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1989 Mazda RX-7 Factory Service Manual

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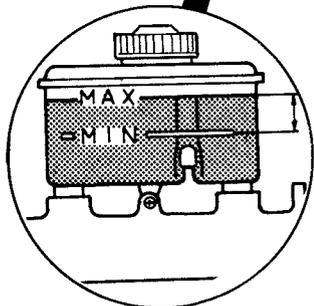
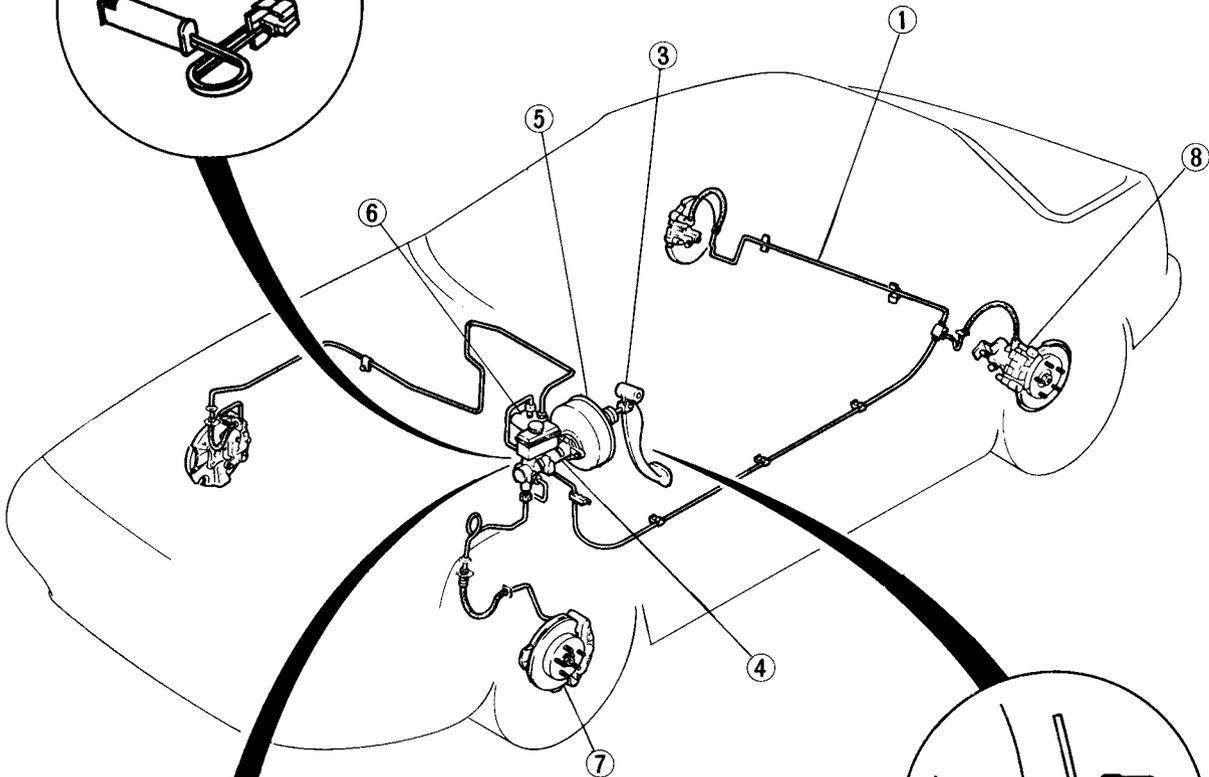
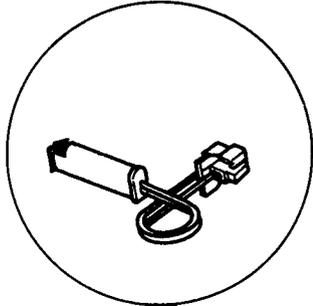
BRAKING SYSTEM

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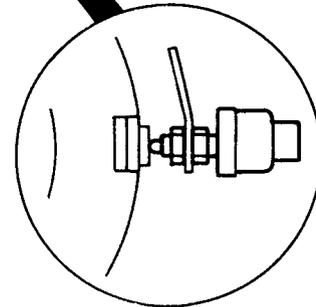
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CONVENTIONAL BRAKE SYSTEM

BRAKE FLUID LEVEL SENSOR
INSPECTION, SECTION T



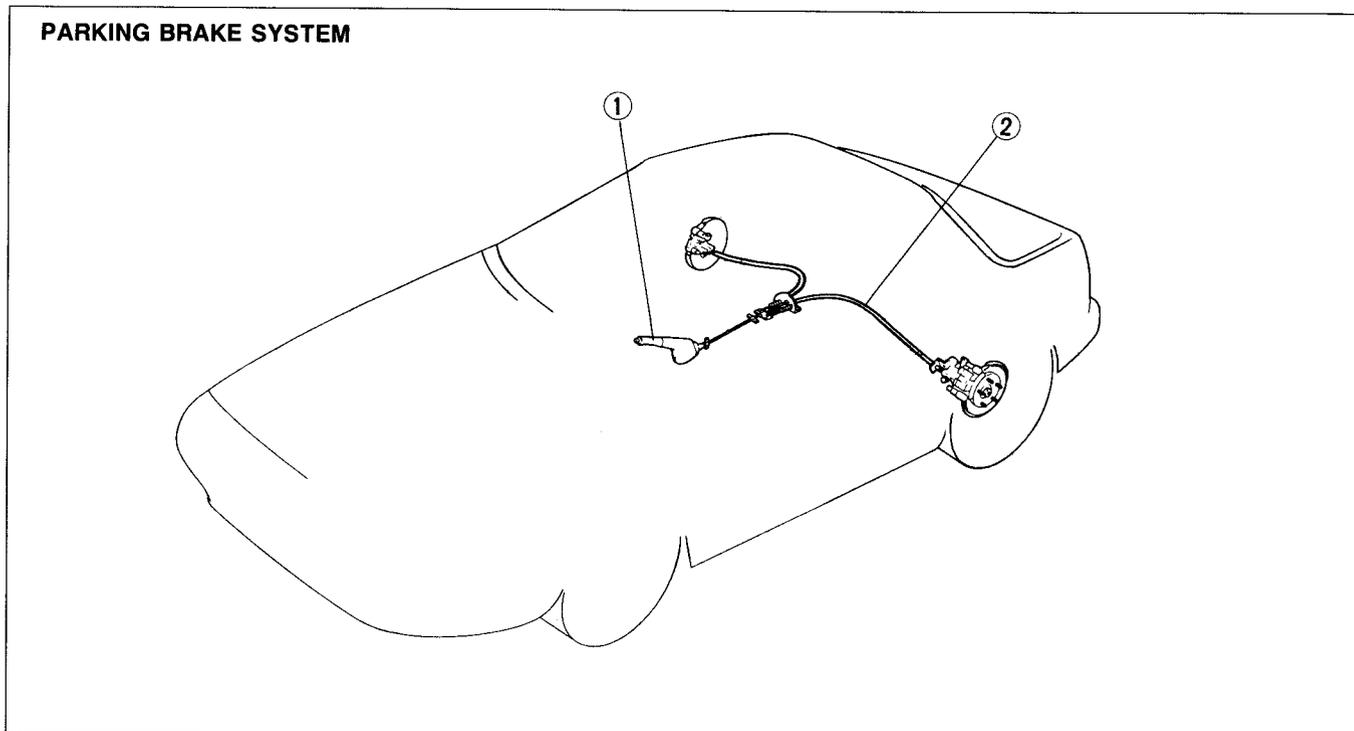
FLUID SPECIFICATION:
[SAE J1703 OR FMVSS116 DOT3]



STOP LIGHT SWITCH
INSPECTION, SECTION T

<p>1. Brake hydraulic line On-vehicle inspection page P- 8 Removal and Installation page P- 8 Air bleeding page P- 8</p> <p>2. Brake fluid On-vehicle inspection page P- 9 Replacement page P- 9</p> <p>3. Brake pedal On-vehicle inspection page P-10 Removal, Inspection and Installation page P-11</p> <p>4. Master cylinder Non-turbo: Removal and Installation page P-13 Disassembly, Inspection and Assembly page P-15 Turbo: Removal and Installation page P-17 Disassembly, Inspection and Assembly page P-21</p> <p>5. Power brake unit Non-turbo: On-vehicle inspection page P-24 Removal and Installation page P-26 Disassembly and Inspection page P-27 Assembly page P-28 Turbo: On-vehicle inspection page P-30 Removal and Installation page P-32</p>	<p>6. Proportioning bypass valve (PBV) On-vehicle inspection page P-33 Removal and Installation page P-34</p> <p>7. Front disc brake Single piston caliper: On-vehicle inspection page P-35 Replacement (pad) page P-35 Removal and Installation page P-36 Inspection page P-37 Disassembly, Inspection and Assembly page P-38 Four piston caliper: On-vehicle inspection page P-39 Replacement (pad) page P-39 Removal and Installation page P-40 Inspection page P-41 Disassembly, Inspection and Assembly page P-42</p> <p>8. Rear disc brake On-vehicle inspection page P-43 Replacement (pad) page P-43 Removal and Installation page P-44 Inspection page P-45 Disassembly, Inspection and Assembly page P-46</p>
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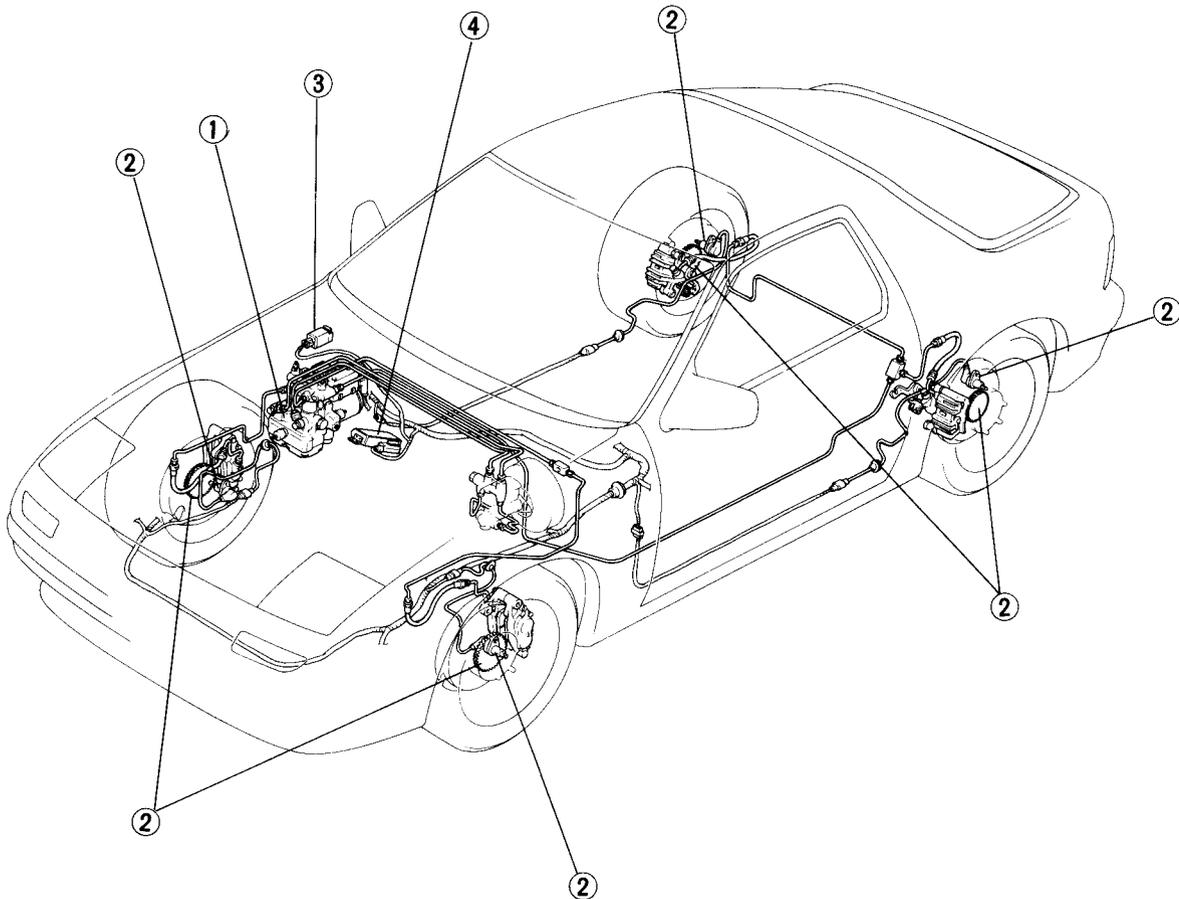
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<p>1. Parking brake lever On-vehicle inspection page P-49 Removal, Inspection and Installation page P-50</p>	<p>2. Parking brake cable Removal, Inspection and Installation page P-51</p>
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ANTI-LOCK BRAKE SYSTEM (ABS)



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- 1. Hydraulic unit
 - On-vehicle inspection page P-63
 - Removal and Installation page P-65
- 2. Speed sensor and rotor
 - On-vehicle inspection page P-67
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 - Removal, Inspection and Installation (Rear) page P-70

- 3. Main relay
 - On-vehicle inspection page P-71
- 4. ABS control unit

OUTLINE

OUTLINE OF CONSTRUCTION

1. Front ventilated disc brake and either ventilated or solid disc rear brake are available.
2. The front disc brake incorporates either 1-piston or 4-piston caliper.
3. The power brake unit is a single diaphragm (9-inch) for Non-Turbo models and a tandem diaphragm (7-inch & 8-inch) for Turbo models.
4. Anti-lock brake system (ABS) is optional with Turbo models.

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SPECIFICATIONS

Item		NON-TURBO		TURBO
		Type A*	Type B*	
Brake pedal	Type	Suspended		
	Pedal lever ratio	4.5 : 1		
	Maximum stroke	mm (in)	136 (5.35)	
Master cylinder	Type	Tandem (with level sensor)		
	Cylinder bore	mm (in)	22.22 (0.875)	23.81 (0.937)
Power brake unit	Type	Single diaphragm		Tandem diaphragm
	Diameter	mm (in)	238 (9.37)	188 & 215 (7.40 & 8.46)
Front disc brake	Type		Ventilated disc, single-piston caliper	Ventilated disc, four-piston caliper
	Cylinder bore	mm (in)	50.8 (2.00)	36.12 (1.42)
	Pad dimensions (Area x Thickness)	mm ² x mm (in ² x in)	4,280 x 9 (6.63 x 0.35)	4,700 x 11 (7.28 x 0.43)
	Disc plate dimensions (Outer diameter x Thickness)	mm (in)	276 x 22 (10.87 x 0.87)	
Rear disc brake	Type		Solid disc	Ventilated disc
	Cylinder bore	mm (in)	34.93 (1.375)	
	Pad dimensions (Area x Thickness)	mm ² x mm (in ² x in)	3,210 x 8 (4.98 x 0.31)	
	Disc plate dimensions (Outer diameter x Thickness)	mm x in	261 x 10 (10.28 x 0.39)	273 x 20 (10.75 x 0.79)
Braking force control device		Proportioning bypass valve		
Parking brake		Center lever (Mechanical, two rear brakes)		
Brake fluid		SAE J1703 or FMVSS116 DOT-3		

Type A*: Standard suspension models

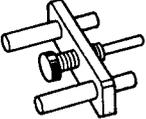
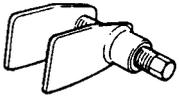
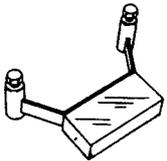
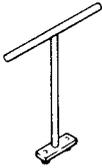
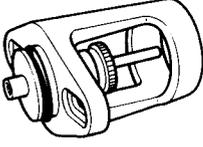
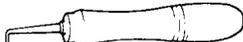
Type B*: Sport suspension, Auto Adjusting Suspension (AAS), or convertible models

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P CONVENTIONAL BRAKE SYSTEM

CONVENTIONAL BRAKE SYSTEM

PREPARATION SST

<p>49 0259 770B Wrench, flare nut</p> 	<p>49 F043 001 Adjust gauge</p> 	<p>49 0221 600C Expand tool, disc brake</p> 
<p>49 F033 001 Stopper, disc brake piston</p> 	<p>49 FA18 602 Wrench, disc brake piston</p> 	<p>49 B043 001 Adjust gauge</p> 
<p>49 B043 002 Installer, bearing</p> 	<p>49 1285 071 Puller, bearing</p> 	<p>49 0208 701A Boot air out tool</p> 

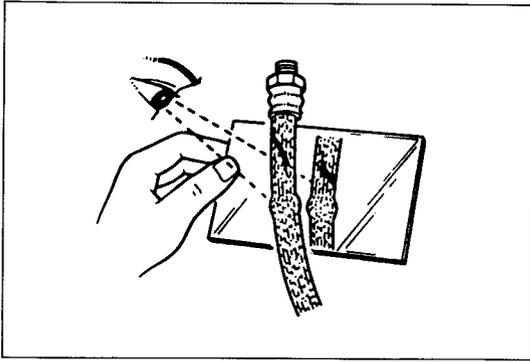
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TROUBLESHOOTING GUIDE

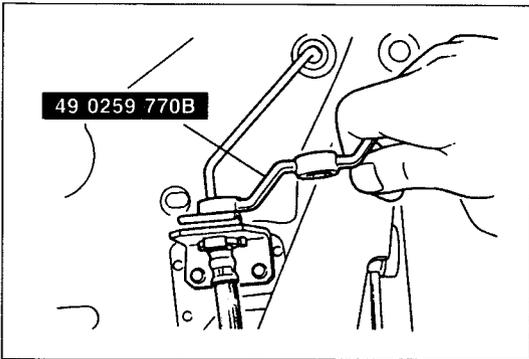
Problem	Possible cause	Action	Page
Poor braking	Leakage of brake fluid	Repair	—
	Air in lines	Air bleed	P- 8
	Worn pad	Replace	P-35,39,43
	Brake fluid, grease, oil, or water on pad	Clean or replace	P-35,39,43
	Hardening of pad surface or poor contact	Grind or replace	P-35,39,43
	Malfunction of disc brake piston	Replace	P-38,42,46
	Malfunction of master cylinder	Repair or replace	P-13,17
	Malfunction of power brake unit	Repair or replace	P-26,32
	Malfunction of check valve (vacuum hose)	Repair or replace	P-26,32
	Damaged vacuum hose	Replace	P-26,32
Deterioration of flexible hose	Replace	P- 8	
Malfunction of Proportioning Bypass Valve (PBV)	Replace	P-34	
Brakes pull to one side	Worn pad	Replace	P-35,39,43
	Brake fluid, grease, oil, or water on pad	Clean or replace	P-35,39,43
	Hardening of pad surface or poor contact	Grind or replace	P-35,39,43
	Abnormal wear, distortion, or eccentricity of disc	Repair or replace	Section M
	Malfunction of automatic adjusting in rear brake	Repair	—
	Looseness or deformation of dust cover mounting bolt	Tighten or replace	Section M
	Malfunction of disc brake piston	Repair or replace	P-38,42,46
	Improper adjustment wheel bearing preload or wear	Adjust or replace	Section M
	Improper adjustment of wheel alignment	Adjust	Section R
Unequal tire air pressure	Adjust	Section Q	
Brakes do not release	No brake pedal play	Adjust	P-10
	Improper adjustment of push rod clearance	Adjust	P-14,18
	Clogged master cylinder return port	Clean	—
	Pad does not return properly	Repair	—
	Improper return of malfunction of piston seal of disc brakes	Replace	P-38,42,46
	Excessive runout of disc plate	Replace	Section M
Improper adjustment of wheel bearing preload	Adjust or replace	Section M	
Pedal goes too far (Too much pedal stroke)	Air in system because of insufficient brake fluid	Add fluid and bleed air	P- 8
	Improper adjustment of pedal play	Adjust	P-10
	Worn pad	Replace	P-35,39,43
	Air in lines	Air bleed	P- 8
Abnormal noise or vibration during braking	Worn pad	Replace	P-35,39,43
	Deterioration pad surface	Grind or replace	P-35,39,43
	Brakes do not release	Repair	—
	Foreign material or scratches on disc plate contact surface	Clean	—
	Looseness of caliper mounting bolt(s)	Tighten	P-36,40,44
	Damage or deviation of disc contact surface	Replace	Section M
	Poor contact of pad	Repair or replace	P-35,39,43
	Insufficient grease on sliding parts	Apply grease	—

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P CONVENTIONAL BRAKE SYSTEM



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9MU0PX-008

BRAKE HYDRAULIC LINE

On-vehicle Inspection

Check for the following and replace parts as necessary.

1. Cracking, damage, or corrosion of brake hose
2. Damage to brake hose threads
3. Scars, cracks, or swelling of flexible hose
4. All lines for fluid leakage

Removal and Installation

1. Loosen or tighten the flare nut with the **SST**.

Flare nut tightening torque:

13—22 N·m (1.3—2.2 m·kg, 9.4—16 ft·lb)

2. When connecting the flexible hose, do not overtighten or twist it.
3. After installation:
 - (1) Check that the hose does not contact other parts when the vehicle bounces or when the steering wheel is turned fully right or left.
 - (2) Bleed the air from the brake system.

Air-Bleeding

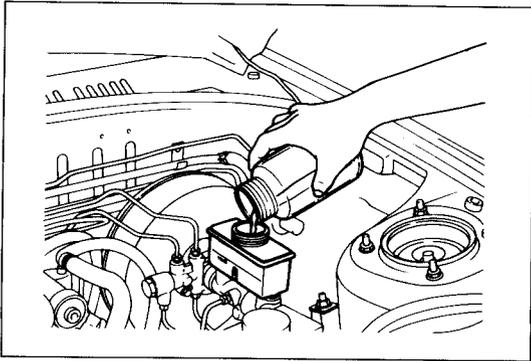
Air-bleeding locations are as follows:

Disassembly locations			Air-bleeding locations			
			Front		Rear	
			Right side	Left side	Right side	Left side
Master cylinder			* (3)	* (4)	* (1)	* (2)
Caliper	Front	Right side	*	—	—	—
		Left side	—	*	—	—
	Rear	Right side	—	—	*	—
		Left side	—	—	—	*
Proportioning bypass valve (PBV)			* (3)	—	* (1)	* (2)

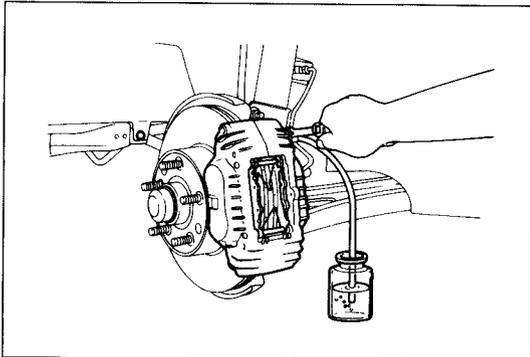
* : indicates locations where air-bleeding is necessary.

() indicates orders of air-bleeding.

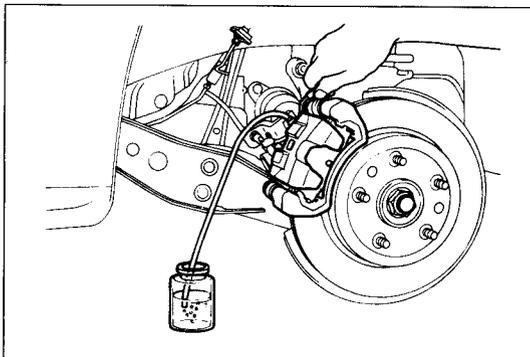
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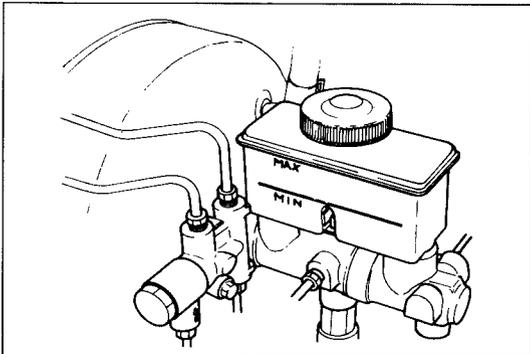
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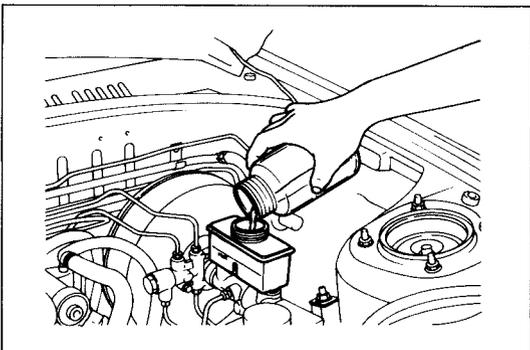
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97U0PX-012



97U0PX-013

Bleed air as described below.

1. Jack up the vehicle and support it with safety stands.
2. Fill the reserve tank with brake fluid. Be sure that the reserve tank is at least half full at all times during the air bleeding process.

Caution

- a) Be careful not to spill brake fluid onto a painted surface.
- b) Use only the specified brake fluid. Do not mix it with any other type.

3. After removing the bleeder cap, connect one end of a transparent vinyl tube to the bleeder screw and place the other end in a receptacle.
4. One person should depress the brake pedal a few times, and then hold it in the depressed position.
5. A second person should loosen the bleeder screw, drain out the fluid, and retighten the screw.

Caution

- a) The two people should stay in voice contact with each other.
- b) Be sure the pedal remains depressed until the air bleed screw is tightened.

6. Repeat steps 4 and 5 until no air bubbles are seen.

Caution

- a) After tightening the bleeder screw, check to be sure that there is no fluid leakage.
- b) Be sure to clean away any spilled fluid with rags.

7. After bleeding the air, add brake fluid to the reserve tank up to the specified level.

BRAKE FLUID

Inspection

1. Clean the area around the reservoir and the reservoir cap.
2. Check the fluid level. If the level is near or below the "MIN" mark, add brake fluid to "MAX" mark.

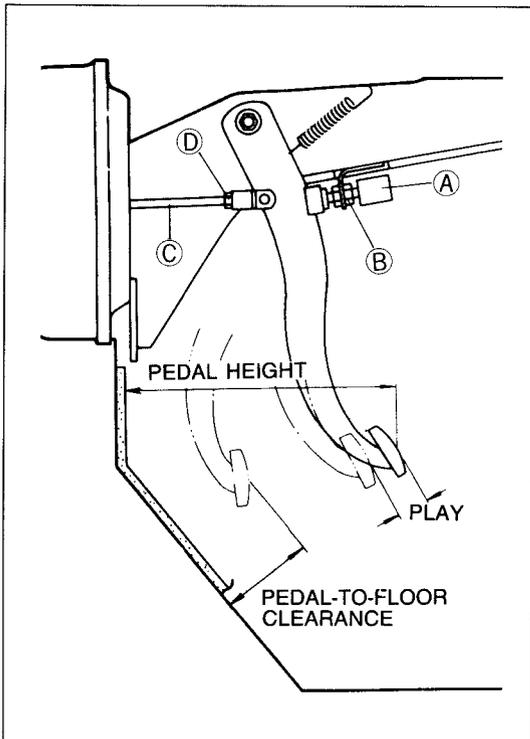
Fluid specification:

SAE J1703 or FMVSS116 DOT-3

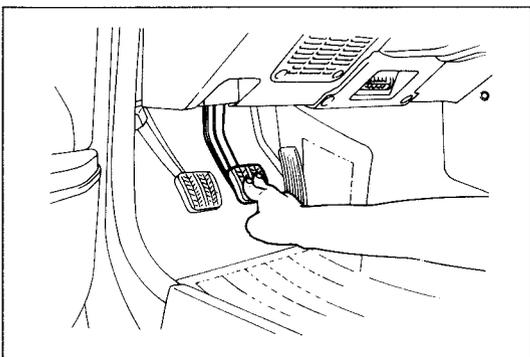
Replacement

1. Remove the brake fluid from the reservoir with a suction pump.
2. Fill the reservoir with new brake fluid.
3. Attach a vinyl tube to the bleeder screw and place the other end of the tube in a clear container.
4. Pump out the old brake fluid by loosening the bleeder screws one by one and pumping the brake pedal.

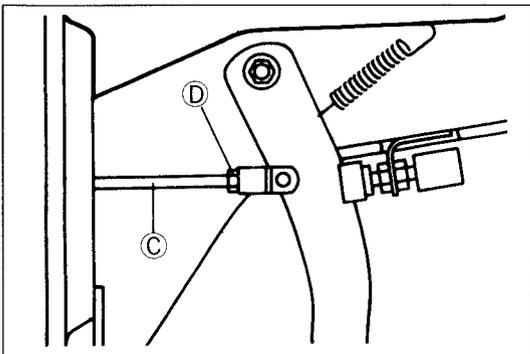
P CONVENTIONAL BRAKE SYSTEM



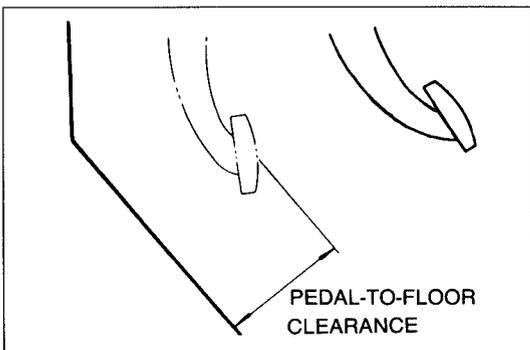
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BRAKE PEDAL

On-vehicle Inspection

Pedal height Inspection

Check that the distance from the center of the upper surface of the pedal pad to the carpet is as specified.

**Pedal height: 184—189mm (7.24—7.44 in)
(With carpet)**

Adjustment

1. Disconnect the stoplight switch connector.
2. Loosen locknut B and turn switch A until it does not contact the pedal.
3. Loosen locknut D and turn rod C to adjust the height.
4. Adjust the pedal free play and tighten locknut D.
5. Turn the stoplight switch until it contacts the pedal; then turn an additional 1/2 turn. Tighten locknut B.

Locknut B tightening torque:

14—18 N·m (1.4—1.8 m·kg, 10—13 ft·lb)

Locknut D tightening torque:

24—34 N·m (2.4—3.5 m·kg, 17—25 ft·lb)

Pedal play Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
2. Gently depress the pedal again by hand and check the free play (until the valve plunger contacts the stopper plate = until the power piston begins to move).

Pedal play: 4—7mm (0.16—0.28 in)

Adjustment

Loosen locknut D of operating rod C; then turn the rod to adjust the free play.

Locknut D tightening torque:

24—34 N·m (2.4—3.5 m·kg, 17—25 ft·lb)

Pedal-to-floor clearance Inspection

Check that the distance from the floor panel to the center of the upper surface of the pedal pad is as specified when the pedal is depressed with a force of **589 N (60 kg, 132 lb)**.

**Pedal-to-floor clearance: 100mm (3.94 in) min.
(Without carpet)**

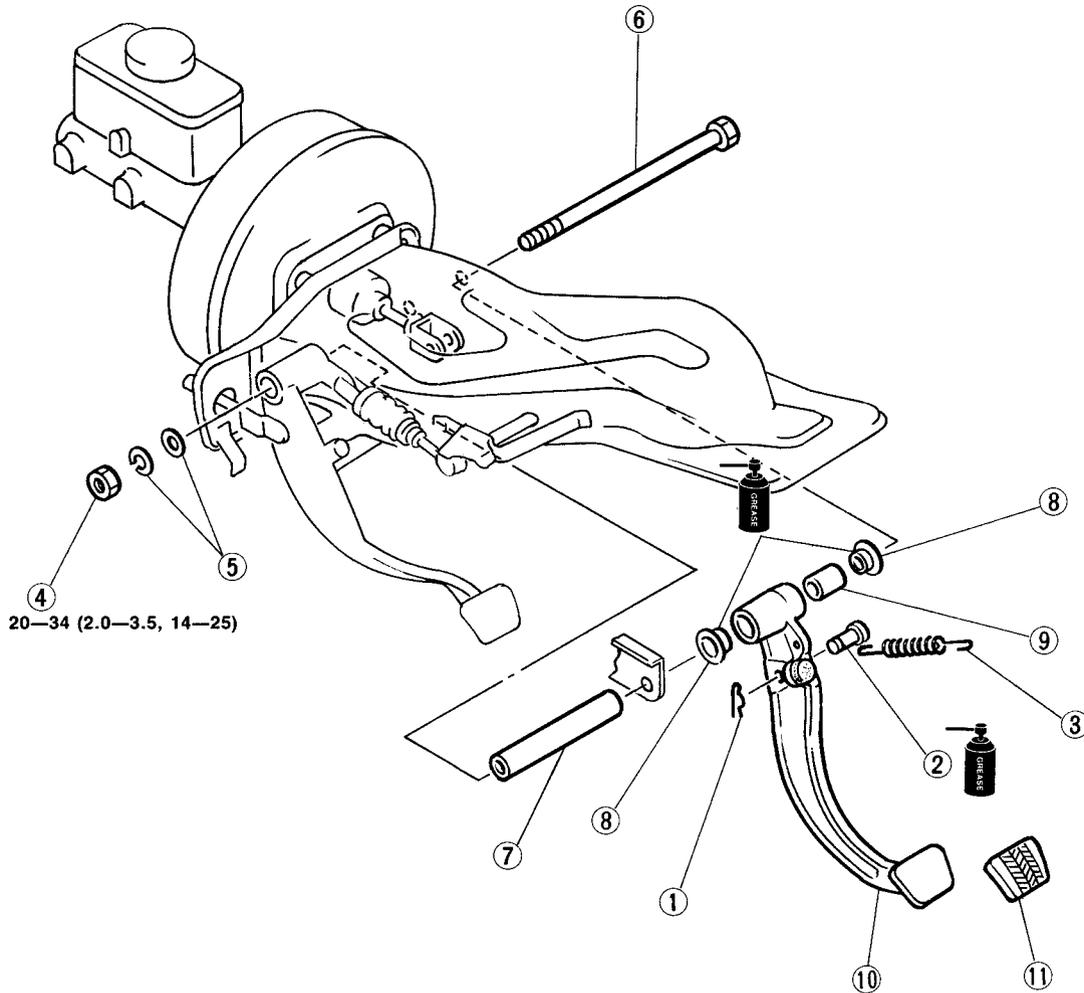
If the distance is less than specified, check for the following problems:

1. Air in brake system
2. Malfunction of automatic adjuster
3. Worn pads

Removal, Inspection, and Installation

1. Remove in the order shown in the figure.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Install in the reverse order of removal.
4. After installation, check and adjust the pedal height and free play if necessary.

MANUAL TRANSMISSION



N-m (m-kg, ft-lb)

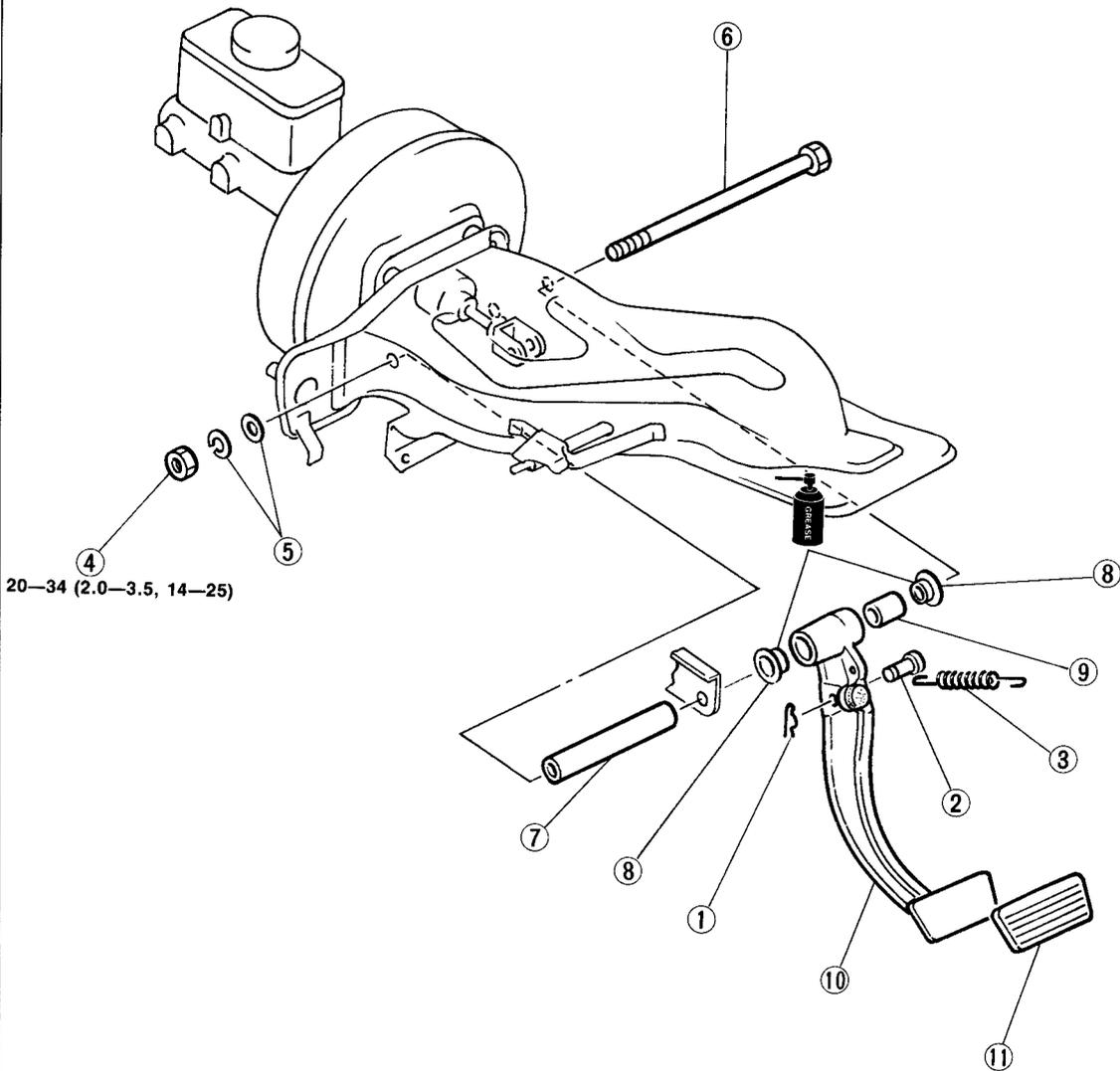
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1. Cotter pin
2. Clevis pin
3. Return spring
4. Nut
5. Washers
6. Bolt
7. Spacer

8. Bushing
Inspect for wear
9. Pedal pipe
10. Brake pedal
Inspect for bending
11. Pedal pad
Inspect for wear or damage

P CONVENTIONAL BRAKE SYSTEM

AUTOMATIC TRANSMISSION



N-m (m-kg, ft-lb)

97U0PX-017

1. Cotter pin
2. Clevis pin
3. Return spring
4. Nut
5. Washers
6. Bolt
7. Spacer

8. Bushings
Inspect for wear
9. Pedal pipe
10. Brake pedal
Inspect for bending
11. Pedal pad
Inspect for wear or damage

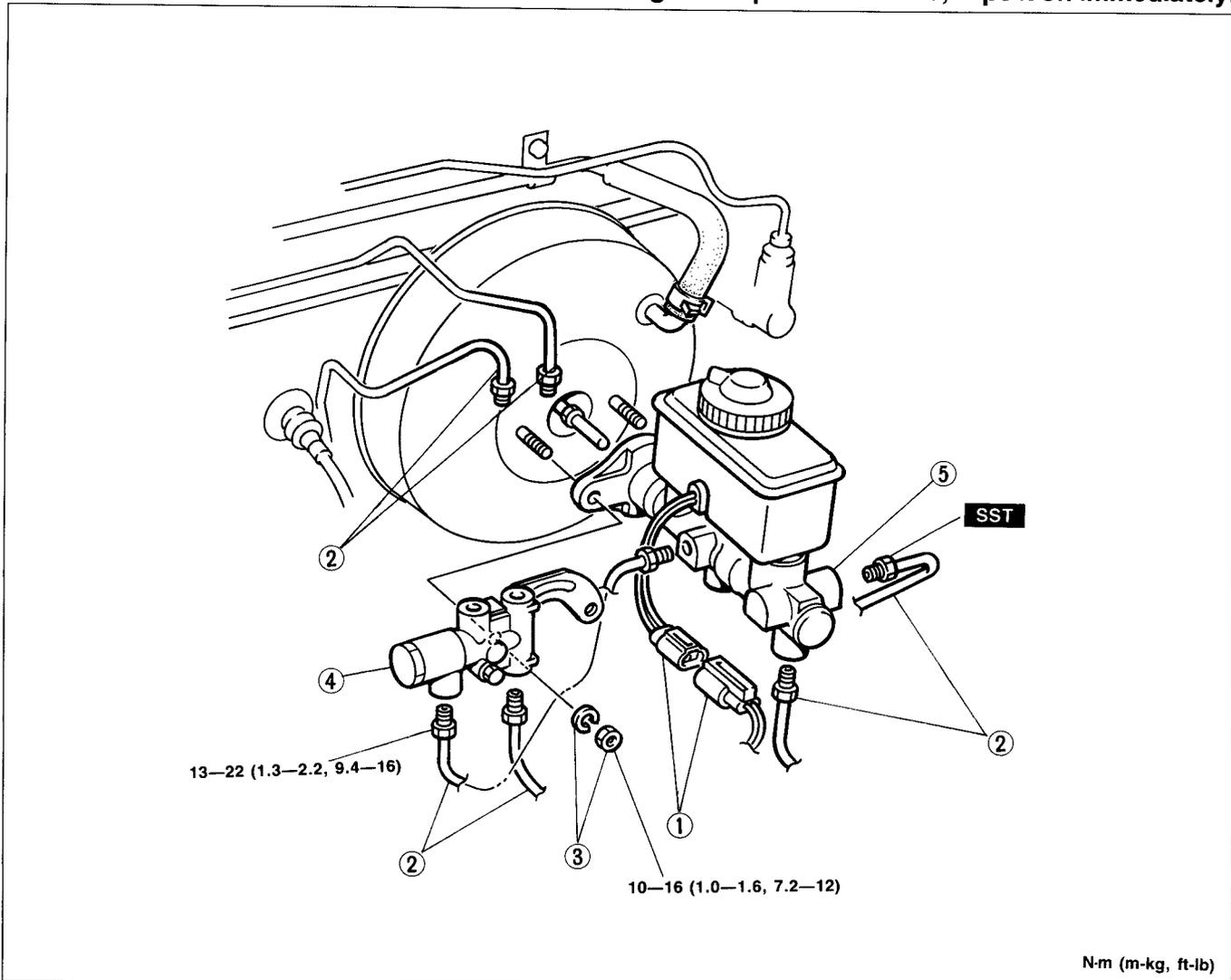
MASTER CYLINDER (NON-TURBO)

Removal and Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.
3. After installation, add brake fluid, bleed air, and check for fluid leakage.

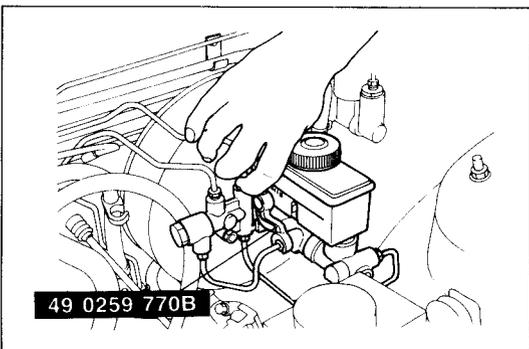
Caution

Brake fluid will damage painted surfaces. If it does get on a painted surface, wipe it off immediately.



9MU0PX-018

- | | |
|---------------------------------|---|
| 1. Fluid level sensor connector | 4. Proportioning bypass valve (PBV) and bracket |
| 2. Brake pipes | 5. Master cylinder assembly |
| Removal..... page P-13 | Disassembly, Inspection |
| 3. Nut and washer | and Assembly..... page P-15 |



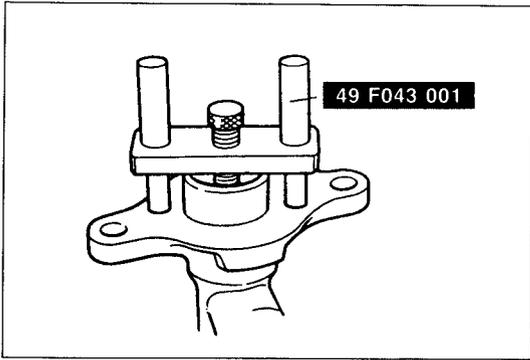
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Removal note

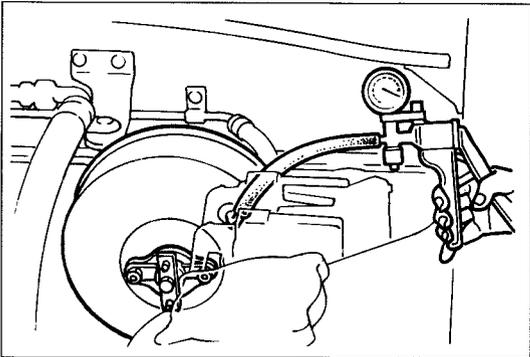
Brake pipe

Disconnect/connect the brake pipe from/to the master cylinder with the **SST**.

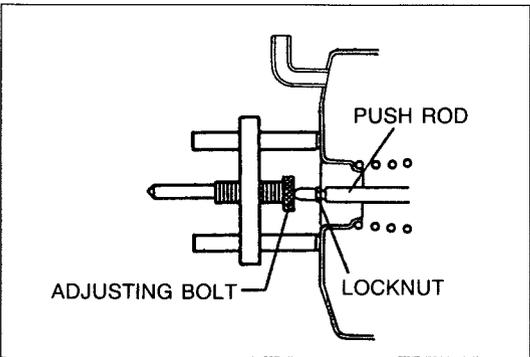
P CONVENTIONAL BRAKE SYSTEM



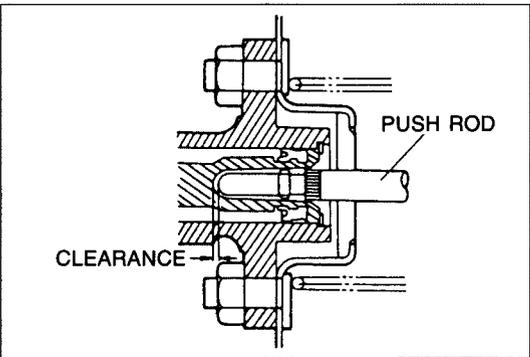
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9MU0PX-022



9MU0PX-023



9MU0PX-024

Installation note

Push rod clearance

Check the clearance between the push rod of the power brake unit and the piston of the master cylinder.

1. Place the **SST** a top the master cylinder. Turn the adjustment bolt until it bottoms in the push rod hole in the piston.
2. Apply **500 mmHg (19.7 inHg)** vacuum to the power brake unit with a vacuum pump.
3. Invert the adjustment gauge used in Step 1, and place it on the power brake unit.
4. Check the clearance between the end of the adjustment bolt and the push rod of the power brake unit. If it is not **0mm (0 in)**, loosen the push rod locknut and turn the push rod to make the adjustment.

Reference

By making the above adjustment, the clearance between the push rod and piston (after installation of the brake master cylinder and the power brake unit) will be as shown in the table below.

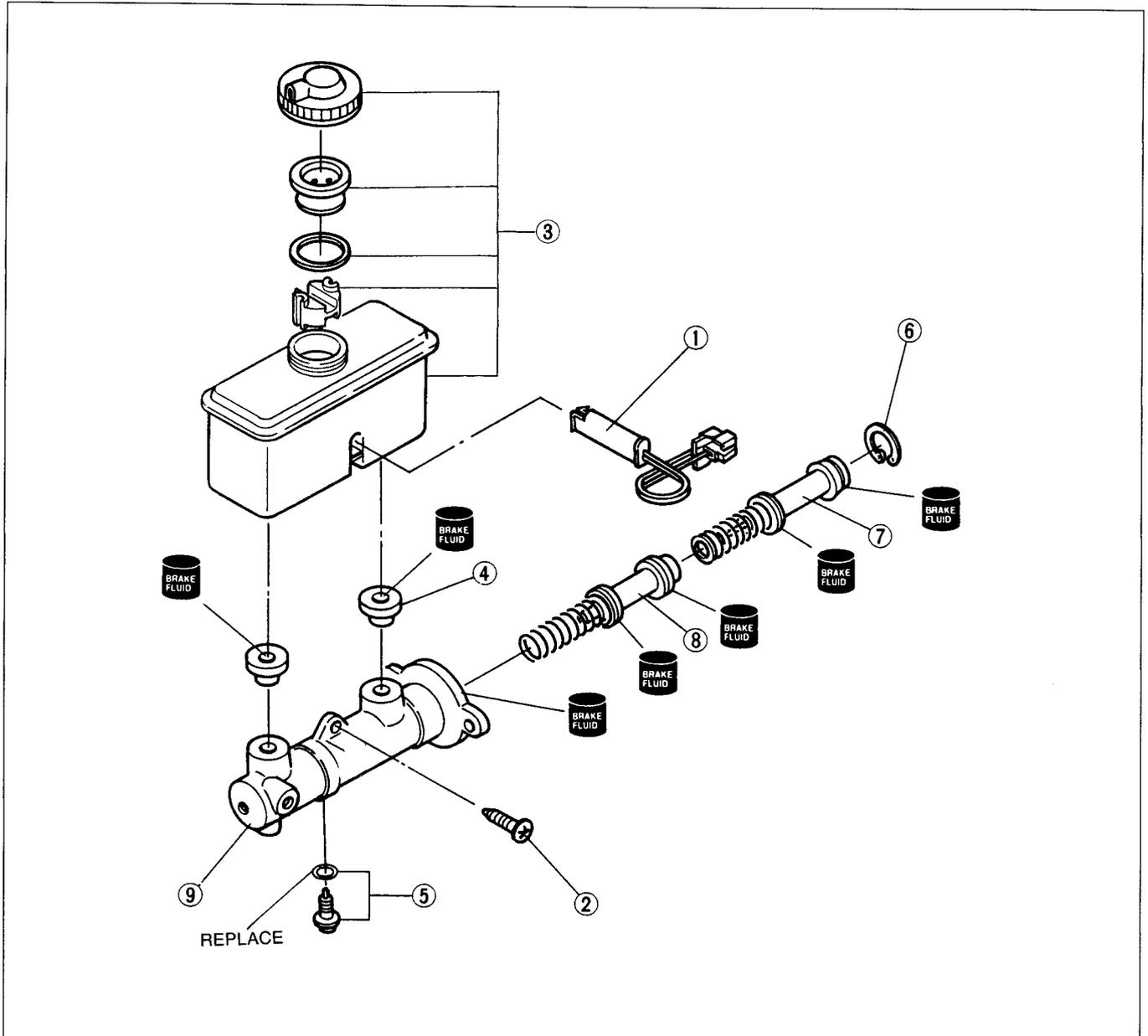
	Push rod-to-piston clearance
When vacuum applied to unit is approx. 500 mmHg (19.7 inHg)	0.1—0.3mm (0.004—0.012 in)

Disassembly, Inspection and Assembly

1. After removing the brake fluid, disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

Caution

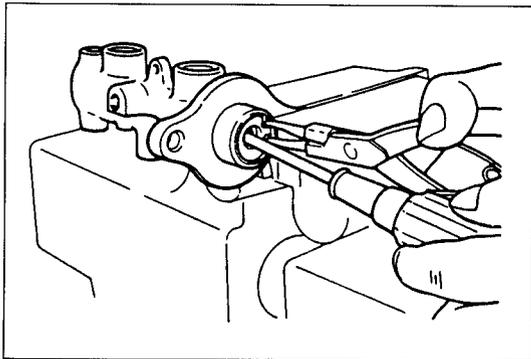
- a) **Secure the master cylinder flange in a vise when necessary.**
- b) **Replace the piston assembly, if necessary.**
- c) **Do not let foreign material enter the cylinder, and do not scratch the inside of the cylinder or the outer surface of the piston.**



97U0PX-019

- | | |
|-----------------------------------|------------------------------|
| 1. Fluid level sensor | 6. Snap ring |
| 2. Screw | Disassembly page P-16 |
| 3. Reserve tank assembly | 7. Primary piston assembly |
| Inspect for damage or deformation | Inspect for damage |
| 4. Bushing | 8. Secondary piston assembly |
| Inspect for damage | Inspect for damage |
| 5. Stopper screw and O-ring | Disassembly page P-16 |
| Assembly page P-16 | 9. Master cylinder body |
| | Inspect for damage |

P CONVENTIONAL BRAKE SYSTEM

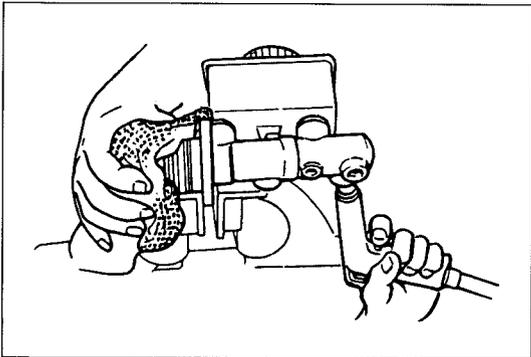


9MU0PX-027

Disassembly note

Snap ring

Push the piston in to remove or install the snap ring with snap-ring pliers.



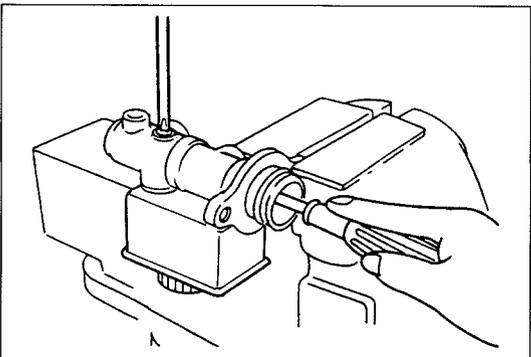
9MU0PX-028

Secondary piston assembly

Remove the secondary piston assembly by gradually blowing compressed air into the cylinder.

Caution

Use a rag to catch the secondary piston assembly.



9MU0PX-029

Assembly note

Stopper screw

1. Push the primary piston assembly in fully.
2. Install and tighten the stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.

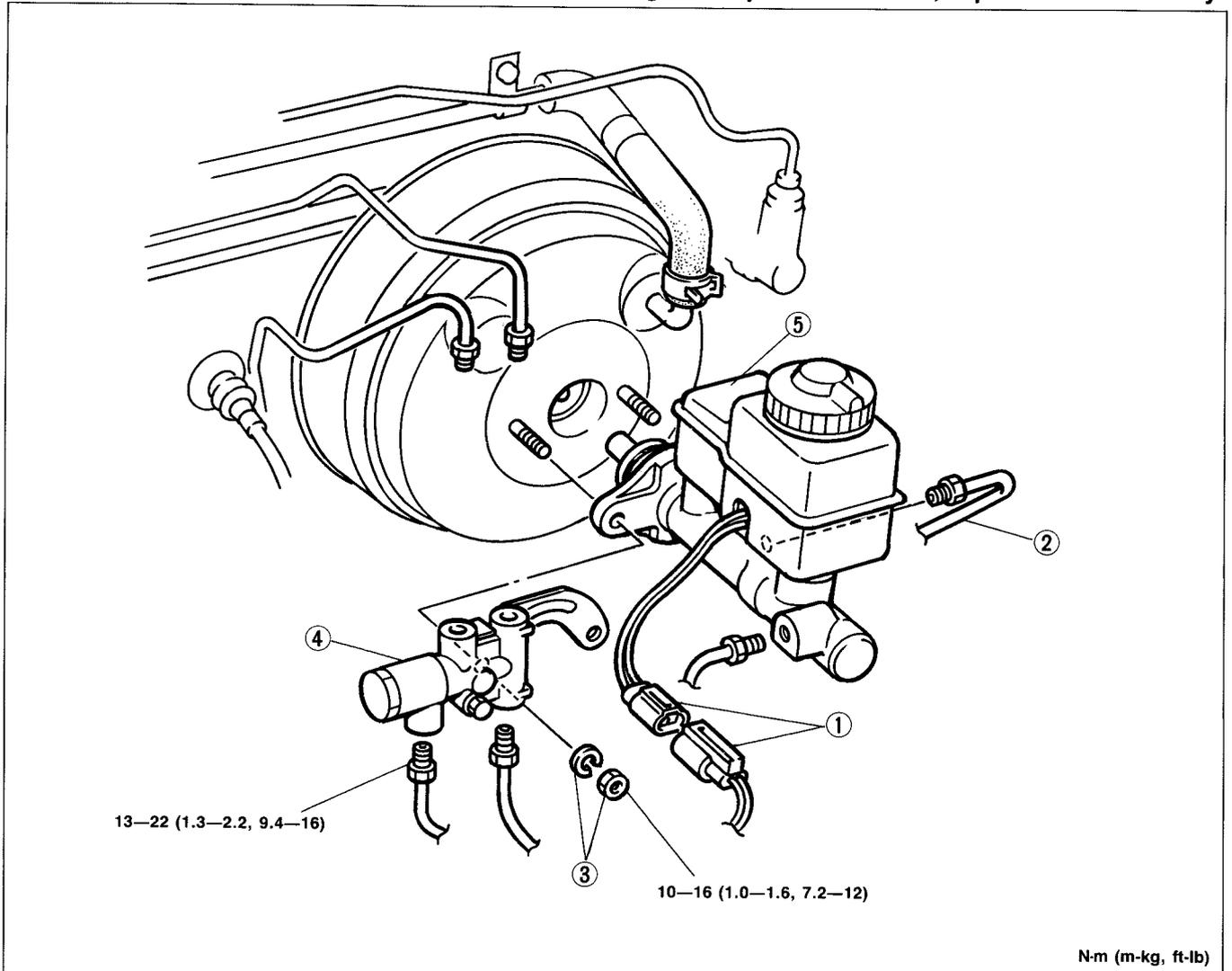
MASTER CYLINDER (TURBO)

Removal and Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.
3. After installation, add brake fluid, bleed air, and check for fluid leakage.

Caution

Brake fluid will damage painted surfaces. If it does get on a painted surface, wipe it off immediately.



97U0PX-020

1. Fluid level sensor connector

2. Brake pipes

Removal..... page P-17

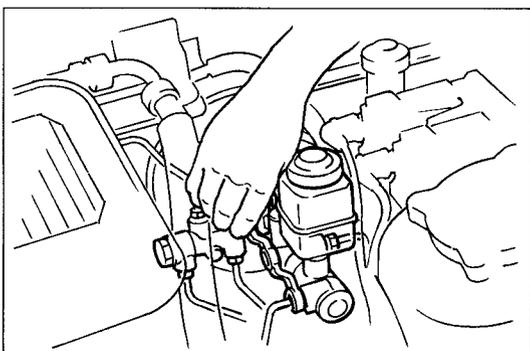
3. Nut and washer

4. Proportioning bypass valve (PBV) and bracket

5. Master cylinder

Disassembly, Inspection

and Assembly..... page P-21



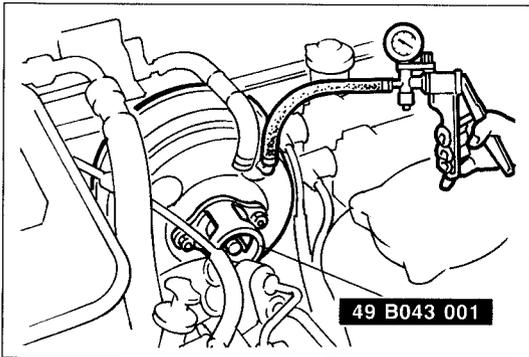
9MU0PX-020

Removal note

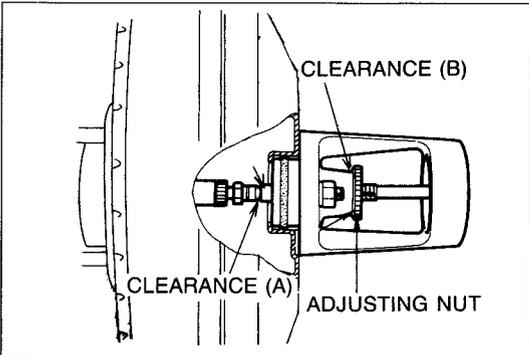
Brake pipe

Disconnect/connect the brake pipe from/to the master cylinder with the **SST**.

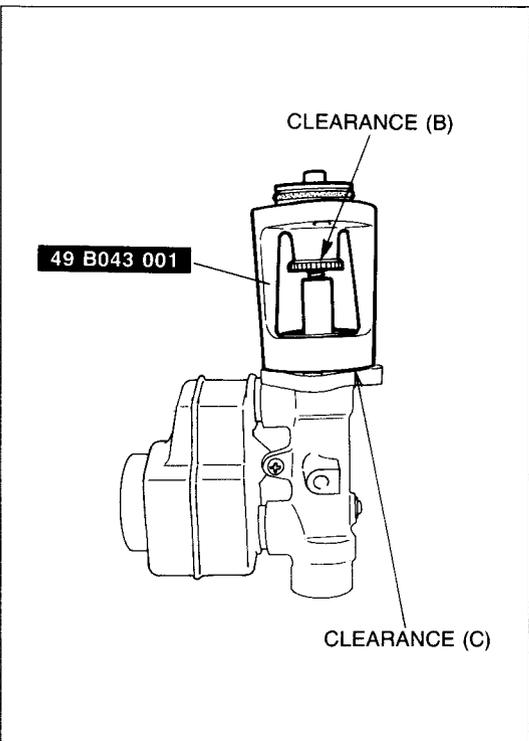
P CONVENTIONAL BRAKE SYSTEM



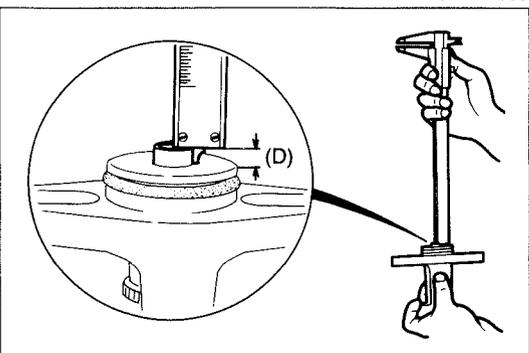
97U0PX-021



73A11X-016



73A11X-008



73A11X-017

Installation note

Push rod clearance

Inspection

Inspect the push rod clearance in the following order.

1. Attach the **SST** to the power brake unit.

Tightening torque:

10—16 N·m (1.0—1.6 m·kg, 7.2—12 ft·lb)

2. Apply a vacuum of **500 mmHg (19.7 inHg)** using a vacuum pump.

3. Set clearance (A) between the push rod end of power brake unit and the push rod end of the **SST** and clearance (B) between the adjust nut and the **SST** body to 0mm (0 in) by turning the adjust nut.

4. Remove the **SST** from the power brake unit keeping the clearance as above. Install the **SST** to the master cylinder body as shown in the figure.

5. Measure clearance (C) between the **SST** and the master cylinder, and then measure clearance (B) between the adjust nut and the **SST** body.

Judgement Table

	Measurement	Necessity of adjustment
(a)	Clearance at (C)	Yes
(b)	Clearance at (B)	Yes
	Both clearances of (C) and (B) are 0mm (0 in)	No

(a) is when the push rod of the power brake unit extends.

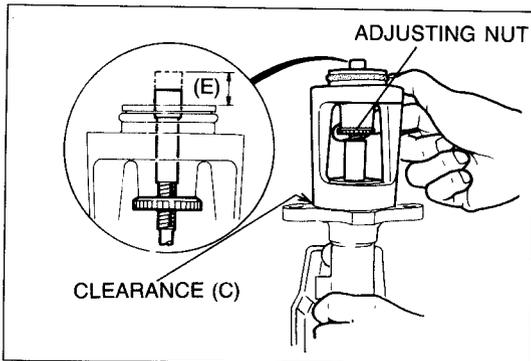
(b) is when the push rod of the power brake unit is recessed.

Adjustment

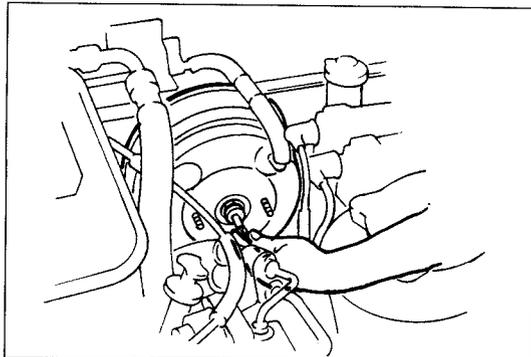
Adjust the push rod clearance in the following order.

1. For (a) of judgement table:

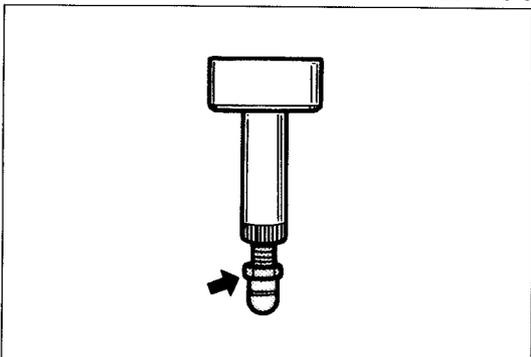
- (1) Measure the height of (D) and record after removing the **SST** from the master cylinder.



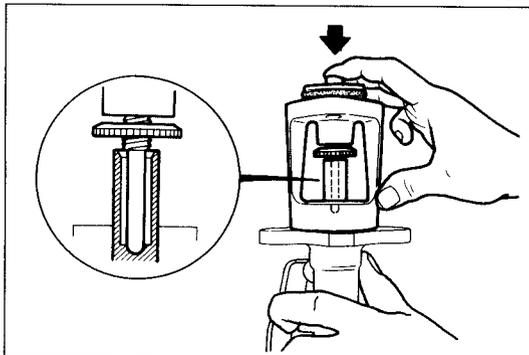
73A11X-018



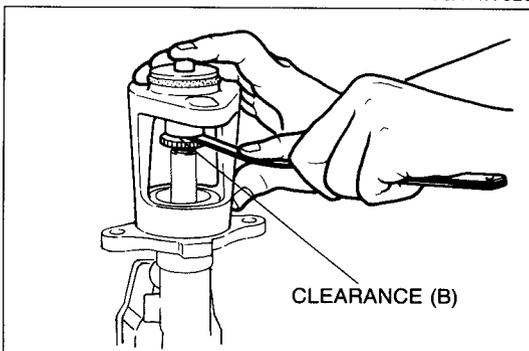
63G11X-349



73A11X-019



73A11X-020



73A11X-021

- (2) Install the **SST** again to the master cylinder, and turn the adjust nut so that clearance (C) between the **SST** and the master cylinder is 0mm (0 in).
- (3) Measure the height of (E) when clearance (C) is 0mm (0 in).

(E) — (D) = Projecting amount of the power brake unit push rod (push rod clearance).

- (4) Remove the push rod from the power brake unit.

- (5) Make the push rod clearance 0mm (0 in) by turning the nut shown in the figure and shortening the push rod length by the amount of (E) — (D).

Note

The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point to prevent loosening of the bolt. Turn the bolt only within this range when adjusting.

2. For (b) of the judgement table:

- (1) Push the push rod of **SST** lightly by hand until the push rod end touches the bottom of the primary piston in the master cylinder.

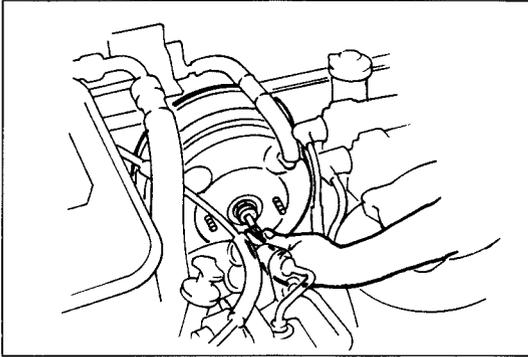
Caution

When pushing only use enough pressure to contact the rod in the piston. If too much pressure is applied a false reading will occur.

- (2) Measure clearance (B) between the adjust nut and the **SST** body with the rod held down.

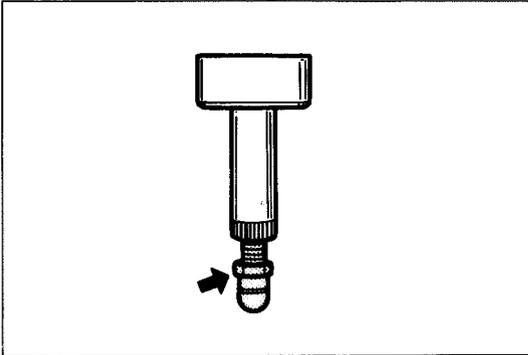
(B) = Recessed amount of the power brake unit push rod (push rod clearance).

P CONVENTIONAL BRAKE SYSTEM



63G11X-353

(3) Remove the push rod from the power brake unit.



73A11X-022

(4) Make the push rod clearance 0 mm (0in) by turning the nut shown in the figure and lengthening the push rod length by the amount of (B).

Note

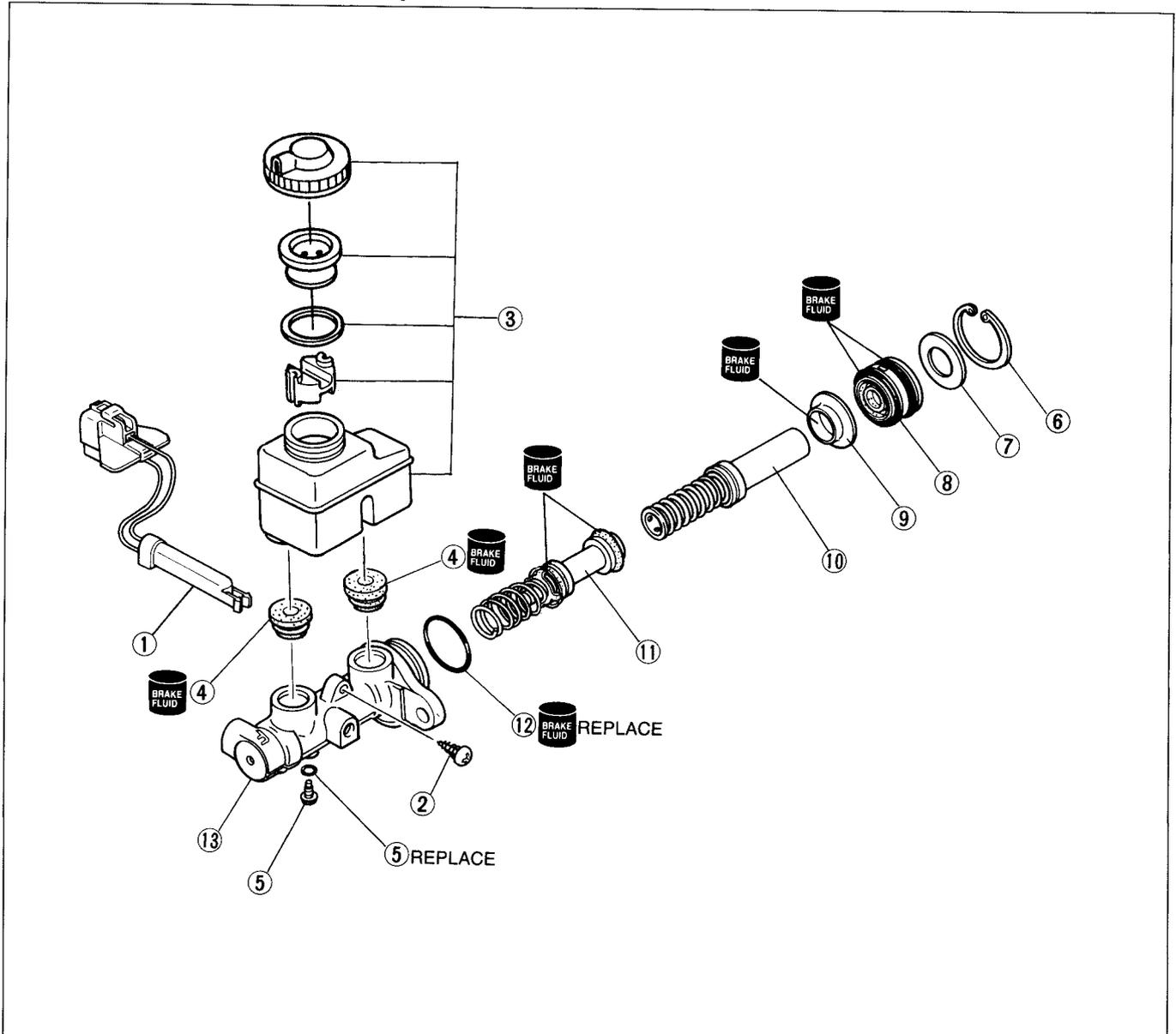
The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point to prevent loosening of the bolt. Turn the bolt only within this range when adjusting.

Disassembly, Inspection and Assembly

1. After removing the brake fluid, disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Assemble in the reverse order of removal, referring to **Assembly Note**.

Caution

- a) Secure the master cylinder flange in a vise when necessary.
- b) Replace the piston assembly, if necessary.
- c) Do not let foreign material enter the cylinder, and do not scratch the inside of the cylinder or the outer surface of the piston.

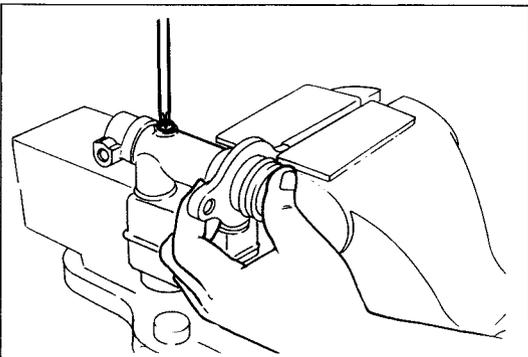


97U0PX-022

P CONVENTIONAL BRAKE SYSTEM

1. Fluid level sensor
2. Screw
3. Reserve tank assembly
Inspect for damage or deformation
4. Bushing
Inspect for damage
5. Stopper screw and O-ring
Disassembly page P-22
Assembly page P-23
6. Snap ring
Disassembly page P-22
7. Spacer
8. Piston guide assembly
Assembly page P-23
9. Stopper
10. Primary piston assembly
Inspect for damage
11. Secondary piston assembly
Disassembly page P-22
Inspect for damage
12. O-ring
13. Master cylinder
Inspect for damage or cracks

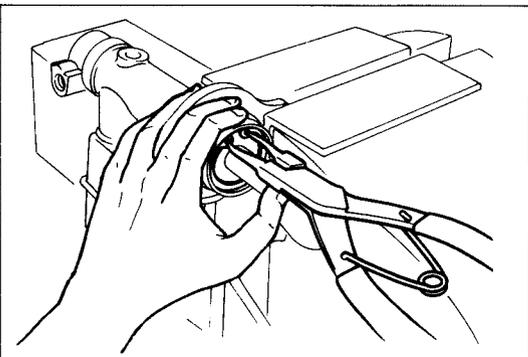
97U0PX-023



76G11X-015

Disassembly note Stopper screw

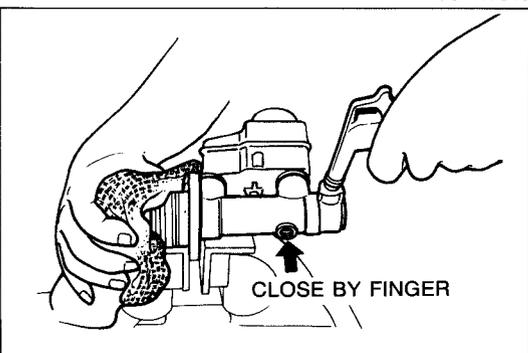
Push the piston in by hand and remove the stopper screw.



76G11X-016

Snap ring

Push the piston in fully with a rod and remove the snap ring using snap ring pliers.



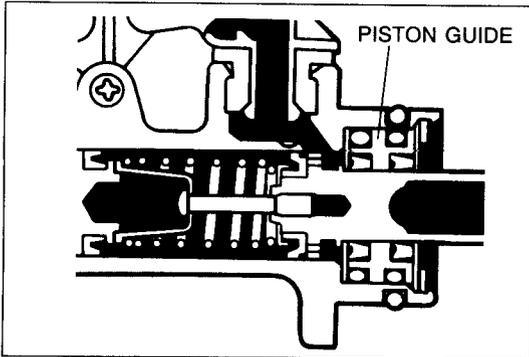
76G11X-017

Secondary piston assembly

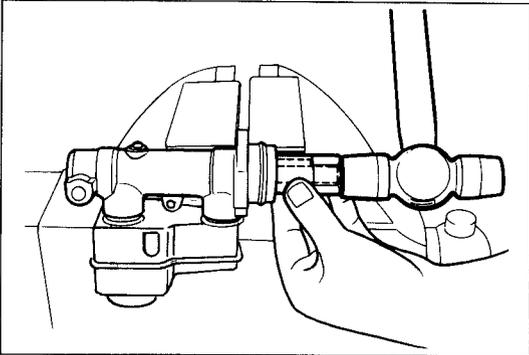
Remove the secondary piston assembly by gradually blowing compressed air into the cylinder.

Caution

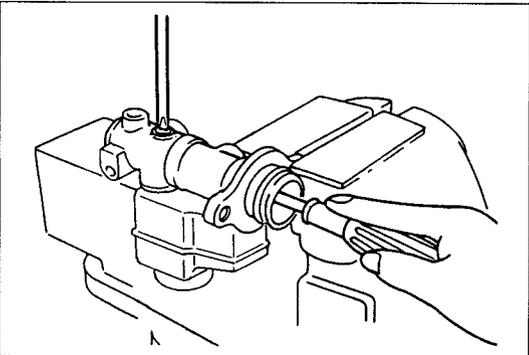
Use a rag to catch the secondary piston assembly when applying compressed air.



97U0PX-024



76G11X-022



97U0PX-025

Assembly note

Piston guide assembly

Insert the piston guide and primary piston assembly into the cylinder slowly and straight; then fit them in the position in the cylinder.

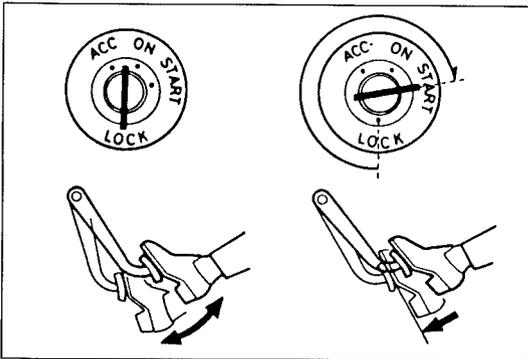
Note

If the piston guide is not easily installed in the cylinder, use a suitable pipe and tap it to install.

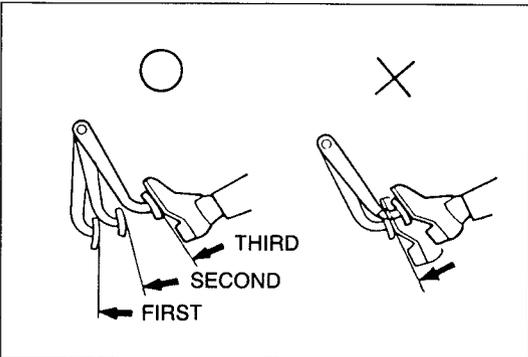
Stopper screw

1. Push the primary piston assembly in fully.
2. Install and tighten the stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.

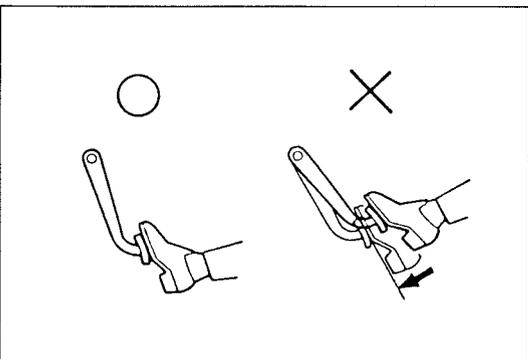
P CONVENTIONAL BRAKE SYSTEM



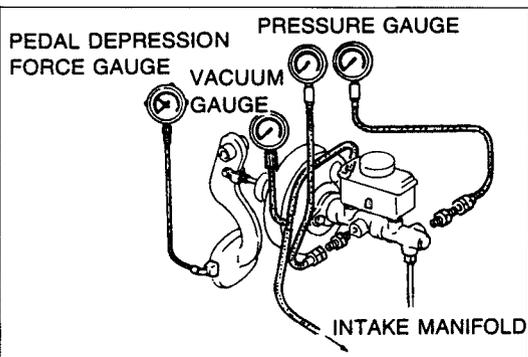
97U0PX-026



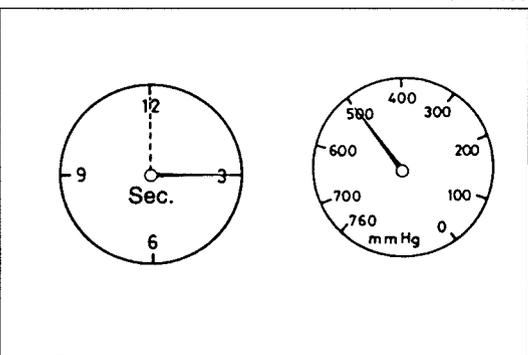
9MU0PX-031



9MU0PX-032



9MU0PX-033



9MU0PX-034

POWER BRAKE UNIT (NON-TURBO)

On-vehicle Inspection

Power brake unit function check (Simple method)

Step 1

1. With the engine stopped, depress the pedal a few times.
2. With the pedal depressed, start the engine.
3. If immediately after the engine starts the pedal moves down slightly, the unit is operating.

Step 2

1. Start the engine.
2. Stop the engine after it has run for **1 or 2 minutes**.
3. Depress the pedal with the usual force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.
5. If a problem is found, inspect for damage of the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it once again.

Step 3

1. Start the engine.
2. Depress the pedal with the usual force.
3. Stop the engine with the pedal held depressed.
4. Hold the pedal down for **about 30 seconds**.
5. If the pedal height does not change, the unit is operating.
6. If there is a problem, check for damage to the check valve or vacuum hose, and check the connection. Repair if necessary, and check once again.

If the nature of the problem is still not clear after following the 3 steps above, follow the more detailed check described in "Method-using tester," below.

(Method-using tester)

Connect a pressure gauge, vacuum gauge, and pedal depression force gauge as shown in the figure. After bleeding the air from the pressure gauge, conduct the test as described in the 3 steps below.

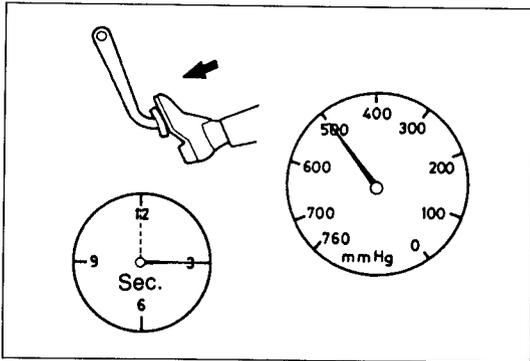
Note

Use commercially available gauges and pedal depression force gauge.

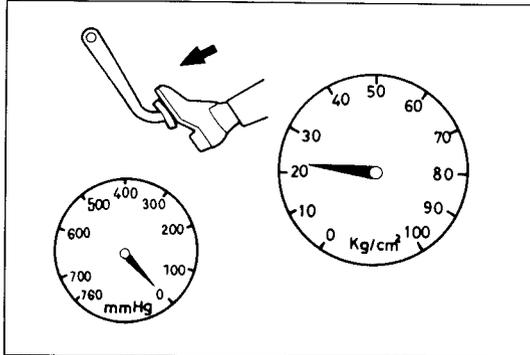
a) Checking for vacuum loss

Unloaded condition

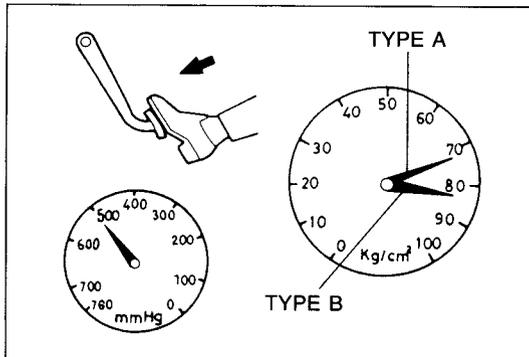
1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
3. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.



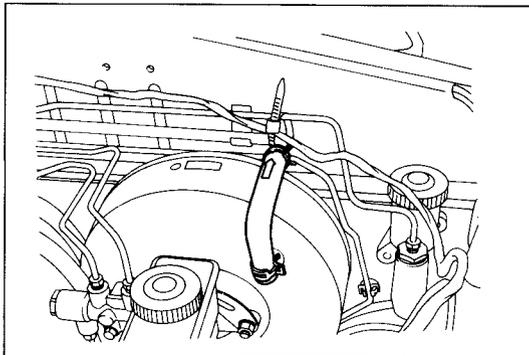
9MU0PX-035



97U0PX-027



97U0PX-028



9MU0PX-038

Loaded condition

1. Start the engine.
2. Depress the brake pedal with a force of **196 N (20 kg, 44 lb)**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
4. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.

b) Checking for hydraulic pressure

1. If with the engine stopped (vacuum **0 mmHg**) the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure
196 N (20 kg, 44 lb)	2,158 kPa (22 kg/cm ² , 312 psi)

2. Start the engine. Depress the brake pedal when the vacuum reaches **500 mmHg (19.7 inHg)**. If the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure
196 N (20 kg, 44 lb)	7,063 kPa (72 kg/cm ² , 1,024 psi) min... *Type A 8,339 kPa (85 kg/cm ² , 1,209 psi) min... *Type B

*Type A: Standard suspension models

*Type B: Sporty suspension, Auto Adjusting Suspension (AAS), or convertible top models

Inspection of check valve

Note

The check valve is pressed into the vacuum hose. There is an arrow on the hose to indicate direction of hose installation.

Inspection

1. Disconnect the vacuum hose from the engine.
2. Apply suction and pressure to the hose from the engine side. Check that air flows only toward the engine. If the air passes in both directions or not at all, replace the check valve (along with the hose).

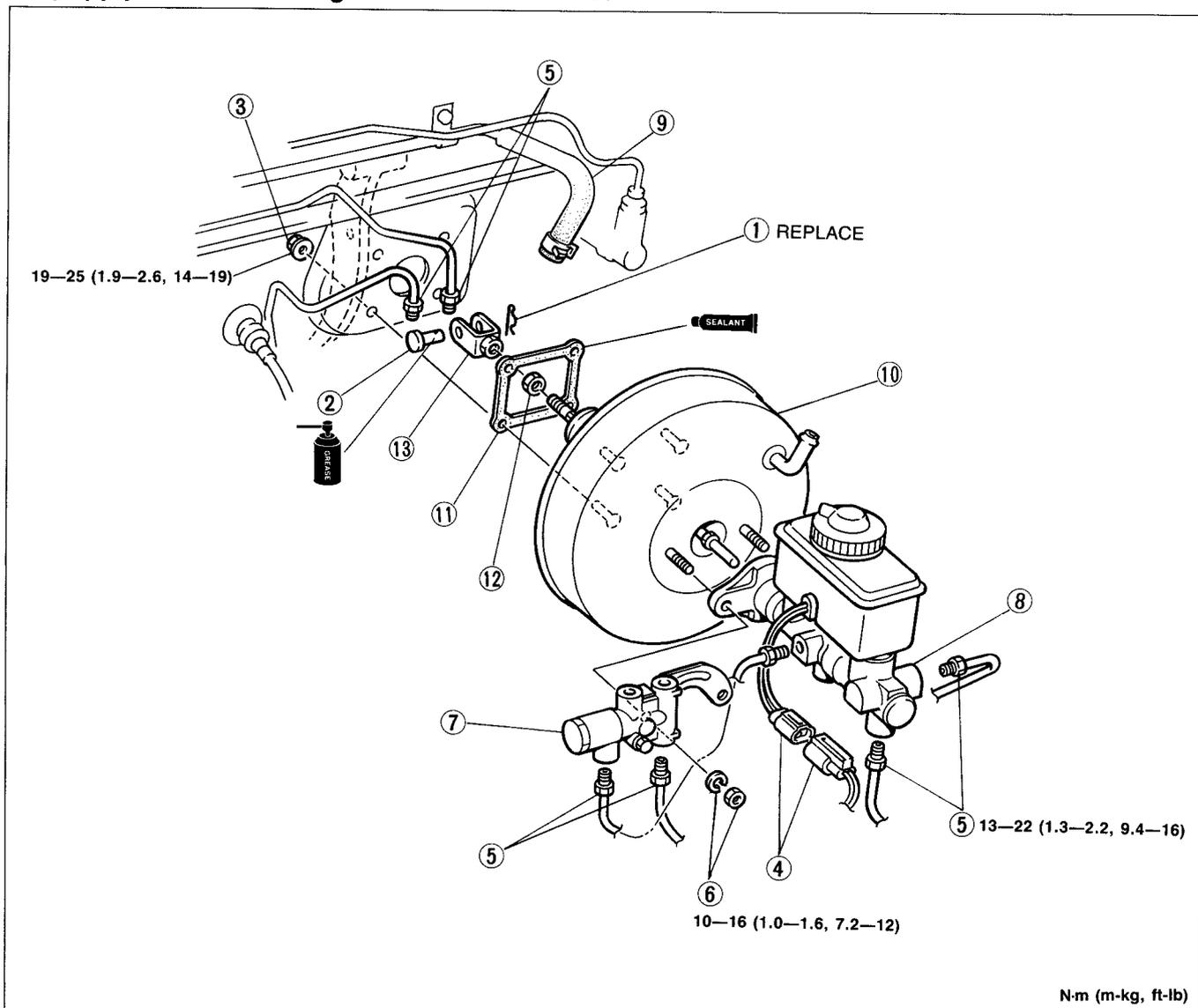
P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Take the following steps after installation:
 - (1) Check and adjust the push rod and piston clearance. (Refer to page P-14.)
 - (2) Add fluid and bleed the air. (Refer to page P-8.)
 - (3) Check all parts for fluid leakage.
 - (4) Make an on-vehicle check of the unit. (Refer to page P-24.)
 - (5) Check that the vacuum hose does not contact other parts.

Caution

- a) Apply grease to the clevis pin.
- b) Apply sealant to the gasket contact surface.



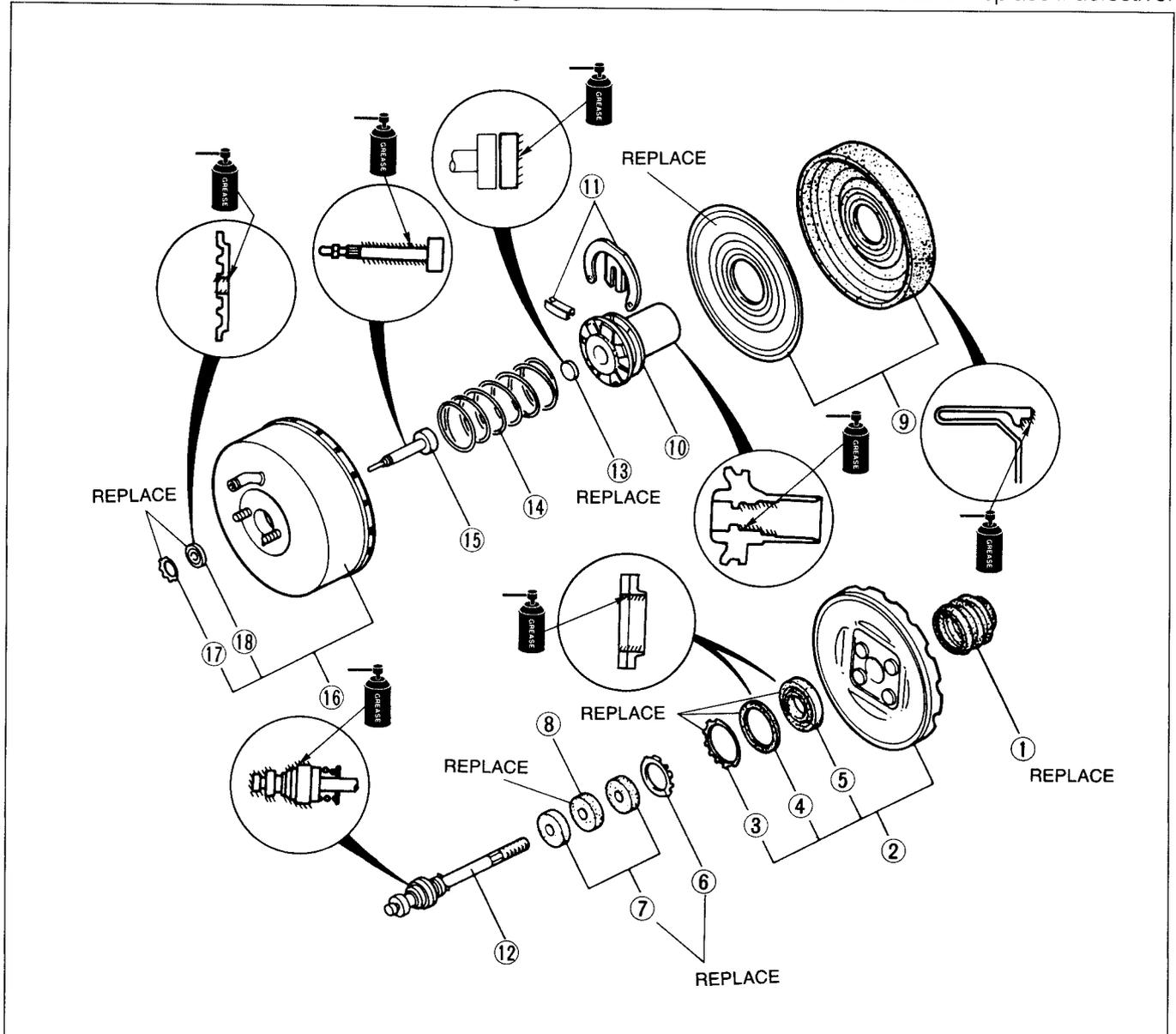
N-m (m-kg, ft-lb)

97U0PX-029

- | | |
|---|---|
| 1. Cotter pin | 9. Vacuum hose |
| 2. Clevis pin | 10. Power brake unit |
| 3. Nut | On-vehicle inspection page P-24 |
| 4. Fluid level sensor coupler | Disassembly and Inspection..... page P-27 |
| 5. Brake pipes | Assembly page P-28 |
| Removal..... page P-13 | 11. Gasket |
| 6. Nut and washer | 12. Nut |
| 7. Proportioning bypass valve and bracket | 13. Operating lever |
| 8. Master cylinder | |

Disassembly, and Inspection

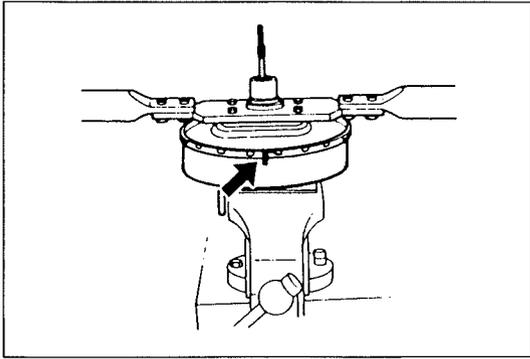
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Wipe free of fluid and carefully inspect all rubber parts for cuts, nicks, or other damage.
3. Inspect all components and parts. Replace parts if necessary.
4. Make sure the seats of the valve rod and plunger are smooth and free of nicks and scars. Replace if defective.



97U0PX-030

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Dust boot 2. Rear shell assembly
Disassembly page P-28
Inspect for scratches, scores, pits, dents, or other damage 3. Retainer 4. Bearing 5. Dust seal 6. Retainer 7. Air filter 8. Air silencer 9. Diaphragm and plate
Inspect for cuts or other damage | <ol style="list-style-type: none"> 10. Power piston assembly
Inspect for cracks, distortion, chipping, or damaged seats 11. Retainer key
Disassembly page P-28 12. Valve rod and plunger assembly 13. Reaction disc
Inspect for deterioration 14. Spring 15. Push rod 16. Front shell assembly
Inspect for scratches, scores, pits, dents, or other damage 17. Retainer 18. Seal |
|---|---|

P CONVENTIONAL BRAKE SYSTEM



9MU0PX-041

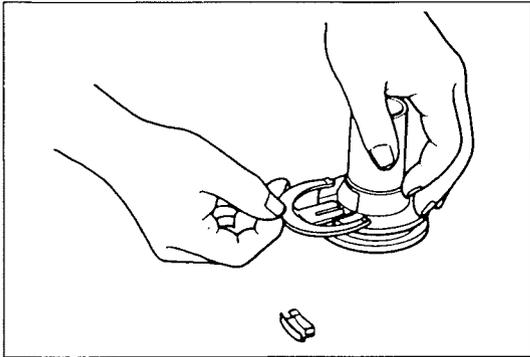
Disassembly note

Rear shell

1. Before separating the front and rear shells, make mating marks to be used in reassembly.
2. Fit a locally obtained spanner onto the studs of the rear shell, and rotate the rear shell counterclockwise to unlock it.

Caution

The rear shell is spring loaded; loosen it carefully.



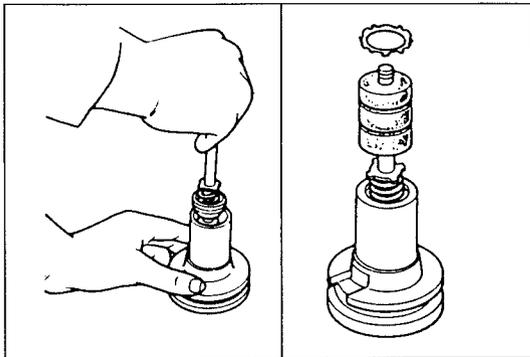
9MU0PX-042

Retainer key

Press the valve rod in to remove the valve retainer key. Remove the valve rod and plunger assembly.

Caution

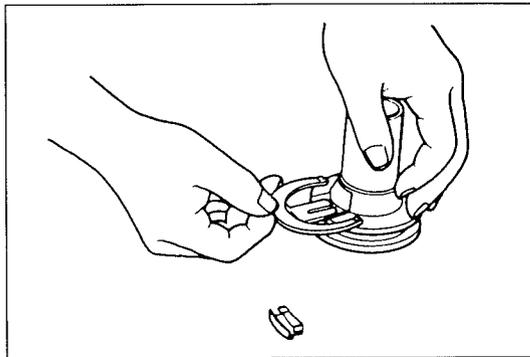
The valve rod and plunger must be serviced as an assembly.



9MU0PX-043

Assembly

1. Install the valve rod and plunger assembly.
2. Install the air filter and silencer.
3. Install the retainer.

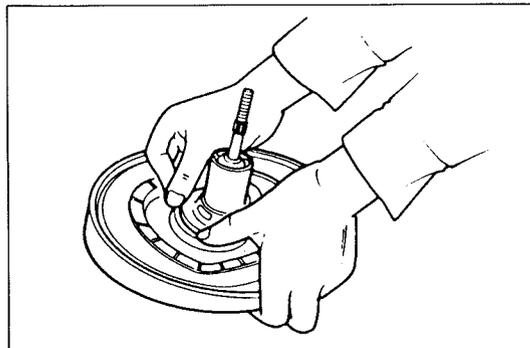


9MU0PX-044

4. Install the retainer key.

Caution

Push down the valve rod, align the groove in the valve plunger with the slot of the power piston, and insert the valve retainer key.

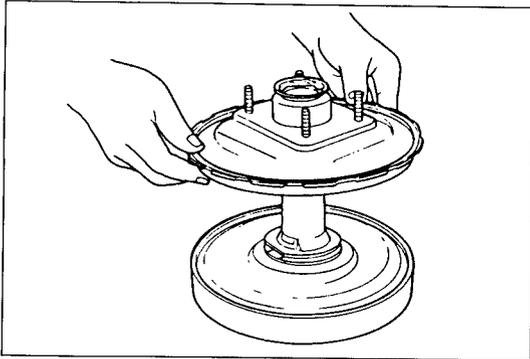


9MU0PX-045

5. Connect the diaphragm to the power piston and plate.

Caution

Make certain the diaphragm is well seated in the groove.

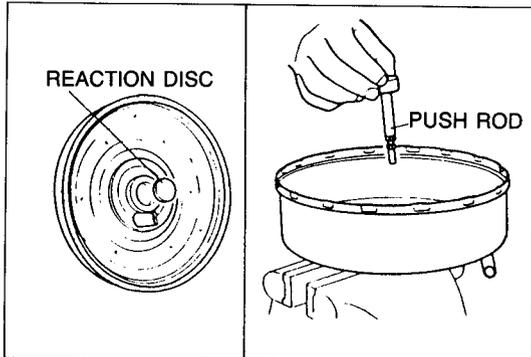


9MU0PX-046

6. Assemble the rear shell assembly.

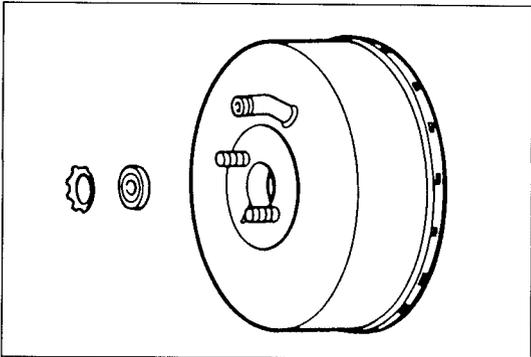
Caution

Carefully guide the tube end of the power piston through the seal in the rear shell.



9MU0PX-047

7. Push the reaction disc into the power piston with the push rod.

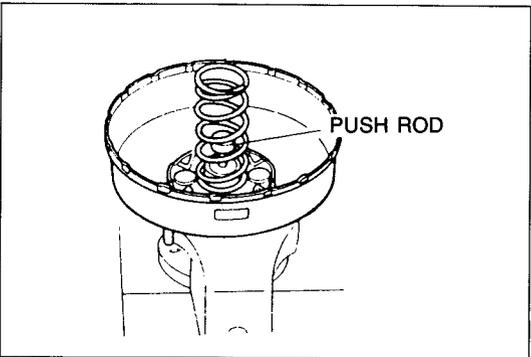


9MU0PX-048

8. Put the dust seal and retainer into the front shell.

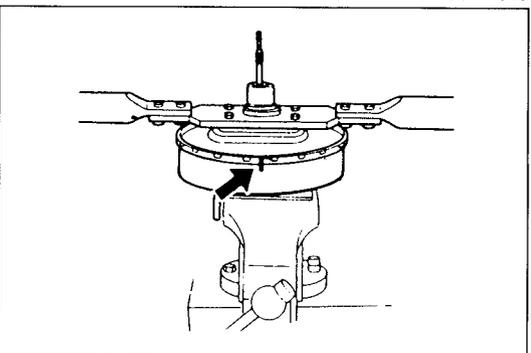
Caution

Place the front shell assembly in a vise to complete the following operations.



9MU0PX-049

9. Install the push rod.
10. Install the return spring.

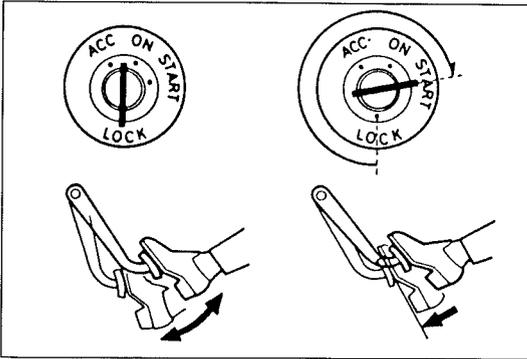


9MU0PX-050

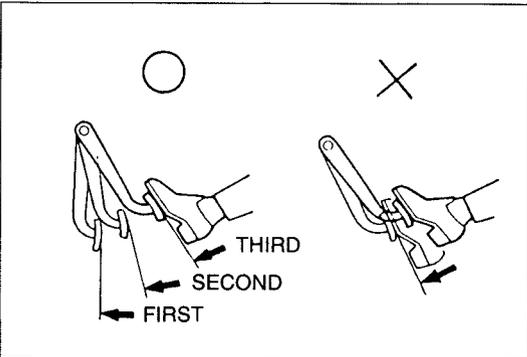
11. Press the rear shell down and rotate it clockwise until the matching marks are aligned.

12. Set the dust boot onto the rear shell.

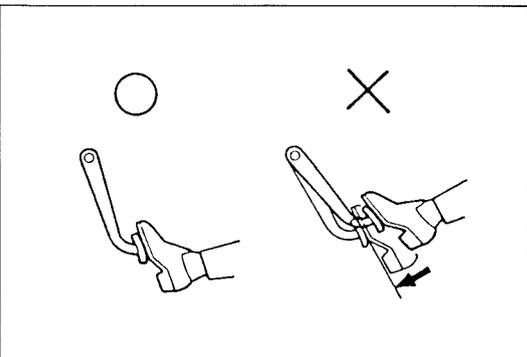
P CONVENTIONAL BRAKE SYSTEM



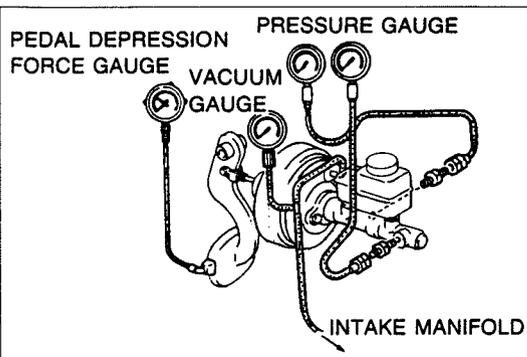
97U0PX-031



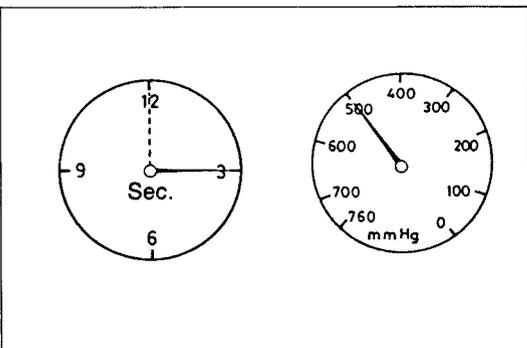
9MU0PX-031



9MU0PX-032



9MU0PX-033



9MU0PX-034

POWER BRAKE UNIT (TURBO)

On-vehicle Inspection

Power brake unit function check (Simple method)

Step 1

1. With the engine stopped, depress the pedal a few times.
2. With the pedal depressed, start the engine.
3. If immediately after the engine starts the pedal moves down slightly, the unit is operating.

Step 2

1. Start the engine.
2. Stop the engine after it has run for **1 or 2 minutes**.
3. Depress the pedal with the usual force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.
5. If a problem is found, inspect for damage of the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it once again.

Step 3

1. Start the engine.
2. Depress the pedal with the usual force.
3. Stop the engine with the pedal held depressed.
4. Hold the pedal down for **about 30 seconds**.
5. If the pedal height does not change, the unit is operating.
6. If there is a problem, check for damage to the check valve or vacuum hose, and check the connection. Repair if necessary, and check once again.

If the nature of the problem is still not clear after following the 3 steps above, follow the more detailed check described in "Method-using tester," below.

(Method-using tester)

Connect a pressure gauge, vacuum gauge, and pedal depression force gauge as shown in the figure. After bleeding the air from the pressure gauge, conduct the test as described in the 3 steps below.

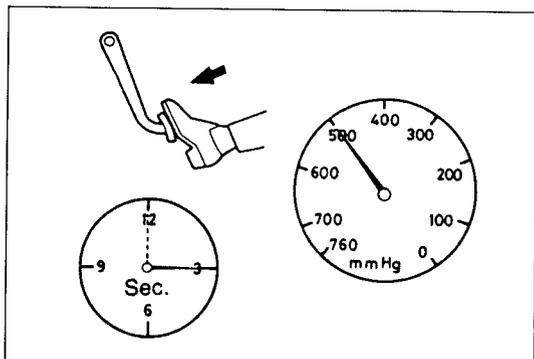
Note

Use commercially available gauges and pedal depression force gauge.

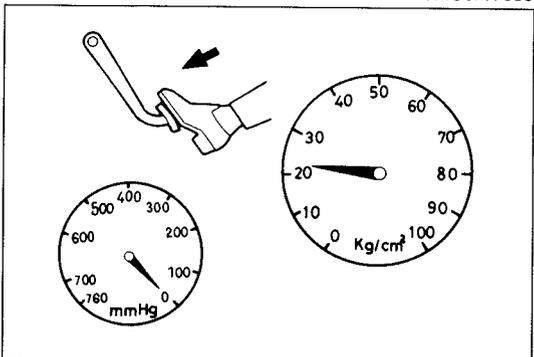
a) Checking for vacuum loss

Unloaded condition

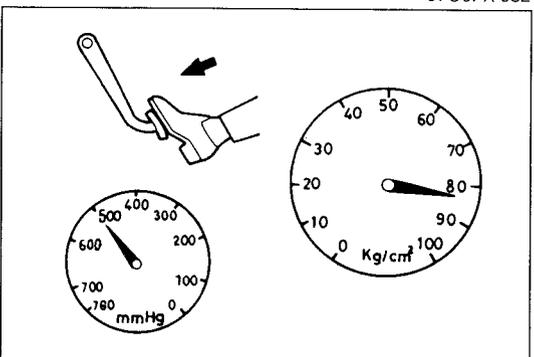
1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
3. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.



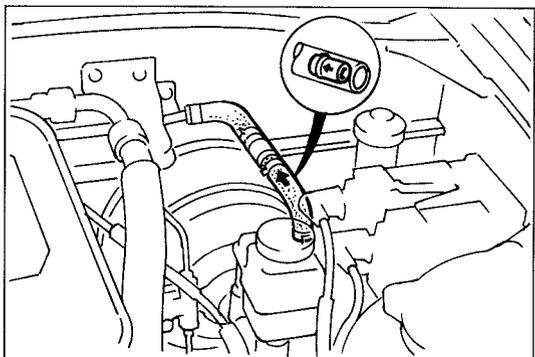
9MU0PX-035



97U0PX-032



97U0PX-033



9MU0PX-038

Loaded condition

1. Start the engine.
2. Depress the brake pedal with a force of **196 N (20 kg, 44 lb)**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
4. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.

b) Checking for hydraulic pressure

1. If with the engine stopped (vacuum **0 mmHg**) the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure
196 N (20 kg, 44 lb)	2,158 kPa (22 kg/cm ² , 312 psi)

2. Start the engine. Depress the brake pedal when the vacuum reaches **500 mmHg (19.7 inHg)**. If the fluid pressure is within specification, the unit is operating.

Pedal force	Fluid pressure
196 N (20 kg, 44 lb)	8,339 kPa (85 kg/cm ² , 1,209 psi)

Inspection of check valve

Note

The check valve is pressed into the vacuum hose. There is an arrow on the hose to indicate direction of hose installation.

Inspection

1. Disconnect the vacuum hose from the engine.
2. Apply suction and pressure to the hose from the engine side. Check that air flows only toward the engine. If the air passes in both directions or not at all, replace the check valve (along with the hose).

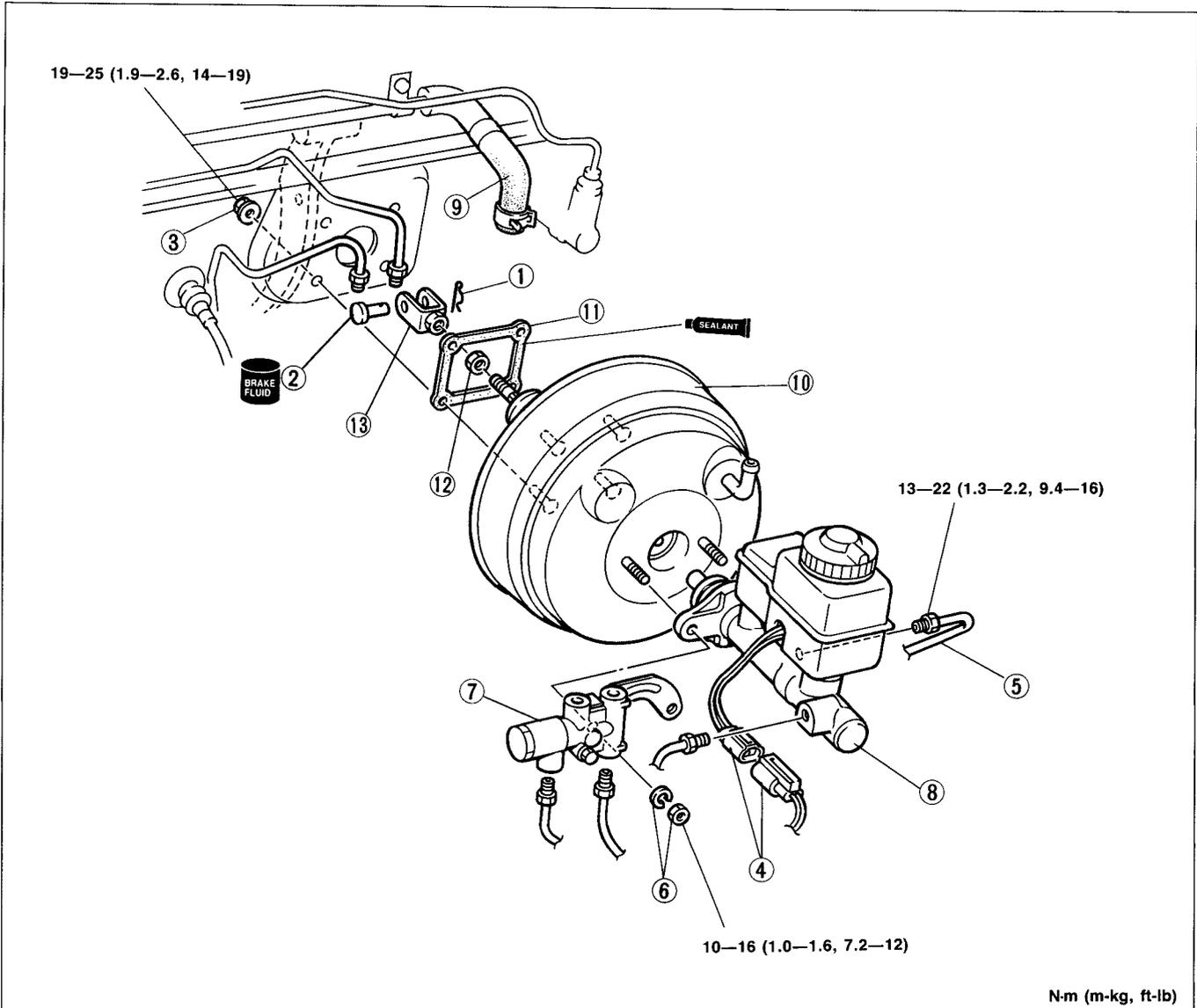
P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.
3. Take the following steps after installation:
 - (1) Check and adjust the push rod and piston clearance. (Refer to page P-18.)
 - (2) Add fluid and bleed the air. (Refer to page P-8.)
 - (3) Check all parts for fluid leakage.
 - (4) Make an on-vehicle check of the unit. (Refer to page P-30.)
 - (5) Check that the vacuum hose does not contact other parts.

Caution

- a) Apply grease to clevis pin.
- b) Apply sealant to the gasket contact surface.



N·m (m·kg, ft·lb)

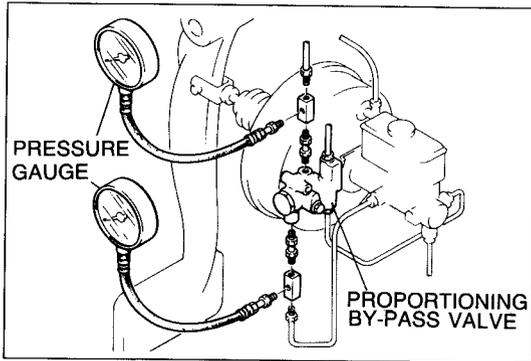
97U0PX-034

1. Clip
2. Clevis pin
3. Nut
4. Fluid level sensor connector
5. Brake pipe
Removal..... page P-17
6. Nut and washer
7. Proportioning bypass valve (PBV) and bracket
8. Master cylinder assembly

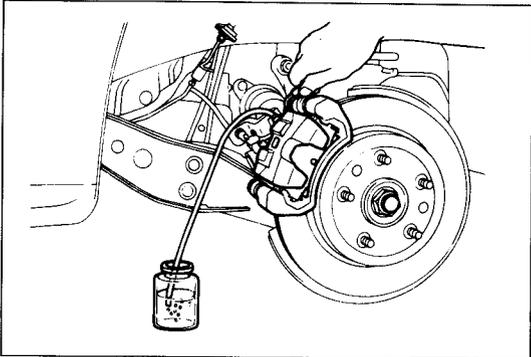
9. Vacuum hose
10. Power brake unit

Caution Do not disassemble

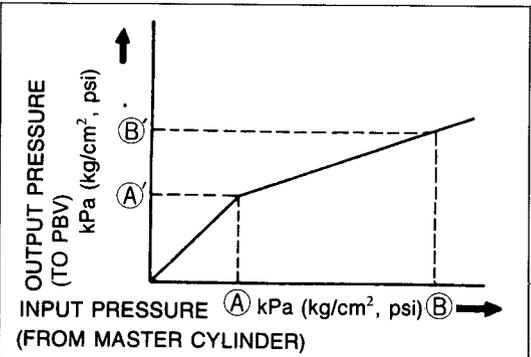
11. Gasket
12. Nut
13. Operating lever



97U0PX-035



97U0PX-036



97U0PX-037

PROPORTIONING VALVE BYPASS (PBV)

Function Check

1. Connect two pressure gauges (9,810 kPa [100 kg/cm², 1,422 psi]) to the brake pipes and adapters as shown in the figure.

Adapter and flare nut tightening torque:

13—22 N·m (1.3—2.2 m·kg, 9.4—16 ft·lb)

Note

Disconnect and connect the brake pipes with the SST (49 0259 770B).

2. Bleed air from the brake system. (Refer to page P-8.)

3. Depress the brake pedal until the master cylinder pressure equals A; then measure output pressure (rear brake pressure) A'.
4. Depress the brake pedal again, apply additional pressure until A reaches B; then measure pressure B'.

Specification

Fluid pressure		kPa (kg/cm ² , psi)	
A	A'	B	B'
2,943 (30,427)	2,600—3,286 (26.5—33.5, 377—476)	7,848 (80, 1,138)	5,05—5,739 (51.5—58.5, 732—832)

5. If the measurements are not within specification, replace the valve assembly.
6. Install the brake pipes to the valve, and bleed air from the brake system.

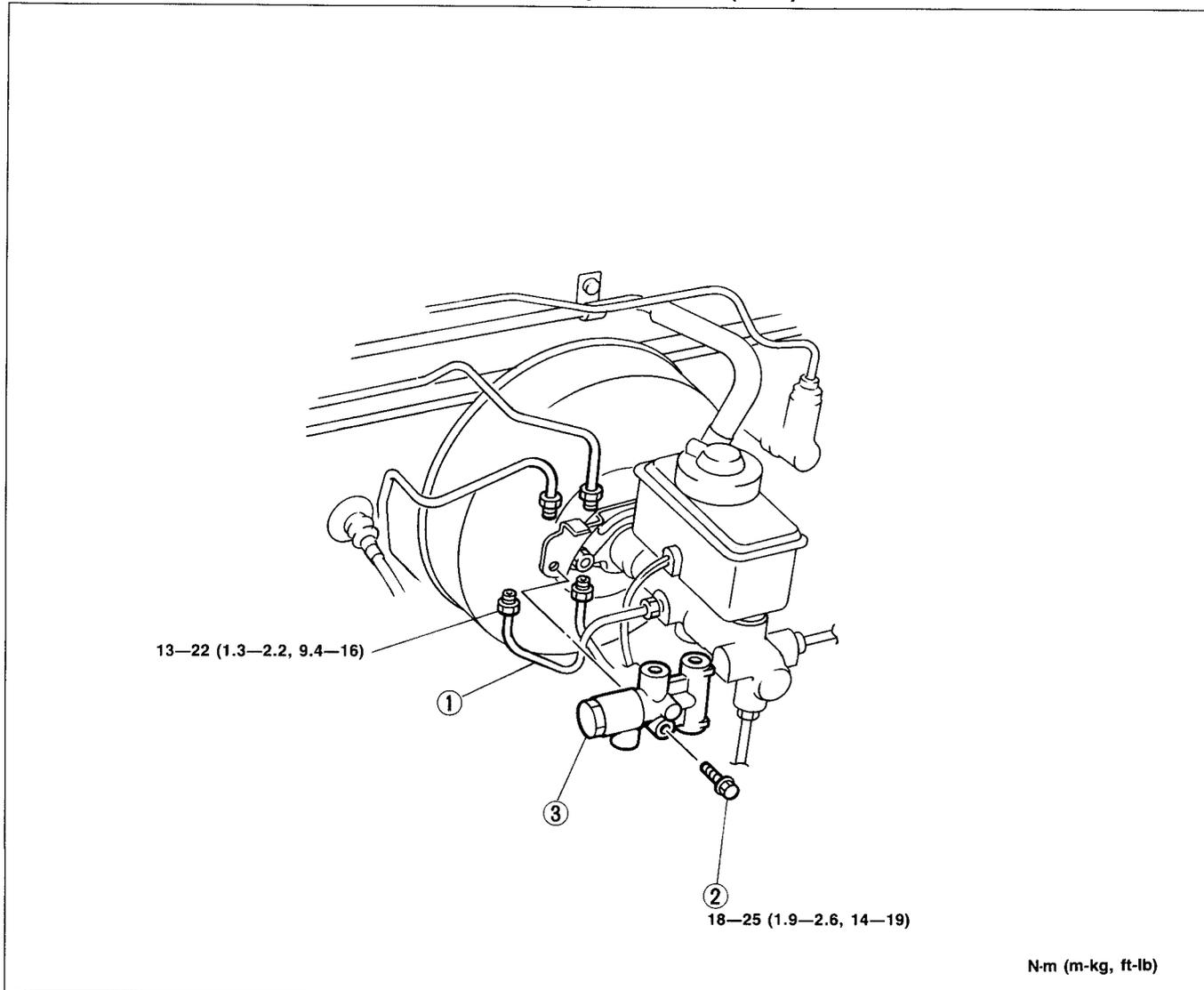
P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal.
3. After installation, add brake fluid, bleed air, and check for fluid leakage.

Caution

- a) Brake fluid will damage painted surfaces. If it does get on a painted surface, wipe it off immediately.
- b) Do not disassemble the proportioning bypass valve (PBV).



97U0PX-038

1. Brake pipes

Removal..... page P-34

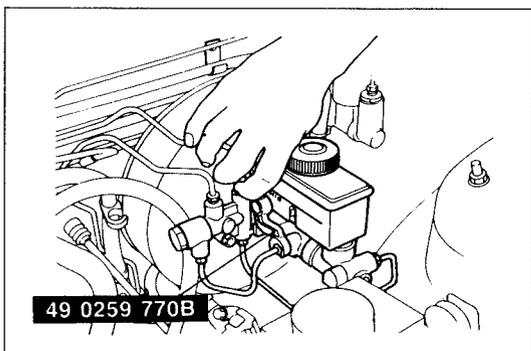
2. Bolt

3. Proportioning bypass valve (PBV)

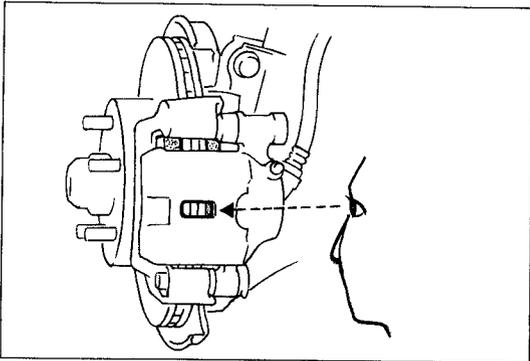
Removal note

Brake pipe

Disconnect/connect the brake pipe from/to the valve with the SST.



97U0PX-039



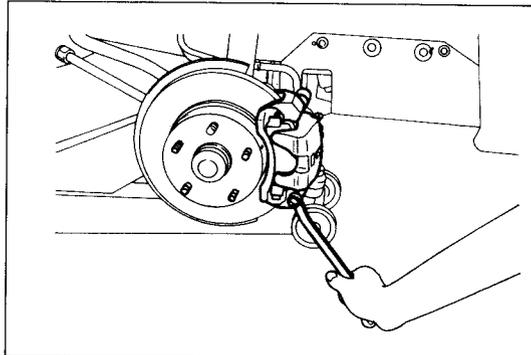
97U0PX-040

FRONT DISC BRAKE (SINGLE PISTON CALIPER)

On-vehicle Inspection

Disc pad

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Sight through the caliper inspection hole and see if the remaining thickness of the pad is at least **2.0mm (0.08 in)**.



9MU0PX-066

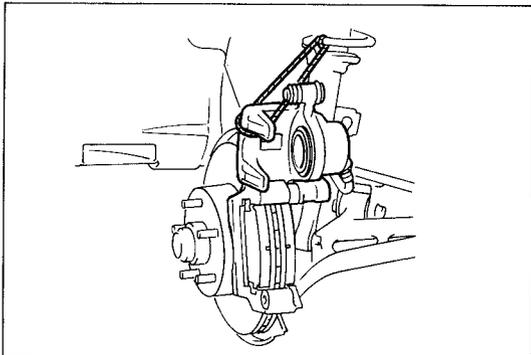
Replacement

Disc pad

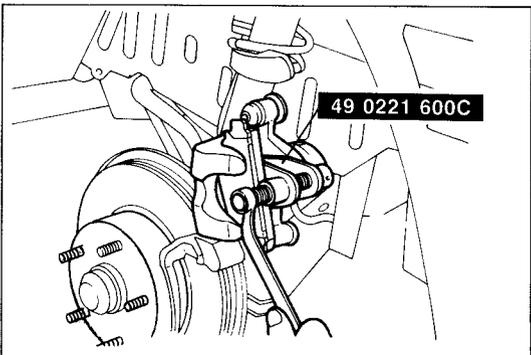
Caution

Replace the left and right pads as a set.

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Remove the lower lock-pin bolt; then lift the caliper and support it.
4. Remove the pads.

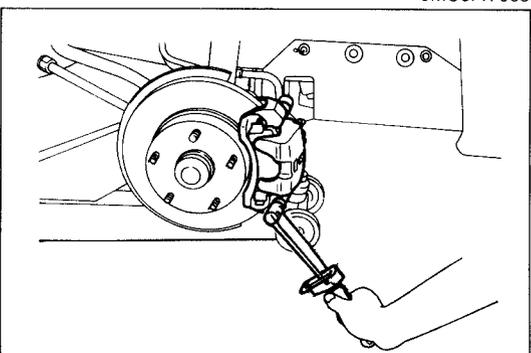


9MU0PX-067



9MU0PX-068

5. Push the piston inward with the **SST**.
6. Install the new pads in the mounting support.



97U0PX-041

7. Lower the caliper assembly onto the mounting support.
8. Tighten the lock bolt to the specified torque.

Tightening torque:

31—41 N·m (3.2—4.2 m·kg, 23—30 ft·lb)

9. Mount the wheels.

Caution

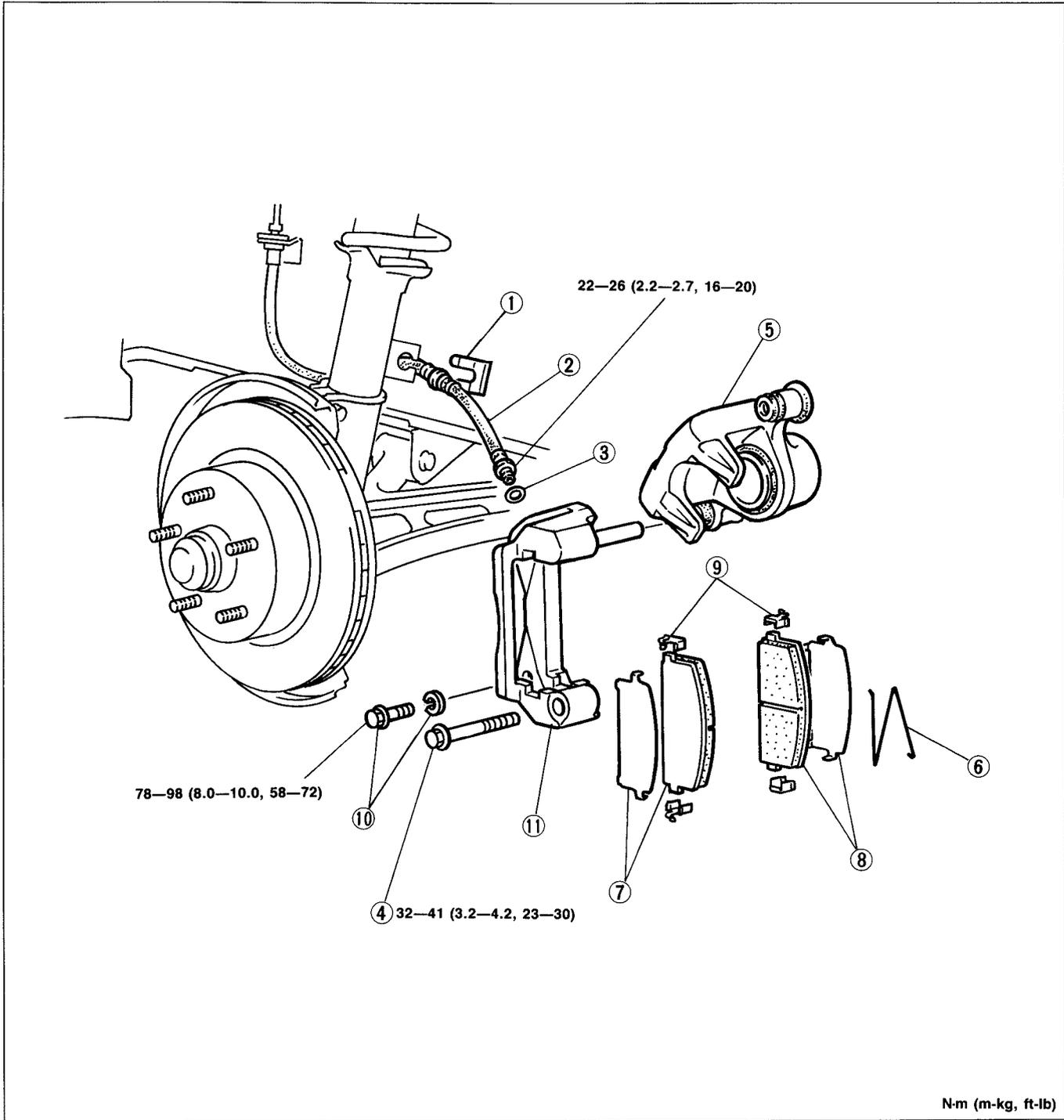
Apply the brakes 2—3 times. Rotate the wheels and check to see if the brakes drag.

10. Lower the vehicle.

P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

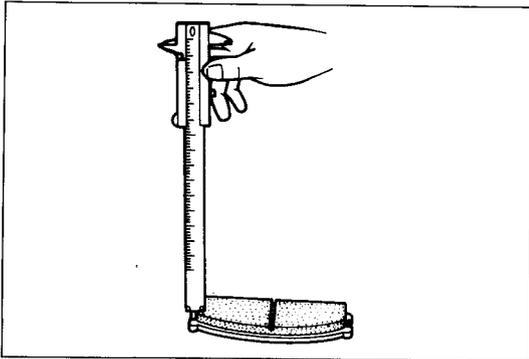
1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels; then remove components in the order shown in the figure.
3. Install in the reverse order of removal.
4. Tighten all nuts and bolts to the specified torque, referring to the figure.



N-m (m-kg, ft-lb)

97U0PX-042

- | | |
|--|---|
| 1. Clip | 6. Pad spring |
| 2. Flexible hose | 7. Outer shim and pad
Inspection page P-37 |
| 3. O-ring | 8. Inner shim and pad
Inspection page P-37 |
| 4. Lock-pin bolt | 9. Guide plates |
| 5. Caliper assembly
Disassembly, Inspection
and Assembly page P-38 | 10. Bolt and washer |
| | 11. Mounting support |



9MU0PX-071

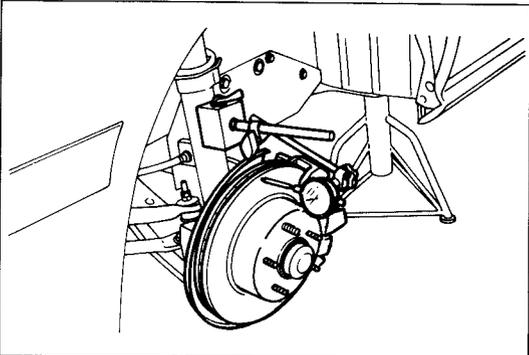
Inspection

Check the following and replace parts as necessary.

Disc pad

1. Oil or grease on facing
2. Abnormal wear or cracks
3. Deterioration or damage by heat
4. Remaining lining thickness

Thickness: 2.0mm (0.08 in) min.



9MU0PX-072

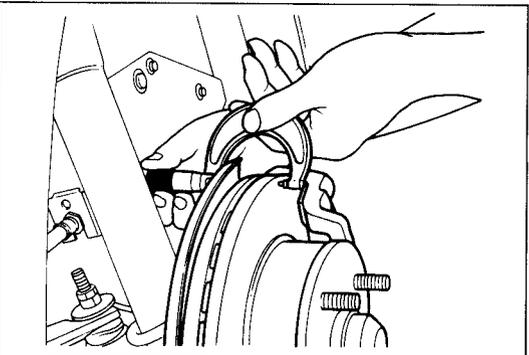
Disc plate

1. Runout.

Runout: 0.1mm (0.004 in) max.

Caution

- a) There must be no wheel bearing looseness.
- b) The measurement location is the outer edge of the disc plate surface.



97U0PX-043

2. Wear or damage.

Thickness

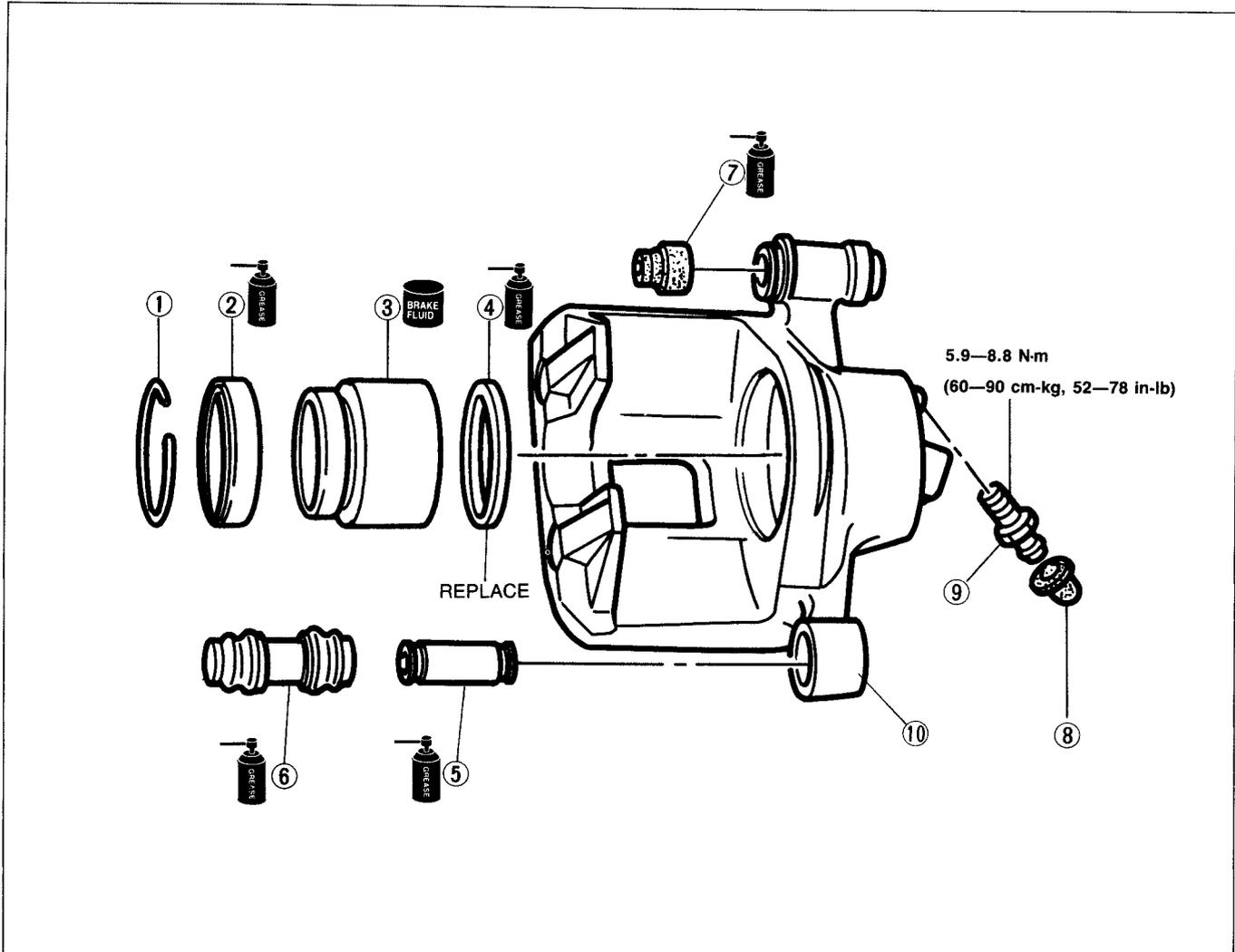
Standard: 22mm (0.87 in)

Minimum: 20mm (0.79 in)

P CONVENTIONAL BRAKE SYSTEM

Disassembly, Inspection and Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Assemble in the reverse order of removal.



97U0PX-044

- | | |
|--|--|
| 1. Piston ring | 5. Guide |
| 2. Dust boot
Inspect for cracks | 6. Boot
Inspect for wear or cracks |
| 3. Piston
Disassembly page P-38
Inspect for wear or cracks | 7. Bushing
Inspect for wear or cracks |
| 4. Piston seal
Disassembly page P-39 | 8. Rubber cap |
| | 9. Bleeder screw |
| | 10. Caliper
Inspect for damage |

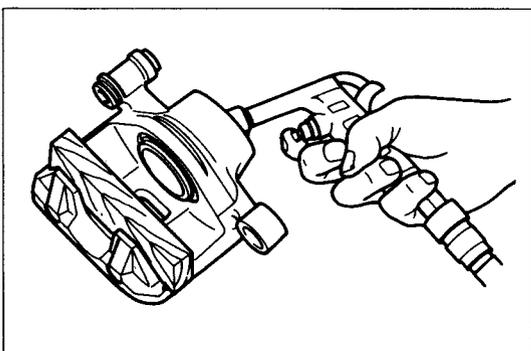
Disassembly note

Piston

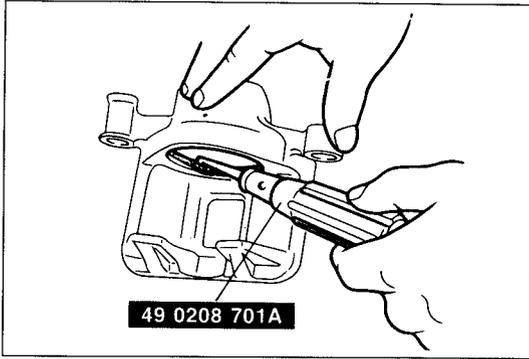
Place a piece of wood in the caliper; then blow compressed air through the hole to force the piston out of the caliper.

Caution

Blow the compressed air slowly to prevent the piston from popping out.



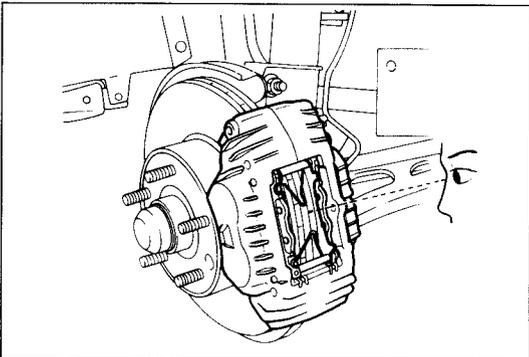
9MU0PX-075



97U0PX-045

Piston seal

Remove the piston seal from the caliper with the **SST**.



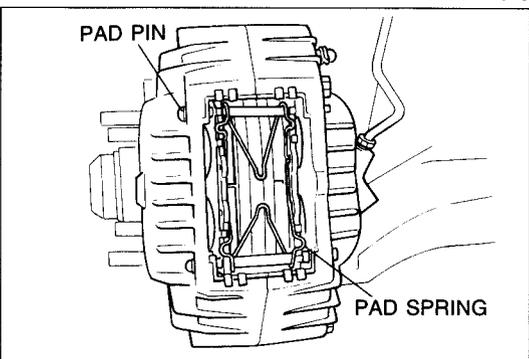
97U0PX-046

FRONT DISC BRAKE (FOUR PISTON CALIPER)

On-vehicle Inspection

Disc pad

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Sight through the caliper inspection hole and see if the remaining thickness of the pad is at least **2.0mm (0.08 in)**.



97U0PX-047

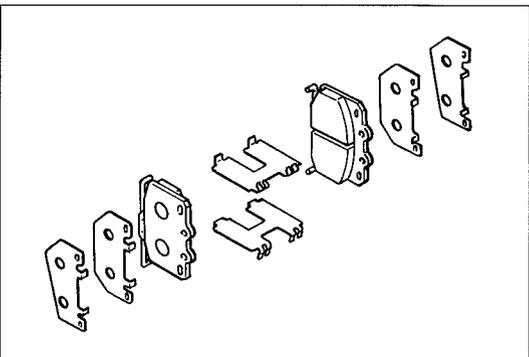
Replacement

Disc pad

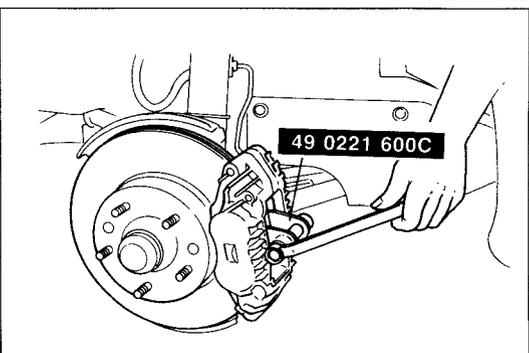
Caution

Replace the left and right pads as a set.

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Remove the pad pins and pad springs.
4. Remove the pads and shims.



97U0PX-048



97U0PX-049

5. Push the piston inward with the **SST**.
6. Install the new pads.
7. Mount the wheels.

Caution

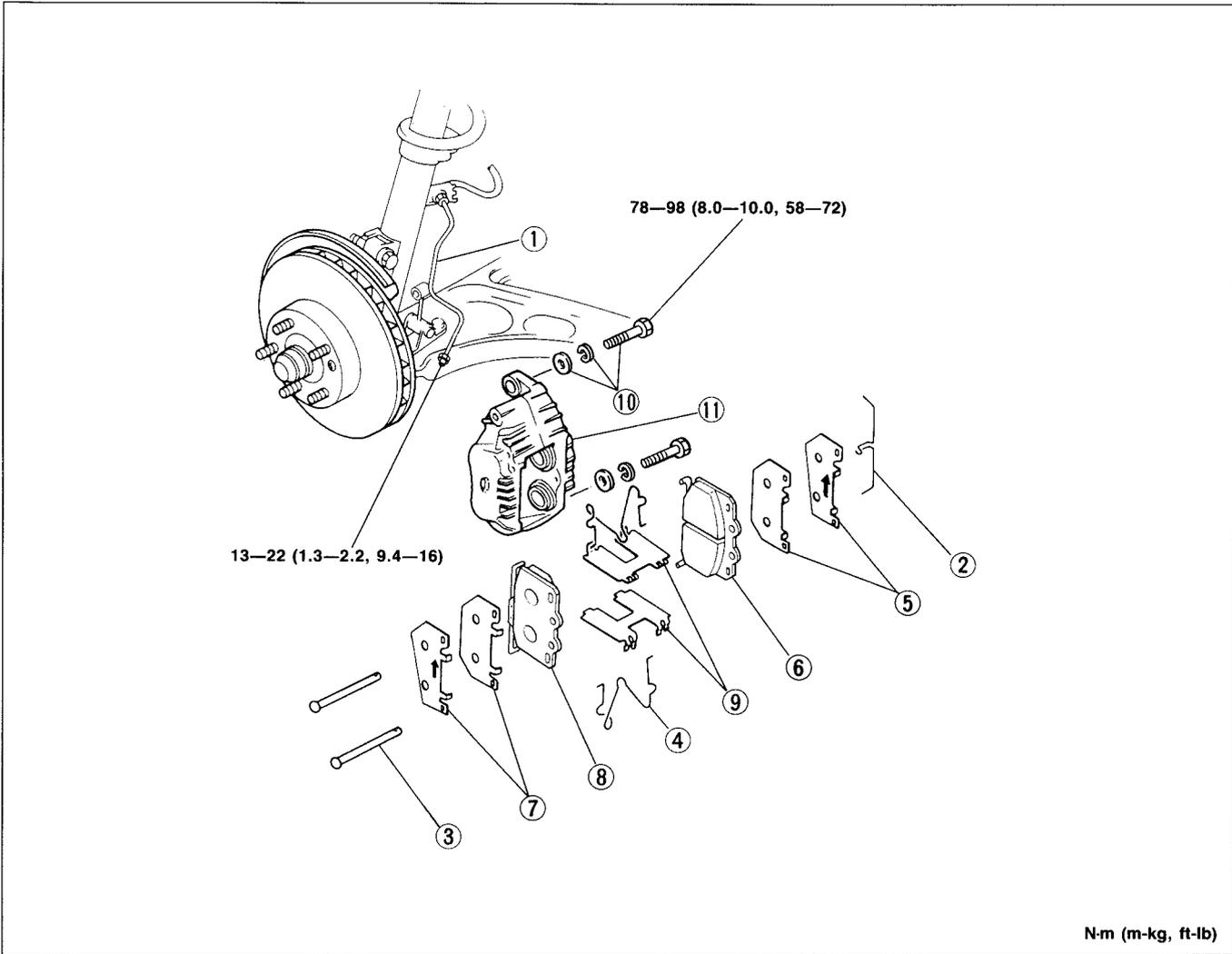
Apply the brakes 2—3 times. Rotate the wheels and check if the brakes drag.

8. Lower the vehicle.

P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

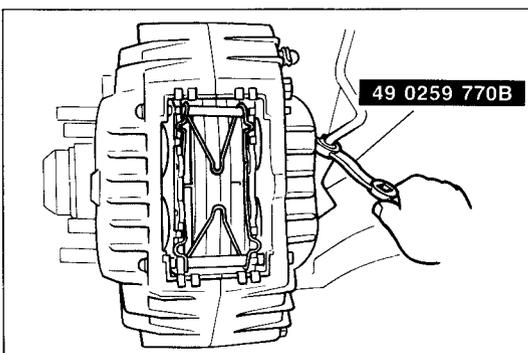
1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels; then remove components in the order shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal.
4. Tighten all nuts and bolts to the specified torque, referring to the figure.



N-m (m-k, ft-lb)

97U0PX-050

- | | |
|--|---|
| 1. Brake pipe
Removal..... page P-40 | 7. Outer shims |
| 2. Pad clip | 8. Outer pad
Inspection page P-41 |
| 3. Pad pin | 9. Guide plates |
| 4. V-springs | 10. Bolt and washers |
| 5. Inner shims | 11. Caliper assembly
Disassembly page P-42 |
| 6. Inner pad
Inspection page P-41 | |

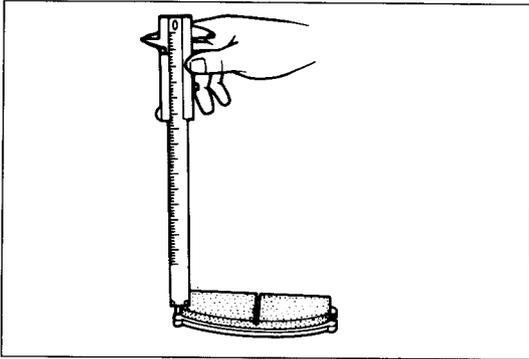


97U0PX-093

Removal note

Brake pipe

Remove the brake pipe from the caliper with the **SST**.



9MU0PX-071

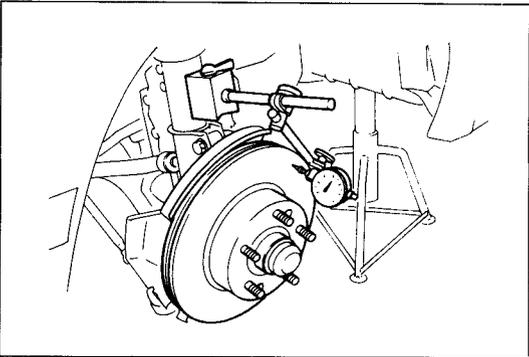
Inspection

Check the following and replace parts as necessary.

Disc pad

1. Oil or grease on facing
2. Abnormal wear or cracks
3. Deterioration or damage by heat
4. Remaining lining thickness

Thickness: 2.0mm (0.08 in) min.



9MU0PX-072

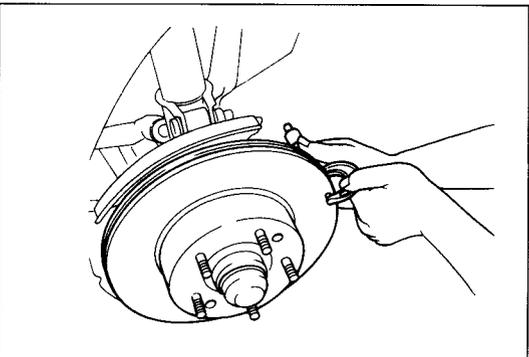
Disc plate

1. Runout.

Runout: 0.1mm (0.004 in) max.

Caution

- a) There must be no wheel bearing looseness.
- b) The measurement location is the outer edge of the disc plate surface.



97U0PX-043

2. Wear or damage.

Thickness

Standard: 22mm (0.87 in)

Minimum: 20mm (0.79 in)

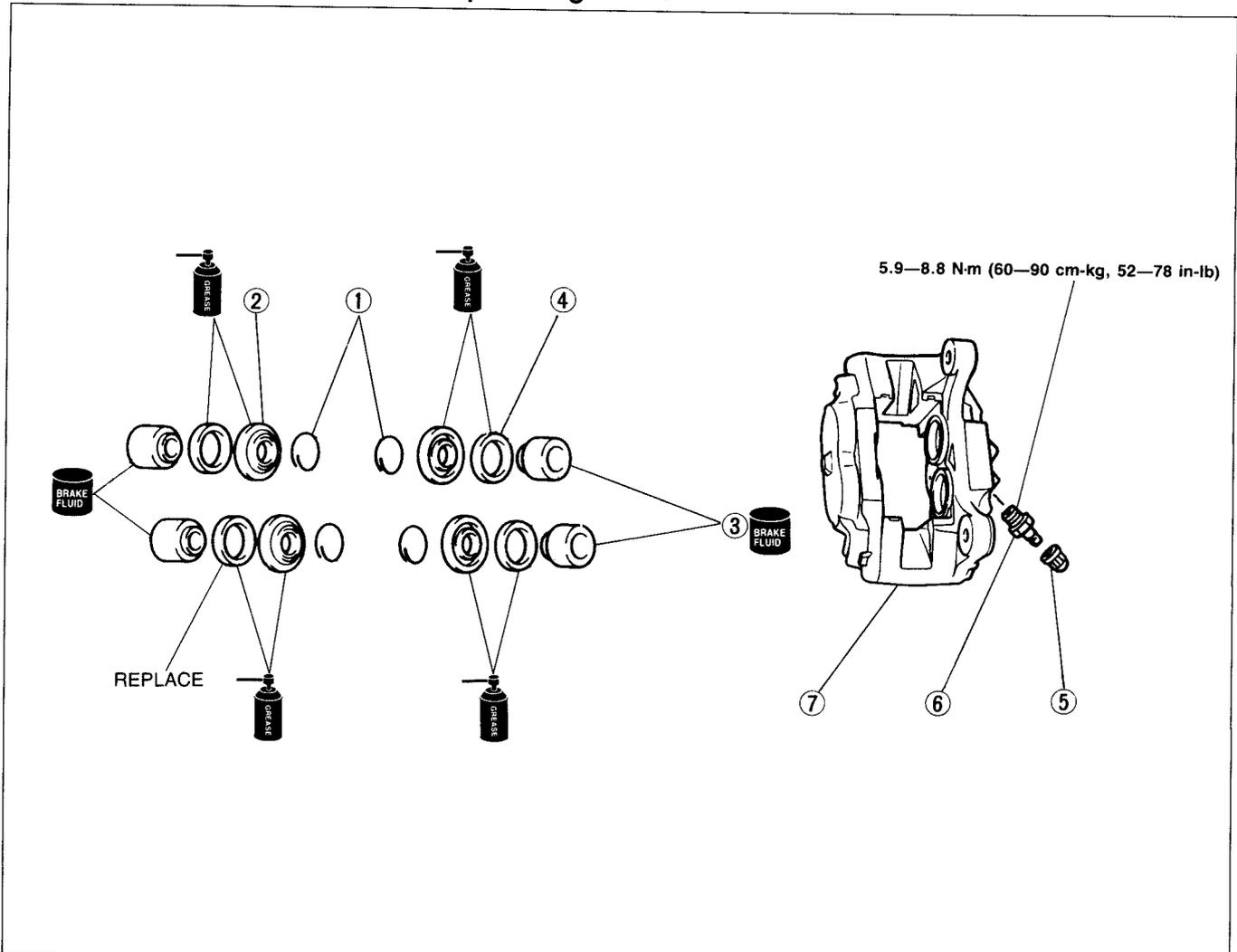
P CONVENTIONAL BRAKE SYSTEM

Disassembly, Inspection and Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Assemble in the reverse order of removal.

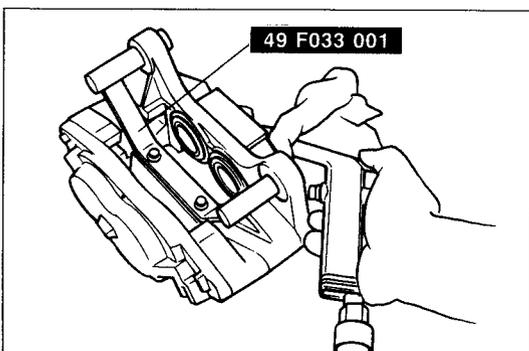
Caution

Do not loosen or remove the caliper bridge bolts.



97U0PX-051

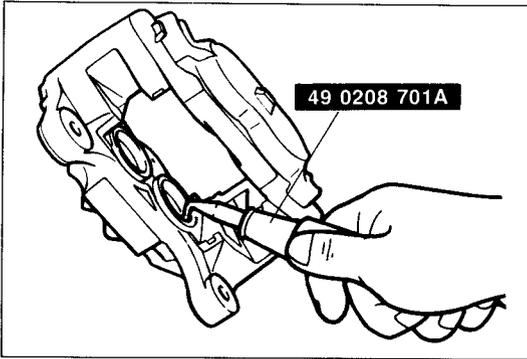
- | | |
|-----------------------------|-----------------------------|
| 1. Piston ring | 4. Piston seal |
| 2. Dust boot | Disassembly page P-43 |
| Inspect for wear or cracks | 5. