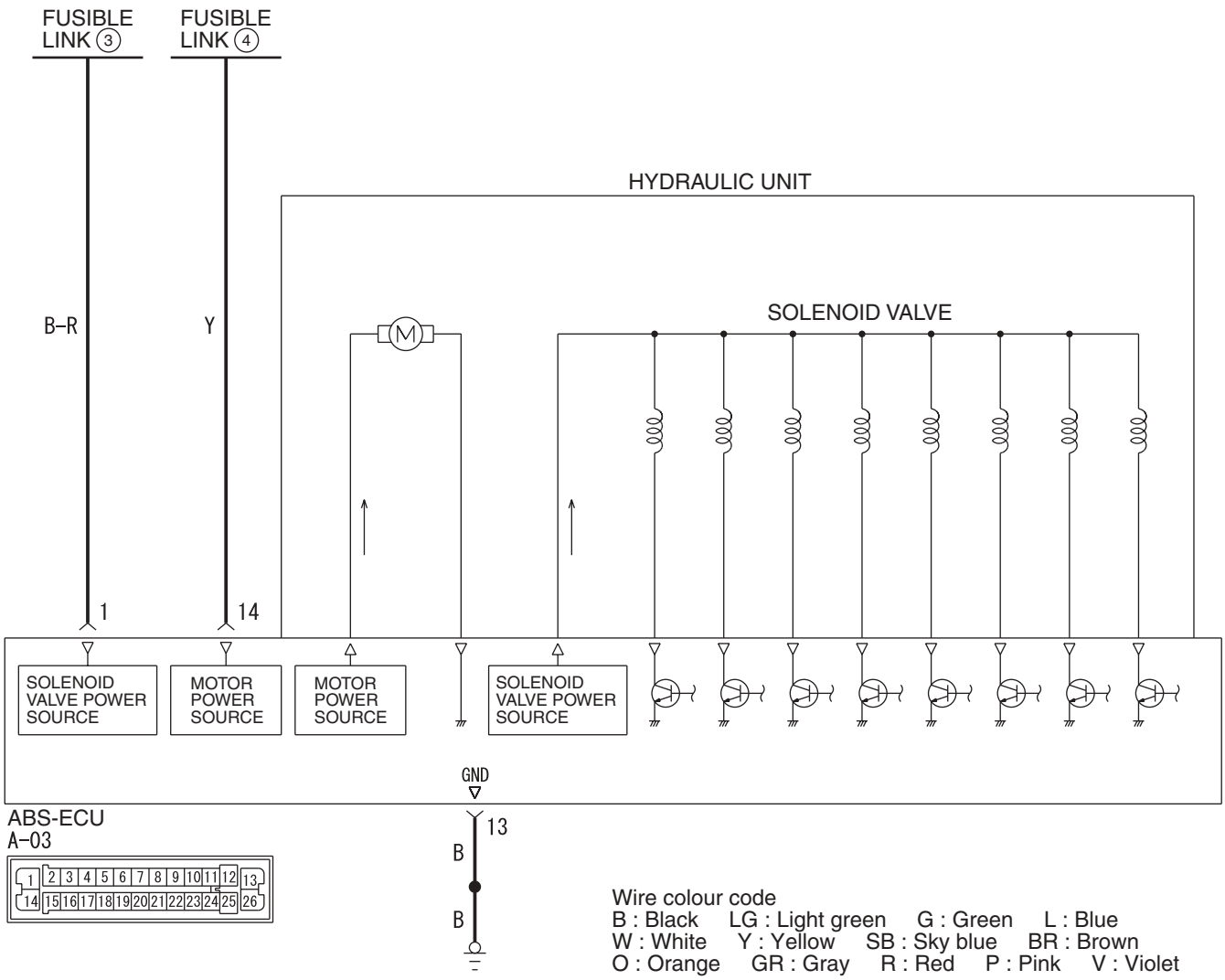
Q: Is code No.C1271 set?

YES : Go to Step 1.

NO : The procedure is complete.

Code No.C1276: Valve system

Solenoid Valve and Motor Power Supply Circuit



W4X35E018A

OPERATION

- The ABS-ECU contains the power supply circuit (terminal 1) for the solenoid valve. The solenoid valve is energized by the valve relay, which is incorporated in the ABS-ECU.
- The valve relay, which is incorporated in the ABS-ECU, is always energizing the solenoid valve unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

- The ABS-ECU monitors the power supply voltage to the solenoid valve. If the voltage is lower than the predetermined value, the ECU sets this diagnosis code as a failure in the valve relay circuit.

PROBABLE CAUSES

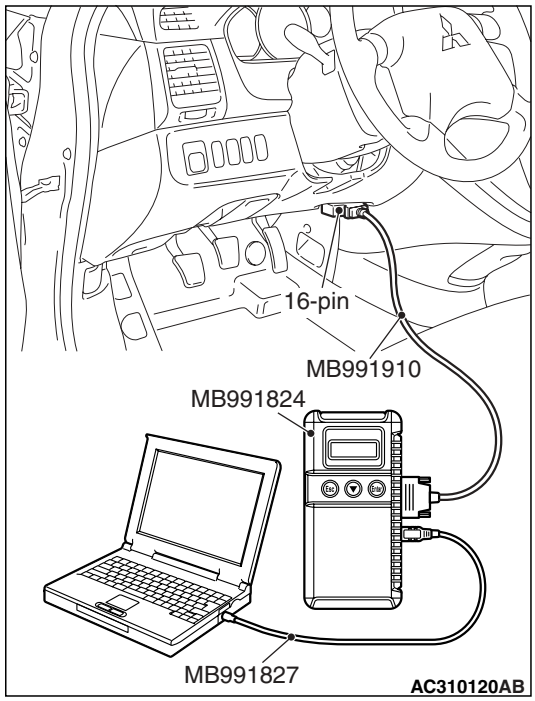
The most likely causes for these diagnosis codes to set are:

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



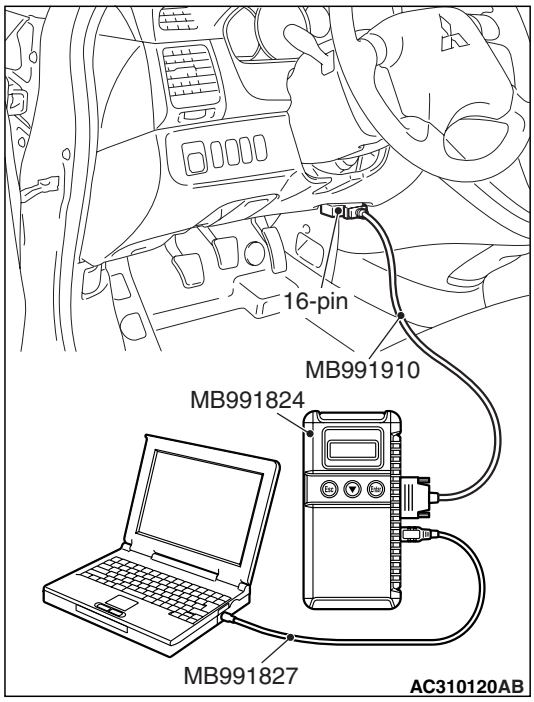
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

⚠ CAUTION

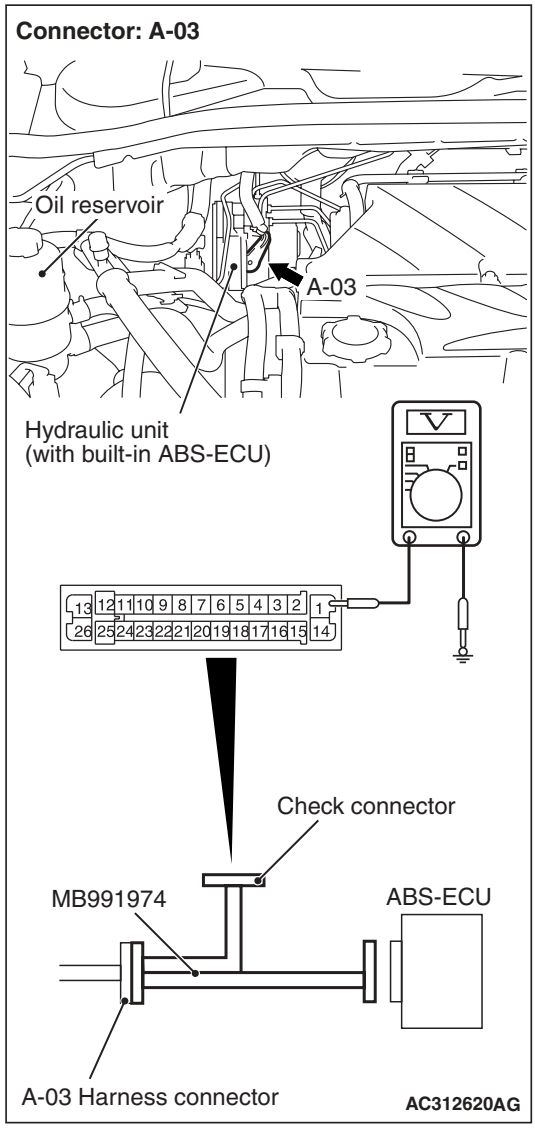


Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1276 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Voltage measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.
NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

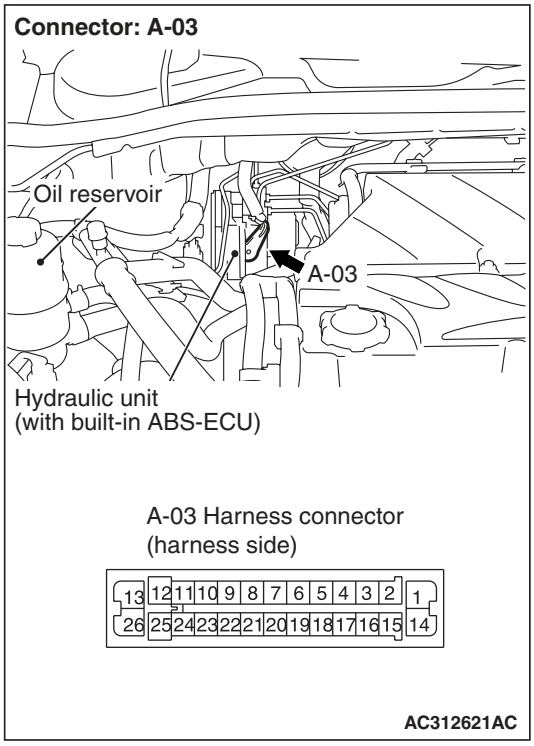
(2) Turn the ignition switch to the "ON" position.

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

OK: System voltage

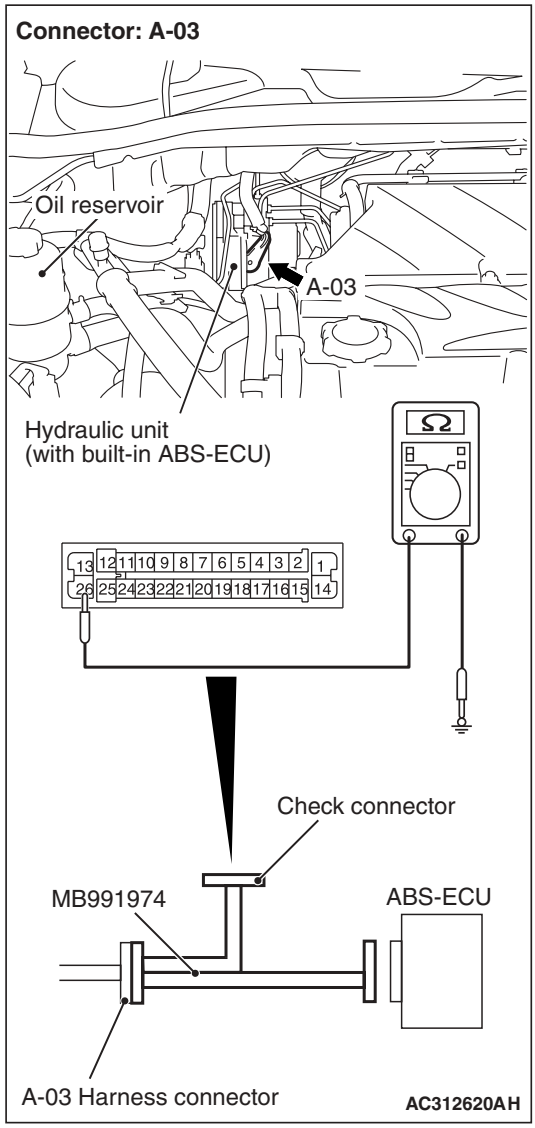
Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Is the check result normal?
YES : An open or short circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 1 and fusible link No.3. Then go to Step 8.
NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 5. Measure the resistance at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

(2) Measure the resistance between terminal 26 and earth.

