

GROUP 35B

ANTI-LOCK BRAKING SYSTEM (ABS)

CONTENTS

GENERAL DESCRIPTION	35B-2	IN THE EVENT OF A DISCHARGED BATTERY	35B-110
ABS DIAGNOSIS	35B-4	HYDRAULIC UNIT	35B-111
INTRODUCTION TO ANTI-LOCK BRAKING SYSTEM DIAGNOSIS	35B-4	REMOVAL AND INSTALLATION	35B-111
ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY	35B-4	ABS SENSOR	35B-113
DIAGNOSIS FUNCTION	35B-5	REMOVAL AND INSTALLATION	35B-113
DIAGNOSTIC TROUBLE CODE CHART ..	35B-11	INSPECTION	35B-114
DIAGNOSTIC TROUBLE CODE PROCEDURES	35B-12	G-SENSOR	35B-115
SYMPTOM CHART	35B-62	REMOVAL AND INSTALLATION	35B-115
SYMPTOM PROCEDURES	35B-63	INSPECTION	35B-116
DATA LIST REFERENCE TABLE	35B-101	STEERING ANGULAR VELOCITY SENSOR	35B-117
ACTUATOR TEST REFERENCE TABLE ..	35B-102	REMOVAL AND INSTALLATION	35B-117
CHECK AT ABS-ECU	35B-102	SPECIFICATIONS	35B-118
SPECIAL TOOLS	35B-105	FASTENER TIGHTENING SPECIFICATIONS	35B-118
ON-VEHICLE SERVICE	35B-106	GENERAL SPECIFICATIONS	35B-118
ABS SENSOR OUTPUT VOLTAGE MEASUREMENT	35B-106	SERVICE SPECIFICATIONS	35B-118
HYDRAULIC UNIT CHECK	35B-108		

GENERAL DESCRIPTION

M1352000100681

Top components such as Brembo™ brakes, EBD and sports ABS improve braking power and braking stability.

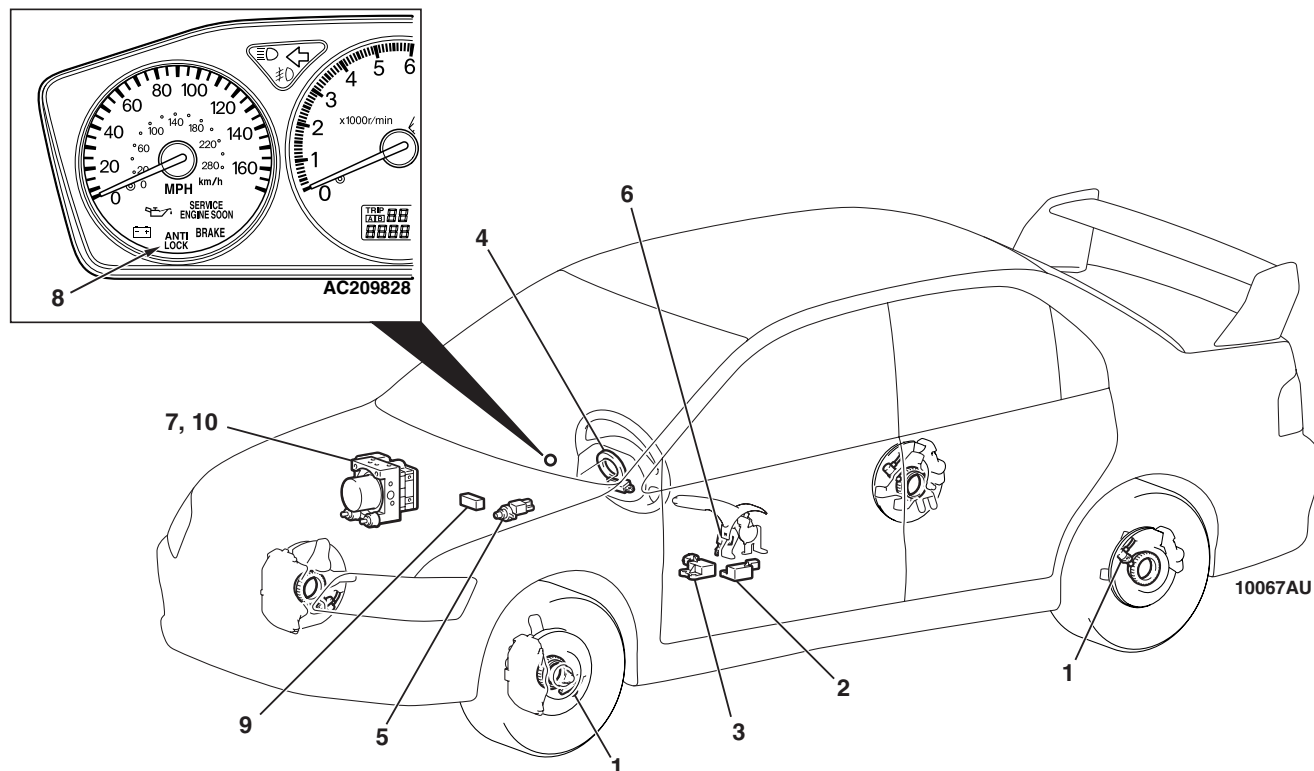
SPORTS ABS

- 4-wheel independent control optimizes the brake force to each wheel to achieve a balance of improved braking force and braking stability.
- A steering angular velocity sensor was added to monitor the steering angle status. Braking force is altered in response to the steering status to improve the quality of steering when cornering.
- The steering angular velocity sensor, lateral G-sensor and longitudinal G-sensor accurately monitor driving conditions and optimize ABS control to match the specific driving conditions.

EBD (ELECTRONIC BRAKE-FORCE DISTRIBUTION SYSTEM)

- Rear brake power is electronically controlled to optimize performance in accordance with road and load conditions and to ensure optimal distribution of braking force between the front and rear brakes.
- Rear brake fluid pressure control employs a brake modulator hydraulic unit solenoid valve that made it possible to eliminate the pressure control valves (proportioning valves).
- Effective use of rear wheel brake force reduces temperature build-up in the front brakes under hard braking conditions.
- Independent control of the left and right rear brakes when braking during cornering achieves a balance of improved vehicle stability and braking force.

CONSTRUCTION DIAGRAM



AC211546AB

NAME OF PART		NO.	OUTLINE OF FUNCTION
Sensor	ABS sensor	1	Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS-ECU.
	Lateral G-sensor	2	Sends data on vehicle's rate of lateral acceleration to the ABS-ECU.
	Longitudinal G-sensor	3	Sends data on vehicle's rate of longitudinal acceleration to the ABS-ECU.
	Steering angular velocity sensor	4	Sends data on steering wheel angle to the ABS-ECU. Indicates the ABS-ECU when steering wheel is in straight-ahead position.
	Stoplight switch	5	Sends a signal to the ABS-ECU to indicate whether the brake pedal is depressed or not.
	Parking brake switch	6	Sends a signal to the ABS-ECU to indicate whether the parking brake lever is pulled or not.
Actuator	Hydraulic unit	7	Drives the solenoid valves according to signals from the ABS-ECU in order to control the brake hydraulic pressure for each wheel.
	ABS warning light	8	Illuminates in response to signals from the ABS-ECU when a problem develops in the system.
Data link connector		9	Outputs the diagnostic trouble codes and allows communication with the scan tool.
Brake modulator (ABS-ECU)		10	Controls actuators (described above) based on the signals coming from each sensor.
			Controls the self-diagnosis and fail-safe functions.
			Controls the diagnostic function (scan tool compatible).

SYSTEM CHECK SOUND

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

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

ABS OPERATION SOUNDS AND SENSATIONS

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

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

LONG STOPPING DISTANCES ON LOOSE ROAD SURFACES

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

SHOCK AT STARTING CHECK

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

ABS DIAGNOSIS

INTRODUCTION TO ANTI-LOCK BRAKING SYSTEM DIAGNOSIS

M1352012500482

The anti-lock brake system (ABS) operates differently from conventional brake systems. These differences include sounds, sensations, and vehicle performance that owners and service technicians who are not familiar with ABS may not be used to.

ABS DIAGNOSTIC TROUBLE CODE DETECTION CONDITIONS

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

Some operational characteristics may seem to be malfunctions, but they are simply signs of normal ABS operation. When diagnosing the ABS system, keep these operational characteristics in mind. Inform the owner of the kind of performance characteristics to expect from an ABS-equipped vehicle.

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

ABS DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1352011100782

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

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any ABS DTC.
4. If you cannot verify the condition and there are no ABS DTCs, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions [P.00-13](#).
5. If you can verify the condition but there are no ABS DTCs, or the system cannot communicate with the scan tool, check that the basic brake system is operating properly.
 - If the basic brake system is not operating properly, refer to the GROUP 35A, Basic Brake System Diagnosis [P.35A-4](#).
 - If the basic brake system is operating properly, refer to [P.35B-62](#).
6. If there is an ABS DTC, record the number of the DTC, then erase the DTC from the memory using the scan tool.
7. Reproduce the ABS DTC set conditions to see if the same ABS DTC will set again.
 - If the same ABS DTC sets again, perform the diagnostic procedures for the DTC. Refer to [P.35B-11](#).
 - If you cannot get the same ABS DTC to set again, the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions [P.00-13](#).

DIAGNOSIS FUNCTION

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

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

⚠ CAUTION

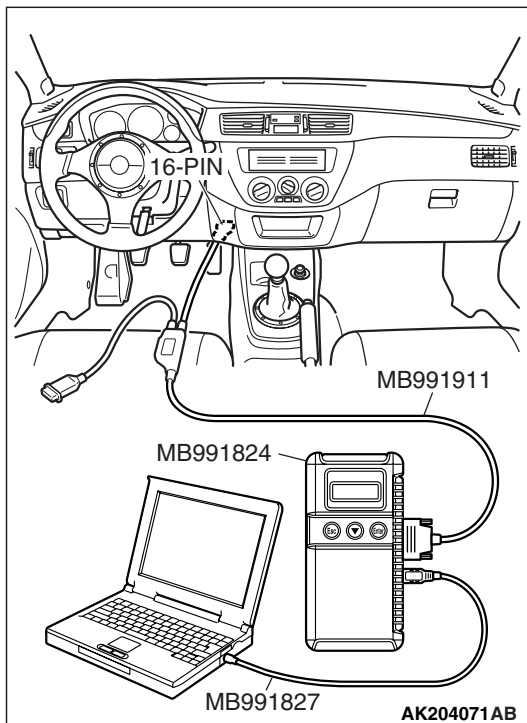
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

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

7. Start the M.U.T.-III system on the personal computer.

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



HOW TO READ AND ERASE DIAGNOSTIC
TROUBLE CODE<READING DTC BY THE ABS WARNING LIGHT
AND SPECIAL TOOL MB991529>

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness

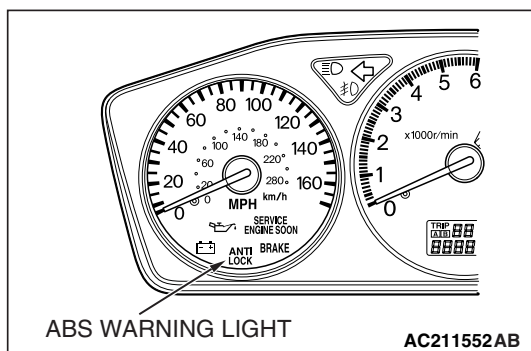
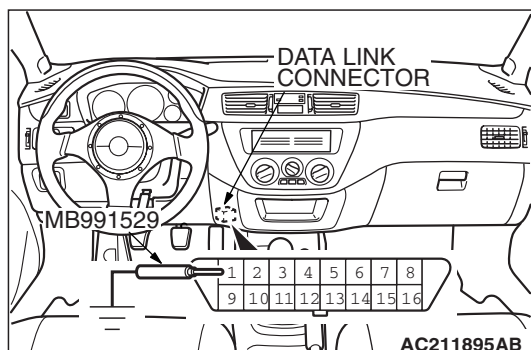
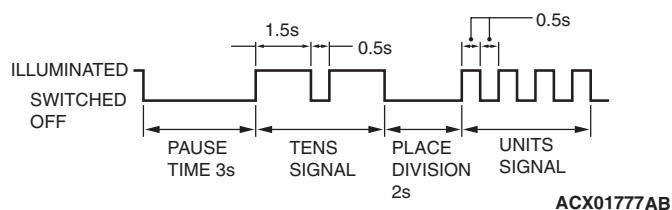
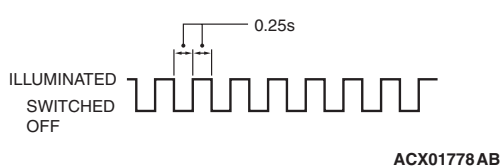
1. Use special tool MB991529 to ground number 1 terminal of the data link connector.

CAUTION

Do not depress the brake pedal after the ignition switch is turned "ON". If the brake pedal is depressed while the ABS is inoperative and the ignition switch is "ON," the ABS warning light will remain on. Because of this, diagnostic trouble codes will not be read out.

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

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

WHEN THE DIAGNOSTIC TROUBLE CODE NO. 24
IS OUTPUTWHEN NO DIAGNOSTIC TROUBLE CODE IS
OUTPUT

4. Turn the ignition switch to the "LOOK" (OFF) position.
5. Disconnect special tool MB991529.

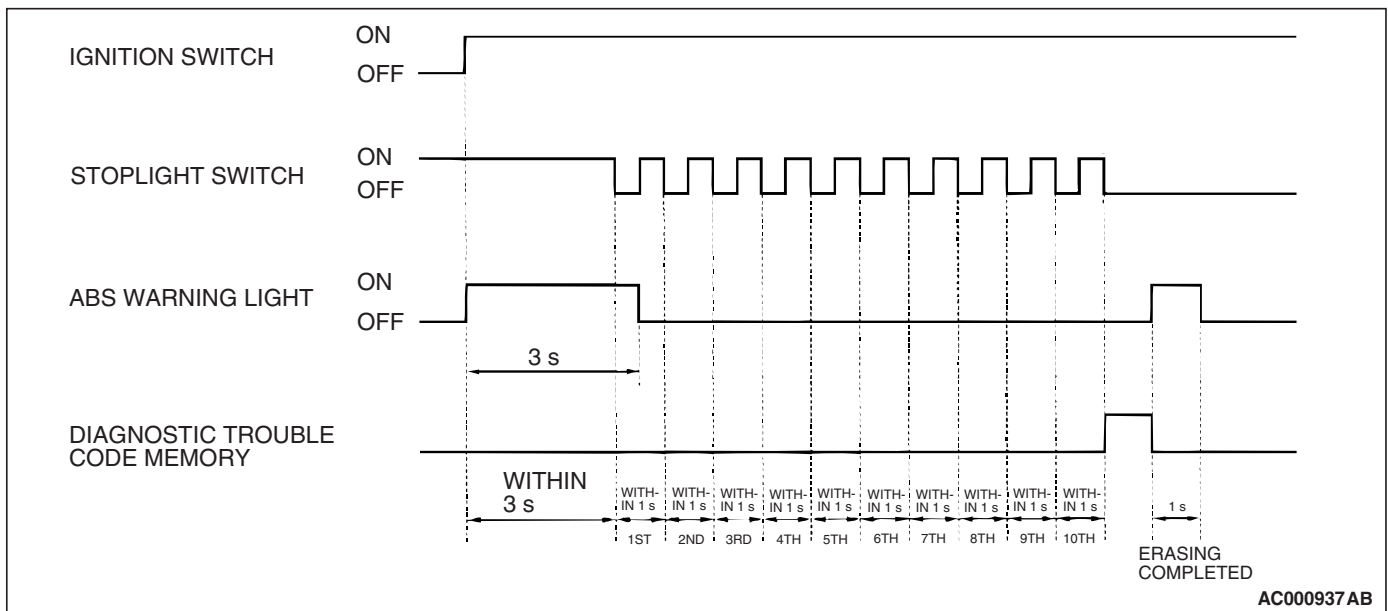
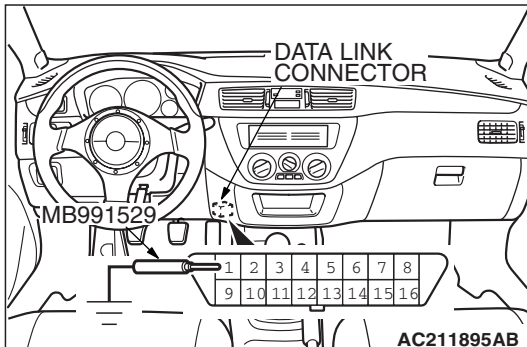
<ERASING DTC BY SPECIAL OPERATION FOR BRAKE PEDAL>

Required Special Tool:

- MB991529: Diagnostic Trouble Code Check Harness

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

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



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

<Reading/Erasing by scan tool MB991958>

Required Special Tools:

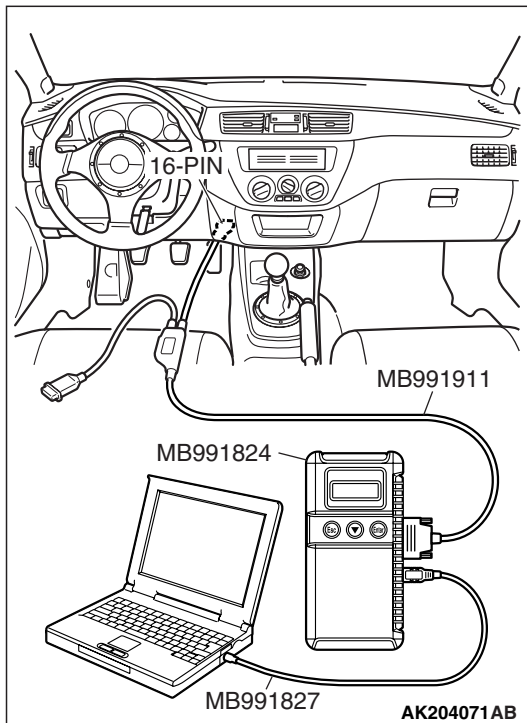
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991911: M.U.T.-III Main Harness B

⚠ CAUTION

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

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

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



HOW TO READ DATA LIST (M.U.T.-III)

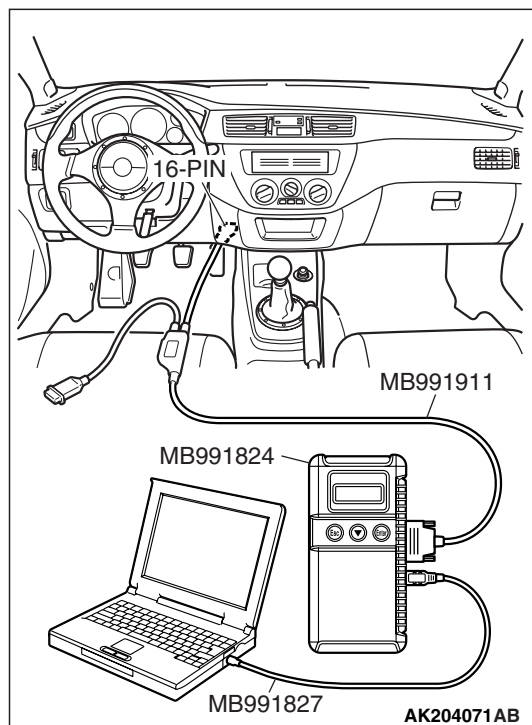
Required Special Tools:

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

CAUTION

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

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



HOW TO PERFORM ACTUATOR TEST (M.U.T.-III)

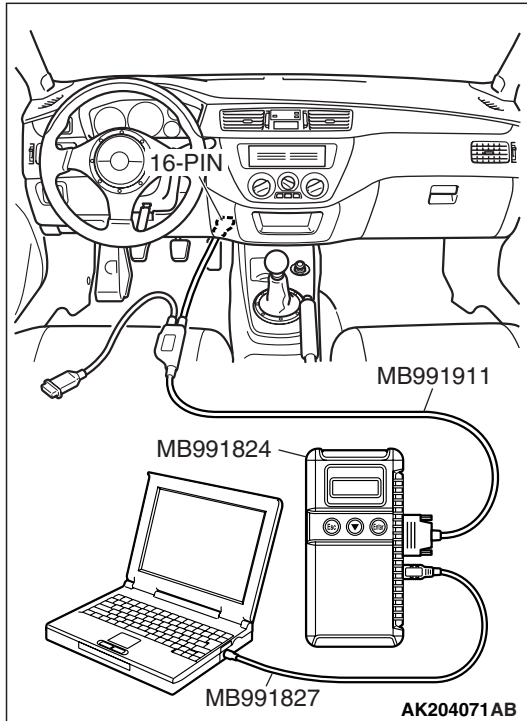
Required Special Tools:

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

⚠ CAUTION

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

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



DIAGNOSTIC TROUBLE CODE CHART

M1352011300913

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

DTC	INSPECTION ITEM	REFERENCE PAGE
11	Front right ABS sensor (Open circuit or short-circuit)	P.35B-12
12	Front left ABS sensor (Open circuit or short-circuit)	
13	Rear right ABS sensor (Open circuit or short-circuit)	
14	Rear left ABS sensor (Open circuit or short-circuit)	
16	ABS-ECU power supply system (Abnormal voltage drop or rise)	P.35B-24
21	Front right ABS sensor system	P.35B-12
22	Front left ABS sensor system	
23	Rear right ABS sensor system	
24	Rear left ABS sensor system	
32	Longitudinal G-sensor system	P.35B-28
41	Front right solenoid valve system	P.35B-38
42	Front left solenoid valve system	
43	Rear right solenoid valve system	
44	Rear left solenoid valve system	
51	Valve relay problem (Stays on)	Replace the brake modulator hydraulic unit (Integrated with ABS-ECU).
52	Valve relay problem (Stays off)	P.35B-38
53	Motor relay problem (Stays off)	
54	Motor relay problem (Stays on)	Replace the brake modulator hydraulic unit (Integrated with ABS-ECU).
55	Motor system (Seized pump motor)	P.35B-38
63	ABS-ECU abnormality	Replace the brake modulator hydraulic unit (Integrated with ABS-ECU).
71	Lateral G-sensor system	P.35B-42
81	Steering angular velocity sensor (ST-1) system	P.35B-52
82	Steering angular velocity sensor (ST-2) system	
83	Steering angular velocity sensor (ST-N) system	

NOTE: diagnostic trouble code No.16 is cleared from the memory by turning the ignition switch to the "ACC" position. When the system is properly reset, this code is also cleared from the memory.

NOTE: diagnostic trouble code No. 52 and 63 are cleared from the memory by turning the ignition switch to the "ACC" position.

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 11: Front Right ABS Sensor (Open Circuit or Short Circuit)

DTC 12: Front Left ABS Sensor (Open Circuit or Short Circuit)

DTC 13: Rear Right ABS Sensor (Open Circuit or Short Circuit)

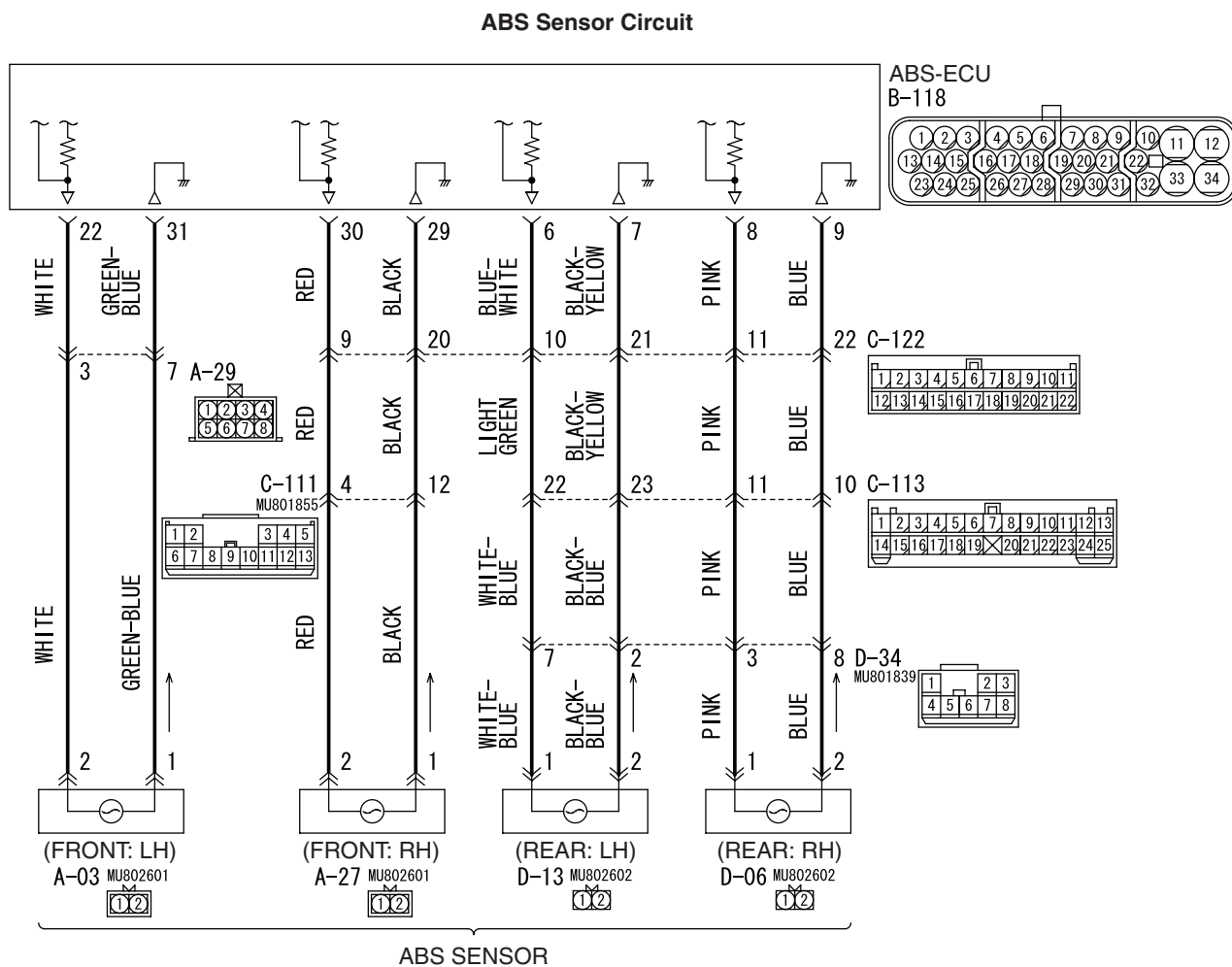
DTC 14: Rear Left ABS Sensor (Open Circuit or Short Circuit)

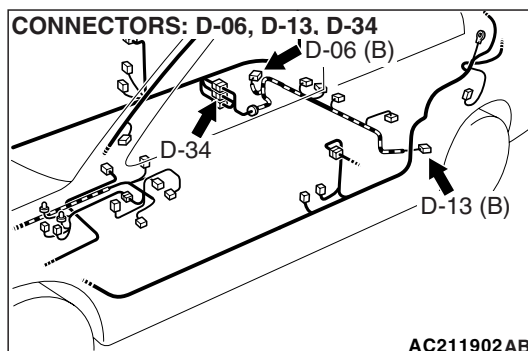
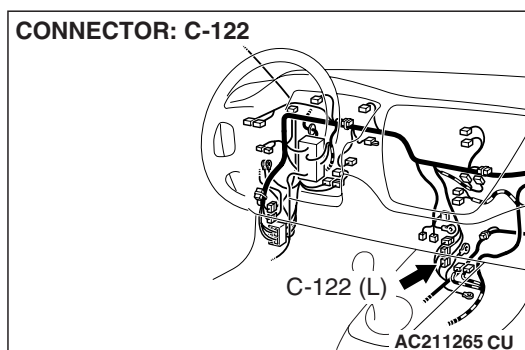
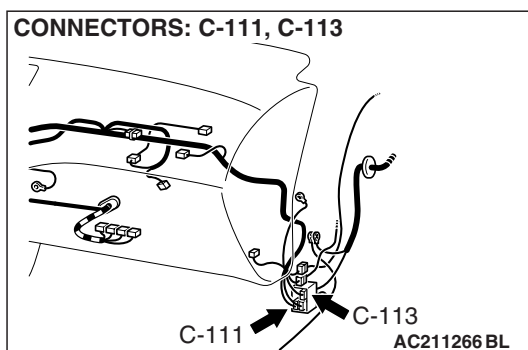
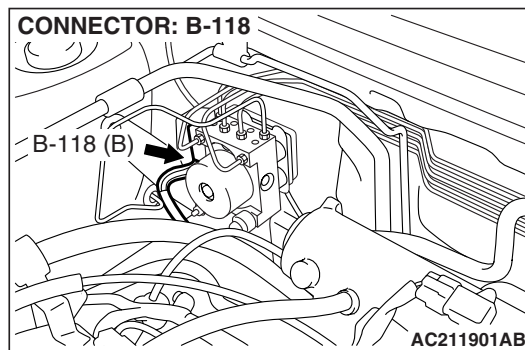
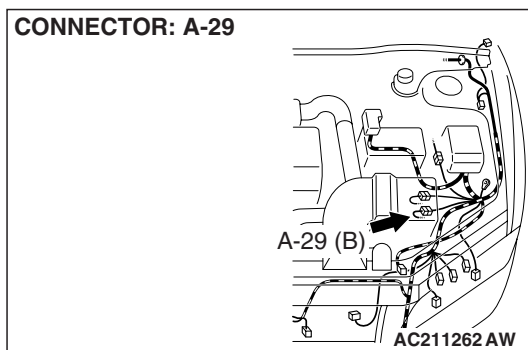
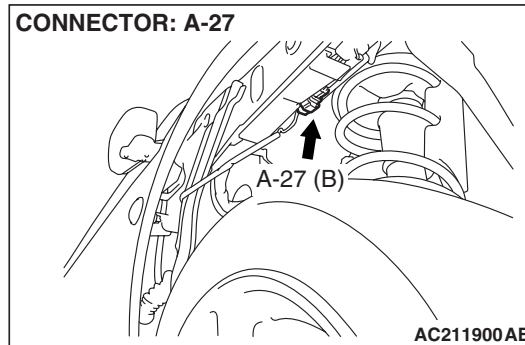
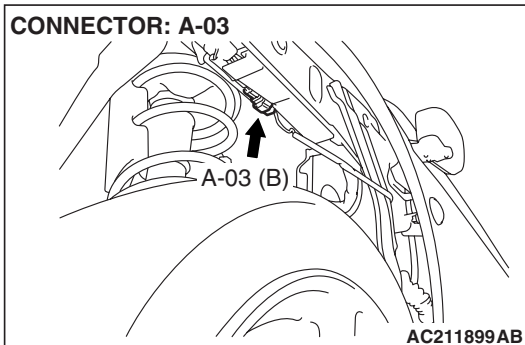
DTC 21: Front Right ABS Sensor System

DTC 22: Front Left ABS Sensor System

DTC 23: Rear Right ABS Sensor System

DTC 24: Rear Left ABS Sensor System

W3J18M00AA
AC211704AB



CIRCUIT OPERATION

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

ABS DTC SET CONDITIONS

- DTCs 11, 12, 13, 14 are output when signal is not input due to breakage of the wires of one or more of the four ABS sensors.
- DTCs 21, 22, 23, 24 are output in the following cases:
 - Open circuit is not found but no input is received by one or more of the four ABS sensors at 10 km/h (6 mph) or more.
 - Sensor output drops due to a malfunctioning ABS sensor or warped ABS rotor.

TROUBLESHOOTING HINTS

The most likely causes for these DTCs to set are:
DTC 11, 12, 13, 14

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

The most likely causes for these DTCs to set are:
DTC 21, 22, 23, 24

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

DIAGNOSIS**Required Special Tools:**

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

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

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

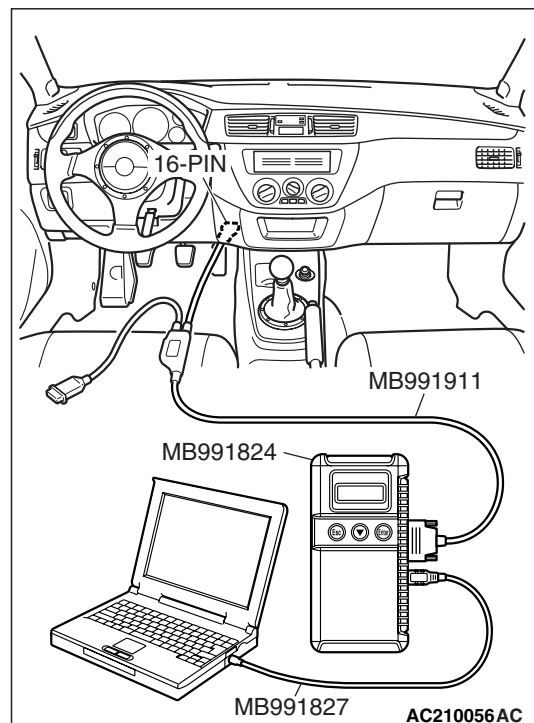
- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to the data reading mode, and check the data list items by driving the vehicle.
 - Item 11 (DTC 11 or 21 is set): Front right ABS sensor
 - Item 12 (DTC 12 or 22 is set): Front left ABS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

Q: Is the ABS sensor input normal?

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

P.00-13.

NO : Go to Step 2.



STEP 2. Check the ABS sensor installation.

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

YES : Go to Step 3.

NO : Install it properly (Refer to P.35B-113). Then go to Step 15 .

STEP 3. Inspect the ABS sensor and/or ABS rotor.

Refer to P.35B-114.

Check items:

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

Q: Is the ABS sensor or ABS rotor damaged?

YES : Replace it (Refer to P.35B-113). Then go to Step 15.

NO : Go to Step 4.

STEP 4. Check ABS sensor circuit. Measure the resistance at the ABS-ECU connector B-118.

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

(2) Measure the resistance between the ABS-ECU connector terminals.

- If DTC 11 or 21 is set: between terminals 29 and 30
- If DTC 12 or 22 is set: between terminals 22 and 31
- If DTC 13 or 23 is set: between terminals 8 and 9
- If DTC 14 or 24 is set: between terminals 6 and 7

Standard Value: 1.24 –1.64 k Ω

Q: Is the resistance within the standard value?

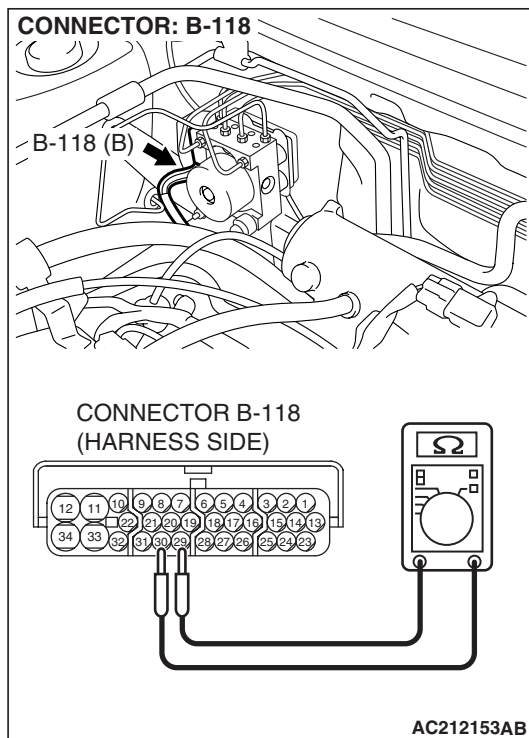
YES : Go to Step 13.

