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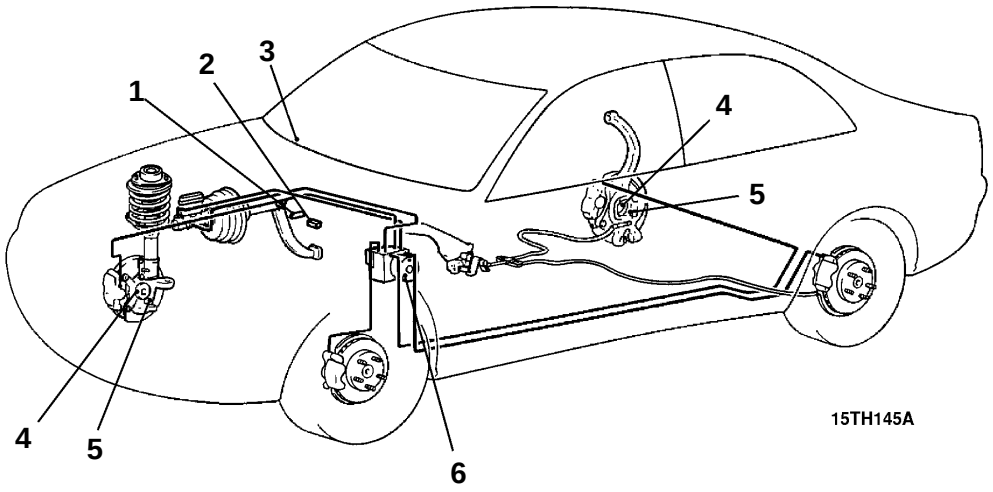
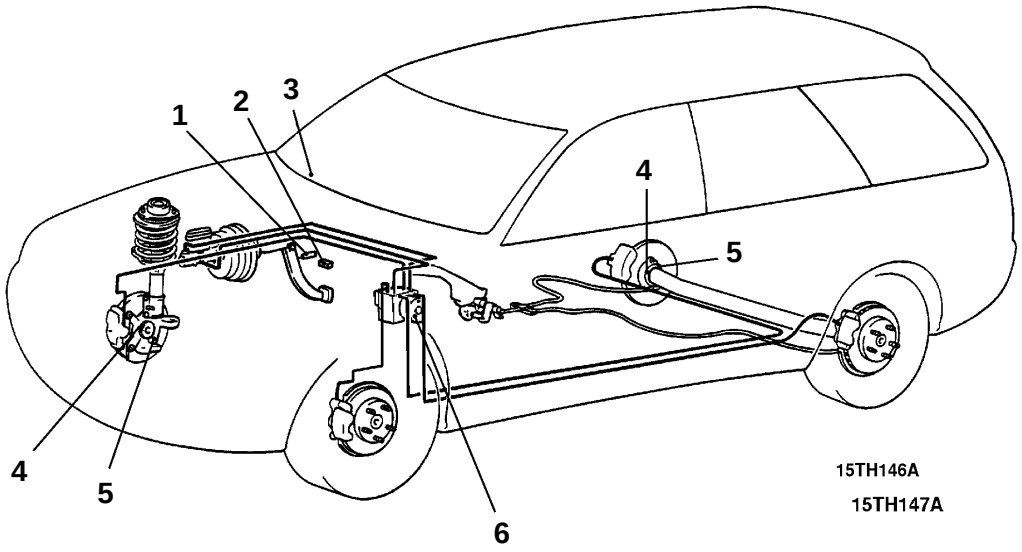
GENERAL INFORMATION

The ABS consists of wheel speed sensors, brake pedal switch, integral hydraulic unit and ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function. The diagnosis codes recorded in the memory will not be erased even if the ignition switch is turned to OFF. In addition, reading of diagnosis codes, service data and actuator testing are possible using the MUT-II. Electronic Brake-Force Distribution (EBD) uses the ABS Hydraulic Unit to control rear brake pressures, hence deleting the need for a proportioning valve.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	48
Rear rotor teeth	48

CONSTRUCTION DIAGRAM





1. Stop lamp switch
2. Data link connector
3. ABS warning light
4. Rotor
5. Wheel speed sensor
6. ABS-ECU/Hydraulic unit

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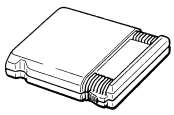
SERVICE SPECIFICATIONS

Items	Standard value
Speed sensor's internal resistance kΩ	1.4 – 1.8
Clearance between the wheel speed sensor mounting surface and the toothed rotor mm.	28.2–28.5

SEALANT

Items	Specified sealant	Remarks
Thread part fitting	Loctite 577	Semi-drying sealant
Vacuum switch		

SPECIAL TOOLS

Tool	Tool number and name	Supersession	Application
	MB991502 MUT-II	–	For checking ABS
	ROM pack	–	

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TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

Refer Group 00.

NOTES WITH REGARD TO DIAGNOSIS

The conditions listed in the following table are considered normal.

Condition	Explanation of condition
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed. This is considered normal.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)
ABS operation (Long braking distance)	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 overconfident.

Diagnosis detection condition depends on the diagnosis code.
When checking to see if the trouble symptom reoccurs after the diagnosis code has been erased, check the detection conditions column in the inspection chart for diagnosis codes (refer on vehicle service) and the memorise conditions recorded in the “Comments” column of the inspection procedure chart for diagnosis codes in order to carry out testing under driving conditions which satisfy each of the given conditions.

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read the diagnosis codes by the MUT-II or ABS warning lamp. (Refer Group 00.)

ERASING DIAGNOSIS CODES

WITH MUT-II

Read the diagnosis codes by the MUT-II or ABS warning lamp. (Refer Group 00.)

WITHOUT MUT-II

1. Press on the brake pedal so that the brake pedal switch is on.
2. Switch the ignition ON.
3. Wait until the ABS warning lamp goes out, then release the brake pedal.
4. “Toggle” the brake pedal so that the ABS–ECU receives a brake pedal switch on signal 9 times in 20 seconds.
5. The warning lamp will illuminate for 1 second to confirm code erasure.

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INSPECTION CHART FOR DIAGNOSIS CODES

Inspect according to the inspection chart that is appropriate for the diagnosis code.

Diagnosis code no.	Inspection item		Detection conditions
11	Front right wheel speed sensor	Open circuit	B, C
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor output signal abnormal		A, B
16	Power supply system		A, B, C
21	Front right wheel speed sensor	Short circuit	B, C
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
38	Stop light switch system		B, C
41	Front right solenoid valve (inlet)		B, C
42	Front left solenoid valve (inlet)		
43	Rear right solenoid valve (inlet)		
44	Rear left solenoid valve (inlet)		
45	Front right solenoid valve (outlet)		B, C
46	Front left solenoid valve (outlet)		
47	Rear right solenoid valve (outlet)		
48	Rear left solenoid valve (outlet)		
51	Valve relay		A, B, C
53	Motor relay		B
63	ABS–ECU		A, B, C

Detection conditions

A: During system check immediately after starting
B: While ABS control is not operating while driving
C: While ABS control is operating

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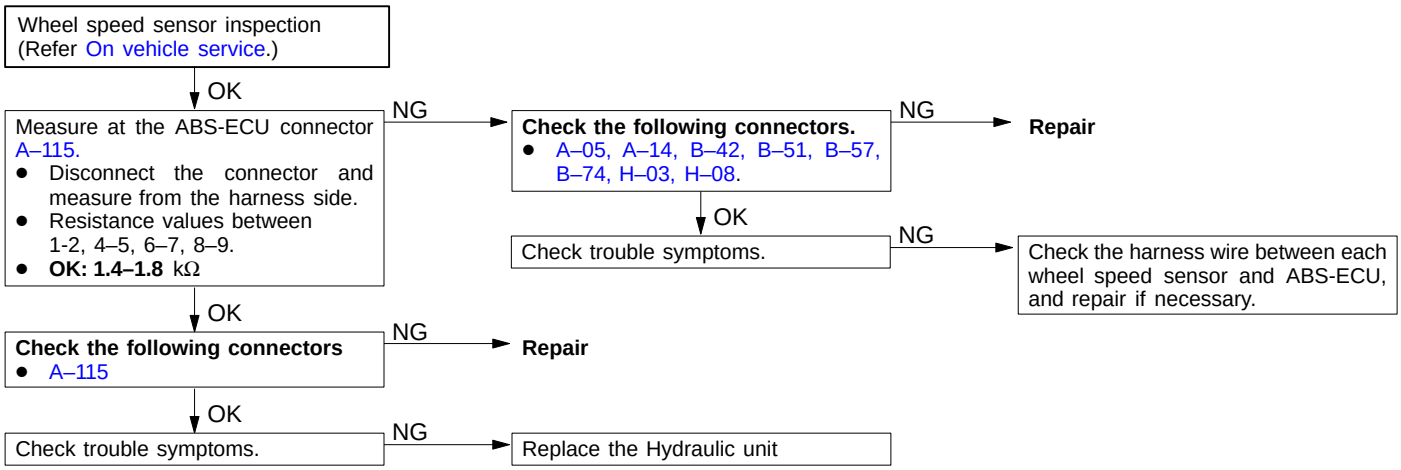
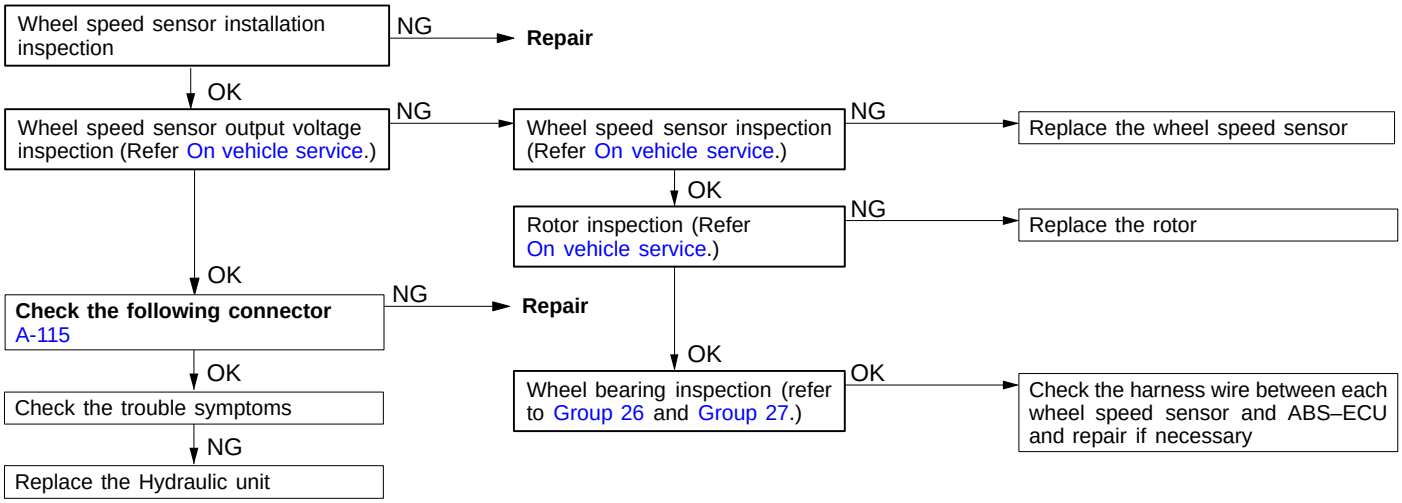
INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11, 12, 13, 14 Wheel speed sensor open circuit	Probable cause
[Comment] These codes are displayed when the sensor with the open circuit can be distinguished.	• Malfunction of wheel speed sensor (Open circuit) • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
[Comment] A wheel speed sensor outputs an abnormal signal (other than an open or short circuit)	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Damaged rotor • Wheel bearing worn or loose • Malfunction of wiring harness or connector • Malfunction of ABS–ECU



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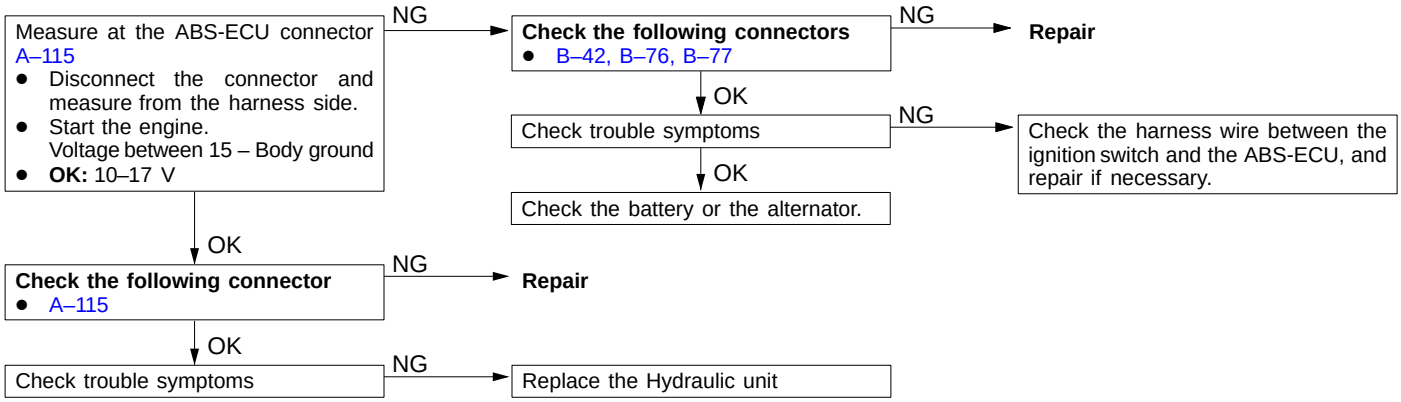
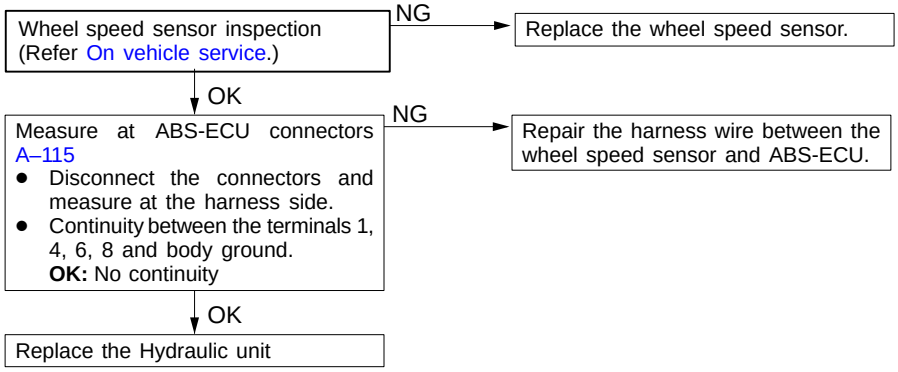
Code No. 16 Power supply system	Probable cause
[Comment] This diagnosis code is output when the ABS-ECU power voltage is outside the standard value. Furthermore, if the voltage returns to normal, this diagnosis code will not be output.	• Malfunction of wiring harness or connector. • Malfunction of battery or alternator • Malfunction of ABS-ECU

Caution
If the battery voltage drops during inspection, this code will be output as a current problem, and correct diagnosis of the problem cannot be made.
Before carrying out the following inspection, check the battery condition, and recharge it if necessary.



Code No. 21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
[Comment] These codes are displayed when the sensor with the short circuited can be distinguished.	• Malfunction of wheel speed sensor • Malfunction of wiring harness • Malfunction of ABS-ECU

NOTE
Short circuit is not detected when IG power voltage drops.