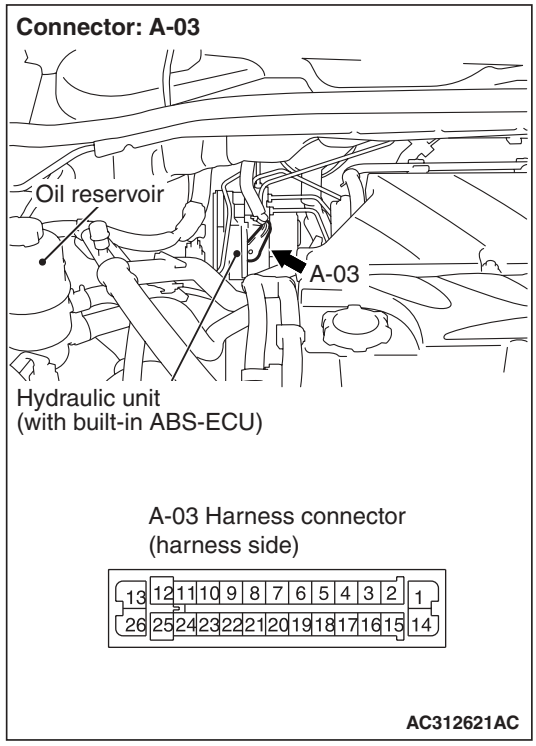
OK: 2 ohm or less

Q: Is the result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

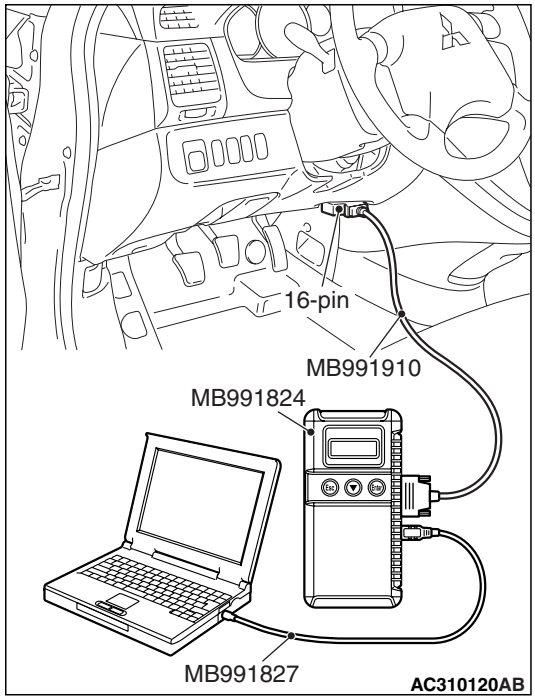


Q: Is the result normal?

YES : An open circuit may be present in the earth circuit. Repair the wiring harness between ABS-ECU connector A-03 terminal 26 and the body earth. Then go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

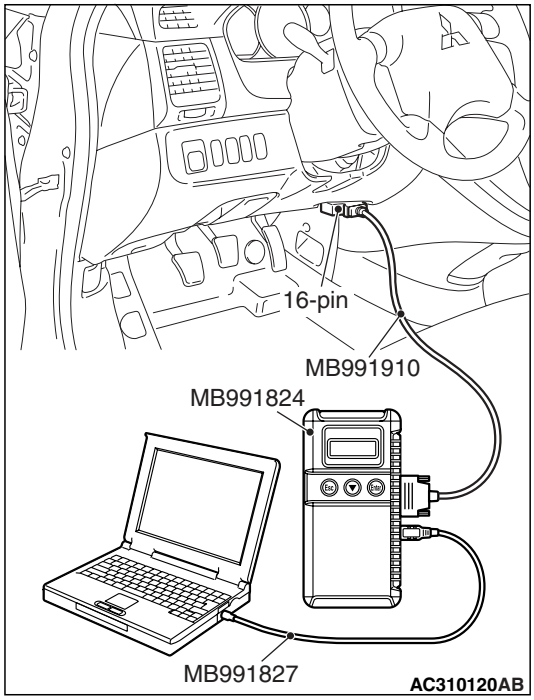
STEP 7. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1276 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 8. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1276 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1607: Trouble in ABS-ECU

⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

⚠ CAUTION

Whenever the ECU is replaced, ensure that the CAN bus lines are normal.

DIAGNOSIS CODE SET CONDITIONS

The ABS-ECU always monitors itself while the system is working. If the ECU detects any faults, it will set this diagnosis code.

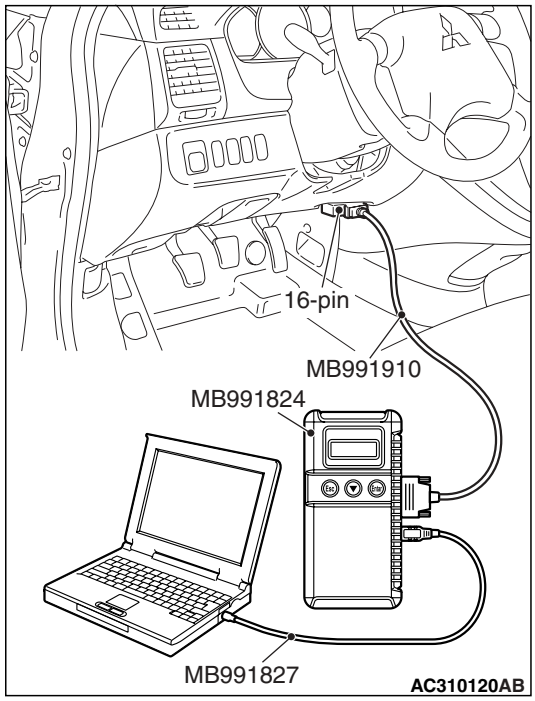
PROBABLE CAUSES

- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

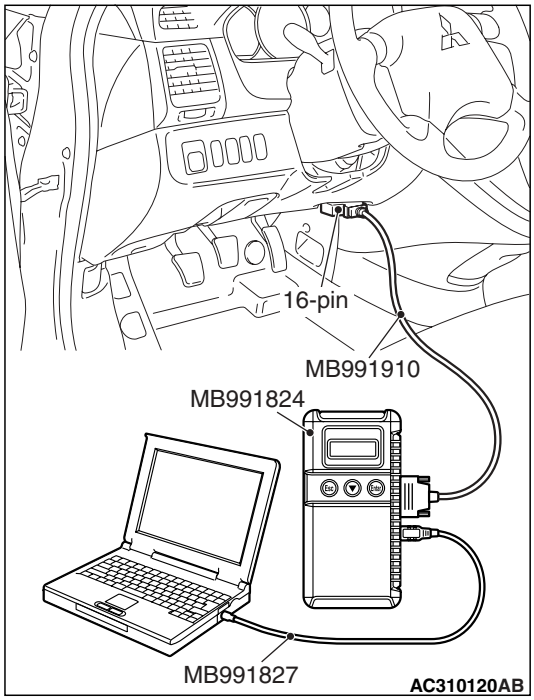
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. MUT-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1607 set?

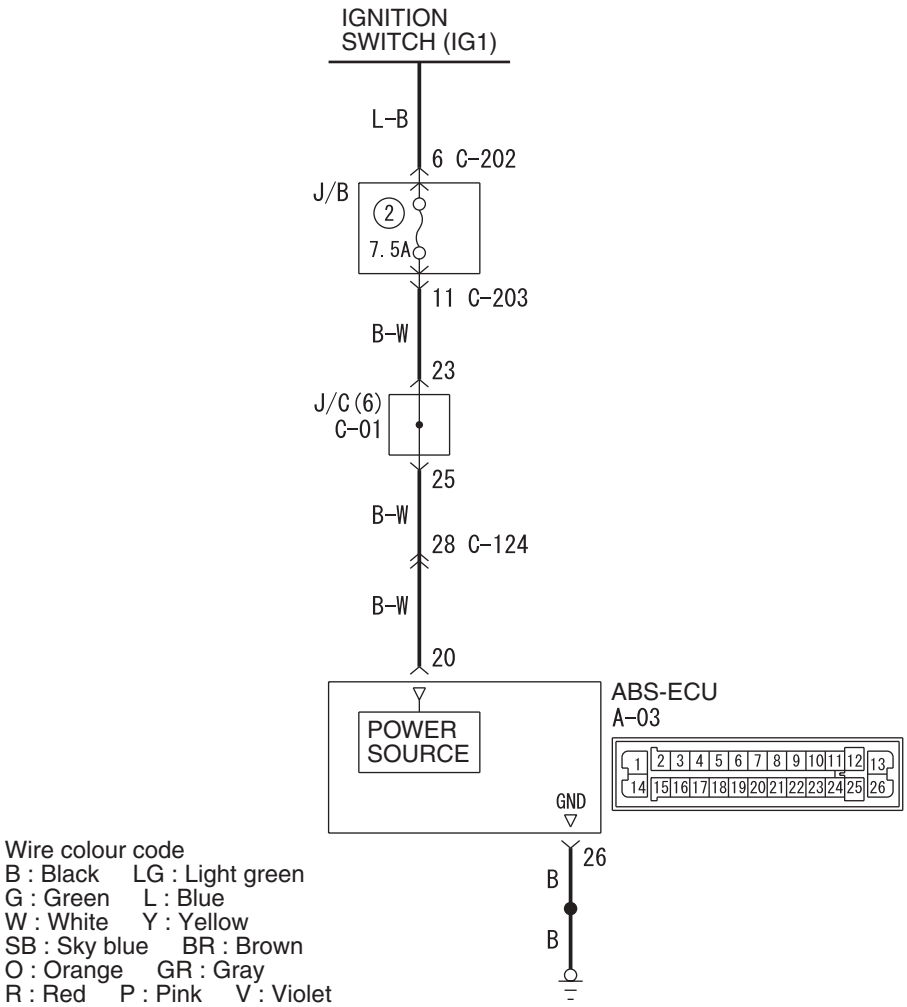
YES : Replace the hydraulic unit (integrated with ABS-ECU).

NO : The procedure is complete.

Code No.C1860: Power supply high voltage
Code No.C1861: Power supply low voltage

<LH drive vehicles>

ABS-ECU Power Supply and Ground Circuit



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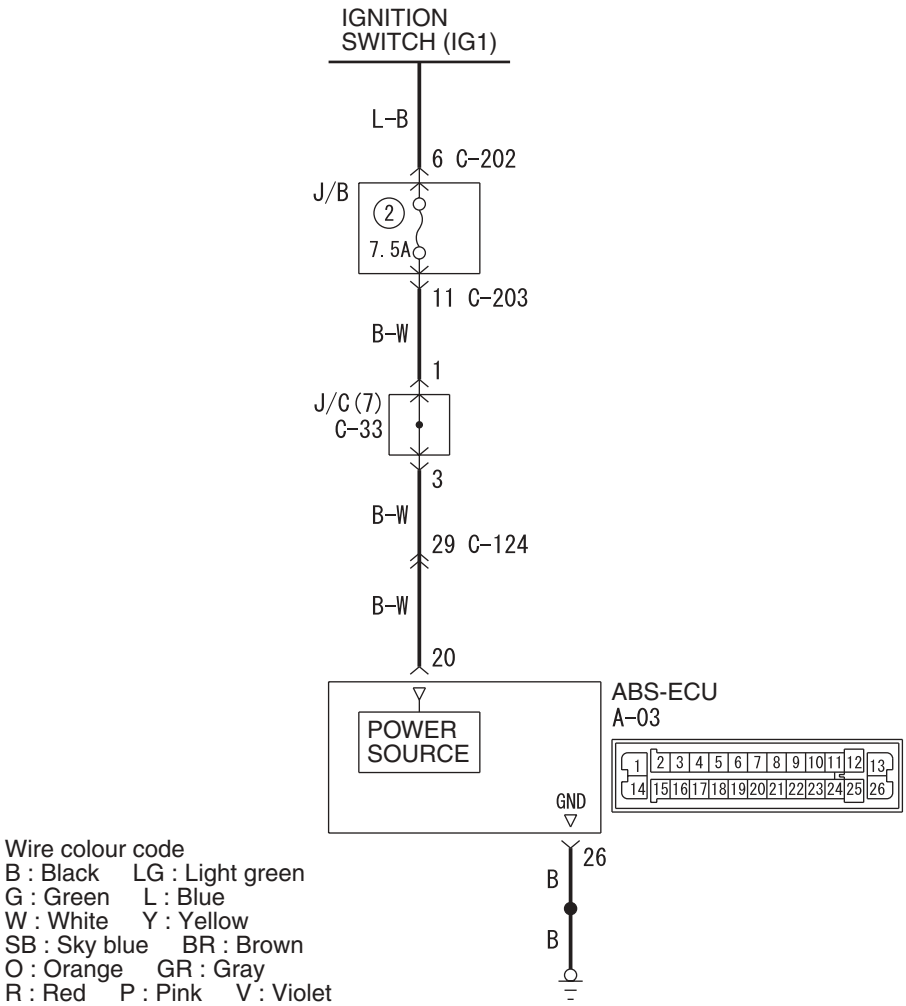
<RH drive vehicles>

ABS-ECU Power Supply and Ground Circuit



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⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines.

OPERATION

The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 2 and the ABS-ECU terminal 20.

DIAGNOSIS CODE SET CONDITIONS

C1860 will be set when the power supply voltage to the ABS-ECU has decreased to a predetermined value or lower. C1861 will be set when the power supply voltage to the ABS-ECU has increased to a predetermined value or higher.

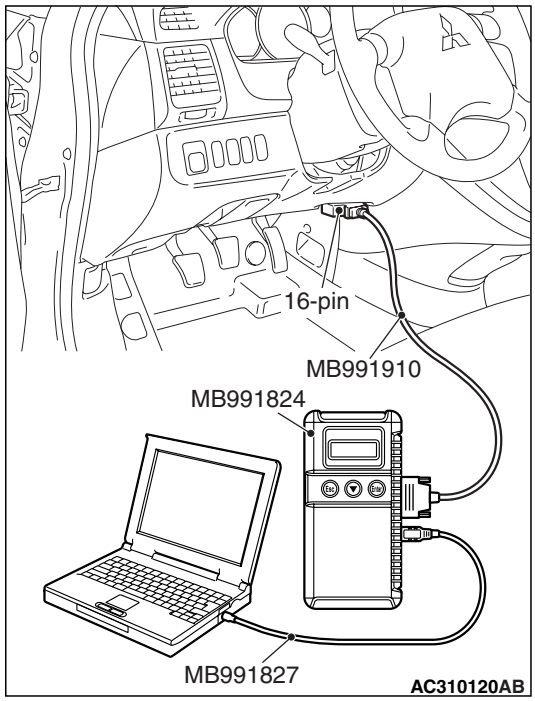
PROBABLE CAUSES

- Excessive electrical load
- Defective battery
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ABS-ECU)
- Charging system failed

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



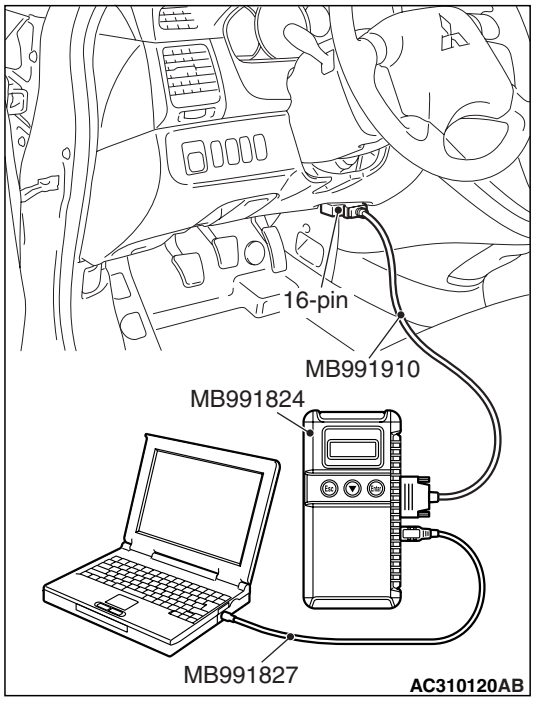
Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

STEP 2. MUT-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1860 or C1861 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check the battery.

Check the battery (Refer to GROUP 54A, Battery test P.54A-6).

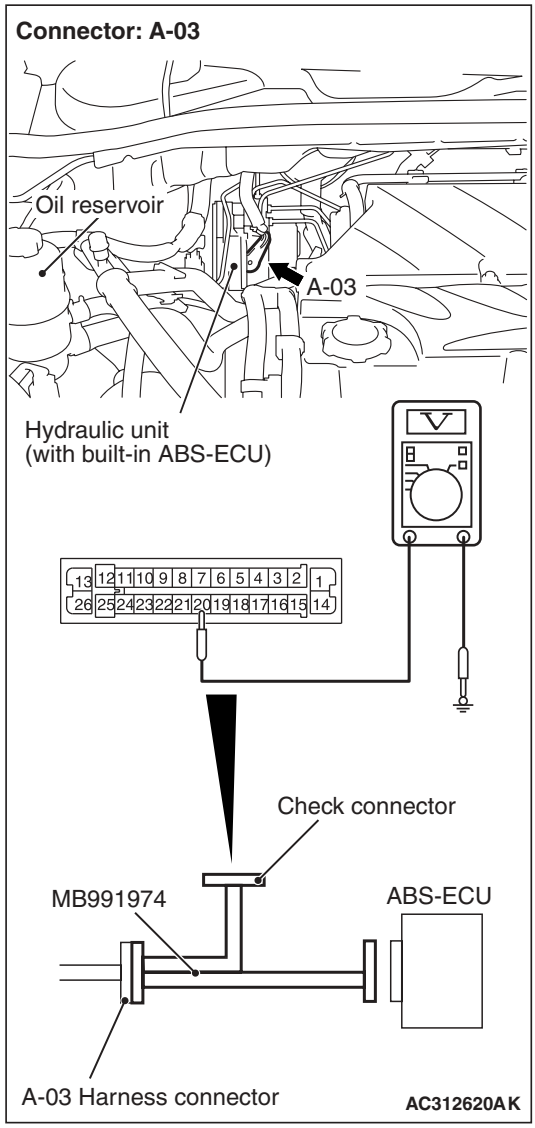
Q: Is the check result normal?
YES : Go to Step 4.
NO : Charge or replace the battery.

STEP 4. Check the charging system.

Check the charging system (Refer to GROUP 16, Charging system P.16-5).

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s).

STEP 5. Voltage measurement at ABS-ECU connector A-03.

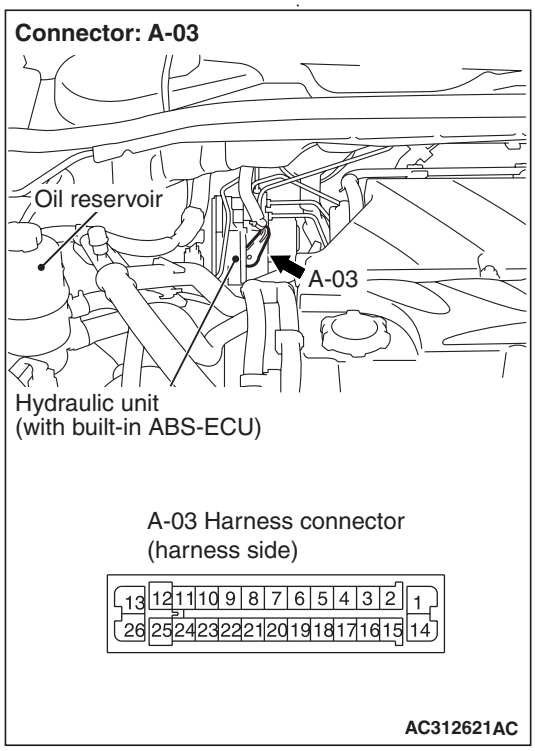


(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.
NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 20 and earth.

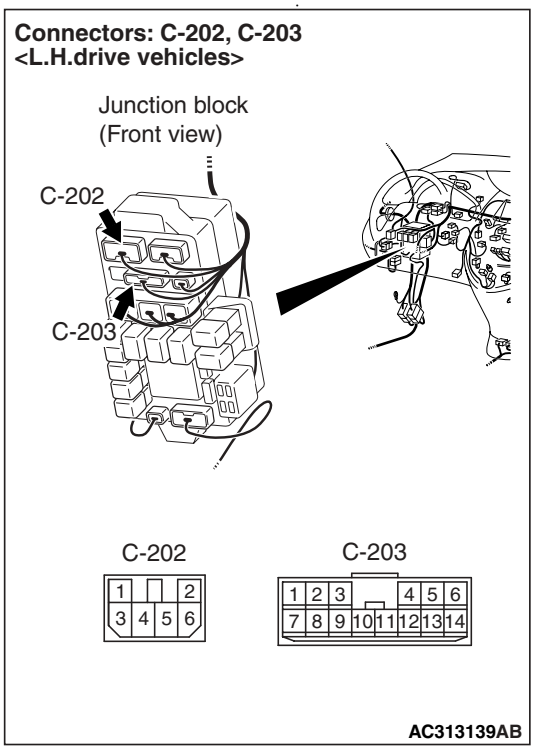
OK: System voltage

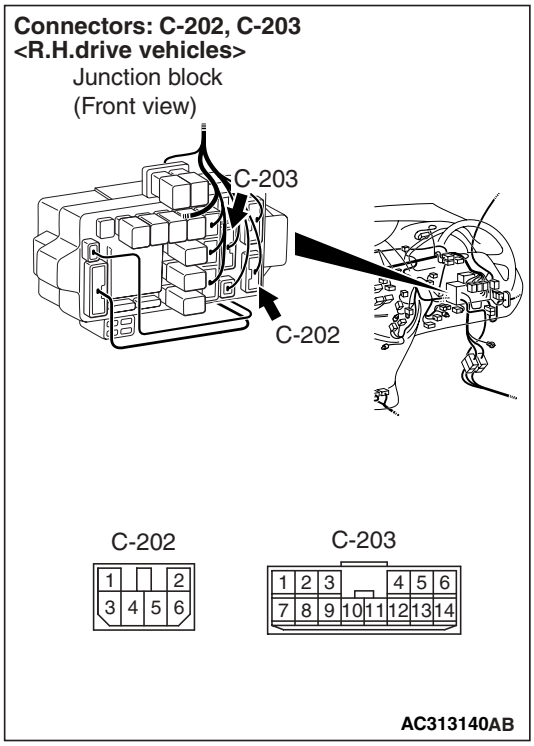
Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the following connectors.

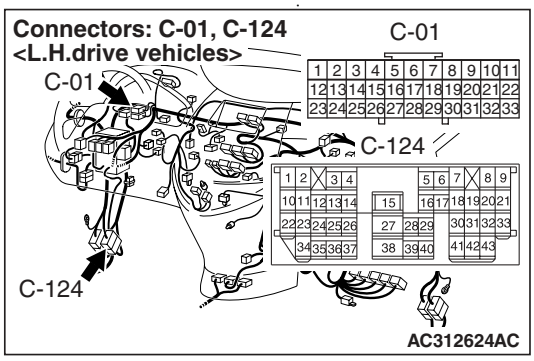


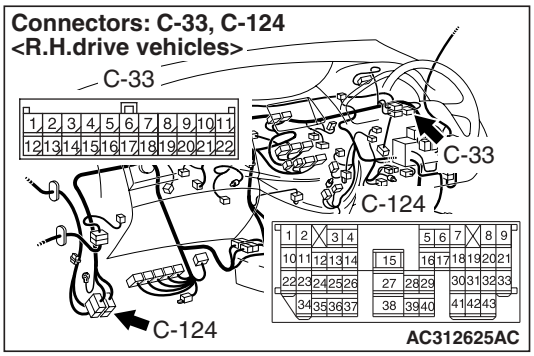
ABS-ECU connector A-03



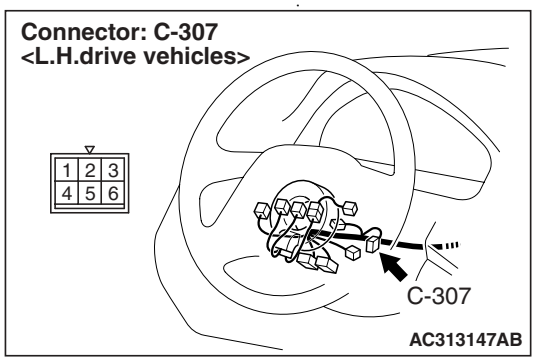


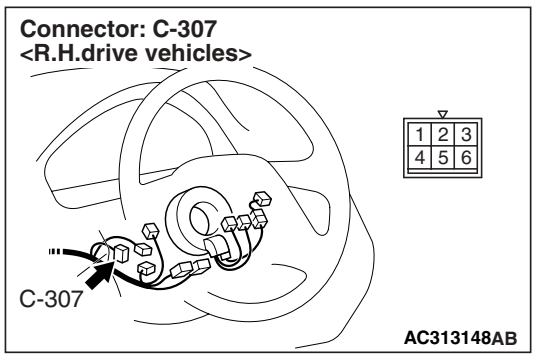
Junction block connectors C-202 and C-203





Joint connector C-01 <LH drive vehicles> or C-33 <RH drive vehicles> and intermediate connector C-124





Ignition switch connector C-307
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

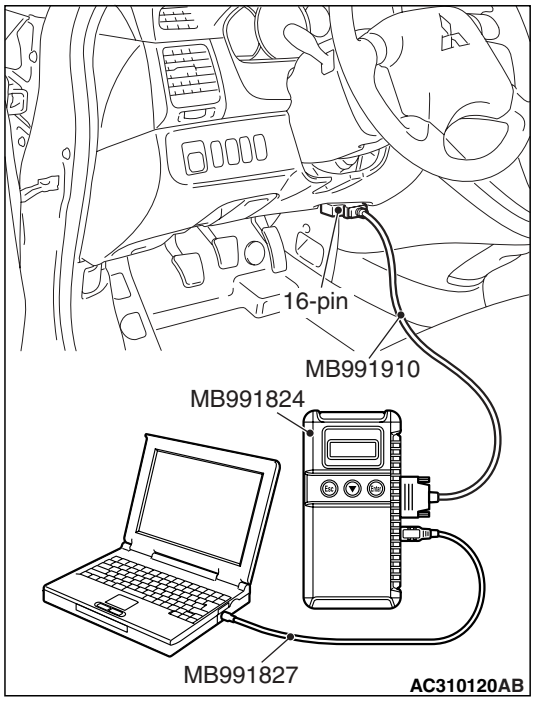
Q: Is the check result normal?

YES : An open or short circuit may be present in the power supply line to the ABS-ECU. Repair the wiring harness between ABS-ECU connector A-03 terminal 20 and ignition switch connector C-307 terminal 2. Then go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 7. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

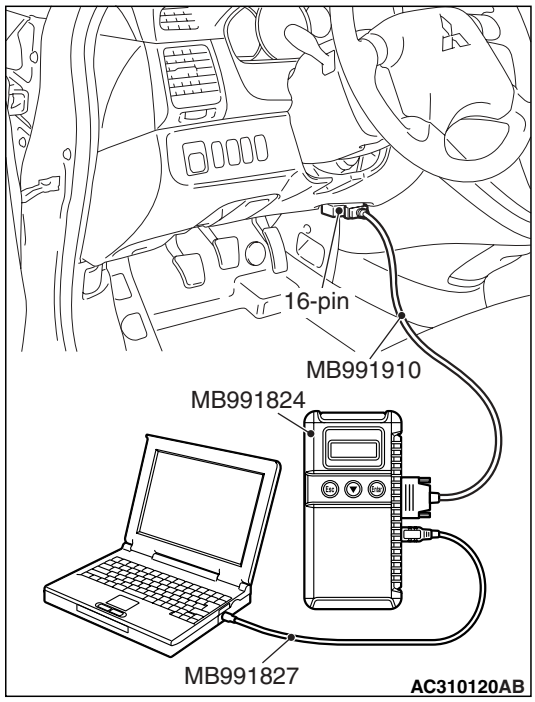
Q: Is code No.C1860 or C1861 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU). Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 8. Check whether the diagnosis code is reset.

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1860 or C1861 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1073: Bus off

⚠ CAUTION

- **If diagnosis code U1073 is set in the ABS-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGMENT

This code is stored when the ABS-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, regular data transmission will be cancelled.

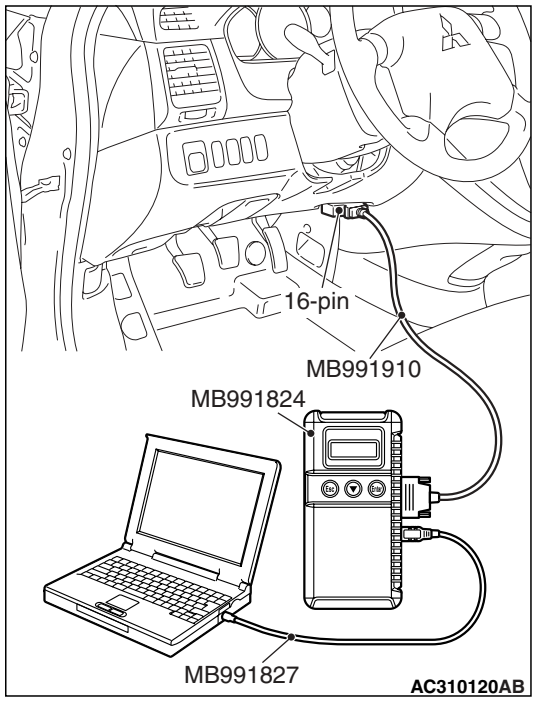
PROBABLE CAUSES

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION

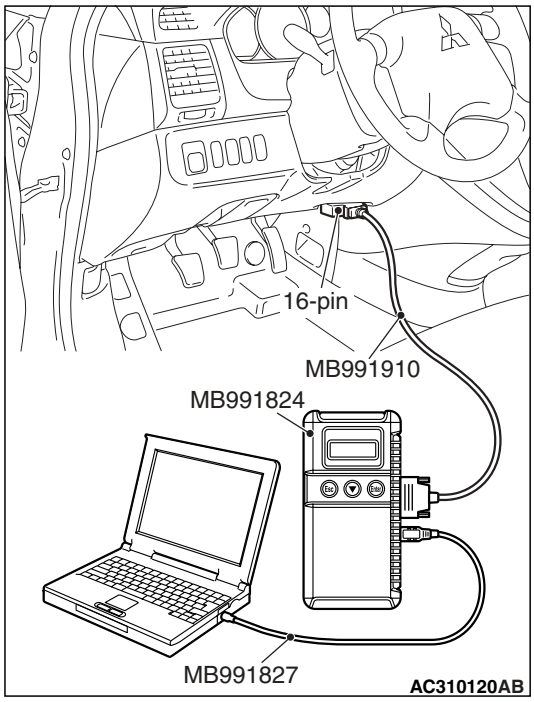


Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9). Then go to Step 2.

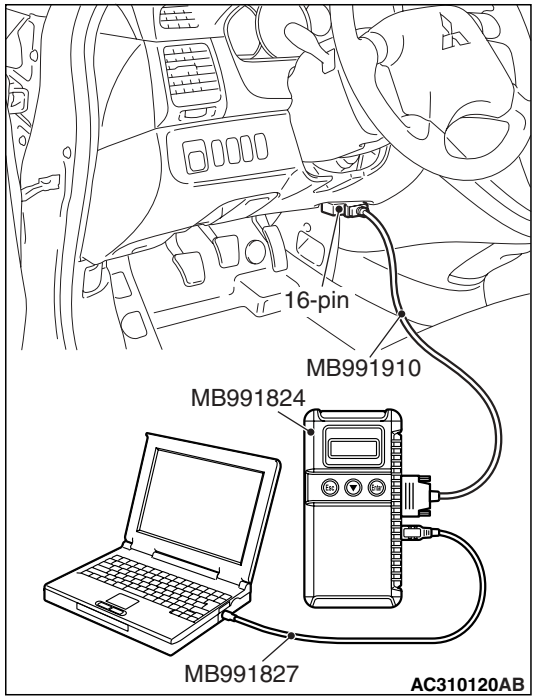
STEP 2. MUT-III diagnosis code



Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1073 set?
YES : Replace the hydraulic unit (integrated with ABS - ECU). Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.

STEP 3. Check whether the diagnosis code is reset.



Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1073 set?
YES : Go to Step 1.
NO : The procedure is complete.

INSPECTION CHART FOR TROUBLE SYMPTOMS

M1352011400761

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.

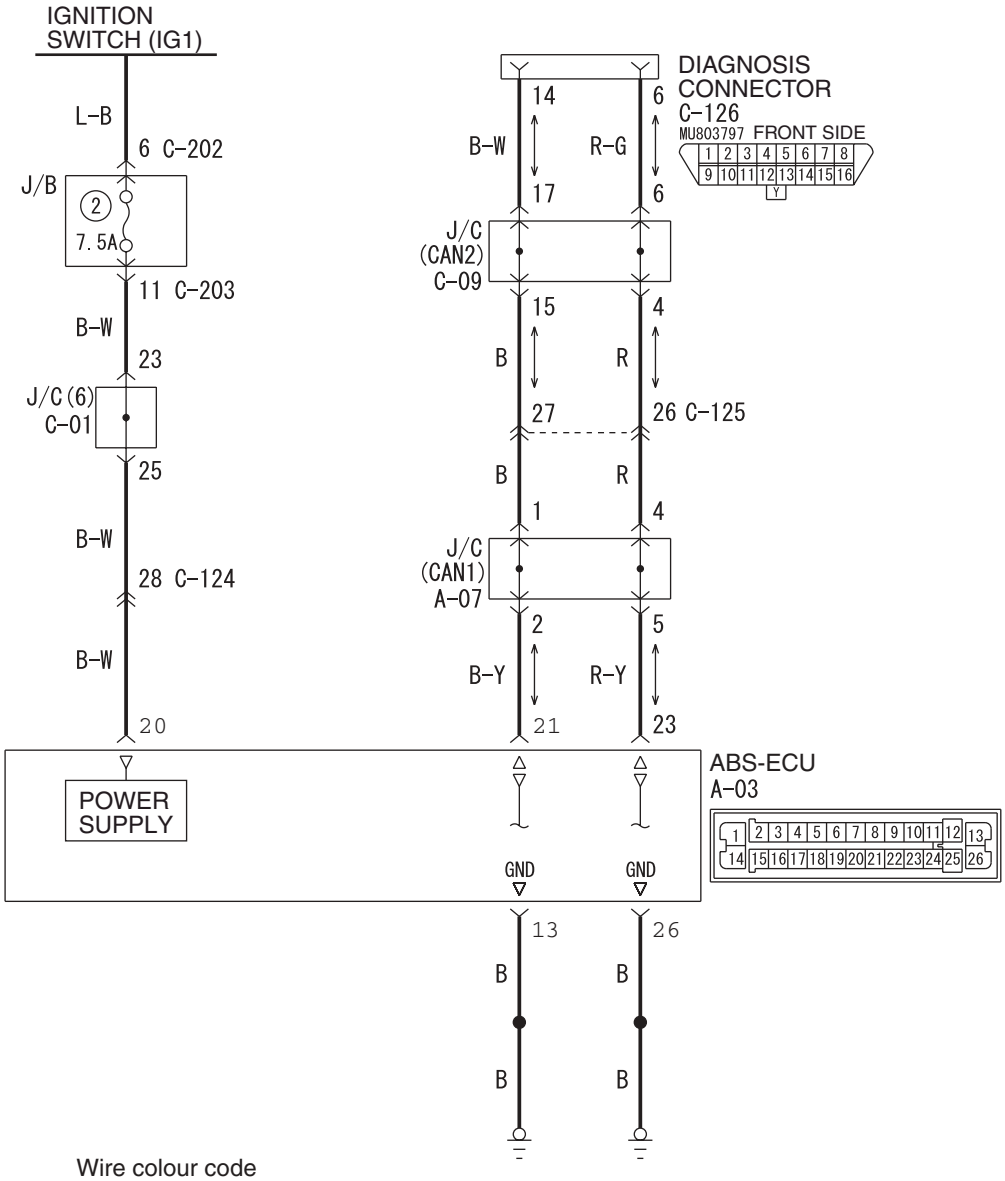
Symptom	Inspection procedure No.	Reference page
Communication between MUT-III and the ABS-ECU is not possible.	1	P.35B-62
ABS-ECU power supply circuit system	2	P.35B-65
When the ignition switch is turned to the "ON" position (Engine stopped), the ABS warning lamp does not illuminate.	3	P.35B-70
The ABS warning lamp remains illuminated after the engine is started.	4	P.35B-70
Faulty ABS operation	5	P.35B-72

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1: Communication between Scan Tool and the ABS-ECU is not possible.

<LH drive vehicles>

Data Link 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

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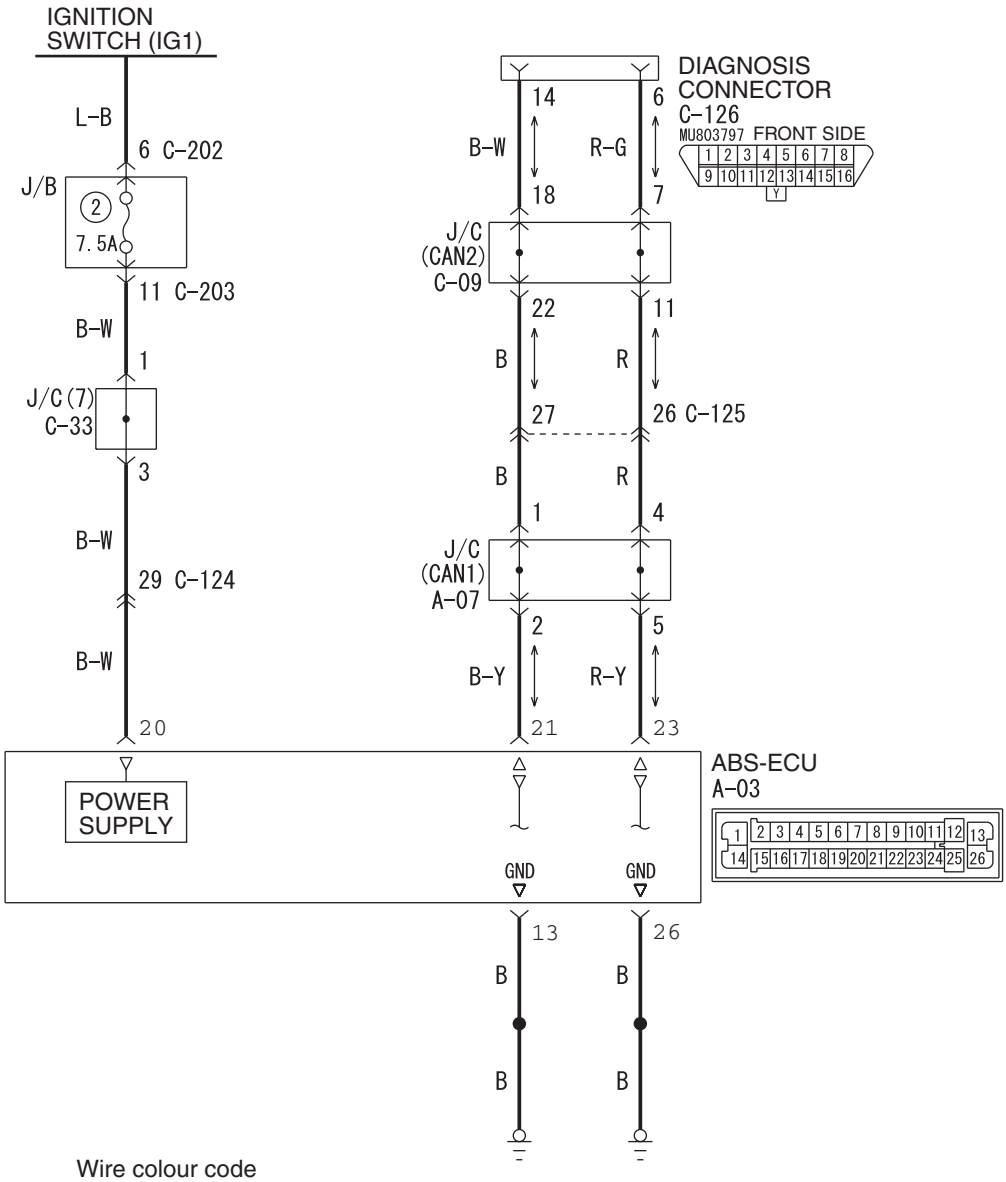
<RH drive vehicles>

Data Link 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

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TECHNICAL DESCRIPTION (COMMENT)

If the MUT-III can not communicate with the ABS system, the CAN bus lines may be defective. If the ABS system does not work, the ABS-ECU or its power supply circuit may be defective.

