

04-13 ANTILOCK BRAKE SYSTEM

ANTILOCK BRAKE SYSTEM

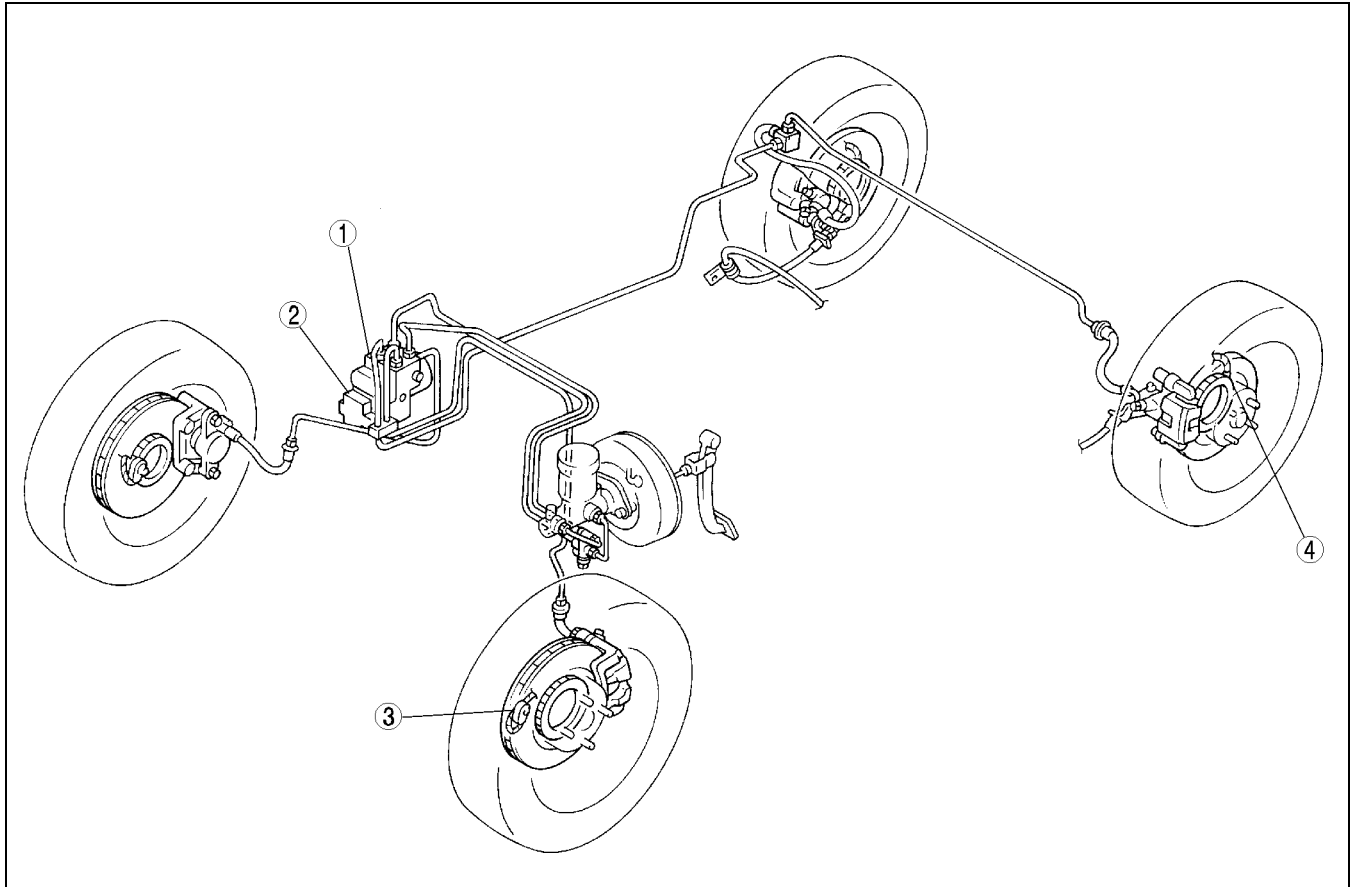
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A5U041343000W01