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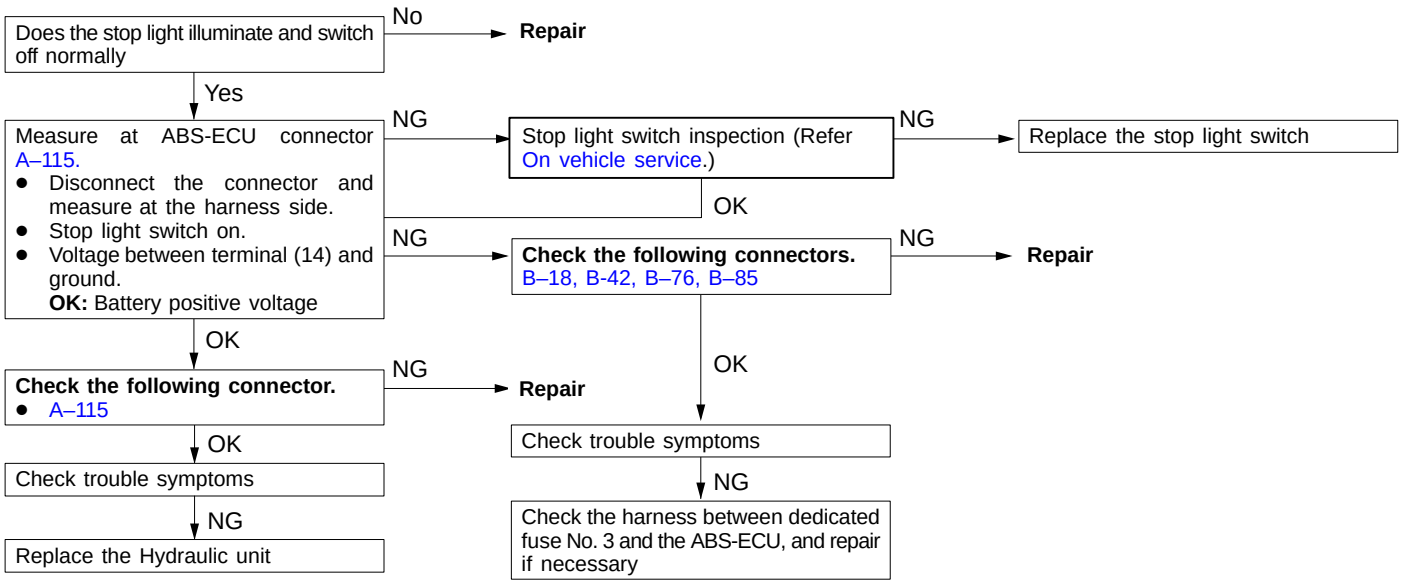
Code No. 38 Stop light switch system	Probable cause
[Comment] This diagnosis code is output if it is judged to be a short circuit when the stop light switch is ON for a continuous period of 15 minutes or more.	• Malfunction of wiring harness or connector • Malfunction of stop light switch • Malfunction of ABS-ECU



Code No. 41, 42, 43, 44 Solenoid valve (inlet)	Probable cause
[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. and determines if there is an open circuit or short circuit in the solenoid coil or in the harness, i.e. no current flows in the solenoid even though the ABS–ECU turns it on, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Refer to Troubleshooting procedure for DTC No.16.

Code No. 45, 46, 47, 48 Solenoid valve (outlet)	Probable cause
[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. and determines if there is an open circuit or short circuit in the solenoid coil or in the harness, i.e. no current flows in the solenoid even though the ABS–ECU turns it on, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Refer to Troubleshooting procedure for DTC No.16.

Code No. 51 Valve relay	Probable cause
[Comment] When the ignition switch is turned to ON, the ABS–ECU switches the valve relay off and on during the initial check to check if the valve relay is operating normally.	• Malfunction of ABS valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of hydraulic unit

Refer to Troubleshooting procedure for DTC No.16.

Code No. 53 Motor relay, motor	Probable cause
[Comment] The code is output at the following times: • When the motor relay is on but no signal is input to the motor monitor line (motor is not operating etc.). • When the motor relay is off but a signal is input to the motor monitor line (motor continues operating etc.).	• Malfunction of ABS motor relay • Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU

Refer to Troubleshooting procedure for DTC No.16.

Code No. 63 ABS-ECU	Probable cause
[Comment] The code is output at the following times: • During diagnosis output test or flash code output test.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU

Refer to Troubleshooting procedure for DTC No.16.

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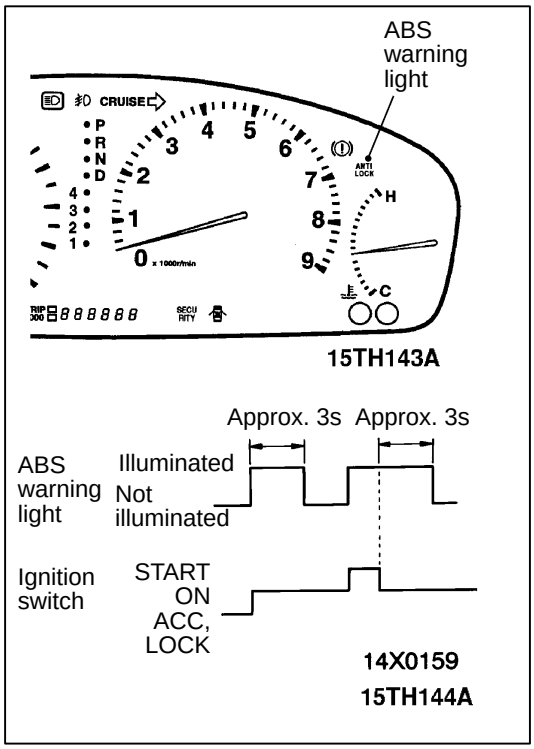

ABS WARNING LIGHT INSPECTION

Check that the ABS warning light illuminates as follows.

1. When the ignition key is turned to “ON”, the ABS warning light illuminates for approximately 3 seconds and then switches off.
2. When the ignition key is turned to “START”, the ABS warning light remains illuminated.
3. When the ignition key is turned from “START” back to “ON”, the ABS warning light illuminates for approximately 3 seconds and then switches off.
4. If the illumination is other than the above, check the diagnosis trouble codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1
	Communication with ABS only is not possible.	2
When the ignition key is turned to “ON” (engine stopped), the ABS warning light does not illuminate.		3
After the engine starts, the light remains illuminated.		4
After the engine started, the ABS warning light and the Brake warning light remains illuminated.		5
Faulty ABS operation	Unequal braking power on both sides	6
	Insufficient braking power	
	ABS operates under normal braking conditions	
	ABS operates before vehicle stops under normal braking conditions	
	Large brake pedal vibration when ABS operates	
	Large brake pedal vibration (Caution 2.)	Caution 2

Caution

1. **If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate even though sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.**
2. **During ABS operation, changes in the feeling of the brake pedal (vibration may occur or pedal may not be able to be depressed). Such changes are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking, and is considered normal.**

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INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

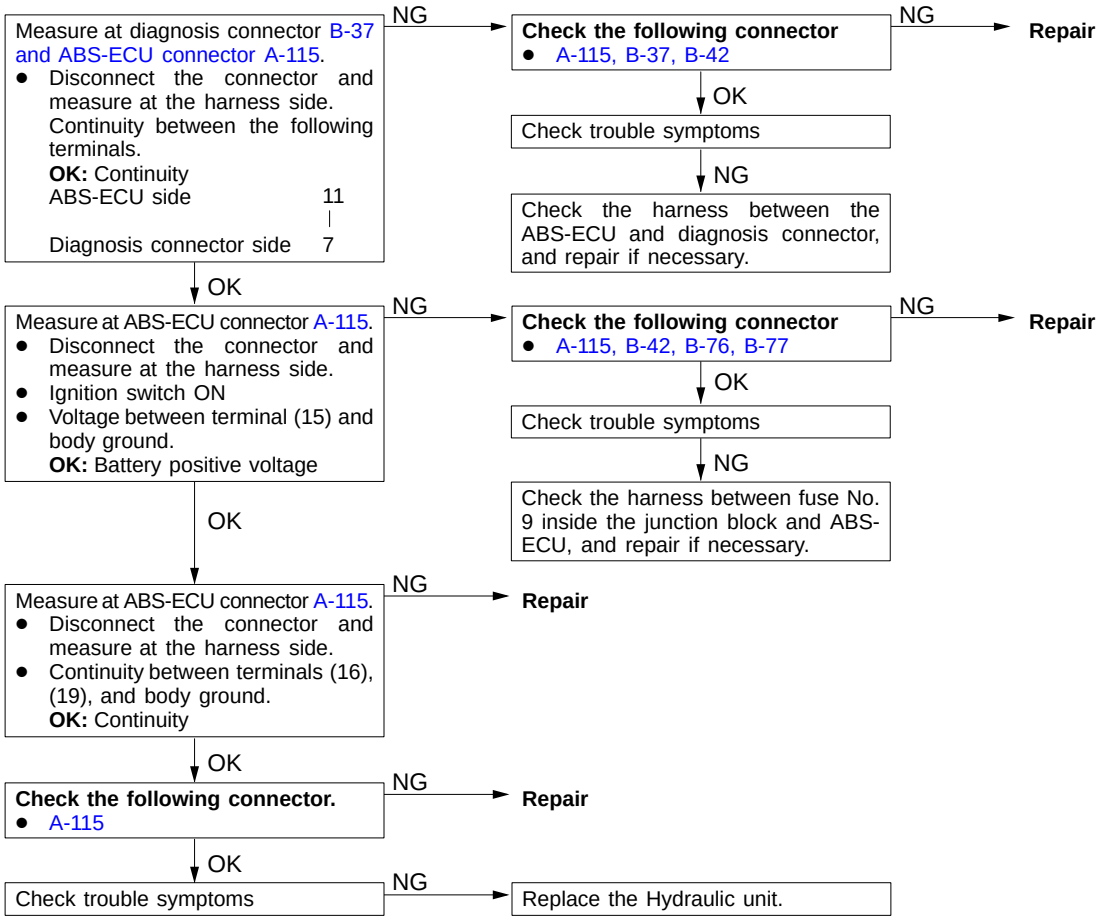
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
[Comment] The reason is probably a defect in the power supply system (including ground) for the diagnosis line.	• Malfunction of connector • Malfunction of harness

Refer Group 13A.