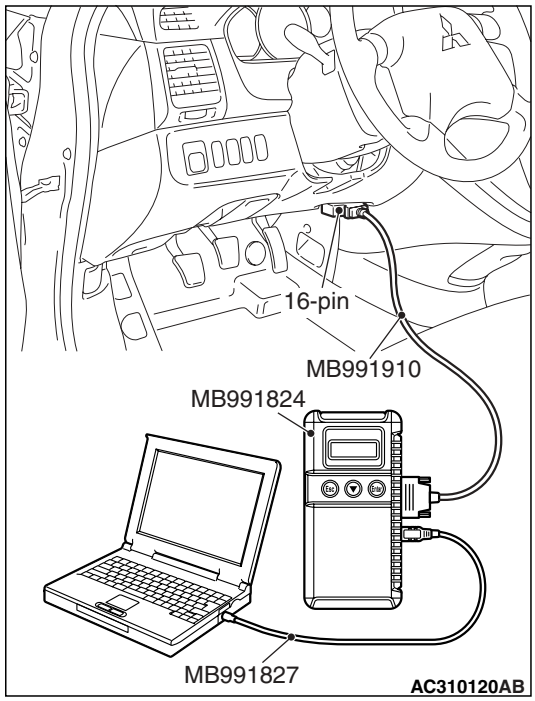
PROBABLE CAUSES

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

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

Use MUT-III to diagnose the CAN bus lines.

(1) Connect MUT-III to the 16-pin diagnosis connector.

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

(3) Diagnose the CAN bus line.

Q: Is the check result normal?

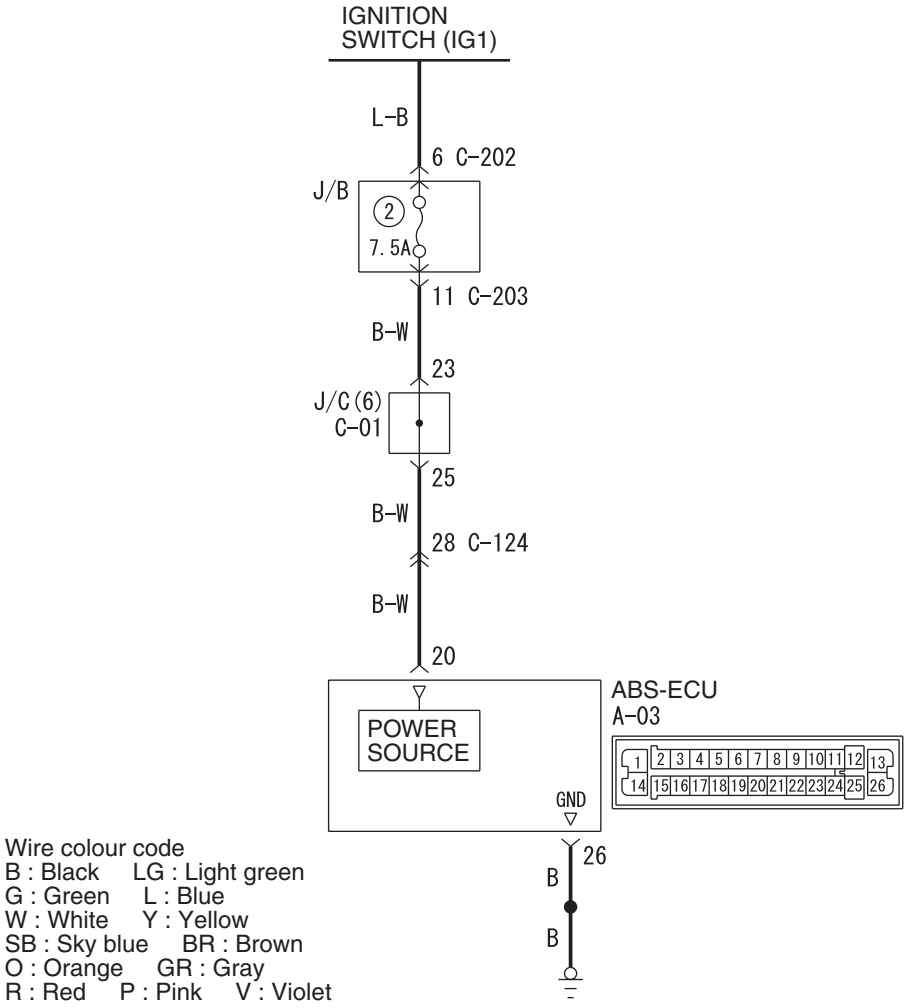
YES : Check and repair the power supply circuit system (Refer to P.35B-65).

NO : Repair the CAN bus lines (Refer to GROUP 54D, CAN bus line Diagnostic flow P.54D-9).

INSPECTION PROCEDURE 2: ABS-ECU power supply supply system

<LH drive vehicles>

ABS-ECU Power Supply and Ground Circuit



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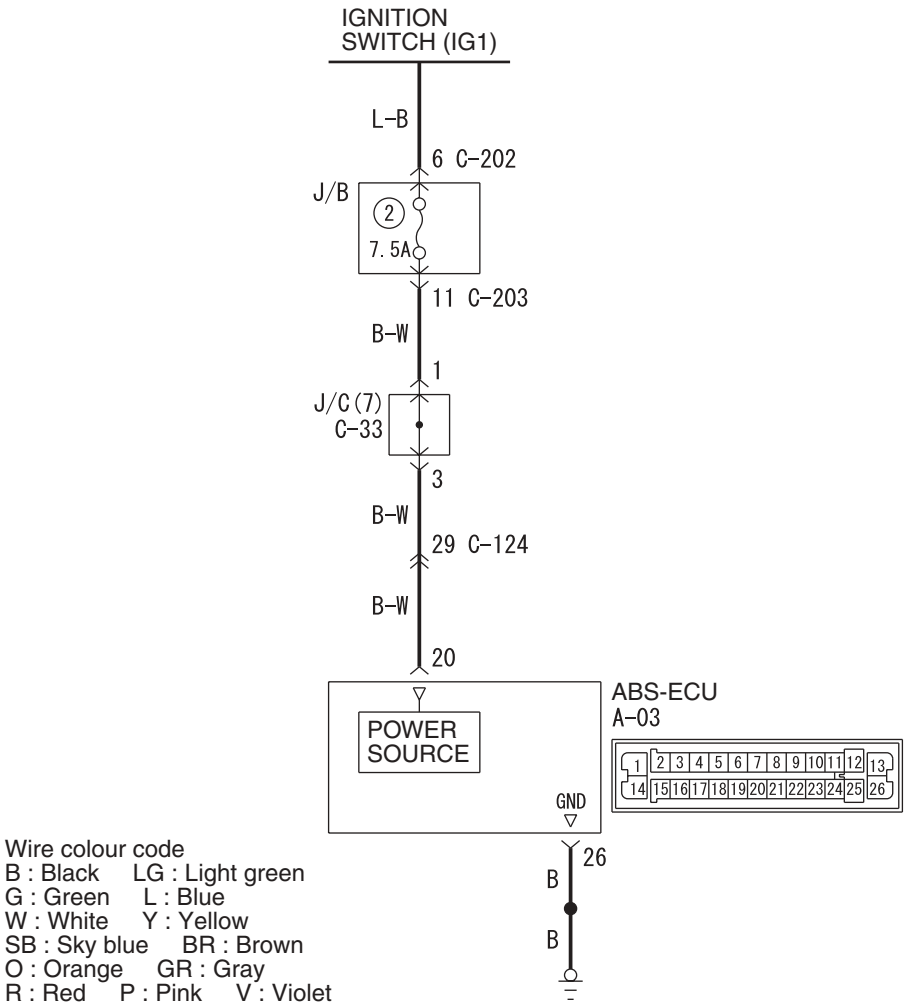
<RH drive vehicles>

ABS-ECU Power Supply and Ground Circuit



W4X35E019A

OPERATION

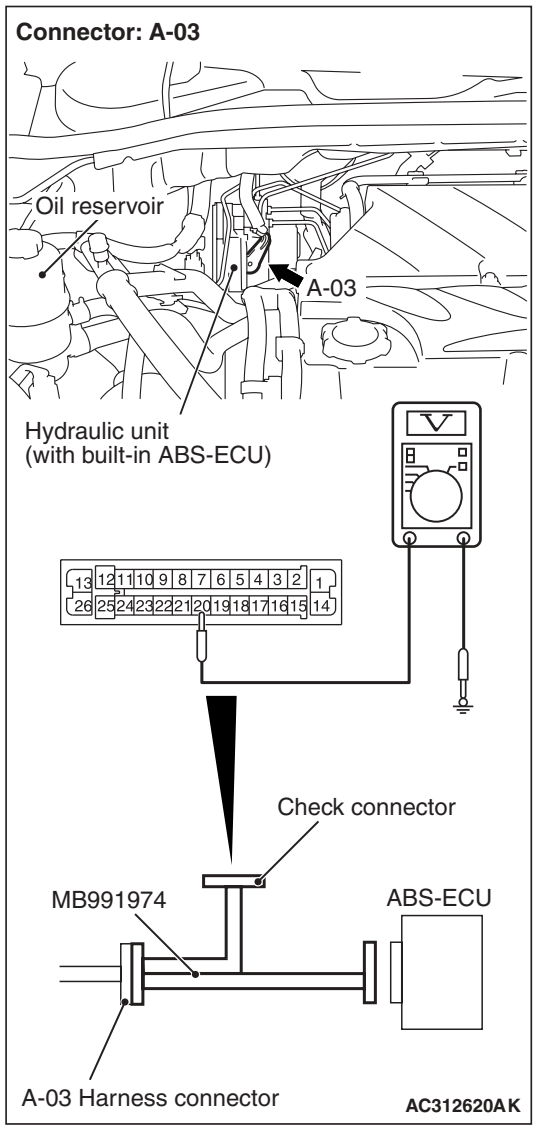
- The ABS-ECU is energized by the ignition switch (IG1) through multi-purpose fuse 2 and the ABS-ECU terminal 20.
- If the power supply to the ABS-ECU has failed, MUT-III will not be able to communicate with it.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Defective battery
- Charging system failed
- Malfunction of the hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

STEP 1. Voltage measurement at ABS-ECU connector A-03.



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

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

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

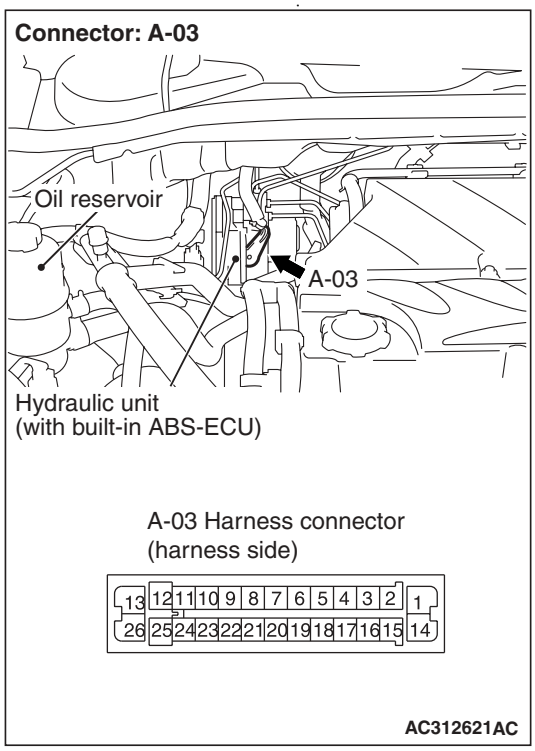
OK: System voltage

Q: Is the check result normal?

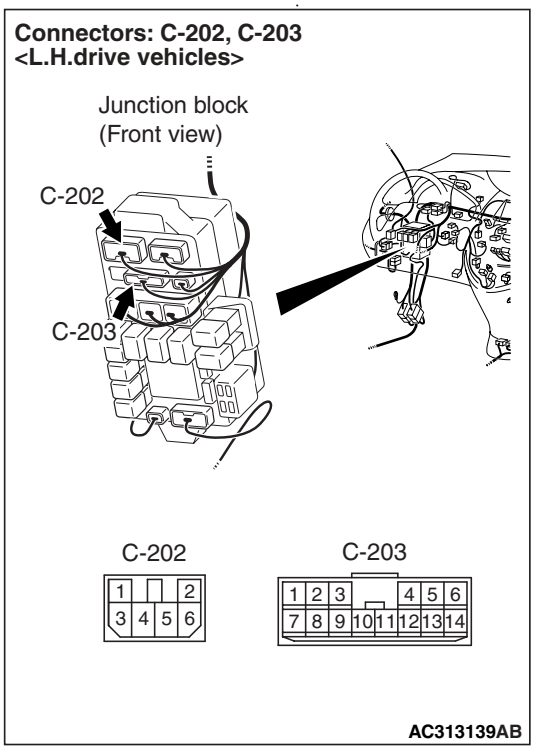
YES : Go to Step 3.

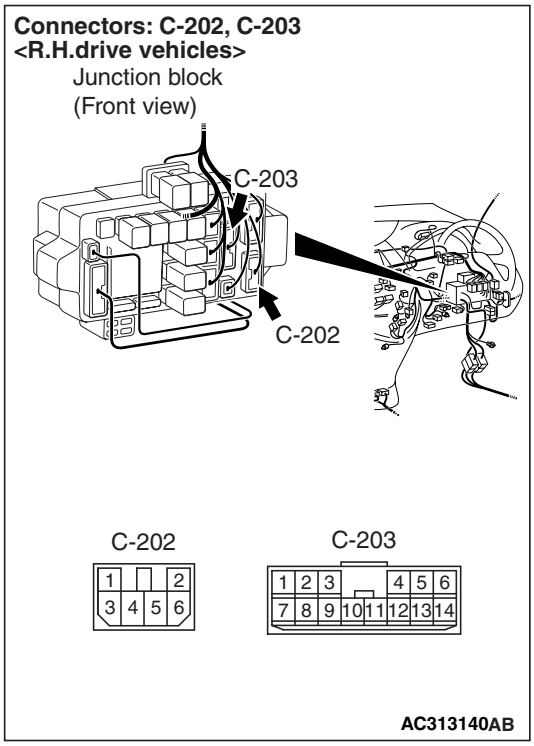
NO : Go to Step 2.

