GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

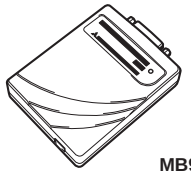
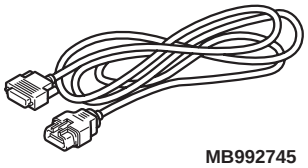
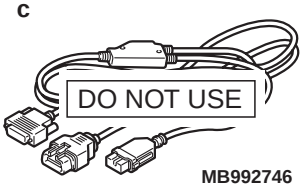
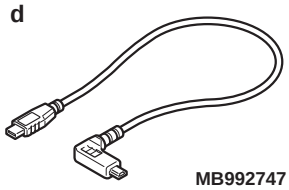
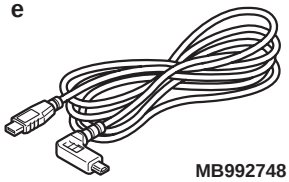
SERVICE SPECIFICATIONS

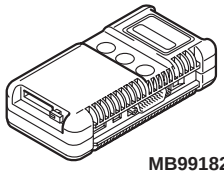
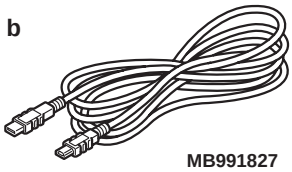
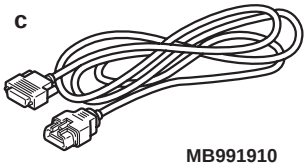
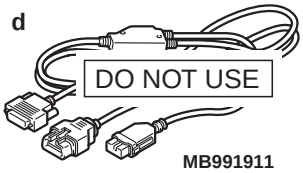
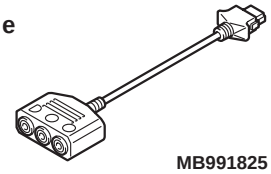
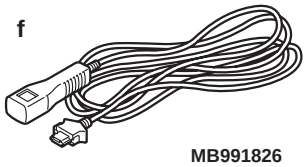
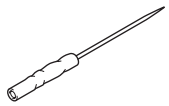
M1352000300964

Item	Standard value
Wheel speed sensor current mA	5.9 – 8.4 or 11.8 – 16.8
Wheel speed sensor insulation resistance MΩ	5 or more

SPECIAL TOOLS

M1352000601883

Tool	Number	Name	Use
a  MB992744 b  MB992745 c  MB992746 d  MB992747 e  MB992748 ACB05421AB	a. MB992744 b. MB992745 c. MB992746 d. MB992747 e. MB992748	a. Vehicle communication interface-Lite (V.C.I.-Lite) b. V.C.I.-Lite main harness A (for vehicles with CAN communication) c. V.C.I.-Lite main harness B (for vehicles without CAN communication) d. V.C.I.-Lite USB cable short e. V.C.I.-Lite USB cable long	ABS check (Diagnosis code display and data list display by M.U.T.-III)

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measurement adapter f. M.U.T.-III trigger harness	**⚠ CAUTION** **For vehicles with CAN communication, use the M.U.T.-III main harness A to send the simulated vehicle speed. If you connect the M.U.T.-III main harness B instead, the CAN communication does not function correctly.** ABS check (Diagnosis code display and data list display by M.U.T.-III)
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector for loose, corroded or damaged terminals, or terminals pushed back in the connector.
	MB991709	Wiring harness set	Checking the ABS-ECU and output current measure at the wheel speed sensor

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1352011100997

Refer to GROUP 00 – How to Use Troubleshooting/Contents of Troubleshooting .

NOTES WITH REGARD TO DIAGNOSIS

M1352012600393

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

Phenomenon	Explanation of phenomenon
When the engine starts, a knocking sound can be heard coming from the engine compartment.	This sound occurs as a result of system operation checking, and is not a malfunction.
• Sound of the motor inside the ABS hydraulic unit operation. (whine) • Sound is the generated along with vibration of the brake pedal. (scraping) • When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)	This is the sound of normal system operation, and is not a malfunction.
Shocks are felt if the brake pedal is depressed when driving at low speed.	This is due to system operation checking (starting-of check when the vehicle speed reaches a certain number of km/h) and is not a malfunction.

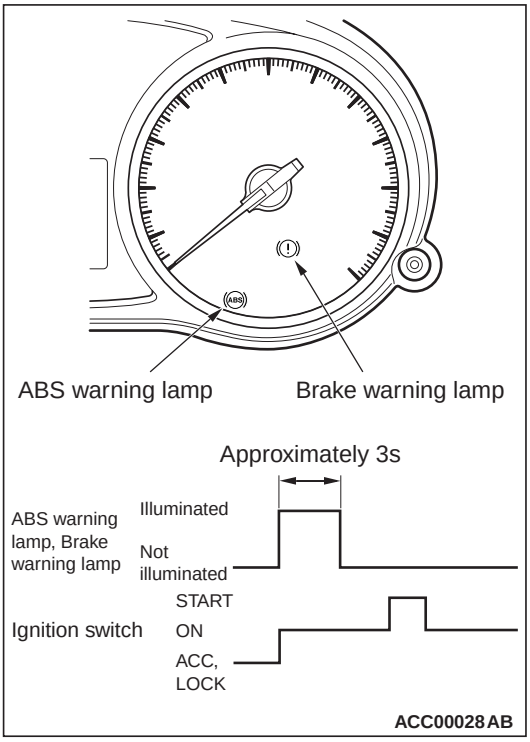
2. For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
3. Diagnosis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

ABS WARNING LAMP AND BRAKE WARNING LAMP CHECK

M1352012001316

Check that ABS and brake warning lamps illuminate as follows.

NOTE: The EBD warning lamp is also used as the brake warning lamp.



1. When the ignition switch is turned to the ON position, ABS and brake warning lamps illuminate.
2. The ABS and brake warning lamps illuminate for three seconds[*1] and then turn OFF[*2].
3. Otherwise, check the diagnosis code.

NOTE:

- *[*1]: The ABS warning lamp may stay ON until the vehicle speed reaches 10 km/h. As far as ABS-ECU stores any diagnosis code related to the wheel speed sensor malfunction or the motor malfunction as past trouble, ABS-ECU continues illuminating the ABS warning lamp until it verifies that the malfunction for that code is resolved (startup check).*
- *[*2]: The brake warning lamp does not turn OFF when the parking brake is applied or the brake fluid level is lowered.*

DIAGNOSTIC FUNCTION

M1352011201726

ABS-ECU has the following functions for easier system checks. The following items can be diagnosed using M.U.T-III.

- Diagnosis code set (Refer to P.35B-11).
- Service data output (Refer to P.35B-54).
- Actuator test (Refer to P.35B-55).
- Freeze frame data output (Refer to).

CHECK OF FREEZE FRAME DATA

The freeze frame data can be checked by using the M.U.T.-III.

When detecting fault and storing the diagnosis code, the ECU connected to CAN bus line obtains the data before the determination of the diagnosis code and the data when the diagnosis code is determined, and then stores the ECU status of that time. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. The displayed items are as the table below.

Display item list

Item No.	Item name	Data item	Unit
1	Odometer	Total driving distance after the diagnosis code is generated	km
2	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (OFF)" after the past failure transition	Number of counts is displayed.
5	Power supply voltage	Voltage of power supply when the diagnosis code is generated	V
9	G sensor	G sensor value when a diagnosis code is set	G
13	Stop lamp switch	Stop light switch condition when the diagnosis code is generated :OFF/ON	–
21	Pump motor	Pump motor status (ON/OFF) when a diagnosis code is set	–
301	ABS control	ABS control when the diagnosis code is generated :OFF/ON	–
401	FL wheel speed sensor	Wheel speed (FL) when the diagnosis code is generated	km/h
402	FR wheel speed sensor	Wheel speed (FR) when the diagnosis code is generated	km/h

Item No.	Item name	Data item	Unit
403	RL wheel speed sensor	Wheel speed (RL) when the diagnosis code is generated	km/h
404	RR wheel speed sensor	Wheel speed (RR) when the diagnosis code is generated	km/h

FAIL-SAFE FUNCTION

If any malfunction is detected by the self-diagnostic function, ABS-ECU illuminates the ABS warning lamp and brake warning lamp*, and it disables ABS and EBD control.

*NOTE: *: The brake warning lamp and display are used as EBD control warning lamp.*

Illumination condition of warning lamp and display in case of failure

Diagnosis code No.	Item	Countermeasures for failure			
		Brake warning lamp	Brake warning display	ABS warning lamp	ABS warning display
C100A	FL wheel speed sensor circuit	OFF*1	OFF*1	ON*2	ON*2
C1015	FR wheel speed sensor circuit				
C1020	RL wheel speed sensor circuit				
C102B	RR wheel speed sensor circuit				
C1011	FL wheel speed sensor signal	OFF*1	OFF*1	ON*2	ON*2
C101C	FR wheel speed sensor signal				
C1027	RL wheel speed sensor signal				
C1032	RR wheel speed sensor signal				
C1014	FL wheel speed sensor performance	OFF*1	OFF*1	ON*2	ON*2
C101F	FR wheel speed sensor performance				
C102A	RL wheel speed sensor performance				
C1035	RR wheel speed sensor performance				
C1041	FL wheel speed tone performance	OFF*1	OFF*1	ON*2	ON*2
C1042	FR wheel speed tone performance				
C1043	RL wheel speed tone performance				
C1044	RR wheel speed tone performance				
C1046	FL wheel speed sensor phase	OFF*1	OFF*1	ON*2	ON*2
C1047	FR wheel speed sensor phase				
C1048	RL wheel speed sensor phase				
C1049	RR wheel speed sensor phase				

Diagnosis code No.	Item	Countermeasures for failure			
		Brake warning lamp	Brake warning display	ABS warning lamp	ABS warning display
C104B	FL inlet valve	ON	ON	ON	ON
C104F	FR inlet valve				
C1053	RL inlet valve				
C1057	RR inlet valve				
C105F	FL outlet valve	ON	ON	ON	ON
C1063	FR outlet valve				
C1067	RL outlet valve				
C105B	RR outlet valve				
C2104	Valve power supply circuit	ON	ON	ON	ON
C1073	Motor drive circuit	OFF	OFF	ON*2	ON*2
C2116	Pump motor voltage low	OFF	OFF	ON*2	ON*2
C1000	Brake SW (stuck)	OFF	OFF	OFF	OFF
C2200	ECU internal error	ON*3	ON*3	ON*3	ON*3
C2101	Power supply high voltage: 18.0 ± 1.0 V or more	ON	ON	ON	ON
C1395	Incomplete Brake fluid filling*6	OFF	OFF	Flashes (2 Hz)	ON
C1210	Longitudinal G sensor input circuit*4	OFF	OFF	ON	ON
C1242	Longitudinal G sensor signal*4	OFF	OFF	ON	ON
C123A	Sensor calibration*4	OFF	OFF	ON	ON
C1608	EEPROM fail	OFF	OFF	OFF	OFF
C1707	Implausible coding data	OFF	OFF	ON	ON
C2002	Valve calibration not completed	OFF	OFF	ON	ON
C2204	Sensor cluster internal error*4	OFF	OFF	ON	ON
U0114	4WD CAN timeout	OFF	OFF	OFF	OFF
U0141	ETACS CAN timeout	OFF	OFF	OFF	OFF
U1073	Bus-off	OFF	OFF	OFF	OFF
U1195	Coding not completed	OFF	OFF	ON	ON
U1197	Coding data unavailable	OFF	OFF	ON	ON

NOTE:

- **1 :Turns ON when two or more wheels are faulty.*
- **2 :Stays ON until the vehicle speed reaches 10 km/h when the ignition switch is turned to ON next time, even if the malfunction is repaired and returns to normal condition.*
- **3 :May not illuminate depending on the trouble cause.*
- **4 :4WD*

Under EBD and ABS control in case of failure

Diagnosis code No.	Item	Countermeasures for failure	
		EBD control	ABS control
C100A	FL wheel speed sensor circuit	Executed*1	Prohibited
C1015	FR wheel speed sensor circuit		
C1020	RL wheel speed sensor circuit		
C102B	RR wheel speed sensor circuit		
C1011	FL wheel speed sensor signal	Executed*1	Prohibited
C101C	FR wheel speed sensor signal		
C1027	RL wheel speed sensor signal		
C1032	RR wheel speed sensor signal		
C1014	FL wheel speed sensor performance	Executed*1	Prohibited
C101F	FR wheel speed sensor performance		
C102A	RL wheel speed sensor performance		
C1035	RR wheel speed sensor performance		
C1041	FL wheel speed tone performance	Executed*1	Prohibited
C1042	FR wheel speed tone performance		
C1043	RL wheel speed tone performance		
C1044	RR wheel speed tone performance		
C1046	FL wheel speed sensor phase	Executed*1	Prohibited
C1047	FR wheel speed sensor phase		
C1048	RL wheel speed sensor phase		
C1049	RR wheel speed sensor phase		
C104B	FL inlet valve	Prohibited	Prohibited
C104F	FR inlet valve		
C1053	RL inlet valve		
C1057	RR inlet valve		
C105F	FL outlet valve	Prohibited	Prohibited
C1063	FR outlet valve		
C1067	RL outlet valve		
C105B	RR outlet valve		
C2104	Valve power supply circuit	Prohibited	Prohibited
C1073	Motor drive circuit	Executed	Prohibited
C2116	Pump motor voltage low	Executed	Prohibited

Diagnosis code No.	Item		Countermeasures for failure	
			EBD control	ABS control
C1000	Brake SW (stuck)		Executed	Executed
C2200	ECU internal error		Prohibited*2	Prohibited*2
C2101	Power supply high voltage	18.0 ± 1.0 V or more	Prohibited	Prohibited
C1395	Incomplete Brake fluid filling		Executed	Executed
C1210	Longitudinal G sensor input circuit*3		Executed	Prohibited
C1242	Longitudinal G sensor signal*3		Executed	Prohibited
C123A	Sensor calibration*3		Executed	Prohibited
C1608	EEPROM fail		Executed	Executed
C1707	Implausible coding data		Executed	Prohibited
C2002	Valve calibration not completed		Executed	Prohibited
C2204	Sensor cluster internal error*3		Executed	Prohibited
U0114	4WD CAN timeout		Executed	Executed
U0141	ETACS CAN timeout		Executed	Executed
U1073	Bus-off		Executed	Executed
U1195	Coding not completed		Executed	Prohibited
U1197	Coding data unavailable		Executed	Prohibited

NOTE:

- **1: Prohibited when two or more wheels are faulty.*
- **2: Not prohibited when the brake warning lamp is not ON.*
- **3: 4WD*

HOW TO READ DIAGNOSIS CODE

⚠ CAUTION

When reading a diagnosis code, be sure to read it after erasing once because the diagnosis code could be set as a past trouble.

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

HOW TO ERASE DIAGNOSIS CODE

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

DIAGNOSIS CODE CHART

M1352011301949

⚠ CAUTION

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

Diagnosis code No.	Item		Reference page
C100A	FL wheel speed sensor circuit		P.35B-12
C1015	FR wheel speed sensor circuit		
C1020	RL wheel speed sensor circuit		
C102B	RR wheel speed sensor circuit		
C1011	FL wheel speed sensor signal		P.35B-15
C101C	FR wheel speed sensor signal		
C1027	RL wheel speed sensor signal		
C1032	RR wheel speed sensor signal		
C1014	FL wheel speed sensor .performance		P.35B-18
C101F	FR wheel speed sensor performance		
C102A	RL wheel speed sensor performance		
C1035	RR wheel speed sensor performance		
C1041	FL wheel speed tone performance		P.35B-21
C1042	FR wheel speed tone performance		
C1043	RL wheel speed tone performance		
C1044	RR wheel speed tone performance		
C1046	FL wheel speed sensor phase		P.35B-23
C1047	FR wheel speed sensor phase		
C1048	RL wheel speed sensor phase		
C1049	RR wheel speed sensor phase		
C104B	FL inlet valve		P.35B-26
C104F	FR inlet valve		
C1053	RL inlet valve		
C1057	RR inlet valve		
C105F	FL outlet valve		
C1063	FR outlet valve		
C1067	RL outlet valve		
C105B	RR outlet valve		
C2104	Valve power supply circuit		P.35B-27
C1073	Motor drive circuit		P.35B-29
C2116	Pump motor voltage low		P.35B-30
C1000	Brake SW (stuck)		P.35B-32
C2200	ECU internal error		P.35B-33
C2101	Power supply high voltage	18.0 ± 1.0 V or more	P.35B-33

Diagnosis code No.	Item		Reference page
C1395	Incomplete Brake fluid filling		P.35B-34
C1210	Longitudinal G sensor input circuit <4WD>	Abnormality in output voltage	P.35B-34
C1242	Longitudinal G sensor signal <4WD>	Abnormality in output voltage	P.35B-35
C123A	Sensor calibration <4WD>		P.35B-36
C2002	Valve calibration not completed		
C1608	EEPROM fail		P.35B-37
C1707	Implausible coding data		P.35B-39
C2204	Sensor cluster internal error <4WD>		P.35B-40
U0114	4WD CAN timeout		P.35B-40
U0141	ETACS CAN timeout		
U1073	Bus-off		P.35B-41
U1195	Coding not completed		P.35B-42
U1197	Coding data unavailable		

DIAGNOSIS CODE PROCEDURES

Code No. C100A FL wheel speed sensor circuit
Code No. C1015 FR wheel speed sensor circuit
Code No. C1020 RL wheel speed sensor circuit
Code No. C102B RR wheel speed sensor circuit

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- The wheel speed sensor is a kind of a pulse generator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting the wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to the wheel speed.
- The pulse signals, which the wheel speed sensor creates, are sent to ABS-ECU. ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

ABS-ECU monitors the voltage fluctuation in each wheel speed sensor circuit. If ABS-ECU detects the open or short circuit in the circuit, it will set a diagnosis code.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Noise interference
- Malfunction of wheel speed sensor
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code C100A, C1015, C1020 or C102B set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III data list
Check the following data list (Refer to P.35B-54).
- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 4.