INSPECTION PROCEDURE 2

Communication with MUT-II is not possible. (Communication with ABS only is not possible.)	Probable cause
[Comment] When communication with the MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnostic output circuit.	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS power relay • Malfunction of ABS-ECU



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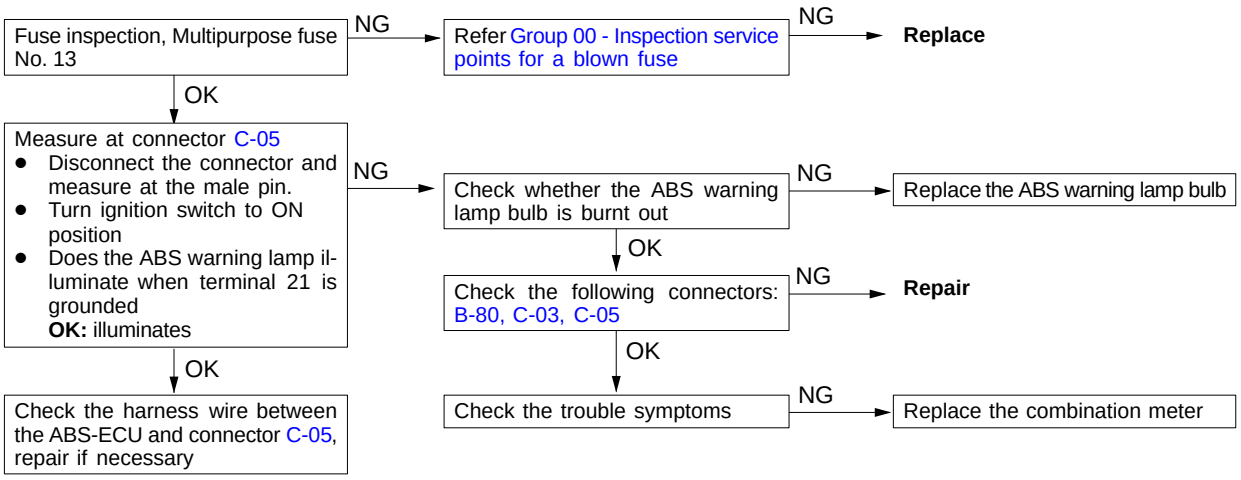
INSPECTION PROCEDURE 3

When ignition key is turned to “ON” (engine stopped), ABS warning light does not illuminate	Probable cause
[Comment] The cause may be an open circuit in the lamp power supply circuit, a blown light bulb, an open circuit in both the circuit between the ABS warning light and the ABS-ECU.	• Blown fuse • Burnt out ABS warning light bulb • Malfunction of wiring harness or connector



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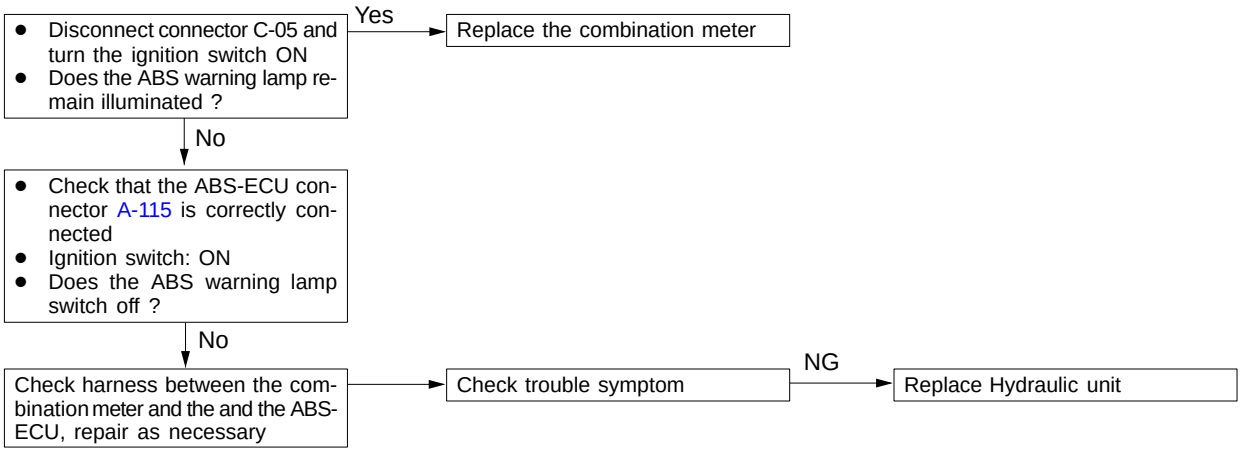
INSPECTION PROCEDURE 4

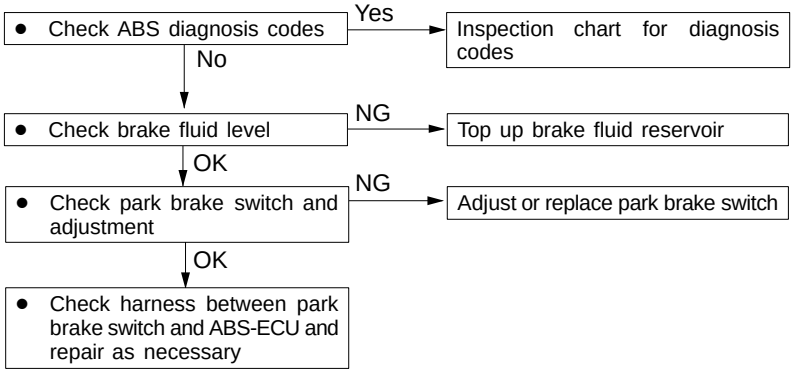
Even after the engine is started, the ABS warning light remains illuminated.	Probable cause
[Comment] The cause may be a short circuit in the ABS warning light illumination circuit or an incorrectly secured connector at the ABS-ECU.	• Combination meter fault • ABS-ECU fault • Harness fault (short)

This breakdown phenomenon is restricted to circumstances where communication with the MUT-II is possible (ABS-ECU power supply normal), and when the diagnosis code is normal.



INSPECTION PROCEDURE 5

Even after the engine is started, the ABS warning light and the Brake warning light remains illuminated.	Probable cause
[Comment] The cause may be an ABS/EBD system fault or an ABS combined with a brake system fault.	• ABS-ECU fault • Valve relay interruption • Solenoid valve actuation fault • Brake failure • Parkbrake switch failure • Harness fault (short)