STEP 2. Check the following connectors.

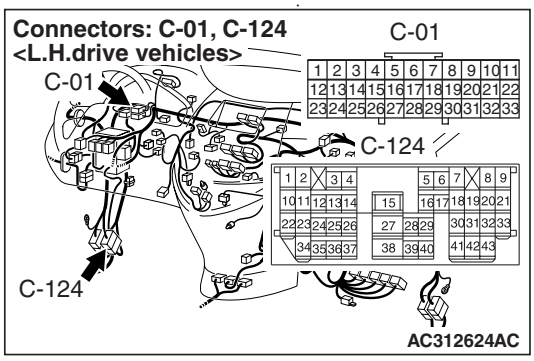


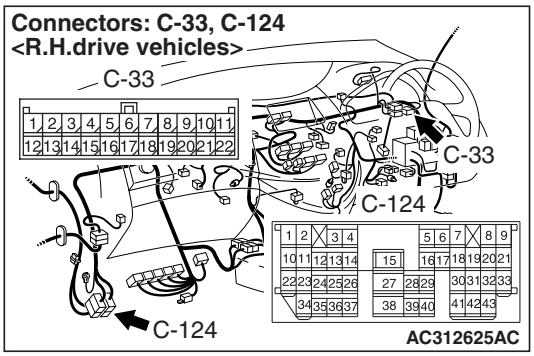
ABS-ECU connector A-03



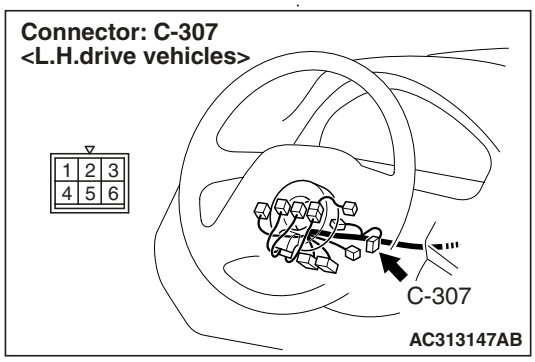


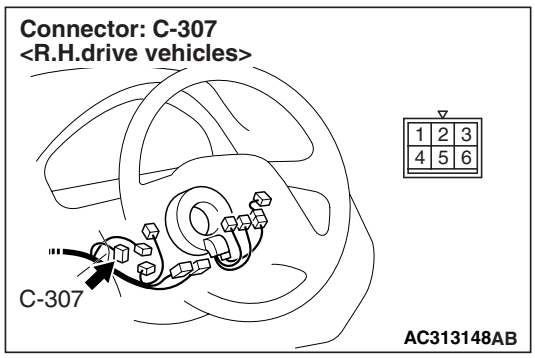
Junction block connectors C-202 and C-203





Joint connector (6) C-01 <LH drive vehicles>, Joint connector (7) C-33 <RH drive vehicles> and intermediate connector C-124





Ignition switch connector C-307

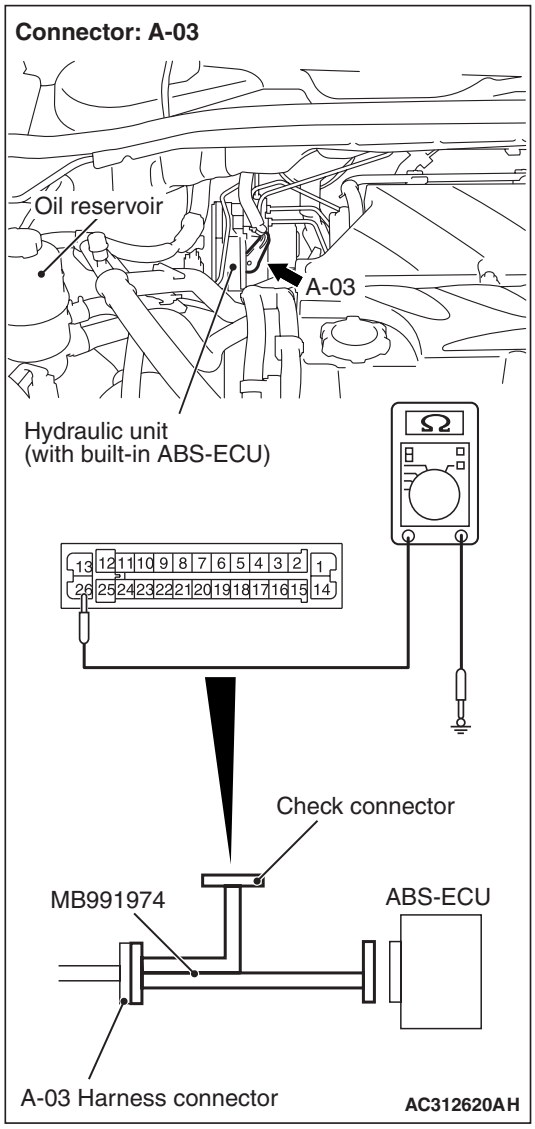
Check the connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the check result normal?

YES : An open or short circuit may be present in the power supply line to the ABS-ECU. Repair the wiring harness between ABS-ECU connector A-03 terminal 20 and ignition switch connector C-307 terminal 2. Go to Step 8.

NO : Repair or replace the damaged component(s). Then go to Step 8.

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



(1) Disconnect the connector A-03, and connect special tool ABS Check Harness (MB991974) to the wiring harness-side connector.

NOTE: Do not connect special tool ABS Check Harness (MB991974) to the ABS-ECU.

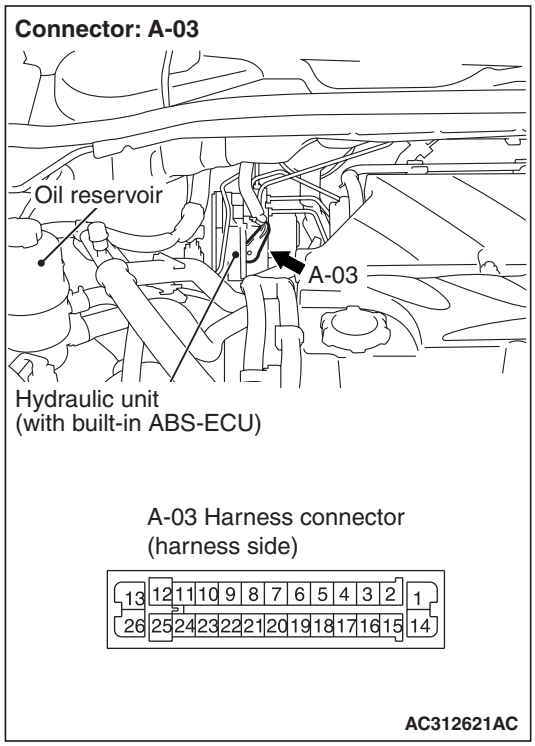
(2) Measure the resistance between terminal 26 and earth.

OK: 2 ohm or less

Q: Is the check result normal?

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

STEP 4. Check ABS-ECU connector A-03 for loose, corroded or damaged terminals, or terminals pushed back in the connector.



Q: Is the check result normal?
YES : An open circuit may be present in the earth circuit. Repair the wiring harness between ABS-ECU connector A-03 terminals 26 and the body earth. Then go to Step 8.
NO : Repair or replace the damaged component(s). Then go to Step 8.

STEP 5. Check the battery.
Check the battery (Refer to GROUP 54A, Battery test P.54A-6).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Charge or replace the battery. Then go to Step 8.

STEP 6. Check the charging system.
Check the charging system (Refer to GROUP 16, Charging system P.16-5).

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace the charging system component(s).Then go to Step 8.

STEP 7. Retest the system.

Q: Can the ABS-ECU communicate with the MUT-III?
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction P.00-5.
NO : Replace the ABS-ECU. Then go to Step 8.

STEP 8. Retest the system.

Q: Can the ABS-ECU communicate with the MUT-III?
YES : The procedure is complete.
NO : Go to Step 1.

INSPECTION PROCEDURE 3: When the Ignition Switch is Turned to the "ON" Position (Engine Stopped), the ABS Warning Lamp does not Illuminate.
INSPECTION PROCEDURE 4: The ABS Warning Lamp Remains Illuminated After the Engine is Started.

OPERATION
- ABS-ECU send the illumination signal of ABS warning lamp to the combination meter via the CAN communication.
- ABS-ECU operates the ABS warning lamp and the ABS warning lamp for three seconds after the ignition switch is turned "ON" position for bulb check.

COMMENT
This may be caused by faults in the CAN bus line, the combination meter or the ABS-ECU.

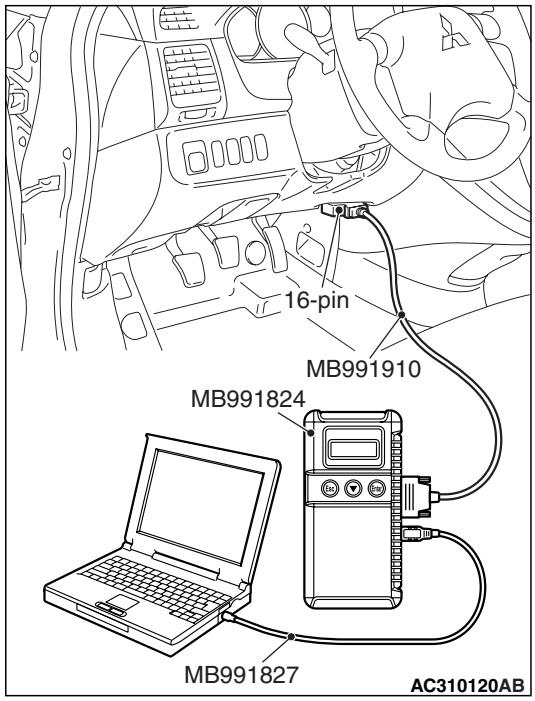
PROBABLE CAUSES
- Malfunction of the combination meter
- Damaged harness, connector
- Malfunction of the ABS-ECU

DIAGNOSIS

STEP 1. MUT-III CAN bus diagnostics

Use MUT-III to diagnose the CAN bus lines.

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

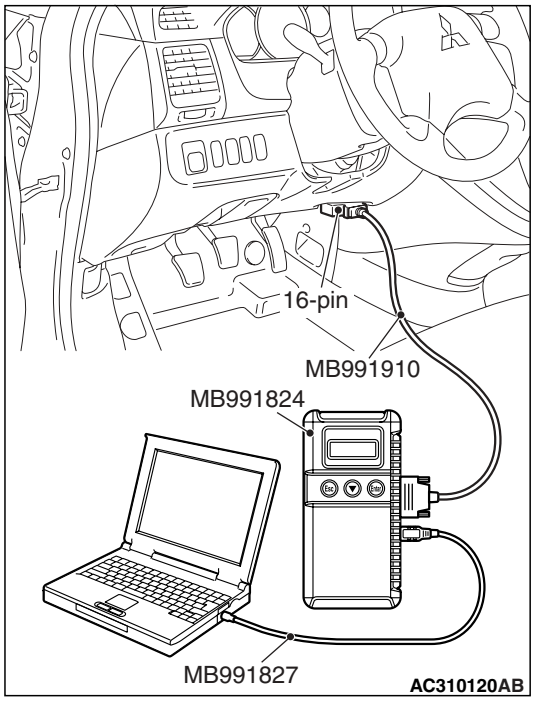
Q: Is the check result normal?

YES : Go to Step 2

NO : Repair the CAN bus lines. (Refer to GROUP 54D, Diagnosis-Can Bus Diagnostic Chart P.54D-16). Then go to Step 4.

STEP 2. MUT-III diagnosis code

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

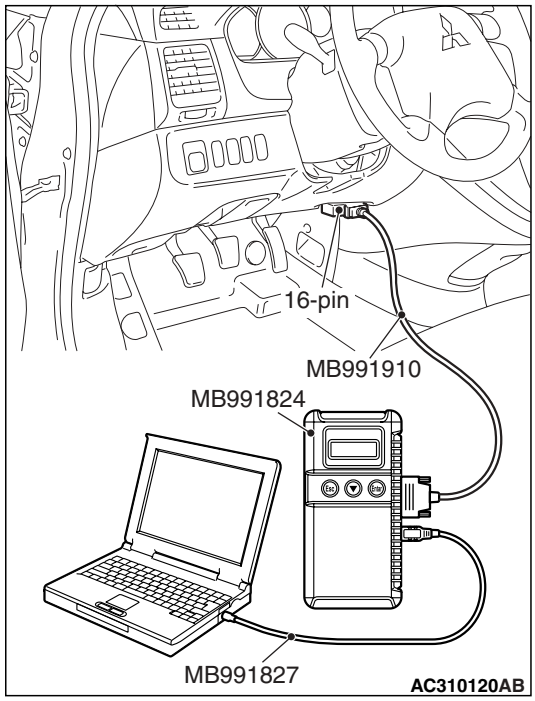
Q: Is any diagnosis code set?

YES : Refer to P.35B-7, Diagnosis Code Chart. Then go to Step 4 .

NO : Go to Step 3.

STEP 3. MUT-III other system diagnosis code

⚠ CAUTION



Before connecting or disconnecting the MUT-III, turn the ignition switch to the "LOCK" (OFF) position.

(1) Connect MUT-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check for Combination meter system diagnosis code.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Disconnect MUT-III.

Q: Is code No.U1102 set?
YES : Replace the hydraulic unit (integrated with TCL/ASC-ECU). Then go to Step 4.
NO : Replace the combination meter assembly. (Refer to GROUP 54A, Combination Meter Assembly P.54A-84). Then go to Step 4.

