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# SERVICE BRAKES

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35109000159

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NOTE  
THE GROUPS MARKED BY  ARE NOT IN THIS MANUAL



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# BASIC BRAKE SYSTEM

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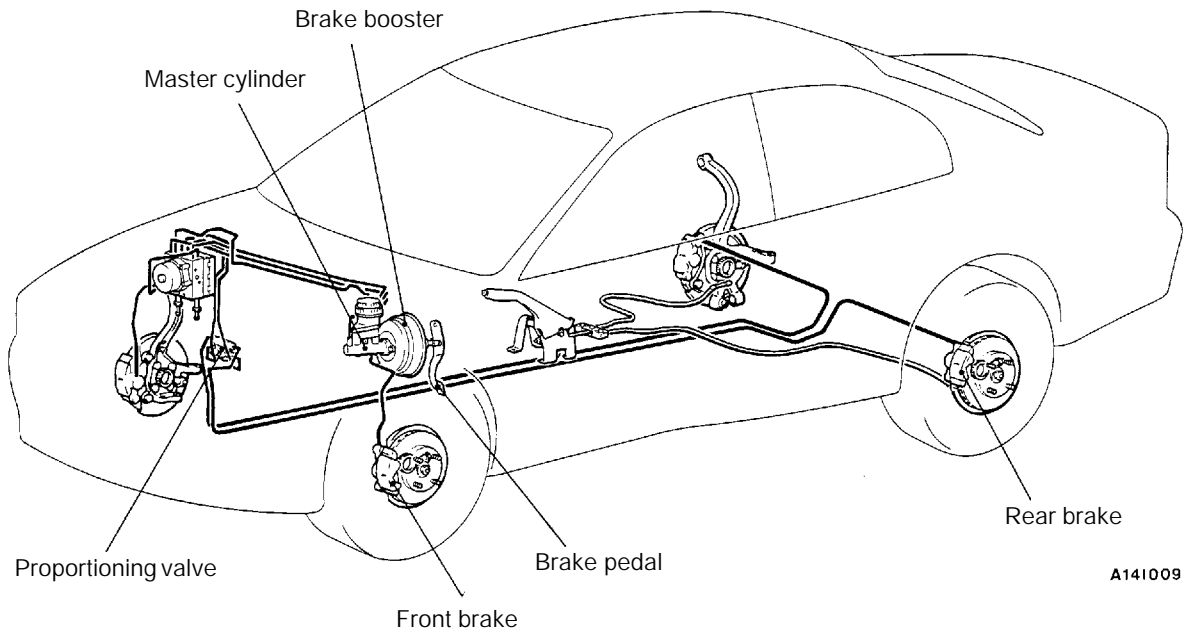
**GENERAL INFORMATION**

35100010182

The brake system offers high dependability and durability along with improved braking performance and brake sensitivity.

Items		Specifications
Master cylinder	Type	Tandem type (with level sensor)
	I.D. mm	23.8
Brake booster	Type	Vacuum type, single
	Effective dia. of power cylinder mm	230
	Boosting ratio	6.0
Proportioning valve	Type	Dual type
	Decompression ratio	0.25
Front brakes	Type	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm	256 × 24
	Wheel cylinder I.D. mm	60.3
	Pad thickness mm	10.0
	Clearance adjustment	Automatic
Rear disc brakes	Type	Floating caliper, 1-piston, solid disc
	Disc effective dia. × thickness mm	262 × 24
	Wheel cylinder I.D. mm	34.9
	Pad thickness mm	10.0
	Clearance adjustment	Automatic
Rear drum brakes	Type	Leading trailing
	Drum I.D. mm	203
	Wheel cylinder I.D. mm	20.6
	Lining thickness mm	4.4
	Clearance adjustment	Automatic
Brake fluid		DOT3 or DOT4

## CONSTRUCTION DIAGRAM



## SERVICE SPECIFICATIONS

35100030201

Items		Standard value	Limit	
Brake pedal height mm		162.8 - 165.8	-	
Brake pedal free play mm		3 - 8	-	
Brake pedal to floor board clearance mm		90 or more	-	
Proportioning valve	Split point MPa	Sedan	$2.94 \pm 0.25$	-
		Wagon	$3.43 \pm 0.25$	-
	Output fluid pressure (Input fluid pressure) MPa	Sedan	$4.66 \pm 0.39$ (9.81)	-
		Wagon	$5.80 \pm 0.39$ (9.81)	-
Output fluid pressure difference between left and right MPa		-	0.39	
Brake booster push rod protruding length mm		9.65 - 9.90	-	
Front disc brake	Pad thickness mm	10.0	2.0	
	Disc thickness mm	24.0	22.4	
	Disc runout mm	-	0.06	
	Drag force (tangential force of wheel mounting bolts) N	69 or less	-	

Items		Standard value	Limit
Rear disc brake	Pad thickness mm	10.0	2.0
	Disc thickness mm	10.0	8.4
	Disc runout mm	-	0.08
	Drag force (tangential force of wheel mounting bolts) N	69 or less	-
Rear drum brake	Lining thickness mm	4.4	1.0
	Drum inside diameter mm	203	205

**LUBRICANTS**

35100040082

Items	Specified Lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease (orange)
Slide pin boot and slide pin bush inner surfaces	
Brake piston boot inner surfaces	
Piston boot mounting grooves	
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No.1
Shoe assembly and auto adjuster assembly contact surfaces	
Shoe and lever assembly and auto adjuster assembly contact surfaces	

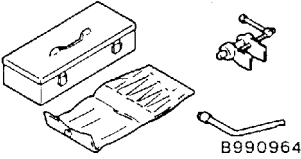
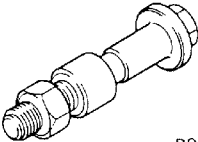
**SEALANTS**

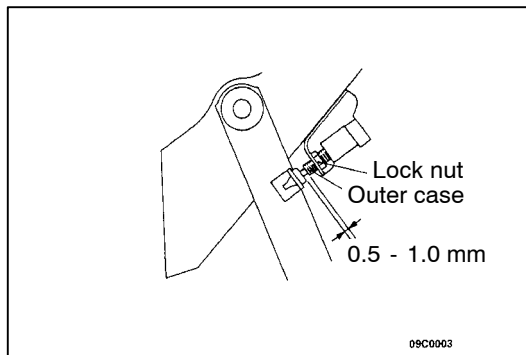
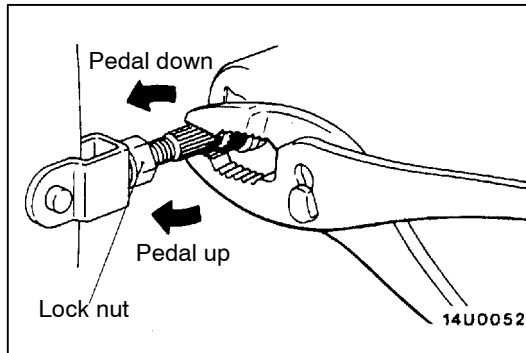
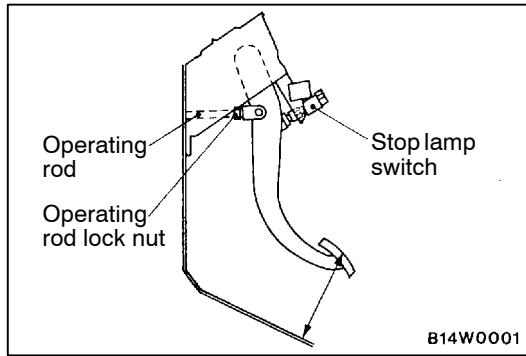
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Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Vacuum switch		

**SPECIAL TOOLS**

35100060071

Tool	Number	Name	Use
 <p>B990964</p>	MB990964 MB990520 MB990619	Brake tool set	<ul style="list-style-type: none"> <li>• Pushing-in of the disc brake piston</li> <li>• Installation of drum brake wheel cylinder piston cup</li> </ul>
 <p>B990998</p>	MB990998	Front hub remover and installer	Provisional holding of the wheel bearing



## ON-VEHICLE SERVICE

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### BRAKE PEDAL CHECK AND ADJUSTMENT

#### BRAKE PEDAL HEIGHT

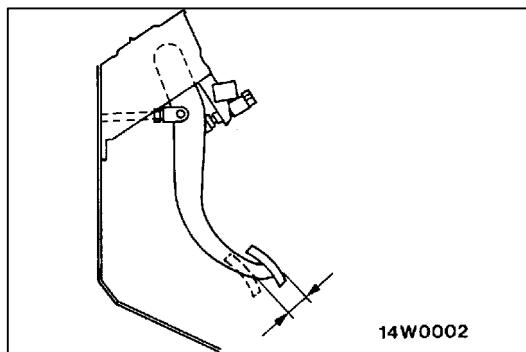
1. Turn up the carpet, etc under the brake pedal.
2. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, follow the procedure below.

**Standard value: 162.8 - 165.8 mm**

- (1) Disconnect the stop lamp switch connector.
  - (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
  - (3) Secure by tightening the lock nut of the operating rod.
  - (4) Push the stop lamp switch in the direction of the pedal stroke until it stops. (The switch will slide if it is pushed firmly.)
  - (5) Lift up the pedal until the operating rod is fully extended, and then slide the stop lamp switch back to the required position. Adjust the position of the switch by turning it until the distance shown in the illustration is correct.
  - (6) Connect the connector of the stop lamp switch.
  - (7) Check that the stop lamp is not illuminated with the brake pedal unpressed.
3. Return the carpet etc.

#### BRAKE PEDAL FREE PLAY

With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.



**Standard value: 3–8 mm**

If the free play exceeds the standard value, it is probably due to excessive play between the retaining ring bolt and brake pedal arm.

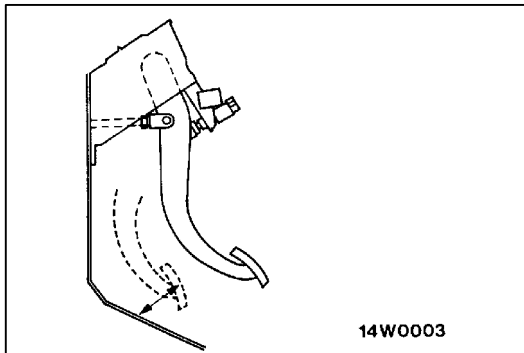
Check for excessive clearance and replace faulty parts as required.

**CLEARANCE BETWEEN BRAKE PEDAL AND FLOOR BOARD**

1. Turn back the carpet etc. under the brake pedal.
2. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

**Standard value: 90 mm or more**

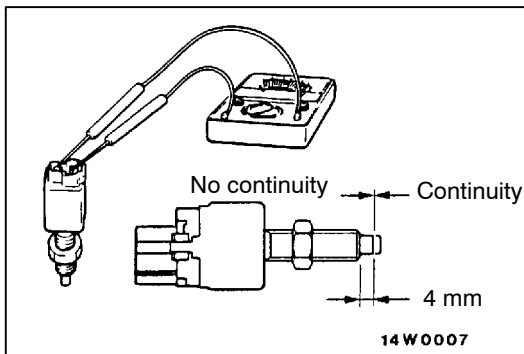
3. If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake. Adjust and replace defective parts as required.
4. Return the carpet etc.



**STOP LAMP SWITCH CHECK**

35100890120

Connect a circuit tester to the stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released. The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm from the outer case edge surface, and if there is continuity when it is released.

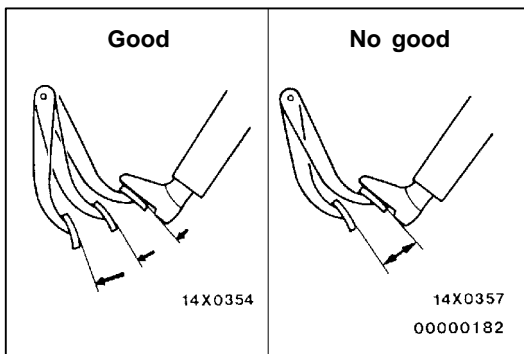


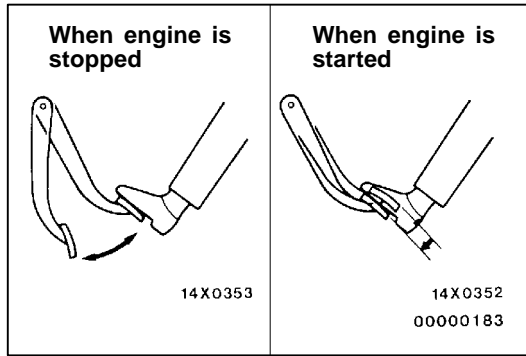
**BRAKE BOOSTER OPERATING TEST**

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For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then stop it.  
If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.





2. With the engine stopped, step on the brake pedal several times.  
Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.
3. With the engine running, step on the brake pedal and then stop the engine.  
Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.  
If the above three tests are okay, the booster performance can be determined as good.  
If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be defective.

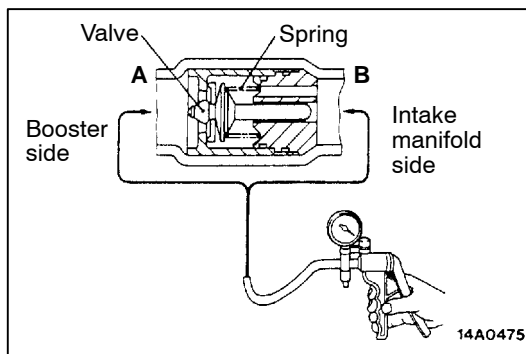
### CHECK VALVE OPERATION CHECK

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1. Remove the vacuum hose. (Refer to P.35A-16.)

#### Caution

The check valve should not be removed from the vacuum hose.



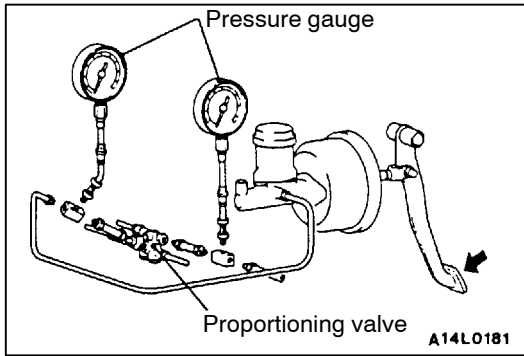
2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

#### Caution

If the check valve is defective, replace it as an assembly unit together with the vacuum hose.





### PROPORTIONING VALVE FUNCTION TEST

35100110172

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Bleed the air in the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.

- (1) Output pressure begins to drop relative to input pressure (split point).

**Standard value:**

MPa

Sedan	Wagon
2.94 ± 0.25	3.43 ± 0.25

- (2) Check to be sure that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is at the values shown in the table below.

**Standard value:**

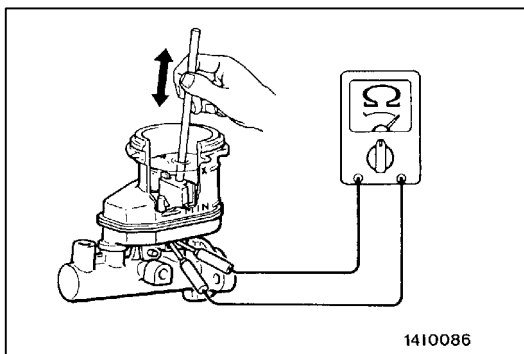
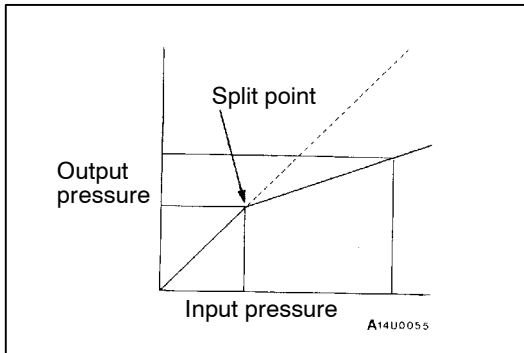
MPa

	Sedan	Wagon
Output fluid pressure (Input fluid pressure)	4.66 ± 0.39 (9.81)	5.80 ± 0.39 (9.81)

- (3) Output pressure difference between left and right brake lines.

**Limit: 0.39 MPa**

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



### BRAKE FLUID LEVEL SENSOR CHECK

35100910123

The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" and if there is continuity when the float surface is below "MIN".

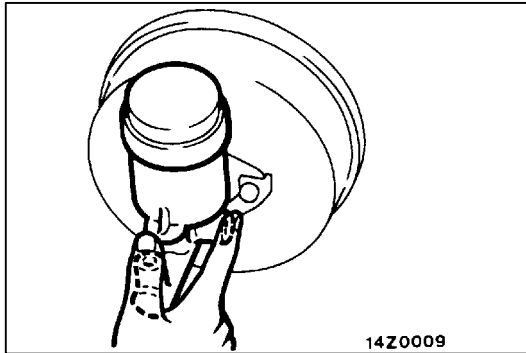
**BLEEDING**

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**Caution**

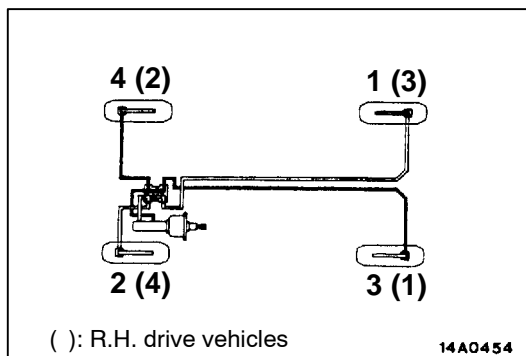
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

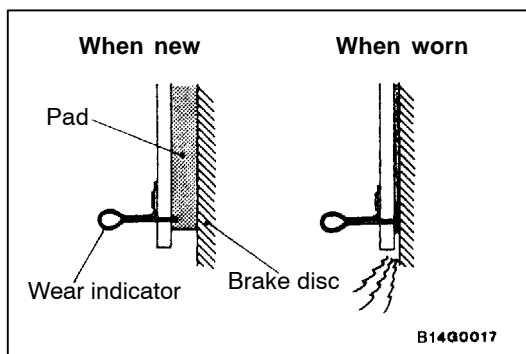
**MASTER CYLINDER BLEEDING**

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

- (1) Fill the reserve tank with brake fluid.
- (2) Keep the brake pedal depressed.
- (3) Have another person cover the master cylinder outlet with a finger.
- (4) With the outlet still closed, release the brake pedal.
- (5) Repeat steps (2) - (4) three or four times to fill the inside of the master cylinder with brake fluid.

**BRAKE PIPE LINE BLEEDING**

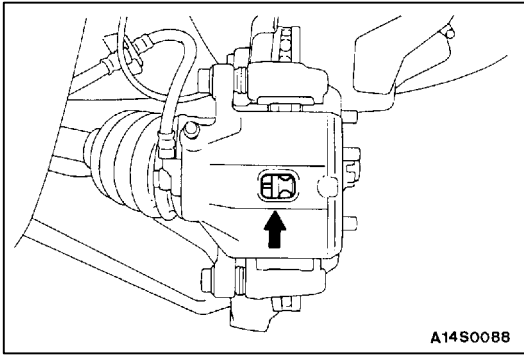
Bleed the air in the sequence shown in the figure.

**DISC BRAKE PAD CHECK AND REPLACEMENT**

35100230014

**NOTE**

The left side outer brake pad has a wear indicator. The wear indicator contacts the brake disc when the brake pad thickness becomes 2 mm and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.