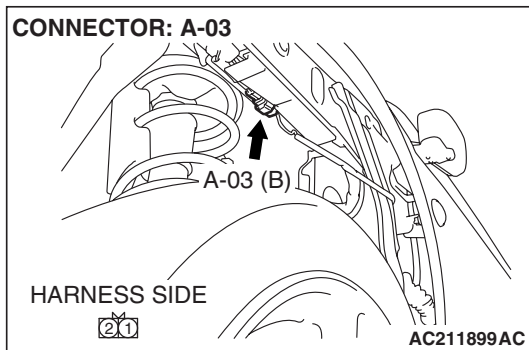
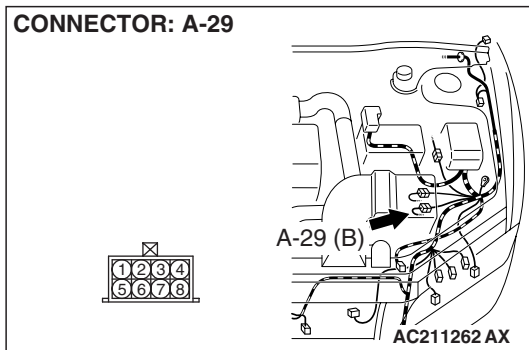
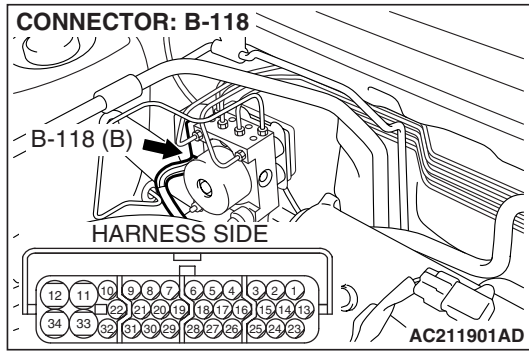
NO <The resistance between terminals 22 and 31 is not within the standard value.> : Go to Step 5.

NO <The resistance between terminals 29 and 30 is not within the standard value.> : Go to Step 7.

NO <The resistance between terminals 6 and 7 is not within the standard value.> : Go to Step 9.

NO <The resistance between terminals 8 and 9 is not within the standard value.> : Go to Step 11.



**STEP 5. Check the following connectors.**

- ABS-ECU connector B-118

- Intermediate connector A-29

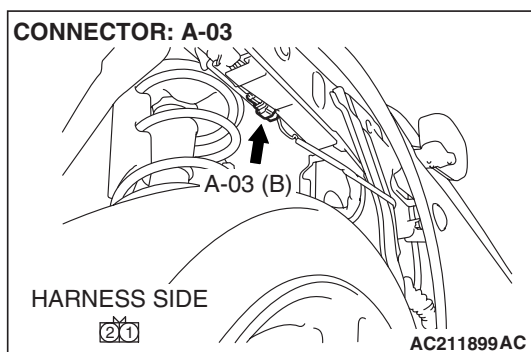
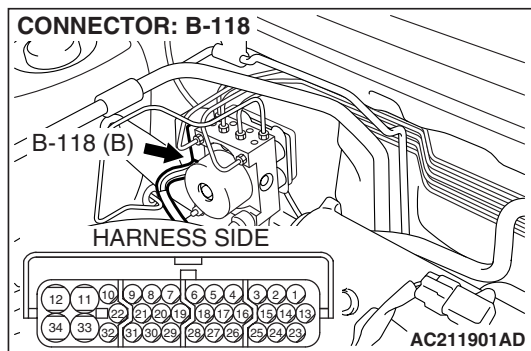
- Front ABS sensor (LH) connector A-03

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 6.

NO : Repair it and then go to Step 15.



STEP 6. Check the following harness wires.

- The wire between ABS-ECU connector B-118 (terminal 22) and front ABS sensor (LH) connector A-03 (terminal 2)
- The wire between ABS-ECU connector B-118 (terminal 31) and front ABS sensor (LH) connector A-03 (terminal 1)

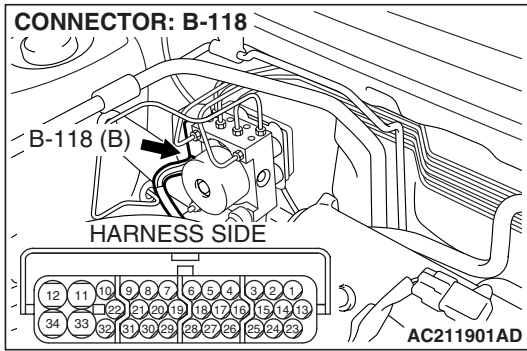
Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 15.

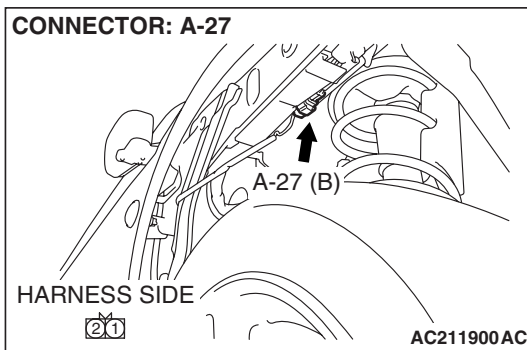
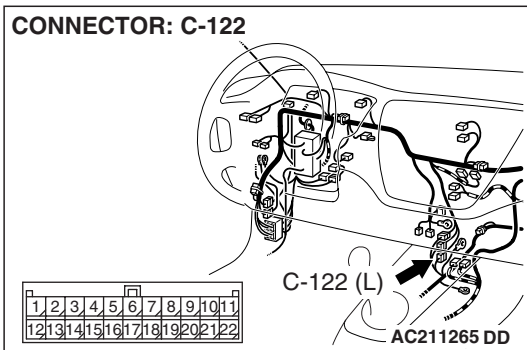
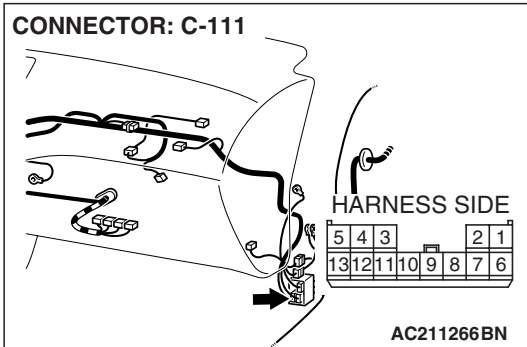
NO : Go to Step 15.

STEP 7. Check the following connectors.

- ABS-ECU connector B-118



- Intermediate connectors C-111, C-122



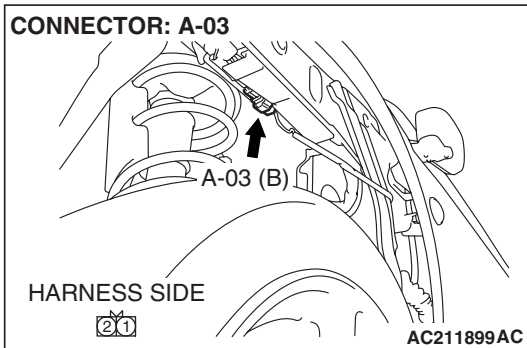
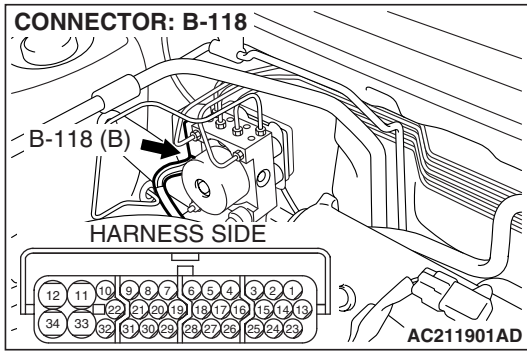
- Front ABS sensor (RH) connector A-27

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 8.

NO : Repair it and then go to Step 15.



STEP 8. Check the following harness wires.

- The wire between ABS-ECU connector B-118 (terminal 29) and front ABS sensor (RH) connector A-27 (terminal 1)
- The wire between ABS-ECU connector B-118 (terminal 30) and front ABS sensor (RH) connector A-27 (terminal 2)

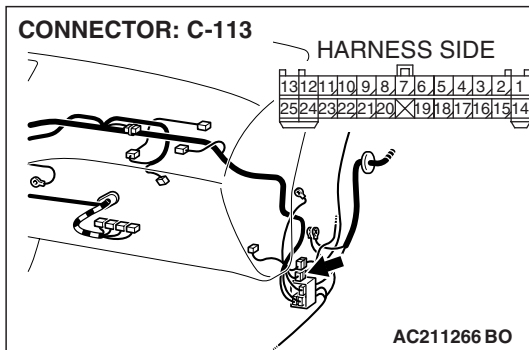
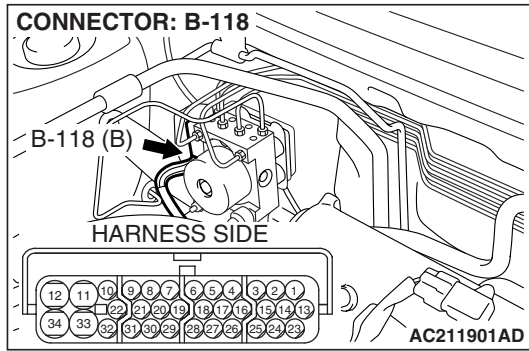
Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 15.

NO : Go to Step 15.

STEP 9. Check the following connectors.

- ABS-ECU connector B-118



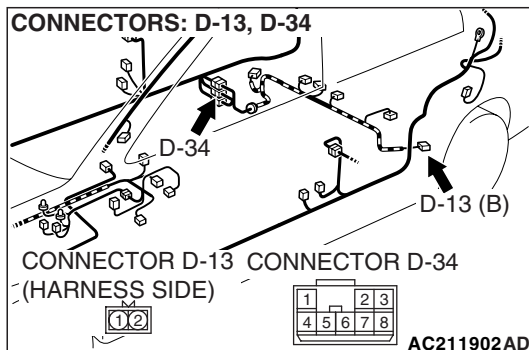
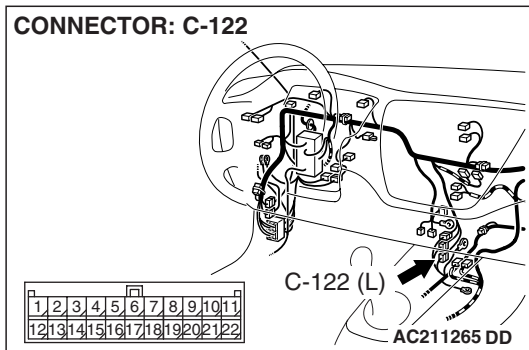
- Intermediate connectors C-113, C-122, D-34
- Rear ABS sensor (LH) connector D-13

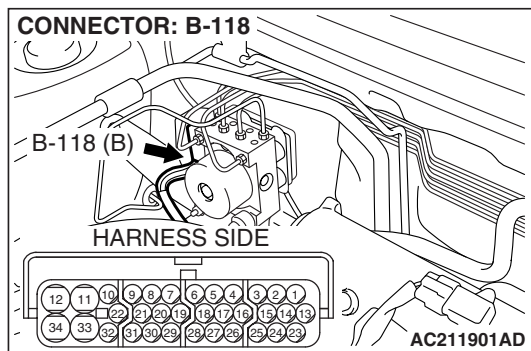
Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

NO : Repair it and then go to Step 15.





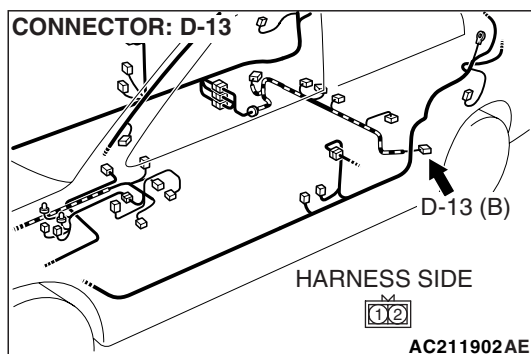
STEP 10. Check the following harness wires.

- The wire between ABS-ECU connector B-118 (terminal 6) and rear ABS sensor (LH) connector D-13 (terminal 1)
- The wire between ABS-ECU connector B-118 (terminal 7) and rear ABS sensor (LH) connector D-13 (terminal 2)

Q: Is any harness wire damaged?

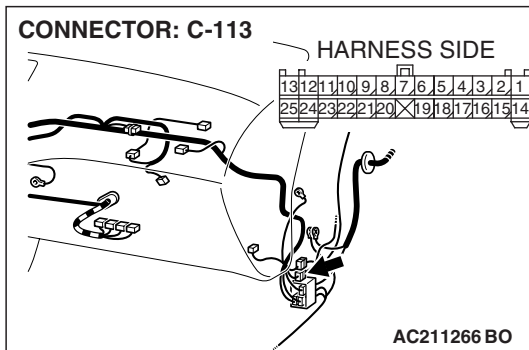
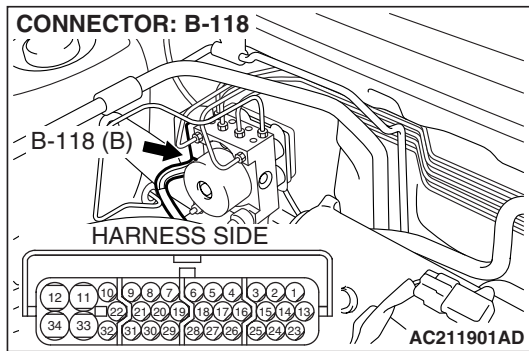
YES : Repair or replace it and then go to Step 15.

NO : Go to Step 15.



STEP 11. Check the following connectors.

- ABS-ECU connector B-118



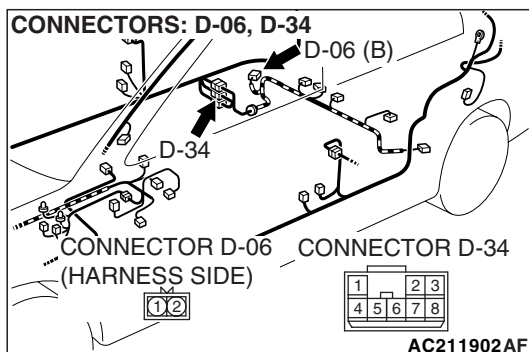
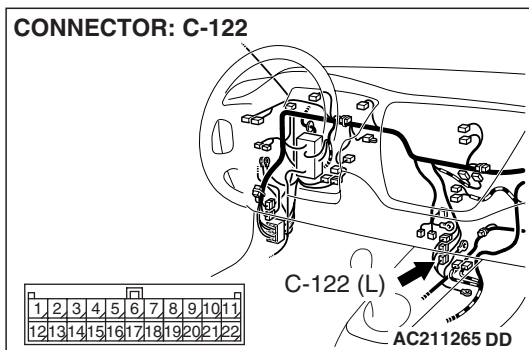
- Intermediate connectors C-113, C-122, D-34
- Rear ABS sensor (RH) connector D-06

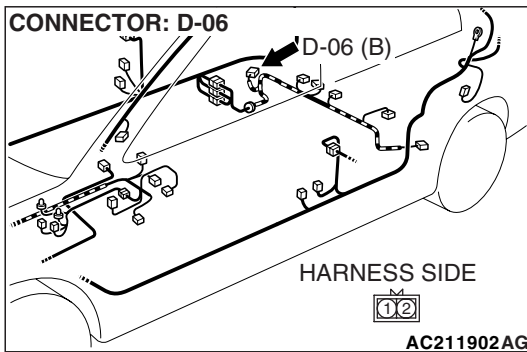
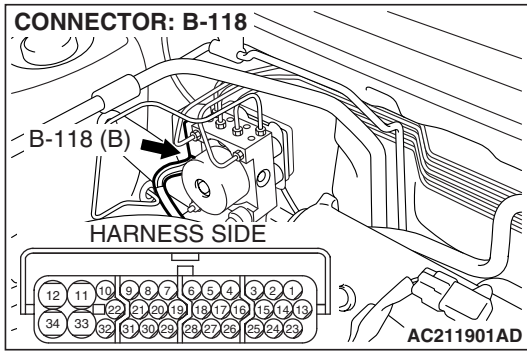
Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 12.

NO : Repair it and then go to Step 15.





STEP 12. Check the following harness wires:

- The wire between ABS-ECU connector B-118 (terminal 8) and rear ABS sensor (RH) connector D-06 (terminal 1)
- The wire between ABS-ECU connector B-118 (terminal 9) and rear ABS sensor (RH) connector D-06 (terminal 2)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 15.

NO : Go to Step 15.

STEP 13. Measure the ABS sensor output voltage.

Refer to [P.35B-106](#).

Output Voltage:

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

Q: Does the voltage meet the specification?

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 15.

NO : Go to Step 14.

STEP 14. Check the wheel bearing.

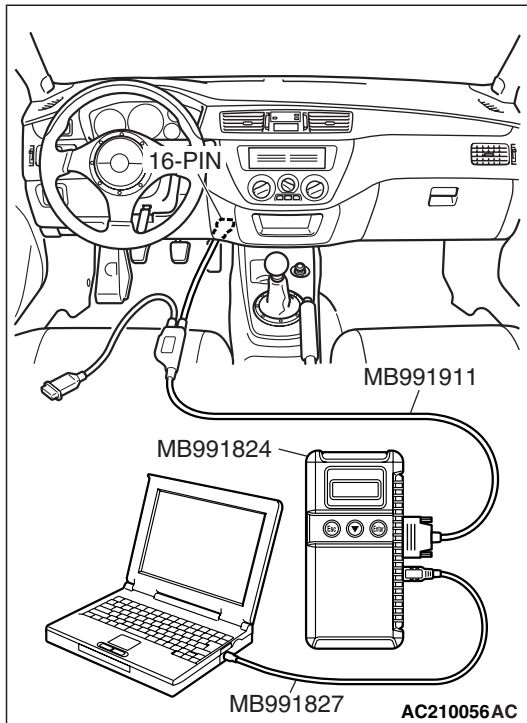
Refer to GROUP 26, On-vehicle Service –Wheel Bearing End Play Check <Front>[P.26-6](#) or GROUP 27, On-vehicle Service –Wheel Bearing End Play Check <Rear>[P.27-14](#) . If play on the wheel bearing is not within the standard value, replace the wheel bearing.

Limit Value: 0.05 mm (0.002 inch)

Q: Is play on the wheel bearing within the standard value?

YES : Go to Step 15.

NO : Replace it and then go to Step 15.

**STEP 15. Recheck for diagnostic trouble code.**

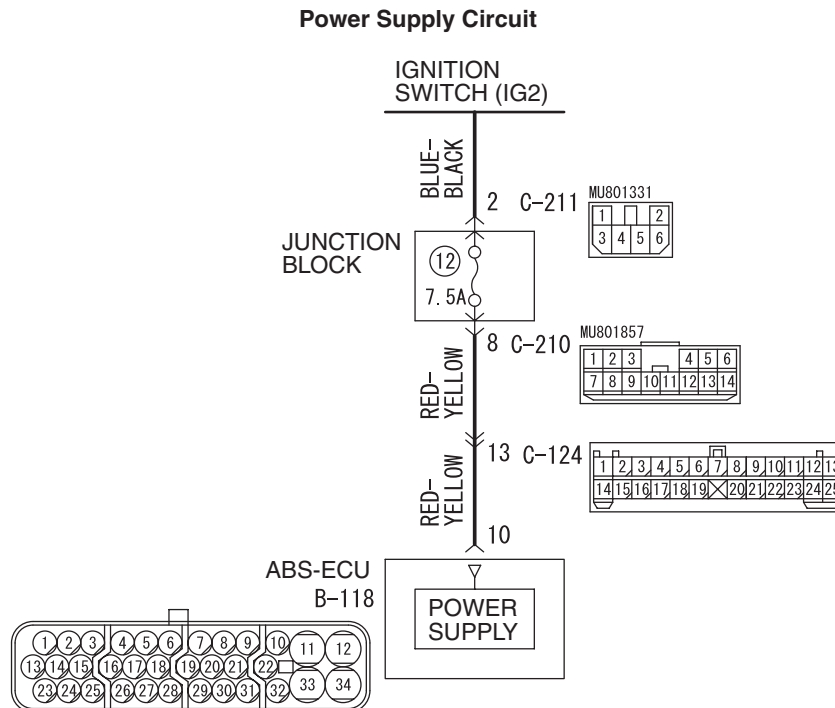
Check again if the DTC is set.

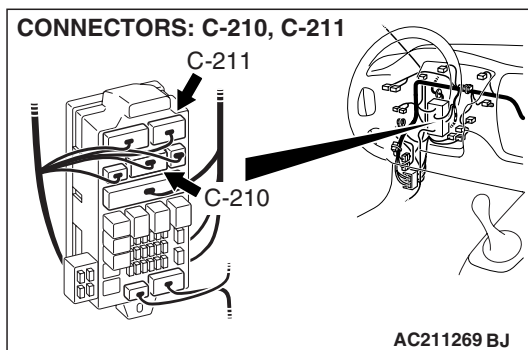
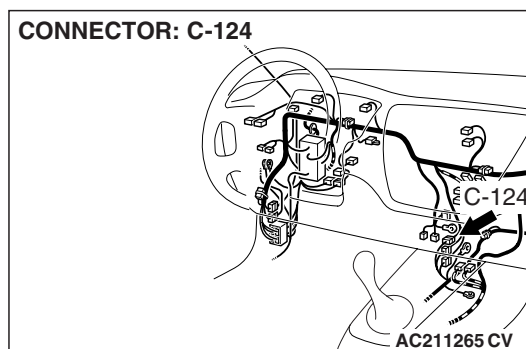
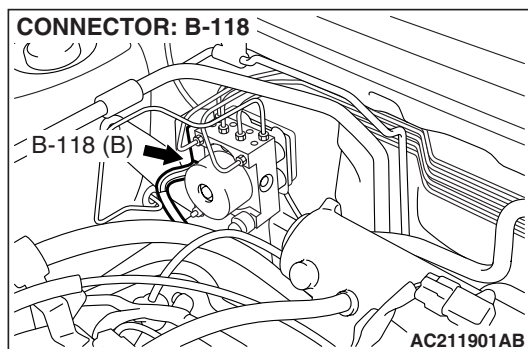
- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTC.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.
- (4) Turn the ignition switch to the "ON" position.
- (5) Check if the DTC is set.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

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

YES : Go to Step 1.

NO : The procedure is complete.

DTC 16: ABS-ECU Power Supply System (abnormal voltage drop or rise)



CIRCUIT OPERATION

The ABS-ECU power is supplied to the ABS-ECU (terminal 10) from the ignition switch (IG2) through the multi-purpose fuse number 12 in the junction block.

ABS DTC SET CONDITIONS

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

TROUBLESHOOTING HINTS

The most likely causes for this DTC to set are:

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

DIAGNOSIS

Required Special Tools:

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

STEP 1. Check the battery.

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

Q: Is the battery damaged?

YES : Charge or replace the battery and then go to Step 5.
NO : Go to Step 2.

STEP 2. Check the charging system.

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

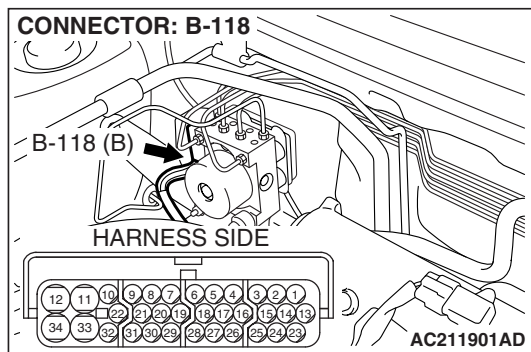
Q: Is the charging system damaged?

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

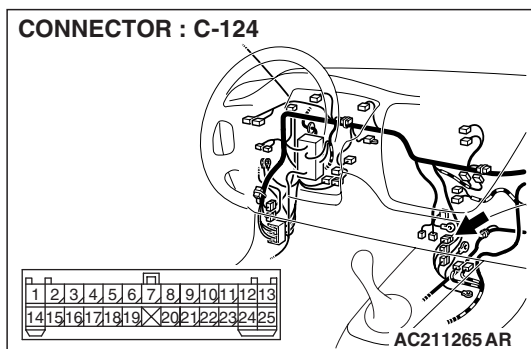
NO : Go to Step 3.

STEP 3. Check the following connectors.

- ABS-ECU connector B-118



- Intermediate connector C-124

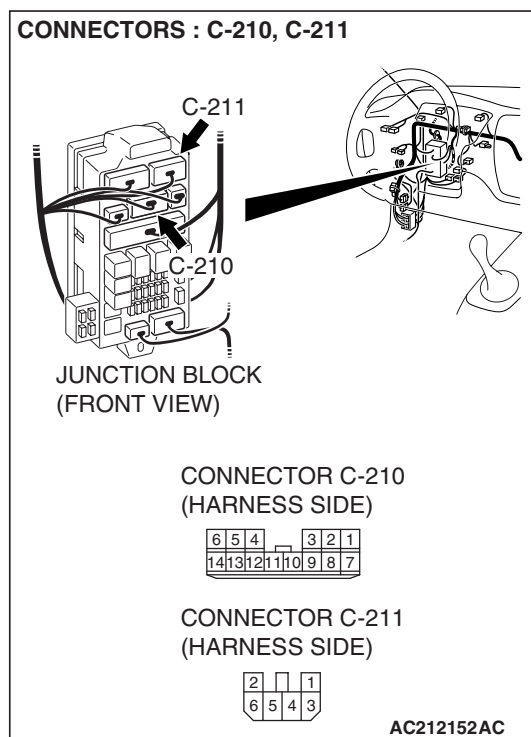


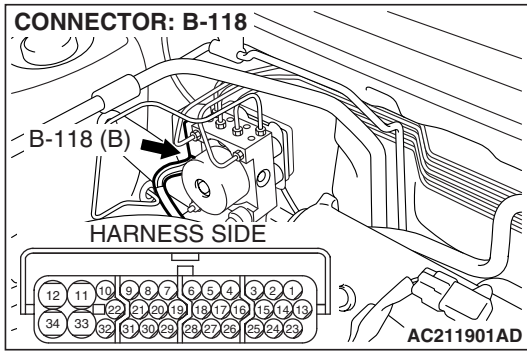
- Junction block connectors C-210, C-211
- Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

NO : Repair it and then go to Step 5.





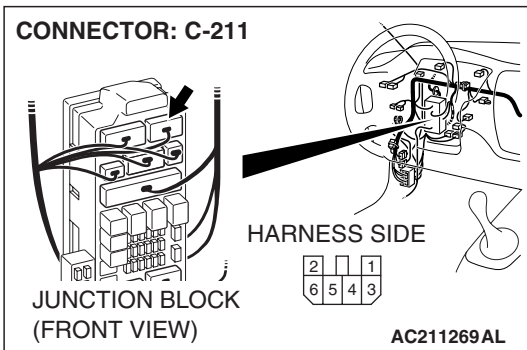
STEP 4. Check the following harness wire.

The wire between ABS-ECU connector B-118 (terminal 10) and junction block connector C-211 (terminal 2)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 5.

NO : Go to Step 5.



STEP 5. Recheck for diagnostic trouble code.

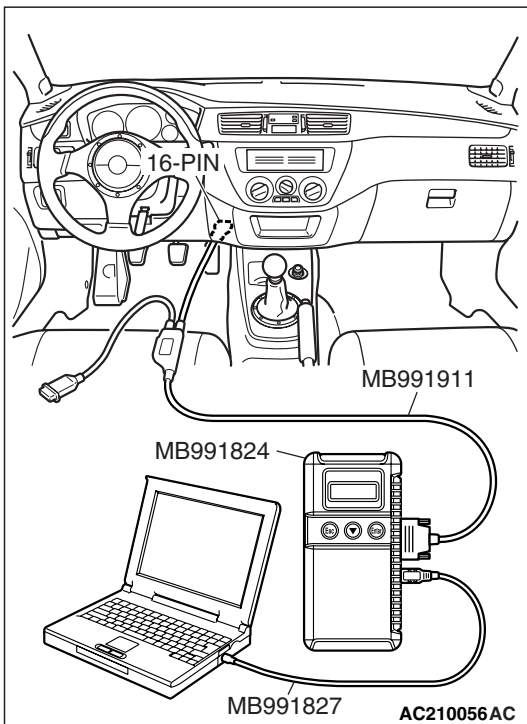
Check again if the DTC is set.

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

Q: Does DTC 16 reset?

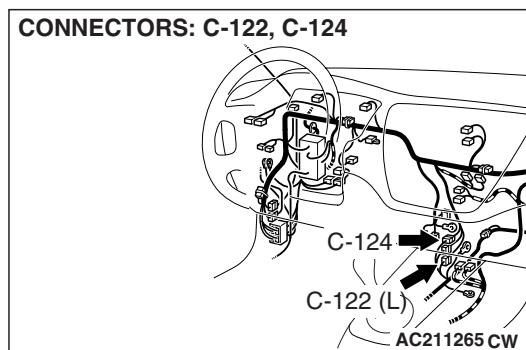
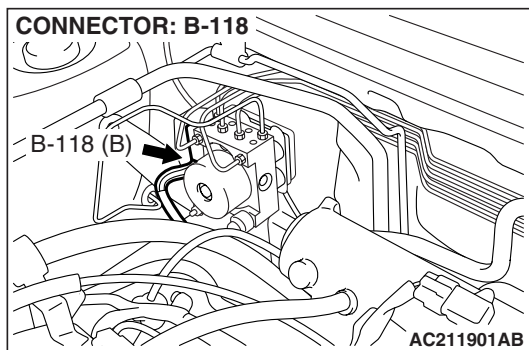
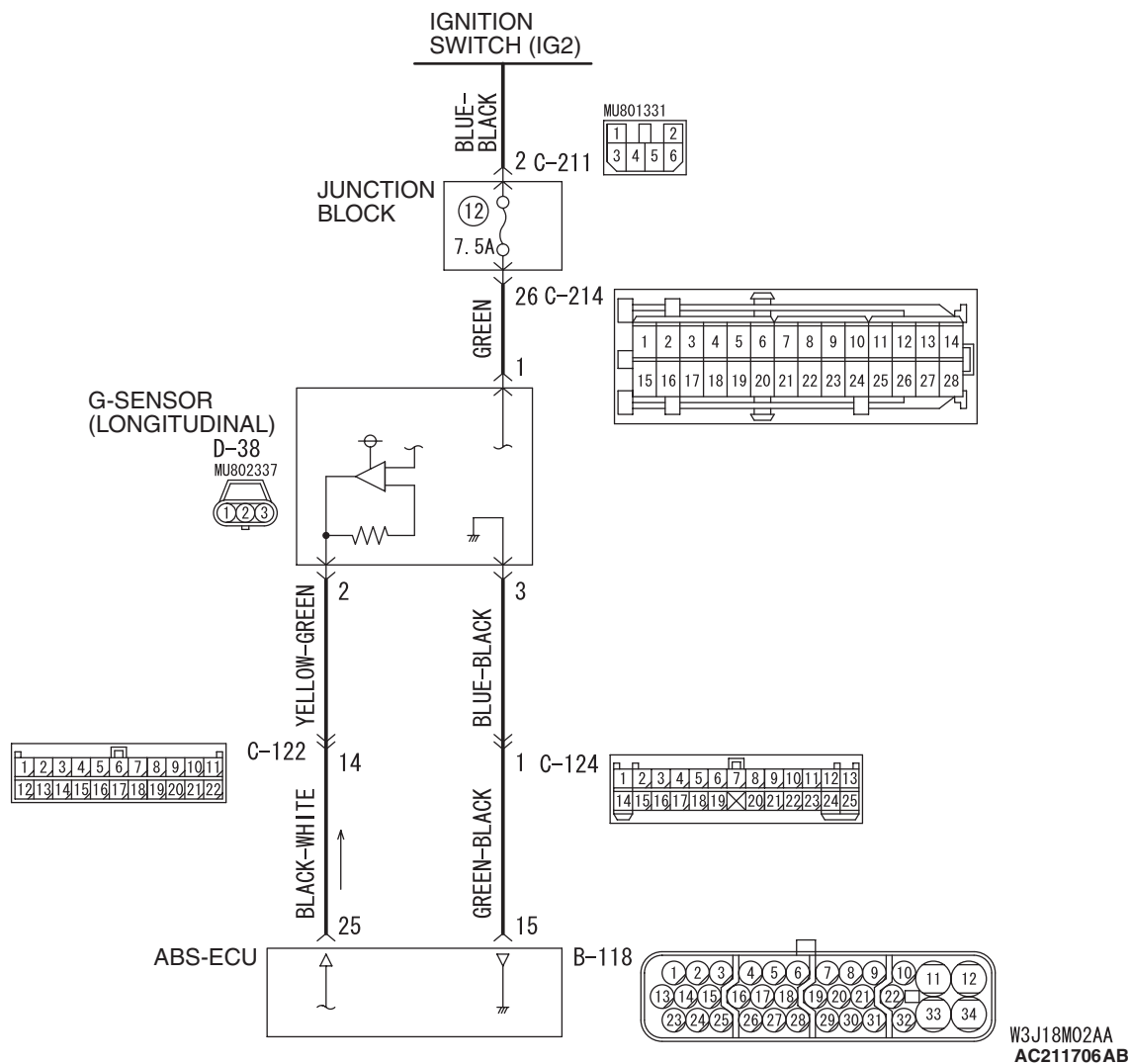
YES : Start over at Step 1.

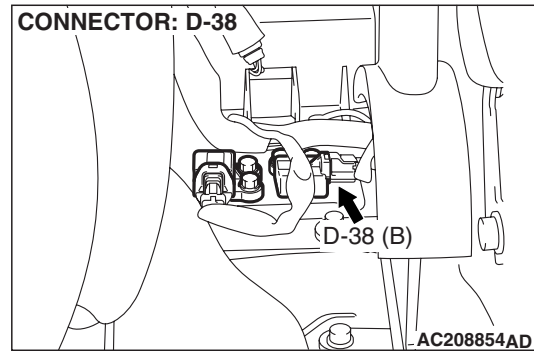
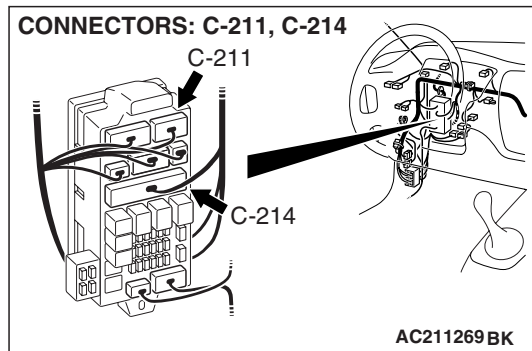
NO : The procedure is complete.



DTC 32: Longitudinal G-Sensor System

Longitudinal G-Sensor Circuit





CIRCUIT OPERATION

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

ABS DTC SET CONDITIONS

This code is output in the following case.

- When the G-sensor output is 0.5 V or lower or 4.5 V or higher (disconnected G-sensor or G-sensor short circuit)

- If the G-sensor output power does not change (G-sensor output fastening).

TROUBLESHOOTING HINTS

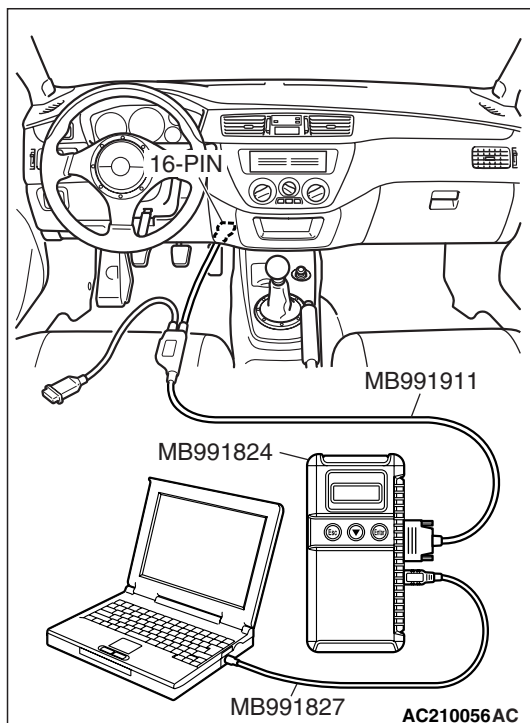
The most likely causes for this DTC to set are:

- Malfunction of the G-sensor
- Damaged wiring harness and connector
- Malfunction of the brake modulator hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991348: Test Harness
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991911: M.U.T.-III Main Harness B

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

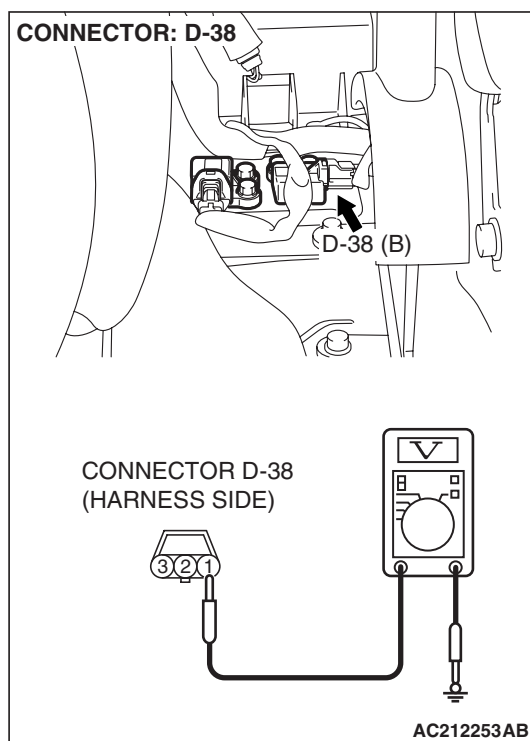
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan MB991958.

- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to data reading mode for following item.
 - Item 32: Longitudinal G-sensor
- (4) Confirm the indicated value. The voltage should measure the followings:
 - When vehicle is stationary (level): 2.4 –2.6 V
 - When vehicle is being driven: 1.0 –4.0 V

Q: Is the longitudinal G-sensor input normal?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope With Intermittent Malfunction [P.00-13](#).

NO : Go to Step 2.

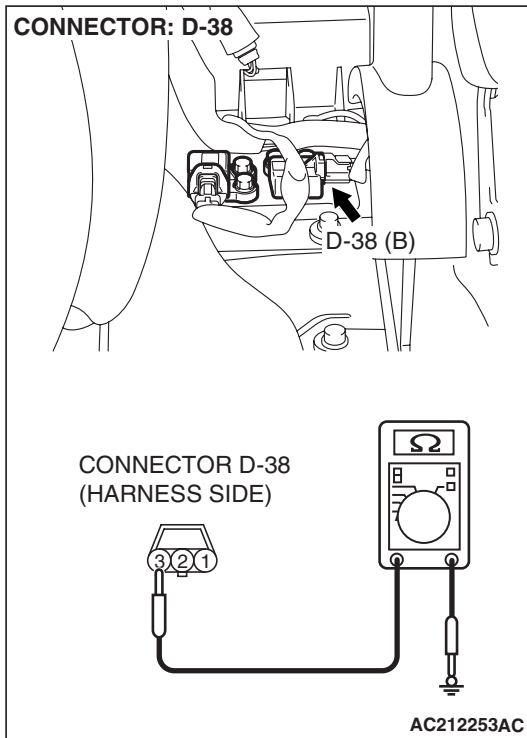
**STEP 2. Check the power supply circuit. Measure the voltage at longitudinal G-sensor connector D-38.**

- (1) Disconnect connector D-38, and check at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 1 and ground. It should measure approximately 12 volts (battery positive voltage).

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

YES : Go to Step 3.

NO : Go to Step 4.



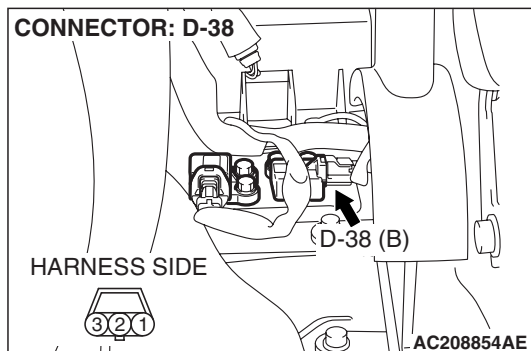
STEP 3. Check the ground circuit. Measure the resistance at longitudinal G-sensor connector D-38.

- (1) Disconnect connector D-38, and check at the harness side.
- (2) Measure the resistance between terminal 3 and ground. It should measure less than 2 ohms.

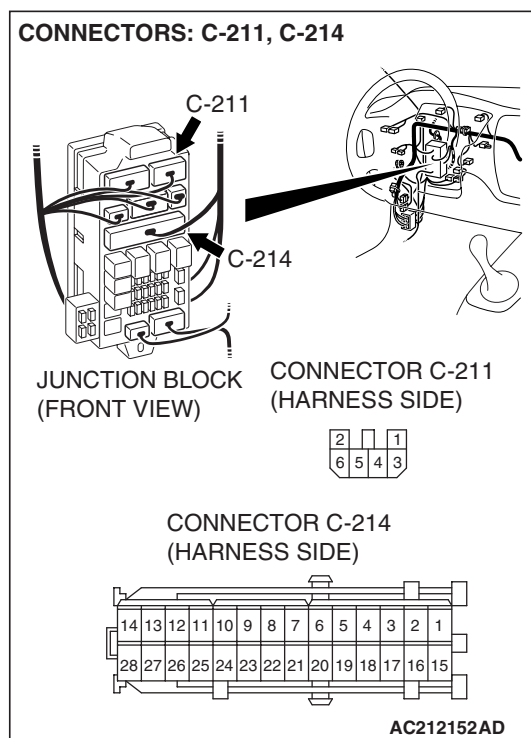
Q: Is the resistance 2 ohms or less?

YES : Go to Step 8.

NO : Go to Step 6.

**STEP 4. Check the following connectors.**

- Longitudinal G-sensor connector D-38



- Junction block connectors C-211, C-214

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.

NO : Repair it and then go to Step 11.

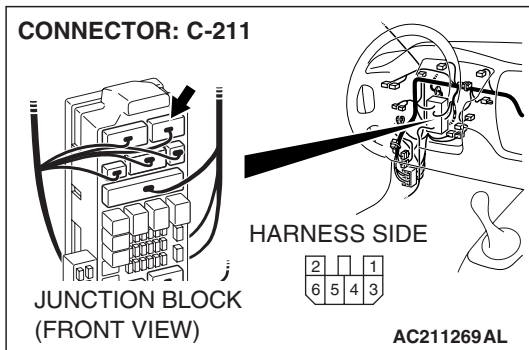
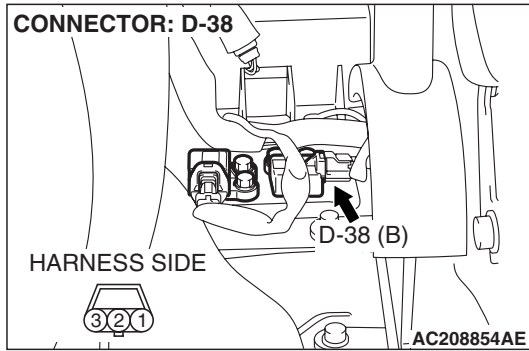
STEP 5. Check the following harness wire.

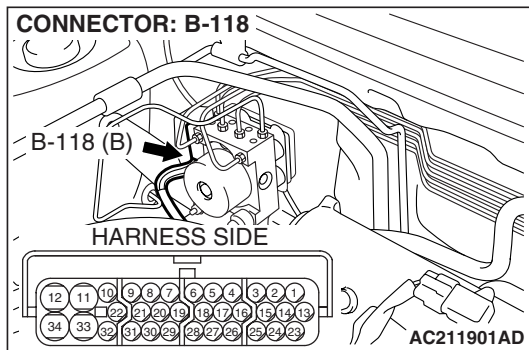
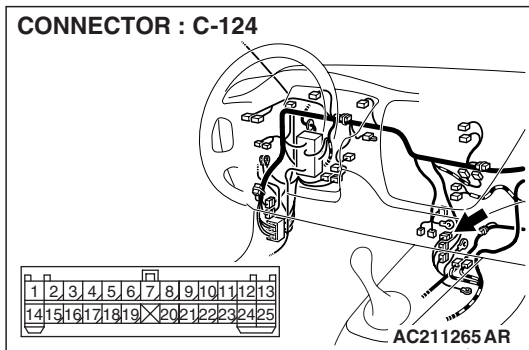
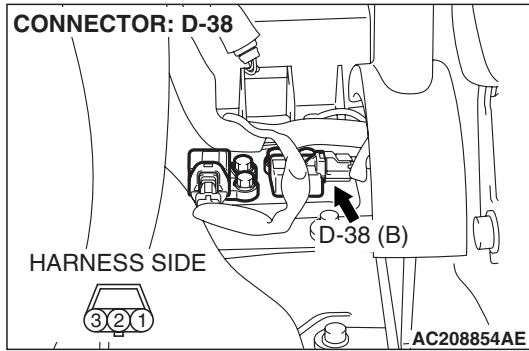
The wire between longitudinal G-sensor connector D-38 (terminal 1) and junction block connector C-211 (terminal 2)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.



**STEP 6. Check the following connectors.**

- Longitudinal G-sensor connector D-38

- Intermediate connector C-124

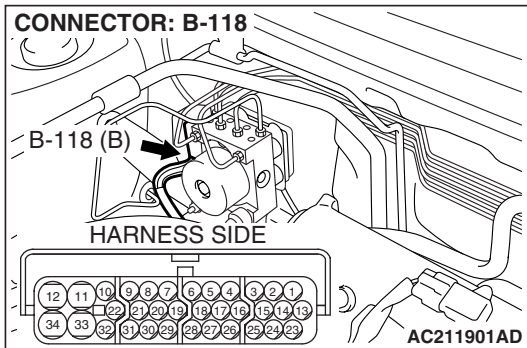
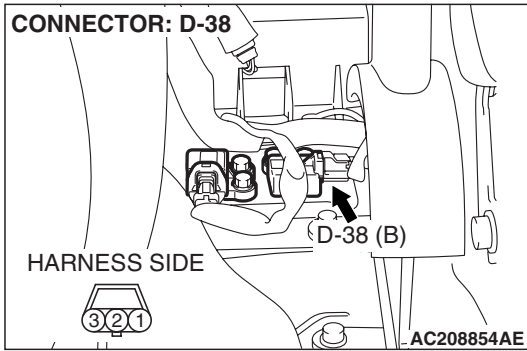
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

NO : Repair it and then go to Step 11.



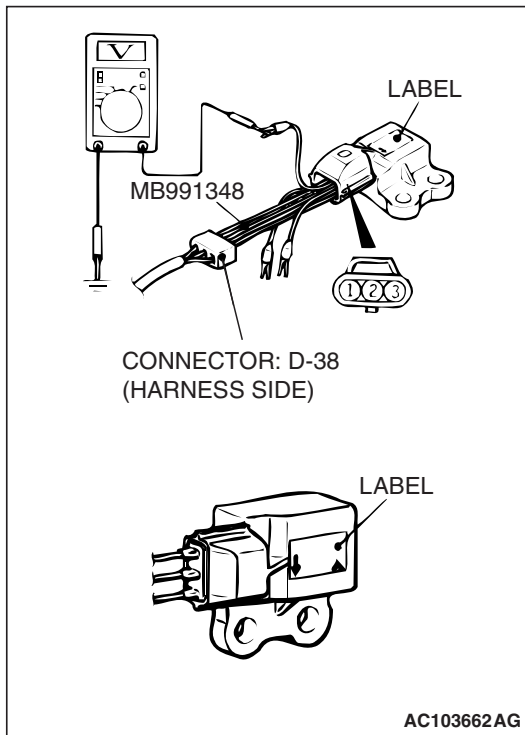
STEP 7. Check the following harness wire.

The wire between longitudinal G-sensor connector D-38 (terminal 3) and ABS-ECU connector B-118 (terminal 15)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.



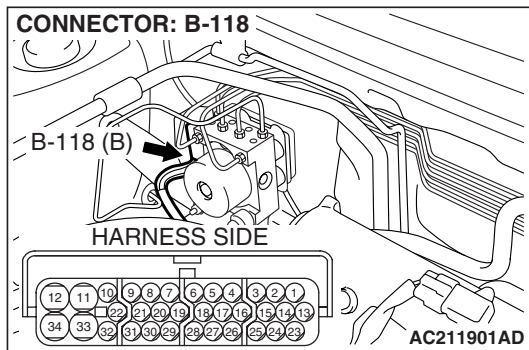
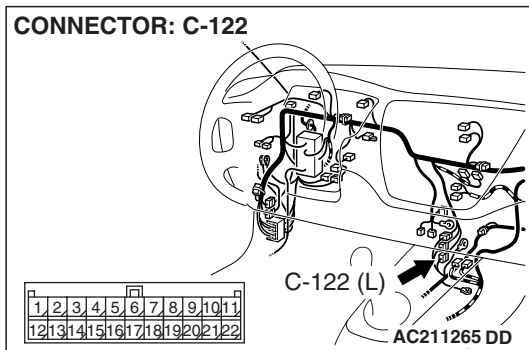
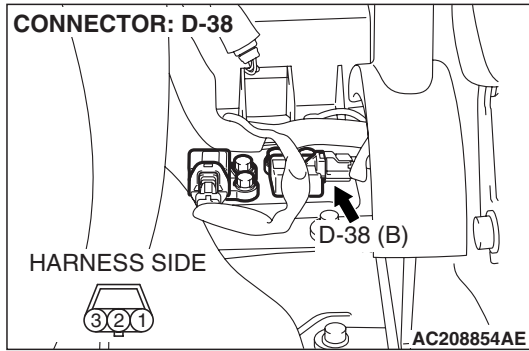
STEP 8. Check longitudinal G-sensor output voltage.

- (1) Disconnect connector D-38, and then connect special tool MB991348 between terminals of the disconnected connectors.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 2 and ground.
 - It should measure 2.4 –2.6 volts when the longitudinal G-sensor is placed on a level plane.
 - Voltage should measure 3.4 –3.6 volts when the longitudinal G-sensor is placed with its label positioned as shown.

Q: Is the longitudinal G-sensor output voltage normal?

YES : Go to Step 9.

NO : Replace the longitudinal G-sensor (Refer to [P.35B-115](#)). Then go to Step 11.

**STEP 9. Check the following connectors.**

- Longitudinal G-sensor connector D-38

- Intermediate connector C-122

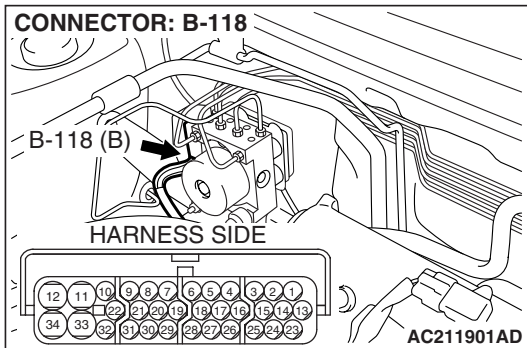
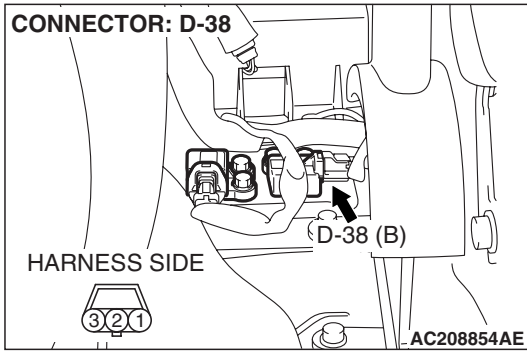
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

NO : Repair it and then go to Step 11.



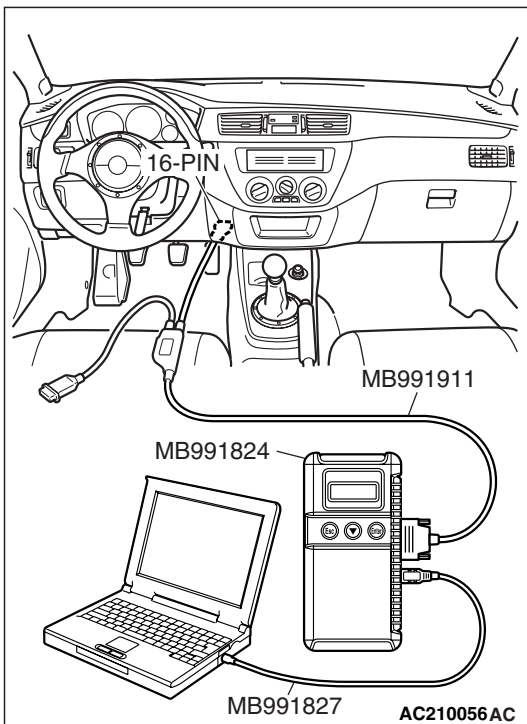
STEP 10. Check the following harness wire.

The wire between longitudinal G-sensor connector D-38 (terminal 2) and ABS-ECU connector B-118 (terminal 25)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 11.



STEP 11. Recheck for diagnostic trouble code.

Check again if the DTC is set.

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

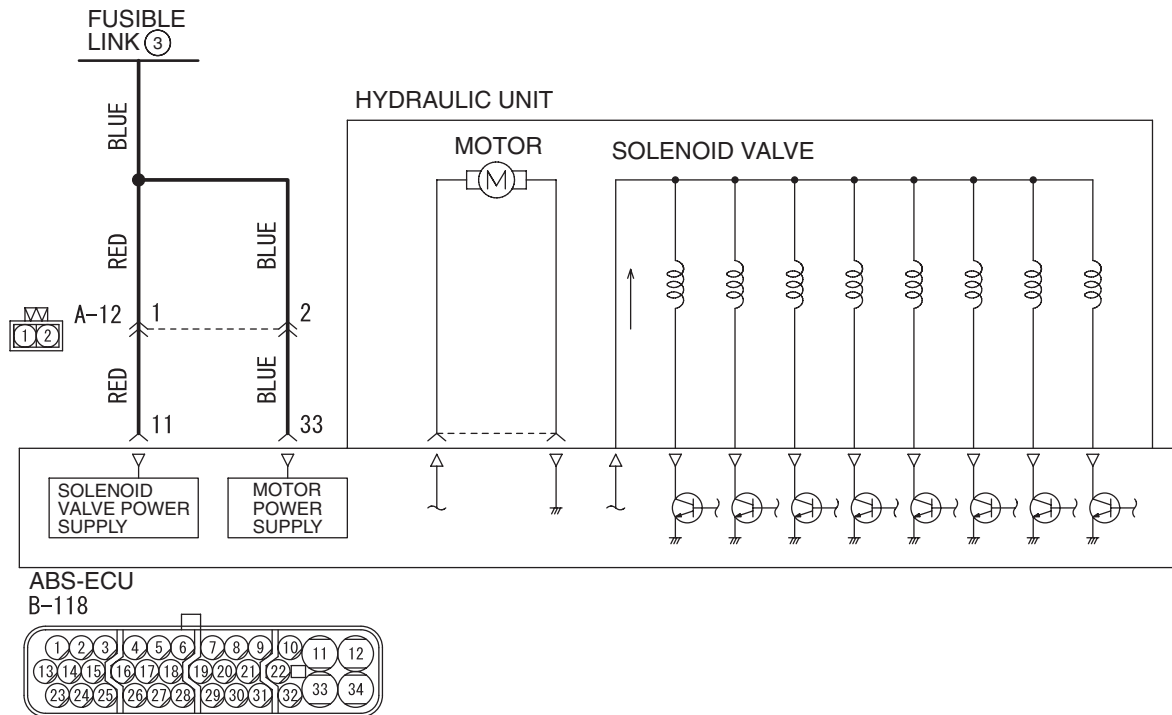
Q: Does DTC 32 reset?

YES : Start over at Step 1.

NO : The procedure is complete.

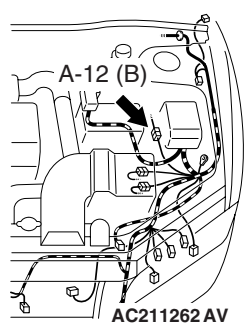
DTC 41: Front Right Solenoid Valve inside Hydraulic Unit
 DTC 42: Front Left Solenoid Valve inside Hydraulic Unit
 DTC 43: Rear Right Solenoid Valve inside Hydraulic Unit
 DTC 44: Rear Left Solenoid Valve inside Hydraulic Unit
 DTC 52: Valve Relay Problem (Stays off)
 DTC 53: Motor Relay Problem (Stays off)
 DTC 55: Motor System (Seized Pump Motor)

Solenoid Valve and Motor Power Supply Circuit

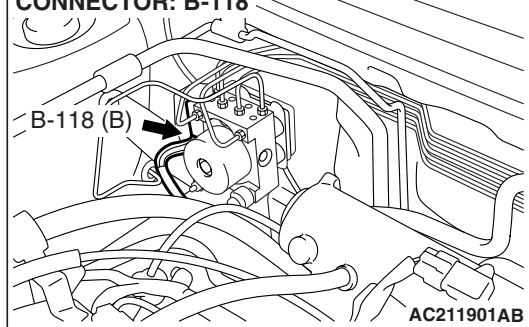


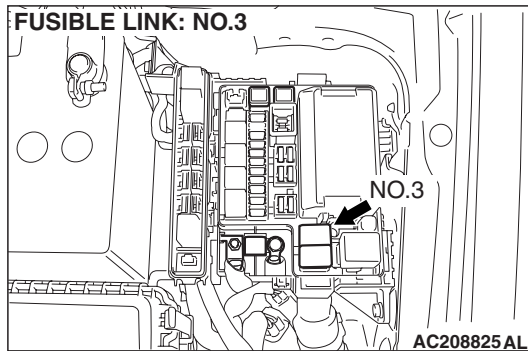
W3J18M04AA
AC211707AB

CONNECTOR: A-12



CONNECTOR: B-118





CIRCUIT OPERATION

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

ABS DTC SET CONDITIONS

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

TROUBLESHOOTING HINTS

The most likely causes for these DTCs to set are:

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

DIAGNOSIS

Required Special Tools:

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

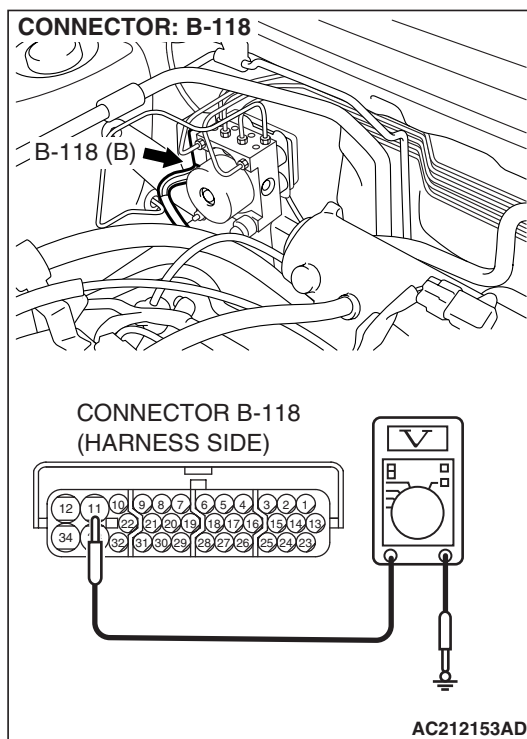
STEP 1. Check the solenoid valve or motor power supply circuit. Measure the voltage at ABS-ECU connector B-118.

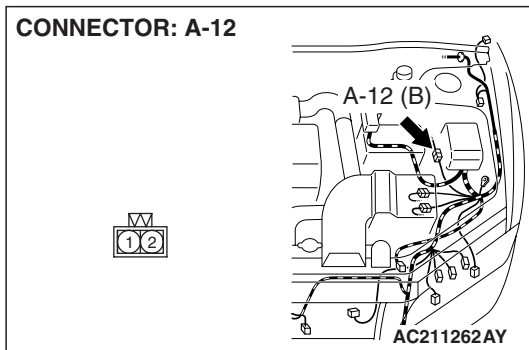
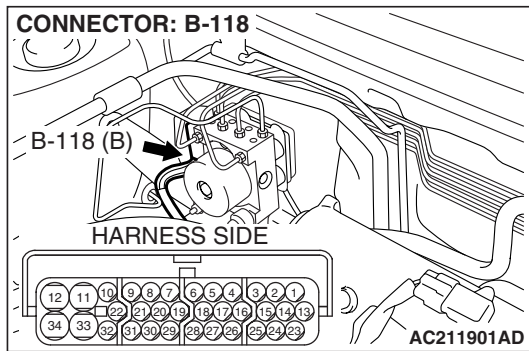
- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Measure the voltage between terminal 11 and ground, and 33 and ground. It should measure approximately 12 volts (battery positive voltage).

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

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 4.

NO : Go to Step 2.



**STEP 2. Check the following connectors.**

- ABS-ECU connector B-118

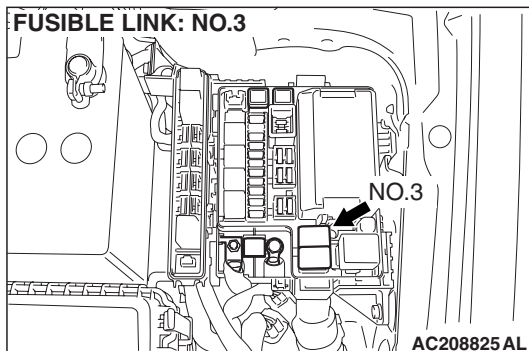
- Intermediate connector A-12

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 3.

NO : Repair it and then go to Step 4.

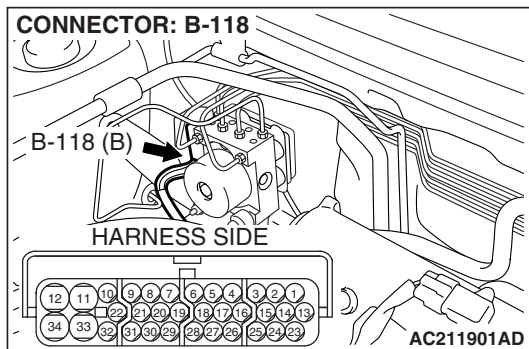
**STEP 3. Check the following harness wires.**

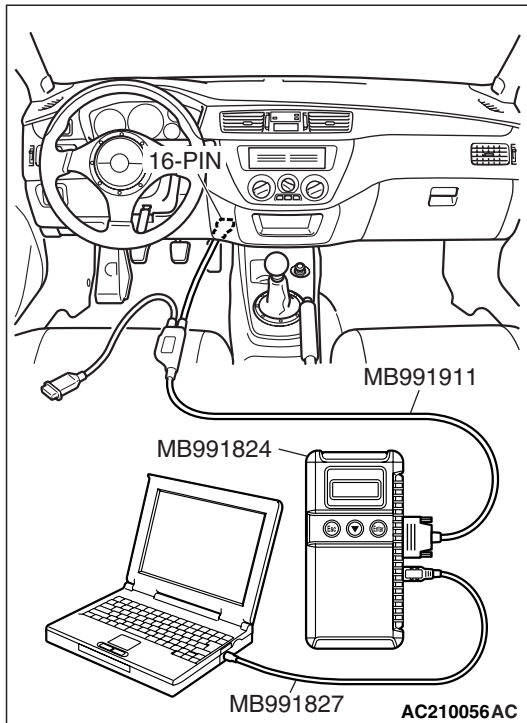
- The wire between fusible link No.3 and ABS-ECU connector B-118 (terminal 11)
- The wire between fusible link No.3 and ABS-ECU connector B-118 (terminal 33)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 4.

NO : Go to Step 4.





STEP 4. Recheck for diagnostic trouble code.

Check again if the DTC is set.

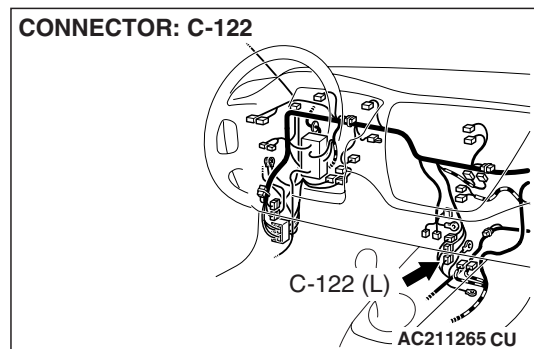
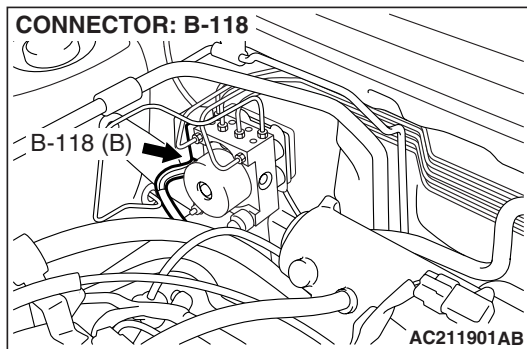
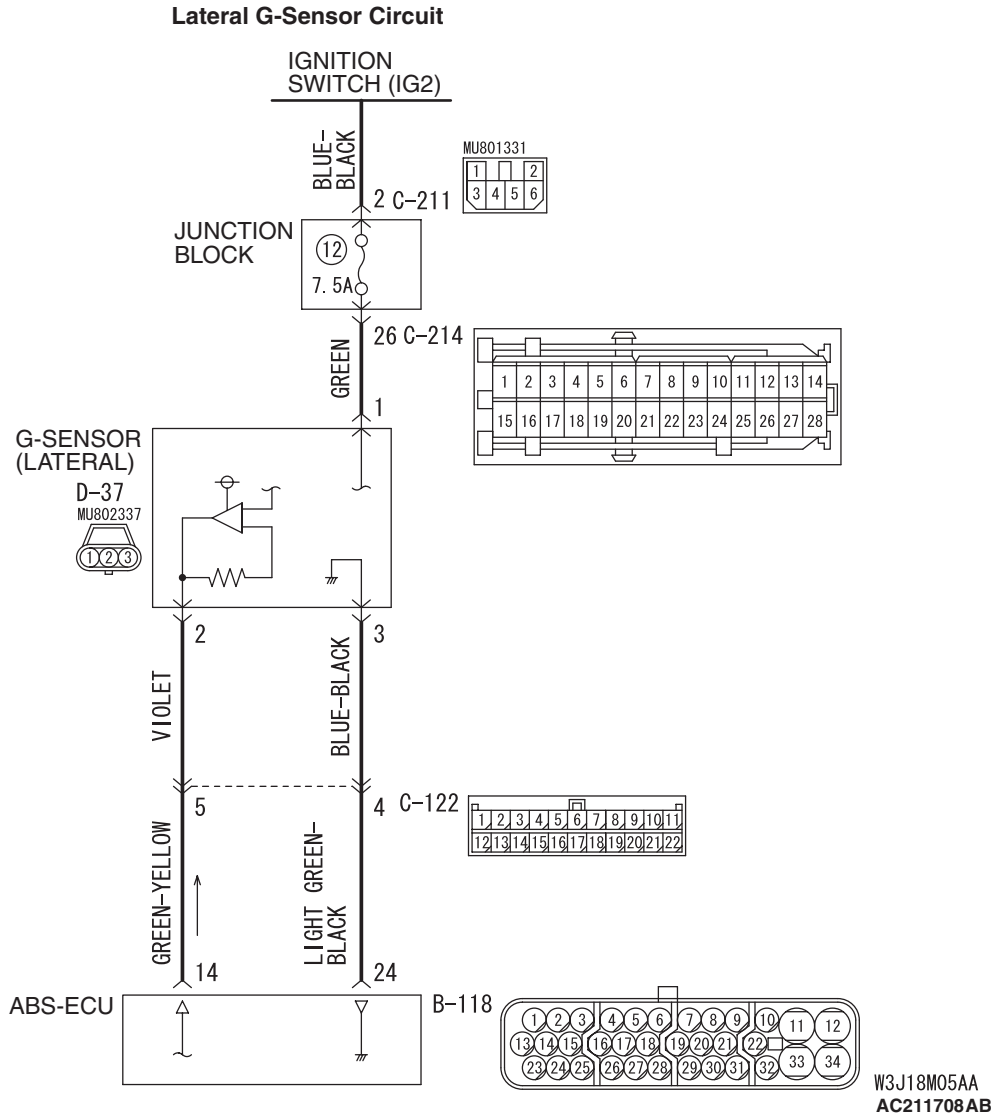
- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTC.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.
- (4) Turn the ignition switch to the "ON" position.
- (5) Check if the DTC is set.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

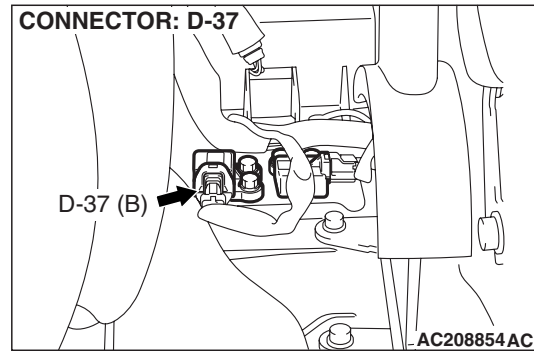
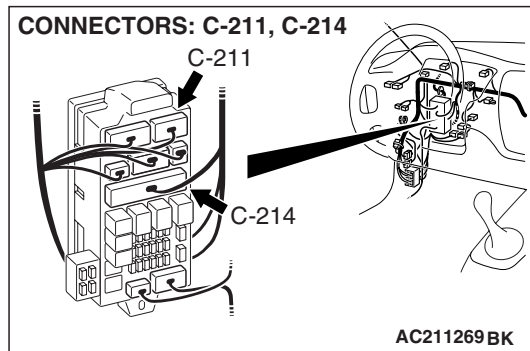
Q: Do diagnostic trouble codes 41, 42, 43, 44, 52, 53 or 55 reset?

YES : Return to Step 1.

NO : The procedure is complete.

DTC 71: Lateral G-Sensor System





CIRCUIT OPERATION

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

ABS DTC SET CONDITIONS

This code is output in the following cases:

- When the G-sensor output is 0.5 V or lower or 4.5 V or higher (disconnected lateral G-sensor or lateral G-sensor short circuit)

- If the lateral G-sensor output power does not change (lateral G-sensor output fastening).

TROUBLESHOOTING HINTS

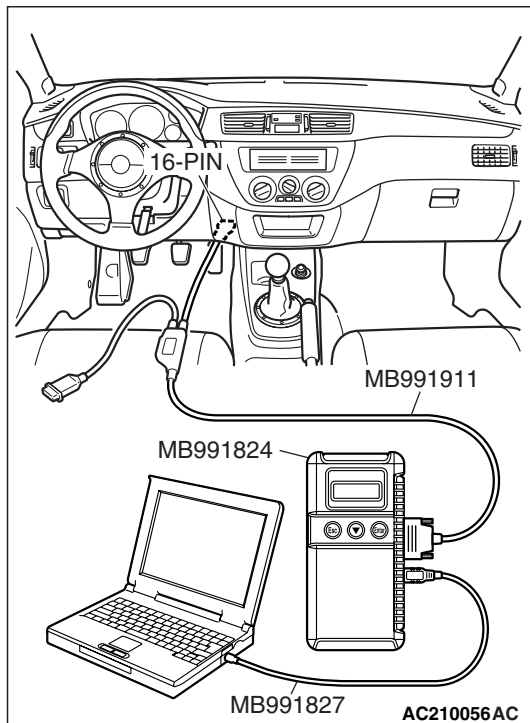
The most likely causes for DTC to set are:

- Malfunction of the lateral G-sensor
- Damaged wiring harness and connector
- Malfunction of the brake modulator hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS

Required Special Tools:

- MB991348: Test Harness
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991911: M.U.T.-III Main Harness B

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

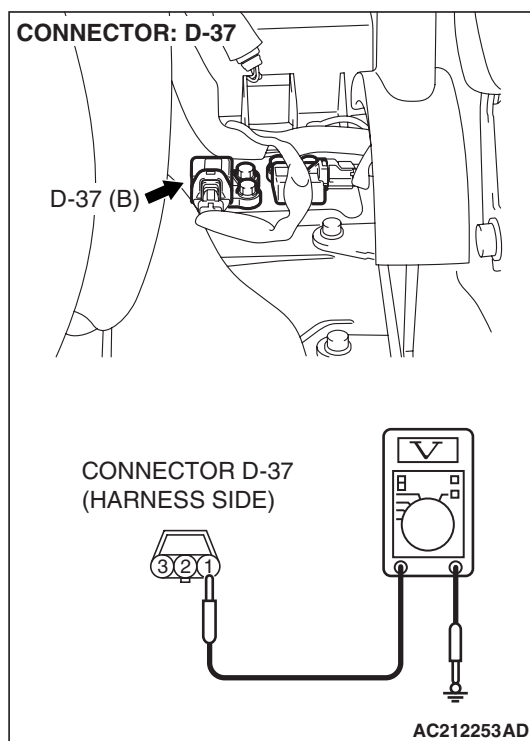
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting scan MB991958.

- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to data reading mode for following item.
 - Item 71: Lateral G-sensor
- (4) Confirm the indicated value. The voltage should measure as follows:
 - When vehicle is stationary (level): 2.4 –2.6 V
 - When vehicle is being driven: 1.0 –4.0 V

Q: Is the lateral G-sensor input normal?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope With Intermittent Malfunction [P.00-13](#).

NO : Go to Step 2.

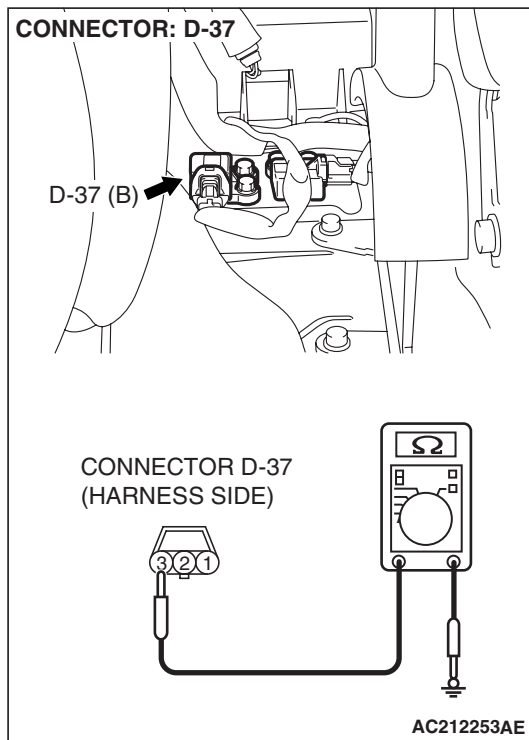
**STEP 2. Check the power supply circuit. Measure the voltage at lateral G-sensor connector D-37.**

- (1) Disconnect connector D-37, and check at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 1 and ground. It should measure approximately 12 volts (battery positive voltage).

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

YES : Go to Step 3.

NO : Go to Step 4.



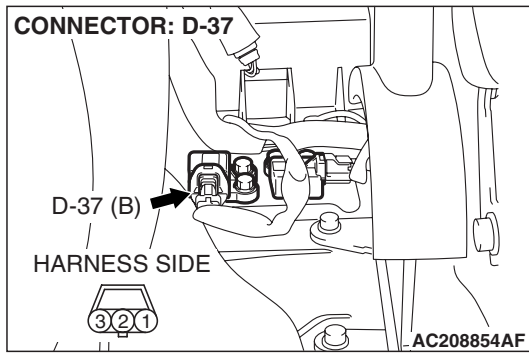
STEP 3. Check the ground circuit. Measure the resistance at lateral G-sensor connector D-37.

- (1) Disconnect connector D-37, and check at the harness side.
- (2) Measure the resistance between terminal 3 and ground. It should measure less than 2 ohms.

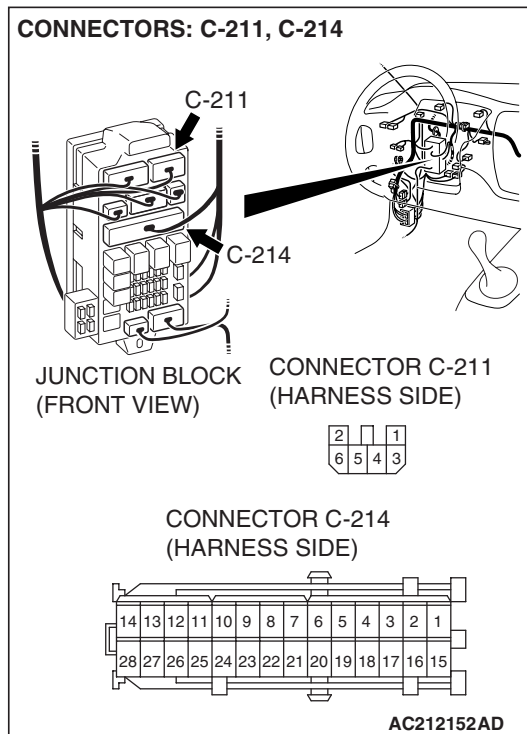
Q: Is the resistance 2 ohms or less?

YES : Go to Step 8.

NO : Go to Step 6.

**STEP 4. Check the following connectors.**

- Lateral G-sensor connector D-37



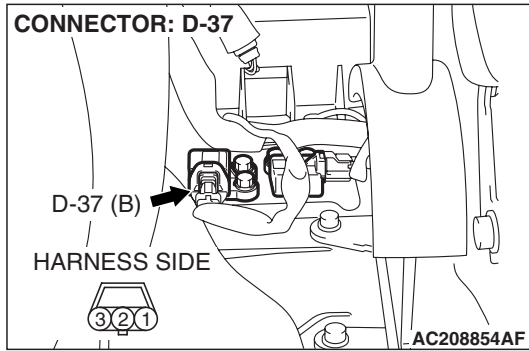
- Junction block connectors C-211, C-214

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.

NO : Repair it and then go to Step 11.



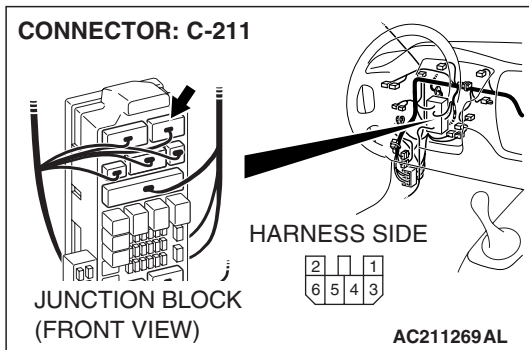
STEP 5. Check the following harness wire.

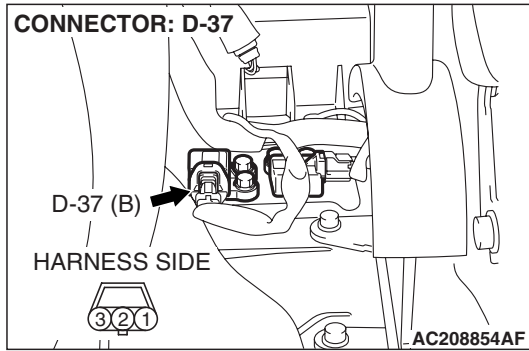
The wire between lateral G-sensor connector D-37 (terminal 1) and junction block connector C-211 (terminal 2)

Q: Is the harness wire damaged?

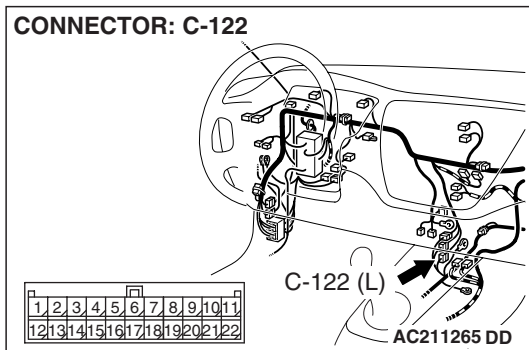
YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.

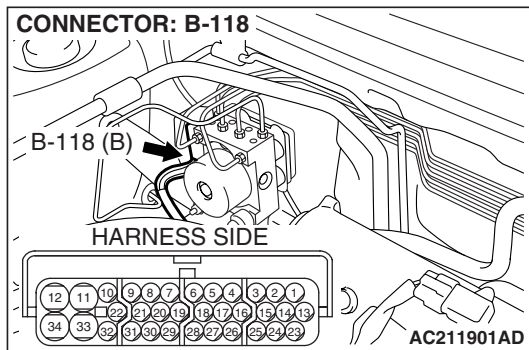


**STEP 6. Check the following connectors.**

- Lateral G-sensor connector D-37



- Intermediate connector C-122



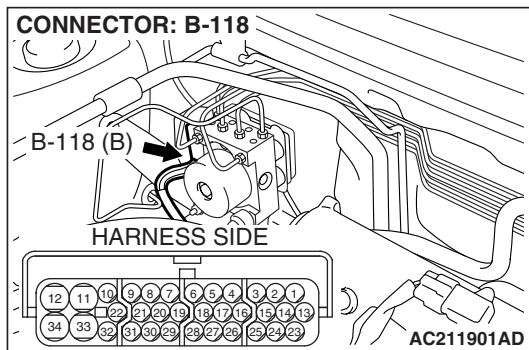
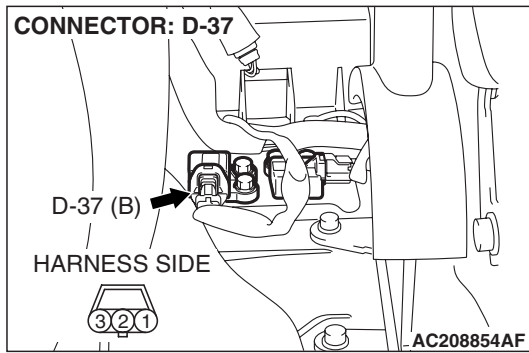
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

NO : Repair it and then go to Step 11.



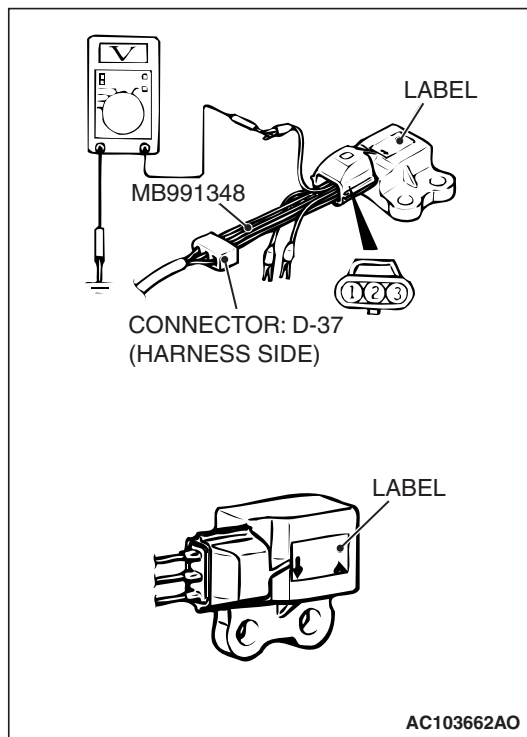
STEP 7. Check the following harness wire.

The wire between lateral G-sensor connector D-37 (terminal 3) and ABS-ECU connector B-118 (terminal 24)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.



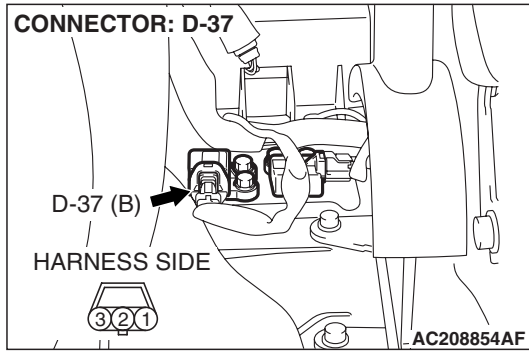
STEP 8. Check lateral G-sensor output voltage.

- (1) Disconnect connector D-37, and then connect special tool MB991348 between terminals of the disconnected connectors.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 2 and ground.
 - It should measure 2.4 –2.6 volts when the lateral G-sensor is placed on a level plane.
 - Voltage should measure 3.4 –3.6 volts when the lateral G-sensor is placed with its label positioned as shown.

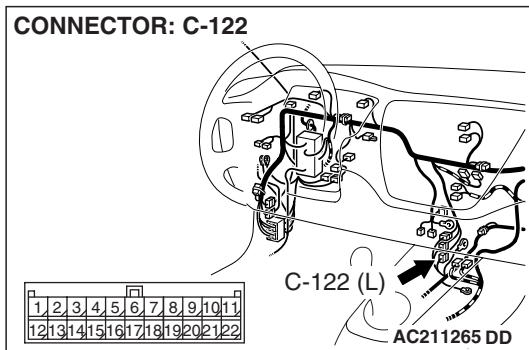
Q: Is the lateral G-sensor output voltage normal?

YES : Go to Step 9.

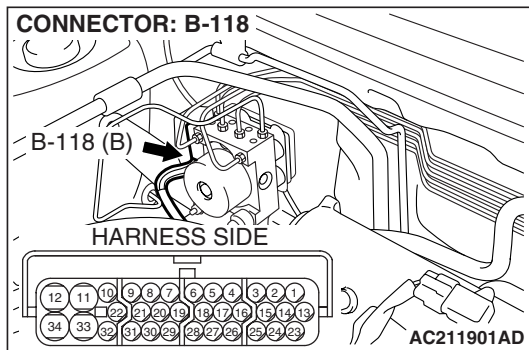
NO : Replace the lateral G-sensor (Refer to [P.35B-115](#)). Then go to Step 11.

**STEP 9. Check the following connectors.**

- Lateral G-sensor connector D-37



- Intermediate connector C-122



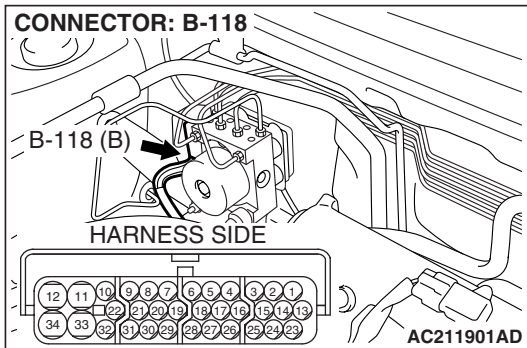
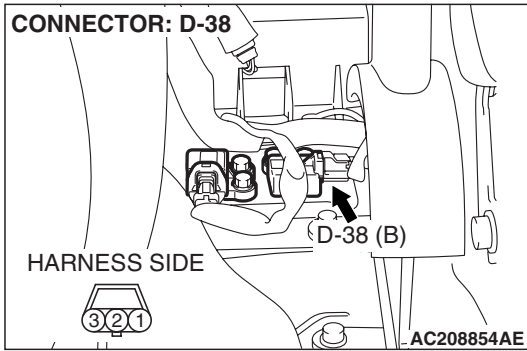
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

NO : Repair it and then go to Step 11.



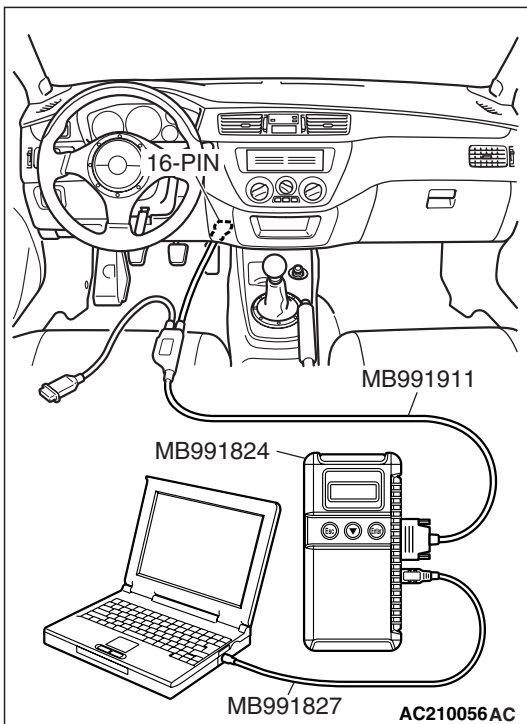
STEP 10. Check the following harness wire.

The wire between lateral G-sensor connector D-37 (terminal 2) and ABS-ECU connector B-118 (terminal 14)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 11.



STEP 11. Recheck for diagnostic trouble code.

Check again if the DTC is set.

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

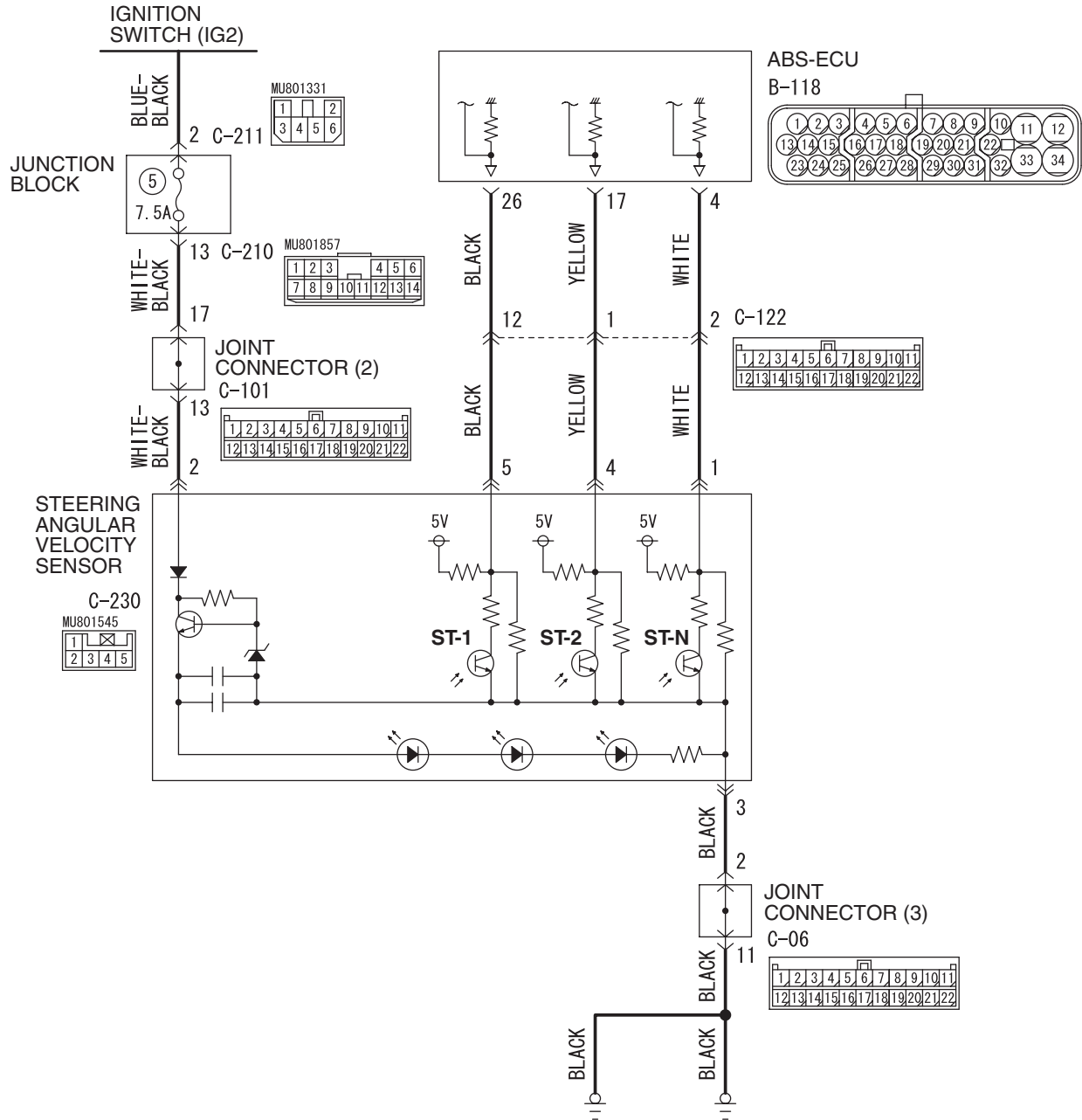
Q: Does DTC 71 reset?

YES : Start over at Step 1.

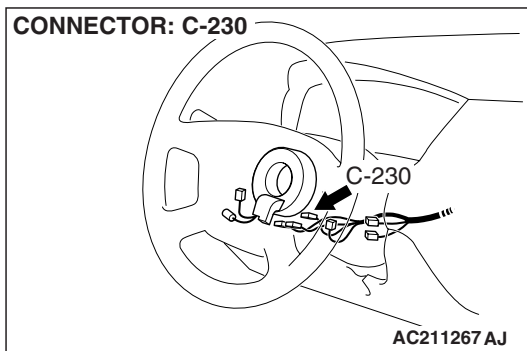
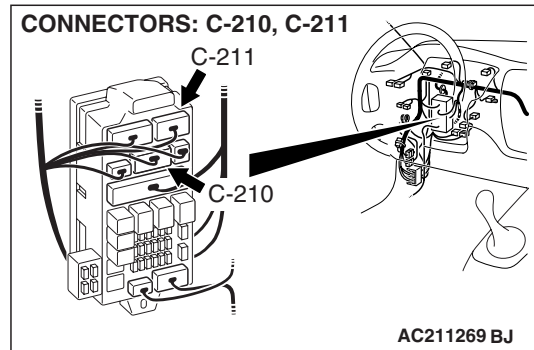
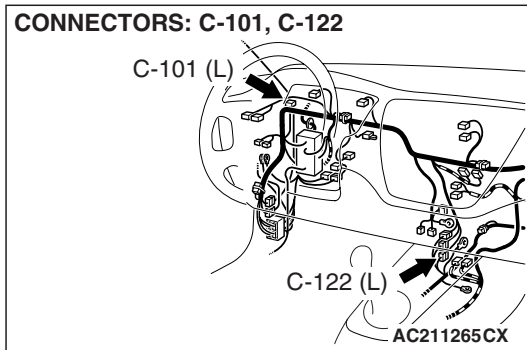
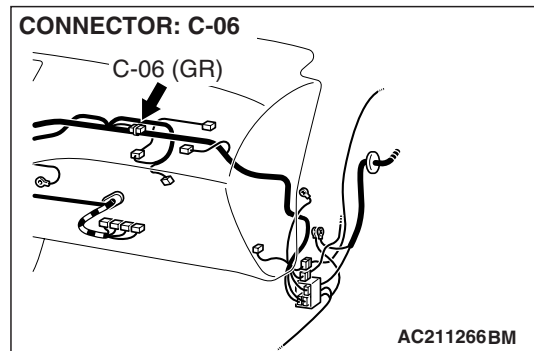
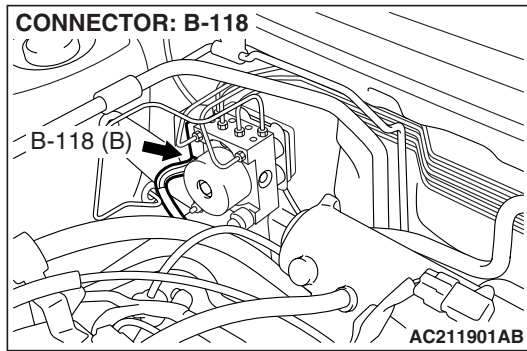
NO : The procedure is complete.

DTC 81: Steering Angular Velocity Sensor (ST-1) System
 DTC 82: Steering Angular Velocity Sensor (ST-2) System
 DTC 83: Steering Angular Velocity Sensor (ST-N) System

Steering Angular Velocity Sensor Circuit



W3J18M07AA
 AC211709AB



CIRCUIT OPERATION

The steering angular velocity sensor monitors the steering angle and outputs the ST-1, ST-2 and ST-N signals. The ABS-ECU calculates the steering angle by reading the signals from the steering angular velocity sensor.

ABS DTC SET CONDITIONS

DTC 81 (ST-1), DTC 82 (ST-2) and DTC 83 (ST-N) are output if there is a fault in the steering angular velocity sensor, an open circuit or short circuit in the signal lines, or the internal circuit in the hydraulic unit and ABS-ECU is defective.

TROUBLESHOOTING HINTS

The most likely causes for these DTCs to set are:

- Malfunction of the steering angular velocity sensor
- Damaged wiring harness and connector
- Malfunction of the brake modulator hydraulic unit (integrated with ABS-ECU)

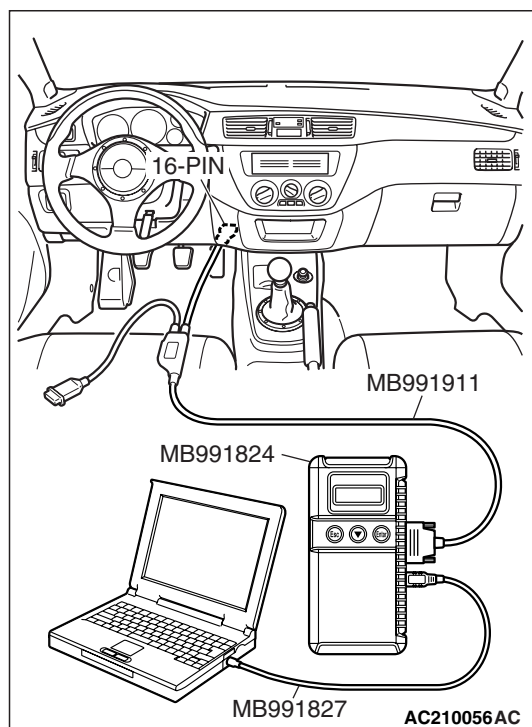
DIAGNOSIS**Required Special Tools:**

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

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

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

- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to data reading mode for following items.
 - Item 74: Steering angular velocity (ST-N)
 - Item 75: Steering angular velocity (ST-1)
 - Item 76: Steering angular velocity (ST-2)
- (4) Confirm the indicated ON/OFF state as follows:



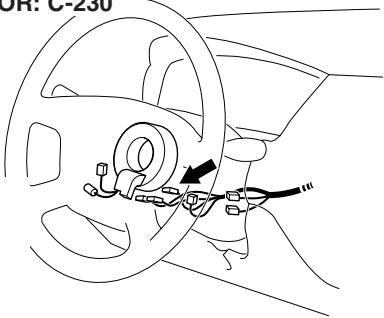
ITEM NO.	CHECK ITEM	CHECKING REQUIREMENT	DISPLAY
74	Steering angular velocity sensor (ST-N)	Steering: Neutral position and position near by $\pm 360^\circ$	ON
		Steering: Except for above	OFF
75	Steering angular velocity sensor (ST-1)	Steering: Turn laterally slowly.	Display ON and OFF alternately
76	Steering angular velocity sensor (ST-2)		

Q: Is the steering angular velocity sensor input normal?

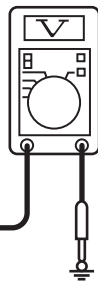
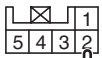
YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope With Intermittent Malfunction [P.00-13](#).

NO : Go to Step 2.

CONNECTOR: C-230



CONNECTOR C-230
(HARNESS SIDE)



AC212249AB

STEP 2. Check the power supply circuit. Measure the voltage at steering angular velocity sensor connector C-230.

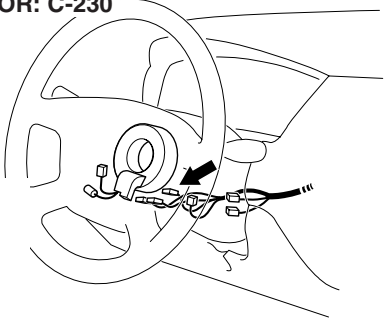
- (1) Disconnect connector C-230, and check at the harness side.
- (2) Turn the ignition switch to the "ON" position.
- (3) Measure the voltage between terminal 2 and ground. It should measure approximately 12 volts (battery positive voltage).

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

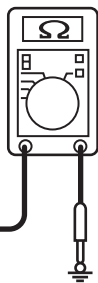
YES : Go to Step 3.

NO : Go to Step 4.

CONNECTOR: C-230



CONNECTOR C-230
(HARNESS SIDE)



AC212249AC

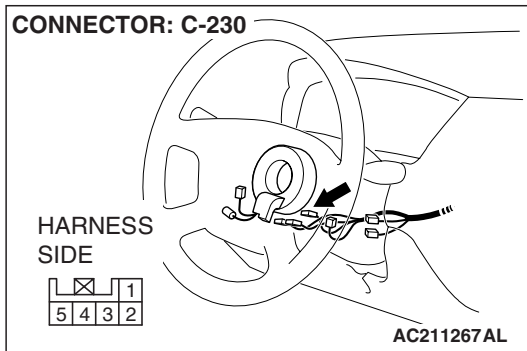
STEP 3. Check the ground circuit. Measure the resistance at steering angular velocity sensor connector C-230.

- (1) Disconnect connector C-230, and check at the harness side.
- (2) Measure the resistance between terminal 3 and ground. It should measure less than 2 ohms.

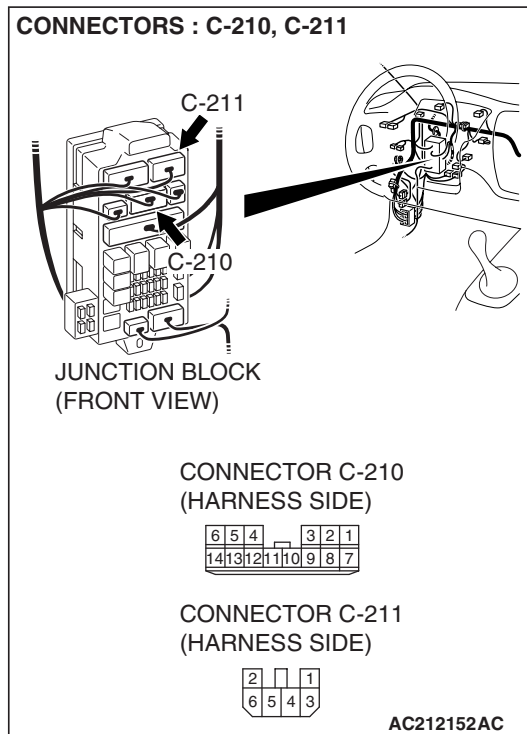
Q: Is the resistance 2 ohms or less?

YES : Go to Step 8.

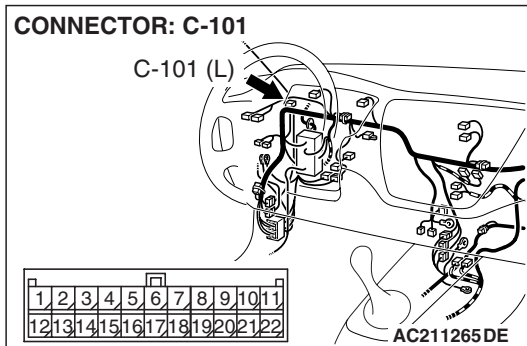
NO : Go to Step 6.

CONNECTOR: C-230**STEP 4. Check the following connectors.**

- Steering angular velocity sensor connector C-230

CONNECTORS : C-210, C-211

- Junction block connectors C-210, C-211

CONNECTOR: C-101

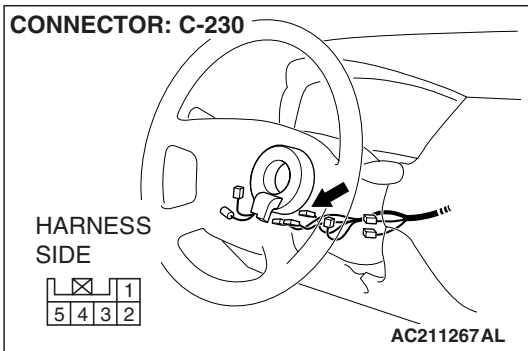
- Joint connector C-101

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.

NO : Repair it and then go to Step 11.



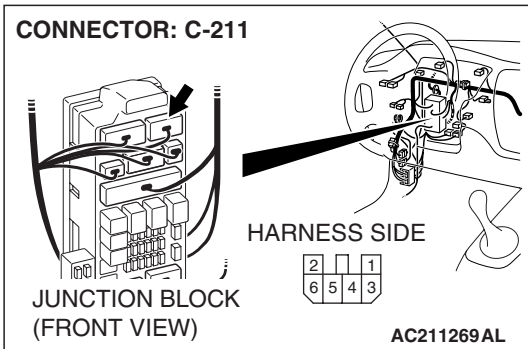
STEP 5. Check the following harness wire.

The wire between steering angular velocity sensor connector C-230 (terminal 2) and junction block connector C-211 (terminal 2)

Q: Is the harness wire damaged?