STEP 4. Retest the system

Q: Turn the ignition switch to the "ON" position. Do the ABS warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: ABS System dose not Operate.

COMMENT

The fail-safe function is probably canceling ABS system. In this case, MUT-III can be used to Retest each system by checking the diagnosis codes.

PROBABLE CAUSES

- Malfunction of the CAN bus line.
- Malfunction of the ABS-ECU.

DIAGNOSIS

STEP 1. Hydraulic unit check
Refer to P.35B-75.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Connect the brake pipes correctly, repair the external brake lines, or replace the hydraulic unit.

STEP 2. Verify that the condition described by the customer exists.

Q: Can any faults be found with the brake operation?
YES : Check the brake system related components except the ABS system.
NO : The procedure is complete.

DATA LIST REFERENCE TABLE

M1352011500724

The following items can be read by the MUT-III from the ABS-ECU input data.

When the system is normal.

Item No.	Check item	Checking requirements	Normal valve
01	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-III are identical.
02	Front-left wheel speed sensor		
03	Rear-right wheel speed sensor		
04	Rear-left wheel speed sensor		
05	ABS-ECU power supply voltage	Ignition switch: ON	10 – 16 V
06	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 MUT-III display data will be unreliable.

ACTUATOR TEST REFERENCE TABLE

M1352011600721

The MUT-III activates the following actuators for testing.

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

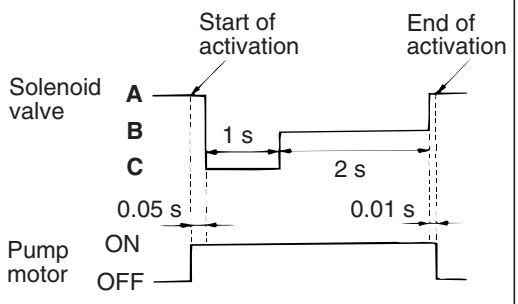
NOTE: Actuator testing is only possible when the vehicle is stationary.

NOTE: The ABS warning lamp continues illuminating until the communication between MUT-III and ABS-ECU is completed.

ACTUATOR TEST SPECIFICATIONS

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

Activation pattern



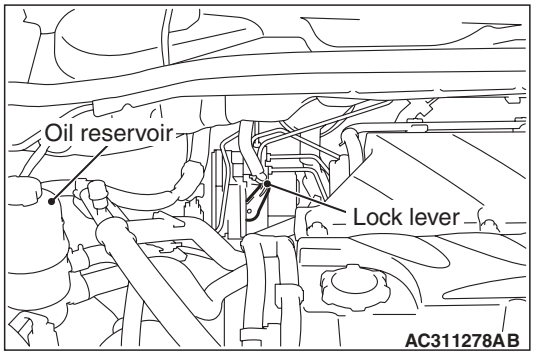
NOTE
A: Hydraulic pressure increases
B: Hydraulic pressure holds
C: Hydraulic pressure decreases

AC100172 AG

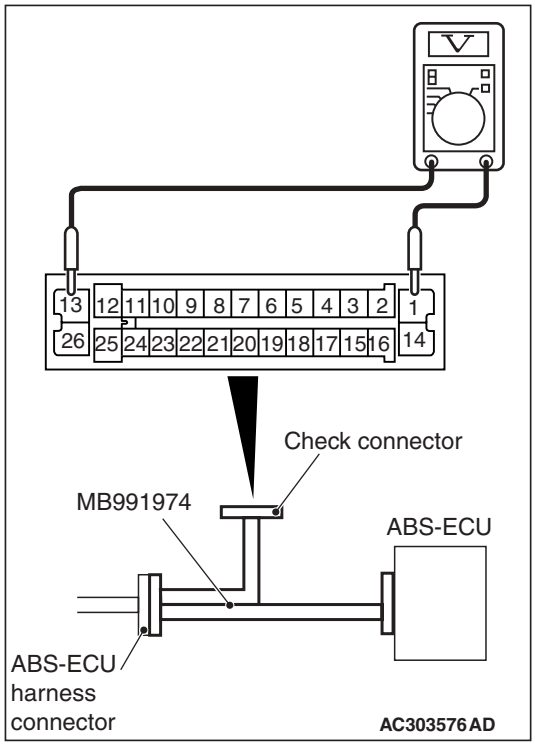
CHECK AT ABS-ECU

M1352011800703

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

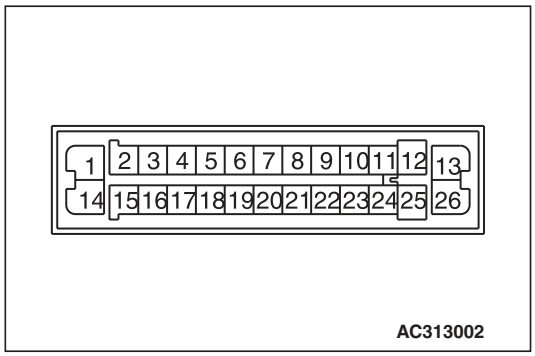


1. Move the lock lever of the ABS-ECU connector as shown in the illustration, and then disconnect the ABS-ECU connector.



2. Connect special tool ABS check harness (MB991974) to measure the voltages between each check connector terminals and earth terminals 13 or 26.

TERMINAL VOLTAGE CHECK CHART

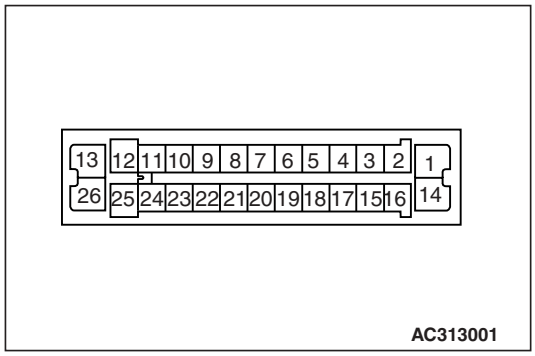


1. Measure the voltages between earth terminal (13) or (26) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

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	Ignition switch: "ON"	System voltage
3	Wheel speed sensor (RL) power supply	Ignition switch: "ON"	System voltage
5	Wheel speed sensor (FR) power supply	Ignition switch: "ON"	System voltage
9	Wheel speed sensor (FL) power supply	Ignition switch: "ON"	System voltage
11	Wheel speed sensor (RR) power supply	Ignition switch: "ON"	System voltage
14	Motor power supply	Ignition switch: "ON"	System voltage
16	Stop lamp switch input	Stop lamp switch: "ON"	System voltage
		Stop lamp switch: "OFF"	Approximately 0 V
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
13 – body earth	Earth	Less than 2 Ω
26 – body earth	Earth	Less than 2 Ω

ON-VEHICLE SERVICE

HYDRAULIC UNIT CHECK

M1352001700675

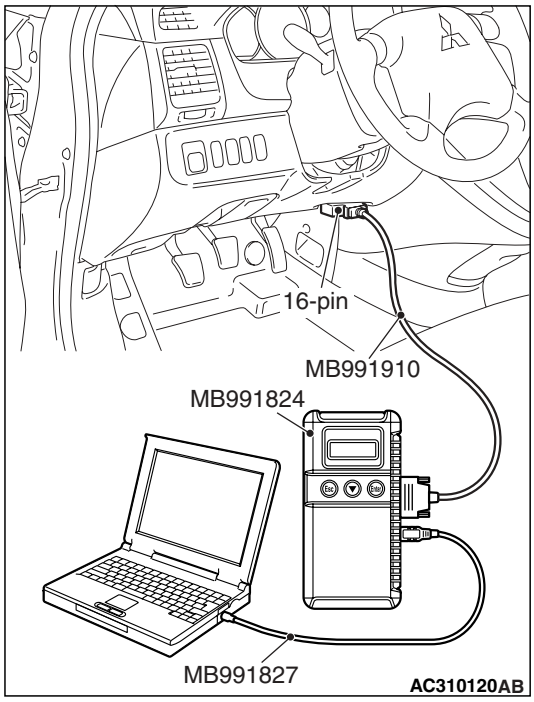
⚠ CAUTION

- **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 MUT-III, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the MUT-III.



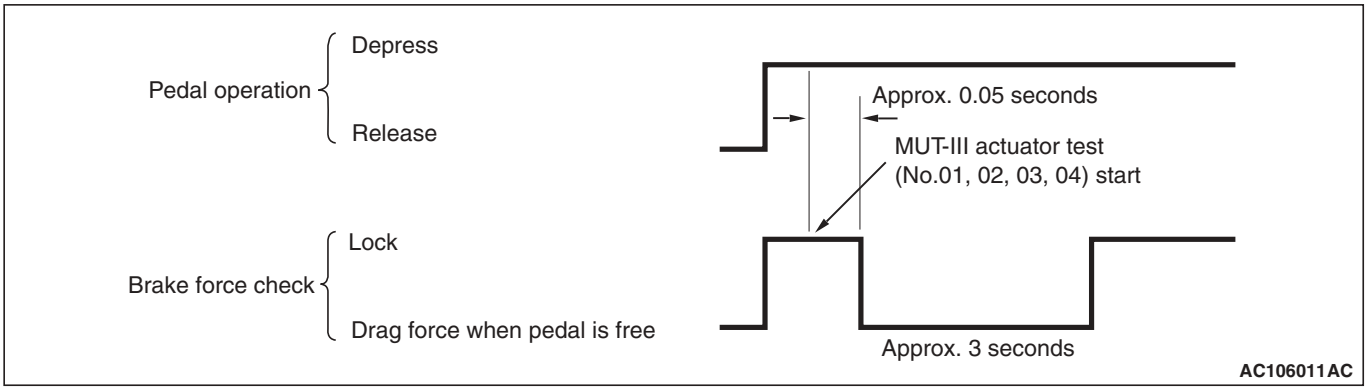
3. Turn the ignition switch to the "LOCK" (OFF) position and set the MUT-III as shown in the illustration.
4. After checking that the shift lever is in neutral, start the engine.

5. Release the parking brake, and use the MUT-III to perform the actuator test with depressing the brake pedal. Confirm that the brake drag force varies by braking force tester or by rotating the wheel with your hand.

   NOTE: The ABS system will switch to the MUT-III mode and the ABS warning lamp will illuminate.

   NOTE: When the ABS has been interrupted by the fail-safe function, the MUT-II/III actuator testing cannot be used.

   NOTE: The ABS warning lamp continues illuminating until the communication between MUT-III and ABS-ECU is completed.



6. This is indicated as shown above.

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

Diagnosis Table

MUT-III Display	Operation	Inspection result	Judgment	Probable cause	Remedy
01 FR VALVE 02 FL VALVE 03 RR VALVE 04 RL VALVE	• Depress brake pedal to lock wheel. • Using the MUT-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 MUT-III immediately after turning the ignition switch to the "LOCK" (OFF) position.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500611

⚠ ***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

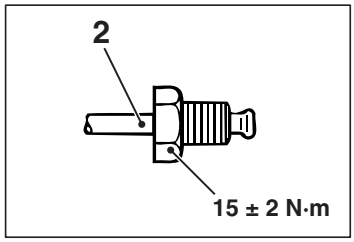
M1352008600550

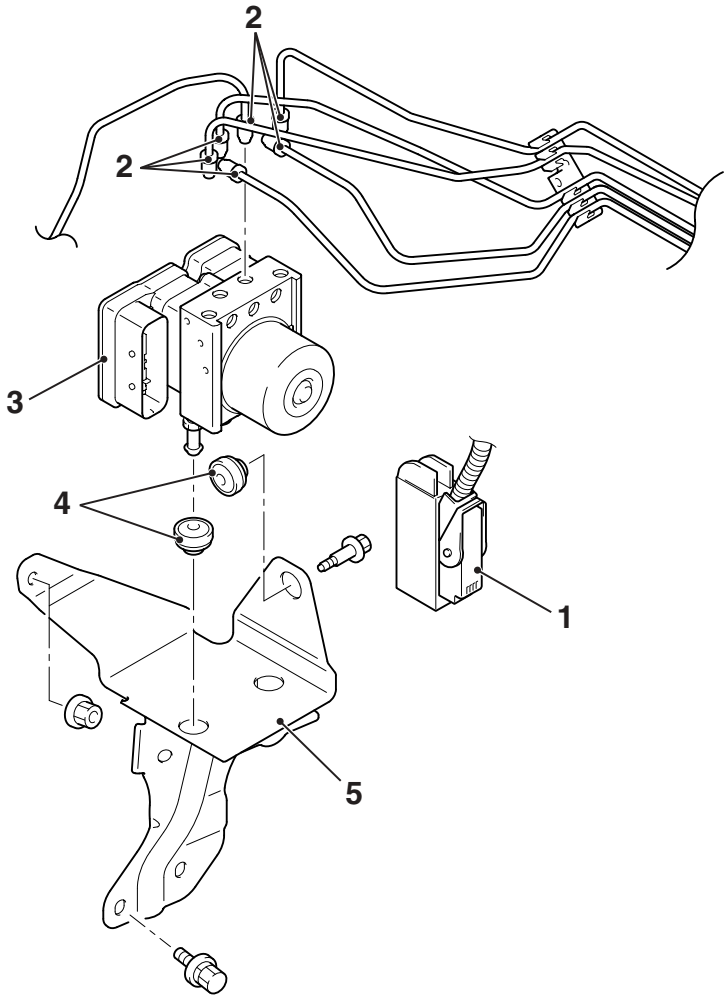
NOTE: The ABS-ECU is integrated in the hydraulic unit.