**Standard value: 10 mm**

**Limit: 2.0 mm**

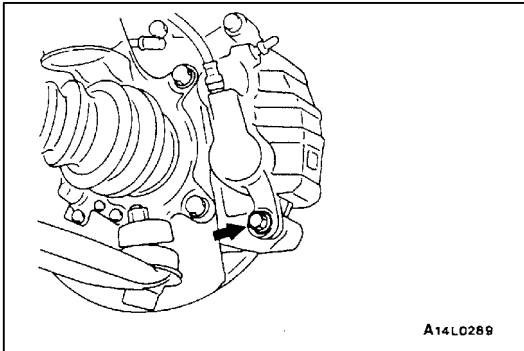
**Caution**

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston and guide pin.**

2. Remove the guide pin. Lift caliper assembly and retain with wires.

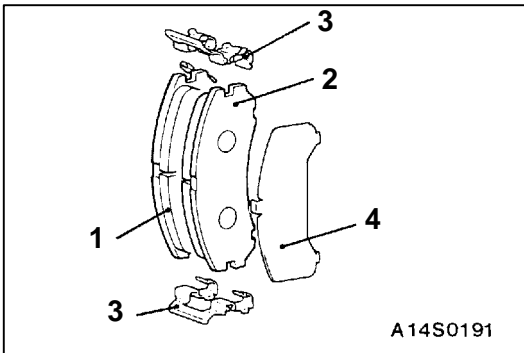
**Caution**

**Do not wipe off the special grease that is on the guide pin or allow it to contaminate the guide pin.**



3. Remove the following parts from caliper support.

- (1) Pad and wear indicator assembly <L.H.>, and pad assembly <R.H.>
- (2) Pad assembly
- (3) Pad liner
- (4) Outer shim



4. In order to measure the brake drag force after pad installation, measure the rotary-sliding resistance of the hub with the pads removed. (Refer to P.35A-19.)
5. Install the pads and the caliper assembly, and then check the brake drag force. (Refer to P.35A-19.)

## DISC BRAKE ROTOR CHECK

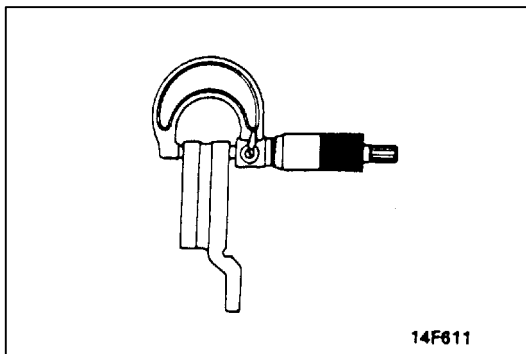
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**Caution**

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	<ul style="list-style-type: none"> <li>• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering.</li> <li>• If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).</li> </ul>
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.

**THICKNESS CHECK**

35100240017

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

**Brake disc thickness**

**Standard value: 24.0 mm <Front>, 10.0 mm <Rear>**

**Limit: 22.4 mm <Front>, 8.4 mm <Rear>**

Thickness variation (at least 8 positions)

The difference between any thickness measurements should not be more than 0.015 mm.

2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specification, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).

## RUN-OUT CHECK

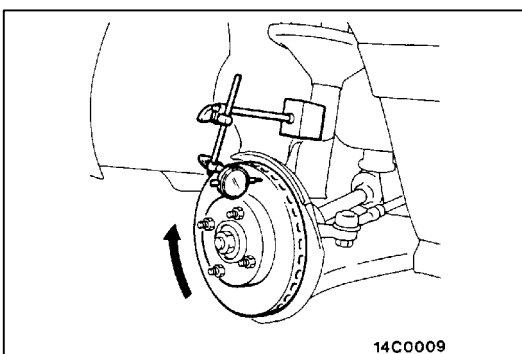
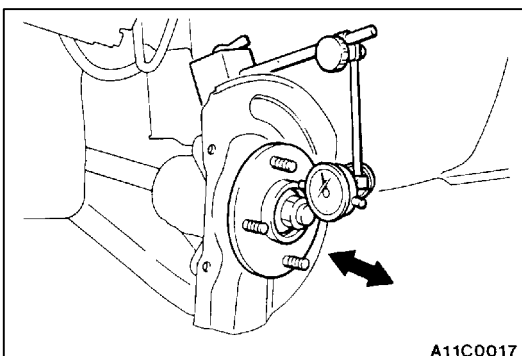
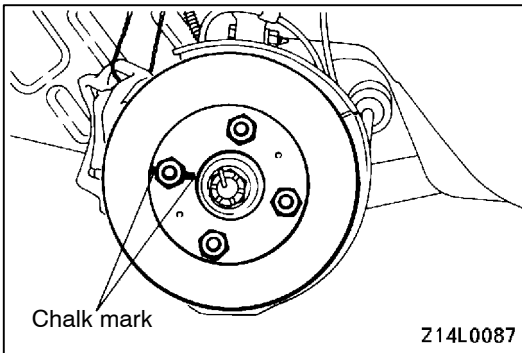
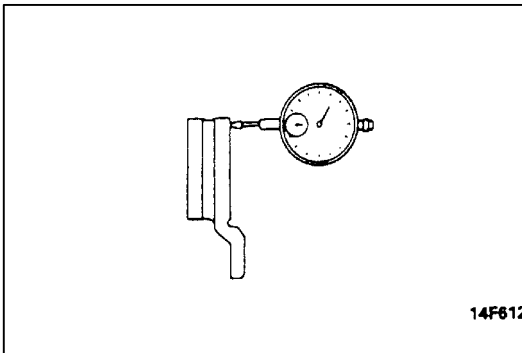
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1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.

3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

**Limit:****0.06 mm or less <Front>****0.08 mm or less <Rear>****NOTE**

Tighten the nuts in order to secure the disc to the hub.



## RUN-OUT CORRECTION

35100180081

1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.

(1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.

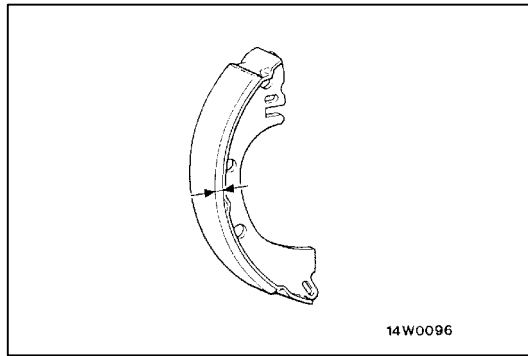
- (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

**Limit: 0.05 mm**

If the play is equivalent to or exceeds the limit, disassemble the hub knuckle and check each part.

- (3) If the play does not exceed the limit specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).

**BRAKE LINING THICKNESS CHECK**

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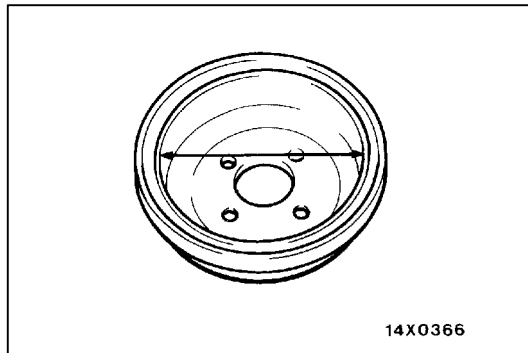
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

**Standard value: 4.4 mm****Limit: 1.0 mm**

Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-24.

**Caution**

1. Whenever the shoe and lining assembly is replaced, replace both R.H. and L.H. assemblies as a set to prevent car from pulling to one side when braking.
2. If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.

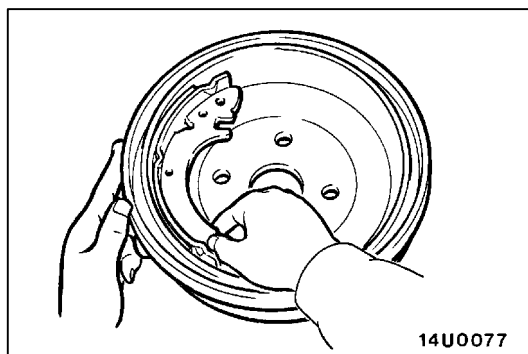
**BRAKE DRUM INSIDE DIAMETER CHECK**

35100320148

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

**Standard value: 203 mm****Limit: 205 mm**

3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.

**BRAKE LINING AND BRAKE DRUM CONNECTION CHECK**

35100310169

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-24.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if there are any irregular contact area.

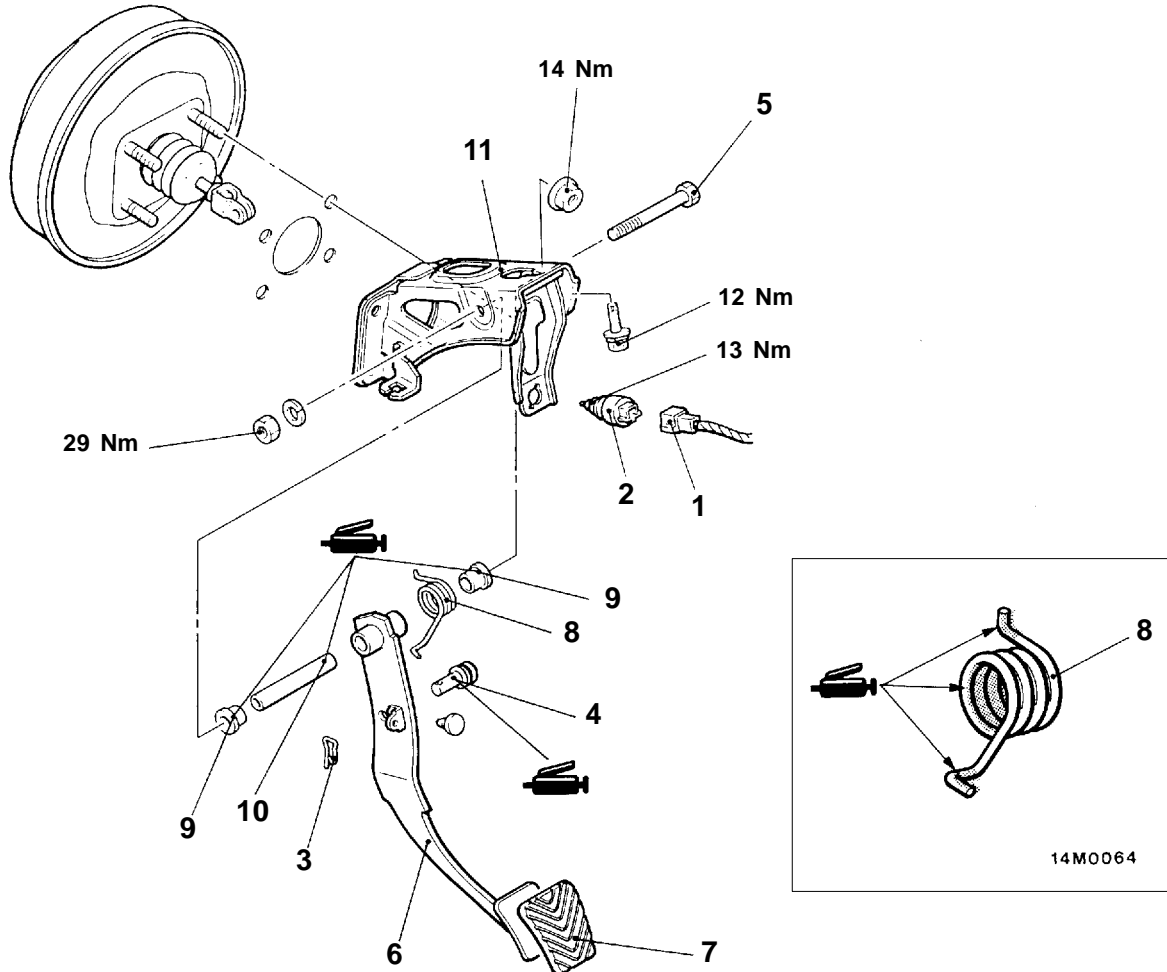
**NOTE**

Clean off chalk after check.

# BRAKE PEDAL

## REMOVAL AND INSTALLATION

**Post-installation Operation**  
 Brake Pedal Adjustment (Refer to P.35A-6.)



1410110  
 00006081

### Removal steps

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Stop lamp switch connector</li> <li>2. Stop lamp switch</li> <li>3. Snap pin</li> <li>4. Pin assembly</li> <li>5. Brake pedal shaft bolt</li> <li>6. Brake pedal</li> </ol> | <ol style="list-style-type: none"> <li>7. Brake pedal pad</li> <li>8. Brake pedal return spring</li> <li>9. Bushing</li> <li>10. Pipe</li> <li>11. Pedal support member</li> </ol> |
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# MASTER CYLINDER AND BRAKE BOOSTER

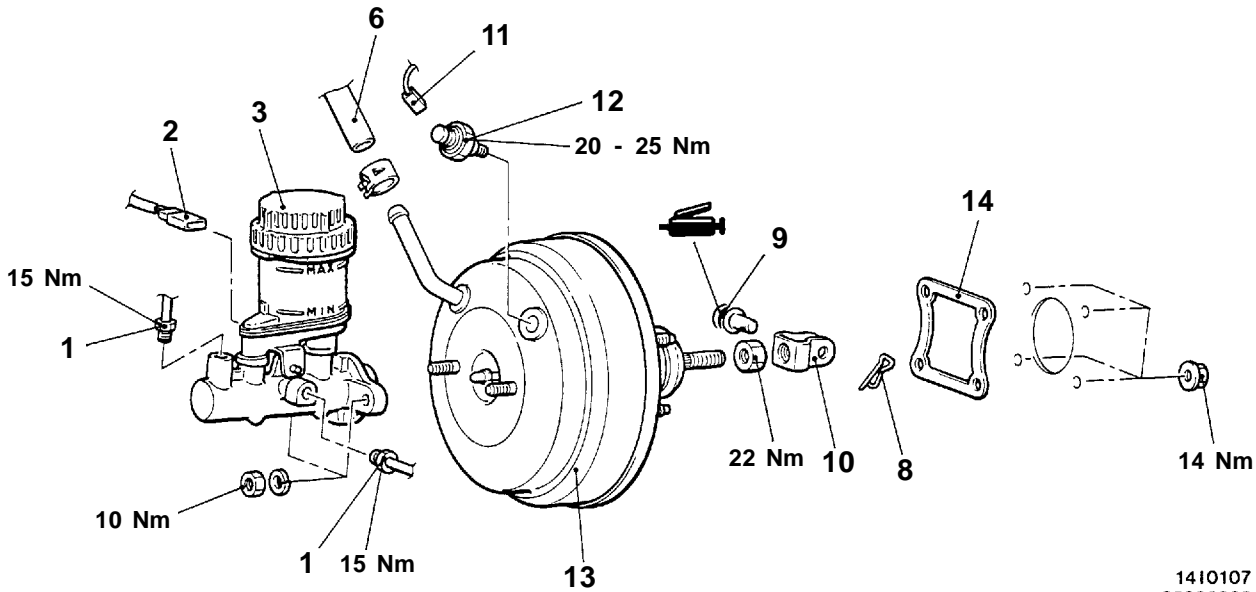
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## REMOVAL AND INSTALLATION

**Pre-removal Operation**  
Brake Fluid Draining

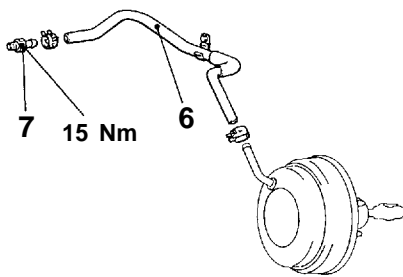
**Post-installation Operation**

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-10.)
- Brake Pedal Adjustment (Refer to P.35A-6.)



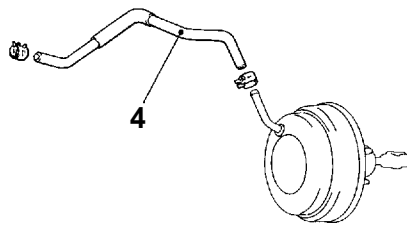
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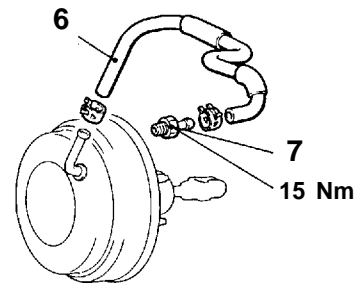
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<L.H. drive vehicles - 4D6>



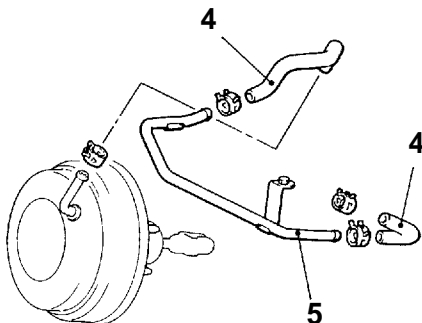
1410104

<R.H. drive vehicles - 4G6, 6A1>

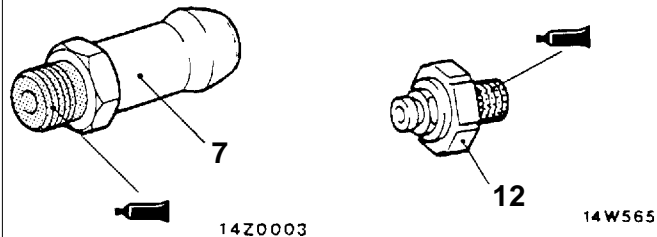


1410073

<R.H. drive vehicles - 4D6>



1410106



Sealant: 3M ATD Part No.8661 or equivalent



**Removal steps**

- |  |  |
|--|--|
| <p>1. Brake pipe connection</p> <p>2. Brake fluid level sensor connector</p> <p>3. Master cylinder assembly</p> <p>▶B◀ ● Push rod protruding length check and adjustment</p> <p>4. Vacuum hose &lt;4D6&gt;</p> <p>5. Vacuum pipe &lt;4D6&gt;</p> <p>▶A◀ 6. Vacuum hose (with built-in check valve)</p> | <p>7. Fitting</p> <p>8. Snap pin</p> <p>9. Pin assembly</p> <p>10. Clevis</p> <p>11. Vacuum switch connector &lt;4D6&gt;</p> <p>12. Vacuum switch &lt;4D6&gt;</p> <p>13. Brake booster</p> <p>14. Sealer</p> |
|--|--|

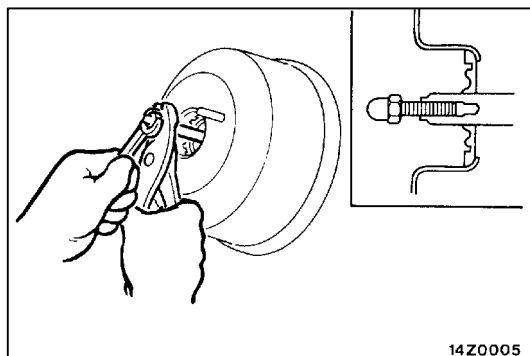
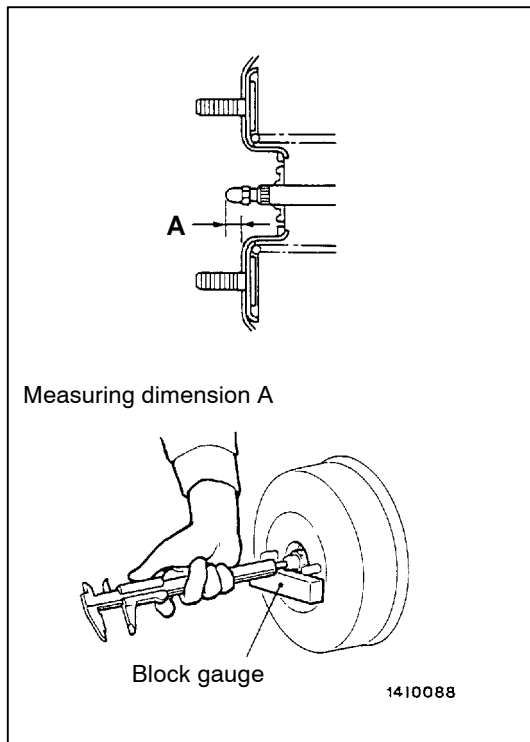
**INSTALLATION SERVICE POINTS**