Z5U0411W139

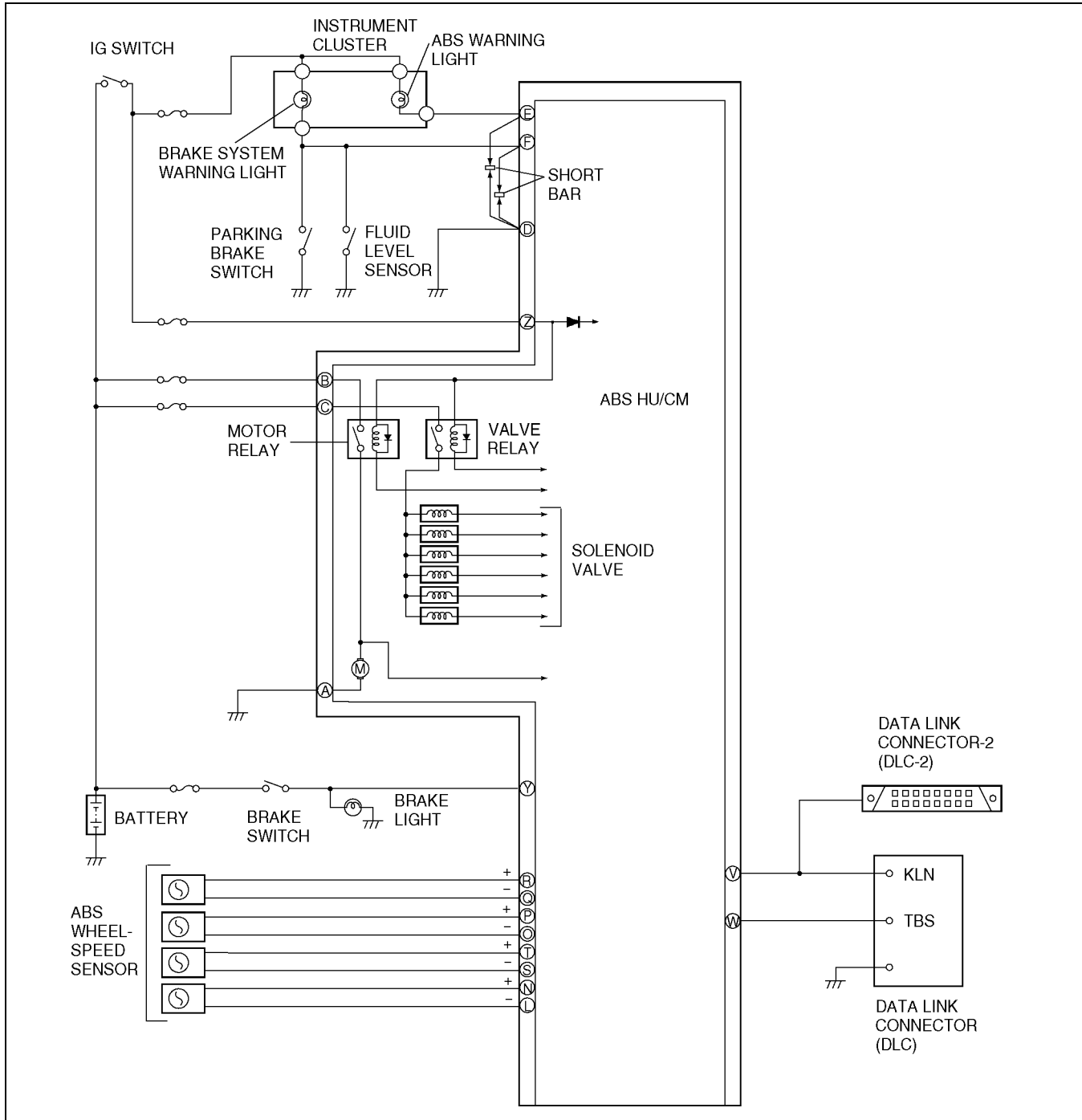
1	ABS hydraulic unit (HU)/control module (CM) (See 04-13-2 ABS HU/CM SYSTEM INSPECTION) (See 04-13-4 ABS HU/CM REMOVAL/INSTALLATION)
2	ABS harness (See 04-13-5 ABS HARNESS AND INPUT SIGNAL INSPECTION)

3	Front ABS wheel-speed sensor (See 04-13-8 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION) (See 04-13-9 FRONT ABS WHEEL-SPEED SENSOR INSPECTION)
4	Rear ABS wheel-speed sensor (See 04-13-10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION) (See 04-13-10 REAR ABS WHEEL-SPEED SENSOR INSPECTION)

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ABS SYSTEM DIAGRAM

A5U041343000W02



A5U0402W002

ABS HU/CM SYSTEM INSPECTION

A5U041343000W03

System Inspection

Preparation

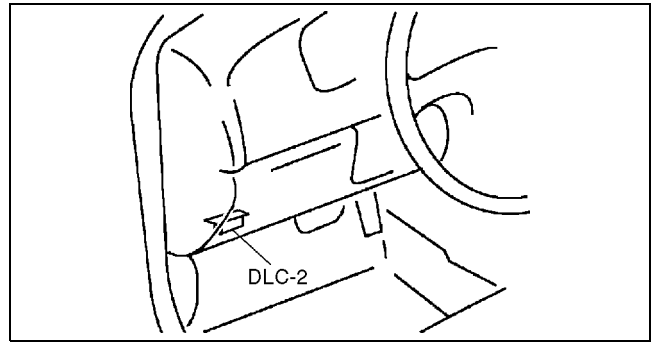
1. Verify that the battery is fully charged. With the ignition switch on, verify that the ABS and BRAKE system warning lights goes out after **3 seconds**.
2. If the lights stays on after **3 seconds**, the ABS HU/CM detects a failure. Follow the troubleshooting procedures.
3. Turn the ignition switch off.
4. On level ground, jack up the vehicle and support it evenly on safety stands. Shift the transaxle to N position.
5. Release the parking brake.
6. Rotate the wheels by hand, and inspect for brake drag.