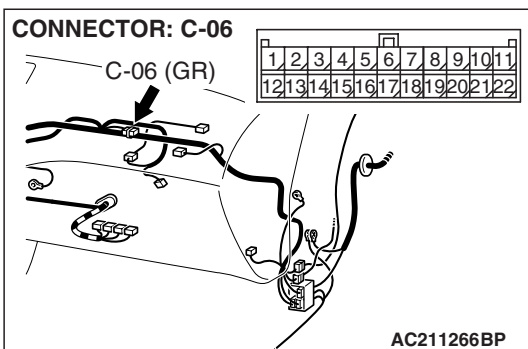
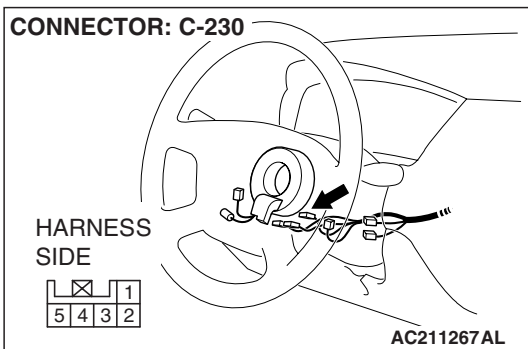
YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.



STEP 6. Check the following connectors.

- Steering angular velocity sensor connector C-230



- Joint connector C-06

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 7.

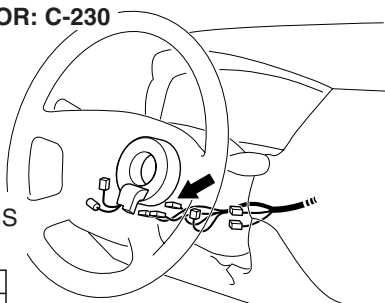
NO : Repair it and then go to Step 11.

- STEP 7. Check the following harness wires.

CONNECTOR: C-230

HARNESS
SIDE

			1
5	4	3	2



AC211267AL

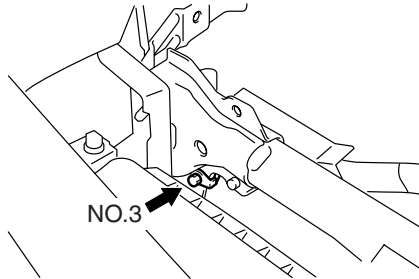
The wire between steering angular velocity sensor connector C-230 (terminal 3) and ground (No.3, No.14)

Q: Is any harness wire damaged?

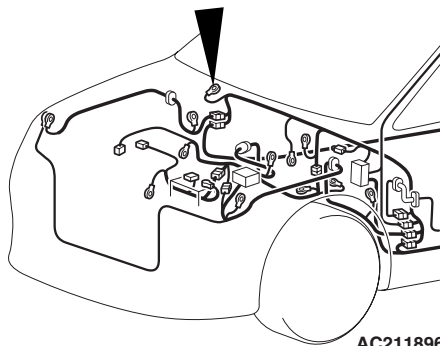
YES : Repair or replace it and then go to Step 11.

NO : Go to Step 11.

GROUND

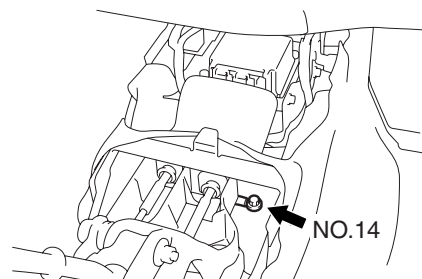
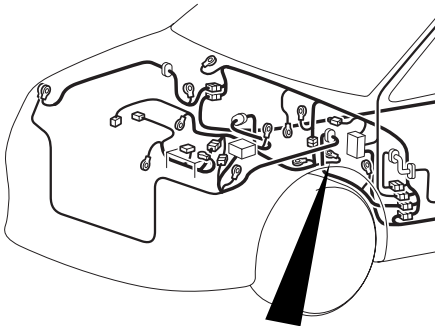


NO.3



AC211896AB

GROUND

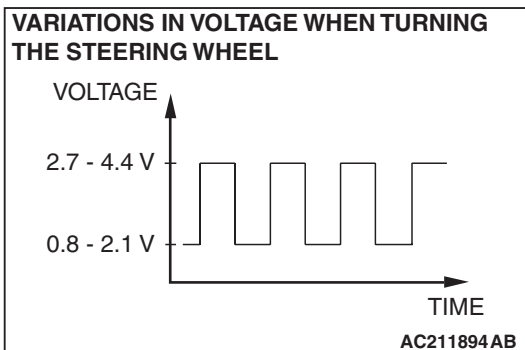
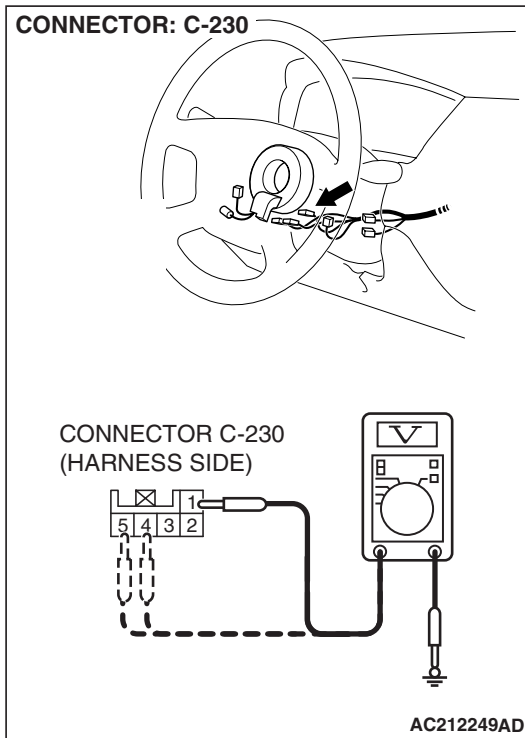


NO.14

AC211898AB

STEP 8. Check steering angular velocity sensor output voltage.

- (1) Connect steering angular velocity sensor connector C-230.
- (2) Turn the ignition switch to the "ON" position.

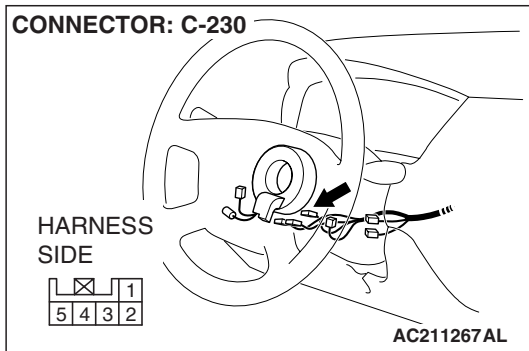


- (3) Measure the voltage, by backprobing, between terminal 1 and ground, terminal 4 and ground, and terminal 5 and ground. The voltage should measure as indicated in the figure.

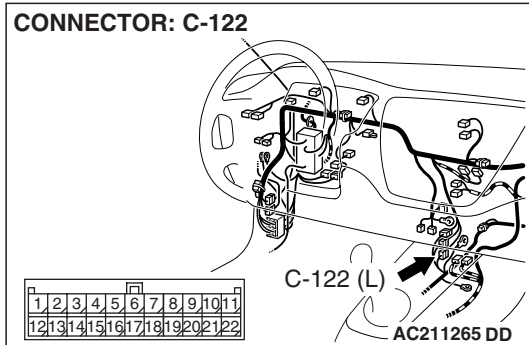
Q: Is the steering angular velocity sensor output voltage normal?

YES : Go to Step 9.

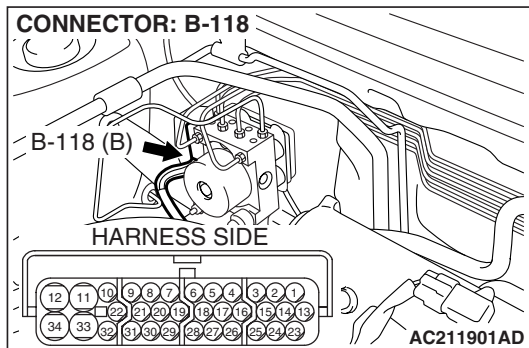
NO : Replace the steering angular velocity sensor (Refer to [P.35B-117](#)). Then go to Step 11.

CONNECTOR: C-230**STEP 9. Check the following connectors.**

- Steering angular velocity sensor connector C-230

CONNECTOR: C-122

- Intermediate connector C-122

CONNECTOR: B-118

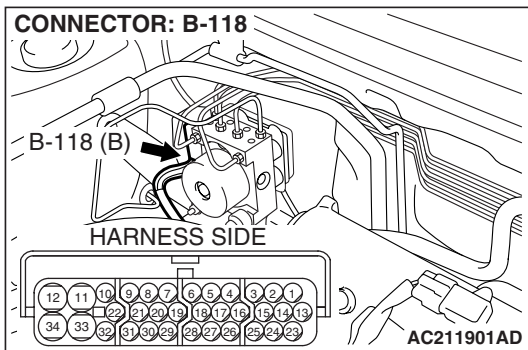
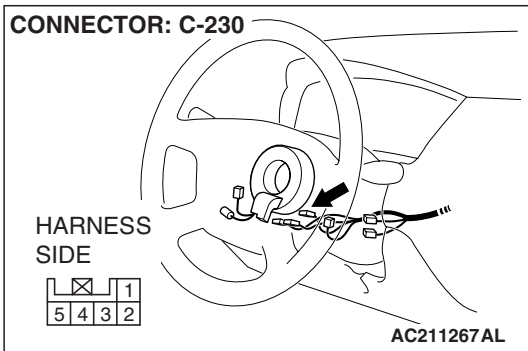
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 10.

NO : Repair it and then go to Step 11.



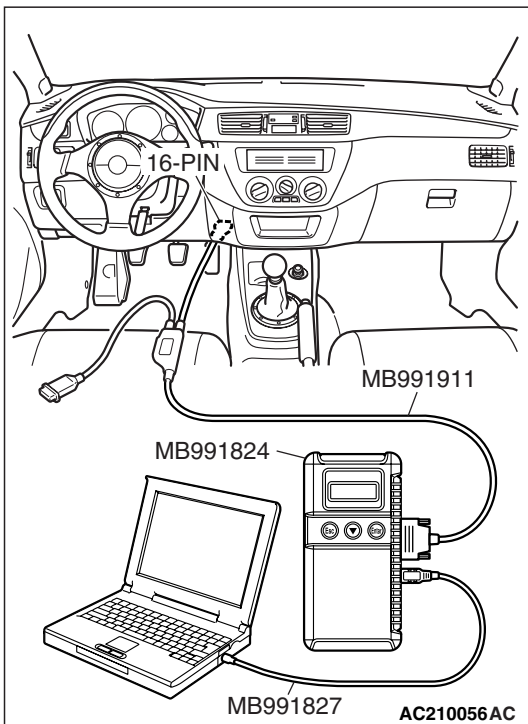
STEP 10. Check the following harness wires.

- If DTC 81 (ST-1) is set: The wire between steering angular velocity sensor connector C-230 (terminal 5) and ABS-ECU connector B-118 (terminal 26)
- If DTC 82 (ST-2) is set: The wire between steering angular velocity sensor connector C-230 (terminal 4) and ABS-ECU connector B-118 (terminal 17)
- If DTC 83 (ST-N) is set: The wire between steering angular velocity sensor connector C-230 (terminal 1) and ABS-ECU connector B-118 (terminal 4)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 11.

NO : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 11.



STEP 11. Recheck for diagnostic trouble code.

Check again if the DTC is set.

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

Q: Does DTC 81, 82 and/or 83 reset?

YES : Return to Step 1.

NO : The procedure is complete.

SYMPTOM CHART

M1352011400534

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.

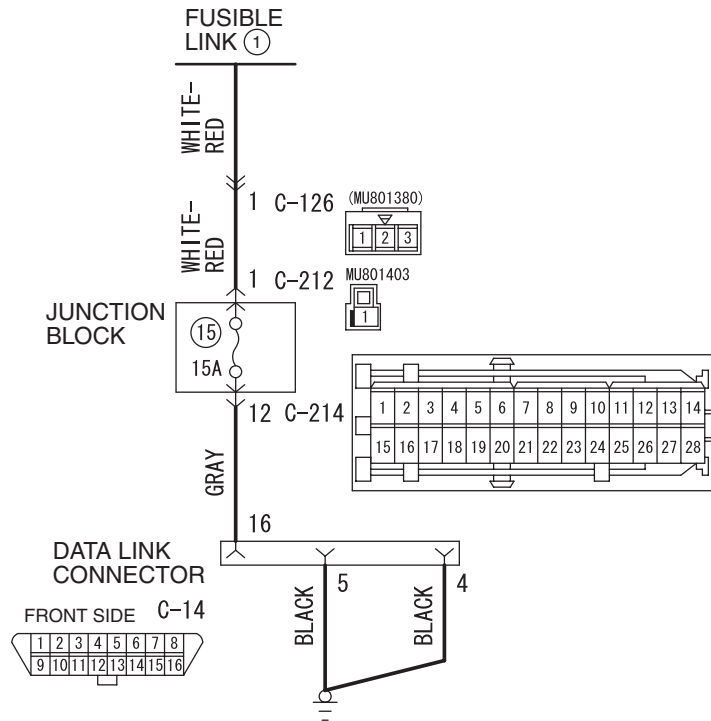
NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

SYMPTOM	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and all the system is not possible.	1	P.35B-63
Communication between the scan tool and the ABS-ECU is not possible.	2	P.35B-68
When the ignition key is turned to the "ON" position (Engine stopped), the ABS warning light does not illuminate.	3	P.35B-76
The ABS warning light remains illuminated after the engine is started.	4	P.35B-83
In the inspection with the scan tool service data, the parking brake switch is not turned ON or turned OFF.	5	P.35B-86
The neutral position learning of the steering angular velocity sensor is not detected.	6	P.35B-92
Faulty ABS operation	7	P.35B-100

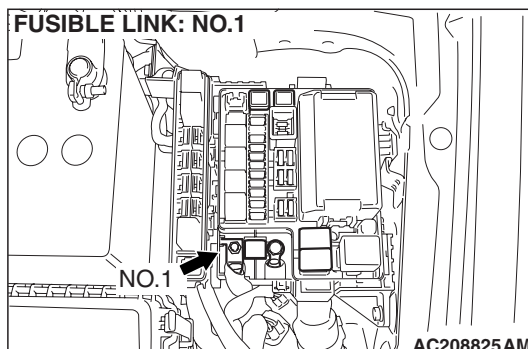
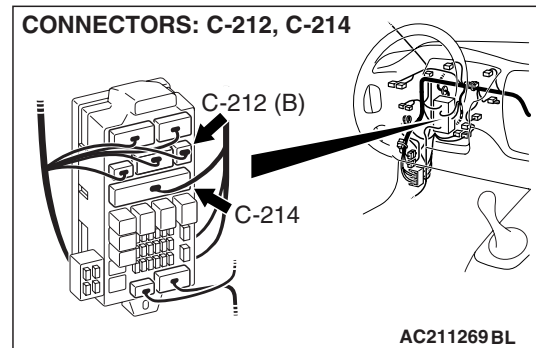
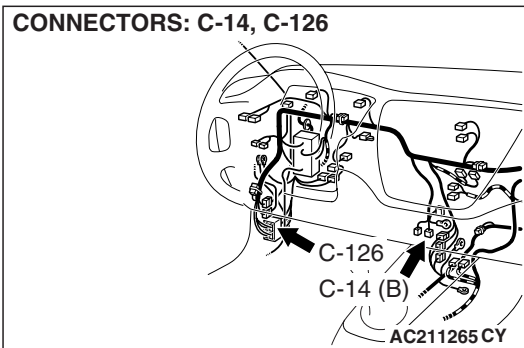
SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Communication between the Scan Tool and all the Systems is Not Possible.

Data Link Connector Power Supply and Ground Circuit



W3J18M08AA
AC211710AB



CIRCUIT OPERATION

A battery positive voltage is applied on the data link connector power terminal (terminal 16). The ground terminals (terminal 4, 5) are grounded to the vehicle body.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably a defect in power supply circuit or the ground circuit.

TROUBLESHOOTING HINTS

The most likely causes for this case are:

- Malfunction of the data link connector
- Damaged wiring harness or connector

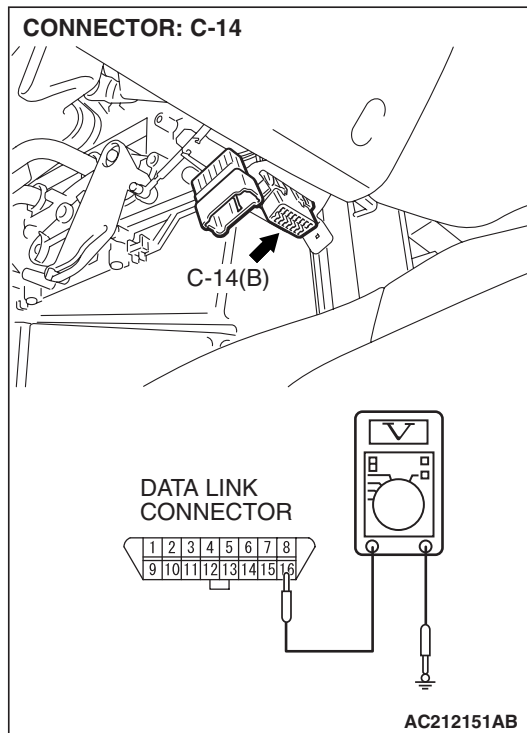
DIAGNOSIS**STEP 1. Check the power supply circuit. Measure the voltage at data link connector C-14.**

Measure the voltage between terminal 16 and ground. It should measure approximately 12 volts (battery positive voltage).

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

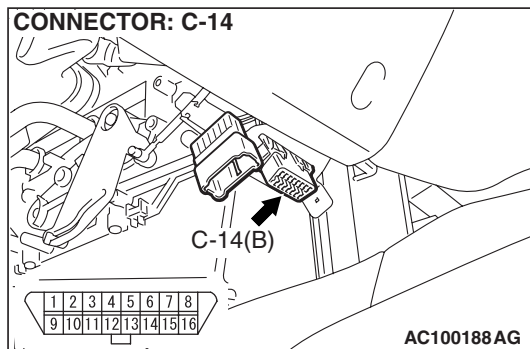
YES : Go to Step 4.

NO : Go to Step 2.

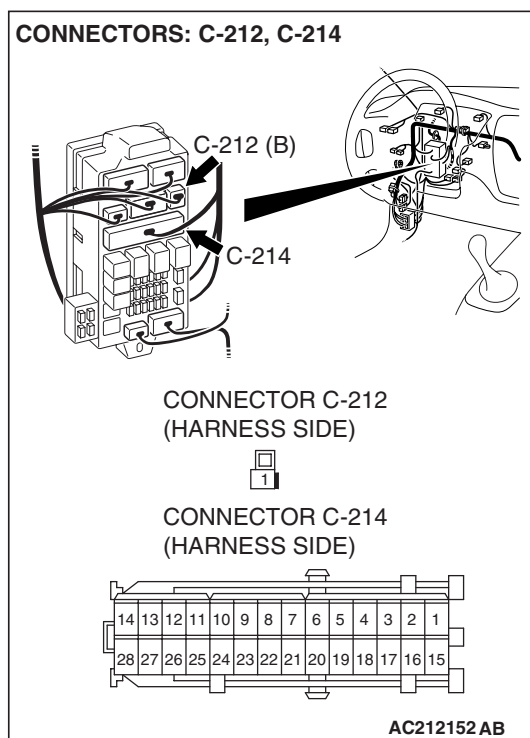


STEP 2. Check the following connectors.

- Data link connector C-14



- Junction block connectors C-212, C-214



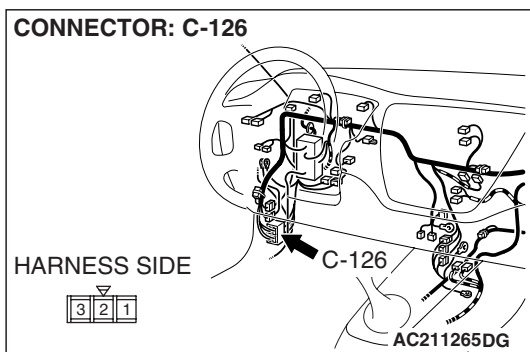
- Intermediate connector C-126

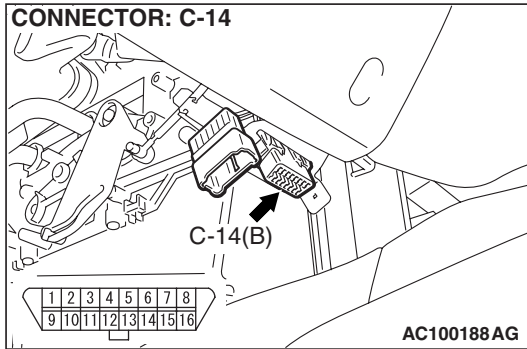
Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 3.

NO : Repair it and then go to Step 7.



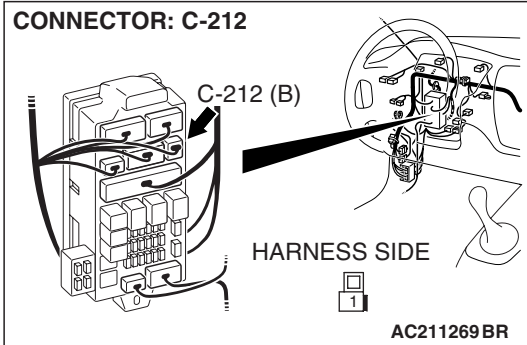
CONNECTOR: C-14**STEP 3. Check the following harness wire.**

The wire between data link connector C-14 (terminal 16) and junction block connector C-212 (terminal 1)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 7.

NO : Go to Step 7.

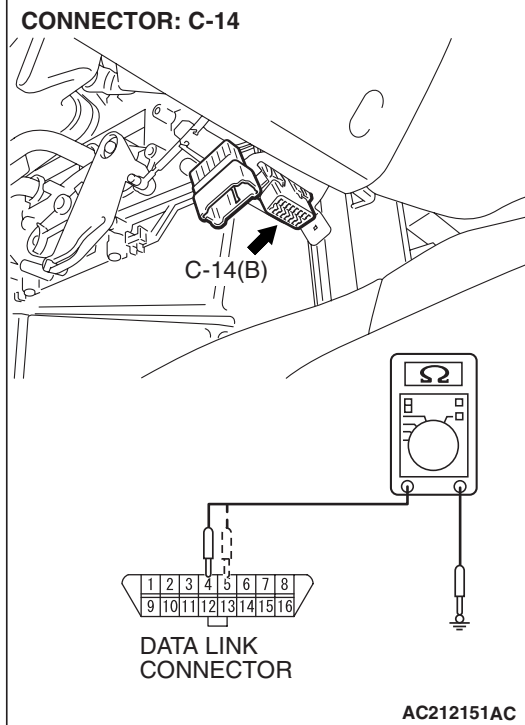
CONNECTOR: C-212**STEP 4. Check the ground circuit. Measure the resistance at data link connector C-14.**

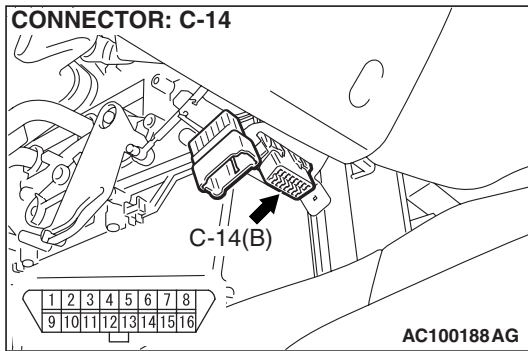
Measure the resistance between terminal 4 and ground, and terminal 5 and ground. It should measure less than 2 ohms.

Q: Is the resistance 2 ohms or less?

YES : Replace the scan tool and then go to Step 7.

NO : Go to Step 5.

CONNECTOR: C-14



STEP 5. Check the following connector.

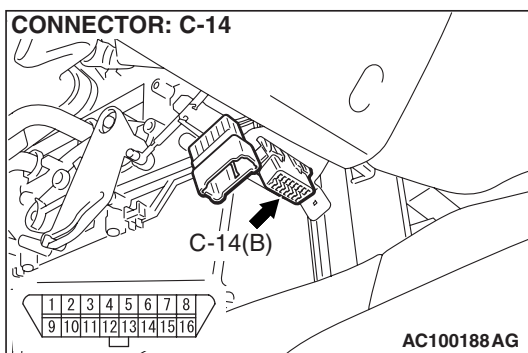
- Data link connector C-14

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

Q: Are the connector and terminals in good condition?

YES : Go to Step 6.

NO : Repair it and then go to Step 7.



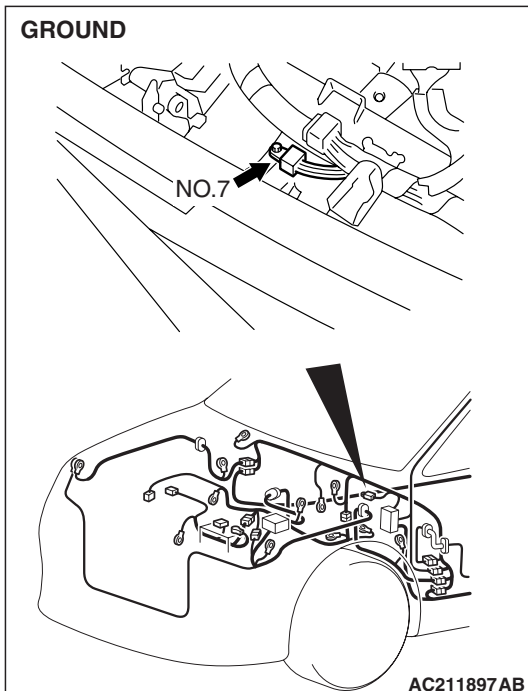
STEP 6. Check the following harness wires.

- The wire between data link connector C-14 (terminal 4) and ground (No.7)
- The wire between data link connector C-14 (terminal 5) and ground (No.7)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 7.

NO : Go to Step 7.



STEP 7. Retest the system.

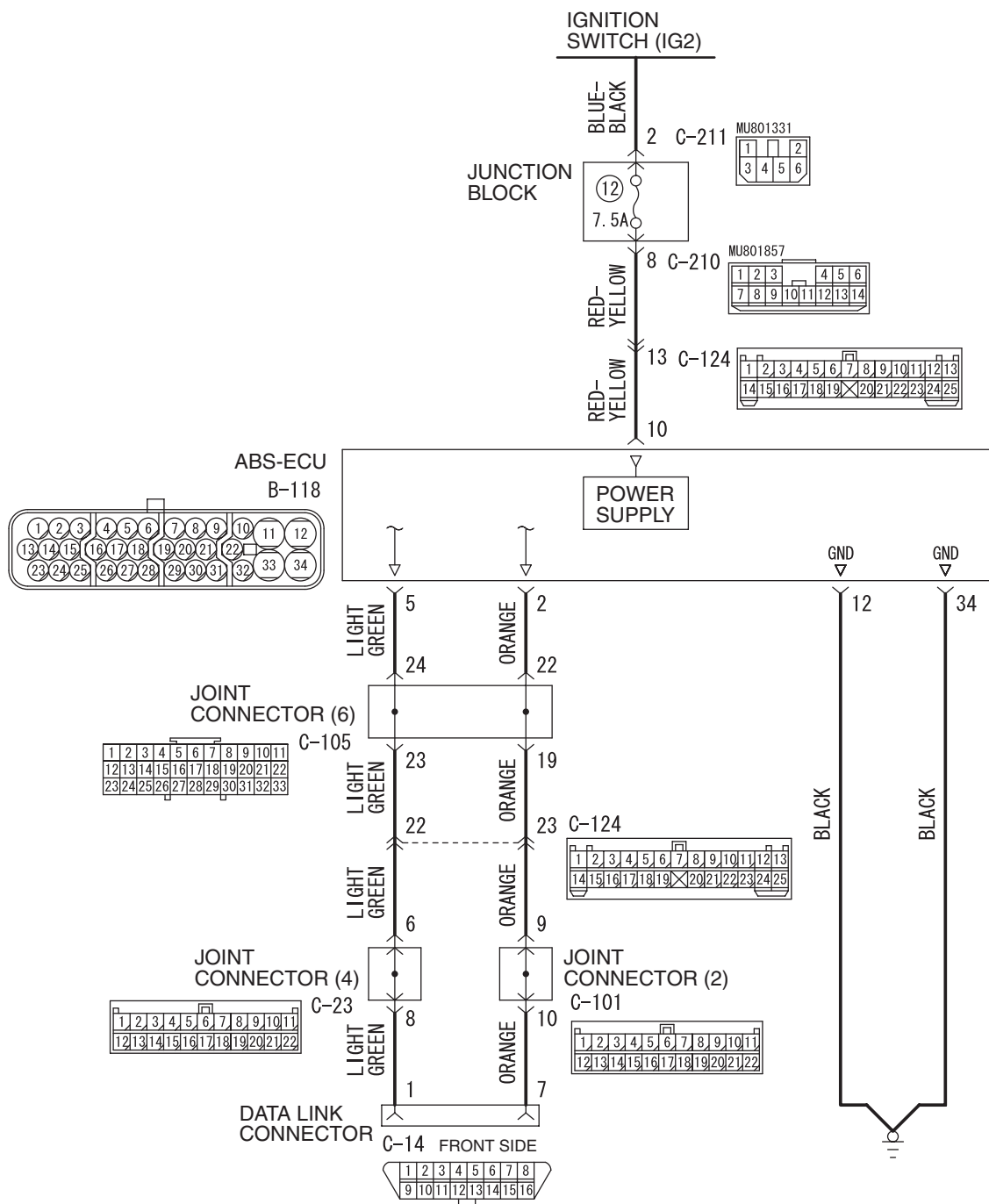
Q: Does the scan tool communicate with the whole system?

YES : The procedure is complete.

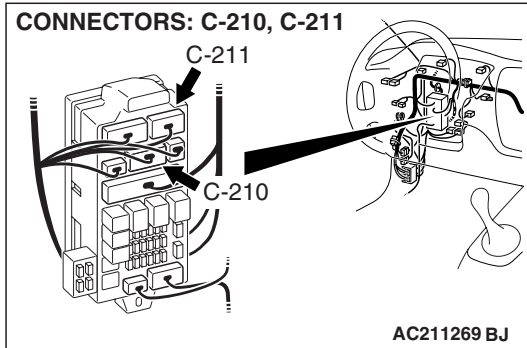
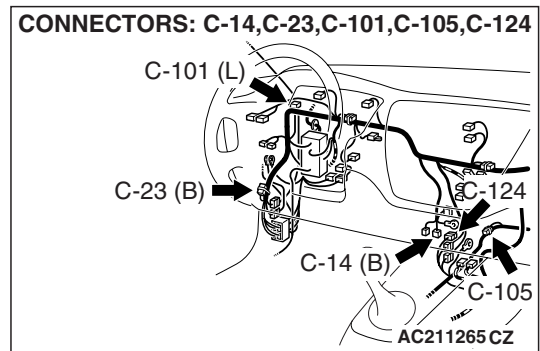
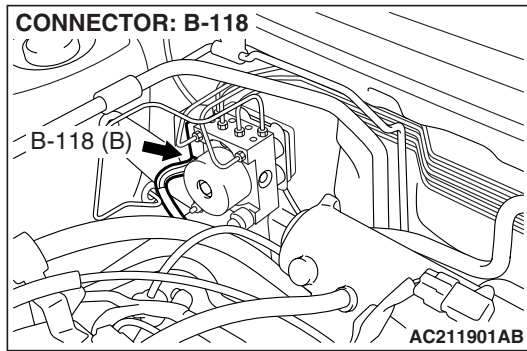
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Communication between the Scan Tool and the ABS-ECU is not possible.

ABS-ECU Power Supply /Ground and Data Link Connector Circuit



W3J18M10AA
AC211711AB



CIRCUIT OPERATION

- The DTC is set by the ABS-ECU (terminal 2) to the diagnostic output terminal (terminal 7) of the data link connector.
- When the data link connector's diagnostic test mode control terminal (terminal 1) is grounded, the ABS-ECU will go into diagnostic mode.

TECHNICAL DESCRIPTION (COMMENT)

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

TROUBLESHOOTING HINTS

The most likely causes for this case are:

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

DIAGNOSIS

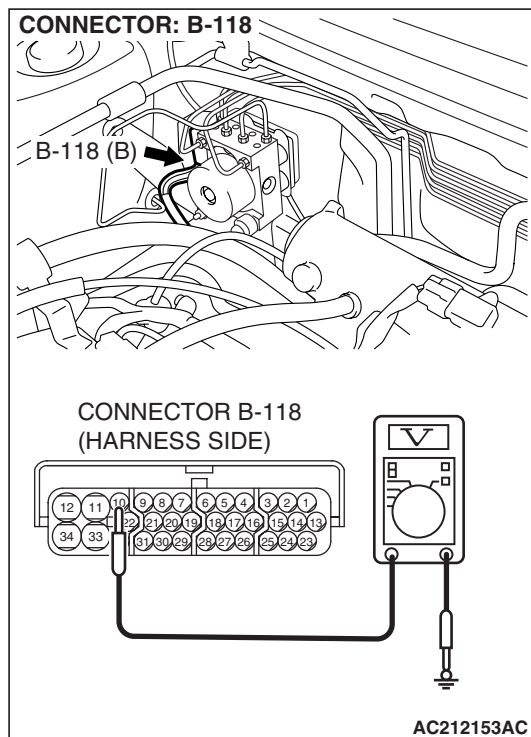
STEP 1. Check the power supply circuit. Measure the voltage at ABS-ECU connector B-118.

- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Start the engine.
- (3) Measure the voltage between terminal 10 and ground. It should measure battery voltage (approximately 12 volts).

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

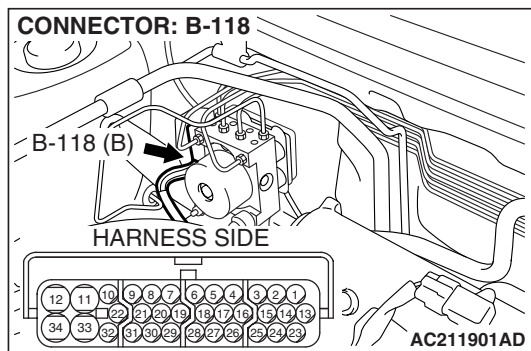
YES : Go to Step 4.

NO : Go to Step 2.

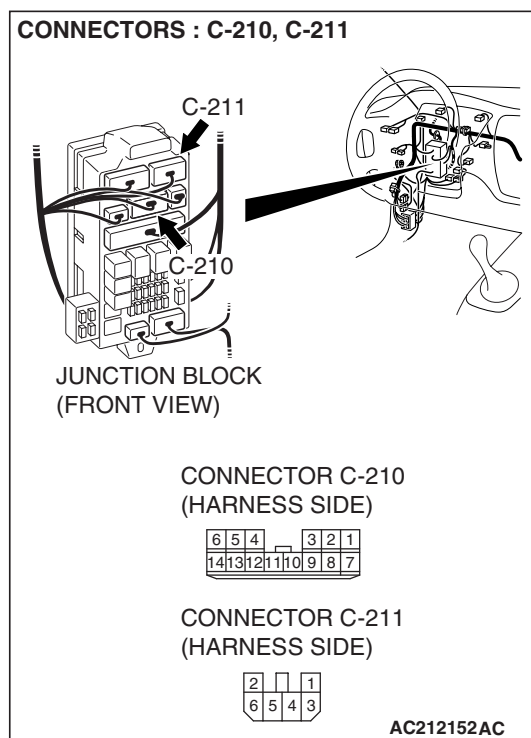


STEP 2. Check the following connectors.