**▶A◀ VACUUM HOSE CONNECTION**

Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

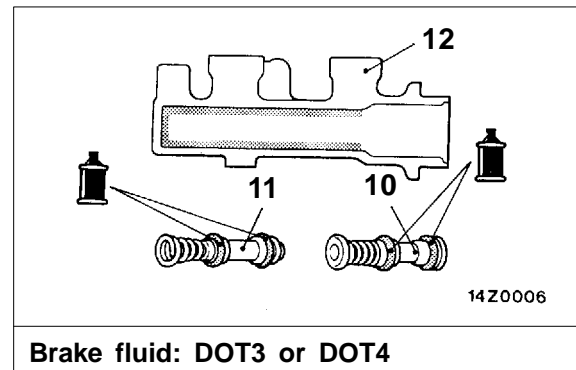
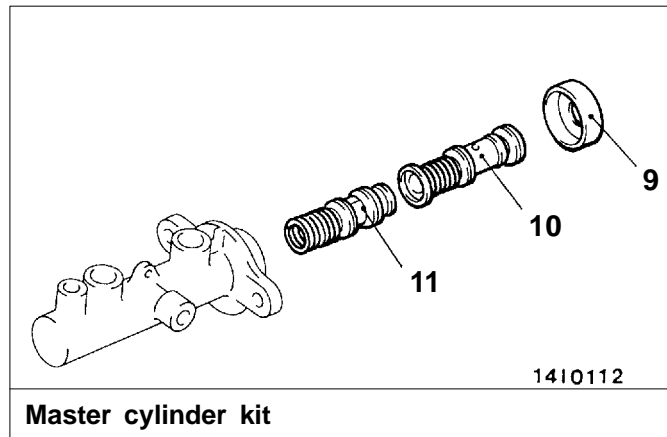
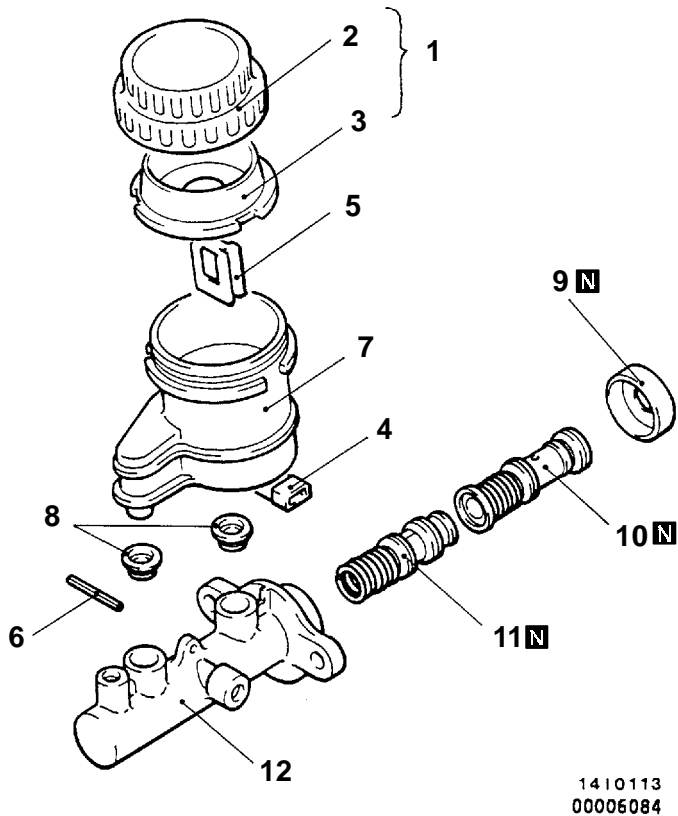
**▶B◀ PUSH ROD PROTRUDING LENGTH CHECK AND ADJUSTMENT**

1. Measure dimension A.  
**Standard value: 9.65 - 9.90 mm**



2. If the protruding length is not within the standard value range, adjust by changing the push rod length by turning the end of the push rod.

## MASTER CYLINDER DISASSEMBLY AND REASSEMBLY



### Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Brake fluid level indicator assembly
5. Float
6. Spring pin
7. Reservoir tank
8. Reservoir seal
9. Piston retainer
10. Primary piston assembly
11. Secondary piston assembly
12. Master cylinder body

# DISC BRAKE

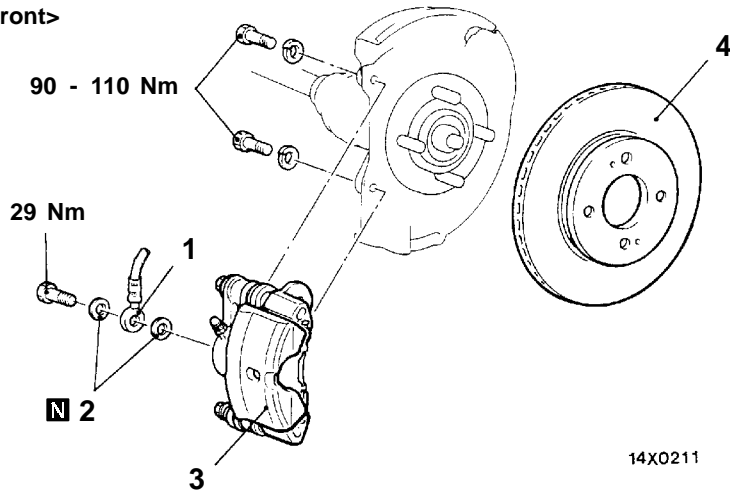
## REMOVAL AND INSTALLATION

**Pre-removal Operation**  
 Brake Fluid Draining

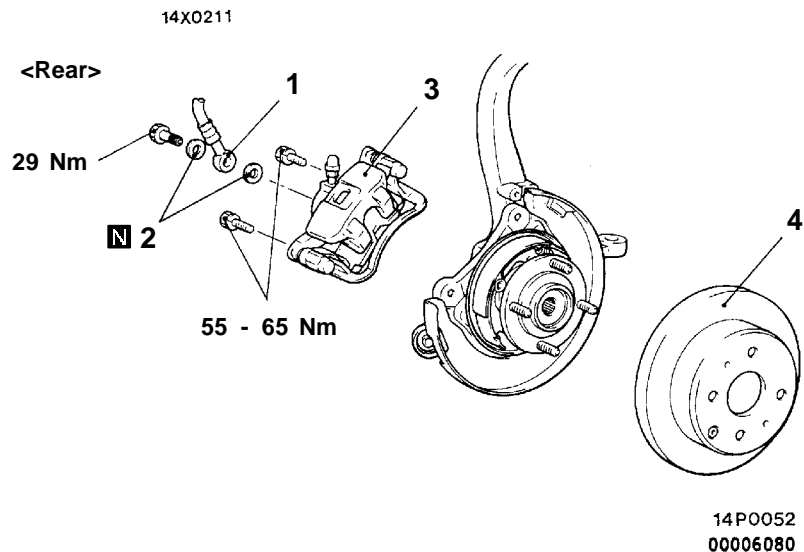
**Post-installation Operation**

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-10.)

<Front>



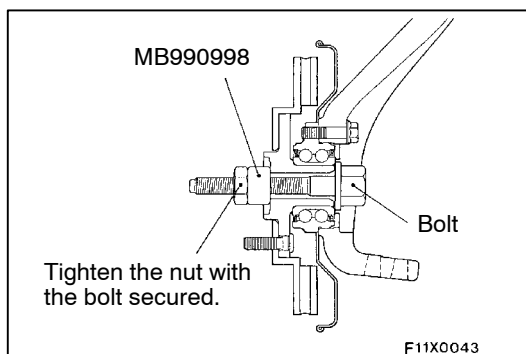
<Rear>



### Removal steps

1. Brake hose connection
2. Gasket

- ▶◀ 3. Disc brake assembly  
 4. Brake disc



## INSTALLATION SERVICE POINT

### ▶◀ DISC BRAKE ASSEMBLY INSTALLATION

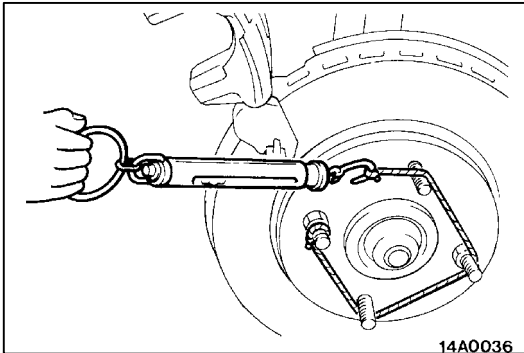
1. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance of the hub by the following procedure with the pads removed.

<Front>

- (1) Remove the drive shaft.  
 (Refer to GROUP 26 - Front Axle.)

- (2) Attach the special tool to the front hub assembly as shown in the illustration, and tighten it to the specified torque.

**Tightening torque: 196 - 255 Nm**



- (3) Use a spring balance to measure the rotary-sliding resistance of the hub in the forward direction.

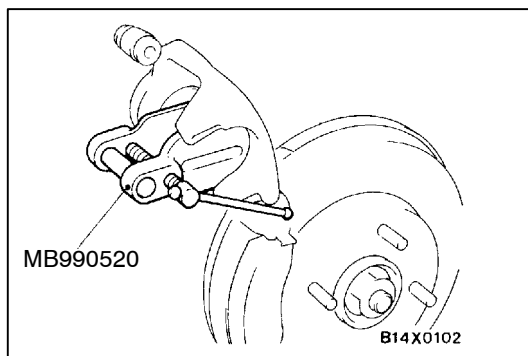
**<Rear>**

Use a spring balance to measure the rotary-sliding resistance of the hub in the forward direction.

2. After installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

**Caution**

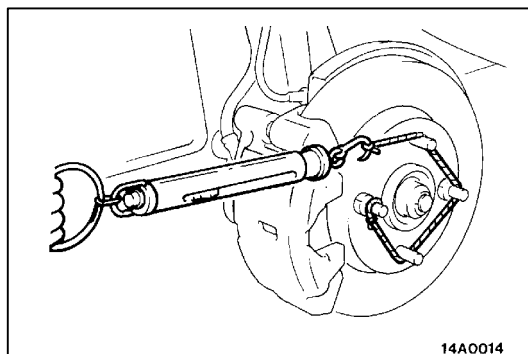
**Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.**



3. Clean piston and insert into cylinder with special tool.  
4. Be careful that the piston boot does not become caught when lowering the caliper assembly, and tighten the guide pin to the specified torque.

**Tightening torque: 74 Nm**

5. Start the engine and then depress the brake pedal 2-3 times.  
6. Stop engine.  
7. Turn brake disc forward 10 times.



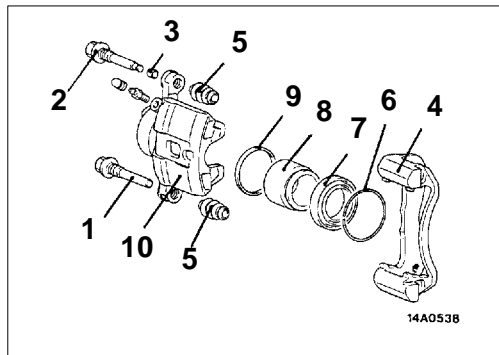
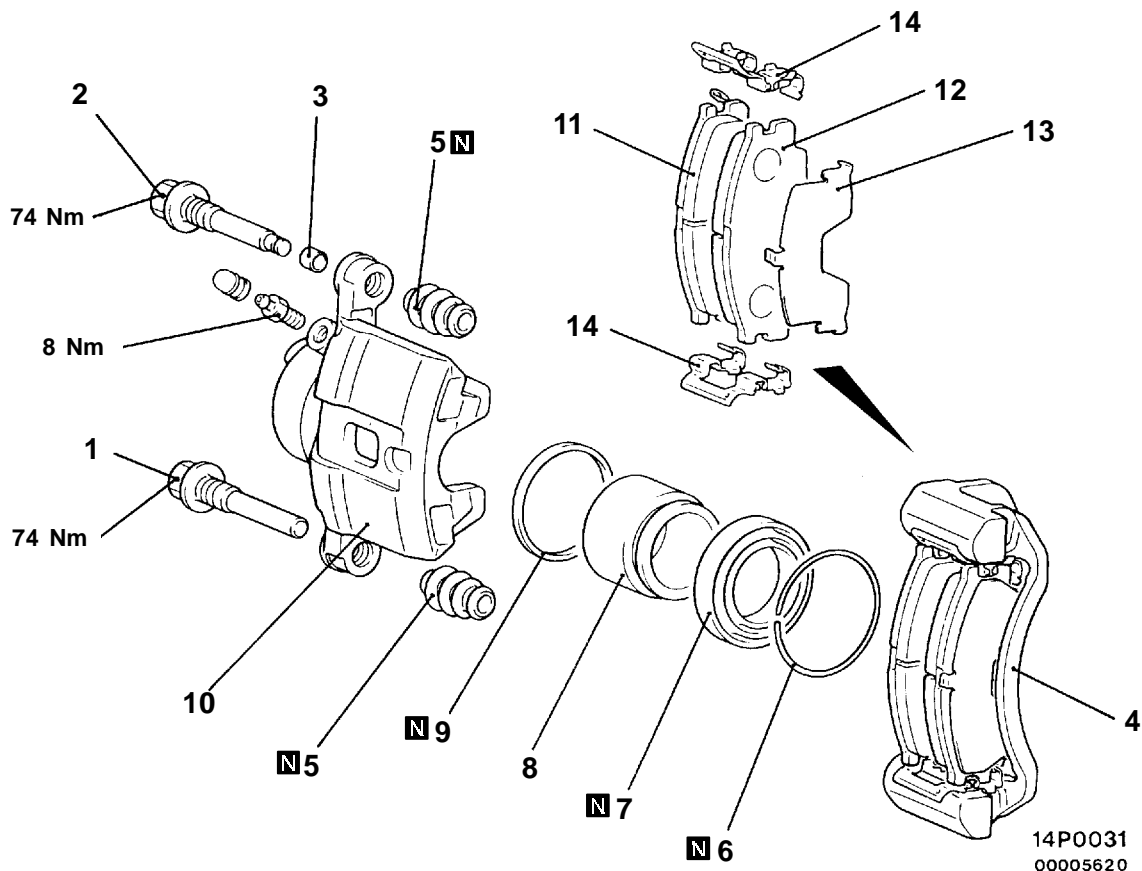
8. Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.  
9. Calculate the drag force of the disc brake (difference between of values measured in item 8 and item 1.)

**Standard value: 69 N or less**

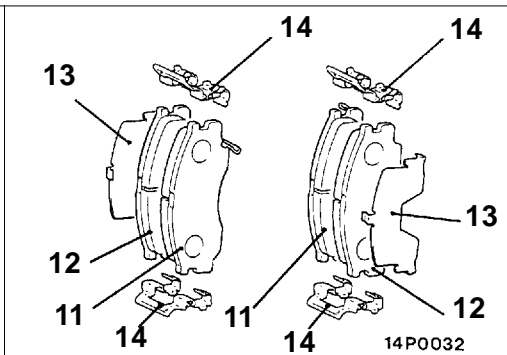
10. If the drag force of the disc brake exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

DISASSEMBLY AND REASSEMBLY

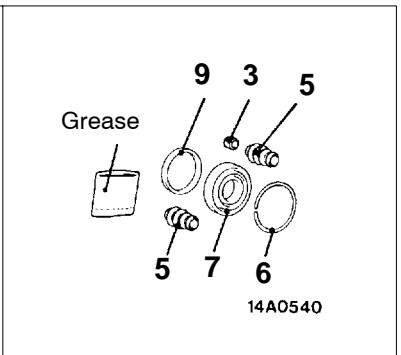
35100820013



Brake caliper kit



Pad repair kit



Seal and boots repair kit

Caliper assembly disassembly steps



1. Guide pin
2. Lock pin
3. Bushing
4. Caliper support (pad, clip, shim)
5. Boot
6. Boot ring
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body

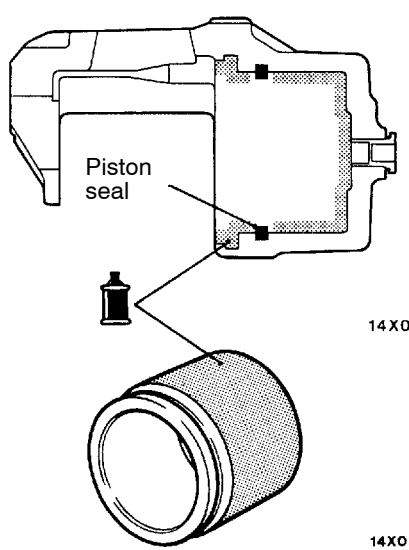


Pad assembly disassembly steps



1. Guide pin
2. Lock pin
3. Bushing
4. Caliper support (pad, clip, shim)
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim (coated with rubber)
14. Clip

LUBRICATION POINTS



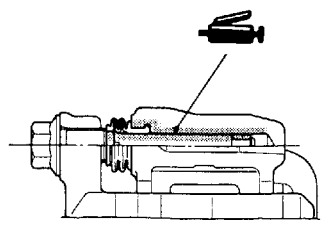
Piston seal

14X0302

14X0301

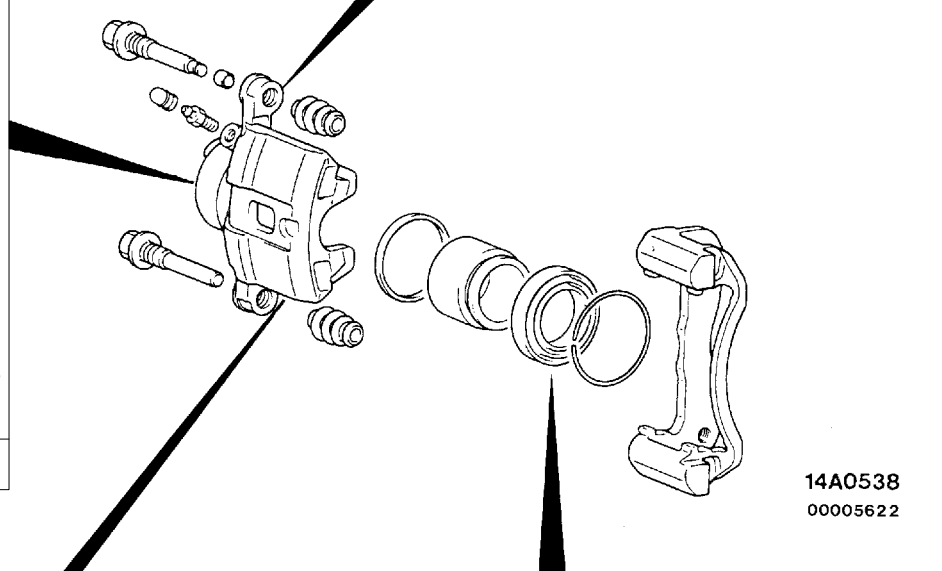
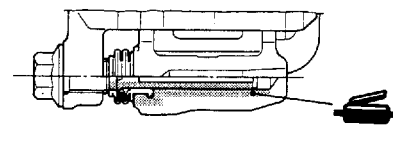
**Caution**  
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4



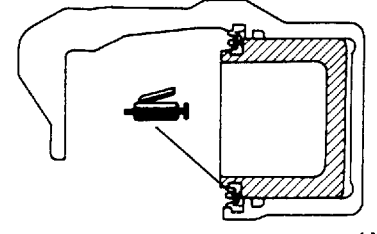
14A0541

Grease: Repair kit grease

14A0541

Grease: Repair kit grease



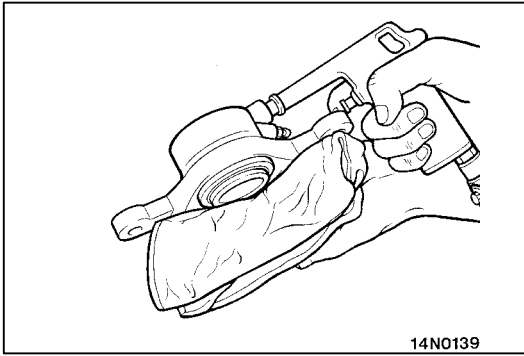
14L0128

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Grease: Repair kit grease

DISASSEMBLY SERVICE POINTS

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

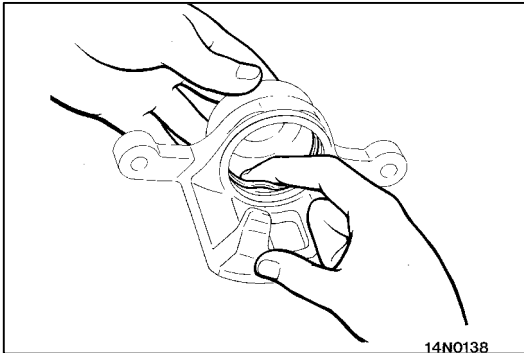


◀A▶ PISTON BOOT/PISTON REMOVAL

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

**Caution**

**Blow compressed air gently.**



◀B▶ PISTON SEAL REMOVAL

1. Remove piston seal with finger tip.

**Caution**

**Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.**

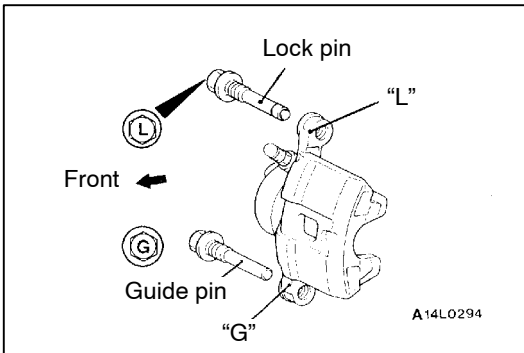
2. Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

**Specified brake fluid: DOT3 or DOT4**

REASSEMBLY SERVICE POINT

▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin and lock pin as illustrated that each head mark of the guide pin and the lock pin matches the indication mark ("G" or "L") located on the caliper body.



INSPECTION

35100630081

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

## REAR DRUM BRAKE

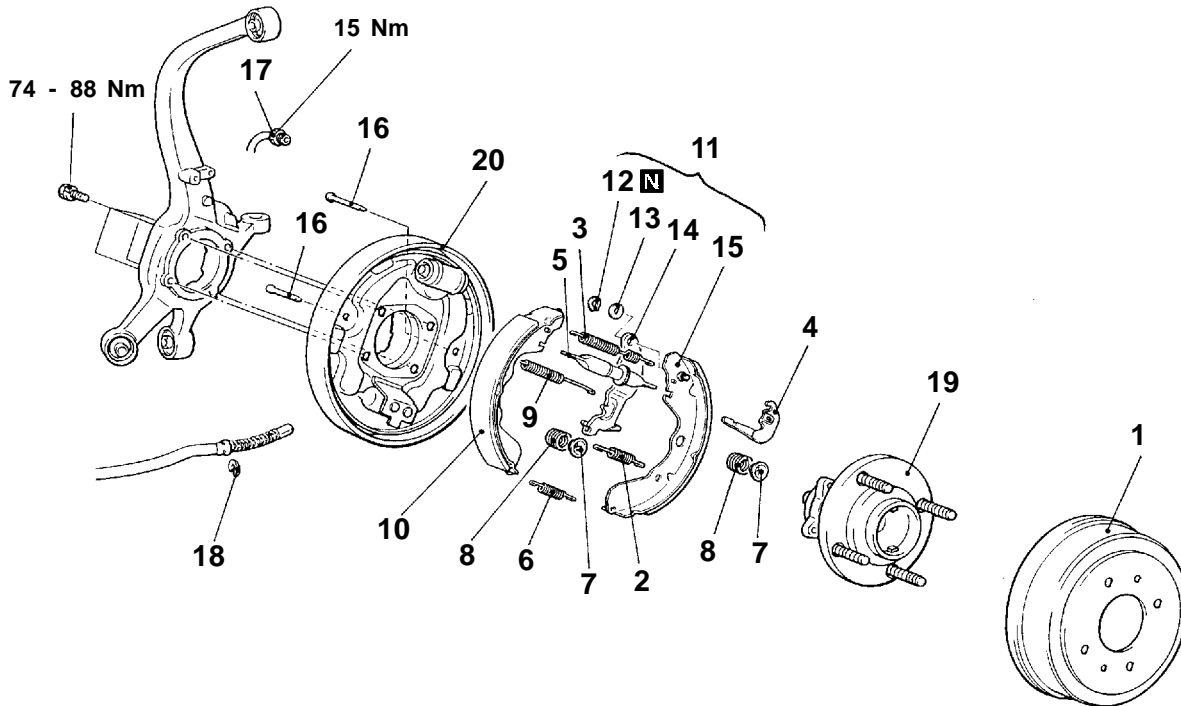
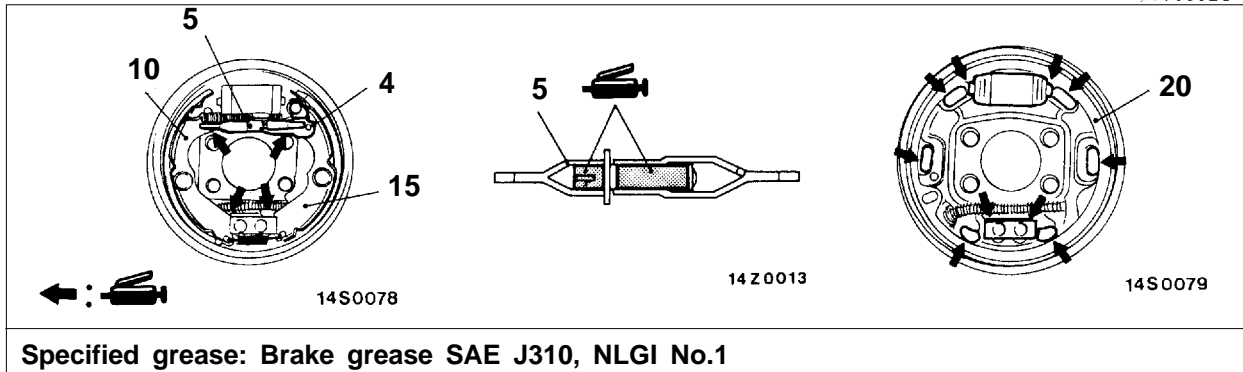
## REMOVAL AND INSTALLATION

**Pre-removal Operation**

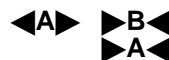
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

**Post-installation Operation**

- Brake Line Bleeding (Refer to P.35A-10.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)

1410069  
00005623**Removal steps**

1. Brake drum
2. Lever return spring
3. Shoe-to-lever spring
4. Adjuster lever
5. Auto adjuster assembly
6. Retainer spring
7. Shoe hold-down cup
8. Shoe hold-down spring
9. Shoe-to-shoe spring
10. Shoe and lining assembly



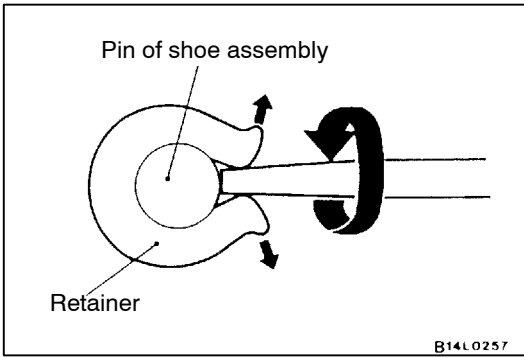
11. Shoe and lever assembly
12. Retainer
13. Wave washer
14. Parking lever
15. Shoe and lining assembly
16. Shoe hold-down pin
17. Brake pipe connection
18. Snap ring
19. Rear hub assembly
20. Backing plate



**REMOVAL SERVICE POINT**

**◀A▶ RETAINER REMOVAL**

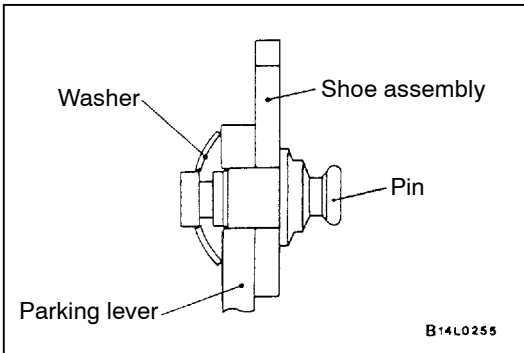
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



**INSTALLATION SERVICE POINTS**

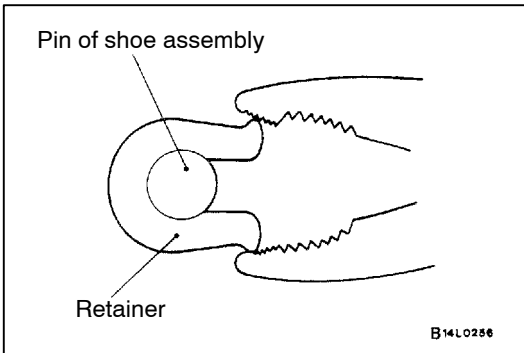
**▶A◀ WAVE WASHER INSTALLATION**

Install the washer in the direction shown in the illustration.



**▶B◀ RETAINER INSTALLATION**

Use pliers or the like to install the retainer or the pin positively.



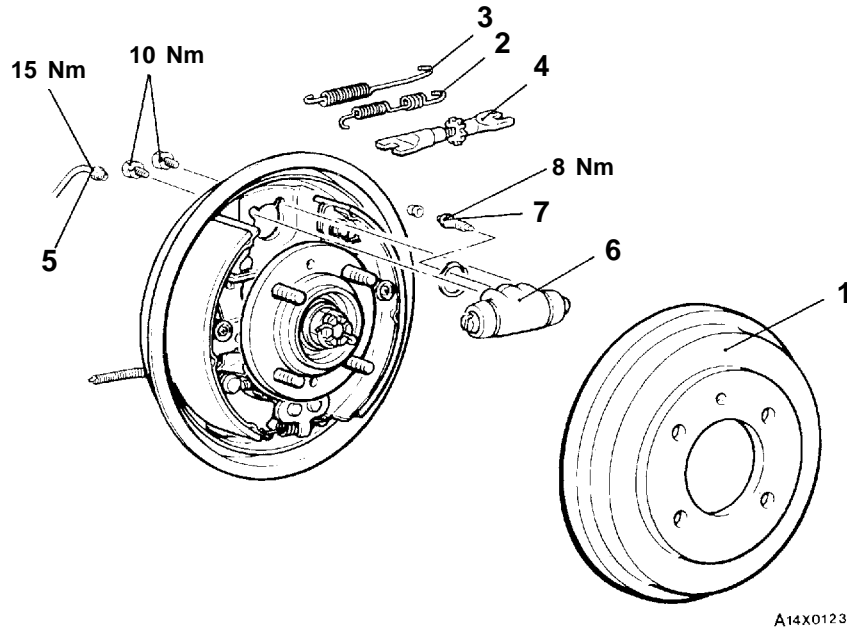
## WHEEL CYLINDER

## REMOVAL AND INSTALLATION

**Pre-removal Operation**  
Brake Fluid draining

**Post-installation Operation**

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-10.)

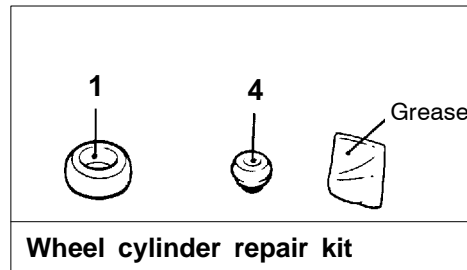
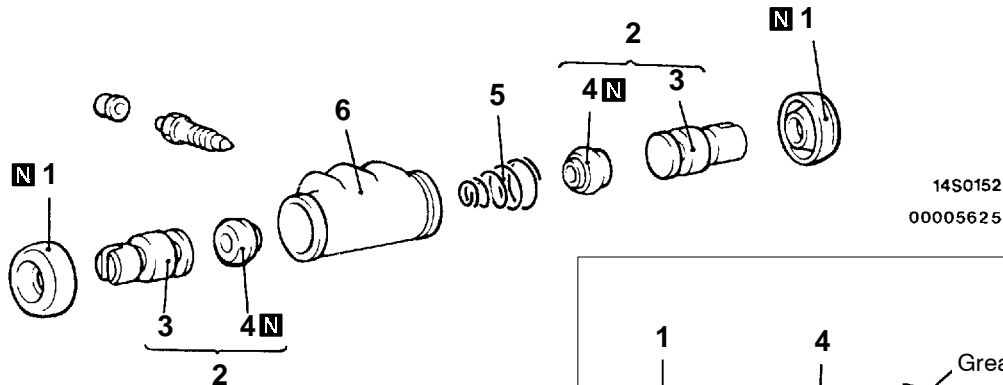
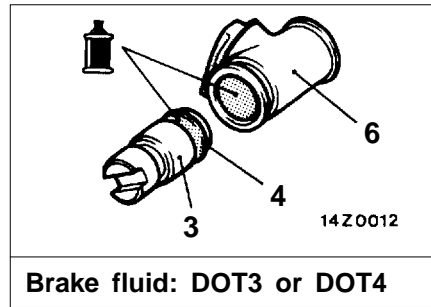
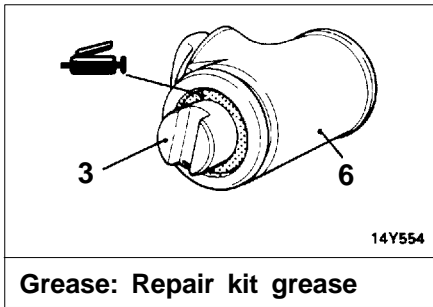
**Removal steps**

1. Brake drum
2. Shoe-to-lever spring
3. Shoe-to-shoe spring
4. Auto adjuster assembly

5. Brake pipe connection
6. Wheel cylinder
7. Bleeder screw

DISASSEMBLY AND REASSEMBLY

35100770097



Disassembly steps

- 1. Boots
- 2. Piston assembly
- ▶A◀ 3. Pistons

- ▶A◀ 4. Piston cups
- 5. Spring
- 6. Wheel cylinder body

REASSEMBLY SERVICE POINT

▶A◀ PISTON CUP/PISTON REASSEMBLY

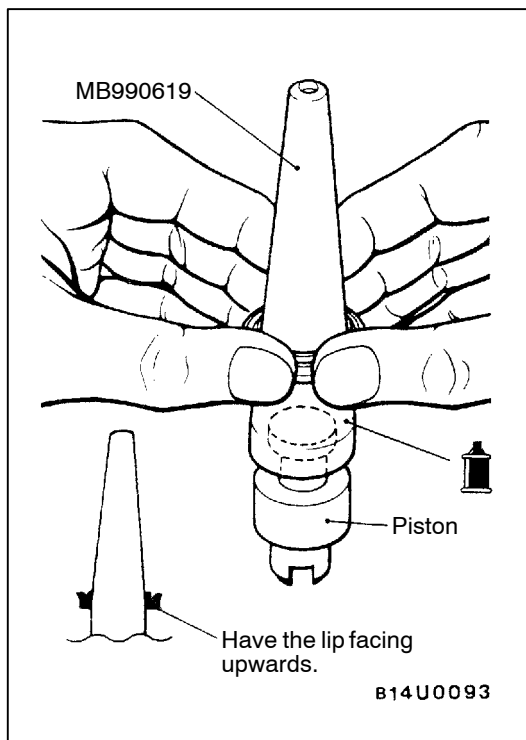
1. Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.
2. Apply the specified brake fluid to the piston cups and the special tool.

**Specified brake fluid: DOT3 or DOT4**

3. Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

**Caution**

**In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.**



## INSPECTION

35100780038

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.

## PROPORTIONING VALVE

35100570154

### REMOVAL AND INSTALLATION

**Pre-removal Operation**  
Brake Fluid Draining

**Post-installation Operation**

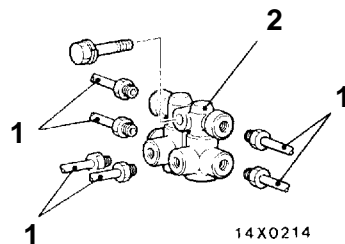
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-10.)