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Using the SSTs

1. Perform the "Preparation."
2. Connect the **SSTs** (WDS or equivalent) to the data link connector-2 (DLC-2).
3. Set up an active command mode inspection according to the combination of commands below. (See 04-02-3 ABS ON-BOARD DIAGNOSIS.)

OPERATION	COMMAND NAME			COMMAND TYPE
	PMP_MOTOR	RF_OUTLET	RF_INLET	
Pressure retention	OFF	OFF	ON	Manual
Pressure reduction	ON	ON	OFF	



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The chart above shows an example of a right wheel inspection.

Note

- When working with two people, one should press on the brake pedal, the other should attempt to rotate the wheel being inspected.

4. Send the command while pressing on the brake pedal and attempting to rotate the wheel being inspected.
5. When pressure is being maintained, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel does not rotate. When pressure is being reduced, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel rotates, even though the brake pedal is being depressed.

Note

- To protect the ABS HU/CM, the solenoid valve used for simulations and the ABS motor stay on for **10 seconds** each time they are switched on.
- Performing the inspections above determines the following.
 - The ABS HU/CM brake lines are normal.
 - The ABS HU/CM hydraulic system is not significantly abnormal.
 - The ABS HU/CM wiring is normal.
- However, the following items cannot be checked.
 - ABS HU/CM input system harness and parts
 - Extremely small leaks in the ABS HU/CM internal hydraulic system
 - Unusual intermittent occurrences in the above items

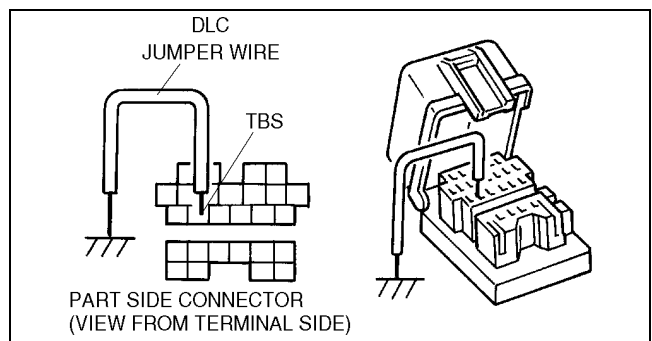
Without using the SSTs

1. Perform the "Preparation."
2. Use a jumper wire to short terminal TBS of the DLC to body GND.

Caution

- **Connecting to the wrong data link connector (DLC) terminal may cause a malfunction. Carefully connect only to the specified terminal.**

3. Depress the brake pedal, and have an assistant verify that the right front wheel does not turn.
4. With the brake pedal still depressed, turn the ignition switch on and verify that the brake is released momentarily (**approx. 0.5 seconds**) and that the wheel turns when pressure-reduction operates.
5. Inspect the operation of the remaining wheels in order: right front, left front, rear.
 - Replace the ABS HU/CM if wheels do not rotate.
 - Inspect brake piping to ABS HU/CM if operation of the remaining wheel order is not within specified.



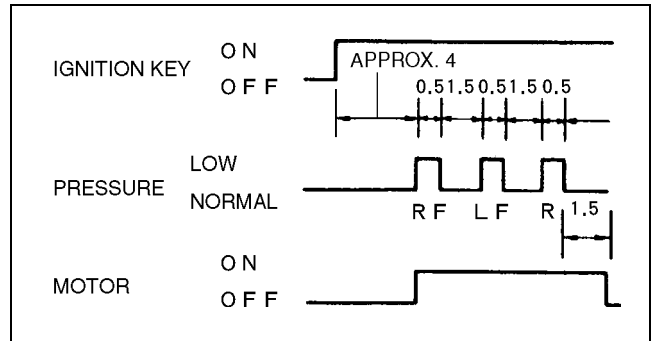
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Note

- If Steps 4 and 5 show correct operation, the following systems are okay:
 - Brake piping to ABS HU/CM
 - Braking system, including ABS HU/CM
 - Electrical system in ABS HU/CM (solenoid, ABS motor, etc.)
- The following are not inspected with above steps:
 - Input system and harness of ABS HU/CM
 - Intermittent failure
 - Fluid leakage from brake including the ABS HU/CM and master cylinder

6. Turn the ignition switch off and remove the jumper wire.

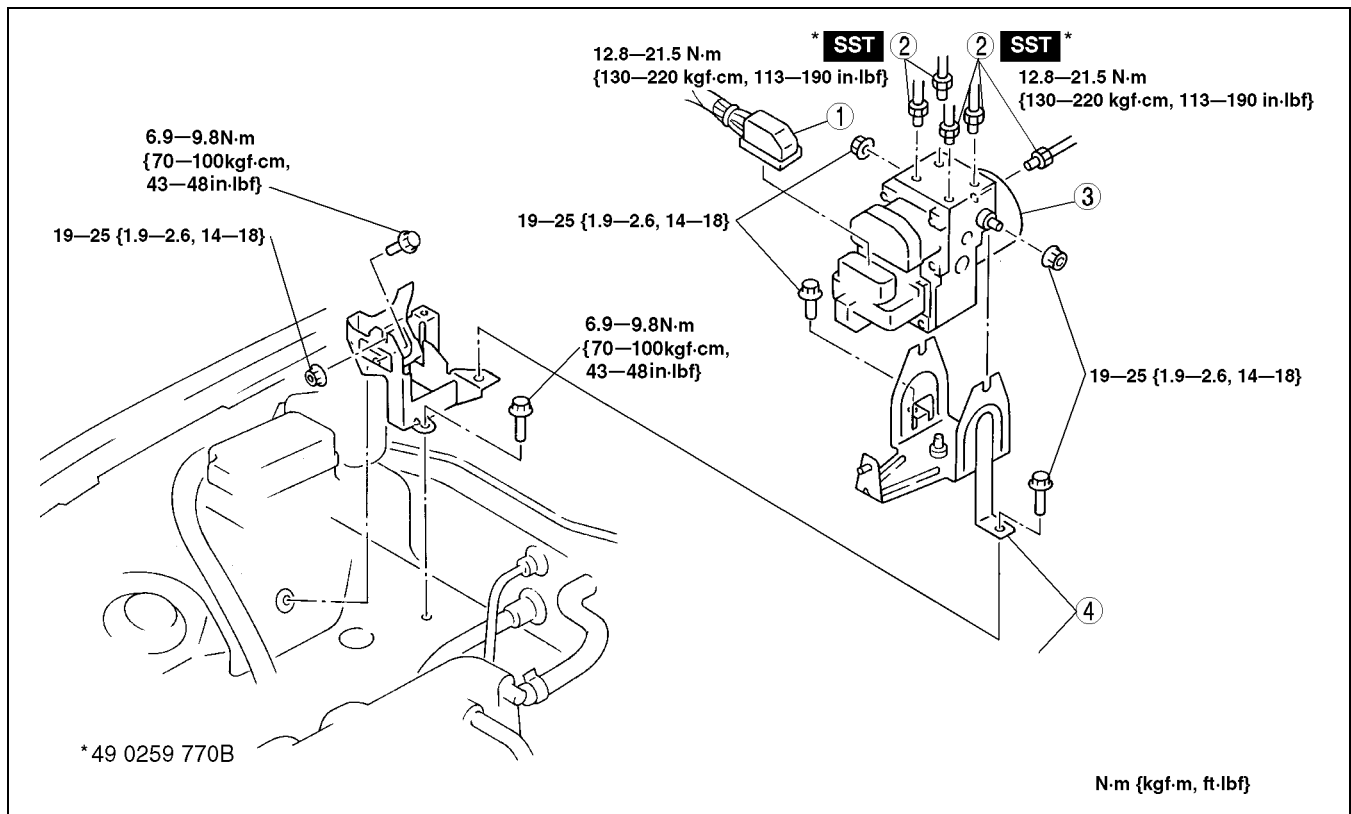


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ABS HU/CM REMOVAL/INSTALLATION

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1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



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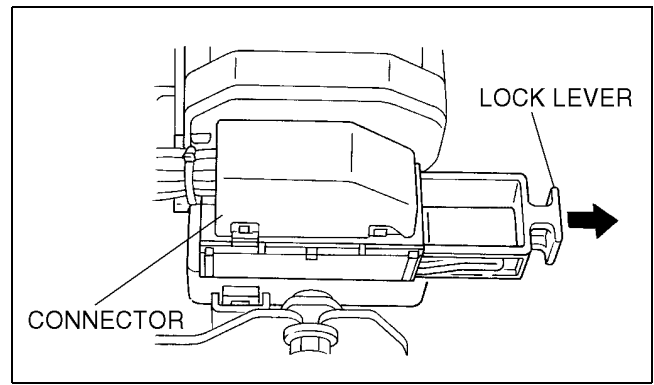
1	Connector (See 04-13-5 Connector Removal Note) (See 04-13-5 Connector Installation Note)
2	Brake pipe

3	ABS HU/CM (See 04-13-5 ABS HU/CM Removal/Installation Note)
4	Bracket

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Connector Removal Note

1. Pull the lock lever to disconnect the connector.



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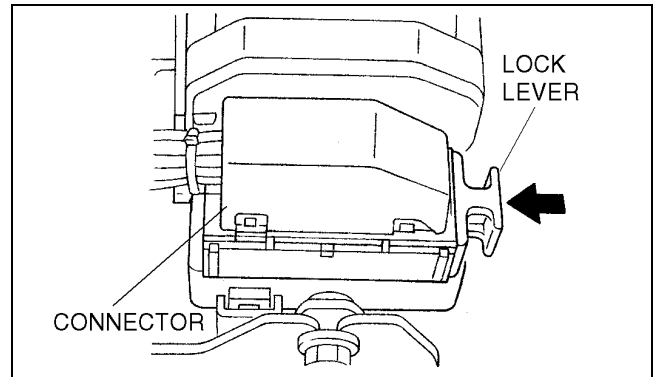
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ABS HU/CM Removal/Installation Note

1. When removing/installing the ABS HU/CM from/to the vehicle, attach a strip of protective tape on the ABS HU/CM connector to prevent brake fluid from entering.

Connector Installation Note

1. Verify that the lock lever is completely pushed in.



Z5U0413W109

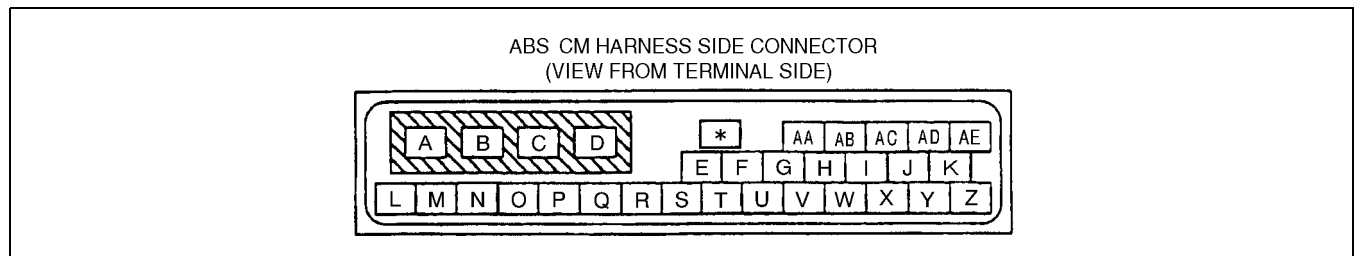
ABS HARNESS AND INPUT SIGNAL INSPECTION

1. Disconnect the ABS HU/CM connector with the ignition switch at OFF.

A5U041343000W05

Caution

- Be careful not to damage the terminals during inspection.
2. Insert a thin isolation plate to the short bar of the connector (asterisk shown in the figure) and open circuit between terminal D and E, D and F.
 3. Attach a wire to the tester lead to avoid damaging the terminals then inspect voltage, resistance or continuity, referring to the table below.



Z5U0413W106

Terminal	Signal name	Connected to	Item	Condition	Specification	Possible cause
A	System ground (ABS motor)	Ground point	Continuity	A—ground point (IG SW is at OFF)	Yes	<ul style="list-style-type: none"> • Harness to ground point
B	Power supply (ABS motor)	Fuse (60 A)	Voltage	B—A	B+	<ul style="list-style-type: none"> • Fuse (60 A) • Harness (B—fuse (60 A))

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Terminal	Signal name	Connected to	Item	Condition	Specification	Possible cause
C	Power supply (solenoid valve)	Fuse (20 A)	Voltage	C—ground point	B+	<ul style="list-style-type: none">• Fuse (20 A)• Harness (C—fuse (20 A))
D	System ground (signal)	Ground point	Continuity	D—ground point	Yes	<ul style="list-style-type: none">• Harness to ground point
E	ABS warning light	ABS warning light	Continuity	E—battery positive terminal (IG SW is at OFF)	No	<ul style="list-style-type: none">• Harness (E—instrument cluster—IG SW)• Instrument cluster• ABS warning light• Instrument cluster power supply harness
			Voltage	E—ground point	B+*1	
F	BRAKE system light	BRAKE system light	Continuity	F—battery positive terminal (IG SW is at OFF)	No	<ul style="list-style-type: none">• Harness (F—instrument cluster—IG SW)• Instrument cluster• BRAKE system warning light• Instrument cluster power supply harness
			Voltage	F—ground point	B+*1	
L N	RR wheel speed	RR wheel-speed sensor	Voltage	M —L vehicle is stopped	0 V (AC)	<ul style="list-style-type: none">• Harness (ABS wheel-speed sensor—ABS HU/CM harness connector)• ABS wheel-speed sensor• ABS wheel-speed sensor, Installation condition
				Inspect by using the wave profile. (See 04–13–7 Inspection Using An Oscilloscope (Reference))		
			Resistance	N—L	1.0—2.0 kilohm	
			Continuity	L—ground point	No	
O P	RF wheel speed	RF wheel-speed sensor	Voltage	P—O vehicle is stopped	0 V (AC)	<ul style="list-style-type: none">• Harness (ABS wheel-speed sensor—ABS HU/CM harness connector)• ABS wheel-speed sensor• ABS wheel-speed sensor, Installation condition
				Inspect by using the wave profile. (See 04–13–7 Inspection Using An Oscilloscope (Reference))		
			Resistance	P—O	1.0—2.0 kilohm	
			Continuity	O—ground point	No	
Q R	LF wheel speed	LF wheel-speed sensor	Voltage	R—Q vehicle is stopped	0 V (AC)	<ul style="list-style-type: none">• Harness (ABS wheel-speed sensor—ABS HU/CM harness connector)• ABS wheel-speed sensor• ABS wheel-speed sensor, Installation condition
				Inspect by using the wave profile. (See 04–13–7 Inspection Using An Oscilloscope (Reference))		
			Resistance	R—Q	1.0—2.0 kilohm	
			Continuity	Q—ground point	No	
S T	LR wheel speed	LR wheel-speed sensor	Voltage	T—S vehicle is stopped	0 V (AC)	<ul style="list-style-type: none">• Harness (ABS wheel-speed sensor—ABS HU/CM harness connector)• ABS wheel-speed sensor• ABS wheel-speed sensor, Installation condition
				Inspect by using the wave profile. (See 04–13–7 Inspection Using An Oscilloscope (Reference))		
			Resistance	T—S	1.0—2.0 kilohm	
			Continuity	S—ground point	No	