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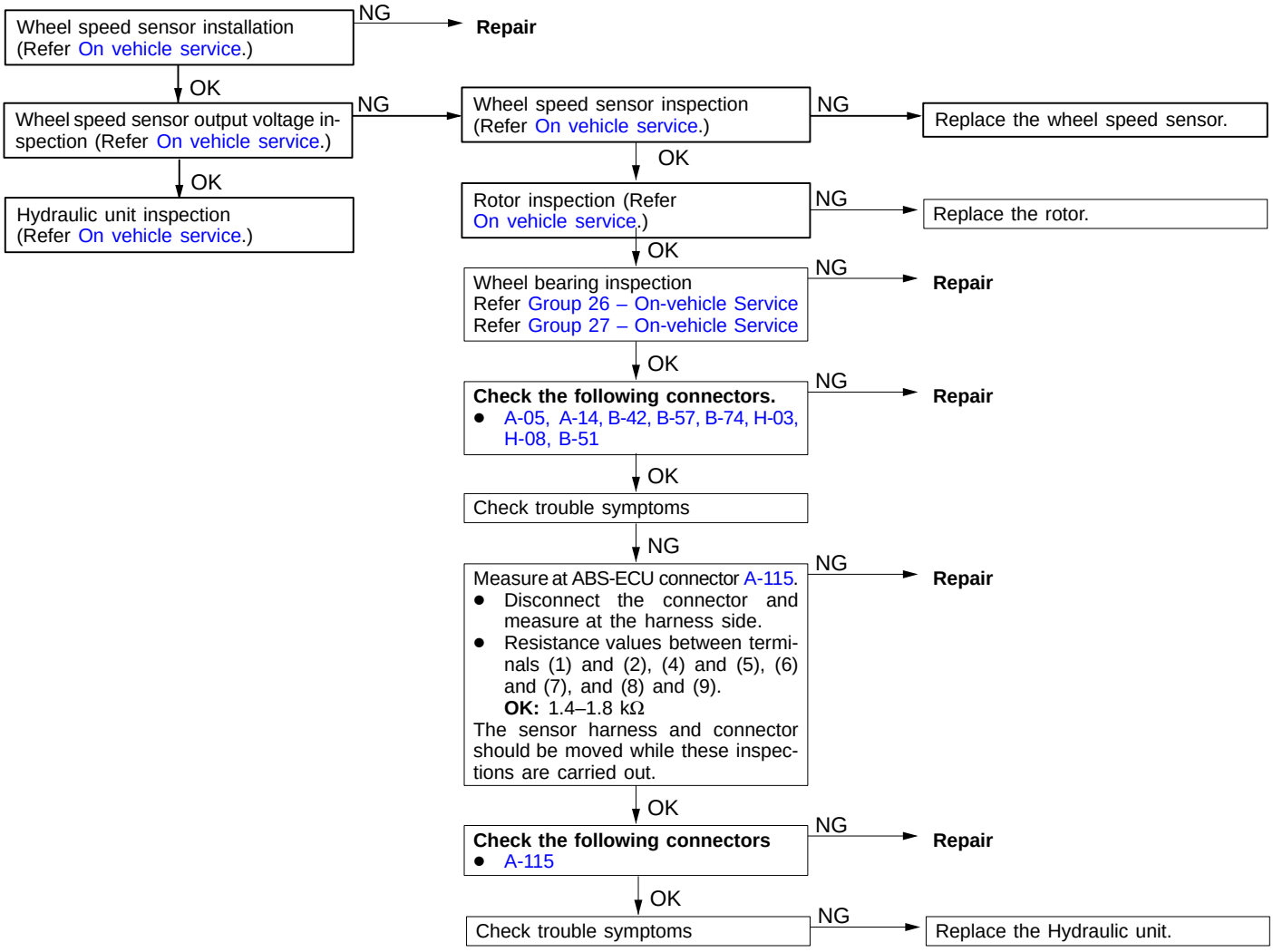
INSPECTION PROCEDURE 6

Brake operation is abnormal	Probable cause
[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



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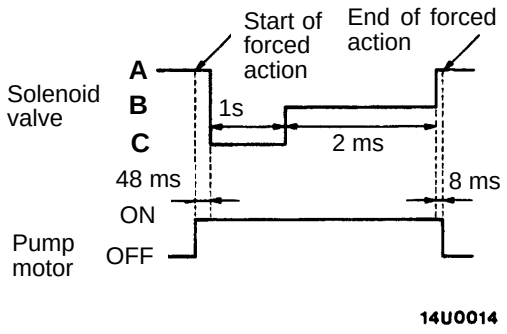
DATA LIST REFERENCE TABLE

With the MUT-II, check the data list for the items listed.

Item No.	Check point	Check condition	Normal condition
11	Front right wheel speed sensor	Check by actually operating vehicle.	Speedometer indication and MUT-II indication are the same.
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
16	Battery positive voltage	IG power voltage and valve monitor voltage	9–16 V
33	Stop lamp switch	Depress brake pedal.	ON
		Release brake pedal.	OFF

ACTUATOR TEST REFERENCE TABLE

The MUT-II activates the following actuators for testing.
NOTE
1. If the ABS-ECU is not functional, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h, forced actuation will be cancelled.
3. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.



NOTE
A: Hydraulic pressure increase
B: Hydraulic pressure holds
C: Hydraulic pressure decrease

ACTUATOR TEST SPECIFICATIONS

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

CHECK AT THE ABS-ECU

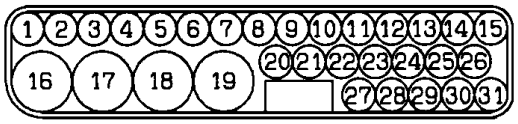
TERMINAL VOLTAGE CHECK CHART

1. Turn the ignition switch to OFF.
2. Disconnect the ABS-ECU connector.
3. Measure the voltage at the terminals of the ABS-ECU harness-side connector while referring to the check chart.

   NOTE
   1. When measuring voltage, a harness for checking contact pin pressure should be used instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution

   Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, ABS-ECU, or all three. Use care to prevent this!
4. If voltmeter shows any deviation from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.



15AG113N

Terminal No.	Name of circuit	Check requirements		Normal condition
14	Stop light switch (Input)	Ignition switch: ON (Stop light switch ON)		Battery positive voltage
		Ignition switch: ON (Stop light switch OFF)		1.0 V or less
17, 18	Memory power supply	At all times		Battery positive voltage
15	ECU power supply	Ignition switch: ON		Battery positive voltage
20	ABS warning light (Output)	Ignition switch: ON	When light is switched off	Battery positive voltage
			When light is illuminated	0–2 V
21	Brake warning light (EBD) (Output)	Ignition switch: ON	When light is switched off	Battery positive voltage
			When light is illuminated	0–2 V

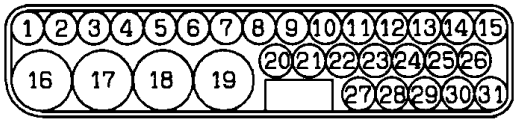
TERMINAL RESISTANCE AND CONTINUITY CHECKS

1. Turn the ignition switch to OFF.
2. Disconnect the ABS-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the ABS-ECU harness-side connector while referring to the check chart.

   NOTE
   1. When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution

   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ABS-ECU, and/or ohmmeter may occur. Use care to prevent this!
4. If ohmmeter shows any deviation from the normal condition, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.



15AG113N

Terminal No.	Name of circuit	Check requirements	Terminal voltage
1–2	Rear right wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
6–7	Front left wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
16–ground	ABS-ECU ground	—	Continuity
19–ground	ABS-ECU ground	—	Continuity
8–9	Rear left wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
4–5	Front right wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ

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ON-VEHICLE SERVICE

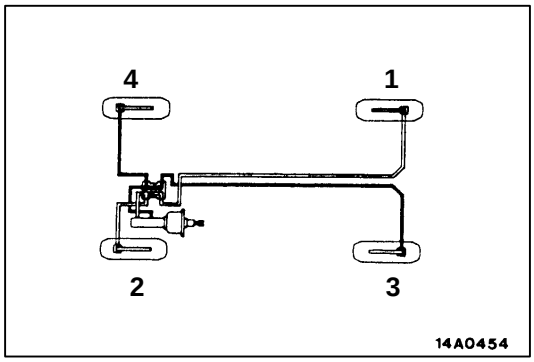
BLEEDING

Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT4

MASTER CYLINDER BLEEDING

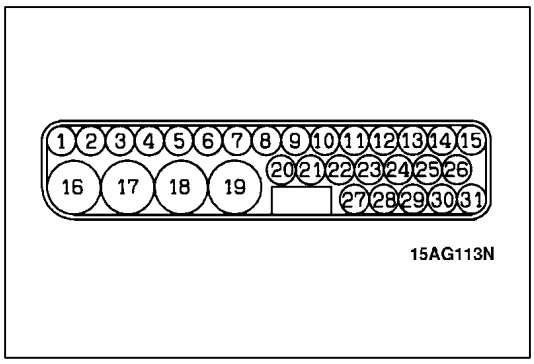
Refer Group 35 - On vehicle service.



BRAKE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

Caution
For vehicles with ABS, be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the Hydraulic Unit.



ABS OPERATION CHECK

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU harness connector and measure from the harness side connector.