Flared brake line nuts

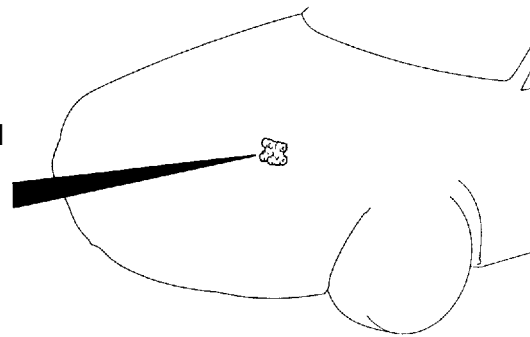


15 Nm

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14X0214



14X0146  
00004624

#### Removal steps



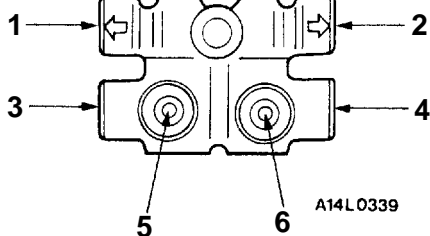
1. Brake pipe
2. Proportioning valve

## INSTALLATION SERVICE POINT

### ▶◀ BRAKE PIPE CONNECTION

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

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Front brake (R.H.)
4. Proportioning valve – Front brake (L.H.)
5. Proportioning valve – Master cylinder (secondary)
6. Proportioning valve – Master cylinder (primary)



A14L0339

# ANTI-SKID BRAKING SYSTEM (ABS) <2WD>

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35209000206

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<b>LUBRICANTS</b> .....	<b>5</b>	Disc Brake Rotor Check .....	Refer to GROUP 35A
<b>SPECIAL TOOLS</b> .....	<b>5</b>	Brake Lining Thickness Check .....	Refer to GROUP 35A
<b>TROUBLESHOOTING</b> .....	<b>6</b>	Brake Drum Inside Diameter Check .....	Refer to GROUP 35A
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**CONTINUED ON NEXT PAGE**

# 35B-2

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**HYDRAULIC UNIT** ..... **26**

**WHEEL SPEED SENSOR** ..... **28**



## GENERAL INFORMATION

35200010222

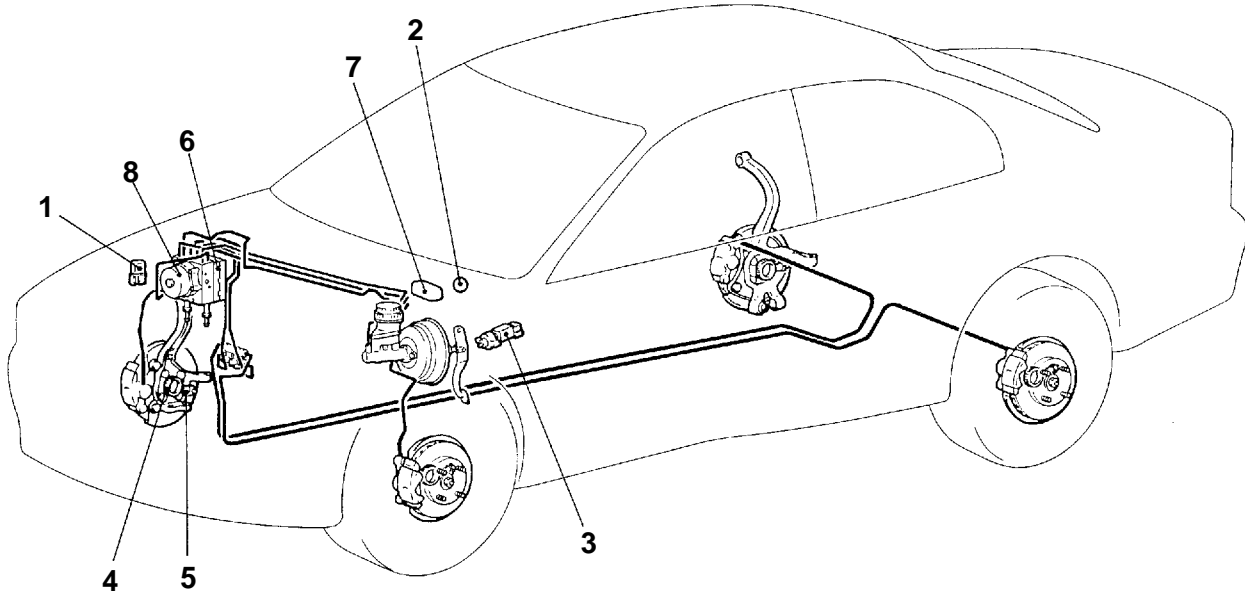
The ABS consists of components such as the wheel speed sensors, stop lamp switch, hydraulic unit assembly, ABS control unit (ABS-ECU) and the ABS warning lamp. If a problem occurs in the system, the malfunctioning components can be

identified and the trouble symptoms will be memorized by the diagnosis function. In addition, reading of diagnosis codes and service data and actuator testing are possible by using the MUT-II.

Items		Specifications
Master cylinder	Type	Tandem type (with level sensor)
	I.D. mm	25.4
Brake booster	Type	Vacuum type, tandem
	Effective dia. of power cylinder mm	180 + 205
	Boosting ratio	6.5
Proportioning valve	Type	Dual type
	Decompression ratio	0.25
Front brakes	Type	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm	256 × 24
	Wheel cylinder I.D. mm	60.3
	Pad thickness mm	10.0
	Clearance adjustment	Automatic
Rear drum brakes	Type	Leading trailing
	Drum I.D. mm	203
	Wheel cylinder I.D. mm	20.6
	Lining thickness mm	4.4
	Clearance adjustment	Automatic
Brake fluid		DOT3 or DOT4
ABS type		4-sensor, 3-channel method
Speed sensor		Magnet coil type on 4 wheels
Front ABS rotor teeth		43
Rear ABS rotor teeth		43

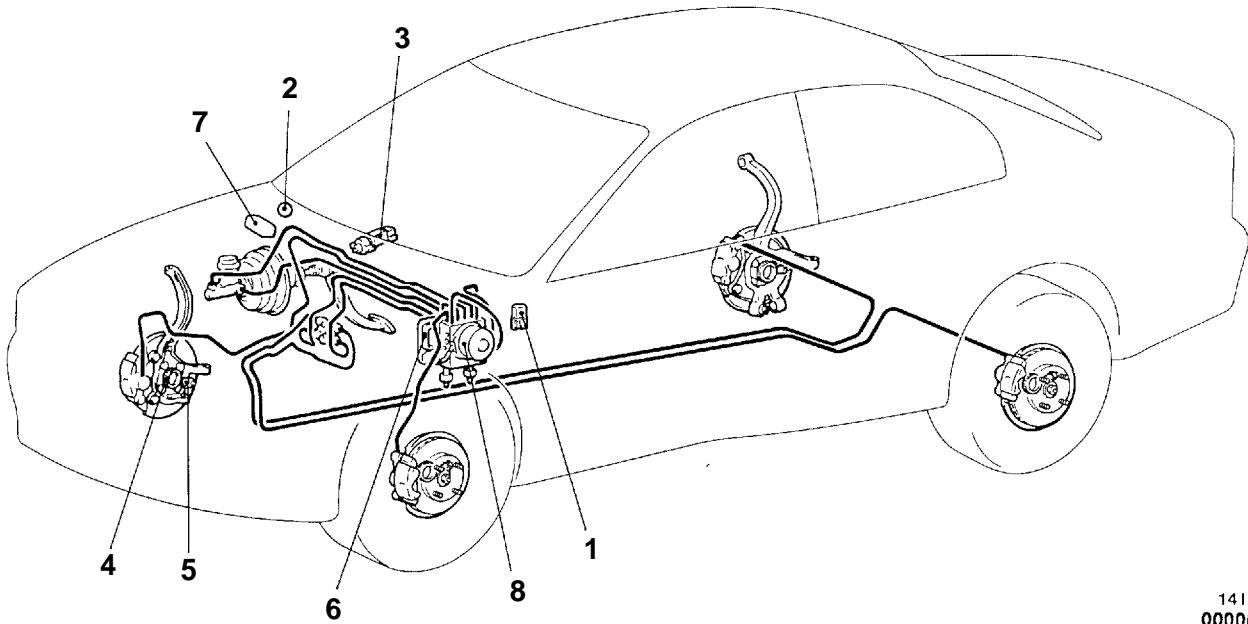
## CONSTRUCTION DIAGRAM

&lt;L.H. drive vehicles&gt;



1410115

&lt;R.H. drive vehicles&gt;

1410118  
00006093

- 1. ABS relay
- 2. ABS warning lamp
- 3. Stop lamp switch
- 4. ABS rotor

- 5. Wheel-speed sensor
- 6. ABS-ECU
- 7. Diagnosis connector
- 8. Hydraulic unit



**SERVICE SPECIFICATIONS**

35200030242

Items	Standard value
Wheel speed sensor internal resistance k $\Omega$	1.0 - 1.5
Clearance between the wheel speed sensor mounting surface and the ABS toothed rotor mm	28.2 - 28.5
Wheel speed sensor insulation resistance k $\Omega$	100 or more

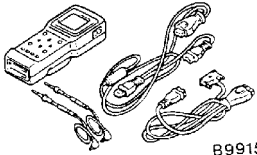
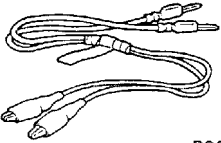
**LUBRICANTS**

35200040054

Items	Specified lubricant
Brake fluid	DOT3 or DOT4

**SPECIAL TOOLS**

35200060210

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
 B991529	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)

**TROUBLESHOOTING**

35201110129

**STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING**

Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.

**NOTES WITH REGARD TO DIAGNOSIS**

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation of phenomenon
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, and is not an abnormality.
ABS operation sound	<ol style="list-style-type: none"> <li>1. Sound of the motor inside the ABS hydraulic unit operation. (whine)</li> <li>2. Sound is the generated along with vibration of the brake pedal. (scraping)</li> <li>3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)</li> </ol>
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 too overconfident.

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.

**DIAGNOSIS FUNCTION**

35201120221

**DIAGNOSIS CODES CHECK**

Read a diagnosis code by the MUT-II or ABS warning lamp.  
(Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.)

**ERASING DIAGNOSIS CODES****With the MUT-II**

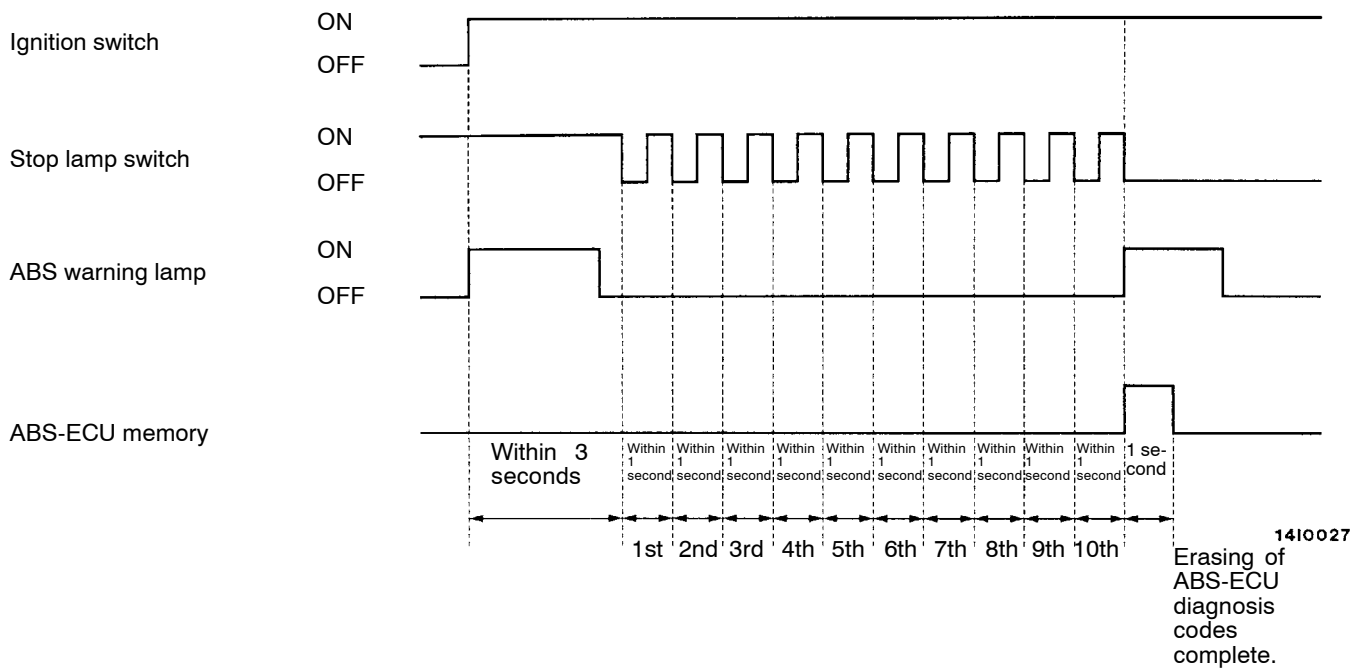
Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.

**With the ABS Warning Lamp**

1. Use the special tool to earth terminal (1) (diagnosis control terminal) of the diagnosis connector. (Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points.)
2. Stop the engine.
3. Turn on the stop lamp switch. (Depress the brake.)
4. After carrying out steps 1. to 3., turn the ignition switch to ON. Within 3 seconds after turning the ignition switch to ON, turn off the stop lamp switch (release the brake). Then, turn the stop lamp switch on and off a total of 10 times.

**NOTE**

If the ABS-ECU function has been stopped because of fail-safe operation, it will not be possible to erase the diagnosis codes.



## INSPECTION CHART FOR DIAGNOSIS CODES

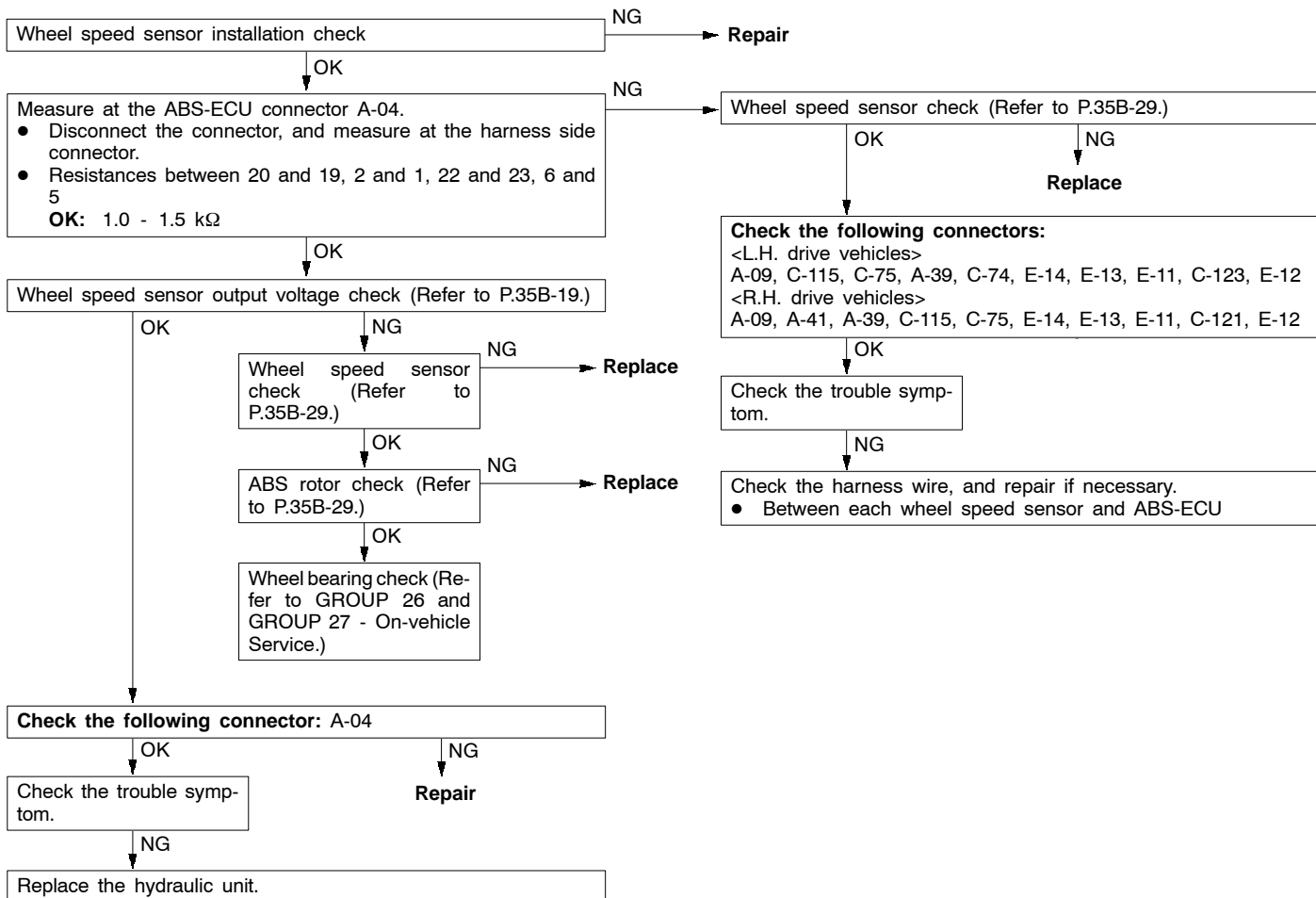
35201130323

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

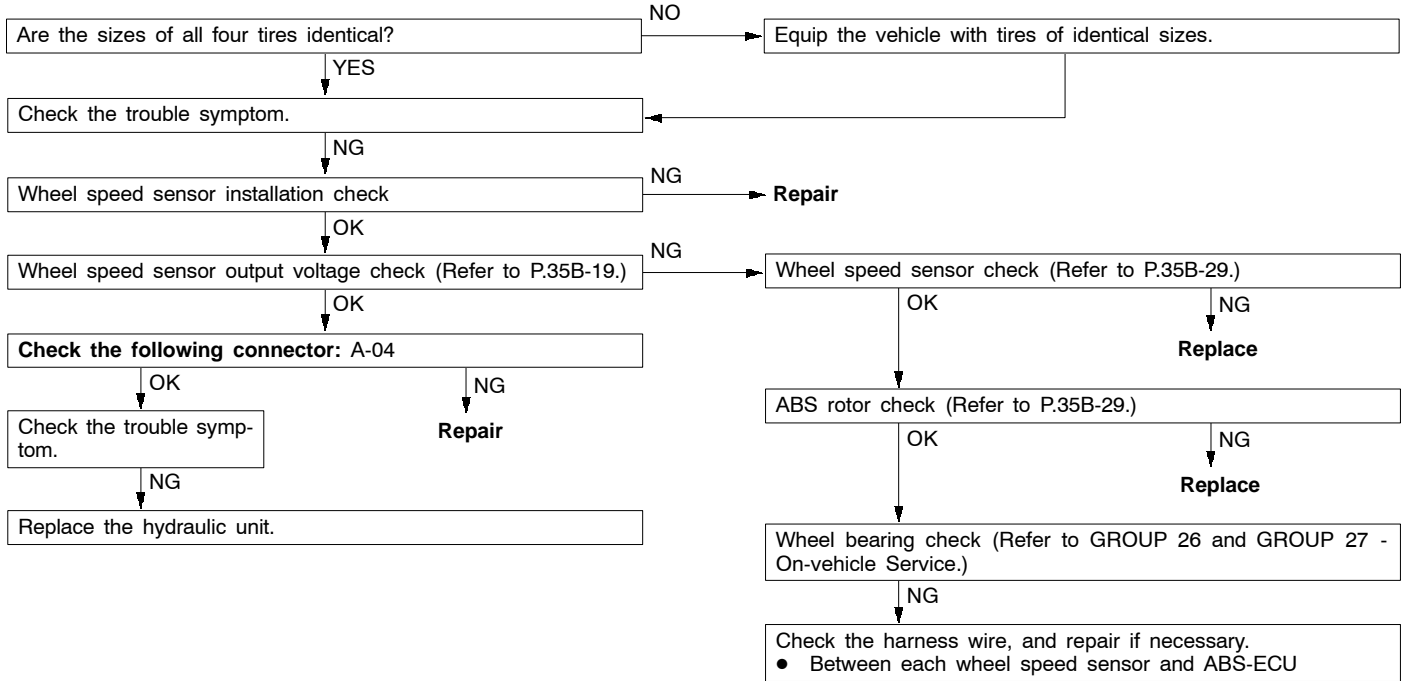
Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open circuit	35B-9
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	35B-10
16	Power supply system		35B-10
21	Front right wheel speed sensor	Short circuit	35B-9
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
33	Stop lamp switch system		35B-11
41	Front right solenoid valve		35B-26 (Replace the hydraulic unit.)
42	Front left solenoid valve		
43	Rear right solenoid valve		
44	Rear left solenoid valve		
51	Valve relay problem (stays on)		
52	Valve relay problem (stays off)		
53	Motor relay problem (stays off)		
54	Motor relay problem (stays on)		
55	Motor system (seized pump motor)		
63	ABS-ECU		