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Terminal	Signal name	Connected to	Item	Condition	Specification	Possible cause
V	On-board diagnosis KLN	Data link connector KLN	Continuity	V—KLN at DLC	Yes	• Harness (V—KLN at DLC)
				V—ground point	No	
W	On-board diagnosis TBS	Data link connector TBS	Continuity	W—TBS at DLC	Yes	• Harness (W—TBS at DLC)
				W—ground point	No	
Y	Brake switch	Brake switch	Voltage	Y—ground point When brake pedal depressed (IG SW is at ON)	B+	<ul style="list-style-type: none"> • Harness (Y—brake switch, brake switch—battery, brake switch—brake light, brake light—ground point) (when brake light normal) • Brake switch • Brake light • Fuse (15A)
				Y—ground point When brake pedal released (IG SW is at ON)	0 V	
Z	Power supply (system)	Ignition switch	Voltage	Z—ground point (IG SW is at ON)	B+	• Harness, fuse (Z—IG SW)
				Z—ground point (IG SW is at OFF)	0 V	

*1 : When an isolation plate is not inserted to the short bar, voltage is **approximately 0.2 V**.

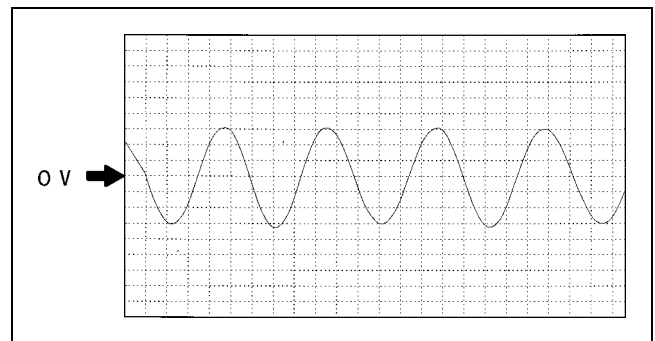
Inspection Using An Oscilloscope (Reference)

Wheel speed

- ABS HU/CM terminal:
RF: P (+)—O (—)
RR: N (+)—L (—)
LF: R (+)—Q (—)
LR: T (+)—S (—)
- Oscilloscope setting: 0.2 V/DIV (Y), 4 ms/DIV (X), AC range
- Vehicle condition: When turned 1 revolution per second

Note

- As vehicle speed increase, period of wave shorten.
- If malfunctioning in the sensor rotor, wave profile warp.