- ABS-ECU connector B-118



- Junction block connectors C-210, C-211



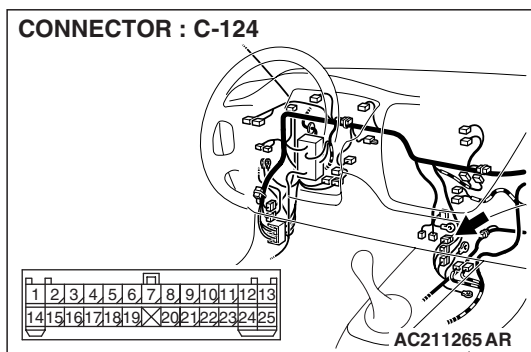
- Intermediate connector C-124

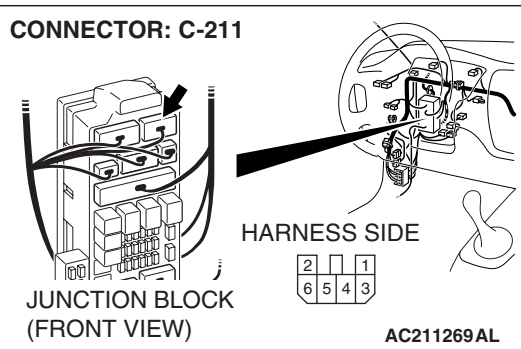
Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 3.

NO : Repair it and then go to Step 9.



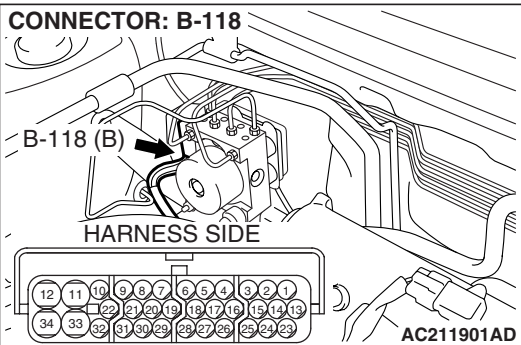
CONNECTOR: C-211**STEP 3. Check the following harness wire.**

The wire between junction block connector C-211 (terminal 2) and ABS-ECU connector B-118 (terminal 10)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 9.

NO : Go to Step 9.

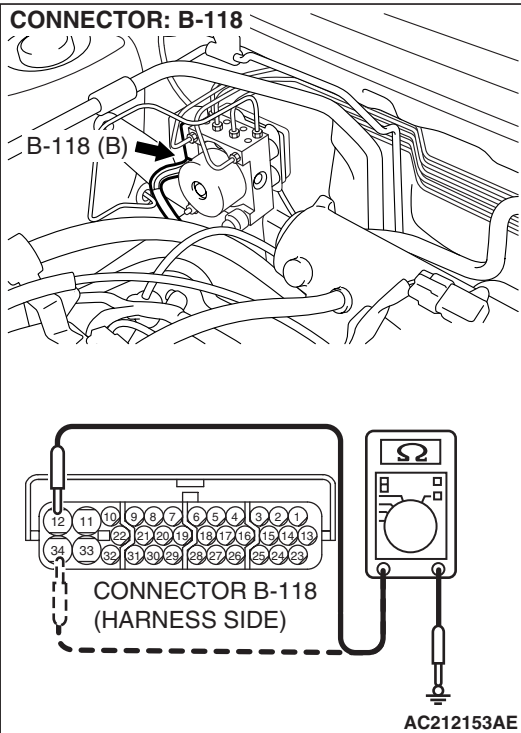
CONNECTOR: B-118**STEP 4. Check the ground circuit. Measure the resistance at ABS-ECU connector B-118.**

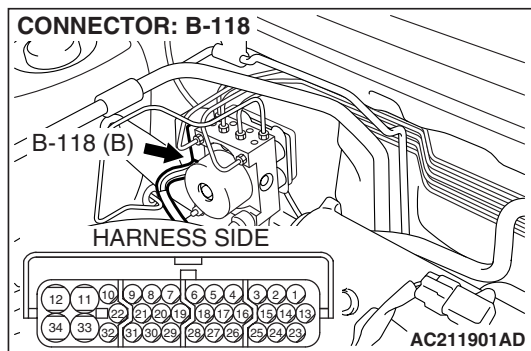
Measure the resistance between terminal 12 and ground, and terminal 34 and ground. It should measure less than 2 ohms.

Q: Is the resistance 2 ohms or less?

YES : Go to Step 7.

NO : Go to Step 5.

CONNECTOR: B-118



STEP 5. Check the following connector.

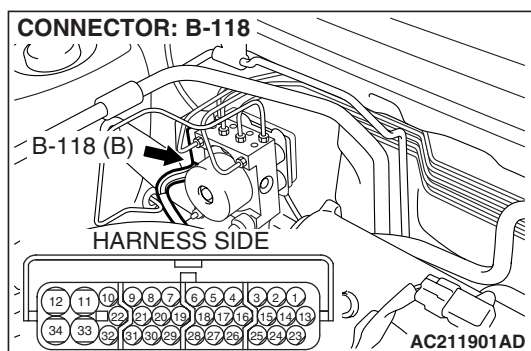
ABS-ECU connector B-118

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

Q: Are the connector and terminals in good condition?

YES : Go to Step 6.

NO : Repair it and then go to Step 9.



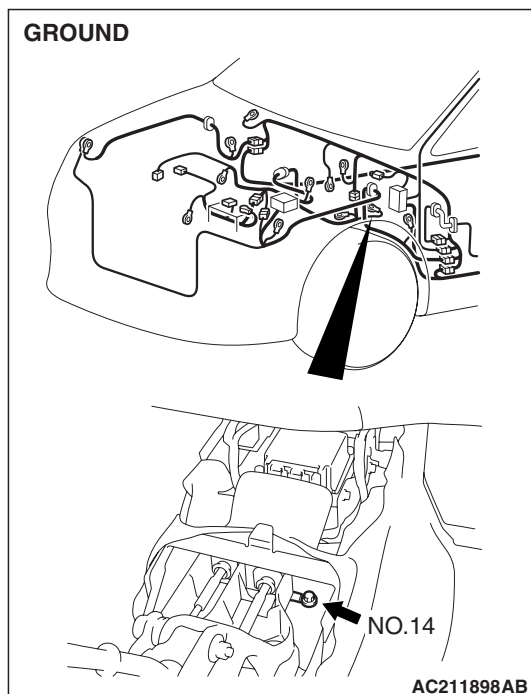
STEP 6. Check the following harness wires.

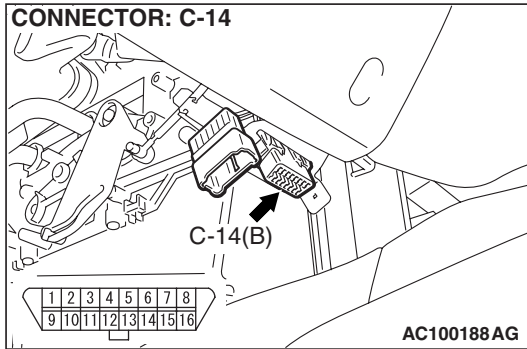
- The wire between ABS-ECU connector B-118 (terminal 12) and ground (No.14)
- The wire between ABS-ECU connector B-118 (terminal 34) and ground (No.14)

Q: Is any harness wire damaged?

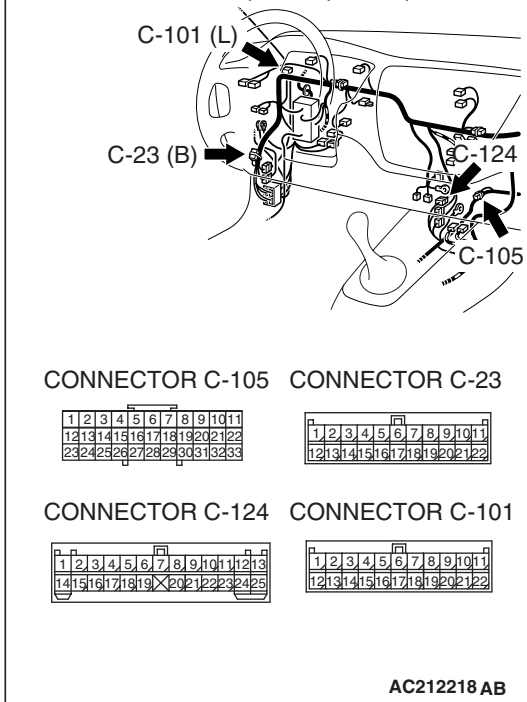
YES : Repair or replace it and then go to Step 9.

NO : Go to Step 9.

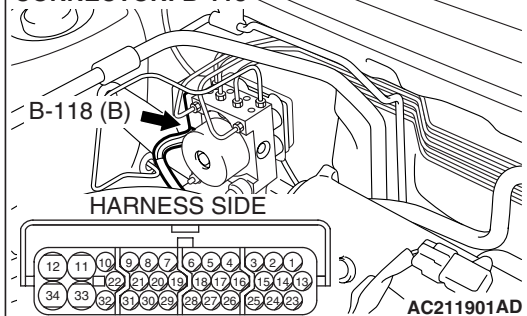


CONNECTOR: C-14**STEP 7. Check the following connectors.**

- Data link connector C-14

CONNECTORS: C-23, C-101, C-105, C-124

- Joint connectors C-23, C-101, C-105
- Intermediate connector C-124

CONNECTOR: B-118

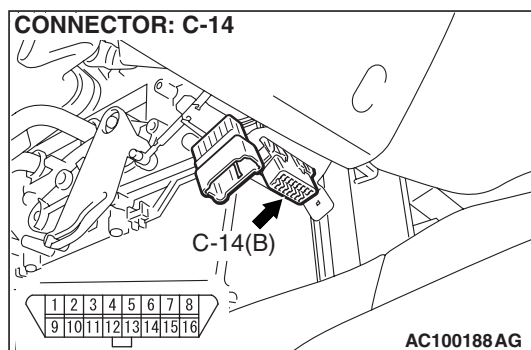
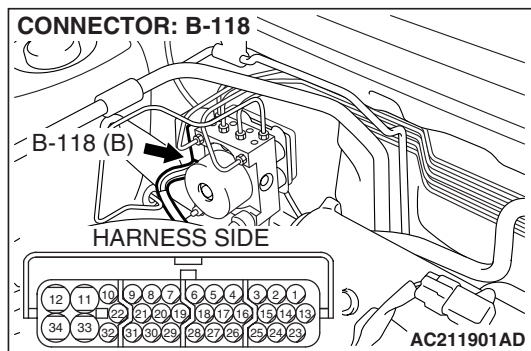
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 8.

NO : Repair it and then go to Step 9.



STEP 8. Check the following harness wires.

- The wire between ABS-ECU connector B-118 (terminal 2) and data link connector C-14 (terminal 7)
- The wire between ABS-ECU connector B-118 (terminal 5) and data link connector C-14 (terminal 1)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 9.

NO : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 9.

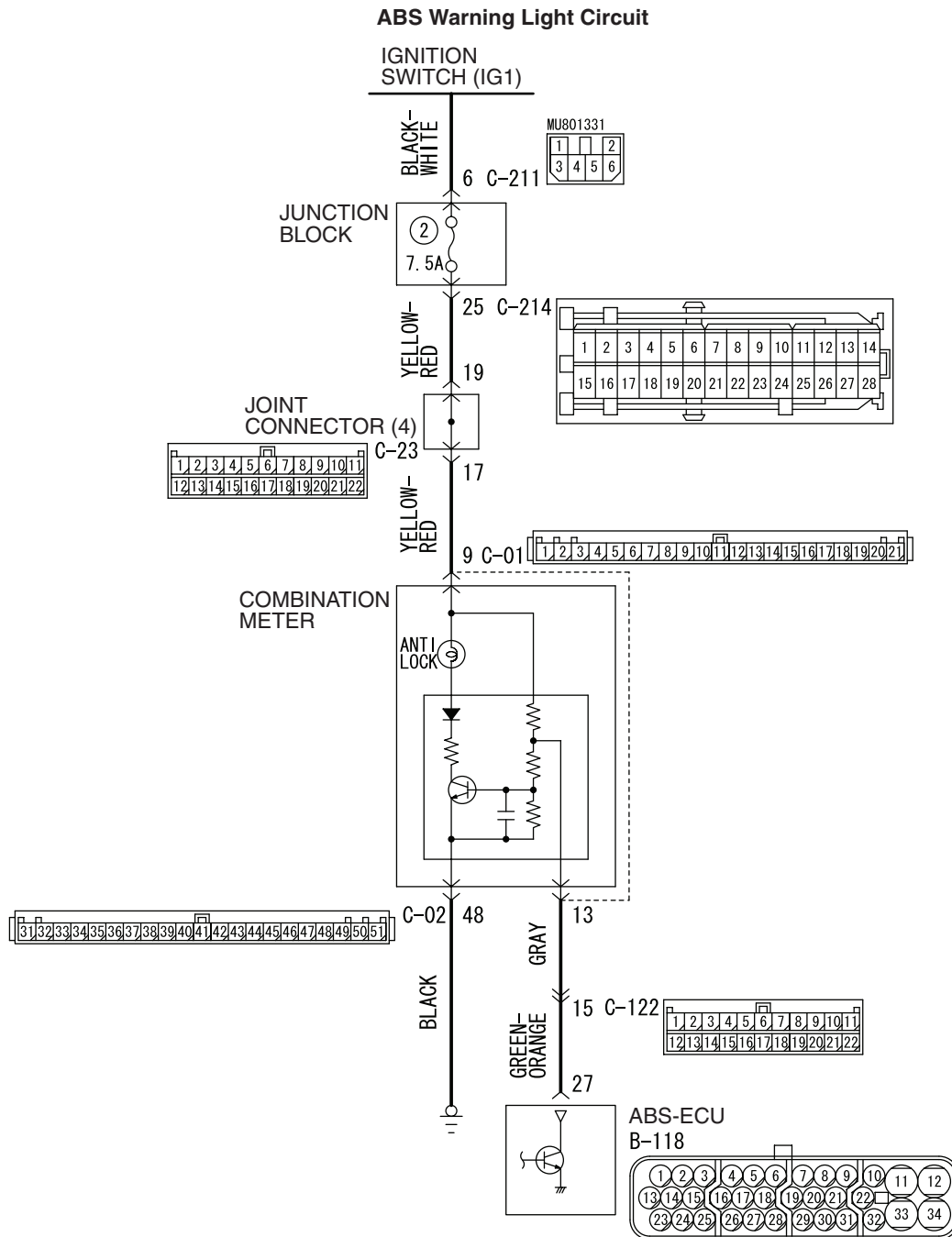
STEP 9. Retest the system.

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

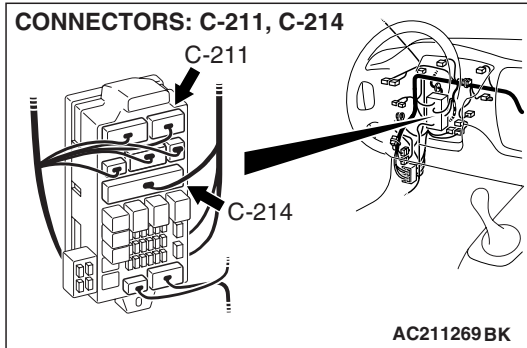
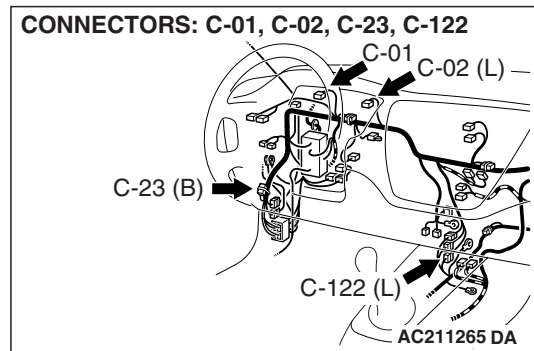
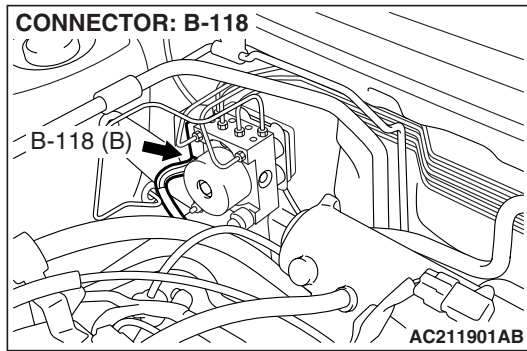
YES : The procedure is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 3: When the Ignition Key is Turned to the "ON" position (Engine Stopped), the ABS Warning Light does not illuminate.



W3J18M11AA
AC211712AB



CIRCUIT OPERATION

- The ABS warning light power is supplied from the ignition switch. The ABS-ECU grounds the circuit to illuminate the light.
- The ABS-ECU illuminates the ABS warning light for 3 seconds while running self-check. This light is illuminated for 3 seconds upon start-up or when the ignition switch is turned to the "ON" position with engine stopped.
- When the ABS-ECU connector is disconnected, the circuit is grounded to illuminate the light.
- The ABS-ECU controls the continuity to the ABS warning light by turning the power transistor in the unit "OFF" and "ON," respectively.

TECHNICAL DESCRIPTION (COMMENT)

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

TROUBLESHOOTING HINTS

The most likely causes for this case are:

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

DIAGNOSIS

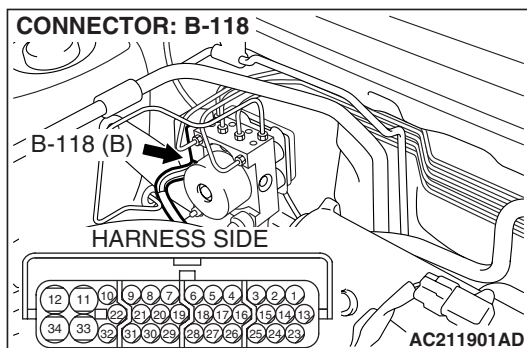
STEP 1. Check the ABS warning light circuit at ABS-ECU connector B-118.

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

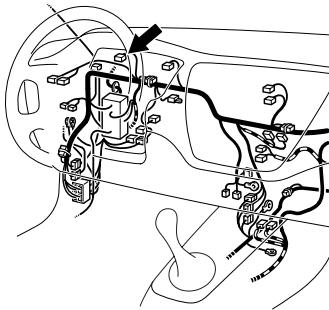
Q: Does the ABS warning light illuminate?

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 10.

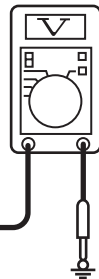
NO : Go to Step 2.



CONNECTOR: C-01

CONNECTOR C-01
(HARNESS SIDE)

21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



AC212218 AC

STEP 2. Check the power supply circuit. Measure the voltage at combination meter connector C-01.

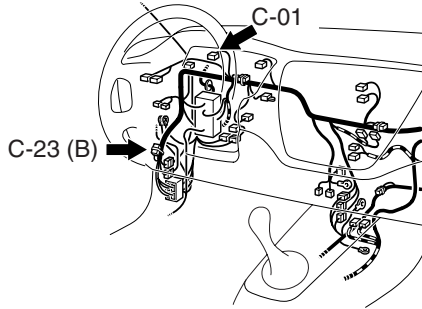
- (1) Disconnect combination meter connector C-01 and measure at the harness side.
- (2) Start the engine.
- (3) Measure the voltage between terminal 9 and ground. It should measure battery voltage (approximately 12 volts).

Q: Is battery positive voltage (approximately 12 volts) present?**YES :** Go to Step 5.**NO :** Go to Step 3.

STEP 3. Check the following connectors.

- Combination meter connector C-01

CONNECTORS: C-01, C-23



CONNECTOR C-01
(HARNESS SIDE)

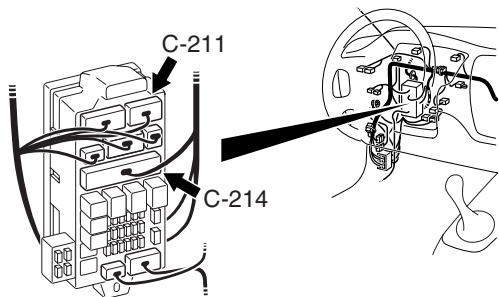
21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
----	----	----	----	----	----	----	----	----	----	----	----	---	---	---	---	---	---	---	---	---

CONNECTOR C-23

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

AC212218AE

CONNECTORS: C-211, C-214



JUNCTION BLOCK
(FRONT VIEW)

CONNECTOR C-211
(HARNESS SIDE)

2	1
6	3

CONNECTOR C-214
(HARNESS SIDE)

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

AC212152AD

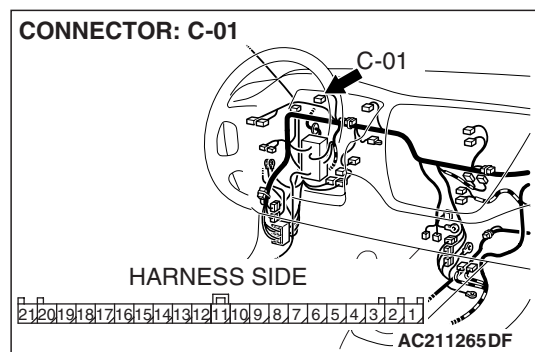
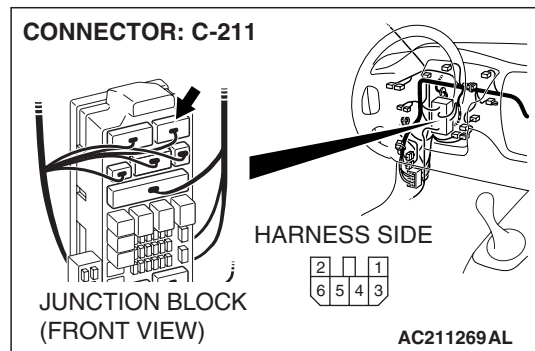
- Junction block connectors C-211, C-214
- Joint connector C-23

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

NO : Repair it and then go to Step 10.

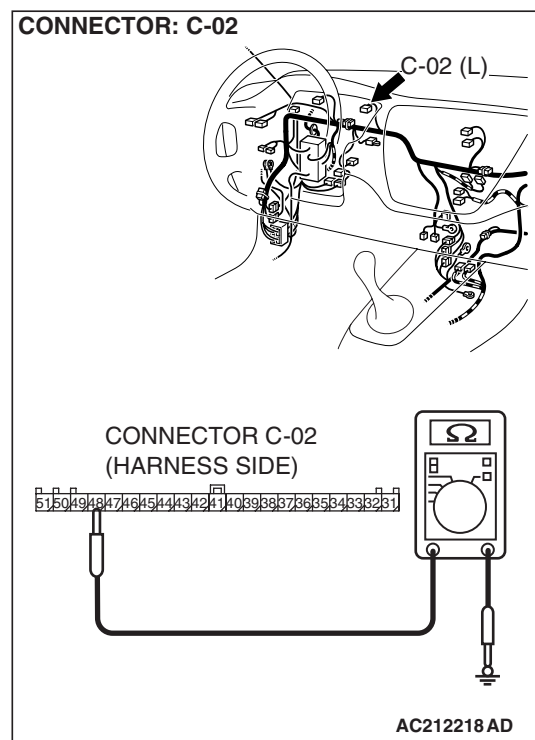
**STEP 4. Check the following harness wire.**

The wire between junction block connector C-211 (terminal 6) and combination meter connector C-01 (terminal 9)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 10.

NO : Go to Step 10.

**STEP 5. Check the ground circuit at combination meter connector C-02.**

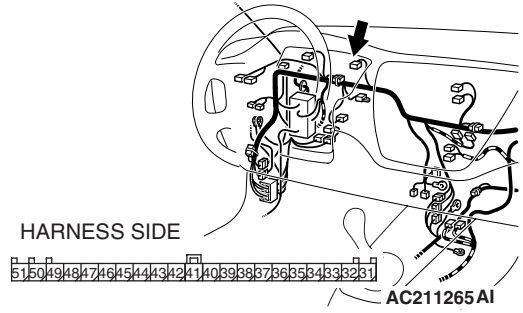
- (1) Disconnect combination meter connector C-02 and measure at the harness side.
- (2) Measure the resistance between terminal 48 and ground. It should measure less than 2 ohms.

Q: Is the resistance 2 ohms or less?

YES : Go to Step 8.

NO : Go to Step 6.

CONNECTOR : C-02



STEP 6. Check the following connector.

Combination meter connector C-02

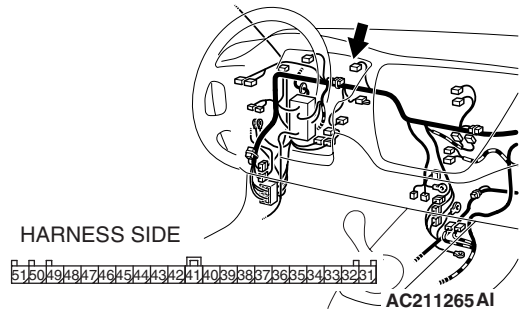
Check the connector for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

YES : Go to Step 7.

NO : Repair it and then go to Step 10.

CONNECTOR : C-02



STEP 7. Check the following harness wire.

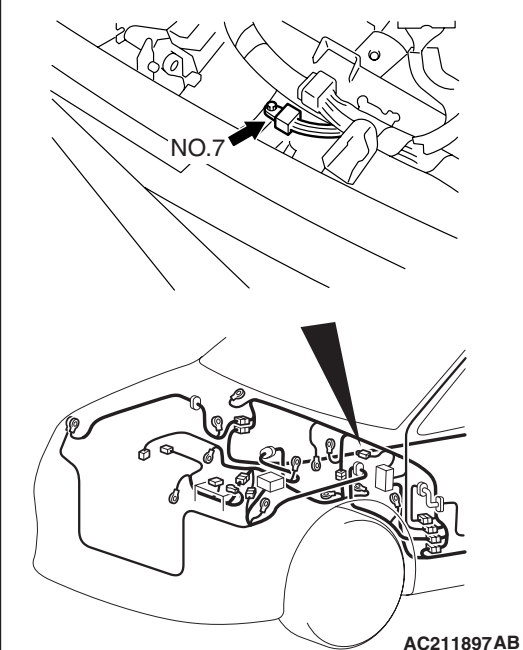
The wire between combination meter connector C-02 (terminal 48) and ground (No.7)

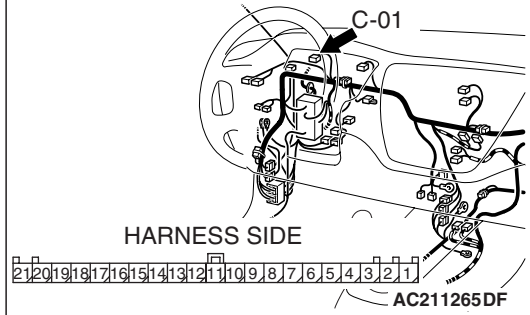
Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 10.

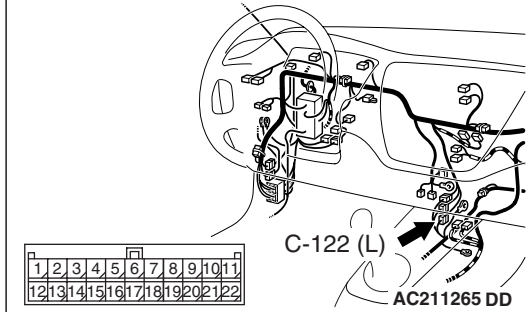
NO : Go to Step 10.

GROUND

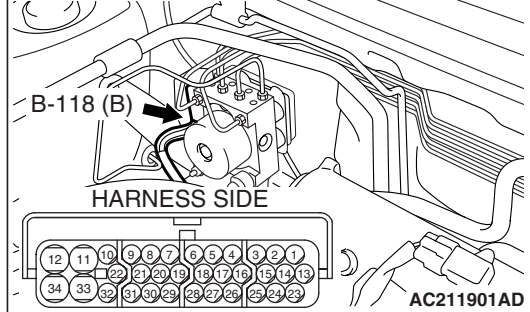


CONNECTOR: C-01**STEP 8. Check the following connectors.**

- Combination meter connector C-01

CONNECTOR: C-122

- Intermediate connector C-122

CONNECTOR: B-118

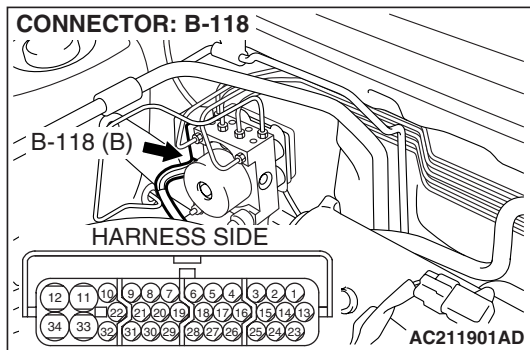
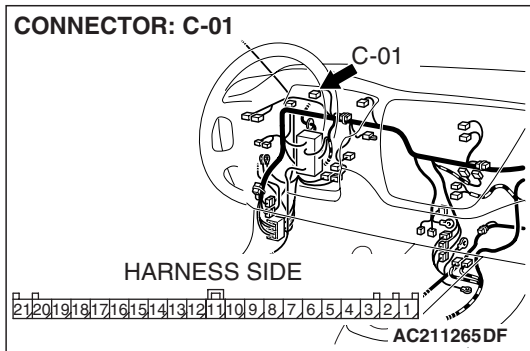
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 9.

NO : Repair it and then go to Step 10.



STEP 9. Check the following harness wire.

The wire between combination meter connector C-01 (terminal 13) and ABS-ECU connector B-118 (terminal 27)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 10.

NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor P.54A-76). Then go to Step 10.

STEP 10. Retest the system.

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

YES : The procedure is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: The ABS Warning Light Remains Illuminated after the Engine is Started.

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

ABS WARNING LIGHT CIRCUIT

Refer to P.35B-76.

CIRCUIT OPERATION

Refer to P.35B-76.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the ABS-ECU malfunction.

TROUBLESHOOTING HINTS

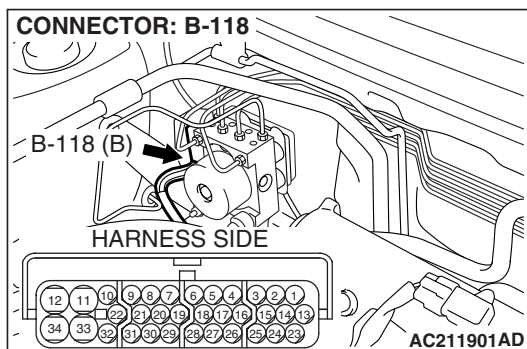
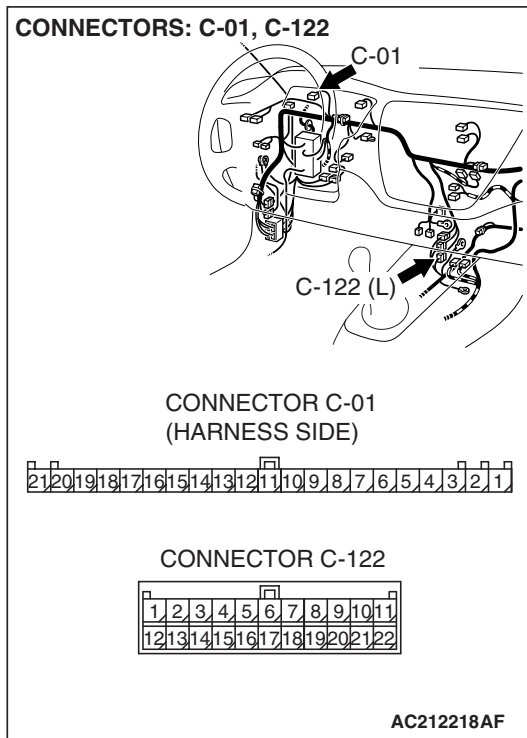
The most likely causes for this case are:

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

DIAGNOSIS

STEP 1. Check the following connectors.

- Combination meter connector C-01
- Intermediate connector C-122



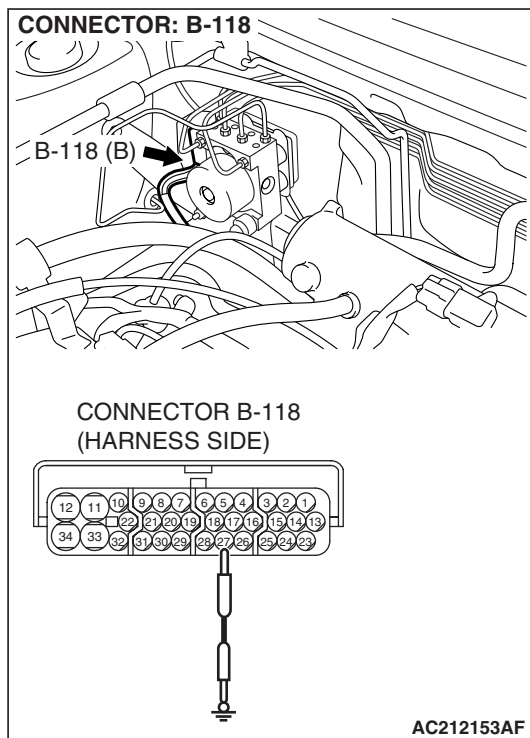
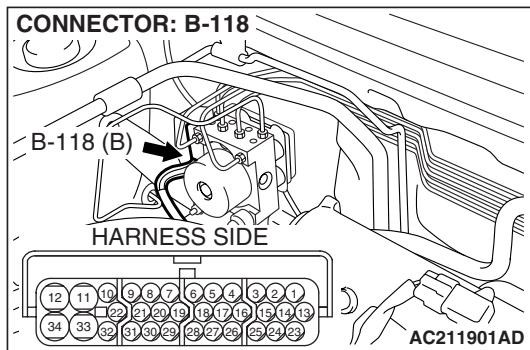
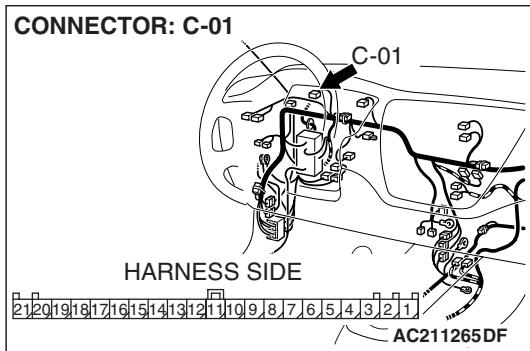
- ABS-ECU connector B-118

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 2.

NO : Repair it and then go to Step 4.



STEP 2. Check the following harness wire.

The wire between combination meter connector C-01 (terminal 13) and ABS-ECU connector B-118 (terminal 27)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 4.

NO : Go to Step 3.