**INSPECTION PROCEDURE FOR DIAGNOSIS CODES**

Code Nos.11, 12, 13 and 14 Wheel speed sensor (open circuit or short circuit)	Probable cause
Code Nos.21, 22, 23 and 24 Wheel speed sensor	
Code Nos 11, 12, 13 and 14 are output if the ABS-ECU detects an open circuit or short-circuit in the (+) wire or (-) wire in any one of the four wheel speed sensors.	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of hydraulic unit</li> </ul>
Code Nos.21, 22, 23 and 24 are output in the following cases. <ul style="list-style-type: none"> <li>● When there is no input from any one of the four wheel speed sensors when travelling at several km/h or more, even though open circuit can not be verified.</li> <li>● When a chipped or blocked-up ABS rotor is detected and if the anti-lock system operates continuously because a malfunctioning sensor or a warped ABS rotor is causing sensor output to drop.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS rotor</li> <li>● Too much gap between the sensor and the rotor</li> <li>● Malfunction of hydraulic unit</li> <li>● Malfunction of wheel bearing</li> </ul>



Code No.15 Wheel speed sensor (abnormal output signal)	Probable cause
<p>This code is output when there is an abnormality in the output signal from any one of the four wheel speed sensors while driving (except for an open circuit or short circuit).</p>	<ul style="list-style-type: none"> <li>● The four vehicle tires are of different sizes</li> <li>● Improper installation of wheel speed sensor</li> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS rotor</li> <li>● Malfunction of wheel bearing</li> <li>● Malfunction of hydraulic unit</li> </ul>

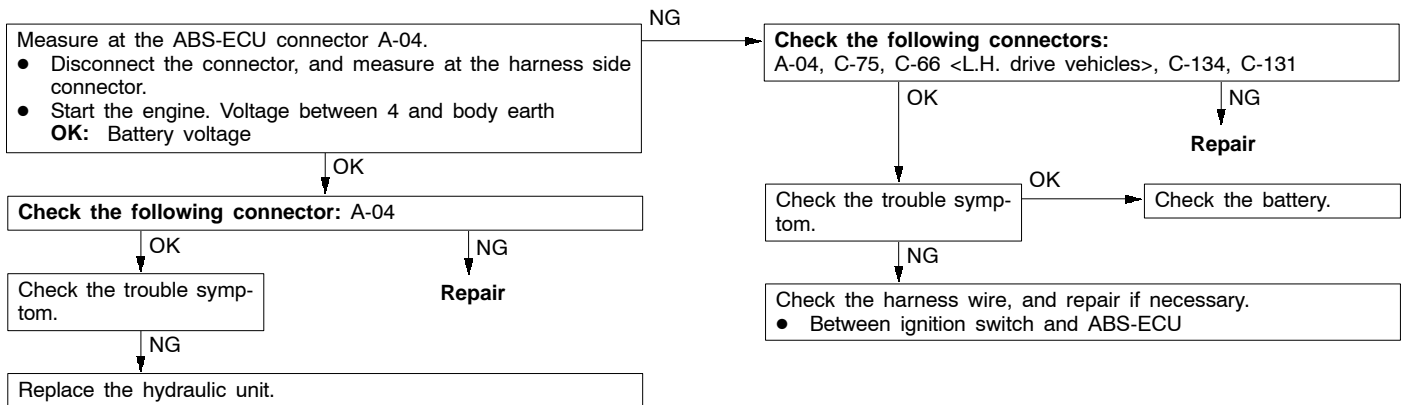


Code No.16 ABS-ECU power supply system (abnormal voltage drop or rise)	Probable cause
<p>This code is output if the ABS-ECU power supply voltage drops below or rises above the rated values. Furthermore, if the voltage returns to normal, this code is no longer output.</p>	<ul style="list-style-type: none"> <li>● Malfunction of battery</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of hydraulic unit</li> </ul>

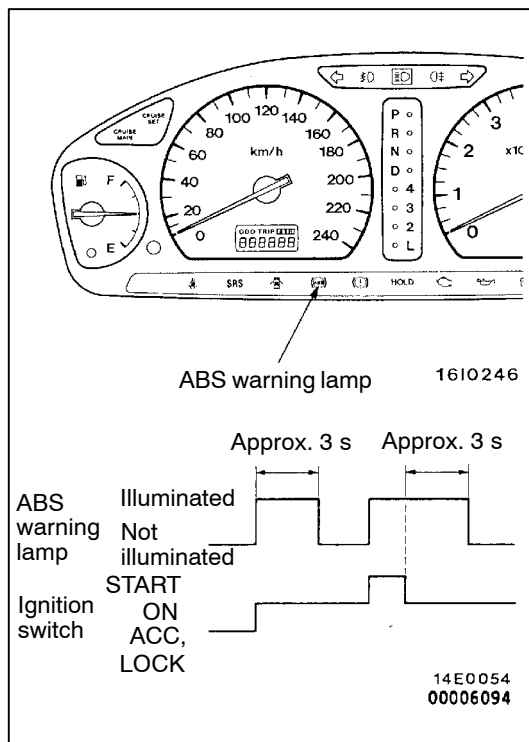
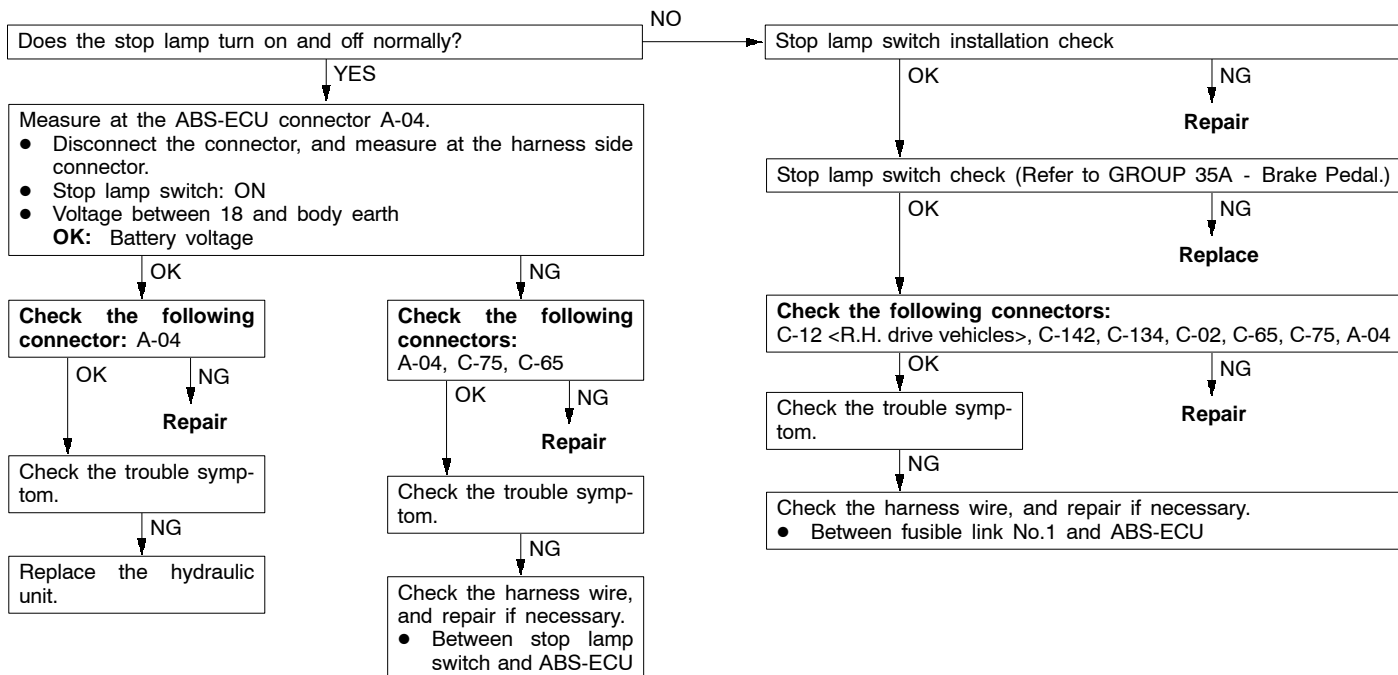
**Caution**

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.

Before carrying out the following inspection, check the battery level, and refill it if necessary.



Code No.33 Stop lamp switch system (open circuit or stop lamp stays ON)	Probable cause
This code is output in the following cases. <ul style="list-style-type: none"> <li>• If the stop lamp switch is continuously on for 15 minutes or more even though the ABS system is not operating.</li> <li>• If there is an open circuit in the stop lamp switch input circuit harness.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of stop lamp switch</li> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of hydraulic unit</li> </ul>



### ABS WARNING LAMP INSPECTION

35201200123

Check that the ABS warning lamp illuminates as follows.

1. When the ignition key is turned to "ON", the ABS warning lamp illuminates for approximately 3 seconds and then switches off.
2. When the ignition key is turned to "START", the ABS warning lamp remains illuminated.
3. When the ignition key is turned from "START" back to "ON", the ABS warning lamp illuminates for approximately 3 seconds and then switches off.

#### NOTE

The ABS warning lamp may remain on until the vehicle reaches a speed of several km/h. This is limited to cases where diagnosis code Nos.21 - 24 and 55 have been recorded because of a previous problem occurring. In this case, the ABS-ECU keeps the warning lamp illuminated until the problem corresponding to that diagnosis code can be detected.

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

**INSPECTION CHART FOR TROUBLE SYMPTOMS**

35201140289

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

Trouble symptoms	Inspection procedure No.	Reference page
Communication between the MUT-II and the whole system is not possible.	1	35B-12
Communication between the MUT-II and the ABS-ECU is not possible.	2	35B-13
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.	3	35B-14
Even after the engine is started, the ABS warning lamp remains illuminated.	4	35B-15
Faulty ABS operation	5	35B-16

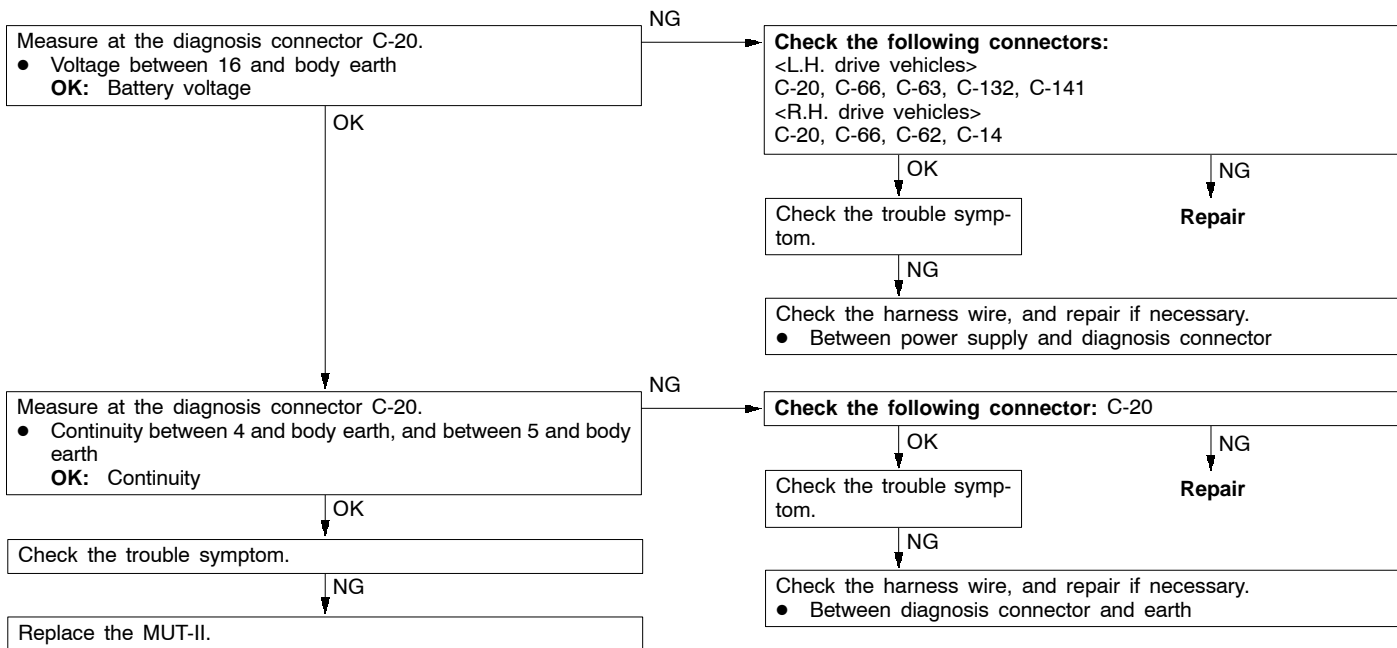
**Caution**

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, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

**Inspection Procedure 1**

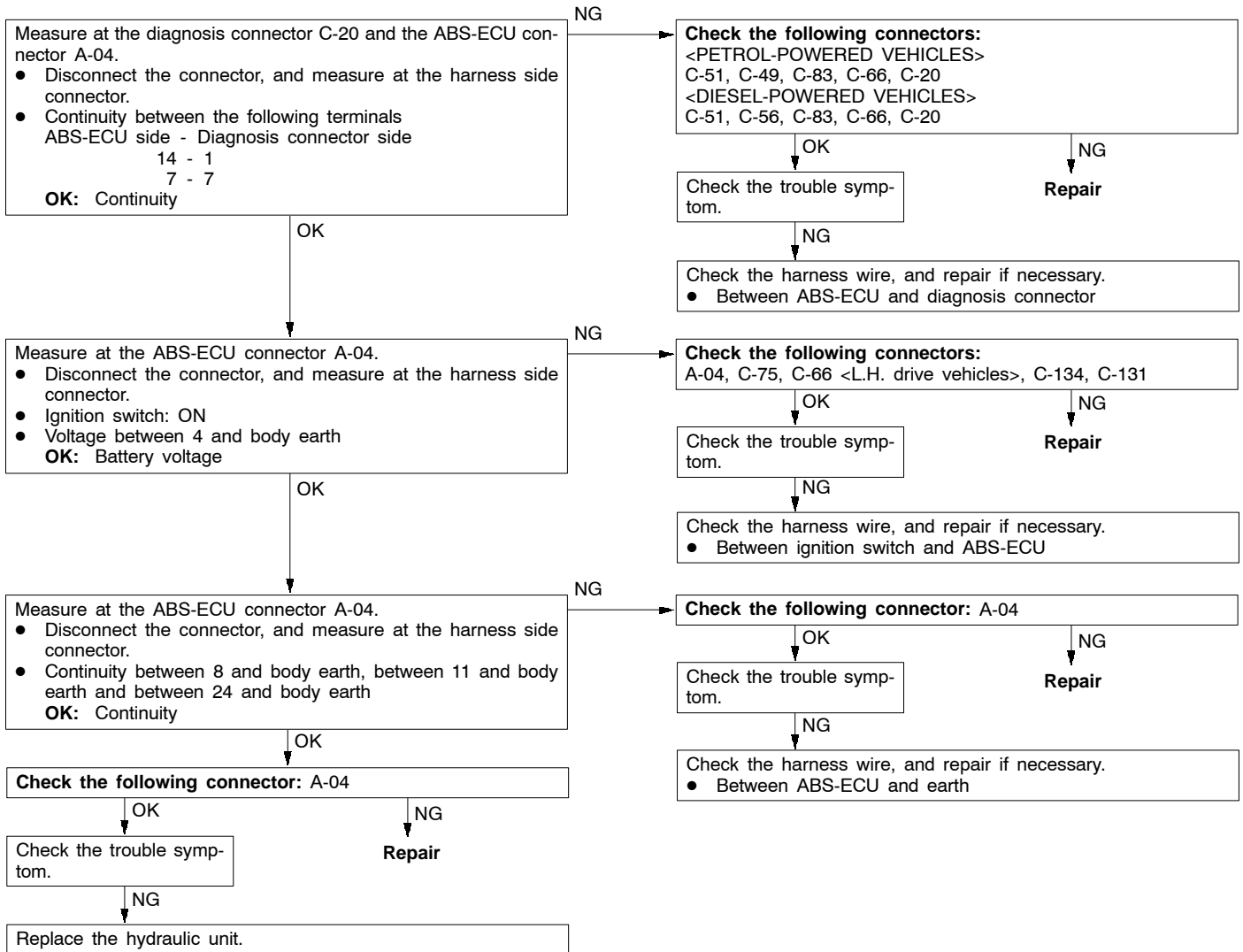
Communication between the MUT-II and the whole system is not possible.	Probable cause
The cause may be a malfunction of the power supply circuit or the earth circuit of the diagnosis connector.	<ul style="list-style-type: none"> <li>• Malfunction of diagnosis connector</li> <li>• Malfunction of wiring harness or connector</li> </ul>





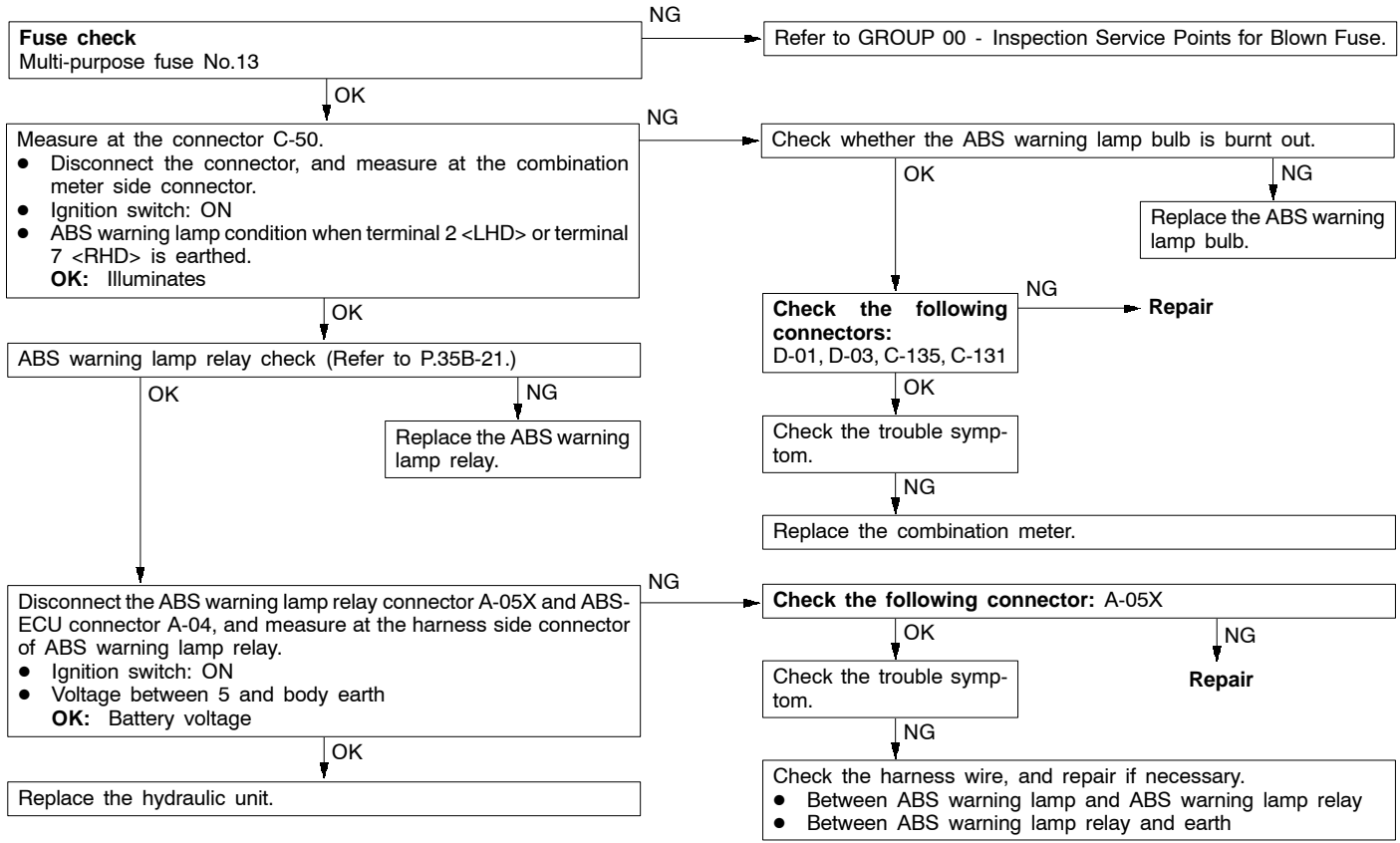
Inspection Procedure 2

Communication between MUT-II and the ABS-ECU is not possible.	Probable cause
The cause may be an open circuit in the ABS-ECU power supply circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> <li>• Blown fuse</li> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of hydraulic unit</li> </ul>