⚠ CAUTION

Always calibrate the steering wheel sensor and the G and yaw rate sensor if the hydraulic unit (integrated in the TCL/ASC-ECU) is replaced.(Refer to P.35C-162 and P.35C-162) <Vehicles with TCL/ASC>

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining • Engine cover removal (Refer to GROUP 11A, Camshaft and valve stem seal P.11A-16.) • Air cleaner body assembly removal (Refer to GROUP 15, Air Cleaner P.15-3). • Canister removal (Refer to GROUP 17, Canister P.17-64.) <LH drive vehicles>	• Canister installation (Refer to GROUP 17, canister P.17-64.) <LH drive vehicles> • Air cleaner body assembly installation (Refer to GROUP 15, Air Cleaner P.15-3). • Engine cover installation (Refer to GROUP 11A, Camshaft and valve stem seal P.11A-16.) • Brake Fluid Filling • Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service – Bleeding P.35A-6). • Hydraulic Unit Check (Refer to P.35C-159).





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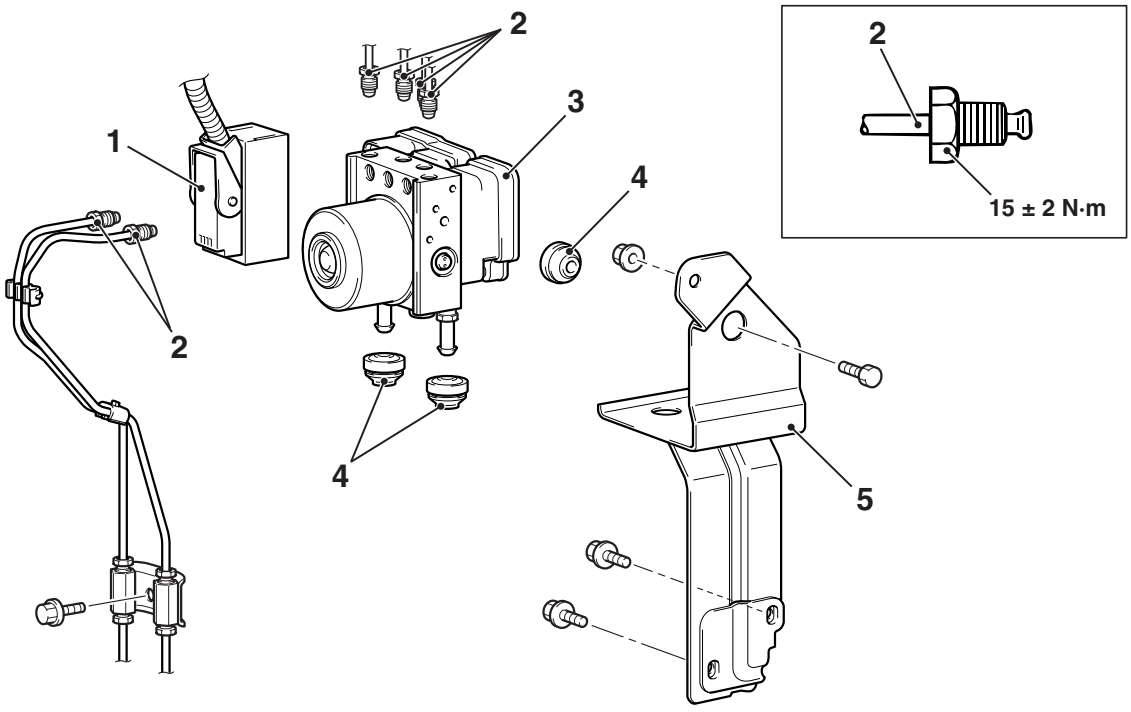

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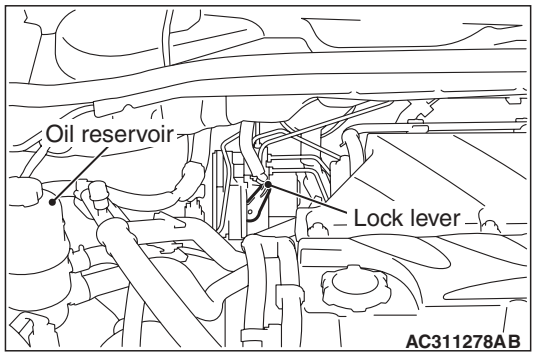
Removal steps

<<A>> 1. ABS-ECU harness connector
2. Brake tube connection
- Brake tube and master cylinder connection <LH drive vehicles>
- Brake tube and brake hose (LH) <LH drive vehicles>

<<B>> 3. Hydraulic unit (ABS-ECU)
4. Hydraulic unit bracket insulator
5. Hydraulic unit bracket

REMOVAL SERVICE POINTS

<<A>> ABS-ECU HARNESS CONNECTOR DISCONNECTION



Operate the lock lever to disconnect the ABS-ECU harness connector as shown.

<<B>> HYDRAULIC UNIT (INTEGRATED WITH 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.**

ABS SENSOR

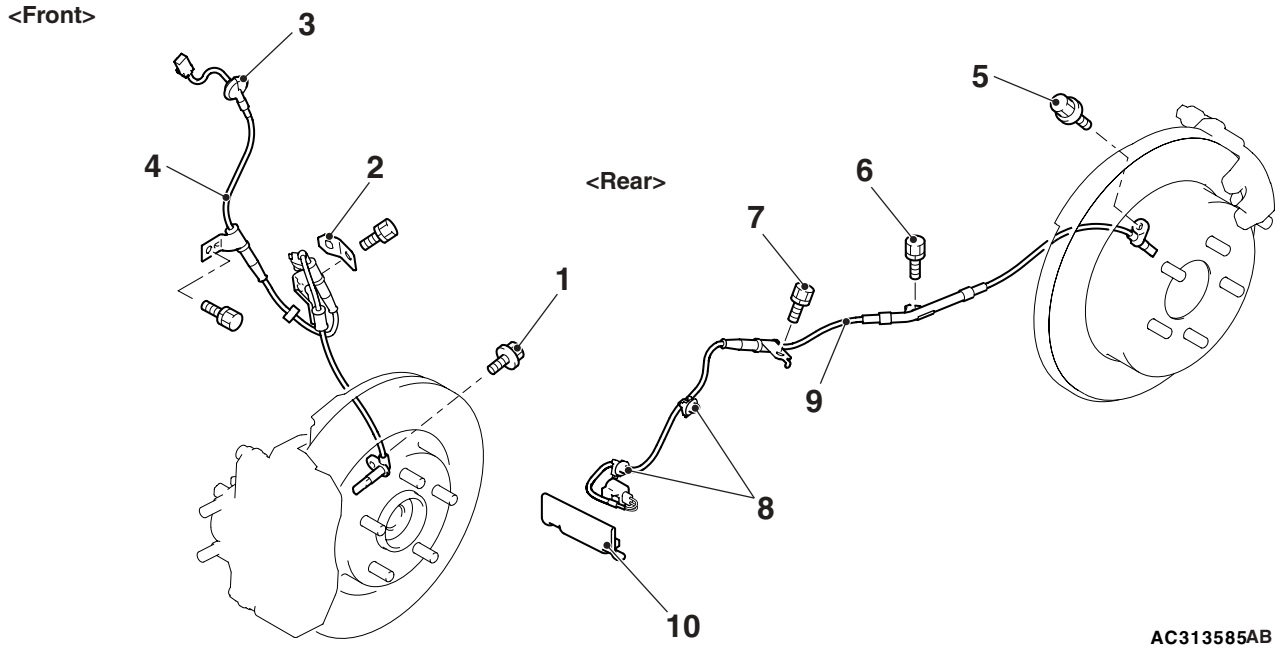
REMOVAL AND INSTALLATION

M1352008300667

⚠ CAUTION

The vehicle speed detection encoder collects any metallic particle easily, because it is magnetized. Make sure that the encoder should not collect any metallic particle. Check that there is not any trouble prior to reassembling it.

Pre-removal operation	Post-installation Operation
• Engine cover removal (Refer to GROUP 11A, Camshaft and valve stem seal P.11A-16.) <Front: left> • Air cleaner body assembly removal (Refer to GROUP 15, Air Cleaner P.15-3.) <Front: left>	• Air cleaner body assembly installation (Refer to GROUP 15, Air Cleaner P.15-3.) <Front: left> • Engine cover installation (Refer to GROUP 11A, Camshaft and valve stem seal P.11A-16.) <Front: left>



Front wheel speed sensor removal steps

1. Bolt (front wheel speed sensor and knuckle connection)
2. front wheel speed sensor bracket

<<A>> • Front wheel speed sensor connector

>>A<< 3. Front wheel speed sensor grommet

4. Front wheel speed sensor

Rear wheel speed sensor removal steps

5. Bolt (rear wheel speed sensor and trailing arm connection)
6. Bolt (rear wheel speed sensor and rear suspension lower arm assembly connection)

Rear wheel speed sensor removal steps (Continued)

7. Bolt (rear wheel speed sensor and rear suspension crossmember connection)
8. Bolt (rear wheel speed sensor and body connection)

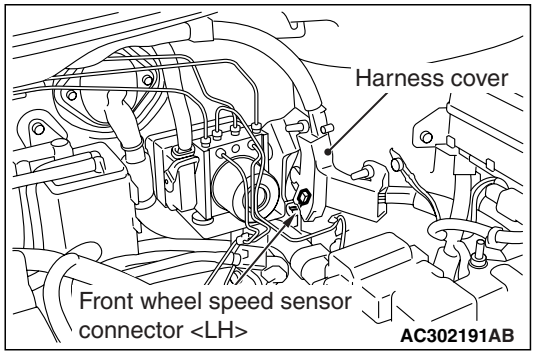
• Rear wheel speed sensor connector

9. Rear wheel speed sensor
10. Heat protector

NOTE: The vehicle speed detection encoder is integrated with the front hub and the rear hub, which is non-serviceable.

REMOVAL SERVICE POINT

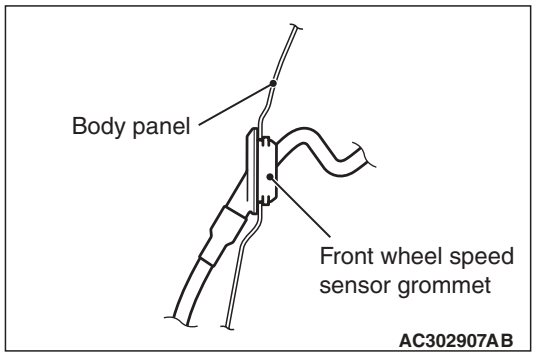
<<A>> FRONT WHEEL SPEED SENSOR CONNECTOR REMOVAL <LH>



NOTE: The front wheel speed sensor connector is in the harness cover as shown.

INSTALLATION SERVICE POINT

>>A<< FRONT WHEEL SPEED SENSOR GROMMET REMOVAL

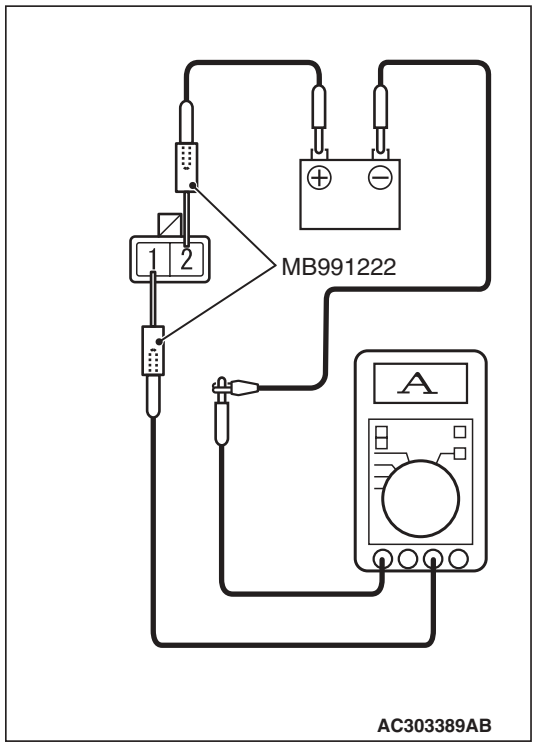


Install the front wheel speed sensor grommet to the body panel so that there is no space between them.

INSPECTION

M1352008400523

ABS SENSOR CURRENT CHECK



⚠ CAUTION

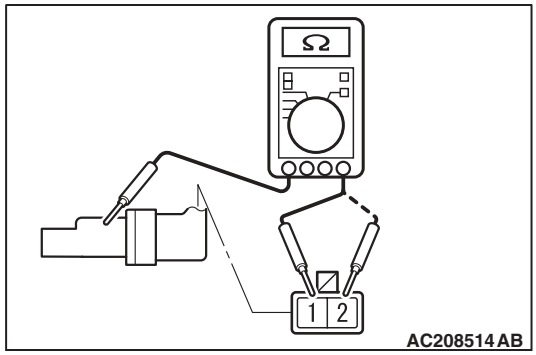
Do not connect the battery terminals in reverse as the wheel speed sensor may be damaged.

1. Use special tool probe MB991222 to connect the circuit tester and measure current flown through wheel speed sensor with wheel speed sensor separated from the vehicle.

   Standard value: 5.9 – 8.4mA

2. If the measurement value is outside the standard value, replace the wheel speed sensor with a new one.

WHEEL SPEED SENSOR INSULATION CHECK



1. Measure the insulation resistance from terminals 1 and 2 to the wheel speed sensor and body with the wheel speed sensor separated from the vehicle.

Standard value: 5 MΩ or more

2. If the insulation resistance is outside the standard value, replace the wheel speed sensor with a new one.