STEP 4. Voltage measurement at the ABS-ECU connector (FL+, FL-, FR+, FR-, RL+, RL-, RR+, RR- terminal)
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.

Code No.C100A is set
- Measure the voltage between the ABS-ECU connector (FL+ terminal) and the body earth, and between the ABS-ECU connector (FL- terminal) and the body earth.

OK: 1 V or less

Code No.C1015 is set
- Measure the voltage between the ABS-ECU connector (FR+ terminal) and the body earth, and between the ABS-ECU connector (FR- terminal) and the body earth.

OK: 1 V or less

Code No.C1020 is set
- Measure the voltage between the ABS-ECU connector (RL+ terminal) and the body earth, and between the ABS-ECU connector (RL- terminal) and the body earth.

OK: 1 V or less

Code No.C102B is set
- Measure the voltage between the ABS-ECU connector (RR+ terminal) and the body earth, and between the ABS-ECU connector (RR- terminal) and the body earth.

OK: 1 V or less

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

STEP 5. Resistance measurement at ABS-ECU connector (FL+, FL-, FR+, FR-, RL+, RL-, RR+, RR- terminal)
Disconnect the connector, and measure at the wiring harness side.

Code No.C100A is set
- Measure the resistance between the ABS-ECU connector (FL+ terminal) and the body earth, and between the ABS-ECU connector (FL- terminal) and the body earth.

OK: No continuity

Code No.C1015 is set
- Measure the resistance between the ABS-ECU connector (FR+ terminal) and the body earth, and between the ABS-ECU connector (FR- terminal) and the body earth.

OK: No continuity

Code No.C1020 is set
- Measure the resistance between the ABS-ECU connector (RL+ terminal) and the body earth, and between the ABS-ECU connector (RL- terminal) and the body earth.

OK: No continuity

Code No.C102B is set
- Measure the resistance between the ABS-ECU connector (RR+ terminal) and the body earth, and between the ABS-ECU connector (RR- terminal) and the body earth.

OK: No continuity

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

STEP 6. Check the wiring harness between the ABS-ECU connector terminal and the wheel speed sensor connector terminal.

Code No.C100A is set
- Check of short circuit in FL+, FL- line between ABS-ECU connector and front wheel speed sensor (LH) connector.

Code No.C1015 is set
- Check of short circuit in FR+, FR- line between ABS-ECU connector and front wheel speed sensor (RH) connector.

Code No.C1020 is set
- Check of short circuit in RL+, RL- line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Code No.C102B is set
- Check of short circuit in RR+, RR- line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Q: Is the check result normal?
YES : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 11.
NO : Repair the connector(s) or wiring harness. Then go to Step 11.

STEP 7. Resistance measurement at the ABS-ECU connector (FL+, FL-, FR+, FR-, RL+, RL-, RR+, RR- terminal)
Disconnect the connector, and measure at the wiring harness side.

Code No.C100A is set
- Measure the resistance between the ABS-ECU connector (FL+ terminal) and the ABS-ECU connector (FL- terminal).

  OK: Continuity

Code No.C1015 is set
- Measure the resistance between the ABS-ECU connector (FR+ terminal) and the ABS-ECU connector (FR- terminal).

  OK: Continuity

Code No.C1020 is set
- Measure the resistance between the ABS-ECU connector (RL+ terminal) and the ABS-ECU connector (RL- terminal).

  OK: Continuity

Code No.C102B is set
- Measure the resistance between the ABS-ECU connector (RR+ terminal) and the ABS-ECU connector (RR- terminal).

  OK: Continuity

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 10.

STEP 8. Check the wiring harness between the ABS-ECU connector terminal and the wheel speed sensor connector terminal.

Code No.C100A is set
- Check of open circuit in FL+, FL- line between ABS-ECU connector and front wheel speed sensor (LH) connector.

Code No.C1015 is set
- Check of open circuit in FR+, FR- line between ABS-ECU connector and front wheel speed sensor (RH) connector.

Code No.C1020 is set
- Check of open circuit in RL+, RL- line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Code No.C102B is set
- Check of open circuit in RR+, RR- line between ABS-ECU connector and rear wheel speed sensor (RH) connector.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness. Then go to Step 11.

STEP 9. Check for wheel speed sensor as a single unit
Refer to P.35B-67.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 11.

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code C100A, C1015, C1020 or C102B set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 11.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 11. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code C100A, C1015, C1020 or C102B set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1011 FL wheel speed sensor signal
Code No. C101C FR wheel speed sensor signal
Code No. C1027 RL wheel speed sensor signal
Code No. C1032 RR wheel speed sensor signal

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- The wheel speed sensor is a kind of a pulse generator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting the wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to the wheel speed.
- The pulse signals, which the wheel speed sensor creates, are sent to ABS-ECU. ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS

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

- Irregular change in the wheel speed sensor signal
- Wheel speed sensor signal continuously indicates high value.

PROBABLE CAUSES

Current trouble

- Excessive gap between the wheel speed sensor and the wheel speed detection encoder
- Adhesion of foreign materials on the wheel speed sensor
- Adhesion of foreign materials on the wheel speed detection encoder
- Wheel bearing malfunction
- Malfunction of wheel speed sensor
- Damaged wiring harness and connectors
- External noise interference
- Improper installation of the wheel speed sensor
- Deformation of the wheel speed detection encoder
- ABS-ECU malfunction
- Disturbance of magnetisation pattern for wheel speed detection encoder
- The number of poles on the magnetic encoder for wheel speed detection (the number of N-pole and S-pole) is changed.

Past trouble

- When the diagnosis code No. C100A, C1015, C1020 or C102B is also set, carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).
- When the diagnosis code No. C100A, C1015, C1020 or C102B is not set, the following conditions may be present:
  - Some wheels slip
  - Unstable vehicle attitude
  - External noise interference
  - Vehicle ran with the parking brake applied.

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1011, C101C, C1027 or C1032 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code
Check that the diagnosis code No. C100A, C1015, C1020 or C102B is also set.

Q: Is the diagnosis code No.C100A, C1015, C1020 or C102B also set?
YES : Perform the diagnosis for the diagnosis code No.C100A, C1015, C1020 or C102B (Refer to P.35B-12).
NO : Go to Step 4.

STEP 4. Check the wiring harness between the ABS-ECU connector terminal and the wheel speed sensor connector terminal

Code No.C1011 is set
- Check of short to power supply, short to earth, and open circuit in FL+, FL– line between ABS-ECU connector and front wheel speed sensor (LH) connector.

Code No.C101C is set
- Check of short to power supply, short to earth, and open circuit in FR+, FR– line between ABS-ECU connector and front wheel speed sensor (RH) connector.

Code No.C1027 is set
- Check of short to power supply, short to earth, and open circuit in RL+, RL– line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Code No.C1032 is set
- Check of short to power supply, short to earth, and open circuit in RR+, RR– line between ABS-ECU connector and rear wheel speed sensor (RH) connector.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector(s) or wiring harness. Then go to Step 11.

STEP 5. Check for wheel speed sensor installation
Check how the wheel speed sensor is installed (Disconnection of wheel speed sensor, loose mounting bolt, etc.).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Reinstall the wheel speed sensor correctly (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 6.

STEP 6. Check for wheel speed sensor output current
Refer to P.35B-58.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 10.

STEP 7. Check for wheel bearing looseness

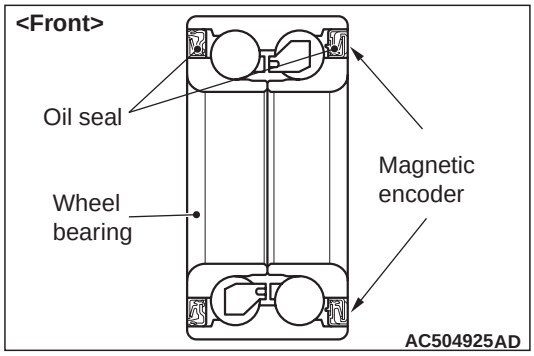
NOTE: Loose wheel bearing may increase the gap between the wheel speed sensor and the wheel speed detection magnet encoder. Check the wheel bearing for looseness. <Refer to GROUP 26 – Wheel Bearing Axial Play Check . (front), GROUP 27A – Wheel Bearing Axial Play Check (rear-2WD) or GROUP 27B – Wheel Bearing Axial Play Check (rear-4WD)>

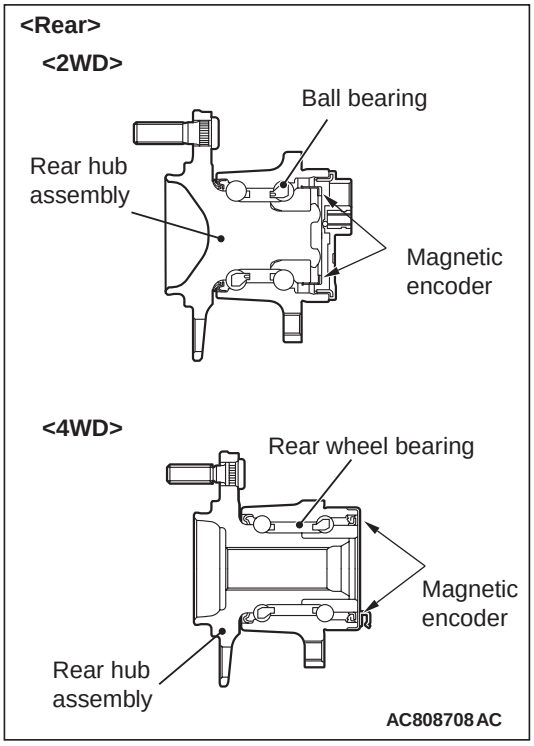
Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 11.

STEP 8. Check of wheel speed detection encoder





Check the encoder for adhesion of foreign materials or deformation.

Q: Is the check result normal?

YES : Go to Step 9.

NO (Adhesion of foreign materials) : Remove the foreign materials and clean the encoder so as not to disturb the magnetization pattern on it while taking care of the magnet, magnetic substance, and magnetic attraction. Then go to Step 11.

NO (Deformation) : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 11.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1011, C101C, C1027 or C1032 set?
YES : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1011, C101C, C1027 or C1032 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 11.
NO : This diagnosis is complete.

STEP 11. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1011, C101C, C1027 or C1032 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1014 FL wheel speed sensor performance
Code No. C101F FR wheel speed sensor performance
Code No. C102A RL wheel speed sensor performance
Code No. C1035 RR wheel speed sensor performance

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
- The wheel speed sensor is a kind of a pulse generator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting the wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to the wheel speed.
- The pulse signals, which the wheel speed sensor creates, are sent to ABS-ECU. ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS
ABS-ECU monitors the signals from each wheel speed sensor while the vehicle is being driven. If any fault below is found in these sensor signals, ABS-ECU will set the relevant diagnosis code.
- Missing wheel speed sensor signal
- Wheel speed sensor signal continuously indicates low value than the other wheel speed sensor signals.

PROBABLE CAUSES
Current trouble
- Excessive gap between the wheel speed sensor and the magnetic encoder for wheel speed detection
- Wheel bearing malfunction
- Deformation of the magnetic encoder for wheel speed detection
- Adhesion of foreign materials on the wheel speed sensor
- Adhesion of foreign materials on the magnetic encoder for wheel speed detection
- Malfunction of wheel speed sensor
- Improper installation of the wheel speed sensor
- ABS-ECU malfunction
- Disturbance of magnetization pattern for magnetic encoder for wheel speed detection

- The number of poles on the magnetic encoder for wheel speed detection (the number of N-pole and S-pole) is changed.

Past trouble

- When the diagnosis code No. C100A, C1015, C1020 or C102B is also set, carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).
- When the diagnosis code No. C100A, C1015, C1020 or C102B is not set, the following conditions may be present:
  - Some wheels slip.
  - Unstable vehicle attitude
  - External noise interference
  - Vehicle ran with the parking brake applied.
  - Only two wheels are rotated on a drum tester.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1014, C101F, C102A or C1035 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code

Check that the diagnosis code No.C100A, C1015, C1020 or C102B is also set.

Q: Is the diagnosis code No.C100A, C1015, C1020 or C102B also set?

YES : Perform the diagnosis for the diagnosis code No.C100A, C1015, C1020 or C102B (Refer to P.35B-12).

NO : Go to Step 4.

STEP 4. Check the wiring harness between the ABS-ECU connector terminal and the wheel speed sensor connector terminal

Code No.C1014 is set

- Check of short to power supply, short to earth, and open circuit in FL+, FL– line between ABS-ECU connector and front wheel speed sensor (LH) connector.

Code No.C101F is set

- Check of short to power supply, short to earth, and open circuit in FR+, FR– line between ABS-ECU connector and front wheel speed sensor (RH) connector.

Code No.C102A is set

- Check of short to power supply, short to earth, and open circuit in RL+, RL– line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Code No.C1035 is set

- Check of short to power supply, short to earth, and open circuit in RR+, RR– line between ABS-ECU connector and rear wheel speed sensor (RH) connector.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the connector(s) or wiring harness. Then go to Step 11.

STEP 5. Check for wheel speed sensor installation

Check how the wheel speed sensor is installed (Disconnection of wheel speed sensor, loose mounting bolt, etc.).

Q: Is the check result normal?

YES : Go to Step 6.

NO : Reinstall the wheel speed sensor correctly (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 6.

STEP 6. Check for wheel speed sensor output current

Refer to P.35B-58.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 10.

STEP 7. Check for wheel bearing looseness

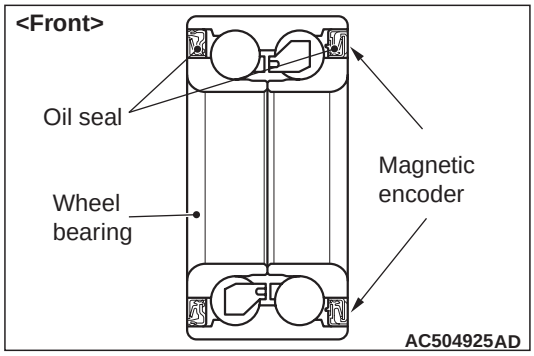
NOTE: Loose wheel bearing may increase the gap between the wheel speed sensor and the wheel speed detection magnet encoder. Check the wheel bearing for looseness. <Refer to GROUP 26 – Wheel Bearing Axial Play Check . (front), GROUP 27A – Wheel Bearing Axial Play Check (rear-2WD) or GROUP 27B – Wheel Bearing Axial Play Check (rear-4WD)>

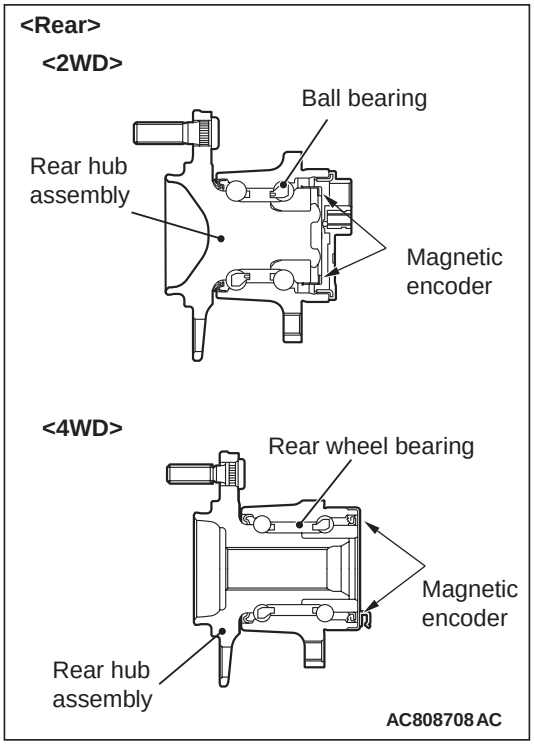
Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 11.