Inspection Procedure 3

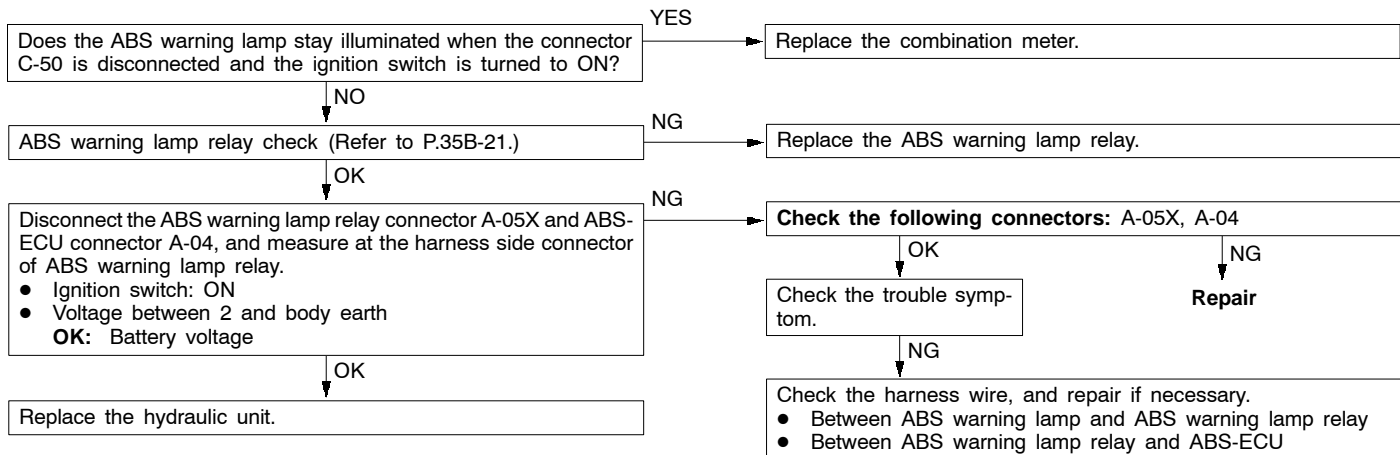
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.	Probable cause
The cause may be an open circuit in the lamp power supply circuit, a blown lamp, a malfunction of the ABS warning lamp relay or an open circuit between the ABS warning lamp and the earth.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Burn out ABS warning lamp bulb</li> <li>● Malfunction of ABS warning lamp relay</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of hydraulic unit</li> </ul>



Inspection Procedure 4

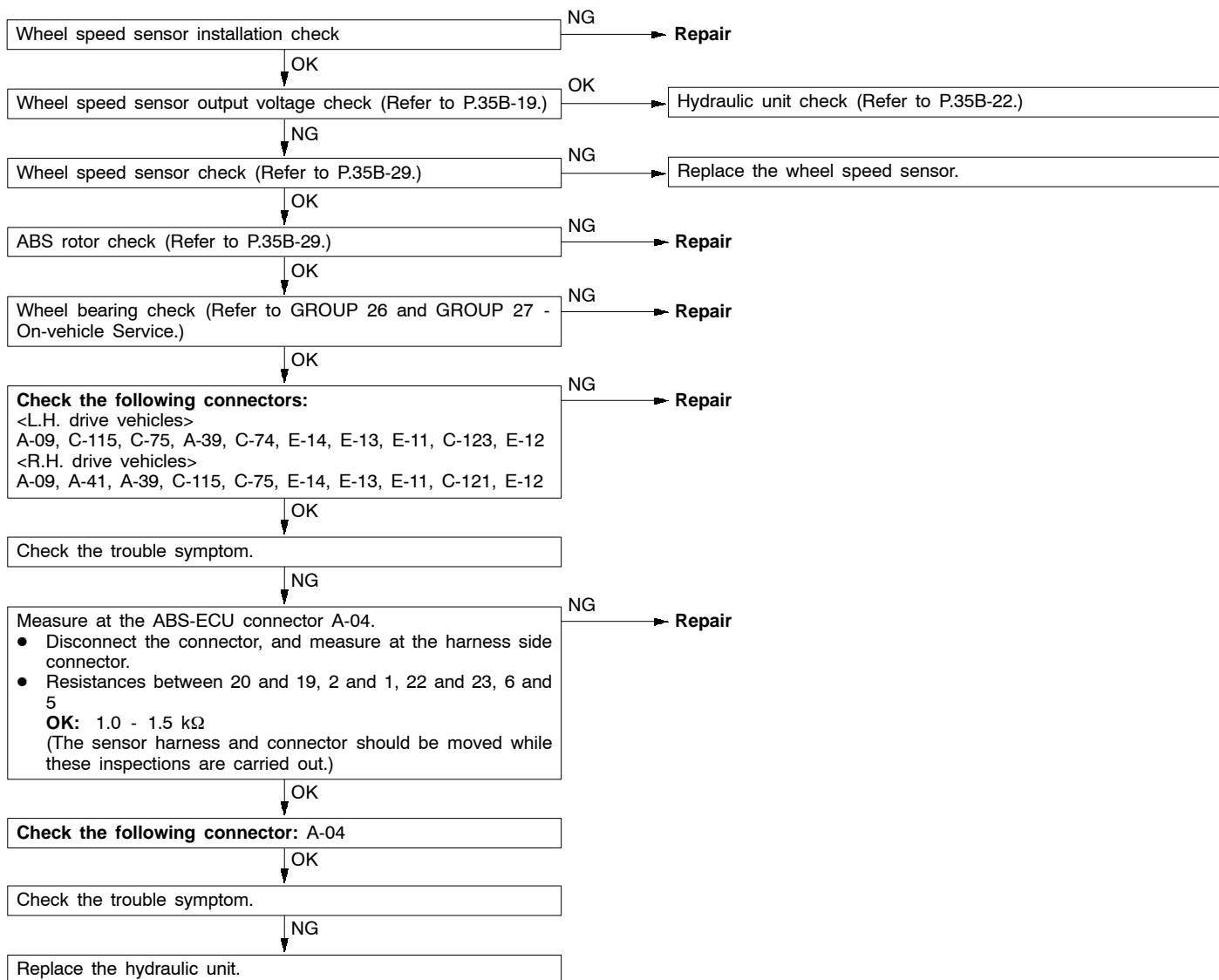
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	<ul style="list-style-type: none"> <li>● Malfunction of combination meter</li> <li>● Malfunction of ABS warning lamp relay</li> <li>● Malfunction of wiring harness (short circuit)</li> <li>● Malfunction of hydraulic unit</li> </ul>

**NOTE**  
 This trouble symptom is limited to cases where communication with the MUT-II is possible (ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



Inspection Procedure 5

Faulty ABS operation	Probable cause
<p>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.</p>	<ul style="list-style-type: none"> <li>● Improper installation of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of ABS rotor</li> <li>● Foreign material adhering to wheel speed sensor</li> <li>● Malfunction of wheel bearing</li> <li>● Malfunction of hydraulic unit</li> </ul>



**DATA LIST REFERENCE TABLE**

35201150206

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

**1. When the system is normal**

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-II are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9.2 - 17.5 V
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

**2. When the ABS-ECU shut off ABS operation.**

When the diagnosis system stops the ABS-ECU, the MUT-II display data will be unreliable.

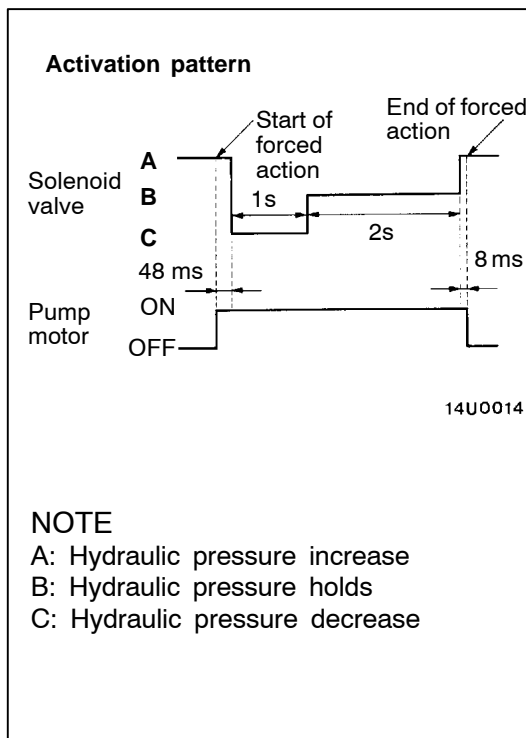
**ACTUATOR TEST REFERENCE TABLE**

35201160025

The MUT-II activates the following actuators for testing.

**NOTE**

1. If the ABS-ECU runs down, 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 canceled.
3. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.



**ACTUATOR TEST SPECIFICATIONS**

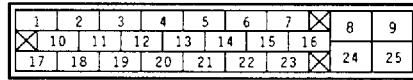
No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

## CHECK AT ABS-ECU

35201180229

## TERMINAL VOLTAGE CHECK CHART

1. Measure the voltage between each terminal and earth.
2. The terminal layout is shown in the illustration below.

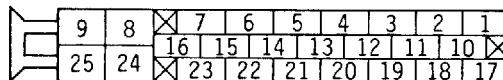


1410029

Terminal No.	Check item	Checking requirements		Normal condition
4	ABS-ECU power supply	Ignition switch: ON		Battery voltage
		Ignition switch: START		0 V
7	MUT-II	When the MUT-II is connected		Serial communication with MUT-II
		When the MUT-II is not connected		1 V or less
9	Solenoid valve power supply	Always		Battery voltage
14	Diagnosis changeover input	When the MUT-II is connected		0 V
		When the MUT-II is not connected		Approx. 12 V
16	ABS valve transistor output	Ignition switch: ON	When the lamp is switched off	2 V or less
			When the lamp is illuminated	Battery voltage
18	Stop lamp switch input	Ignition switch: ON	Stop lamp switch: ON	Battery voltage
			Stop lamp switch: OFF	1 V or less
25	Motor power supply	Always		Battery voltage

## RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

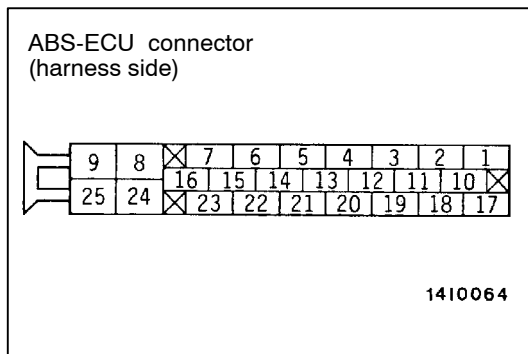
1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.



1410064

Terminal No.	Signal	Normal condition
1 - 2	Wheel speed sensor (front left)	1.0 - 1.5 kΩ
5 - 6	Wheel speed sensor (rear left)	1.0 - 1.5 kΩ
19 - 20	Wheel speed sensor (front right)	1.0 - 1.5 kΩ

Terminal No.	Signal	Normal condition
23 - 22	Wheel speed sensor (rear right)	1.0 - 1.5 kΩ
8 - Body earth	Solenoid valve earth	Continuity
24 - Body earth	Motor earth	



## ON-VEHICLE SERVICE

35200160224

### WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

- Lift up the vehicle and release the parking brake.
- Disconnect the ABS-ECU connector, and then use the special tool (inspection harness for connector pin contact pressure) to measure the output voltage at the harness-side connector.
- 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.

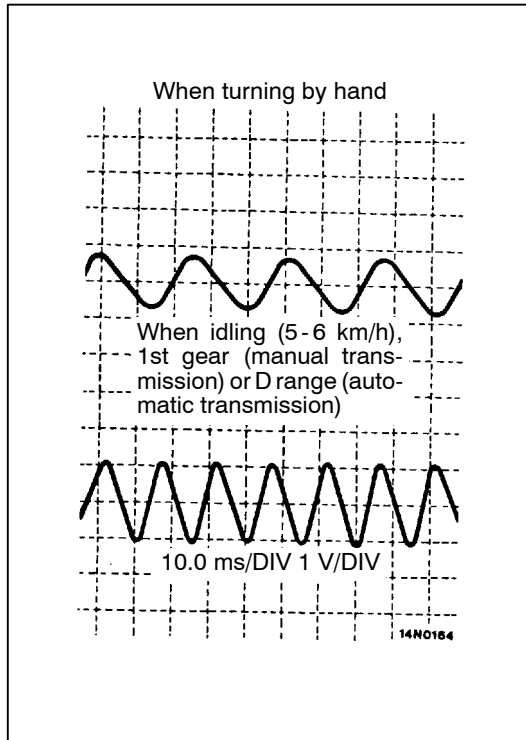
Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	1	19	5	23
	2	20	6	22

#### Output voltage

**When measuring with a circuit tester:  
42 mV or more**

**When measuring with an oscilloscope:  
120 mV p-p or more**

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



### Inspecting Waveforms With An Oscilloscope

Use the following method to observe the output voltage waveform from each wheel sensor with an oscilloscope.

- Start the engine, and rotate the front wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). 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 waveform measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

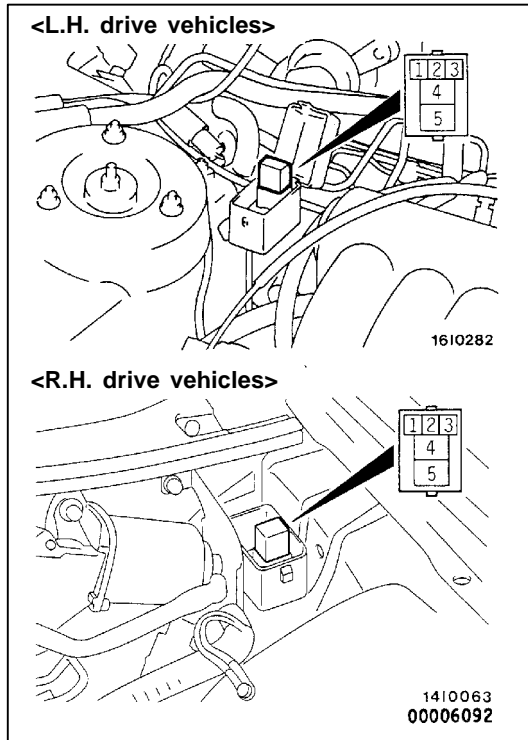
### Points In Waveform Measurement

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

### Caution

Because the wheel speed sensor cables move together with the front and rear suspension, they vibrate greatly when driving over poor road surfaces. As a result, the sensor harnesses should also be shaken when monitoring of output waveforms of the wheel speed sensors in order to simulate conditions such as driving over poor road surfaces.





### ABS WARNING LAMP RELAY CONTINUITY CHECK

35200930023

Battery voltage	Terminal No.			
	1	2	3	5
Power is not supplied	○	○	○	○
Power is supplied	⊕		⊖	

## HYDRAULIC UNIT CHECK

35200170227

**Caution**

Turn the ignition switch off before connecting or disconnecting the MUT-II.

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**

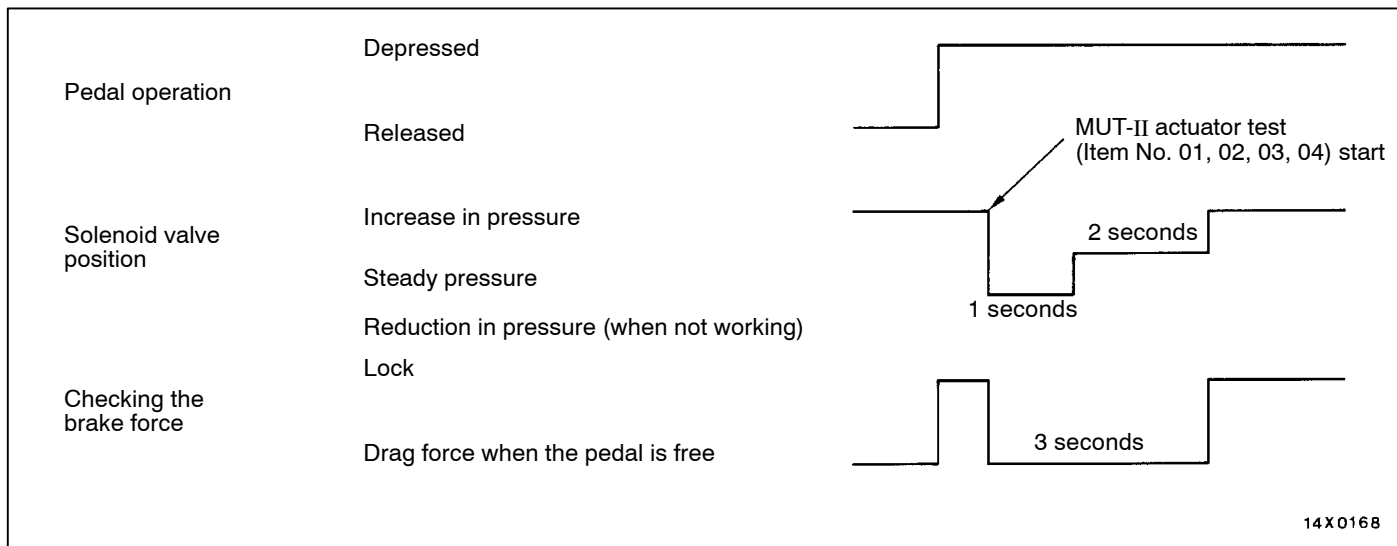
1. The roller of the braking force tester and the tyre should be dry during testing.
  2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.
2. Release the parking brake, and feel the drag force (drag torque) on each road 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.
  4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.
  5. Use the MUT-II to force-drive the actuator.

**NOTE**

1. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.
  2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.
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 that the braking force decreases when the actuator is force-driven.

Front wheel	785 - 981 N
Rear wheel	588 - 784 N

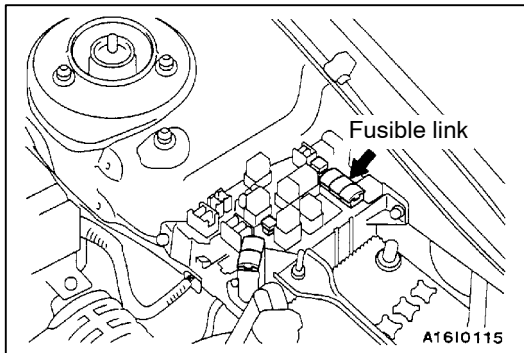
The result should be as shown in the following diagram.