STEP 3. Check the ABS warning light circuit at ABS-ECU connector B-118.

- (1) Disconnect ABS-ECU connector B-118 and check at the harness side connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Ground terminal 27 and check the ABS warning light.

Q: Does the ABS warning light go off?

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 4.

NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly and Vehicle Speed Sensor [P.54A-76](#)). Then go to Step 4.

STEP 4. Retest the system.

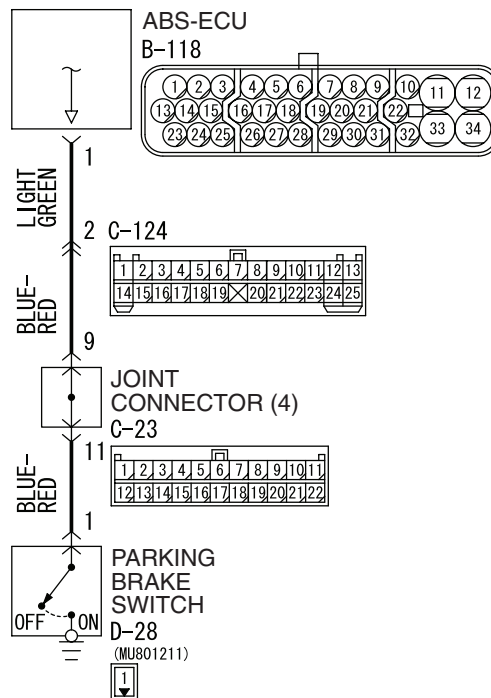
Q: Does the ABS warning light turn off in 3 seconds after start-up?

YES : The procedure is complete.

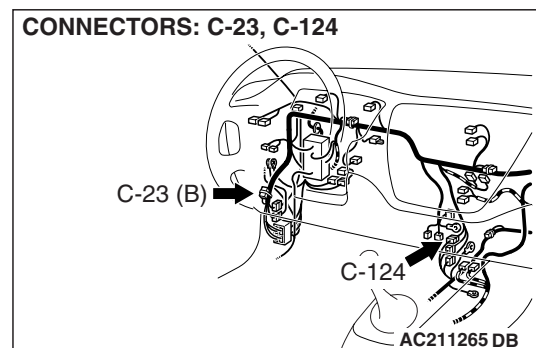
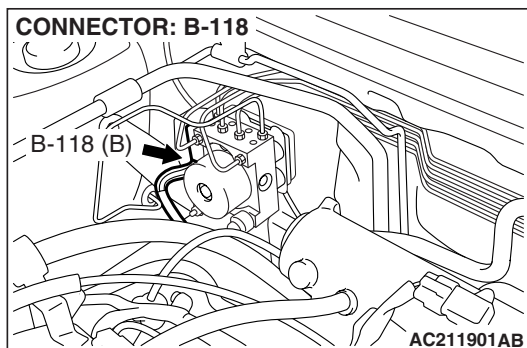
NO : Return to Step 1.

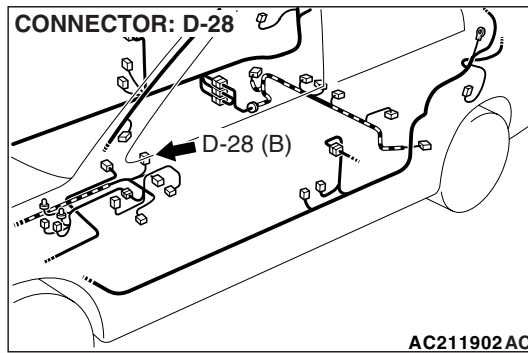
INSPECTION PROCEDURE 5: In the Inspection with the Scan Tool Service Data, the Parking Brake Switch is not Turned ON or Turned OFF.

Parking Brake Switch Circuit



W3J18M06AA
AC211714AB





CIRCUIT OPERATION

The ABS-ECU monitors the parking brake switch to optimize the ABS control.

TECHNICAL DESCRIPTION (COMMENT)

The cause may be an open or a short circuit between the parking brake switch and the ABS-ECU.

TROUBLESHOOTING HINTS

The most likely causes for this case are:

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

DIAGNOSIS

Required Special Tools:

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

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

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

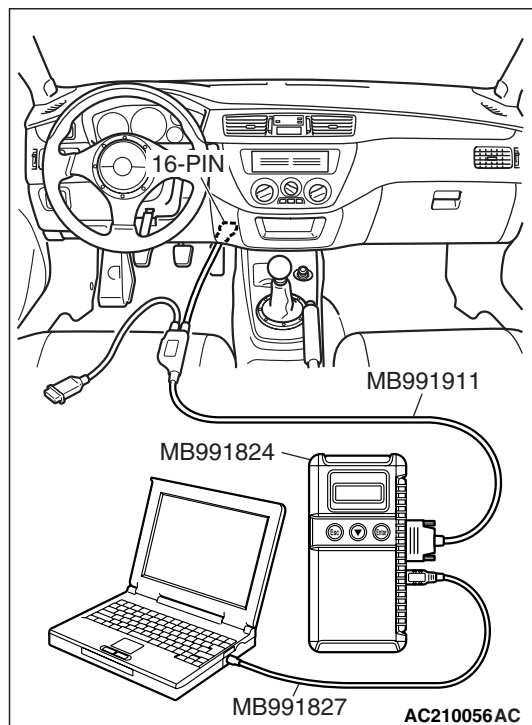
- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to data reading mode for following item.
 - Item 29: Parking brake switch
- (4) Confirm the indicated ON/OFF state as follows:

CHECKING REQUIREMENT	DISPLAY
Pull the parking brake lever	ON
Release the parking brake lever	OFF

Q: Is the parking brake switch input normal?

YES : This malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope With Intermittent Malfunction [P.00-13](#).

NO : Go to Step 2.

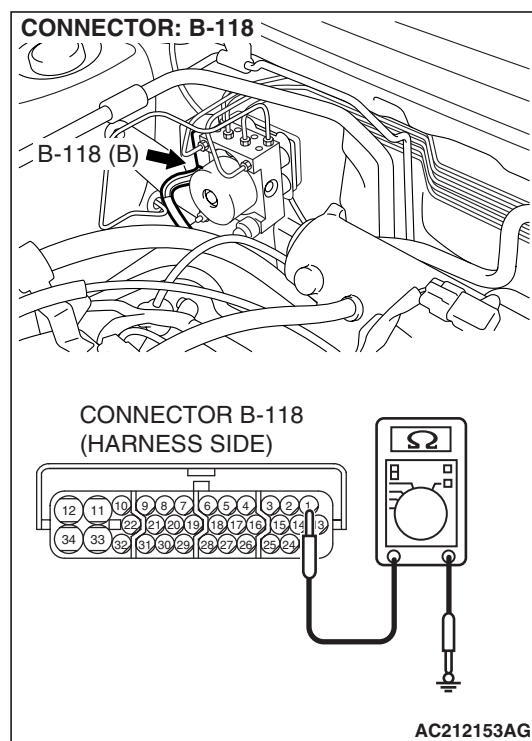
**STEP 2. Check the parking brake switch circuit at ABS-ECU connector B-118.**

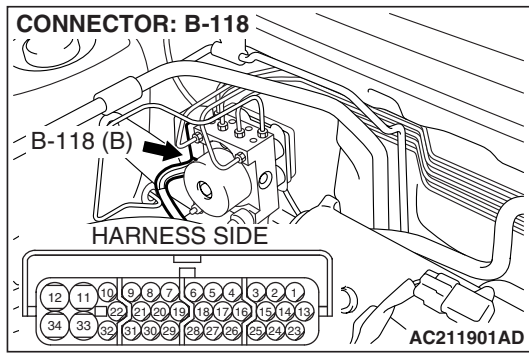
- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Check for continuity between terminal 1 and ground with pulling or releasing the parking brake lever. If the parking brake lever is pulled, there should be no continuity, and if the parking brake lever is released, there should be continuity (less than 2 ohms).

Q: Does continuity exist when the parking brake lever is released, and dose continuity not exist when the parking brake lever is pulled?

YES : Go to Step 3.

NO : Go to Step 4.





STEP 3. Check the following connector.

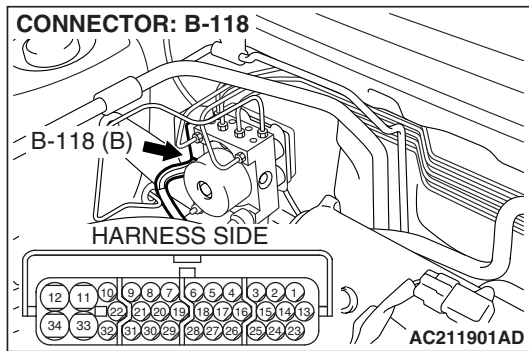
ABS-ECU connector B-118

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

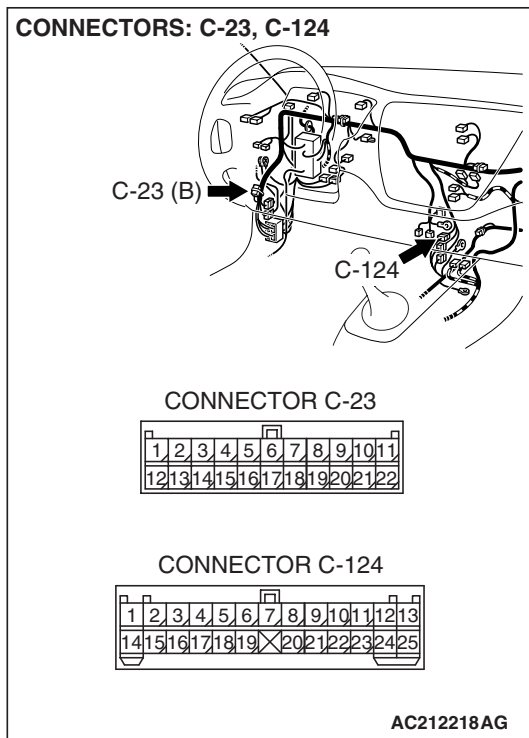
Q: Are the connector and terminals in good condition?

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 6.

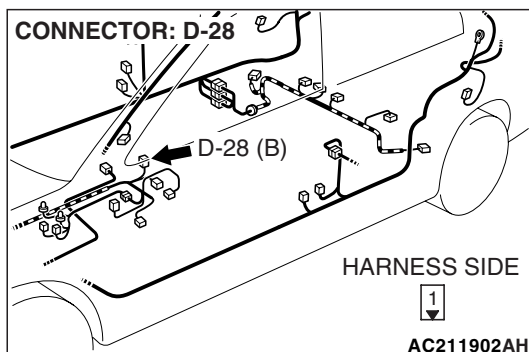
NO : Go to Step 6.

**STEP 4. Check the following connectors.**

- ABS-ECU connector B-118



- Intermediate connector C-124
- Joint connector C-23



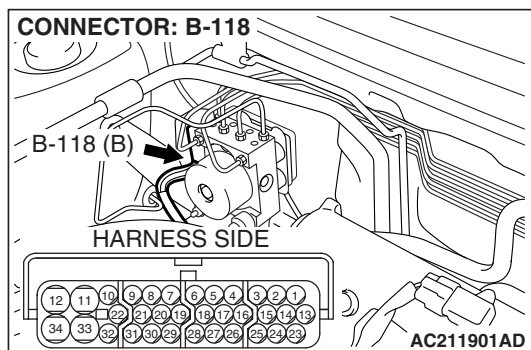
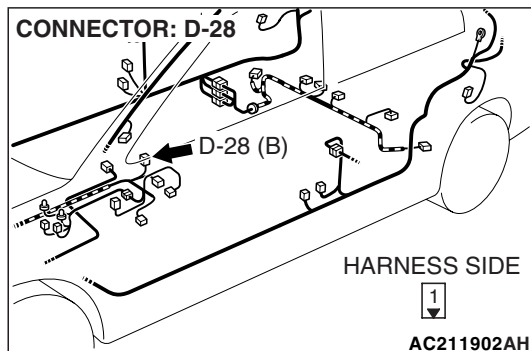
- Parking brake switch connector D-28

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 5.

NO : Repair it and then go to Step 6.



STEP 5. Check the following harness wire.

The wire between parking brake switch connector D-28 (terminal 1) and ABS-ECU connector B-118 (terminal 1)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 6.

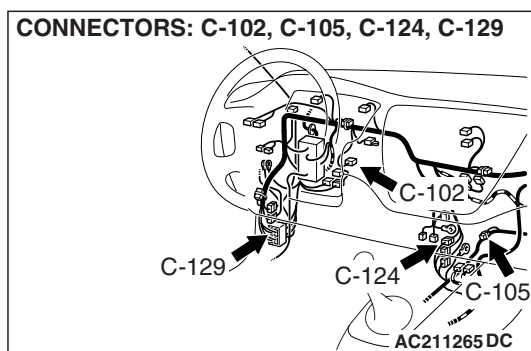
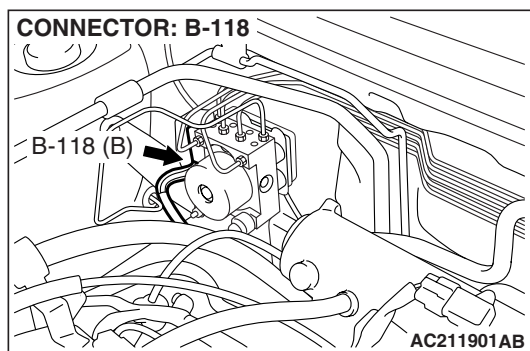
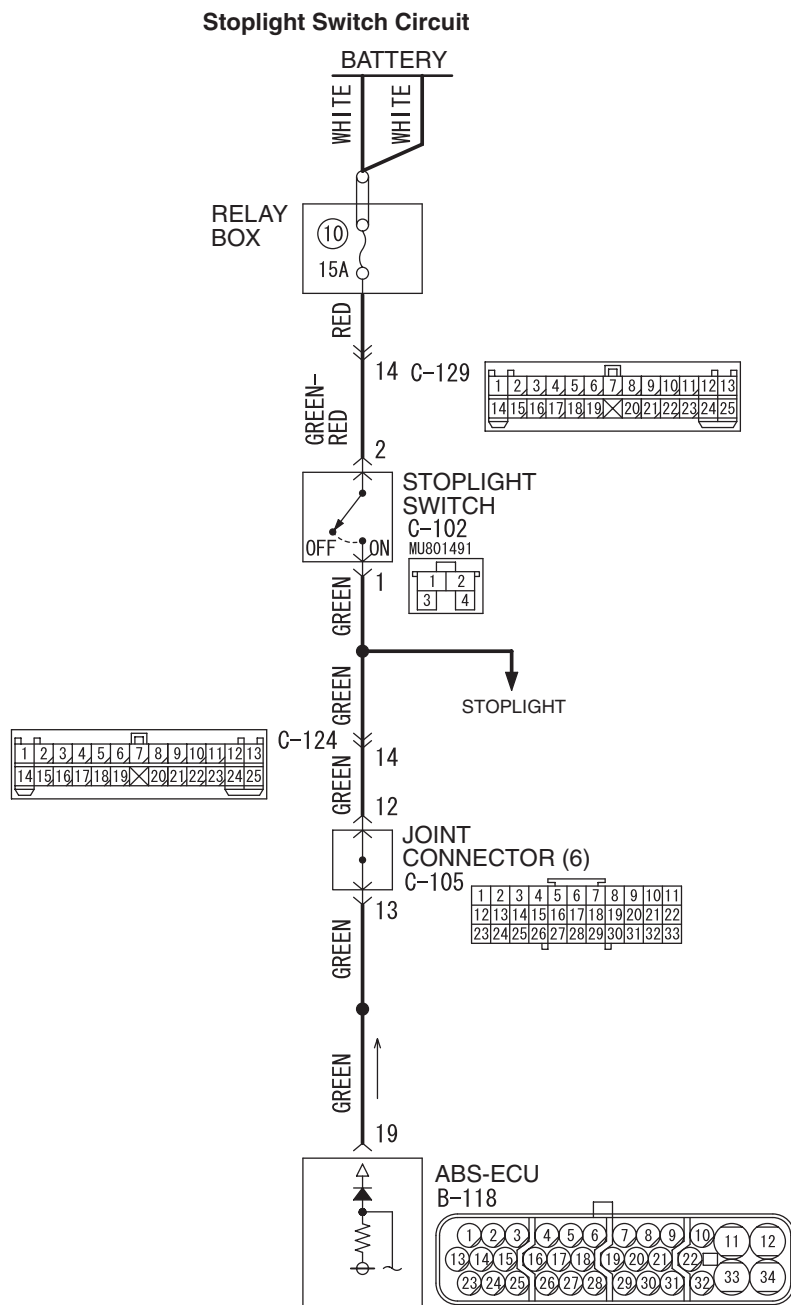
NO : Replace the parking brake switch (Refer to GROUP 36, Parking Brake Lever P.36-6). Then go to Step 6.

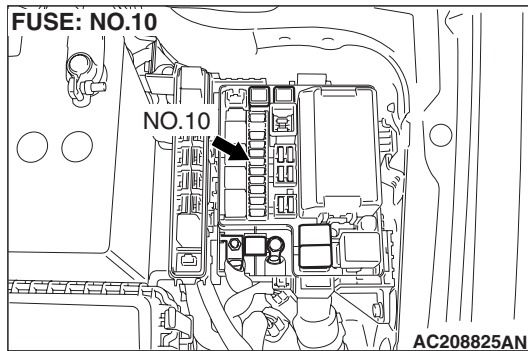
STEP 6. Recheck for diagnostic trouble code.

Q: Does the parking brake switch turn ON/OFF normally in the inspection by scan tool service data?

YES : The procedure is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 6: The Neutral Position Learning of the Steering Angular Velocity Sensor is not Detected.



CIRCUIT OPERATION

The ABS system detects the neutral position learning of the steering angular velocity sensor by the signal from the stoplight.

TECHNICAL DESCRIPTION (COMMENT)

The diagnosis is difficult because it depends on driving condition and road surface, if the diagnostic trouble code has not been set, carry out the following checks (refer to TROUBLESHOOTING HINTS).

TROUBLESHOOTING HINTS

The most likely causes for this case are:

- Damaged wiring harness or connector
- Malfunction of the stoplight switch system
- Tires are not all the same diameter
- Malfunction of suspension
- Malfunction of the steering angular velocity sensor installation
- Malfunction of the brake modulator hydraulic unit (integrated with ABS-ECU)

DIAGNOSIS**Required Special Tools:**

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

STEP 1. Check the front tires.**Q: Are the tire diameters different?**

- YES** : Replace the appropriate tire and then go to Step 13.
NO : Go to Step 2.

STEP 2. Check the front suspension.**Q: Is the front suspension abnormal?**

- YES** : Repair the front suspension and then go to Step 13.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list.**⚠ CAUTION**

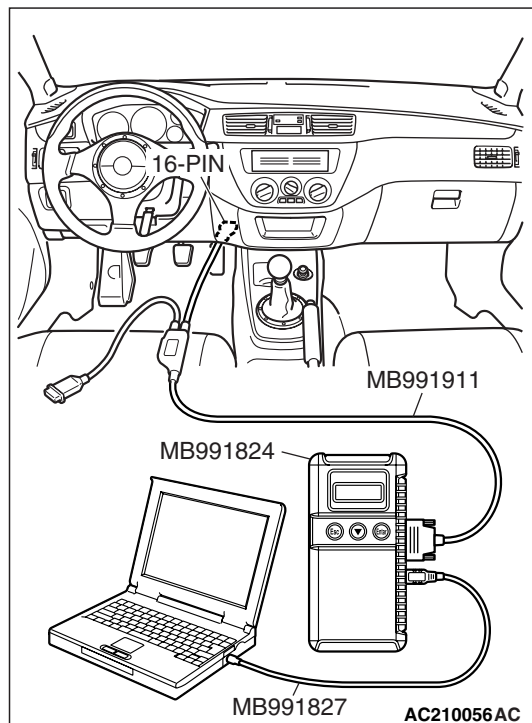
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 as shown in the illustration.
- (2) Start the engine.
- (3) Set scan tool MB991958 to data reading mode for following item.
 - Item 37: Steering angular sensor neutral position learning
- (4) Confirm the indicated ON/OFF state as follows:

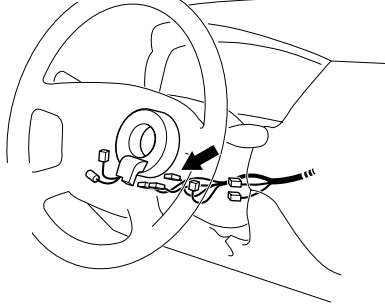
CHECKING REQUIREMENT	DISPLAY
After driving straight at vehicle speed over than 10 km/h (6.3 mph)	ON
Before driving with ignition switch ON	OFF

Q: Is the steering angular velocity sensor straight ahead position learning input normal?

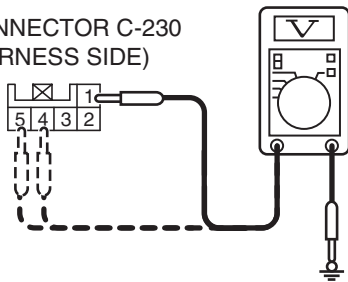
- YES** : Go to Step 5.
NO : Confirm the steering angular velocity sensor is correctly installed. Then go to Step 4.



CONNECTOR: C-230

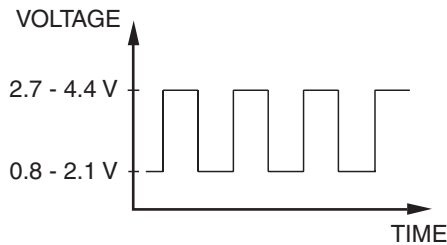


CONNECTOR C-230
(HARNESS SIDE)



AC212249AD

VARIATIONS IN VOLTAGE WHEN TURNING
THE STEERING WHEEL



AC211894AB

STEP 4. Check for steering angular velocity sensor output voltage.

- (1) Connect steering angular velocity sensor connector C-230.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage, by backprobing, between terminal 1 and ground, terminal 4 and ground, and terminal 5 and ground. The voltage should measure as indicated in the figure.

Q: Is the steering angular velocity sensor output voltage normal?

YES : Go to Step 13.

NO : Replace the steering angular velocity sensor (Refer to [P.35B-117.](#)) and then go to Step 13.

STEP 5. Check the stoplight.

Q: Does the stoplight turn on and off normally?

YES : Go to Step 9.

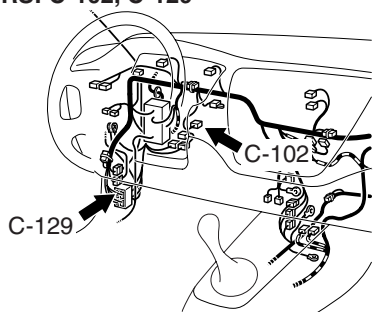
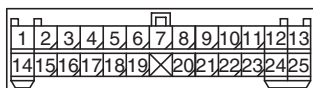
NO : Go to Step 6.

STEP 6. Check the stoplight switch installation condition.

Q: Is the stoplight switch installed correctly?

YES : Check the stoplight switch (Refer to GROUP 35A, Brake pedal [P.35A-25](#)). Then go to Step 7.

NO : Repair the installation of the stoplight switch (Refer to GROUP 35A, On-vehicle Service - Brake pedal Check and Adjustment [P.35A-13](#)). Then go to Step 13.

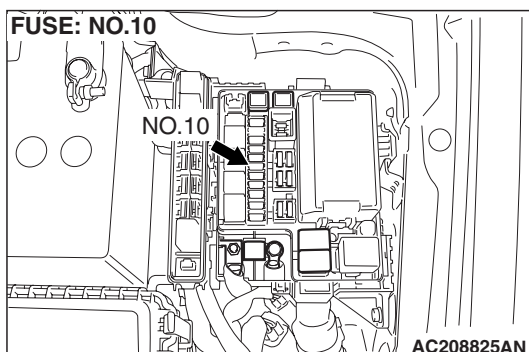
CONNECTORS: C-102, C-129**CONNECTOR C-102
(HARNESS SIDE)****CONNECTOR C-129**

AC212218AH

STEP 7. Check the following connectors.

- Intermediate connectors C-129
- Stoplight switch connector C-102

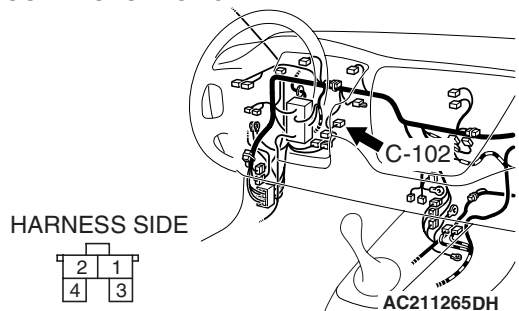
Check the connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?**YES :** Go to Step 8.**NO :** Repair it and then go to Step 13.**FUSE: NO.10**

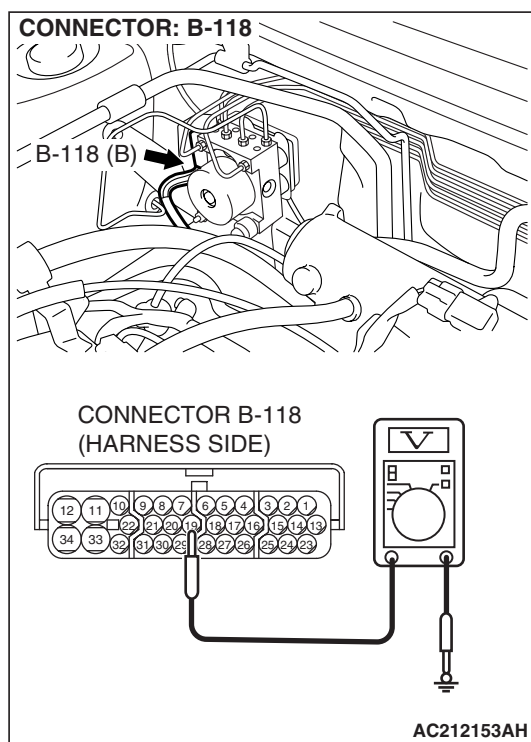
AC208825AN

STEP 8. Check the following harness wires.

- The wire between relay box in engine compartment (fuse No.10) and stoplight switch connector C-102 (terminal 2)
- The wire between stoplight switch connector C-102 (terminal 1) and stoplights

Q: Is any harness wire damaged?**YES :** Repair or replace it and then go to Step 13.**NO :** Go to Step 9.**CONNECTOR: C-102****HARNESS SIDE**

AC211265DH



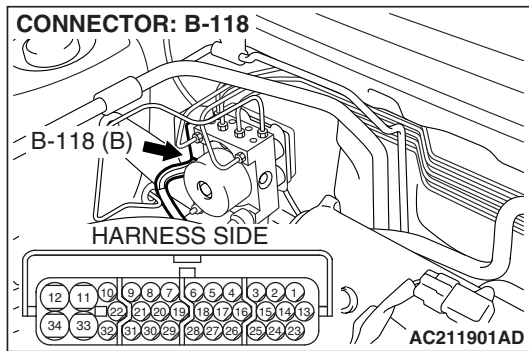
STEP 9. Check the stoplight switch circuit. Measure the voltage at ABS-ECU connector B-118.

- (1) Disconnect ABS-ECU connector B-118 and measure at the harness side.
- (2) Depress the brake pedal to turn on the stoplight switch.
- (3) Measure the voltage between terminal 19 and ground. It should measure battery voltage (approximately 12 volts).

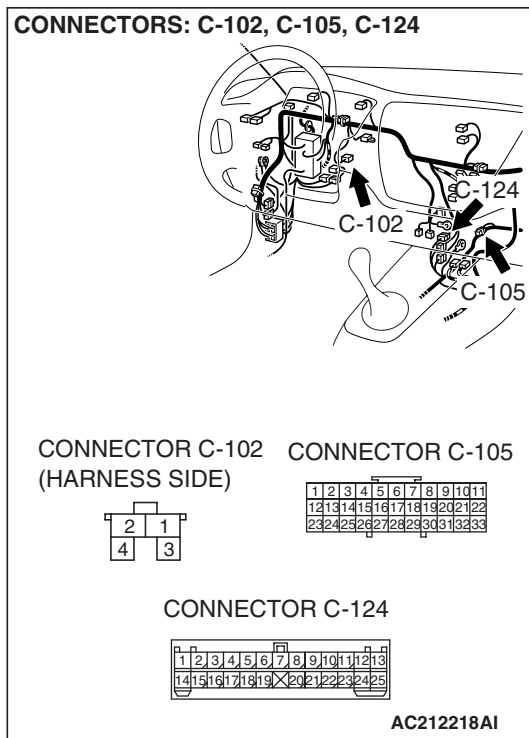
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.

NO : Go to Step 10.

**STEP 10. Check the following connectors.**

- ABS-ECU connector B-118



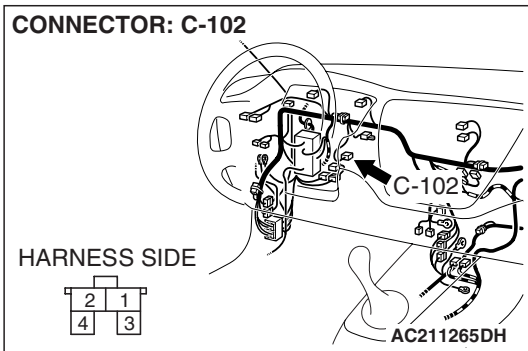
- Joint connector C-105
- Intermediate connector C-124
- Stoplight switch connector C-102

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

Q: Are the connectors and terminals in good condition?

YES : Go to Step 11.

NO : Repair it and then go to Step 13.



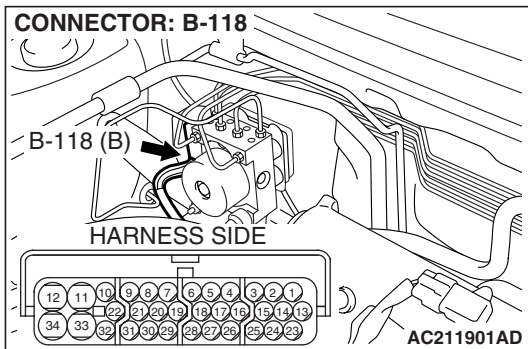
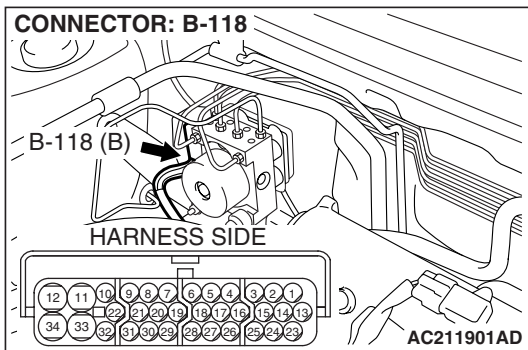
STEP 11. Check the following harness wire.

The wire between stoplight switch connector C-102 (terminal 1) and ABS-ECU connector B-118 (terminal 19)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 13.

NO : Go to Step 13.



STEP 12. Check the following connector.

ABS-ECU connector B-118

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

Q: Are the connector and terminals in good condition?

YES : Replace the brake modulator hydraulic unit (integrated with ABS-ECU) (Refer to [P.35B-111](#)). Then go to Step 13.

NO : Repair it and then go to Step 13.

STEP 13. Retest the system.

Q: Is the neutral position learning of the steering angular velocity sensor detected by the ABS system?

YES : The procedure is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 7: Faulty ABS Operation

TECHNICAL DESCRIPTION (COMMENT)

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

TROUBLESHOOTING HINT

- The most likely cause for this case is:
- Malfunction of the brake modulator hydraulic unit

DIAGNOSIS

Check the brake modulator hydraulic unit (Refer to [P.35B-108](#)). If the brake modulator hydraulic unit (integrated with ABS-ECU) is malfunctioning, replace it. Then check that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1352011500713

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

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENT		NORMAL VALUE
FR SNSR	11	Front-right ABS sensor	Drive the vehicle		Vehicle speeds displayed on the speedometer and scan tool are identical.
FL SNSR	12	Front-left ABS sensor			
RR SNSR	13	Rear-right ABS sensor			
RL SNSR	14	Rear-left ABS sensor			
BATT. VOLTAGE	21	ABS-ECU power supply voltage	Ignition switch: ON		10 –16 V
PARKING SW	29	Parking brake switch	Pull the parking brake lever.		ON
			Release the parking brake lever.		OFF
G S(STRAIGHT)	32	Longitudinal G-sensor	When vehicle stops.		2.4 –2.6 V
			When vehicle is driven.		3.4 –3.6 V
STOP LAMP SW	36	Stoplight switch	Depress the brake pedal.		ON
			Release the brake pedal.		OFF
ST-N MEMORY	37	Steering angular velocity sensor neutral position learning	After driving straight at vehicle speed over 10 km/h (6.3 mph).		ON
			Before driving with ignition switch ON.		OFF
G S(LATERAL)	71	Lateral G-sensor	When vehicle stops.		2.4 –2.6 V
			When vehicle is driven.		3.4 –3.6 V
ST-N	74	Steering angular velocity sensor (ST-N)	Ignition switch: ON	Steering: Neutral position and fully turned	ON
				Steering: Except for the above	OFF
ST-1	75	Steering angular velocity sensor (ST-1)	Ignition switch: ON	Steering: Turn slowly.	Display ON and OFF alternately
ST-2	76	Steering angular velocity sensor (ST-2)			
ST ANGLE	86	Steering degree	<ul style="list-style-type: none"> Ignition switch: ON Steering angular velocity sensor neutral position learning is finished (service data item No. 37 displays ON). 	Steering: Turn 90° to the right.	+ 90°
				Steering: Neutral	OFF
				Steering: Turn 90° to the left.	- 90°

ACTUATOR TEST REFERENCE TABLE

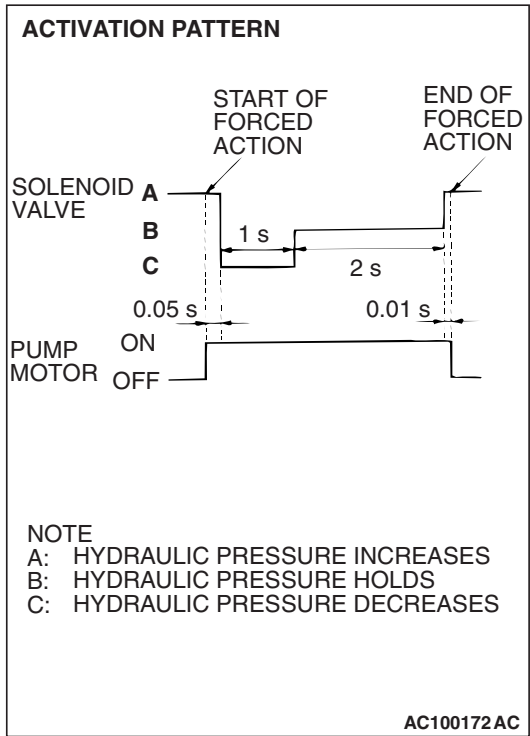
M1352011600776

The scan tool activates the following actuators for testing.