STEP 8. Check of wheel speed detection encoder





Check the encoder for adhesion of foreign materials or deformation.

Q: Is the check result normal?

YES : Go to Step 9.

NO (Adhesion of foreign materials) : Remove the foreign materials and clean the encoder so as not to disturb the magnetisation pattern on it while taking care of the magnet, magnetic substance, and magnetic attraction. Then go to Step 11.

NO (Deformation) : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 11.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1014, C101F, C102A or C1035 set?
YES : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1014, C101F, C102A or C1035 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 11.
NO : This diagnosis is complete.

STEP 11. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1014, C101F, C102A or C1035 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1041 FL wheel speed tone performance
Code No. C1042 FR wheel speed tone performance
Code No. C1043 RL wheel speed tone performance
Code No. C1044 RR wheel speed tone performance

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
- The wheel speed sensor is a kind of a pulse generator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting the wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to the wheel speed.
- The pulse signals, which the wheel speed sensor creates, are sent to ABS-ECU. ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS
ABS-ECU monitors the signals from each wheel speed sensor while the vehicle is being driven. If any periodical drop is found in these sensor signals, ABS-ECU will set the relevant diagnosis code.

PROBABLE CAUSES
- Wheel bearing malfunction
- Deformation of the wheel speed detection encoder
- Adhesion of foreign materials on the wheel speed detection encoder
- ABS-ECU malfunction
- The number of poles on the Magnetic encoder for wheel speed detection (N-pole and S-pole) is changed

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

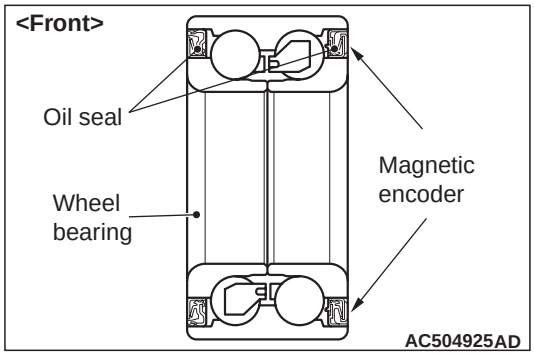
Q: Is the diagnosis code No.C1041, C1042, C1043 or C1044 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

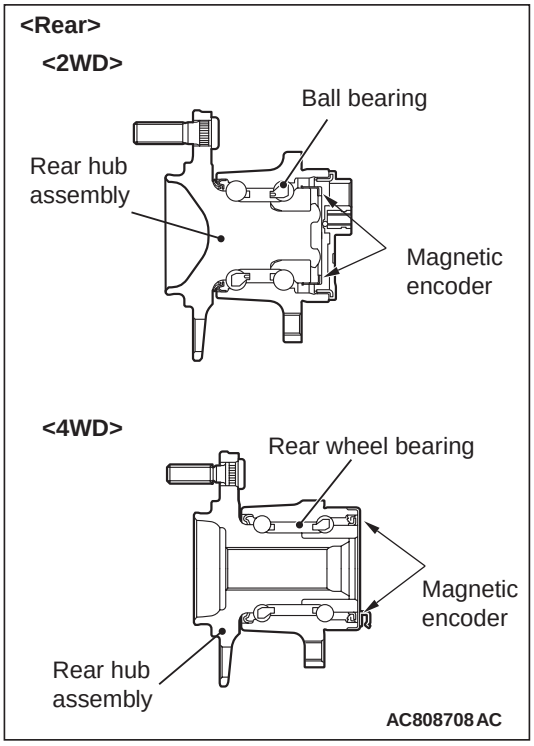
STEP 3. Check for wheel bearing looseness

NOTE: Loose wheel bearing may increase the gap between the wheel speed sensor and the wheel speed detection magnet encoder. Check the wheel bearing for looseness. <Refer to GROUP 26 – Wheel Bearing Axial Play Check . (front), GROUP 27A – Wheel Bearing Axial Play Check (rear-2WD) or GROUP 27B – Wheel Bearing Axial Play Check (rear-4WD)>

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 7.

STEP 4. Check of wheel speed detection encoder





Check the encoder for adhesion of foreign materials or deformation.

Q: Is the check result normal?
YES : Go to Step 5.
NO (Adhesion of foreign materials) : Remove the foreign materials and clean the encoder so as not to disturb the magnetisation pattern on it while taking care of the magnet, magnetic substance, and magnetic attraction. Then go to Step 7.
NO (Deformation) : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 7.

STEP 5. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1041, C1042, C1043 or C1044 set?
YES : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 6.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 6. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1041, C1042, C1043 or C1044 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 7.
NO : This diagnosis is complete.

STEP 7. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1041, C1042, C1043 or C1044 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1046 FL wheel speed sensor phase
Code No. C1047 FR wheel speed sensor phase
Code No. C1048 RL wheel speed sensor phase
Code No. C1049 RR wheel speed sensor phase

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
- The wheel speed sensor is a kind of a pulse generator. It consists of encoders (a plate on which north and south pole sides of the magnets are arranged alternately) for detecting the wheel speed which rotates at the same speed of the wheels and wheel speed sensors. This sensor outputs frequency pulse signals in proportion to the wheel speed.
- The pulse signals, which the wheel speed sensor creates, are sent to ABS-ECU. ABS-ECU uses the frequency of the pulse signals to determine the wheel speed.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if any malfunction below is found:
- When the brake fluid pressure is decreased for a long time.
- When the brake fluid pressure is held for a long time.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- External noise interference
- Malfunction of wheel speed sensor
- ABS-ECU malfunction
- Excessive gap between the wheel speed sensor and the magnetic encoder for wheel speed detection
- Adhesion of foreign materials on the wheel speed sensor
- Adhesion of foreign materials on the magnetic encoder for wheel speed detection
- Wheel bearing malfunction
- Improper installation of the wheel speed sensor
- Deformation of the magnetic encoder for wheel speed detection
- Disturbance of magnetization pattern for magnetic encoder for wheel speed detection
- Missing teeth of the magnetic encoder for wheel speed detection

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1046, 1047, 1048 or 1049 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code

Code No.C1046 is set
- Check that the diagnosis codes No.C100A, C1011, C1014, and C1041 are also set.

Code No.C1047 is set
- Check that the diagnosis codes No.C1015, C101C, C101F, and C1042 are also set.

Code No.C1048 is set
- Check that the diagnosis codes No.C1020, C1027, C102A, and C1043 are also set.

Code No.C1049 is set
- Check that the diagnosis codes No.C102B, C1032, C1035, and C1044 are also set.

Q: Are the diagnosis codes set?
YES : Carry out the diagnosis for the relevant diagnosis codes.
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35B-54).
- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 5.

STEP 5. Check the wiring harness between the ABS-ECU connector terminal and the wheel speed sensor connector terminal

Code No.C1046 is set
- Check of short to power supply, short to earth, and open circuit in FL+, FL– line between ABS-ECU connector and front wheel speed sensor (LH) connector.

Code No.C1047 is set
- Check of short to power supply, short to earth, and open circuit in FR+, FR– line between ABS-ECU connector and front wheel speed sensor (RH) connector.

Code No.C1048 is set
- Check of short to power supply, short to earth, and open circuit in RL+, RL– line between ABS-ECU connector and rear wheel speed sensor (LH) connector.

Code No.C1049 is set
- Check of short to power supply, short to earth, and open circuit in RR+, RR– line between ABS-ECU connector and rear wheel speed sensor (RH) connector.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the connector(s) or wiring harness. Then go to Step 12.

STEP 6. Check for wheel speed sensor installation
Check how the wheel speed sensor is installed (Disconnection of wheel speed sensor, loose mounting bolt, etc.).

Q: Is the check result normal?
YES : Go to Step 7.
NO : Reinstall the wheel speed sensor correctly (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 7.

STEP 7. Check for wheel speed sensor output current
Refer to P.35B-58.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 11.

STEP 8. Check for wheel bearing looseness

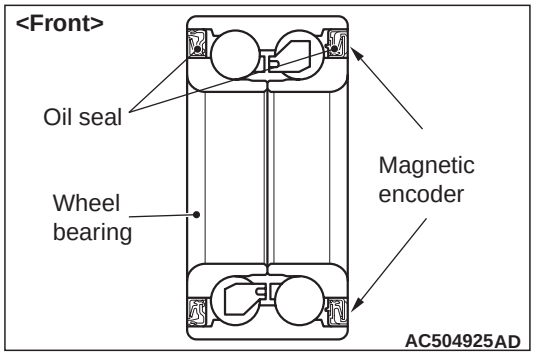
NOTE: Loose wheel bearing may increase the gap between the wheel speed sensor and the wheel speed detection magnet encoder. Check the wheel bearing for looseness. <Refer to GROUP 26 – Wheel Bearing Axial Play Check . (front), GROUP 27A – Wheel Bearing Axial Play Check (rear-2WD) or GROUP 27B – Wheel Bearing Axial Play Check (rear-4WD)>

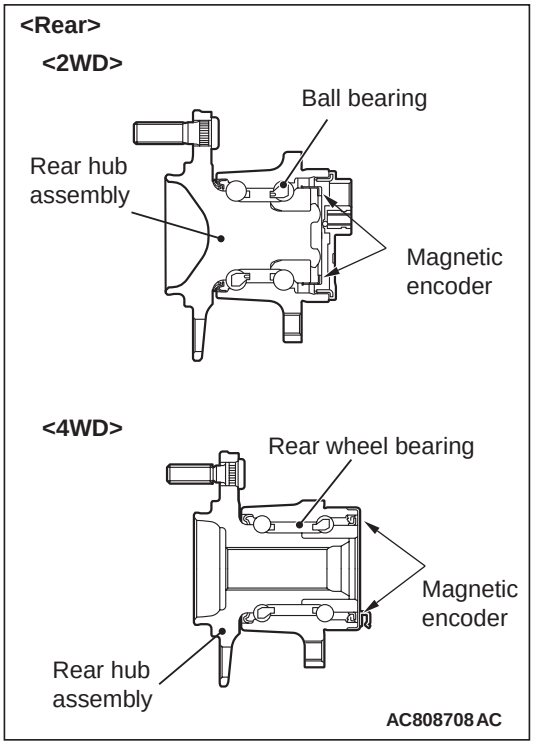
Q: Is the check result normal?

YES : Go to Step 9.

NO : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 12.

STEP 9. Check of wheel speed detection encoder





Check the encoder for adhesion of foreign materials or deformation.

Q: Is the check result normal?

YES : Go to Step 10.

NO (Adhesion of foreign materials) : Remove the foreign materials and clean the encoder so as not to disturb the magnetization pattern on it while taking care of the magnet, magnetic substance, and magnetic attraction. Then go to Step 12.

NO (Deformation) : Replace the wheel bearing <front> or rear wheel hub assembly <rear>. <Refer to GROUP 26 – Front Axle Hub Assembly (front), GROUP 27A – Rear Axle Hub Assembly (rear-2WD) or GROUP 27B – Rear Axle Hub Assembly (rear-4WD)> Then go to Step 12.

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1046, 1047, 1048 or 1049 set?
YES : Replace the wheel speed sensor (Refer to P.35B-63 <front> or P.35B-65 <rear>). Then go to Step 11.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 11. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1046, 1047, 1048 or 1049 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 12.
NO : This diagnosis is complete.

STEP 12. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1046, 1047, 1048 or 1049 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C104B FL inlet valve
Code No. C104F FR inlet valve
Code No. C1053 RL inlet valve
Code No. C1057 RR inlet valve
Code No. C105F FL outlet valve
Code No. C1063 FR outlet valve
Code No. C1067 RL outlet valve
Code No. C105B RR outlet valve

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
- ABS-ECU contains the power supply circuit (+ BV terminal) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in ABS-ECU.
- The valve relay, which is incorporated in ABS-ECU, is always energising the solenoid valve unless the initial check is in progress when the ignition switch is turned on, and the recurrent system check is in progress.
- ABS-ECU activates the solenoid valve by turning on its driving transistor.

DIAGNOSIS CODE SET CONDITIONS
These diagnosis codes will be set under the cases below:
- The solenoid valve is not energized even after ABS-ECU has turned on the driving transistor (Open circuit is present in the power supply circuit to the ABS-ECU solenoid valve, or the valve relay has failed).
- The solenoid valve is not energised even after ABS-ECU has turned on the driving transistor (Open circuit is present in the solenoid valve circuit in ABS-ECU, or the valve relay has failed).
- After ABS-ECU has turned off the driving transistor, the solenoid valve still remains energized (short in the solenoid valve circuit).
- When a solenoid valve failure is detected

PROBABLE CAUSES
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the relevant diagnosis code set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the relevant diagnosis code set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the relevant diagnosis code set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C2104 Valve power supply circuit

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- ABS-ECU contains the power supply circuit (+BV terminal) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in ABS-ECU.
- The valve relay, which is incorporated in ABS-ECU, is always energising the solenoid valve unless the initial check is in progress when the ignition switch is turned on, and the recurrent system check is in progress.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code will be set when the solenoid valve supply voltage is not within the standard value.

PROBABLE CAUSES

Current trouble
- Fusible link malfunction
- Damaged wiring harness and connectors
- Abnormality in battery or alternator
- ABS-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between the power supply circuit (+BV terminal) to ABS-ECU solenoid valve or earth circuit (GND1, GND2 terminal). For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C2104 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
NO : Replace the battery. Then go to Step 10.

YES : Go to Step 4.

STEP 4. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s). Then go to Step 10.

STEP 5. Fusible link check: Check the fusible link No.4 and SBF7.
Visually check for open circuit in the fusible link No.4 and SBF7.

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

STEP 6. Resistance measurement at ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Disconnect the fusible link No.SBF7.
(3) Resistance between the +BV terminal and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Replace the fusible link No.4 or SBF7. Then go to Step 10.
NO : The short circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BV terminal and the fusible link, and then replace the fusible link No.4 or SBF7. Then go to Step 10.

STEP 7. Voltage measurement at the ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between the +BV terminal and the body earth.

OK: Approximately system voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : The open circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BV terminal and the fusible link. Then go to Step 10.

STEP 8. Resistance measurement at ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the GND1 terminal and the body earth, and between the GND2 terminal and the body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : An open circuit may be present in the earth circuit. Repair the wiring harness between the ABS-ECU connector GND1 terminal and the body earth, and between the ASC-ECU connector GND2 terminal and the body earth. Then go to Step 10.

STEP 9. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No.C2104 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No.C2104 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1073 Motor drive circuit

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

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

DIAGNOSIS CODE SET CONDITIONS

If the pump motor switch voltage drop indicates high value when the pump motor operates or after the operation, the pump motor operation is stopped and this diagnosis code is set.

PROBABLE CAUSES

Current trouble

- Fusible link malfunction
- Damaged wiring harness and connectors
- Abnormality in battery or alternator
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between the power supply circuit (+BM terminal) to the ABS-ECU motor and the earth circuit (GND1, GND2 terminal). For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

Q: Is the diagnosis code No.C1073 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 4.
NO : Replace the battery. Then go to Step 10.

STEP 4. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s). Then go to Step 10.

STEP 5. Fusible link check: Check the fusible link No.4 and SBF5.
Visually check for open circuit in the fusible link No.4 and SBF5.

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

STEP 6. Resistance measurement at ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the +BM terminal and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Replace the fusible link No.4 or SBF5. Then go to Step 10.
NO : The short circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BM terminal and the fusible link, and then replace the fusible link No.4 or SBF5. Then go to Step 10.

STEP 7. Voltage measurement at the ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between the +BM terminal and the body earth.

OK: Approximately system voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : The open circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BM terminal and the fusible link. Then go to Step 10.

STEP 8. Resistance measurement at ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the GND1 terminal and the body earth, and between the GND2 terminal and the body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : An open circuit may be present in the earth circuit. Repair the wiring harness between the ABS-ECU connector GND1 terminal and the body earth, and between the ABS-ECU connector GND2 terminal and the body earth. Then go to Step 10.