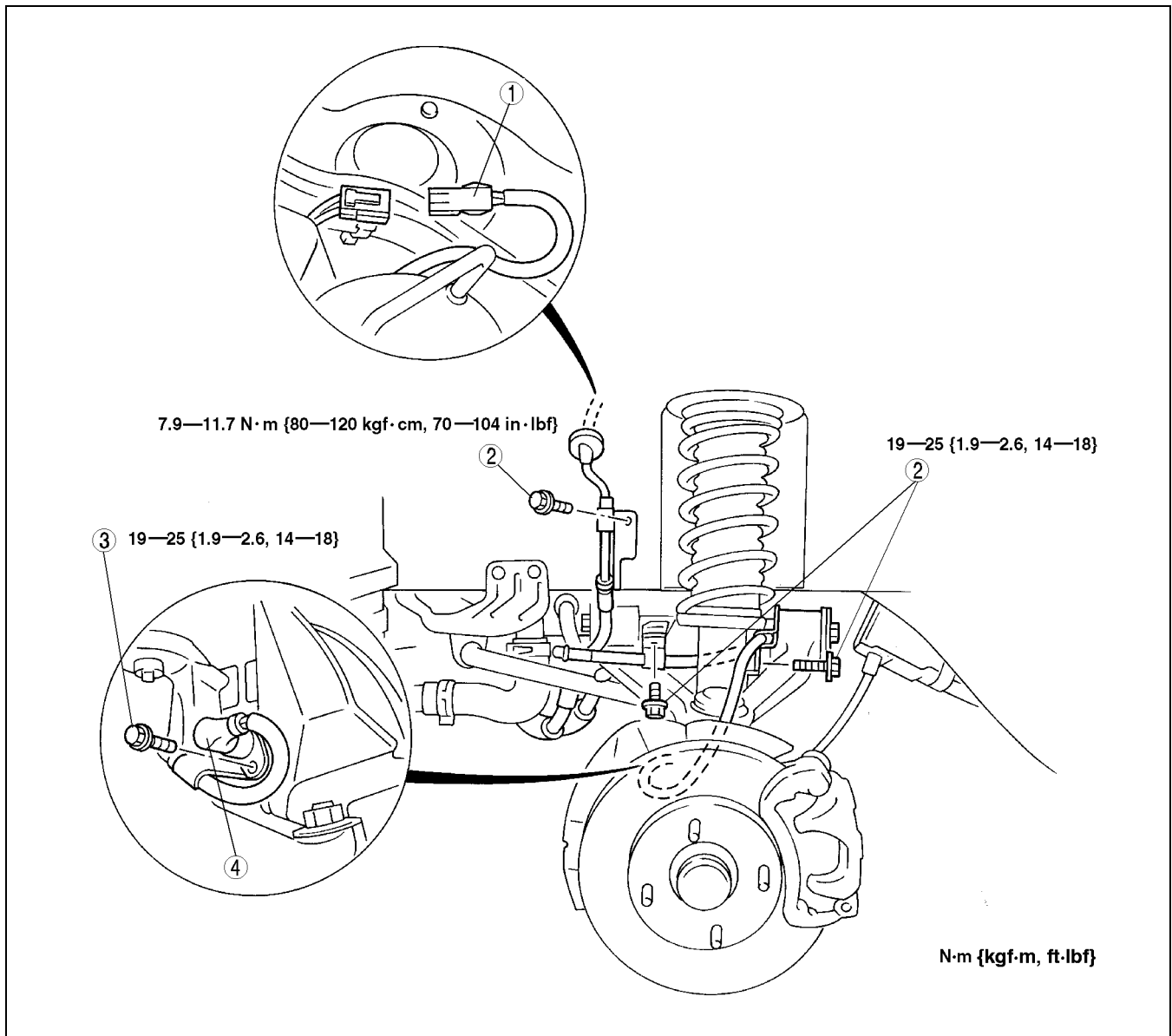
Z5U0413W110

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FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

A5U041343720W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



Z5U0413W101

1	Connector
2	Bolts

3	Bolt
4	ABS wheel-speed sensor

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FRONT ABS WHEEL-SPEED SENSOR INSPECTION

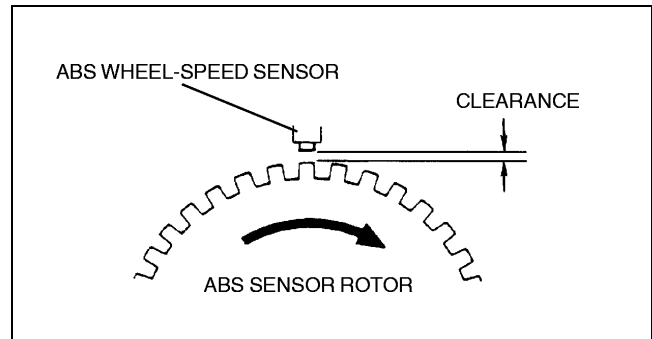
A5U041343720W02

Clearance Inspection

1. Remove the wheel and tire, and inspect the sensor for looseness and damage. Replace the sensor as necessary.
2. Verify the clearance between the ABS wheel-speed sensor and the sensor rotor.
 - If not as specified, replace the ABS wheel-speed sensor or sensor rotor as necessary.

Clearance

0.3—1.1 mm {0.012—0.043 in}



U5U41318

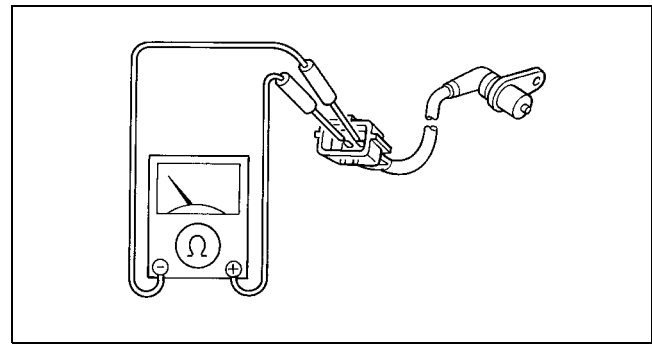
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Resistance Inspection

1. Disconnect the ABS wheel-speed sensor connector.
2. Inspect for resistance at the ABS wheel-speed sensor.

Resistance

1.0—2.0 kilohm



Z5U0413W102

Voltage Inspection

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Inspect each wheel by rotating it at one revolution per second.
 - If not as specified, replace the ABS wheel-speed sensor or sensor rotor as necessary.

Voltage

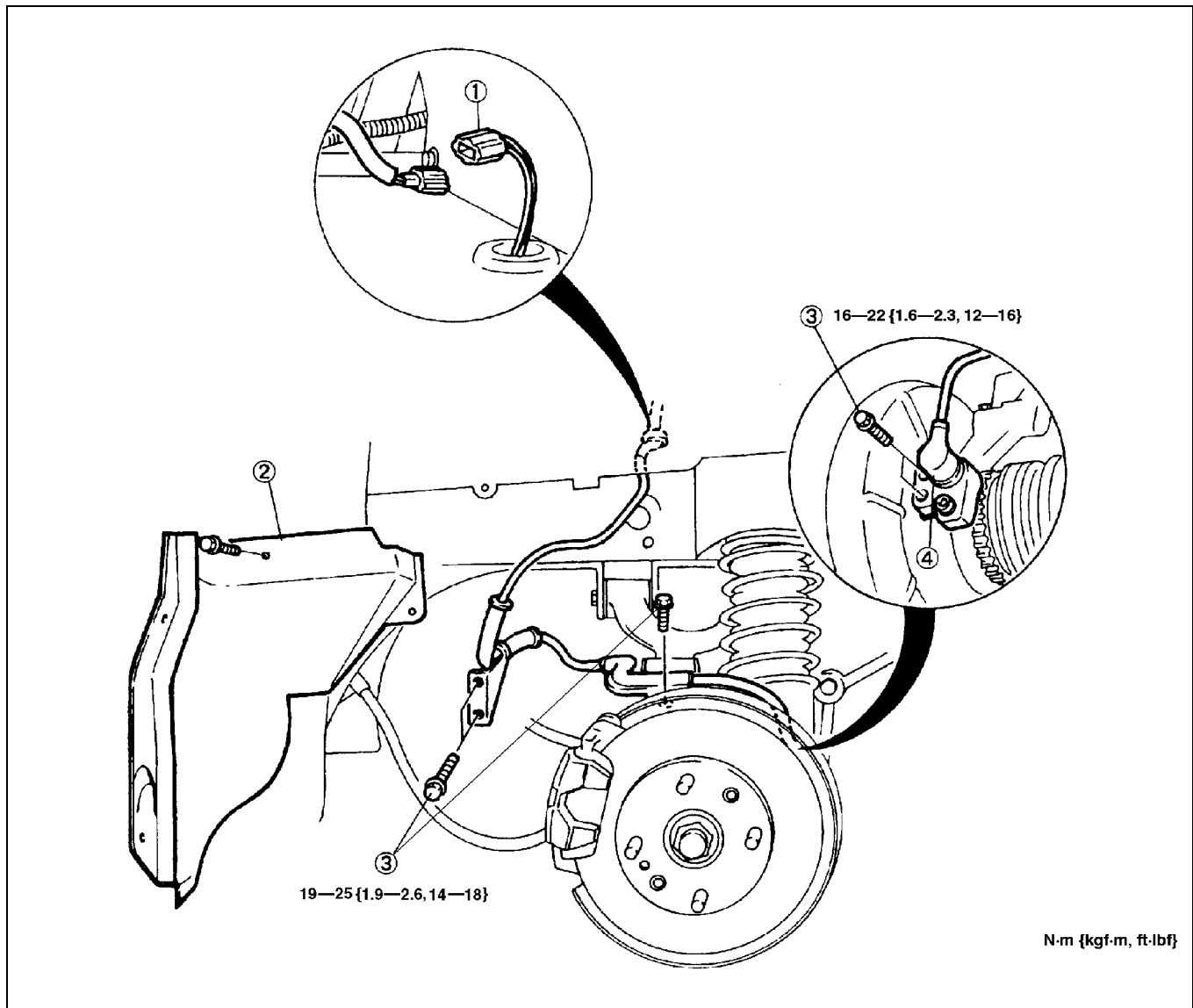
0.25—2.0 V (AC)

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REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

A5U041343710W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



Z5U0413W112

1	Connector
2	Mud guard
3	Bolt
4	ABS wheel-speed sensor

REAR ABS WHEEL-SPEED SENSOR INSPECTION

A5U041343710W02

1. Inspect the rear ABS wheel-speed sensor in the same procedure as the front ABS wheel-speed sensor. (See 04–13–9 FRONT ABS WHEEL-SPEED SENSOR INSPECTION.)