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

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

ACTUATOR TEST SPECIFICATIONS



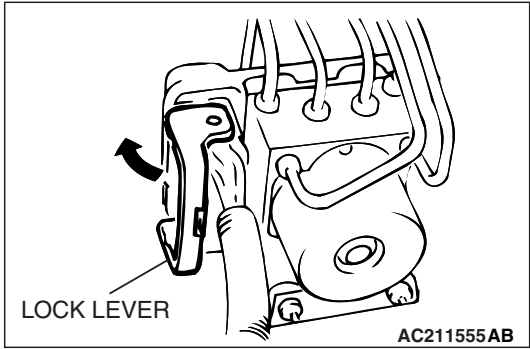
NO.	ITEM	PARTS TO BE ACTIVATED
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

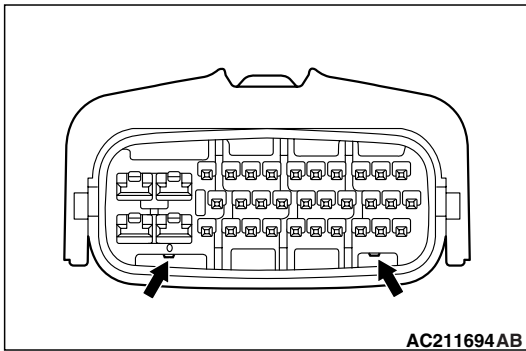
CHECK AT ABS-ECU

M1352011800770

Use the following steps to remove the connector cover of the ABS-ECU and then 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 as connector.





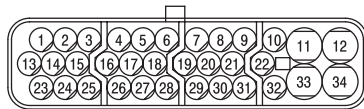
2. Push up and unlock the hooks of the ABS-ECU connector as shown in the illustration, then remove the connector cover.

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (12) (ground terminal) and each respective terminal.
2. The terminal layout is shown in the illustration below.

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

B-118



CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
1	Parking brake switch	Pull the parking brake lever.		1 V or less
		Release the parking brake lever.		Battery positive voltage
2	Scan tool	When the scan tool is connected		Serial communication with Scan tool
		When the scan tool is not connected		1 V or less
4	Steering angular velocity sensor (ST-N)	Ignition switch: "ON"	Steering wheel: Neutral position and fully turned.	0.8 – 2.1 V
			Steering wheel: Except for the above	2.7 – 4.4 V
5	Diagnosis changeover input	When the scan tool is connected		Approximately 0 V
		When the scan tool is not connected		Battery positive voltage
10	ABS-ECU power supply	Ignition switch: "ON"		Battery positive voltage
		Ignition switch: "START" or "ACC"		Approximately 0 V
11	Solenoid valve power supply	Always		Battery positive voltage
14	Lateral G-sensor input	Ignition switch: "ON"		2.4 – 2.6 V (horizontal position)
15	Longitudinal G-sensor ground	Always		0 V

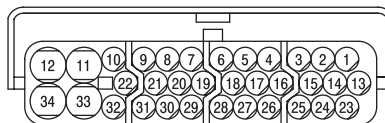
CONNECTOR TERMINAL NO	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
17	Steering angular velocity sensor (ST-2)	Ignition switch: "ON"	Steering wheel: Turned	Variation in the voltage value 0.8 – 2.1 V and 2.7 – 4.4 V
19	Stoplight monitor input	Ignition switch: "ON"	Stoplight switch: "ON"	Battery positive voltage
			Stoplight switch: "OFF"	1 V or less
24	Lateral G-sensor ground	Always		0 V
25	Longitudinal G-sensor input	Ignition switch: "ON"		2.4 – 2.6 V (horizontal position)
26	Steering angular velocity sensor (ST-1)	Ignition switch: "ON"	Steering wheel: Turned	Variation in the voltage value 0.8 – 2.1 V and 2.7 – 4.4 V
27	ABS-ECU warning light transistor output	Ignition switch: "ON"	When the light off	1 V or less
			When the light is illuminated	7 V or more
33	Motor power supply	Always		Battery positive voltage

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

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

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

B-118

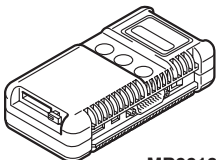
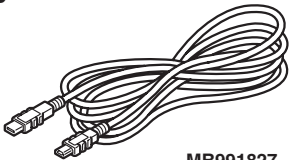

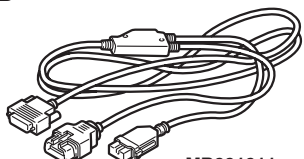
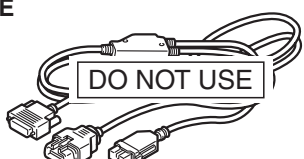
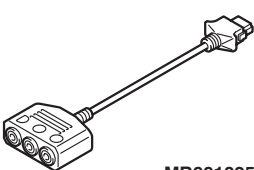
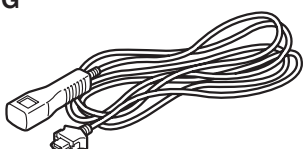
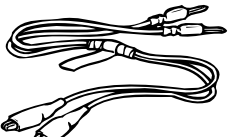



AC211717

CONNECTOR TERMINAL NO.	SIGNAL	NORMAL CONDITION
6 – 7	Rear-left ABS sensor	1.24 – 1.64 k Ω
8 – 9	Rear-right ABS sensor	1.24 – 1.64 k Ω
22 – 31	Front-left ABS sensor	1.24 – 1.64 k Ω
29 – 30	Front-right ABS sensor	1.24 – 1.64 k Ω
12 – body ground	Ground	Less than 2 ohms
34 – body ground	Ground	Less than 2 ohms

SPECIAL TOOLS

M1352000600813

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826</p> <p>MB991958</p>	<p>MB991958</p> <p>A: MB991824</p> <p>B: MB991827</p> <p>C: MB991910</p> <p>D: MB991911</p> <p>E: MB991914</p> <p>F: MB991825</p> <p>G: MB991826</p> <p>M.U.T.-III sub assembly</p> <p>A: Vehicle communication interface (V.C.I.)</p> <p>B: M.U.T.-III USB cable</p> <p>C: M.U.T.-III main harness A (Vehicles with CAN communication system)</p> <p>D: M.U.T.-III main harness B (Vehicles without CAN communication system)</p> <p>E: M.U.T.-III main harness C (for Daimler Chrysler models only)</p> <p>F: M.U.T.-III measurement adapter</p> <p>G: M.U.T.-III trigger harness</p>	<p>MB991824-KIT</p> <p><i>NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.</i></p>	<p>SWS communication line check (ECU check and service data)</p> <p>CAUTION</p> <p>M.U.T.-III main harness B (MB991911) should be used. M.U.T.-III main harness A and C should not be used for this vehicle.</p>
 <p>MB991529</p>	<p>MB991529</p> <p>Diagnostic trouble code check harness</p>	<p>Tool not necessary if scan tool (M.U.T.-III) is available.</p>	<p>For checking of ABS (Diagnostic trouble code display when using the ABS warning light)</p>

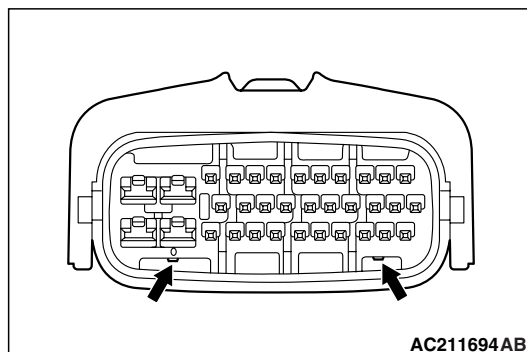
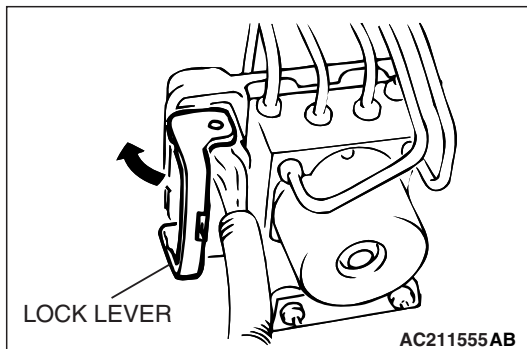
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991348	MB991348 Test harness	—	For checking of G-sensor

ON-VEHICLE SERVICE

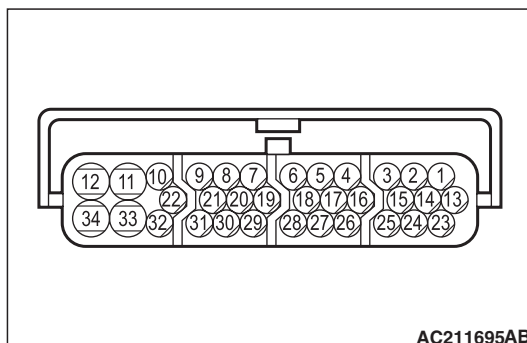
ABS SENSOR OUTPUT VOLTAGE MEASUREMENT

M1352001600678

1. Lift up the vehicle and release the parking brake.
2. Move the lock lever of the ABS-ECU connector as shown, and then disconnect the ABS-ECU connector.



3. Push up and unlock the hooks of the ABS-ECU connector as shown in the illustration, then remove the connector cover.



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

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

TERMINAL NO.			
Front left	Front right	Rear left	Rear right
22	29	6	8
31	30	7	9

Output voltage:

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

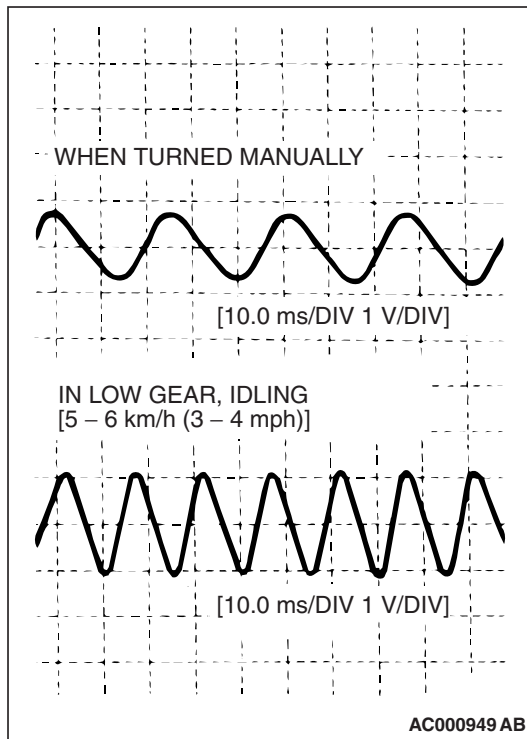
Probable causes of low output voltage

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

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

5. To observe the waveform with an oscilloscope:

- Front Wheels: Shift into low gear and drive the wheels.
- Rear Wheels: Turn the wheels manually at a constant speed.



POINTS IN WAVEFORM MEASUREMENT

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

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

HYDRAULIC UNIT CHECK

M1352001700749

Required Special Tools:

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

⚠ CAUTION

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

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

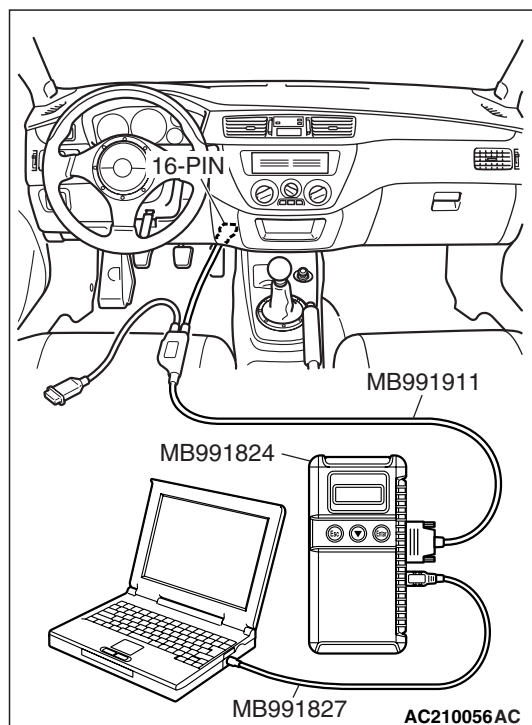
⚠ CAUTION

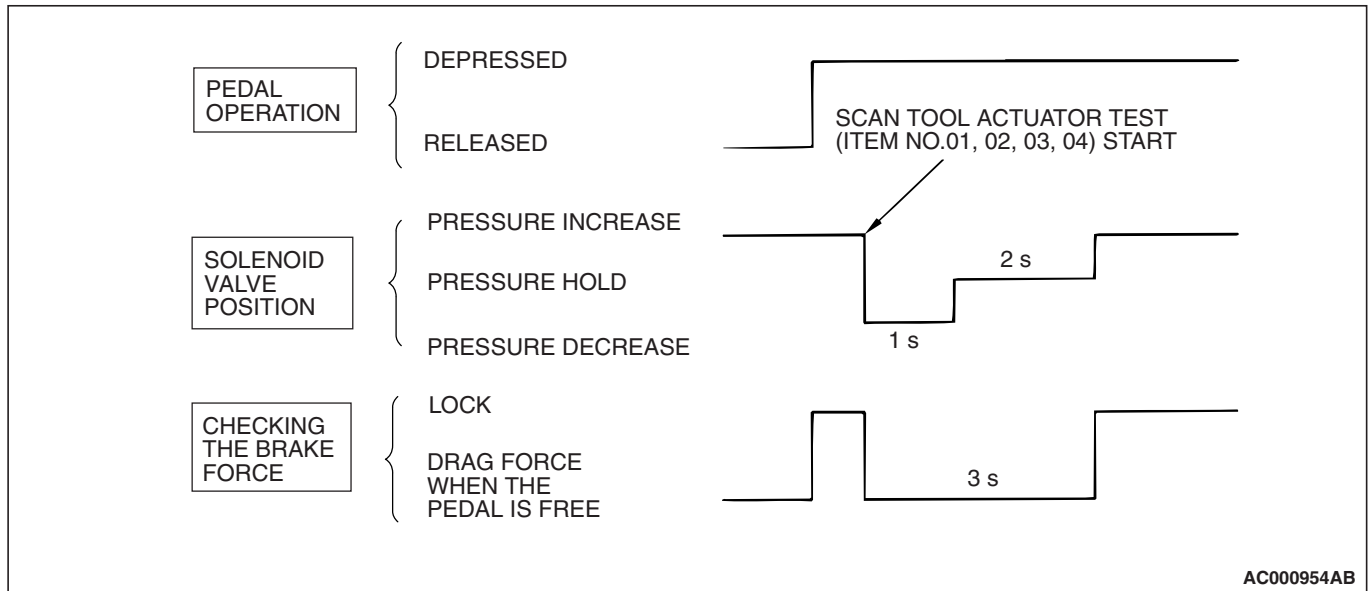
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

4. Connect scan tool MB991958 as shown in the illustration.
5. After checking that the shift lever is in neutral, start the engine.
6. Use scan tool MB991958 to force-drive the actuator. For scan tool MB991958, follow the steps below.
 - (1) Select "Interactive Diagnosis" from the start-up screen.
 - (2) Select "System select."
 - (3) Choose "ABS" from the "CHASSIS" tab.
 - (4) Select "Actuator Test" from "ABS" screen
 - (5) Choose an appropriate item for hydraulic unit check.

NOTE: The ABS system will switch to the scan tool mode and the ABS warning light will illuminate.

NOTE: When the ABS has been interrupted by the fail-safe function, scan tool MB991958 actuator testing cannot be used.





- Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the reading taken in step 2. The result should be as shown in the diagram above.

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

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

DIAGNOSIS TABLE					
SCAN TOOL DISPLAY	OPERATION	INSPECTION RESULT	JUDGMENT	PROBABLE CAUSE	REMEDY
01 FR VALVE 02 FL VALVE 03 RR VALVE 04 RL VALVE	<ul style="list-style-type: none"> Depress brake pedal to lock wheel. Using scan tool MB991958, 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

9. After inspection, disconnect the scan tool MB991958 immediately after turning the ignition switch to the "LOCK" (OFF) position.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500451

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

M1352008600594

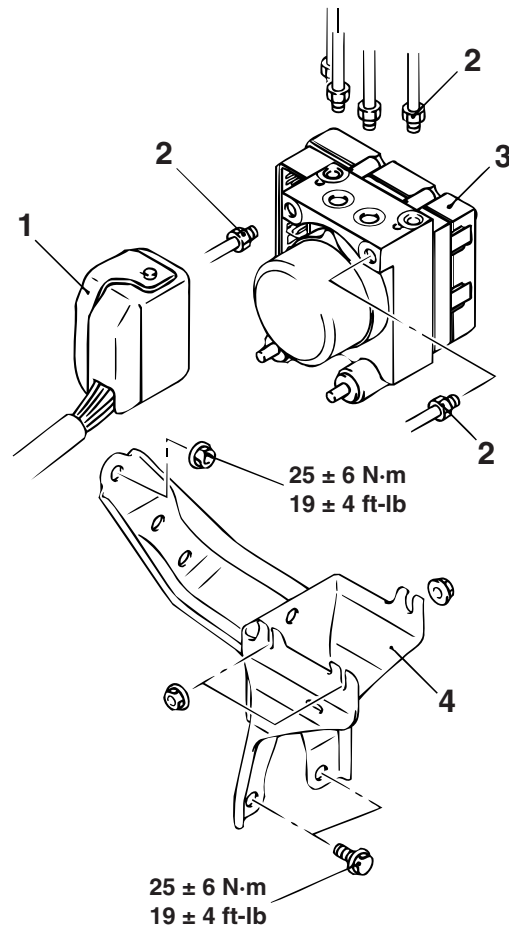
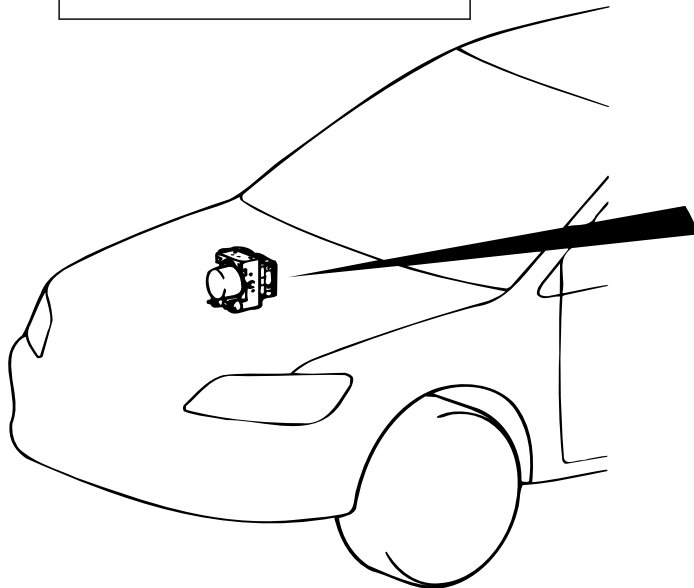
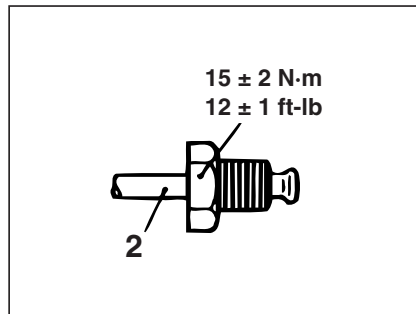
NOTE: The ABS-ECU is integrated in the hydraulic unit.

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Filling
- Brake Line Bleeding (Refer to [P.35A-17.](#))
- Hydraulic Unit Check (Refer to [P.35B-108.](#))



AC100173AC

REMOVAL STEPS

- <<A>> 1. ABS-ECU HARNESS CONNECTOR <>
>>A<< 2. BRAKE TUBE CONNECTION

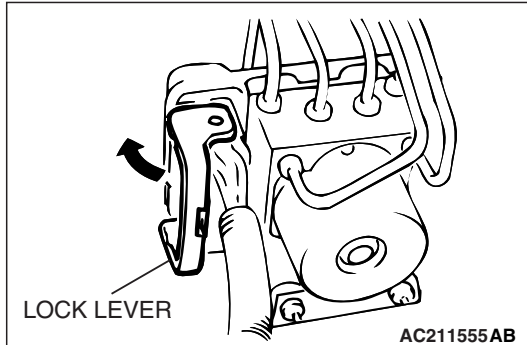
REMOVAL STEPS (Continued)

3. BRAKE MODULATOR HYDRAULIC UNIT (HYDRAULIC UNIT AND ABS-ECU)
4. BRAKE HYDRAULIC UNIT BRACKET

REMOVAL SERVICE POINTS

<<A>> ABS-ECU HARNESS CONNECTOR DIS-
CONNECTION

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

<> BRAKE MODULATOR HYDRAULIC UNIT
(HYDRAULIC UNIT AND ABS-ECU) REMOVAL**⚠ WARNING**

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

⚠ CAUTION

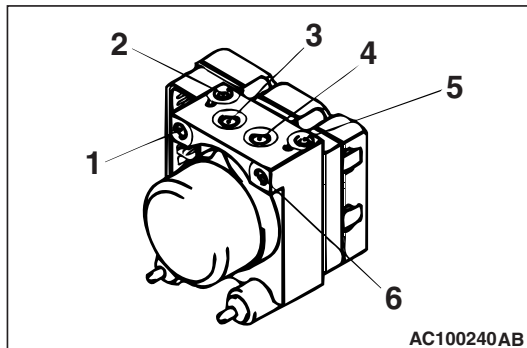
- The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.
- Do not drop or shock the hydraulic unit.
- Do not turn the hydraulic unit upside down or lay it on its side.

INSTALLATION SERVICE POINT

>>A<< BRAKE TUBE CONNECTION

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

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



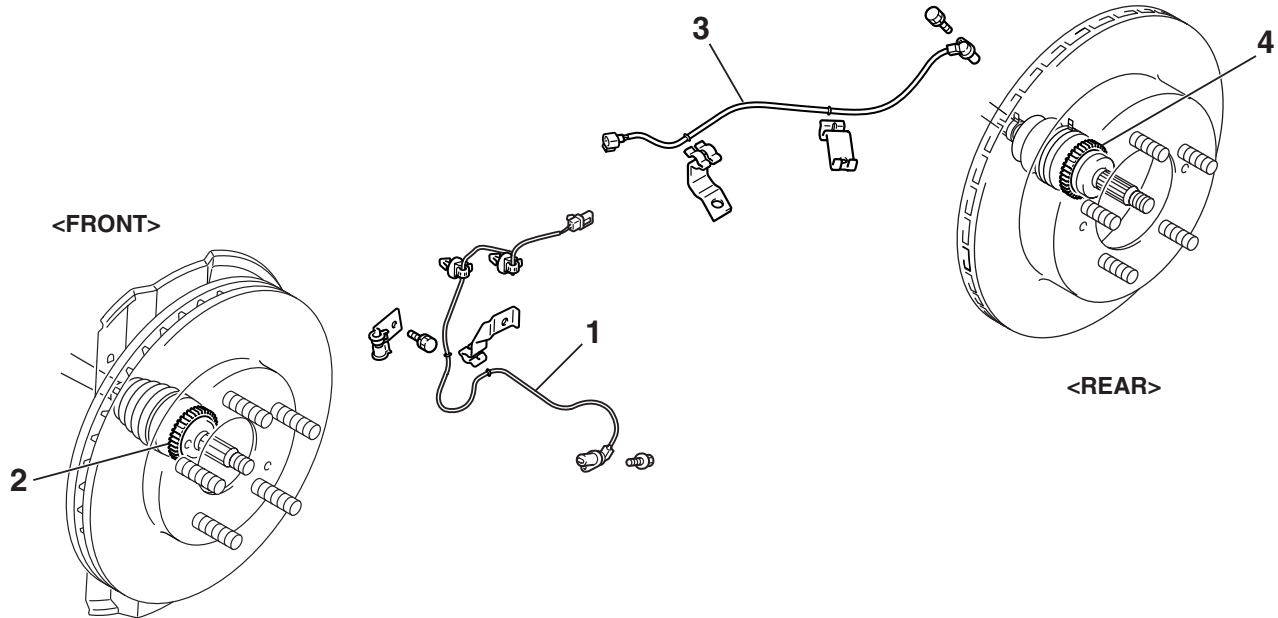
ABS SENSOR

REMOVAL AND INSTALLATION

M1352020700016

Post-installation Operation

- ABS Sensor Output Voltage Measurement (Refer to [P.35B-106.](#))



AC211696AB

FRONT ABS SENSOR REMOVAL STEPS

<<A>>

1. FRONT ABS SENSOR
2. FRONT ABS ROTOR (REFER TO GROUP 26, DRIVESHAFT ASSEMBLY [P.26-13.](#))

REAR ABS SENSOR REMOVAL STEPS

<<A>>

>>A<<

3. REAR ABS SENSOR
4. REAR ABS ROTOR (REFER TO GROUP 27, DRIVESHAFT ASSEMBLY [P.27-22.](#))

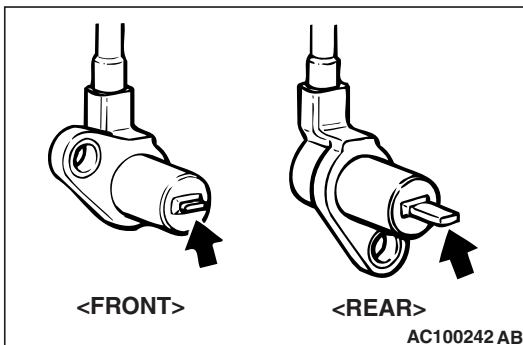
NOTE: The ABS rotors are integrated with the drive-shaft and cannot be disassembled.

REMOVAL SERVICE POINT

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

⚠ CAUTION

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

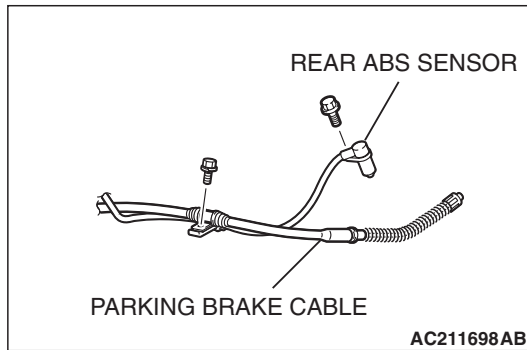


AC100242 AB

INSTALLATION SERVICE POINT

>>A<< REAR ABS SENSOR INSTALLATION

Install the rear ABS sensor, crossing with the parking brake cable as shown.



INSPECTION

M1352020800080

ABS SENSOR CHECK

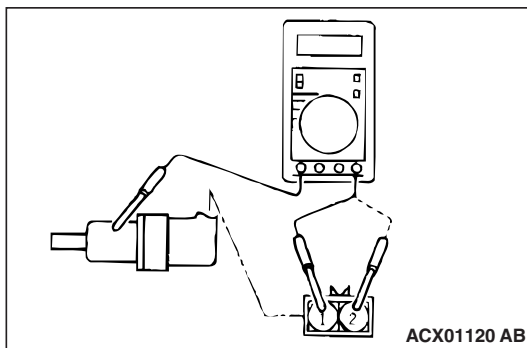
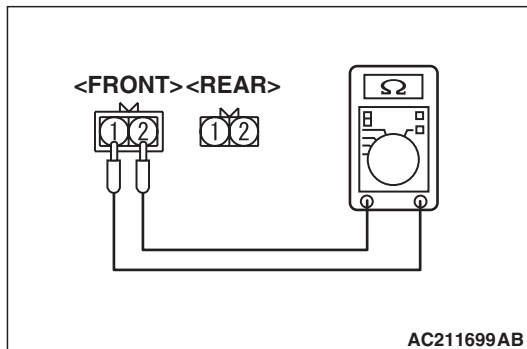
1. Check whether any metallic foreign material has adhered to the projection at the ABS sensor tip. Remove any foreign material. Also check whether the pole piece is damaged. Replace it with a new one if it is damaged.

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

2. Measure the resistance between the ABS sensor terminals.

Standard value: 1.24 –1.64 kΩ

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



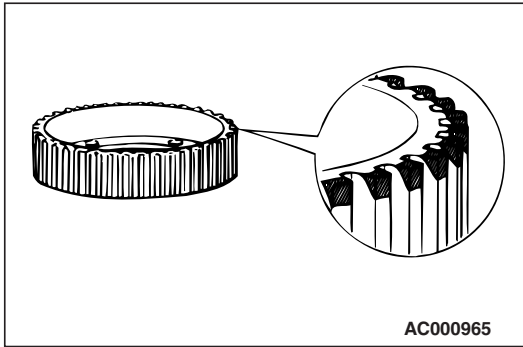
4. Remove all connections from the speed sensor. The circuit should be open between terminals (1) and (2) and the body of the ABS sensor. If the circuit is not open, replace with a new ABS sensor.

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

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

TOOTHED ABS ROTOR CHECK

Check whether the ABS rotor teeth are broken or deformed.
Replace the EBJ assembly of the driveshaft, respectively, if the teeth are damaged or deformed.



G-SENSOR

REMOVAL AND INSTALLATION

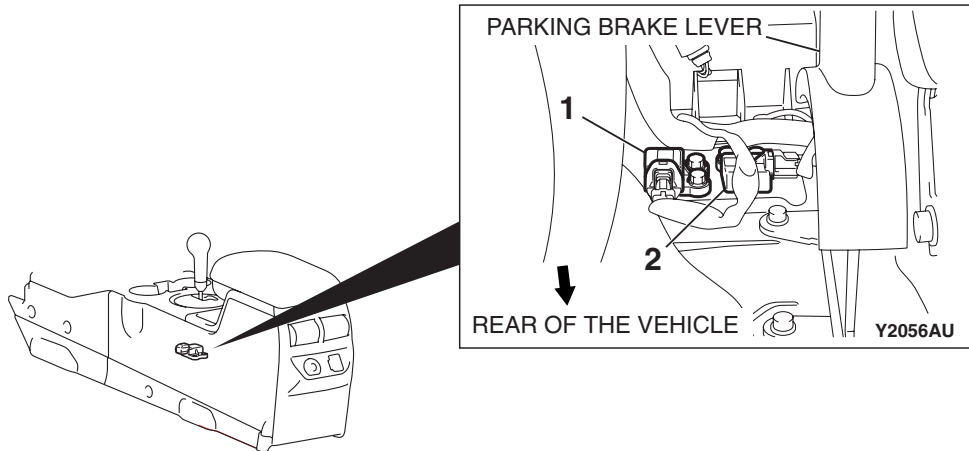
M1352010100370

CAUTION

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

Pre-removal and Post-installation Operation

- Rear Console Assembly Removal and Installation (Refer to GROUP 52A, Rear Floor Console Assembly [P.52A-8.](#))



AC211700AB

- >>B<< 1. LATERAL G-SENSOR
>>A<< 2. LONGITUDINAL G-SENSOR

INSTALLATION SERVICE POINTS

>>A<< LONGITUDINAL G-SENSOR INSTALLATION

The arrow mark on the G-sensor must point to front of the vehicle.

>>B<< LATERAL G-SENSOR INSTALLATION

The arrow mark on the G-sensor must point to the parking brake lever.

INSPECTION

M1352018000043

LATERAL/LONGITUDINAL G-SENSOR CHECK

Required Special Tool:

- MB991348: Test Harness

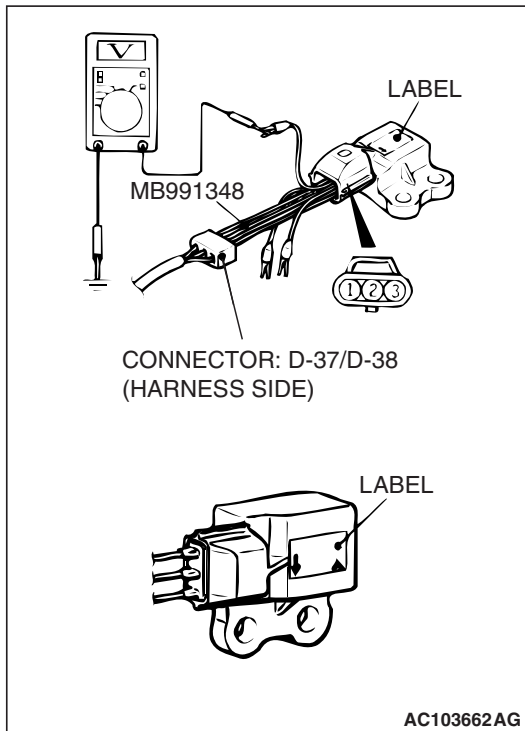
1. Disconnect the G-sensor connector and connect special tool MB991348, between terminals of the disconnected connector.
2. With the ignition switch turned to the "ON" position, read the voltage between terminals number 2 and number 3.

Standard Value: 2.4 –2.6 V

3. With special tool MB991348 connected, rotate so that the arrow points straight down. Read output voltage between terminals number 2 and number 3.

Standard Value: 3.4 –3.6 V

4. If the voltage deviates from the standard value, and nothing is wrong with the power supply wire and ground wire, replace the G-sensor.



STEERING ANGULAR VELOCITY SENSOR

REMOVAL AND INSTALLATION

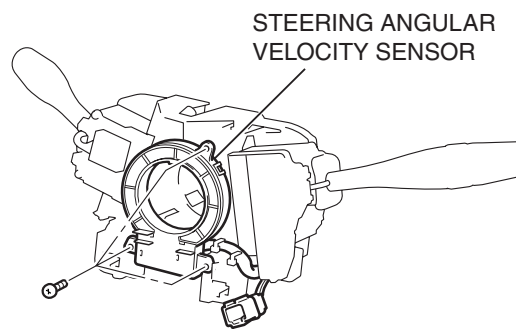
M1352021000065

CAUTION

- Before removing the steering wheel and air bag module assembly, be sure to refer to GROUP 52B, Service Precautions (P.52B-16) and Air Bag Module and Clock Spring (P.52B-168).
- Make sure no oil adheres to the steering angular velocity sensor because a photointerruptors are mounted on the steering angular velocity sensor.

Pre-removal and Post-installation Operation

- Steering Wheel Removal and Installation (Refer to GROUP 37, Steering Wheel P.37-24.)
- Column Cover, Clock Spring and Column Switch Assembly Removal and Installation (Refer to GROUP 37, Steering Shaft P.37-26.)



AC211701AB

SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

M1352012400300

ITEM		SPECIFICATION
Brake tube flare nut		15 ± 2 N· m (12 ± 1 ft-lb)
Hydraulic unit bracket bolt and nut		25 ± 6 N· m (19 ± 4 ft-lb)

GENERAL SPECIFICATIONS

M1352000200053

ITEM			SPECIFICATION
ABS control method			4-sensor, 4-channel
No. of ABS rotor teeth		Front	43
		Rear	43
ABS sensor	Type		Magnet coil type
	Gap between sensor and rotor mm (in)	Front	0.85 (0.033) <Non-adjustable type>
		Rear	0.60 (0.023) <Non-adjustable type>

SERVICE SPECIFICATIONS

M1352000300492

ITEM		STANDARD VALUE
ABS sensor internal resistance kΩ		1.24 –1.64
G-sensor output voltage V	Stationary vehicles	2.4 –2.6
	Arrow facing downward	3.4 –3.6