STEP 9. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1073 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1073 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C2116 Pump motor voltage low

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION

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

DIAGNOSIS CODE SET CONDITIONS

This diagnosis codes will be set under the cases below:

- When the power supply voltage of the pump motor, which is not in operation, is abnormally low for a prolonged period
- When the power supply voltage of the pump motor, which is not in operation, is abnormally high for a prolonged period

PROBABLE CAUSES

Current trouble

- Fusible link malfunction
- Damaged wiring harness and connectors
- Abnormality in battery or alternator
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between the power supply circuit (+BM terminal) to the ABS-ECU motor and the earth circuit (GND1, GND2 terminal). For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Use Troubleshooting/How to Treat Past Trouble).

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C2116 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check

Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 4.
NO : Replace the battery. Then go to Step 10.

STEP 4. Charging system check

Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s). Then go to Step 10.

STEP 5. Fusible link check: Check the fusible link No.4 and SFB5.

Visually check for open circuit in the fusible link No.4 and SFB5.

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

STEP 6. Resistance measurement at ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Disconnect the fusible link No.4 or SFB5.
(3) Resistance between the +BM terminal and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Replace the fusible link No.4 or SFB5. Then go to Step 10.
NO : The short circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BM terminal and the fusible link, and then replace the fusible link No.4 or SFB5. Then go to Step 10.

STEP 7. Voltage measurement at the ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between the +BM terminal and the body earth.

OK: Approximately system voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : The open circuit may be present in the power supply circuit. Repair the wiring harness between the ABS-ECU connector +BM terminal and the fusible link. Then go to Step 10.

STEP 8. Resistance measurement at ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the GND1 terminal and the body earth, and between the GND2 terminal and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 9.
NO : An open circuit may be present in the earth circuit. Repair the wiring harness between the ABS-ECU connector GND1 terminal and the body earth, and between the ABS-ECU connector GND2 terminal and the body earth. Then go to Step 10.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C2116 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C2116 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1000 Brake SW (stuck)

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION
ETACS-ECU sends the ON signal generated when the brake pedal is depressed and OFF signal generated when it is released to ABS-ECU via the CAN bus lines.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set in the following case.
- When the vehicle has run for a long time with the stop lamp switch turned ON.
- When the OFF status of the stop lamp switch does not match the vehicle attitude

PROBABLE CAUSES
- Damaged wiring harness and connectors
- Improper adjustment of stop lamp switch installation position
- Malfunction of the stop lamp switch
- Malfunction of ETACS-ECU
- ABS-ECU malfunction

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is diagnosis code No.C1000 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III other system's data list
Check the ETACS-ECU system data list.
- The brake pedal is depressed.

Item No.	Item name	Normal condition
290	Stop lamp switch	OFF to ON

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to GROUP 54A – ETACS, Inspection Procedure 12 "The stop lamp switch signal is not received."

STEP 4. Diagnosis code recheck
Erase the diagnosis code.

Q: Is diagnosis code No.C1000 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 5. Diagnosis code recheck
Erase the diagnosis code.

Q: Is diagnosis code No.C1000 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C2200 ECU internal error

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION
ABS-ECU controls ABS by calculating the data sent from the wheel speed sensor and the G sensor.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set when ABS-ECU has malfunction.

PROBABLE CAUSES
ABS-ECU malfunction

DIAGNOSTIC PROCEDURE

Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No. C2200 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).
NO : This diagnosis is complete.

Code No. C2101 Power supply high voltage

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The ABS-ECU is energized by the valve power supply circuit (+BV terminal). When the power is supplied from the ignition switch (IG1) to the IG1 relay in ETACS-ECU, IG1 relay is turned on. At this time, the valve power supply circuit (IG1 terminal) energizes the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set when the ABS-ECU power supply voltage is more than 18.0 ± 1.0 V.

PROBABLE CAUSES
- Battery failure
- ABS-ECU malfunction
- Charging system failed

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is diagnosis code No.C2101 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Charge or replace the battery. Then go to Step 4.

STEP 4. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s).

STEP 5. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No.C2101 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 6.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 6. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No.C2101 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1395 Incomplete Brake fluid filling

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set when the brake fluid is not filled in the hydraulic unit.

PROBABLE CAUSES
- Different hydraulic unit (For delivery to factory)
- ABS-ECU malfunction

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No. C1395 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).
NO : This diagnosis is complete.

Code No. C1210 Longitudinal G SNS.input circuit

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
- ABS-ECU monitors if the output of G sensor is normal or not.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if any malfunction below is found:
- When the output value of the G sensor is abnormal

PROBABLE CAUSES

- ABS-ECU malfunction
- External noise interference

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1210 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III data list
Check the following data list (Refer to P.35B-54).

- Item 09: G sensor

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No.C1210 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 5. Check whether the diagnosis code is reset.

Q: Is the diagnosis code No.C1210 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C1242 Longitudinal G sensor signal

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- ABS-ECU monitors if the output of G sensor is normal or not.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set when the abnormality is detected by comparing the G sensor value output from the G sensor with the value output from the wheel speed sensor.

PROBABLE CAUSES

- Improper installation of the G sensor
- Malfunction of wheel speed sensor
- ABS-ECU malfunction
- External noise interference
- When the vehicle is driven on a drum roller

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1242 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check the wheel speed sensor-related diagnosis code.
Use the M.U.T.-III to check whether the wheel speed sensor-related diagnosis code is set or not.

Q: Is any diagnosis code set?

YES : Troubleshoot for the relevant diagnosis code (Refer to P.35B-11).
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35B-54).
- Item 09: G sensor

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61), and then go to Step 6.

STEP 5. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1242 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 6.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 6. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is the diagnosis code No.C1242 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C123A: Sensor calibration
Code No. C2002: Valve calibration not completed

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION
ABS-ECU stores the calibrated value of the G sensor.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set when the calibrated value for G sensor stored in ABS-ECU is not within the predetermined range.

PROBABLE CAUSES
- Power supply is shut down while the calibrated value is being stored.
- ABS-ECU malfunction

STEP 4. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is diagnosis code No.C123A or C2002 set?
YES : Go to Step 3
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Go to Step 4.

Q: Is the charging system in good condition?

YES : Replace the battery. Then go to Step 9.
NO : Repair or replace the charging system component(s).

STEP 5. Voltage measurement at the ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between the +BV terminal and the body earth.

OK: Approximately system voltage

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

STEP 6. Check of short to power supply, short to earth, and open circuit in +BV line between fusible link and ABS-ECU connector

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the fusible link, connector(s) or wiring harness.

STEP 7. Resistance measurement at ABS-ECU connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the GND1 terminal and the body earth, and between the GND2 terminal and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check of open circuit in GND1, GND2 line between ABS-ECU connector and body earth

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness.

STEP 9. Check whether the diagnosis code is reset.

Erase the diagnosis code.

Q: Is diagnosis code No.C123A or C2002 set?
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61), and then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 10. Check whether the diagnosis code is reset.

Erase the diagnosis code.

Q: Is diagnosis code No.C123A or C2002 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1608 EEPROM fail

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **If the ABS-ECU connector is disconnected or the battery terminal is disconnected when the ignition switch is ON, this diagnosis code may be set.**
- **Since the failure information stored in the past is erased after this diagnosis is carried out, reproduce the state of malfunction.**

OPERATION

The ABS-ECU stores diagnosis codes and failure information in the EEPROM*.

The ABS-ECU is energized by the solenoid valve power supply circuit (+BV terminal).

*NOTE: *:EEPROM (Electrical Erasable and Programmable ROM)*

DIAGNOSIS CODE SET CONDITIONS

- This diagnosis code is set when the failure information stored in the EEPROM is not reliable. The failure information stored in the past is not output, and only this diagnosis code is set.
- This diagnosis code may occur when ABS-ECU power supply shutdown or drop between ABS-ECU is writing a data to the EEPROM.

PROBABLE CAUSES

- Disconnection of the ABS-ECU connector or the battery terminal when the ignition switch is ON
- Loose battery terminal

- Abnormality in battery
- Damaged wiring harness and connectors
- ABS-ECU malfunction

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1608 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Replace the battery. Then go to Step 9.
NO : Repair or replace the charging system component(s).

STEP 5. Voltage measurement at the ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between the +BV terminal and the body earth.

OK: Approximately system voltage

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

STEP 6. Check of short to power supply, short to earth, and open circuit in +BV line between fusible link and ABS-ECU connector

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the fusible link, connector(s) or wiring harness.

STEP 7. Resistance measurement at ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the GND1 terminal and the body earth, and between the GND2 terminal and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check of open circuit in GND1, GND2 line between ABS-ECU connector and body earth

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.

Q: Is diagnosis code No. C1608 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to step 10.
NO : Go to step 11.

STEP 10. Check whether the diagnosis code is reset.
Drive the vehicle at 20 km/h or higher.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is diagnosis code No. C1608 set?
YES : Return to Step 1.
NO : Go to step 11.

STEP 11. Check the other diagnosis code.
Drive the vehicle at 20 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 20 km/h or higher.

Q: Is any diagnosis code set?

YES : Carry out the applicable troubleshooting for the diagnosis code (Refer to P.35B-11).
NO : The procedure is complete.

Code No.C1707: Implausible coding data

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**
- **When diagnosis code No.C1707 is set in ABS-ECU, the diagnosis code may also be set in ETACS-ECU. When the diagnosis code is set in ETACS-ECU, carry out the diagnosis of the diagnosis code for ETACS-ECU first.**

OPERATION

ABS-ECU receives the vehicle information stored in the ETACS-ECU via CAN bus lines.

DIAGNOSIS CODE SET CONDITIONS

When received unset coding data from the ETACS-ECU, this diagnosis code is set.

PROBABLE CAUSES

- Malfunction of ETACS-ECU
- ETACS-ECUs have been interchanged between two vehicles.
- ABS-ECU malfunction
- ABS-ECUs have been interchanged between two vehicles.
- Malfunction of ETACS-ECU coding data

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is diagnosis code No.C1707 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III other system diagnosis code
Use M.U.T.-III to check whether any coding-related diagnosis code is set by ETACS-ECU.

Q: Is the diagnosis code set?
YES : Troubleshoot for the relevant diagnosis code.
NO : Go to Step 4.

STEP 4. Check part number of ABS-ECU
Check the part number of ABS-ECU.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 8.

STEP 5. ETACS-ECU coding data check
Refer to GROUP 00 – Coding List .

Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the ETACS-ECU (Refer to GROUP 54A – ETACS-ECU).

STEP 6. Check part number of ETACS-ECU
Check the part number of ETACS-ECU.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the ETACS-ECU (Refer to GROUP 54A – ETACS-ECU).

STEP 7. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "OFF" position.
(3) Turn the ignition switch to the "ON" position.
(4) Turn the ignition switch to the "OFF" position.
(5) Turn the ignition switch to the "ON" position.
(6) Check that the ABS warning lamp goes out.

Q: Is diagnosis code No.C1707 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 8.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "OFF" position.
(3) Turn the ignition switch to the "ON" position.
(4) Turn the ignition switch to the "OFF" position.
(5) Turn the ignition switch to the "ON" position.
(6) Check that the ABS warning lamp goes out.

Q: Is diagnosis code No.C1707 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C2204 Sensor cluster internal error

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION
The ABS-ECU communicates with its integrated G sensor.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code will be set when the ABS-ECU detects an defective G sensor.

NOTE: This diagnosis code may be set when G and yaw rate sensor is put on the turntable turning at high speed.

PROBABLE CAUSES
- ABS-ECU malfunction

DIAGNOSTIC PROCEDURE

Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is the diagnosis code No. C2204 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).
NO : This diagnosis is complete.

Code No. U0114 4WD CAN timeout
Code No. U0141 ETACS CAN timeout

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **If diagnosis codes U0114 and U0141 are set in ABS-ECU, always diagnose the CAN bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set. In this case, the set diagnosis code is not highly reliable.**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**
- **When the ETACS-ECU of vehicles without KOS is replaced, the encrypted code of the ignition key needs to be registered to the ETACS-ECU. (If the encrypted code is not registered, the engine cannot be started. Register the encrypted code as described in GROUP 54A, Immobilizer System – How to Register Key ID .)**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ABS-ECU cannot receive the signal sent from other ECU for a certain period.

OPERATION
ABS-ECU communicates with the 4WD-ECU and ETACS-ECU via the CAN bus lines.

PROBABLE CAUSES

Code No. U0114

- Wiring harness or connector failure of CAN bus line
- 4WD-ECU malfunction
- ABS-ECU malfunction

Code No. U0141

- Wiring harness or connector failure of CAN bus line
- ETACS-ECU malfunction
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 4.

STEP 2. Check whether the diagnosis code is reset.

Q: Is Code No. U0114 or U0141 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III other system diagnosis code
Use M.U.T.-III to check that other diagnosis code is set in the ECU corresponding to the relevant diagnosis.

Q: Is other diagnosis code set?
YES : Troubleshoot for the relevant diagnosis code.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
Use M.U.T.-III to check if the same diagnosis code (time-out) is set in the other ECU.

Q: Is any diagnosis code set?
YES (Code No. U0114 is set) : Replace 4WD-ECU, and then go to Step 5.
YES (Code No. U0141 is set) : Replace the ETACS-ECU, and then go to Step 5.
NO (No diagnosis code is set.) : The procedure is complete.

STEP 5. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is Code No. U0114 or U0141 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).
NO : The procedure is complete.

Code No. U1073 Bus-off

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **If diagnosis code U1073 is set in ABS-ECU, always diagnose the CAN bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set. In this case, the set diagnosis code is not highly reliable.**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set when ABS-ECU has ceased the CAN communication (bus off).

COMMENTS ON TROUBLE SYMPTOM

Malfunction of wiring harness, connector (s), or ABS-ECU may be present.

PROBABLE CAUSES

- Wiring harness or connector failure of CAN bus line
- ABS-ECU malfunction
- Other ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 3.

STEP 2. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No. U1073 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61), and then go to Step 3.
NO : If the trouble symptom is resolved, an intermittent malfunction such as poorly engaged connector(s) or wiring harness is suspected (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 3. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No. U1073 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. U1195 Coding not completed
Code No. U1197 Coding data unavailable

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**
- **When the diagnosis code U1195 or U1197 is set in ABS-ECU, the diagnosis code may also be set in ETACS-ECU. When the diagnosis code is set in ETACS-ECU, carry out the diagnosis of the diagnosis code for ETACS-ECU first.**

OPERATION
ABS-ECU receives the vehicle information stored in the ETACS-ECU via CAN bus lines.

DIAGNOSIS CODE SET CONDITIONS
ABS-ECU communicates with ETACS-ECU via CAN bus lines.
This diagnosis code No.U1195 is set when the variant coding for ETACS-ECU has not been implemented.
This diagnosis code No.U1197 is set when there is difference between the vehicle information from the ETACS-ECU and the vehicle information stored in the ABS-ECU.

PROBABLE CAUSES
Code No.C1195 is set
- Variant coding for ETACS-ECU has not been implemented.
- ABS-ECU malfunction

Code No.C1197 is set
- Malfunction of ETACS-ECU
- ETACS-ECU have been interchanged between two vehicles.
- ABS-ECU malfunction
- External noise interference
- ABS-ECU have been interchanged between two vehicles.

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No. U1195 or U1197 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III other system diagnosis code
Use M.U.T.-III to check whether the ETACS-ECU-related diagnosis code is set or not.

Q: Is any diagnosis code set?

YES : Troubleshoot for the relevant diagnosis code.
NO : Go to Step 4.

STEP 4. Check ETACS coding data
Refer to GROUP 00 – Coding List .

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

STEP 5. ETACS-ECU variant coding
Perform the variant coding to the ETACS-ECU.

Q: Dose variant coding succeed?
YES : Go to Step 7.
NO : Replace the ETACS-ECU (Refer to GROUP 54A – ETACS-ECU), and then go to Step 7.

STEP 6. Check part number of ABS-ECU
Check the part number of ABS-ECU.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 8.

STEP 7. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "OFF" position.
(3) Turn the ignition switch to the "ON" position.
(4) Turn the ignition switch to the "OFF" position.
(5) Turn the ignition switch to the "ON" position.
(6) Check that the ABS warning lamp goes out.

Q: Is the diagnosis code No.U1195 or U1197 set?
YES : Replace the hydraulic unit (ABS-ECU) (Refer to P.35B-61). Then go to Step 8.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "OFF" position.
(3) Turn the ignition switch to the "ON" position.
(4) Turn the ignition switch to the "OFF" position.
(5) Turn the ignition switch to the "ON" position.
(6) Check that the ABS warning lamp goes out.