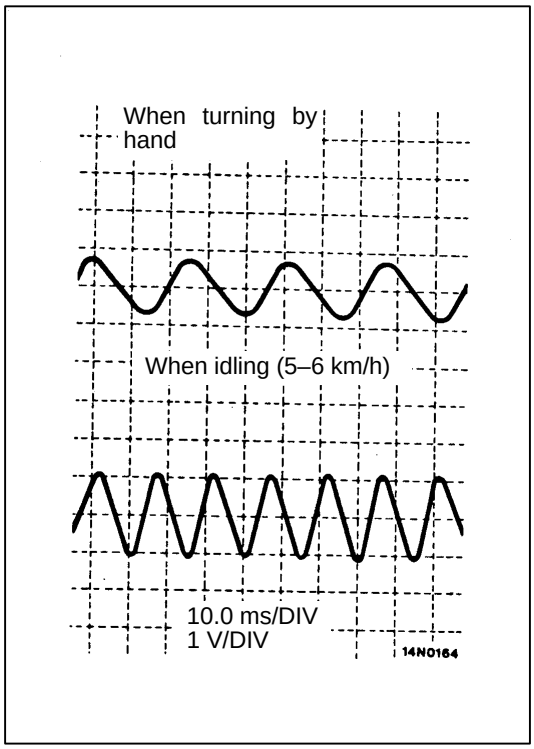
   Caution
   Use a special tool (inspection harness for connector pin contact pressure) to measure the output voltage at the harness side connector to prevent damaging the connector terminals.

3. Rotate the wheel to be measured at approximately 1/2–1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	6	4	8	1
	7	5	9	2

   Output voltage
   When measuring with a circuit tester:
   50 mV or more
   When measuring with an oscilloscope:
   20 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follow:
   - Faulty wheel speed sensor – replace the wheel speed sensor.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope:-

- Start the engine, and rotate the front wheels by engaging D range. Turn the rear wheels manually so that they rotate at a constant speed.

NOTE

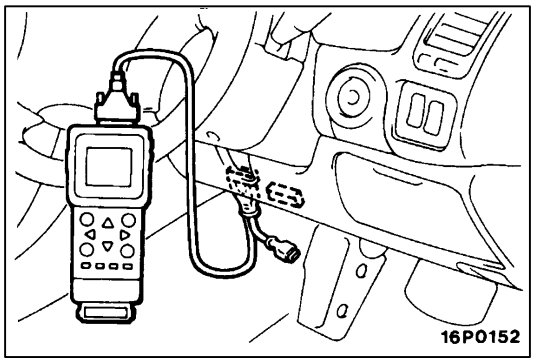
1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The wave form measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be low when the wheel speed is low, and similarly it will be higher as the wheel speed increases.

Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

NOTE

The wheel speed sensor cable moves following motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally on ordinary roads. It is, therefore, recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.



HYDRAULIC UNIT (HU) INSPECTION

Caution
Connection and disconnection of the MUT-II should always be made with the ignition switch in the OFF position.

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution
   1. The roller of the braking force tester and the tyre should be dry during testing.
   2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the MUT-II as shown in the diagram.
4. After checking that the selector lever is in neutral, start the engine.

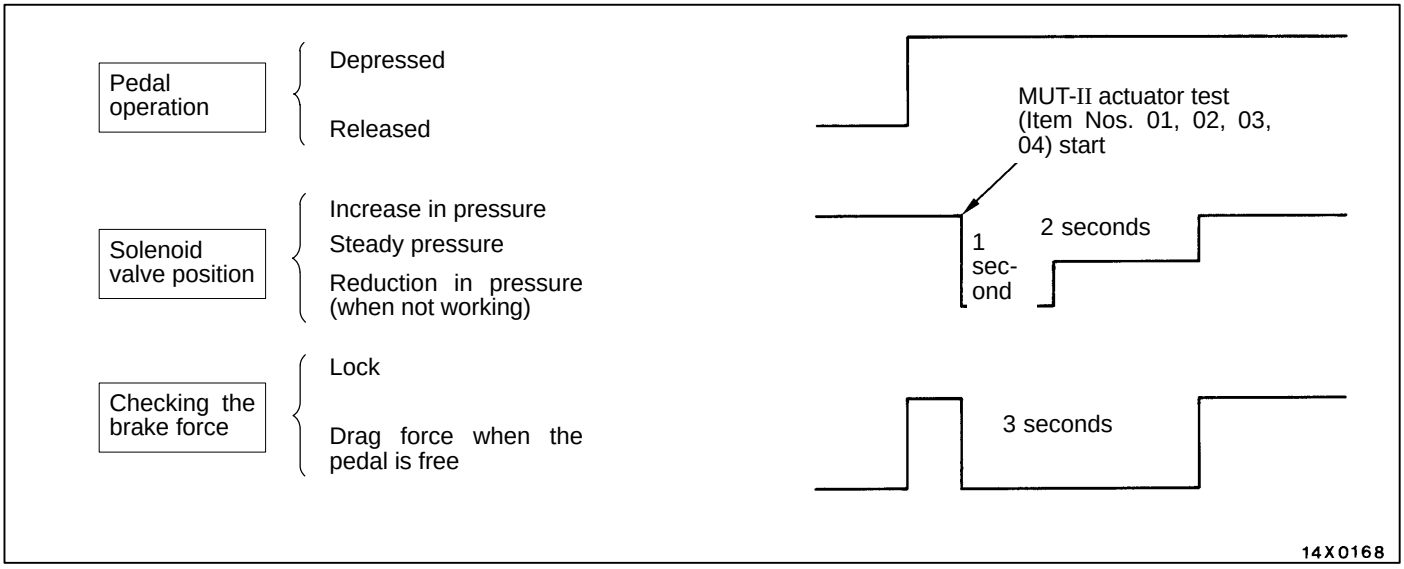
   NOTE
   1. At this time, the ABS system will switch to the MUT-II mode and the ABS warning light will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

5. Use the MUT-II to force-drive the actuator.
6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
   When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

N

Front wheel	785–981
Rear wheel	294–490

The result should be as shown in the following diagram.

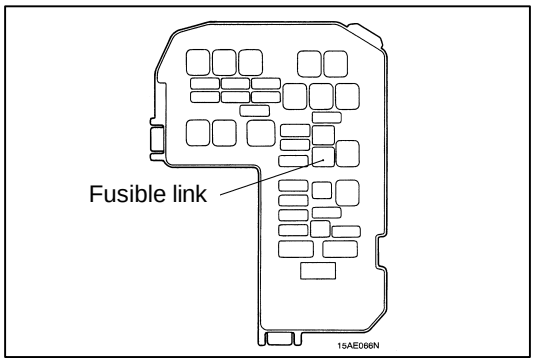


7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."

Diagnosis Table

No.	Operation	Judgement-Normal	Judgement-Abnormal	Probable cause	Remedy
01	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.



REMEDY FOR A FLAT BATTERY

When booster cables are used to start the engine when the battery is completely discharged and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire or stall, making driving difficult.

This happens because ABS consumes a great amount of current for its self-check function. The remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for ABS circuit, thus disabling the anti-lock brake system.

The ABS warning light will illuminate when the fusible link (for ABS) is removed.

After the battery has sufficiently charged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning light is not illuminated.