7. If the result of inspection is abnormal, correct according to the "Diagnosis Table" (Refer to P.35B-23).
8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.

## Diagnosis Table

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

**REMEDY FOR A FLAT BATTERY**

35200350188

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.

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-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removed.

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

# MASTER CYLINDER AND BRAKE BOOSTER

35200400142

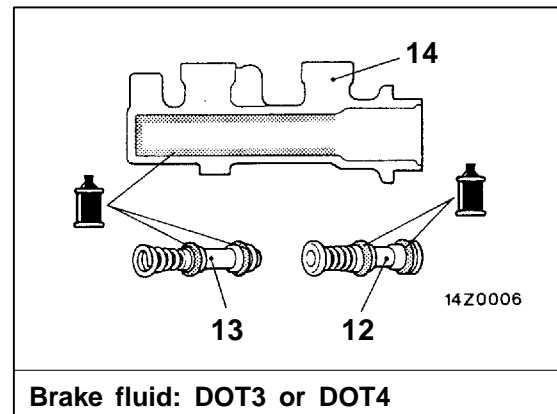
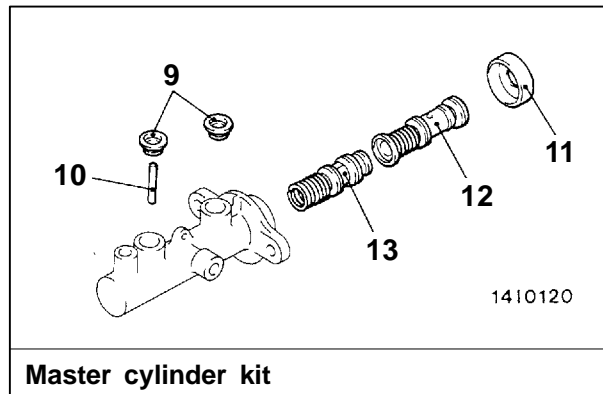
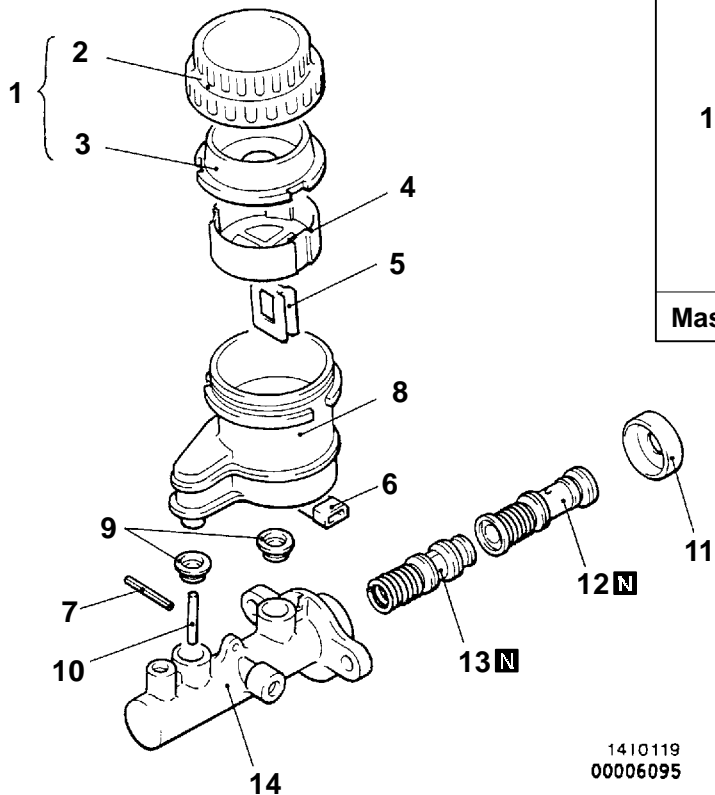
## REMOVAL AND INSTALLATION

Refer to GROUP 35A.

### MASTER CYLINDER

35200450147

### DISASSEMBLY AND REASSEMBLY



#### Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level indicator assembly
6. Float
7. Spring pin
8. Reservoir tank
9. Reservoir seal
10. Pin
11. Piston retainer
12. Primary piston assembly
13. Secondary piston assembly
14. Master cylinder body

#### INSPECTION

35200460027

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

# PROPORTIONING VALVE

## REMOVAL AND INSTALLATION

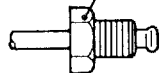
**Pre-removal Operation**  
 Brake Fluid Draining

**Post-installation Operation**

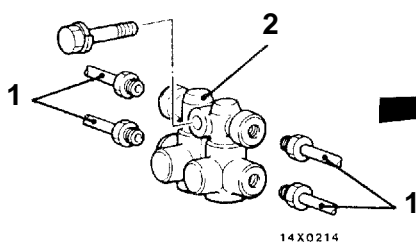
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to GROUP 35A - On-vehicle Service.)

**Flared brake line nuts**

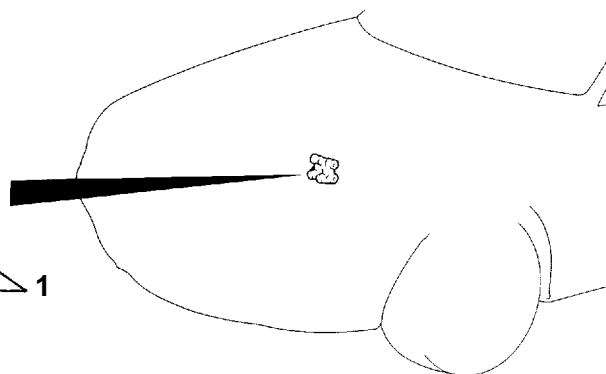
15 Nm



14X0343



14X0214



14X0146  
 00004486

**Removal steps**

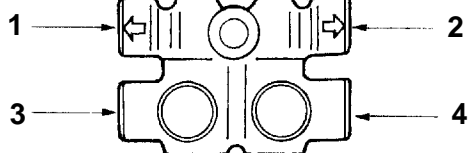
- ▶A◀
1. Brake pipe
  2. Proportioning valve

### INSTALLATION SERVICE POINT

▶A◀ **BRAKE PIPE CONNECTION**

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

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Hydraulic unit
4. Proportioning valve – Hydraulic unit



A14L0340

# HYDRAULIC UNIT

## REMOVAL AND INSTALLATION

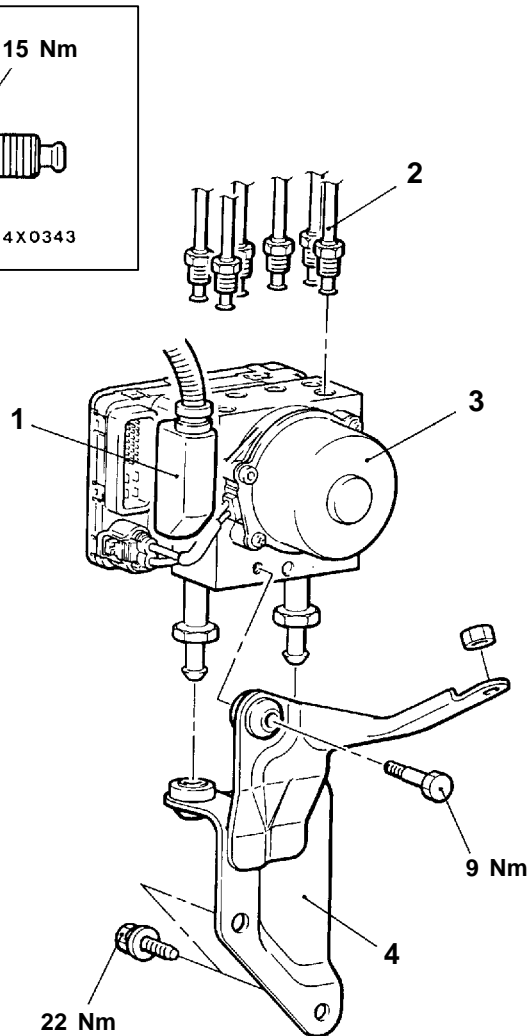
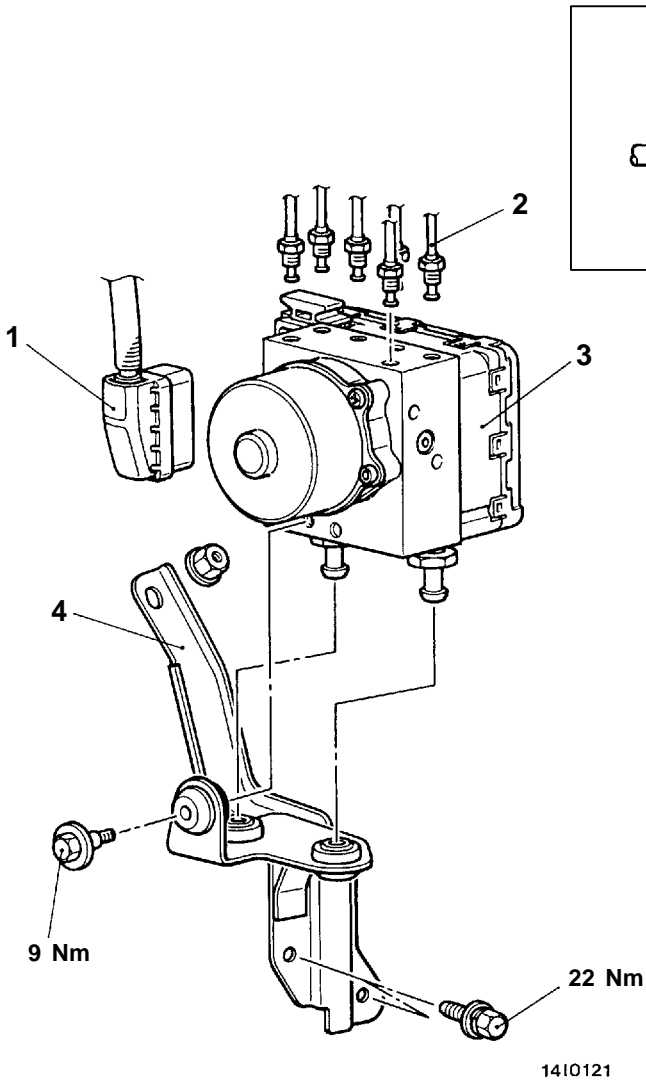
**Pre-removal Operation**  
 Brake Fluid Draining

**Post-installation Operation**

- Brake Fluid Supplying
- Brake Line Bleeding  
 (Refer to GROUP 35A - On-vehicle Service.)
- Brake Pedal Adjustment  
 (Refer to GROUP 35A - On-vehicle Service.)

<L.H. drive vehicles>

<R.H. drive vehicles>

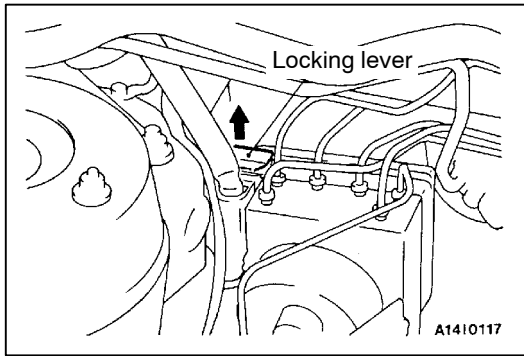


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**Removal steps**

- ◀A▶ 1. Harness connector
- ▶A◀ 2. Brake pipe connection
- ◀B▶ 3. Hydraulic unit and ABS-ECU
- 4. Hydraulic unit bracket assembly



## REMOVAL SERVICE POINT

### ◀A▶ HARNESS CONNECTOR REMOVAL

Raise the locking lever as shown in the illustration, and then disconnect the harness connector.

### ◀B▶ HYDRAULIC UNIT ASSEMBLY REMOVAL

#### Caution

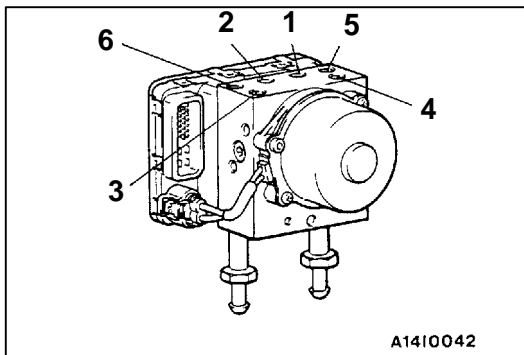
1. The hydraulic unit assembly is heavy, and so care should be taken when removing it.
2. The hydraulic unit assembly is not to be disassembled; its nuts and bolts should absolutely not be loosened.
3. The hydraulic unit assembly must not be dropped or otherwise subjected to impact shocks.
4. The hydraulic unit assembly 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 assembly as shown in the illustration.

1. To the proportioning valve (RH)
2. To the proportioning valve (LH)
3. From the master cylinder (Primary)
4. From the master cylinder (Secondary)
5. To the front brake (RH)
6. To the front brake (LH)



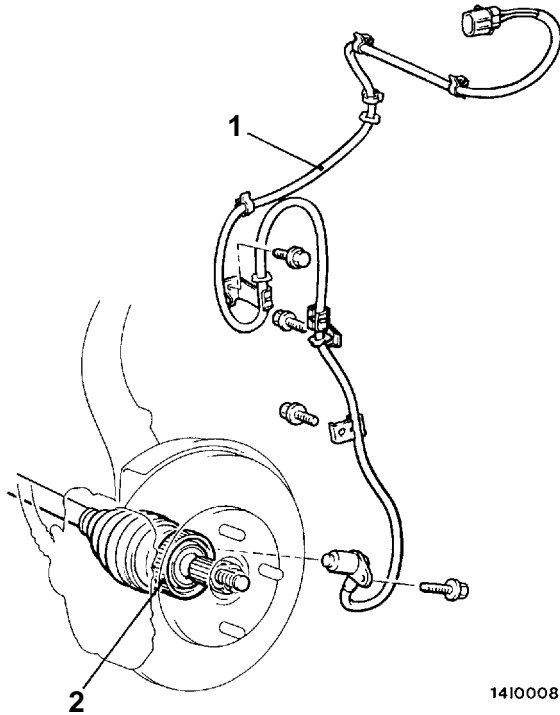
# WHEEL SPEED SENSOR

## REMOVAL AND INSTALLATION

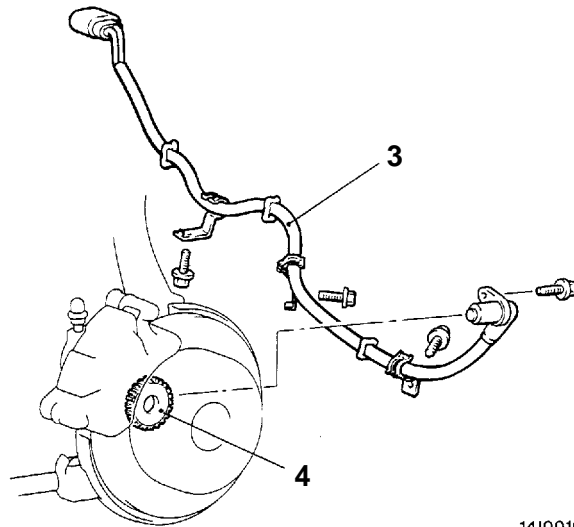
### Post-installation Operation

Wheel Speed Sensor Output Voltage Check  
(Refer to P.35B-19.)

<Front>



<Rear>



### Front speed sensor removal steps

- Splash Shield Removal (Refer to GROUP 42 - Fender.)
- ◀A▶ ▶A▶
1. Front speed sensor
  2. Front ABS rotor (Refer to GROUP 26 - Drive Shaft.)

### Rear speed sensor removal steps

- ◀A▶ ▶A▶
3. Rear speed sensor
  4. Rear ABS rotor (Refer to GROUP 27 - Rear Axle Hub.)

### NOTE

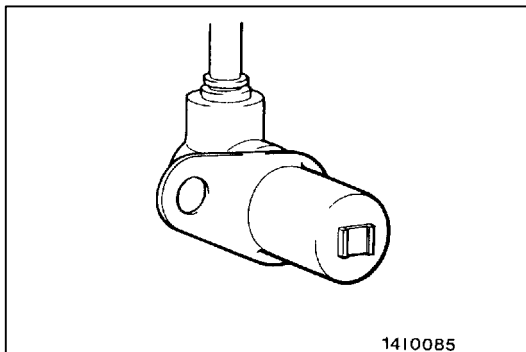
The front rotor is integrated with the drive shaft and is not disassembled.

## REMOVAL SERVICE POINT

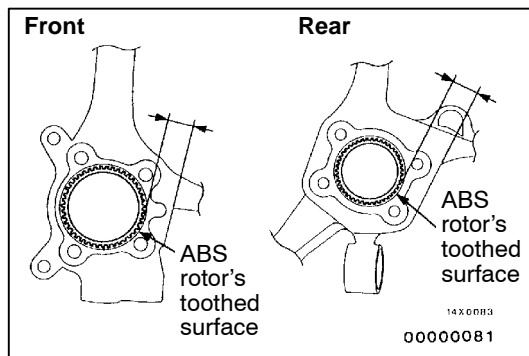
### ◀A▶ FRONT SPEED SENSOR/REAR SPEED SENSOR REMOVAL

#### Caution

Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.





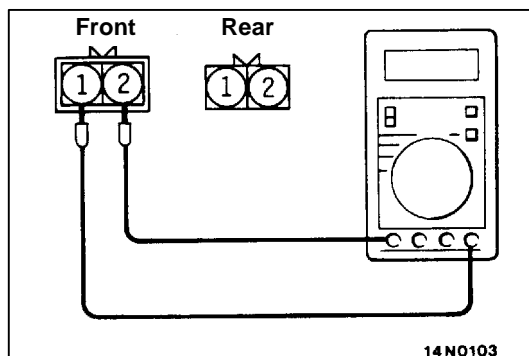


## INSTALLATION SERVICE POINT

### ▶A◀ FRONT SPEED SENSOR/REAR SPEED SENSOR INSTALLATION

The clearance between the wheel speed sensor and the ABS rotor's toothed surface is not adjustable, but measure the distance between the sensor installation surface and the ABS rotor's toothed surface.

**Standard value: 28.2 - 28.5 mm**



## INSPECTION

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### SPEED SENSOR

1. Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip, and if so, remove it.  
Also check whether the pole piece is damaged, and if so, replace it with a new one.

#### NOTE

The pole piece can become magnetized because of the magnet but into the speed sensor, with the result that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to function to correctly sense the wheel rotation speed if it is damaged.

2. Measure the resistance between the speed sensor terminals.

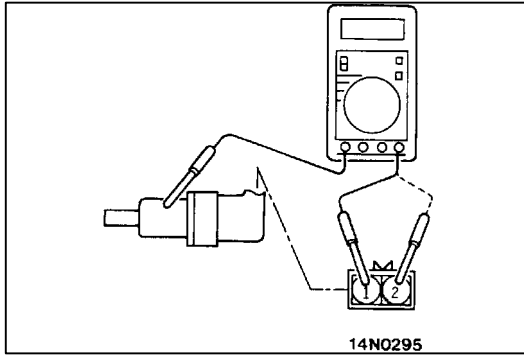
**Standard value: 1.0 - 1.5 kΩ**

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 temporary disconnection occurs.

**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.

**ABS TOOTHED ROTOR**

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