Q: Is the diagnosis code No.U1195 or U1197 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

TROUBLE SYMPTOM CHART

M1352011401667

⚠ CAUTION

- **ABS may operate in the following conditions without hard braking: Slippery road surface, high-speed turn, and bumpy road surface. When asking the customers, confirm that they have/have not encountered ABS operation in corresponding conditions.**
- **During ABS operation, the brake pedal is pulled forward gradually, and the noise occurs at the same time. This is because the brake line pressure varies intermittently to prevent the wheel lock, and not a system malfunction.**
- **During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**

Trouble symptom	Inspection procedure No.	Reference page
M.U.T.-III cannot communicate only with ABS-ECU.	1	P.35B-44
Brake warning lamp stays ON with the parking brake lever released.	2	P.35B-44
ABS warning lamp does not illuminate when ignition switch is turned to the ON position (Engine stopped).	3	P.35B-46
Brake warning lamp does not illuminate when the ignition switch is turned to ON position (Engine stopped).	4	P.35B-47
ABS warning lamp stays ON after the engine is started.	5	P.35B-48

Trouble symptom	Inspection procedure No.	Reference page
Abnormality in brake operation	6	P.35B-49
ABS system inoperative	7	P.35B-50
ABS-ECU power supply circuit system	8	P.35B-51
ABS operate too frequently.	9	P.35B-53
The initial check sound of hydraulic unit is loud	10	P.35B-54

SYMPTOM PROCEDURES

Inspection Procedure 1: M.U.T.-III cannot communication only with ABS-ECU.

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**
- **If the power is supplied with the earth circuit of CAN communication device open circuited, an electric potential abnormality may occur to the CAN bus lines.**

COMMENTS ON TROUBLE SYMPTOM
When M.U.T.-III cannot communicate with the ABS system, the CAN bus line, ABS-ECU power supply circuit system, or ABS-ECU may be faulty.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- ABS-ECU malfunction
- Wrong routing of M.U.T.-III harness
- Abnormality in battery or alternator
- Abnormality in power supply voltage to ABS-ECU
- ECU malfunction of other system

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Check the power supply circuit, and repair if necessary (Refer to P.35B-51).
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

Inspection Procedure 2: Brake warning lamp stays ON with the parking brake lever released.

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION
- When the parking brake switch is turned ON, the combination meter (BRK terminal) is earthed, and then the brake warning lamp illuminates.
- When reduction of the brake fluid amount is detected, the brake fluid level switch is turned from ON to OFF. ETACS-ECU monitors the brake fluid level switch, and instructs the combination meter via the CAN bus line to illuminate the brake warning lamp.

COMMENTS ON TROUBLE SYMPTOM
This may be caused by earth fault in the parking brake switch circuit.

PROBABLE CAUSES
- The brake pad thickness is at the limit value or less.

- The brake fluid amount is at the "LOWER" level or lower.
- Poor adjustment of the parking brake lever
- Damaged wiring harness and connectors
- Parking brake switch malfunction
- Brake fluid level switch malfunction
- Combination meter malfunction
- ETACS-ECU malfunction

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

STEP 2. M.U.T.-III diagnosis code for other systems.
Use M.U.T.-III to check that the diagnosis code is set in the combination meter and ETACS-ECU.

Q: Is the diagnosis code set?
YES : Carry out the diagnosis for the diagnosis code.
NO : Go to Step 3.

STEP 3. Brake fluid level check
Check that the brake fluid is filled up to the "MIN" level or higher.

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

STEP 4. Brake pad check
Refer to GROUP 35A – On-vehicle Service/Brake Pad Check .

Q: Is the check result normal?
YES : Fill the brake fluid up to the "MAX" level. Then go to Step 5.
NO : Replace the brake pad (Refer to GROUP 35A – On-vehicle Service/Brake Pad Replacement). Then go to Step 14.

STEP 5. M.U.T.-III data list for other system
Check the ETACS-ECU system data list.

Item No.	Item name	Normal condition
279	Brake fluid switch	ON

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 6.

STEP 6. Brake fluid level switch check
Refer to GROUP 35A – On-vehicle Service/Brake Fluid Level Switch Check .

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the reservoir tank assembly (Refer to GROUP 35A – Master Cylinder Assembly and Brake Booster). Then go to Step 14.

STEP 7. Resistance measurement at brake fluid level switch connector.
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the resistance between the brake fluid level switch connector (earth terminal) and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check of open circuit in earth line between brake fluid level switch connector and the body earth

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector(s) or wiring harness.

STEP 9. Check of short to power supply, short to earth, and open circuit in HL1+ line between ETACS-ECU connector and brake fluid level switch connector

Q: Is the check result normal?
YES : Replace the ETACS-ECU (Refer to GROUP 54A – ETACS-ECU). Then go to Step 14.
NO : Repair the connector(s) or wiring harness.

STEP 10. Parking brake lever stroke check
Refer to GROUP 36 – On-vehicle Service/Parking Brake Lever Stroke Check and Adjustment .

Q: Is the check result normal?
YES : Go to Step 11.
NO : Adjust the parking brake lever stroke (Refer to GROUP 36 – On-vehicle Service/Parking Brake Lever Stroke Check and Adjustment). Then go to Step 14.

STEP 11. Parking brake switch check
Refer to GROUP 36 – On-vehicle Service/Parking Brake Switch Check .

Q: Is the check result normal?
YES : Go to Step 12.
NO : Replace the parking brake switch (Refer to GROUP 36 – Parking Brake Lever). Then go to Step 14.

STEP 12. Check of short to power supply, short to earth, and open circuit in BRK line between combination meter connector and parking brake switch connector

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the connector(s) or wiring harness.

STEP 13. Retest the system.

Q: Does the brake warning lamp turn ON and OFF normally according to the parking brake lever operation?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Replace the combination meter assembly (Refer to GROUP 54A – Combination Meter). Then go to Step 14.

STEP 14. Retest the system.

Q: Does the brake warning lamp turn ON and OFF normally according to the parking brake lever operation?
YES : This diagnosis is complete.
NO : Return to Step 1.

Inspection Procedure 3: ABS warning lamp does not illuminate when ignition switch is turned to the ON position (engine stopped).

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- ABS-ECU sends the illumination request signal of the ABS warning lamp to the combination meter through ETACS-ECU via CAN communication.
- ABS-ECU illuminates the ABS warning lamp via ETACS-ECU for approximately 3 seconds for valve check with the ignition switch turned to the ON position.

COMMENTS ON TROUBLE SYMPTOM
This may be caused by faults in the CAN bus line, ETACS-ECU, combination meter or ABS-ECU.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- ETACS-ECU malfunction
- Combination meter malfunction
- ABS-ECU malfunction
- Malfunction of coding data for ETACS-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 9.

STEP 2. M.U.T.-III diagnosis code
Use M.U.T.-III to check the diagnosis code for the ABS system.

Q: Is the diagnosis code set?
YES : Carry out the diagnosis for the diagnosis code (Refer to P.35B-11).
NO : Go to Step 3.

STEP 3. M.U.T.-III Special Function for other system
Perform the following special function by the combination meter system, and check if the ABS warning lamp illuminates (Refer to GROUP 54A – Combination Meter).
- Item 6: Indicator (AUTO)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the combination meter.

STEP 4. ETACS-ECU coding data check
Use M.U.T.-III to check if coding data stored in ETACS-ECU is normal (Refer to GROUP 00 – Precautions before Service/Coding List).

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

STEP 5. ETACS-ECU coding data check
Perform the variant coding to the ETACS-ECU.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Replace the ETACS-ECU (Refer to GROUP 54A – ETACS-ECU), and then go to Step 9.

STEP 6. M.U.T.-III diagnosis code for other systems
Using M.U.T.-III, check that diagnosis code No.U0141 is not set by the combination meter system.

Q: Is the diagnosis code set?
YES : Diagnose the combination meter (Refer to GROUP 54A – Combination Meter/Troubleshooting). Then go to Step 9.
NO : Go to Step 7.

STEP 7. M.U.T.-III diagnosis code for other systems
Using M.U.T.-III, check that diagnosis code No. U0121 is not set by the ETACS system.

Q: Is the diagnosis code set?
YES : Perform troubleshooting on ETACS-ECU (Refer to GROUP 54A – ETACS/Troubleshooting). Then go to Step 9.
NO : Go to Step 8.

STEP 8. Retest the system.

Q: Does the ABS warning lamp turn ON and OFF normally?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 9.

STEP 9. Retest the system.

Q: Does the ABS warning lamp turn ON and OFF normally?
YES : This diagnosis is complete.
NO : Return to Step 1.

Inspection Procedure 4: Brake warning lamp does not illuminate when the ignition switch is turned to ON position (Engine stopped).

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- ABS-ECU sends the illumination request signal of the break warning lamp to the combination meter through ETACS-ECU via the CAN communication.
- ABS-ECU illuminates brake warning lamp via ETACS-ECU for approximately 3 seconds for bulb check with the ignition switch turned to the ON position.

COMMENTS ON TROUBLE SYMPTOM
This may be caused by faults in the CAN bus line, ETACS-ECU, combination meter or ABS-ECU.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- Malfunction of ETACS-ECU
- Malfunction of combination meter
- Malfunction of ABS-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 7.

STEP 2. M.U.T.-III diagnosis code

Use M.U.T.-III to check the diagnosis code for the ABS system.

Q: Is the diagnosis code set?

YES : Carry out the diagnosis for the diagnosis code (Refer to P.35B-11).

NO : Go to Step 3.

STEP 3. M.U.T.-III Special Function for other system

Perform the following special function by the combination meter system, and check if the ABS warning lamp illuminates (Refer to GROUP 54A – Combination Meter).

- Item 6: Indicator (AUTO)

Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the combination meter.

STEP 4. M.U.T.-III diagnosis code for other systems

Using M.U.T.-III, check that diagnosis code No.U0141 is not set by the combination meter system.

Q: Is the diagnosis code set?

YES : Diagnose the combination meter (Refer to GROUP 54A – Combination Meter/Troubleshooting). Then go to Step 7.

NO : Go to Step 5.

STEP 5. M.U.T.-III diagnosis code for other systems

Using M.U.T.-III, check that diagnosis code No. U0121 is not set by the ETACS system.

Q: Is the diagnosis code set?

YES : Perform troubleshooting on ETACS-ECU (Refer to GROUP 54A – ETACS/Troubleshooting). Then go to Step 7.

NO : Go to Step 6.

STEP 6. Retest the system.

Q: Does the brake warning lamp turn ON and OFF normally?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).

NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 7.

STEP 7. Retest the system.

Q: Does the brake warning lamp turn ON and OFF normally?

YES : This diagnosis is complete.

NO : Return to Step 1.

Inspection Procedure 5: ABS warning lamp stays ON after the engine is started.

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

OPERATION

- ABS-ECU sends the illumination request signal of the ABS warning lamp to the combination meter through ETACS-ECU via CAN communication.
- ABS-ECU illuminates the ABS warning lamp via ETACS-ECU for approximately 3 seconds for valve check with the ignition switch turned to the ON position.

COMMENTS ON TROUBLE SYMPTOM

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

PROBABLE CAUSES

- Damaged wiring harness and connectors
- Malfunction of ETACS-ECU
- Malfunction of combination meter
- Malfunction of ABS-ECU

NOTE: Due to the abnormality in the supply voltage, the diagnosis code may not be set even when the ABS warning lamp is illuminated.

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 7.

STEP 2. M.U.T.-III diagnosis code
Use M.U.T.-III to check the diagnosis code for the ABS system.

Q: Is the diagnosis code set?
YES : Carry out the diagnosis for the diagnosis code (Refer to P.35B-11).
NO : Go to Step 3.

STEP 3. Check the ABS-ECU power supply circuit system.
Refer to P.35B-51.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Carry out the diagnosis of ABS-ECU power supply circuit system (Refer to P.35B-51).

STEP 4. M.U.T.-III diagnosis code for other systems
Using M.U.T.-III, check that diagnosis code No.U0141 is not set by the combination meter system.

Q: Is the diagnosis code set?
YES : Diagnose the combination meter (Refer to GROUP 54A – Combination Meter/Troubleshooting). Then go to Step 7.
NO : Go to Step 5.

STEP 5. M.U.T.-III diagnosis code for other systems
Using M.U.T.-III, check that diagnosis code No.U0121 is not set by the ETACS system.

Q: Is the diagnosis code set?
YES : Perform troubleshooting on ETACS-ECU (Refer to GROUP 54A – ETACS/Troubleshooting). Then go to Step 7.
NO : Go to Step 6.

STEP 6. Retest the system.
Drive the vehicle more at 10 km/h or high.

Q: Does the ABS warning lamp turn ON and OFF normally?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 7.

STEP 7. Retest the system.
Drive the vehicle more at 10 km/h or high.

Q: Does the ABS warning lamp turn ON and OFF normally?
YES : This diagnosis is complete.
NO : Return to Step 1.

Inspection Procedure 6: Abnormality in brake operation

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

COMMENTS ON TROUBLE SYMPTOM
Although the cause of the trouble cannot be clearly resolved since it depends on the running status and road surface condition, the malfunction of the hydraulic circuit may occur if any diagnosis code is not detected.

PROBABLE CAUSES
- Malfunction of hydraulic unit (integrated with ABS-ECU)
- Malfunction of hydraulic circuit
- Malfunction of brake assembly
- Malfunction of brake booster
- Malfunction of master cylinder assembly

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code check
Use M.U.T.-III to check the diagnosis code for the ABS system (Refer to P.35B-11).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Carry out the diagnosis for the diagnosis code chart (Refer to P.35B-11).

STEP 3. Hydraulic unit (integrated with ABS-ECU) check
Check that the brake tube is correctly mounted to the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).

Q: Is the check result normal?
YES : Go to Step 4.
NO : Connect the brake tubes correctly, and repair or replace the external brake lines of the hydraulic unit (integrated with ABS-ECU).

STEP 4. Brake operation check
Perform the following checks.
- Brake pedal check (Refer to GROUP 35A – On-vehicle Service/Brake Pedal Check).
- Brake booster check (Refer to GROUP 35A – On-vehicle Service/Brake Booster Operation Check).
- Check valve check (Refer to GROUP 35A – On-vehicle Service/Check Valve Operation Check).

Q: Can any fault be found with the brake operation?
YES : Check the brake-related parts, and repair if necessary. Then, go to Step 5.
NO : Go to Step 5.

STEP 5. Hydraulic unit check
Perform the following actuator tests (Refer to P.35B-55).
- Item No.01: FL wheel ABS
- Item No.02: FR wheel ABS
- Item No.03: RL wheel ABS
- Item No.04: RR wheel ABS

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).

Inspection Procedure 7: ABS system inoperative

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever ECU is replaced, ensure that the CAN bus lines are normal.**

COMMENTS ON TROUBLE SYMPTOM
In case of this trouble symptom, ABS system operation may be disabled. Diagnosis code may be set by the ABS system using M.U.T.-III.

PROBABLE CAUSES
- Low battery voltage
- Wiring harness or connector failure of CAN bus line
- The ABS-ECU is defective.
- Different ETACS-ECU, abnormal variant coding information

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Diagnosis code check
Use M.U.T.-III to check the diagnosis code for the ABS system. (Refer to P.35B-11.)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Carry out the diagnosis for the diagnosis code chart (Refer to P.35B-11). Then go to Step 7.

STEP 3. Check the ABS-ECU power supply circuit.
Refer to P.35B-51.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Carry out the diagnosis of ABS-ECU power supply circuit system (Refer to P.35B-51). Then go to Step 7.

STEP 4. Hydraulic unit (integrated with ABS-ECU) check
Check that the brake tube is correctly mounted to the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61).

Q: Is the check result normal?
YES : Go to Step 5.
NO : Connect the brake tube correctly. Then go to Step 7.

STEP 5. Operation check

Q: Does the ABS work normally?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Check the brake system related components except ABS. Then go to Step 6.

STEP 6. Operation check

Q: Does the ABS work normally?
YES : This diagnosis is complete.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 7.

STEP 7. Operation check

Q: Does the ABS warning lamp turn ON and OFF normally?
YES : This diagnosis is complete.
NO : Return to Step 1.

Inspection Procedure 8: ABS-ECU power supply circuit system

⚠ CAUTION
- **When the ABS-ECU power supply voltage becomes 9.7 ± 0.3 V or less, the ABS warning lamp illuminate, and the ABS control is prohibited.**
- **If the battery terminal is not tightened properly, a dump surge may occur and the power supply voltage may become abnormally high for a short time.**

OPERATION
- ABS-ECU contains the power supply circuit (+BV terminal) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in ABS-ECU.
- ABS-ECU contains the power supply circuit (+BM terminal) for the pump motor. The pump motor is energised by the motor relay, which is incorporated in ABS-ECU.
- ABS-ECU contains the power supply circuit (IG1 terminal) for ABS-ECU. When the ignition switch (IG1) is turned ON, the voltage is applied to the relay incorporated in ETACS-ECU to turn ON the relay, and the power is supplied from fusible link through multi-purpose fuse.
- When malfunction occurs in ABS-ECU power supply, the communication with M.U.T.-III becomes unavailable.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- Malfunction of fuse and fusible link
- Improper tightening of battery terminal
- Improper tightening of earth bolt
- Battery failure
- Charging system failed
- Malfunction of ABS-ECU

DIAGNOSTIC PROCEDURE

STEP 1. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 3.
NO : Charge or replace the battery. Then go to Step 2.

STEP 2. Charging system check
Refer to GROUP 16 – On–vehicle Service/Alternator Output Line Voltage Drop Test .

Q: Is the charging system in good condition?
YES : Go to Step 3.
NO : Repair or replace the charging system component(s).

STEP 3. M.U.T.-III other system diagnosis code
Check if diagnosis code is set to the ETACS-ECU.

Q: Is the diagnosis code set?
YES : Troubleshoot the ETACS. Refer to GROUP 54A - ETACS .
NO : Go to Step 4.

STEP 4. Voltage measurement at the ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between ABS-ECU (+BV terminal) and body earth.

OK: Approximately system voltage

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

STEP 5. Check of short to power supply, short to earth, and open circuit in +BV line between fusible link and ABS-ECU connector

Q: Is the check result normal?
YES : Intermittent malfunction is suspected (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the fusible link, connector(s) or wiring harness. Then go to Step 13.

STEP 6. Voltage measurement at the ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between ABS-ECU (+BM terminal) and body earth.

OK: Approximately system voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check of short to power supply, short to earth, and open circuit in +BM line between fusible link and ABS-ECU connector

Q: Is the check result normal?
YES : Intermittent malfunction is suspected (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the fusible link, connector(s) or wiring harness. Then go to Step 13.

STEP 8. Voltage measurement at the ABS-ECU connector.
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between ABS-ECU (IG1 terminal) and body earth.

OK: Approximately system voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check of short to power supply, short to earth, and open circuit in IG1 line between ETACS-ECU and ABS-ECU connector

Q: Is the check result normal?
YES : Intermittent malfunction is suspected (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the connector(s) or wiring harness. Then go to Step 13.

STEP 10. Resistance measurement at ABS-ECU connector
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance between the ABS-ECU (GND1 terminal) and the body earth, and between the ABS-ECU (GND2 terminal) and the body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check of open circuit in GND1, GND2 line between ABS-ECU connector and body earth

Q: Is the check result normal?
YES : Intermittent malfunction is suspected (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the connector(s) or wiring harness. Then go to Step 13.

STEP 12. Retest the system.

Q: Is the communication with M.U.T.-III possible?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 13.

STEP 13. Retest the system.

Q: Is the communication with M.U.T.-III possible?
YES : Return to Step 1.
NO : This diagnosis is complete.

INSPECTION PROCEDURE 9: ABS operates too frequently.

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

COMMENTS ON TROUBLE SYMPTOM

- Although the cause of the trouble cannot be clearly resolved since it depends on the running status and road surface condition, the malfunction of the hydraulic circuit may occur if any diagnosis code is not detected.
- If wheels and tyres other than the ones with genuine specified size are mounted, the ABS may be activated prematurely.
- If a non-genuine braking device or non-genuine impact reduction device is mounted, the ABS may be activated prematurely.

PROBABLE CAUSES

- Mounting of wheels and tyres other than with genuine specified size
- Tyre pressure abnormality
- Tyre wear and deterioration
- Mounting of non-genuine braking device or impact reduction device
- Wheel alignment abnormality
- Malfunction of brake related parts
- ABS-ECU malfunction
- Malfunction of hydraulic circuit
- External radio wave noise interference

DIAGNOSIS PROCEDURE

STEP 1. Check the wheels and the tyres.
Carry out the following check.
- Size check of wheels and tyres
- Tyre wear and deterioration statuses
- Check the tyre pressure.

NOTE: For the tyre pressure, refer to the tyre pressure label attached to the lower section of driver's side door striker.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Correct the wheels and tyres in good condition. Then go to Step 9.

STEP 2. Diagnosis code check
Use M.U.T.-III to check the diagnosis code for the ABS system. (Refer to P.35B-11.)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Carry out the diagnosis for the diagnosis code. (Refer to P.35B-11.) Then go to Step 9.

STEP 3. Check of brake system related components other than hydraulic unit (integrated with ABS-ECU)
At the same time with the following checks, also check that no parts other than the genuine parts are mounted.
- Brake pad check (Refer to GROUP 35A – On-vehicle Service/Brake Pad Check).
- Brake disc runout check (Refer to GROUP 35A – On-vehicle Service/Brake Disk Check).
- Brake drag force check (Refer to GROUP 35A – Front Disc Brake Assembly or GROUP 35A – Rear Disc Brake Assembly).

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the part(s) having damage or other problems. Then go to Step 9.

STEP 4. Wheel alignment check
At the same time with the following checks, also check that no parts other than the genuine parts are mounted.
- Front wheel alignment check (Refer to GROUP 33 – On-vehicle Service/Front Wheel Alignment Check and Adjustment .)
- Rear wheel alignment check (Refer to GROUP 34 – On-vehicle Service/Rear Wheel Alignment Check and Adjustment .)

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair or replace the part(s) having damage or other problems. Then go to Step 9.

STEP 5. M.U.T.-III data list
Check the following data list. (Refer to P.35B-54.)
- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

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

STEP 6. Wheel speed sensor check
Check that no non-genuine electronic device or no wiring harness of other than genuine electronic device is mounted near the wheel speed sensor (at wheel speed detection section and wiring harness section) (Refer to P.35B-63<Front> or P.35B-65<Rear>).

Q: Is the check result normal?
YES : Go to Step 7.
NO : Remove the non-genuine electronic device or the wiring harness of non-genuine electronic device. Then go to Step 9.

STEP 7. Hydraulic unit check
Carry out the following actuator tests, and check if they work normally (Refer to P.35B-55).
- Item No.01: FL wheel ABS
- Item No.02: FR wheel ABS
- Item No.03: RL wheel ABS
- Item No.04: RR wheel ABS

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 9.

STEP 8. ABS operation check

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions).
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-61). Then go to Step 9.

STEP 9. ABS operation check

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Return to Step 1.

Inspection Procedure 10: The initial check sound of hydraulic unit is loud.

⚠ CAUTION
When installing brake tube, match the axial centre of flare nut and brake tube with the centre of hole at the hydraulic unit side, and check that the fluid does not leak.

COMMENT ON TROUBLE SYMPTOM
The operation sound may be decreased by reducing the load at the rubber mount portion of the brake tube and hydraulic unit.

PROBABLE CAUSES
- Improper installation of the hydraulic unit
- Improper installation of the brake tube

DIAGNOSIS PROCEDURE

DRIVING CHECK
(1) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
(2) When vehicle speed reaches 10 km/h, check the operating sound volume and compare it with that of the same model.
OK: The operating sound is the same volume or less by comparing with that of the same model.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Carry out adjustment for hydraulic unit installation. (Refer to P.35B-59).

DATA LIST REFERENCE TABLE

M1352011501471

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

The following items of ECU input data can be read using M.U.T.-III.

Item No.	Check item	Check condition	Normal condition
01	FL wheel speed sensor	Perform a test run of the vehicle.	The speedometer display and the M.U.T.-III display almost agree with each other. (During stop: approximately 0.7km/h)
02	FR wheel speed sensor		
03	RL wheel speed sensor		
04	RR wheel speed sensor		
05	Power supply voltage		System voltage (10 to 18 V ABS operable range)
07	Brake switch (input)	The brake pedal is released.	OFF
		The brake pedal is depressed.	ON
09	G sensor	Vehicle stopped (level)	-0.11 to 0.11 G
		Running	-1 to 1 G
14	Brake switch	The brake pedal is depressed.	ON
		The brake pedal is released.	OFF
15	Emission test mode	When the emission mode is not executed	OFF
		When the emission mode is executed	ON
86	Ignition switch	When the ABS system is not activated	OFF
		When the ABS system is activated	ON
87	Ignition switch (input)	Ignition switch is "ON" position	ON
88	Vehicle speed	Perform a test run of the vehicle.	The speedometer display and the M.U.T.-III display almost agree with each other.
91	Brake pressure sensor	Not used.	
96	G sensor offset	Difference between the positions of the ABS-ECU when the vehicle is stationary and while the vehicle is being driven	-0.2 to 0.2 G
105	Power supply voltage (input)		System voltage (10 to 18 V ABS operable range)
138	ESS request	Not used.	

- System shutdown by ECU
  While ABS-ECU is disabled by the diagnostic function, the M.U.T.-III displayed data is different from the actual measurement.

ACTUATOR TEST REFERENCE TABLE

M1352011601274

Using M.U.T.-III, the following actuators can be forcibly operated:

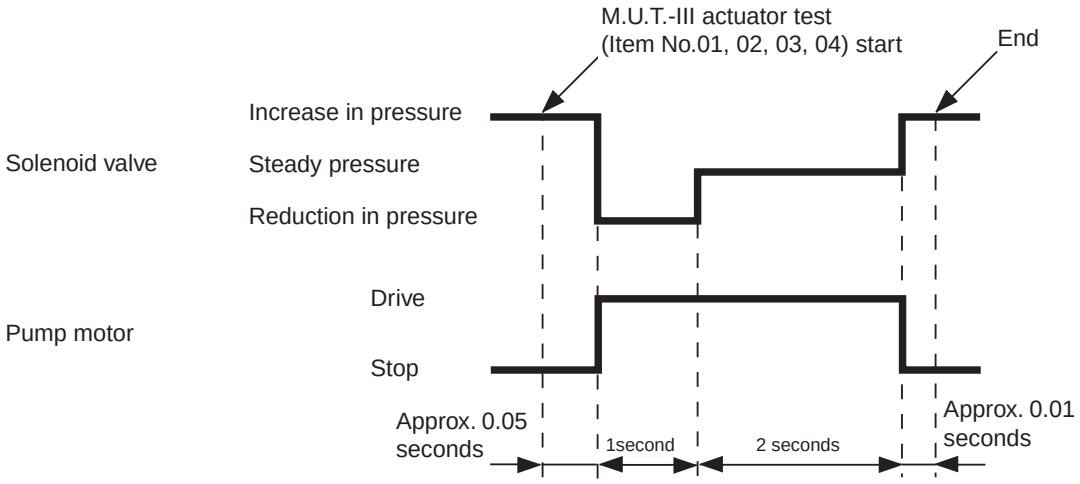
NOTE:

- *ABS is operated by ABS-ECU.*
- *When ABS-ECU is disabled due to the fail-safe function, the actuator test cannot be performed.*
- *The actuator test can be performed only when the vehicle is stationary.*
- *While the actuator test is performed, the ABS warning lamp flashes at a rate of 2 Hz.*
- *After the actuator test has been performed, the brake warning lamp and ABS warning lamp illuminate until the ignition switch is turned to ON again or the communication between M.U.T.-III and ABS-ECU is terminated.*

Actuator test specifications

Item No.	Check item	Driven component
01	FL wheel ABS drive	Solenoid valve for the corresponding wheel of the hydraulic unit and pump motor (simplified inspection mode)
02	FR wheel ABS drive	
03	RL wheel ABS drive	
04	RR wheel ABS drive	
10	ESS test mode	Not used.

Operation pattern of items 01 to 04

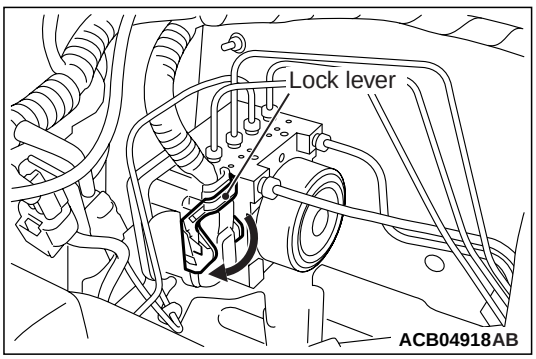


AC606811

CHECK AT ECU TERMINALS

M1352011801494

TERMINAL VOLTAGE CHECK

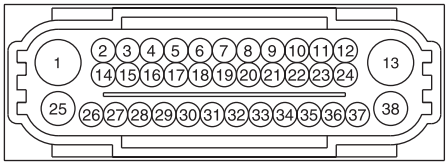


1. Operate the lock lever to disconnect the ABS-ECU harness connector as shown in the figure.

2. Disconnect the ABS-ECU connector, and measure the voltages between earth terminal No.13 or No.38 and each respective terminal.

3. The terminal layout is shown in the illustration.

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

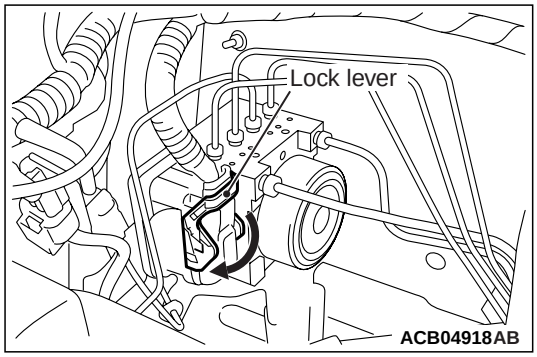


ACB05853

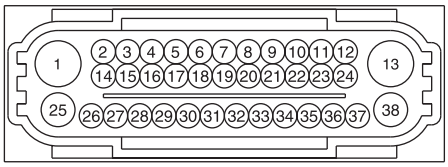
Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
1	+BM	Motor power supply	Always	Battery voltage
2–5	–	–	–	–
6	IG1	ABS-ECU power supply(IG1)	Ignition switch: "ON"	Battery voltage
			Ignition switch: "OFF"	1 V or less
7–9	–	–	–	–
10	CANL	CAN bus line	–	–
11	CANH	CAN bus line	–	–
12	–	–	–	–
13	GND1	Earth	Always	1 V or less
14–24	–	–	–	–
25	+BV	Solenoid valve power supply	Always	Battery voltage
26	FR-	Wheel speed sensor (FR) signal	Drive vehicle	Approximately system voltage
27	FR+	Wheel speed sensor (FR) power supply	Ignition switch: "ON"	Approximately system voltage
28	–	–	–	–
29	RL+	Wheel speed sensor (RL) power supply	Ignition switch: "ON"	Approximately system voltage
30	RL-	Wheel speed sensor (RL) signal	Drive vehicle	Approximately system voltage
31, 32	–	–	–	–
33	RR-	Wheel speed sensor (RR) signal	Drive vehicle	Approximately system voltage
34	RR+	Wheel speed sensor (RR) power supply	Ignition switch: "ON"	Approximately system voltage
35	–	–	–	–
36	FL+	Wheel speed sensor (FL) power supply	Ignition switch: "ON"	Approximately system voltage

Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
37	FL-	Wheel speed sensor (FL) signal	Drive vehicle	Approximately system voltage
38	GND2	Earth	Always	1 V or less

CONTINUITY CHECK AT WIRING HARNESS-SIDE CONNECTOR



1. Operate the lock lever to disconnect the ABS-ECU harness connector as shown in the figure.
2. Check the resistance and continuity between the terminals indicated in the table below.
3. The terminal layout is shown in the illustration.



ACB05853

Terminal No.	Signal	Normal condition
13 – body earth	Earth	Continuity exists (2 Ω or less)
38 – body earth	Earth	Continuity exists (2 Ω or less)

ON-VEHICLE SERVICE

WHEEL SPEED SENSOR OUTPUT CURRENT MEASUREMENT

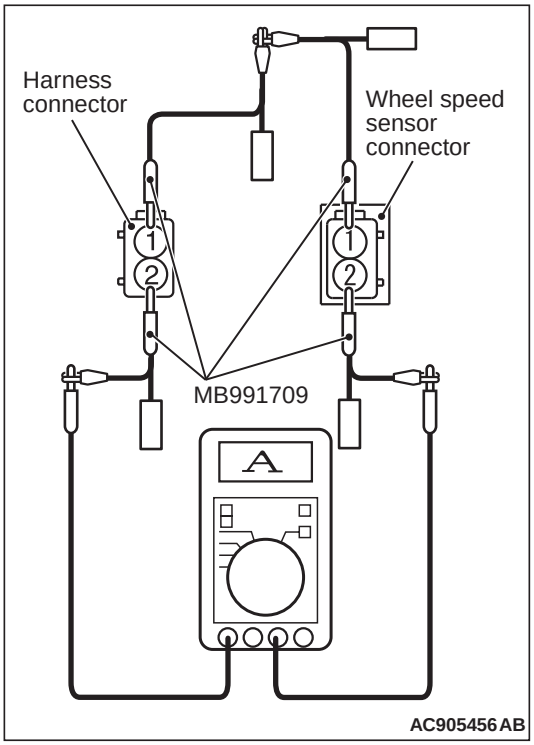
M1352032800043

The relevant wheel, on which the wheel speed sensor is fitted, should be free to run.

1. Remove the wheel speed sensor connector to be checked.

⚠ CAUTION

For precise measurement, do not connect to the wheel speed sensor-side connector and the wiring harness side connector terminal No.1.



2. Use the special tool test harness (MB991709) to connect a multimeter between the wheel speed sensor-side connector and the wiring harness connector terminal No.2.
3. Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not rotate the wheel too quickly. Output current changes significantly as the wheel speed detection magnetic encoder comes near or goes away from the wheel speed sensor.

4. Rotate the wheel, on which the wheel speed sensor is fitted, quite slowly to measure the output current with the multimeter.

   Standard value: 5.9 to 8.4 mA or 11.8 to 16.8 mA

5. If the measurement is not within the standard value, or the output current does not change in proportion to the wheel rotation, replace the wheel speed sensor (Refer to P.35B-63 <Front>, P.35B-65 <Rear>).

HYDRAULIC UNIT CHECK

M1352001701184

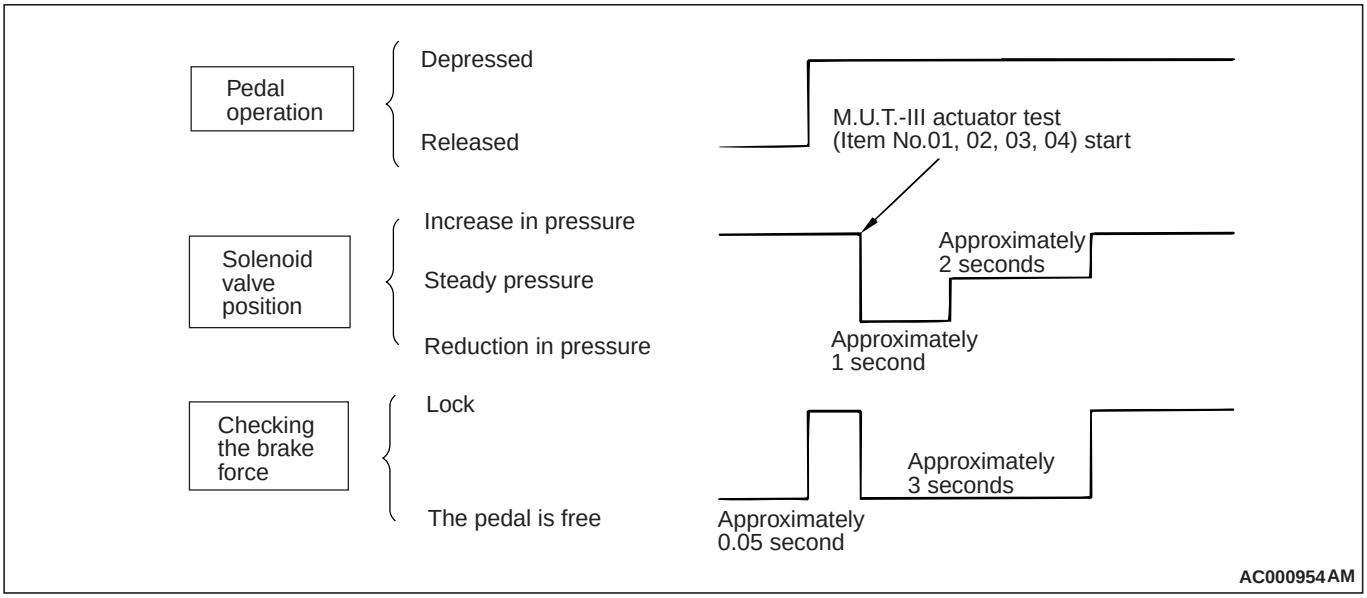
1. Raise the vehicle using a jack and support the specified points with a rigid rack.

⚠ CAUTION

Before connecting or disconnecting M.U.T.-III, always turn the ignition switch to the LOCK (OFF) position.

2. Before setting M.U.T.-III, turn the ignition key to the LOCK (OFF) position.
3. Confirm that the selector lever is in the "N" position, and then start the engine.
4. When carrying out the actuator tests No. 01 to 04, perform the actuator tests using M.U.T.-III while depressing the brake pedal. When carrying out the actuator tests, rotate the wheel by hands to confirm that the braking force changes.

   NOTE:
   - *While performing the actuator test, the ABS warning lamp flashes at a rate of 2 Hz.*
   - *When ABS-ECU is disabled due to the fail-safe function, the M.U.T.-III actuator test cannot be performed.*
   - *After the actuator test has been performed, the ABS warning lamp and brake waning lamp illuminate until the ignition switch is turned to ON again or the communication between M.U.T.-III and ABS-ECU is terminated.*



5. This is indicated as shown in the above.
6. When any malfunction has been found, take a necessary action according to the "Judgement Table."

Judgement Table

Display on M.U.T.-III	Operation	Inspection result	Judgement	Probable cause	Remedy
01 FL wheel speed sensor 02 FR wheel speed sensor 03 RL wheel speed sensor 04 RR wheel speed sensor	• Depress the brake pedal to lock the vehicle. • Select the vehicle to be inspected using M.U.T.-III, perform the actuator test. • Rotate the selected wheel by hands to confirm the braking force.	Braking force decreases for 3 seconds from the lock status.	Normal	–	–
		The wheel does not lock even if the brake pedal is depressed.	Error	Clogged brake line other than hydraulic unit	Check and clean the brake line.
				Clogged hydraulic circuit in the hydraulic unit	Replace the hydraulic unit assembly.
		Braking force does not decrease.		Faulty routing of hydraulic unit brake tube	Route the brake tube correctly.
				Malfunction of hydraulic unit solenoid valve operation	Replace the hydraulic unit assembly.

7. After the inspection, turn the ignition switch to the LOCK (OFF) position, and then disconnect M.U.T.-III.

Hydraulic unit installation adjustment

Operate the pre-removal steps for the hydraulic unit. (Refer to P.35B-61.)

1. Remove all brake tubes.
2. Loosen the mounting bolt and nut of the hydraulic unit bracket.
3. Install all brake tubes temporarily.
4. Shake hydraulic unit to all directions with both hands to make the hydraulic unit bracket insulator fit with the unit.
5. Install the hydraulic unit bracket with mounting bolt and nut not to load the brake tube.
6. Install all brake tubes securely.

   NOTE: Install the flare nut taking care not to let the brake tube turn together.
7. Operate the post-installation steps of the hydraulic unit. (Refer to P.35B-61.)

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500785

⚠ ***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.

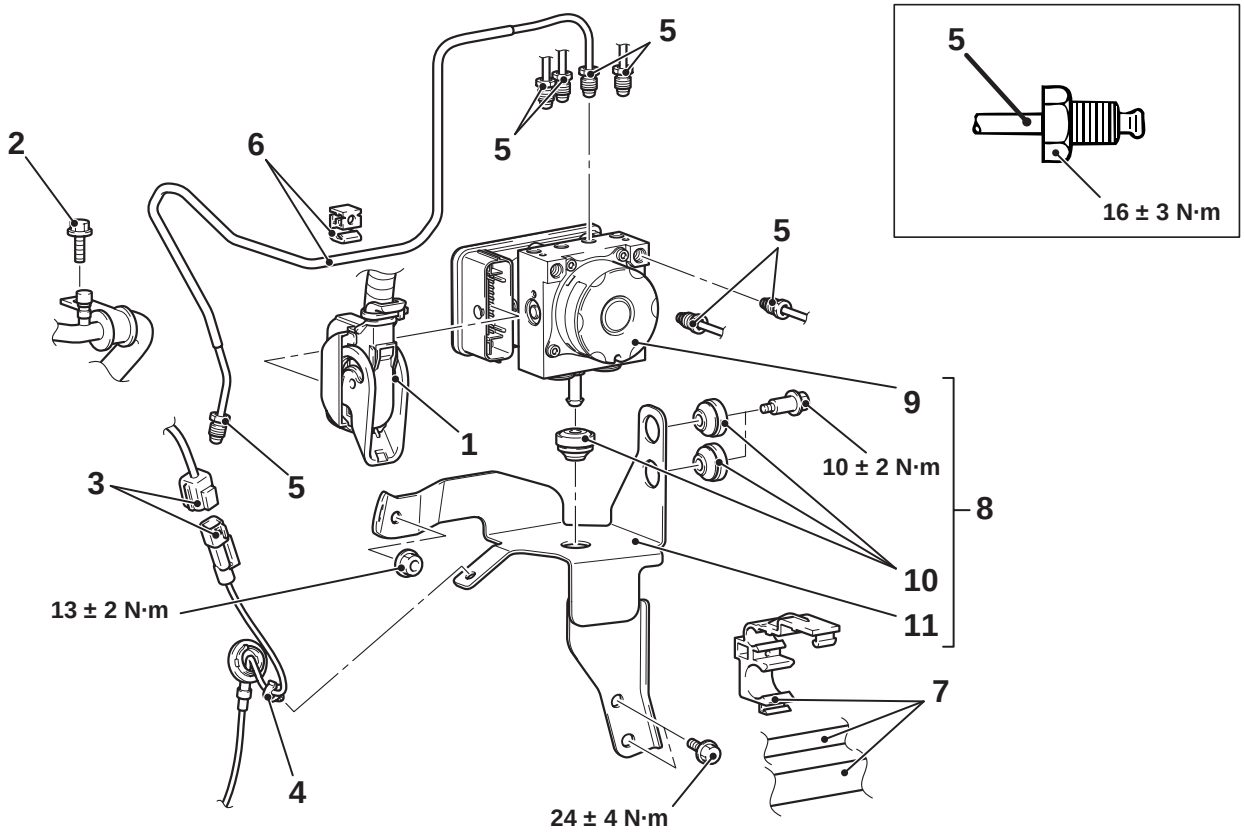
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352008601241

NOTE: ABS-ECU is located in the hydraulic unit.

Pre-removal operation	Post-installation operation
• Brake fluid draining.	• Brake fluid refilling and air bleeding (Refer to GROUP 35A – On-vehicle Service, Bleeding). • Hydraulic unit check (Refer to P.35B-59).



ACB06013AB

Removal steps

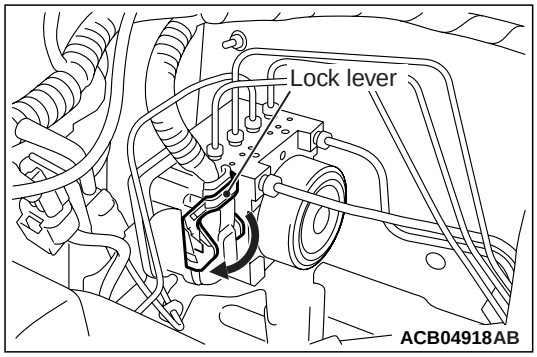
<<A>> 1. ABS-ECU harness connector
2. Suction pipe installation bolt
3. Wheel speed sensor harness connector connection
4. Wheel speed sensor harness clip connection

>>A<< 5. Brake tube connection
6. Brake tube and clip connection
7. Suction pipe, liquid pipe and clip connection
8. Hydraulic unit (ABS-ECU) and hydraulic unit bracket

<<**B**>> 9. Hydraulic unit (ABS-ECU)
10. Hydraulic unit bracket insulator
11. Hydraulic unit bracket

REMOVAL SERVICE POINTS

<<A>> ABS-ECU HARNESS CONNECTOR DISCONNECTION



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

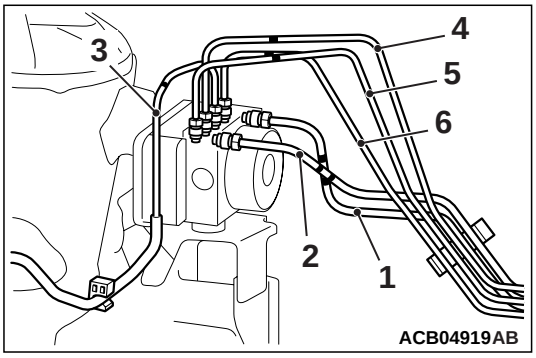
<<B>> HYDRAULIC UNIT (ABS-ECU) REMOVAL

⚠ CAUTION

- **Be careful when removing the hydraulic unit because it is heavy.**
- **Never loosen the nuts and the bolts because the hydraulic unit cannot be disassembled.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay down the unit because the inner air becomes difficult to be bled.**

INSTALLATION SERVICE POINT

>>A<< BRAKE TUBE CONNECTION



Install the brake pipe to the hydraulic unit as shown in the figure.

1. From master cylinder (primary) <Marking colour: Blue and white>
2. From master cylinder (secondary) <Marking colour: Yellow and white>
3. To front brake (RH) <Marking colour: Orange>
4. To front brake (LH) <Marking colour: Red>
5. To rear brake (RH) <Marking colour: White>
6. To rear brake (LH) <Marking colour: Pink>

WHEEL SPEED SENSOR

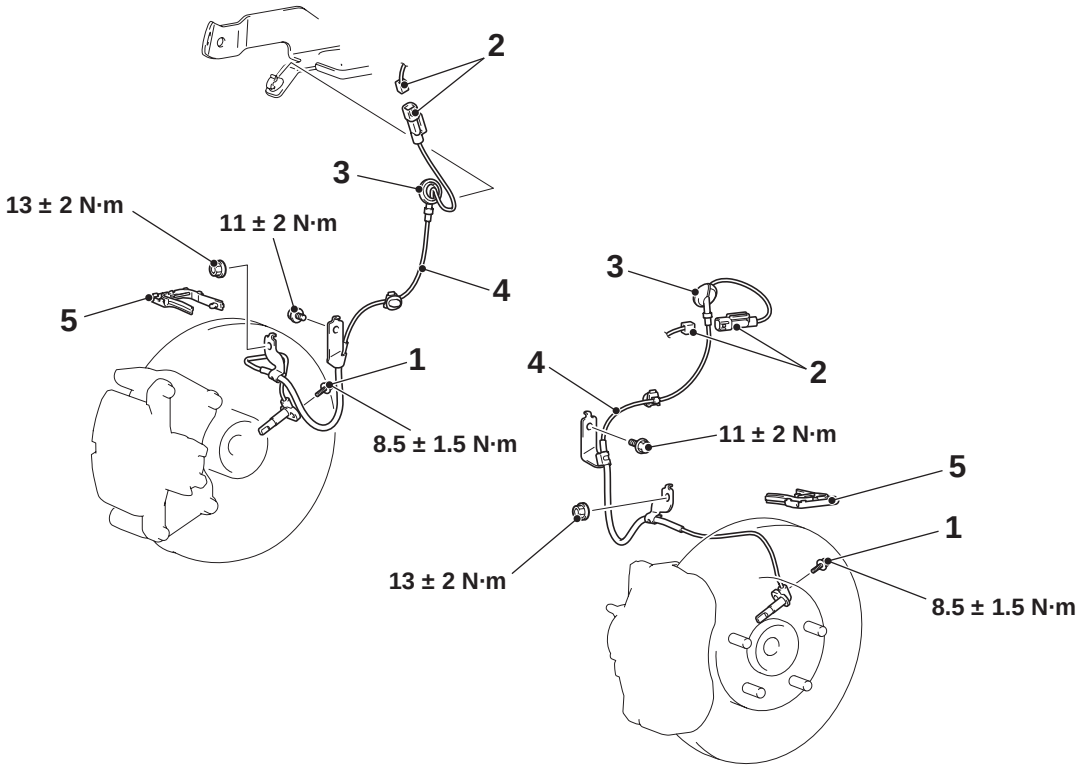
REMOVAL AND INSTALLATION <FRONT>

M1352008301659

⚠ CAUTION

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

Pre-removal and post-installation operation
Air cleaner body assembly removal and installation <Refer to GROUP 15 – Air Cleaner > <Front wheel speed sensor (LH)>.



ACB05594AB

Removal steps

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

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

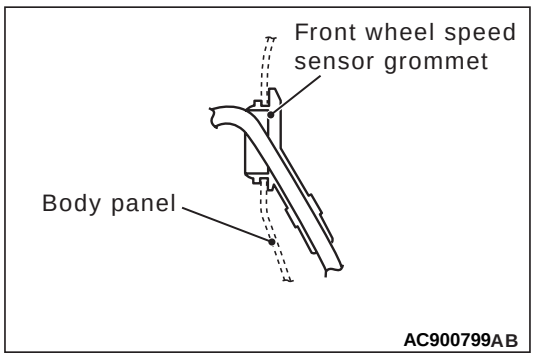
4. Front wheel speed sensor

>>**B**<< 5. Harness clip

NOTE: The vehicle speed detection encoder is integrated with the front wheel bearing, which cannot be disassembled.

INSTALLATION SERVICE POINTS

>>A<< FRONT WHEEL SPEED SENSOR GROMMET INSTALLATION

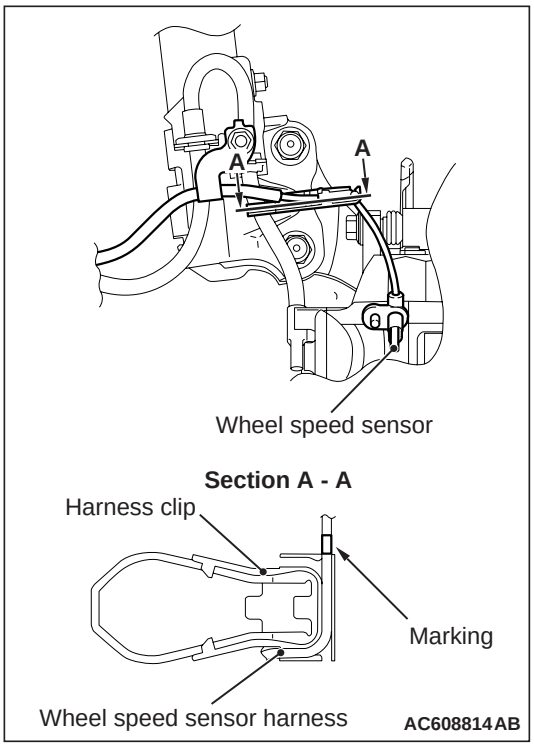


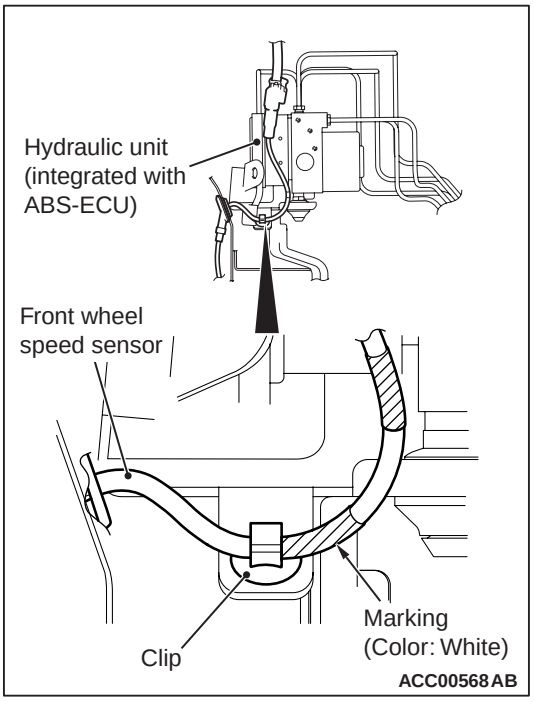
AC900799AB

Install the front wheel speed sensor grommet to the body panel snugly as shown in the figure.

>>B<< HARNESS CLIP INSTALLATION

Install the front wheel speed sensor to the harness clip as shown in the figure.





REMOVAL AND INSTALLATION <REAR>

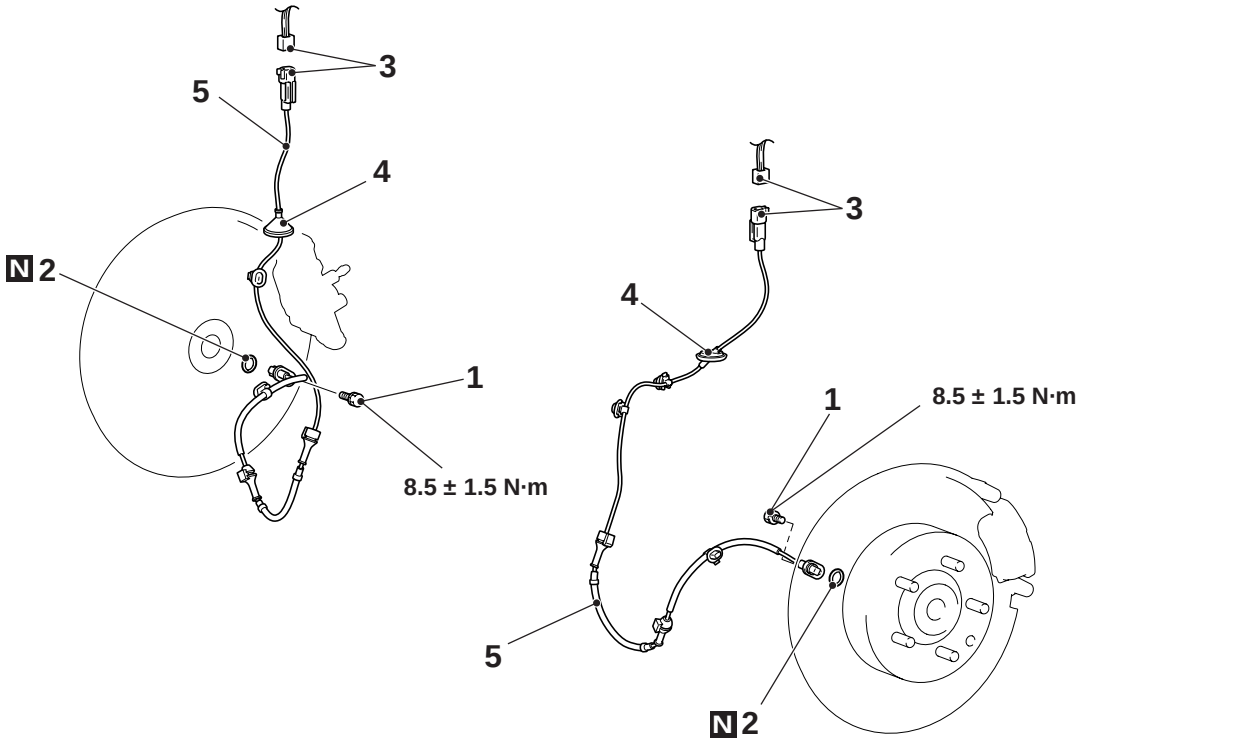
M1352008301660

⚠ CAUTION

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

<2WD>

Pre-removal and post-installation operation
Quarter trim removal and installation (Refer to GROUP 52A – Trim).



ACB05519AB

Removal steps

>>B<< 1. Bolt (rear wheel speed sensor and trailing arm assembly connection)
>>B<< 2. O ring
3. Rear wheel speed sensor connector

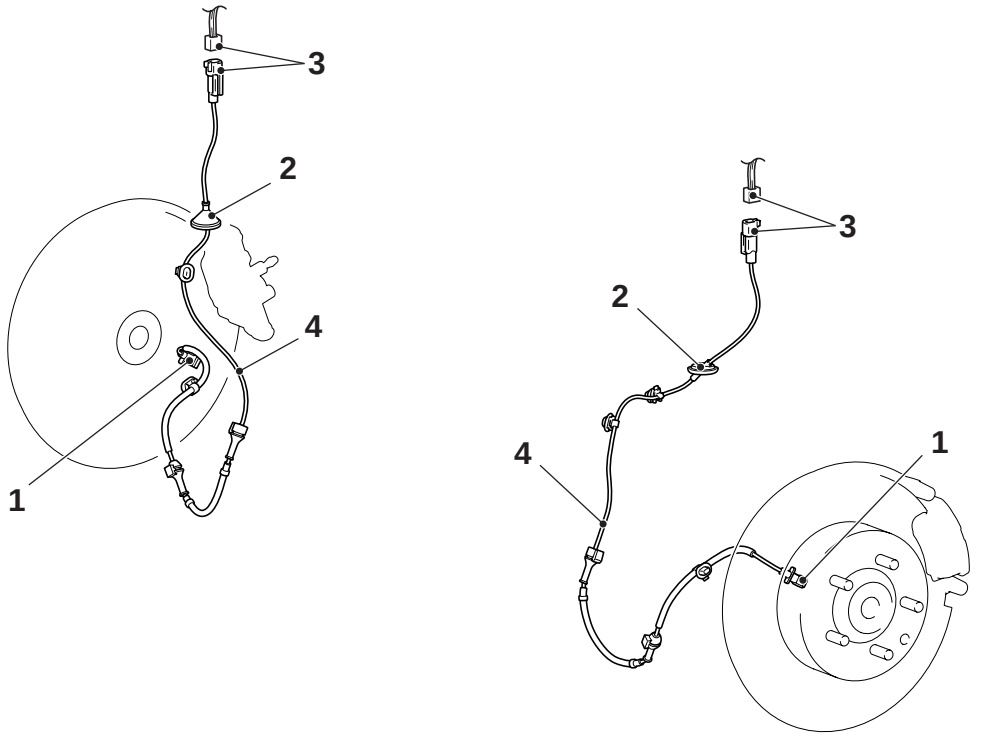
Removal steps (Continued)

>>A<< 4. Rear wheel speed sensor grommet
>>B<< 5. Rear wheel speed sensor

NOTE: The vehicle speed detection encoder is integrated with the rear hub assembly, which cannot be disassembled.

<4WD>

Pre-removal and post-installation operation
Quarter trim removal and installation (Refer to GROUP 52A – Trim).



ACB05520AB

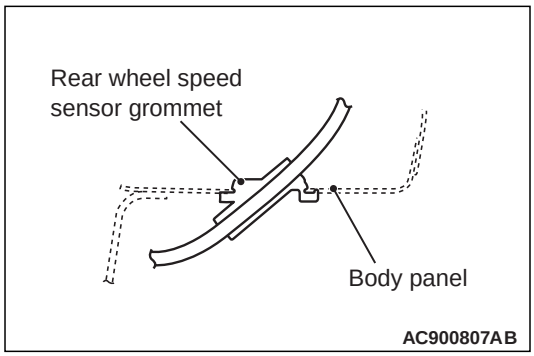
Removal steps

>>C<< 1. Rear wheel speed sensor and trailing arm assembly connection
>>A<< 2. Rear wheel speed sensor grommet
3. Rear wheel speed sensor connector
4. Rear wheel speed sensor

NOTE: The vehicle speed detection encoder is integrated with the rear hub assembly, which cannot be disassembled.

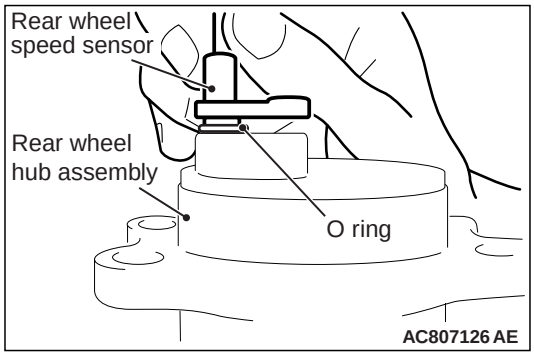
INSTALLATION SERVICE POINTS

>>A<< REAR WHEEL SPEED SENSOR GROMMET INSTALLATION



Install the rear wheel speed sensor grommet to the body panel snugly as shown in the figure.

>>B<< REAR WHEEL SPEED SENSOR, O-RING, AND BOLT (CONNECTION OF REAR WHEEL SPEED SENSOR WITH REAR WHEEL HUB ASSEMBLY) INSTALLATION



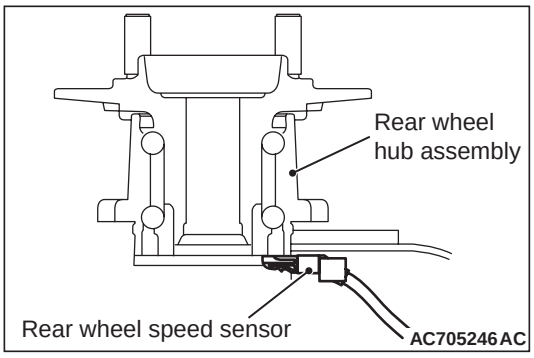
1. Align the mounting bolt hole position of rear wheel speed sensor with the mounting bolt hole position of rear wheel hub assembly.

⚠ CAUTION

- **Do not insert the rear wheel speed sensor at an angle or by prying the sensor because it may be possible that the O-ring of rear wheel speed sensor cannot be mounted properly.**
- **After the insertion, do not perform an alignment of mounting bolt hole positions by rotating the rear wheel speed sensor.**

2. As shown in the figure, mount the rear wheel speed sensor while keeping the sensor perpendicular to the rear wheel hub assembly.

>>C<< REAR WHEEL SPEED SENSOR INSTALLATION

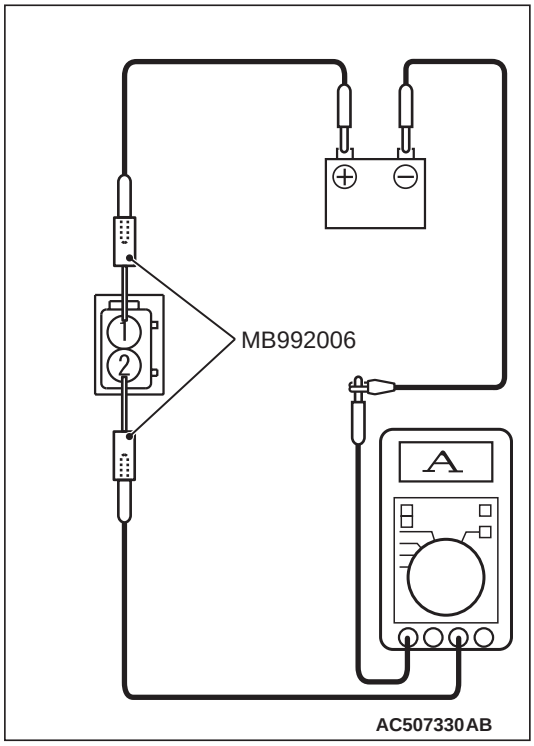


Push the rear wheel speed sensor to the end and install it securely.

INSPECTION

M1352008400750

WHEEL SPEED SENSOR CURRENT CHECK



⚠ CAUTION

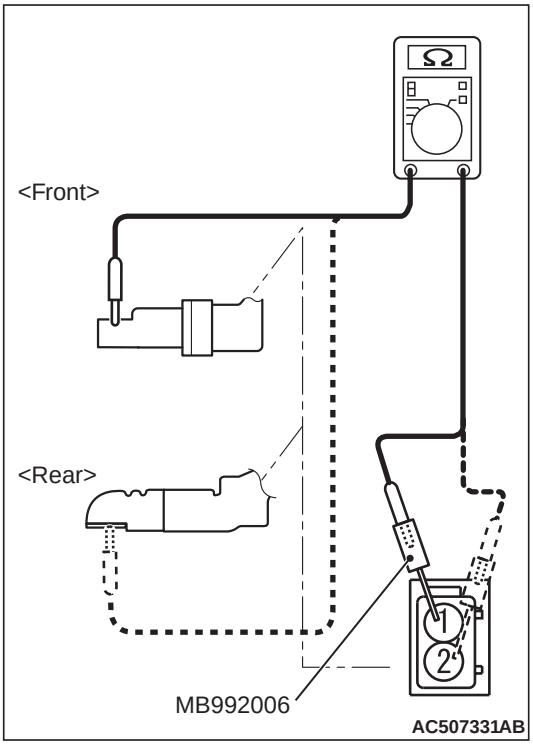
- **Do not connect the battery terminals in reverse as the wheel speed sensor may be damaged.**
- **When the current value is measured by the wheel speed sensor connector, measure it with the wheel speed sensor installed in the vehicle.**

1. Connect the circuit tester to the wheel speed sensor using the special tool extra fine probe (MB992006), and measure the sensor current as a single unit.

   Standard value: 5.9 to 8.4 mA or 11.8 to 16.8 mA

2. If the measurement value is not within the standard value range, replace the wheel speed sensor with a new one.

WHEEL SPEED SENSOR INSULATION CHECK



1. Connect the circuit tester to the wheel speed sensor using the special tool extra fine probe (MB992006), and measure the insulation resistance between the terminal No. 1/2 and the wheel speed sensor body as a single unit.

   Standard value: 5 MΩ or more

2. If the insulation resistance is not within the standard value range, replace the wheel speed sensor with a new one.