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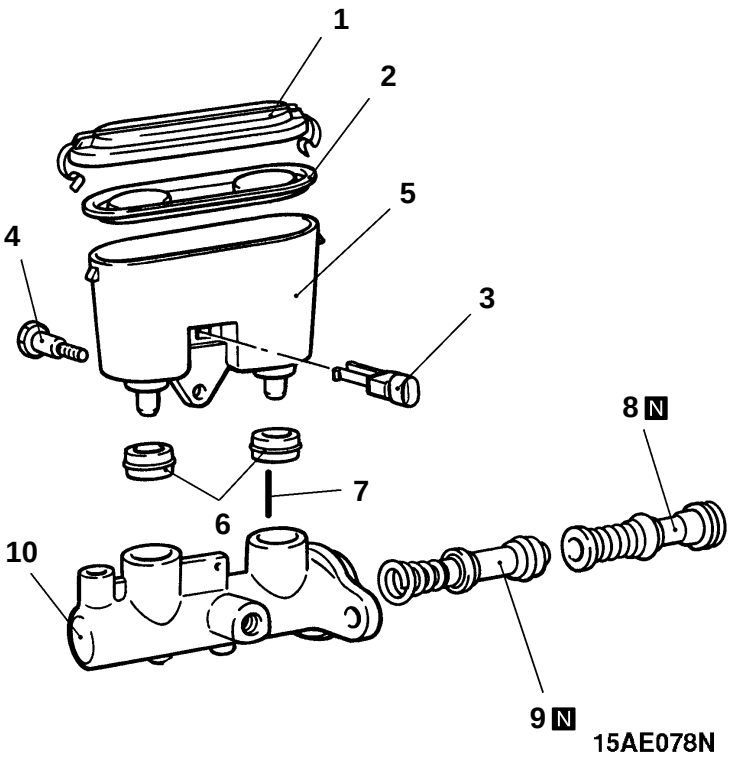
MASTER CYLINDER AND BRAKE BOOSTER

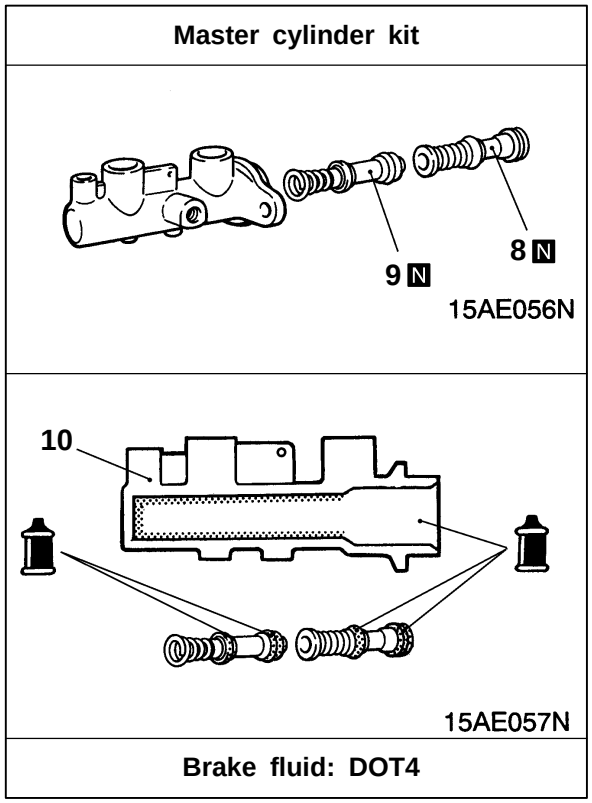
REMOVAL AND INSTALLATION

(Refer Group 35 - Master Cylinder)

MASTER CYLINDER

DISASSEMBLY AND REASSEMBLY





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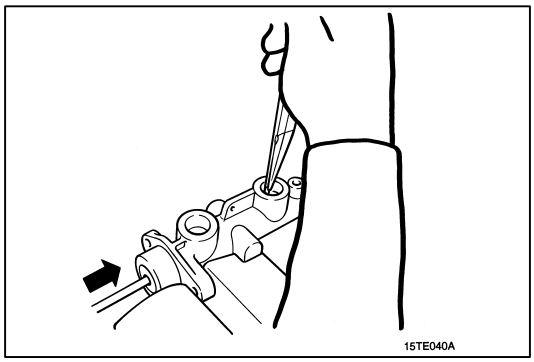
Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Brake fluid level sensor
4. Reservoir bolt
5. Reservoir
6. Reservoir seals
7. Piston stopper pin
8. Primary piston assembly
9. Secondary piston assembly
10. Master cylinder body

◀A▶

Caution
Do not disassemble the primary and secondary piston assemblies.



DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER PIN DISASSEMBLY

Remove the piston stopper pin, while depressing the piston.

INSPECTION

- Check the inner surface of master cylinder body for corrosion or pitting.
- Check the primary and secondary pistons for corrosion, scoring, damage or wear.
- Check the diaphragm for cracks and wear.

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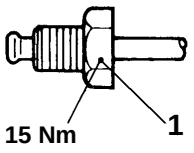
HYDRAULIC UNIT

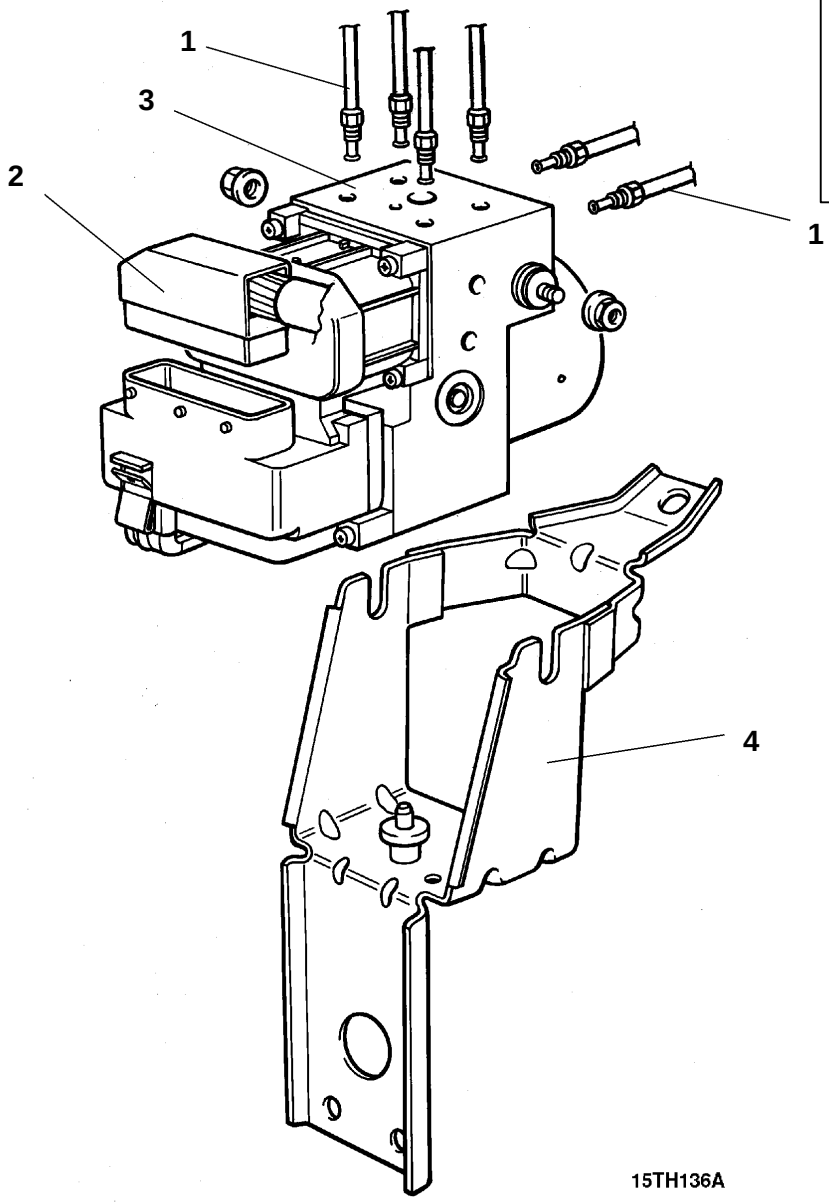
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation
- Installation of the Air Intake Hose Removal
- Brake Fluid Supplying
- Brake Line Bleeding (Refer On vehicle service.)
- Hydraulic Unit Checking (Refer On vehicle service.)

Flared brake line nuts





Removal steps

▶A◀ 1. Connection for brake pipe
2. Connection for harness connector
◀A▶ 3. Hydraulic unit
4. Hydraulic unit bracket

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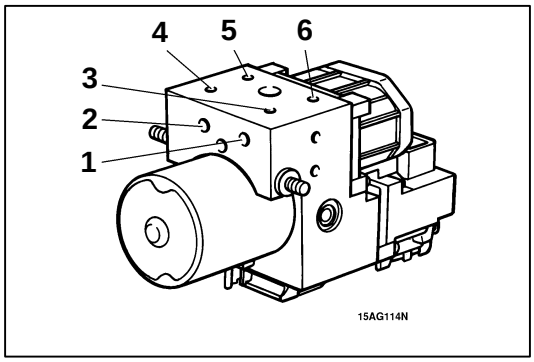
REMOVAL SERVICE POINT

◀A▶ HYDRAULIC UNIT REMOVAL

Caution

1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts must not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

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

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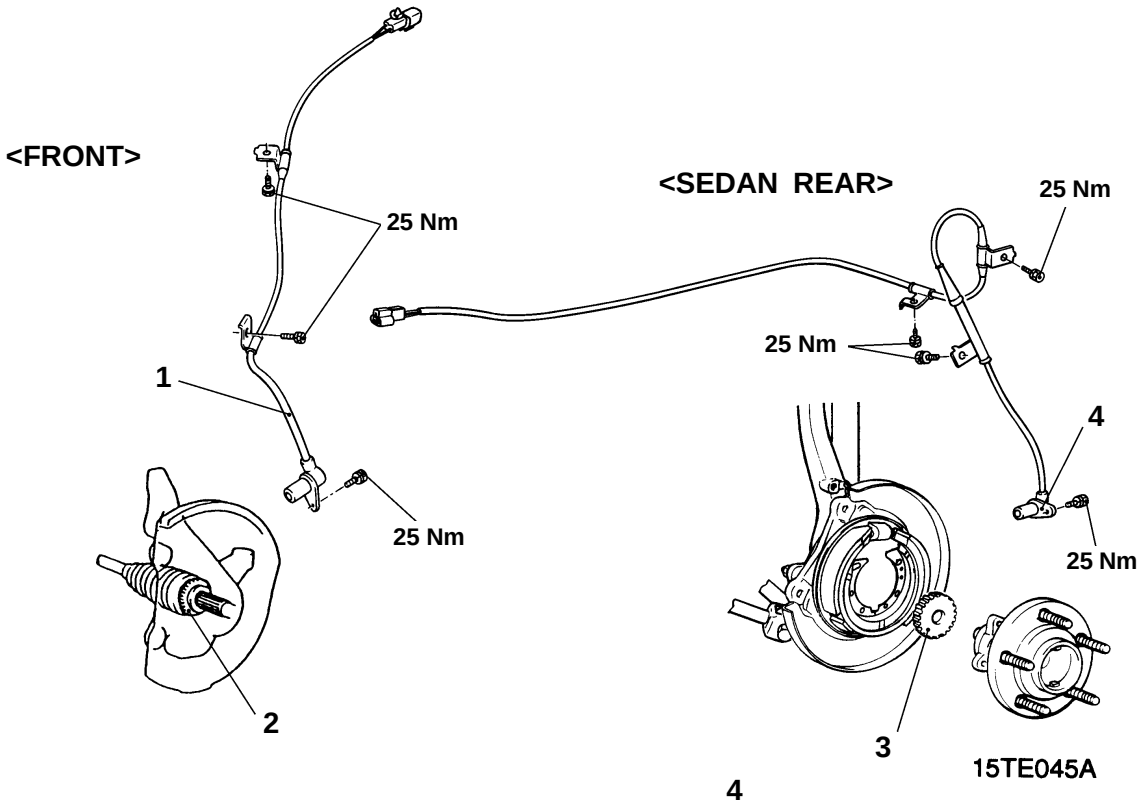
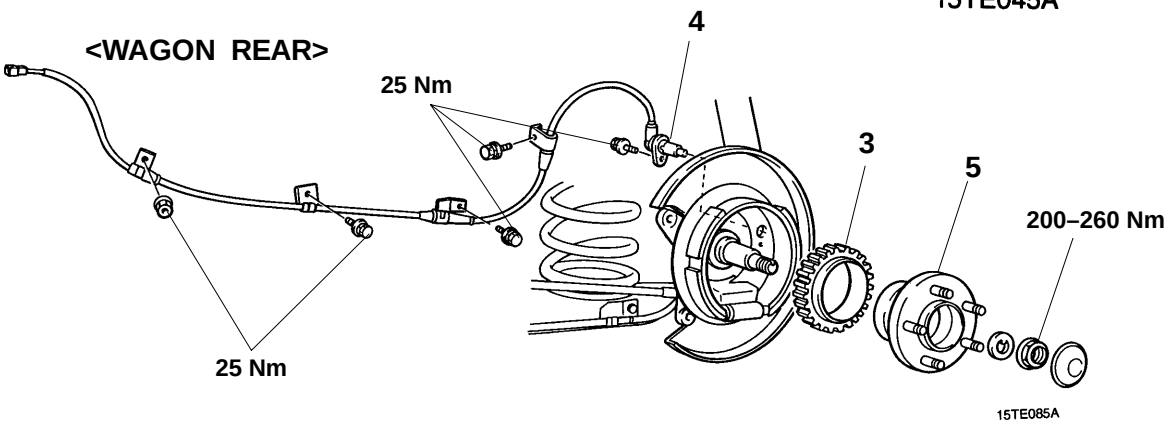
WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Speed Sensor Output Voltage Checking (Refer On vehicle service.)



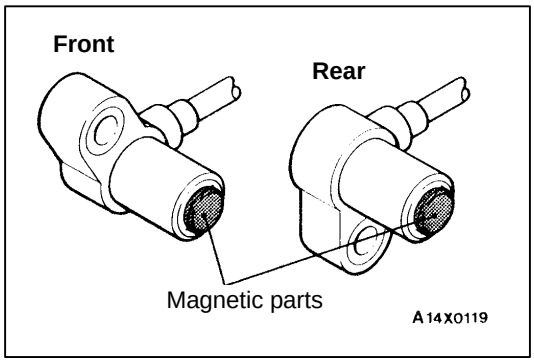


Front speed sensor removal steps
1. Front speed sensor
2. Front rotor (Refer Group 26 -Driveshaft.)

Rear speed sensor removal<Sedan>
3. Rear rotor (Refer Group 27 - Rear Axle hub.)
4. Rear speed sensor

Rear speed sensor removal <Wagon>
3. Rear rotor (Refer Group 27A - Rear Axle hub.)
4. Rear speed sensor
5. Hub

NOTE
The front rotor is integrated with the drive shaft and is not disassembled.

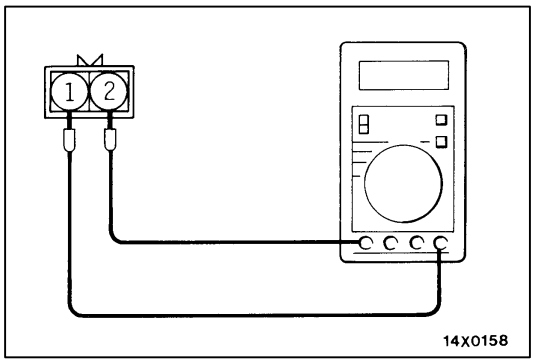


INSPECTION

SPEED SENSOR

1. Check whether any metallic foreign material has adhered to the parts shown in the illustration at the speed sensor tip, and if so, remove it.

   NOTE
   The section shown in the illustration can become magnetised because of the magnet built into the speed sensor, with the result that foreign metallic material is attached to it.



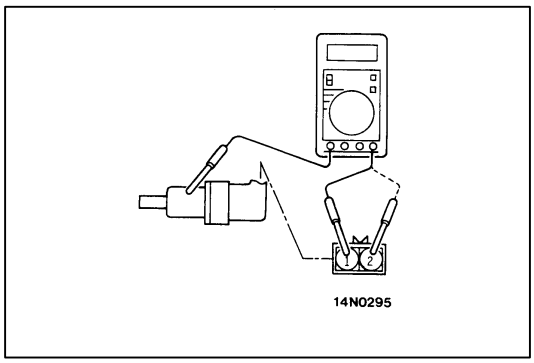
2. Measure the resistance between the speed sensor terminals.

   Standard value: 1.4–1.8 kΩ

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

3. Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

   NOTE
   When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp to check whether or not an intermittent contact results. Check the connector connection and the terminal insertion.

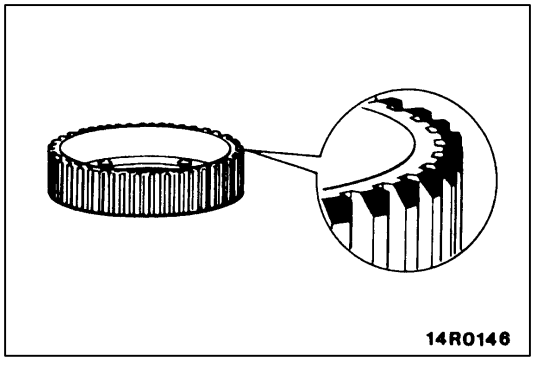


SPEED SENSOR INSULATION INSPECTION

1. Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

   Standard value: 100 kΩ or more

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



TOOTHED ROTOR

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.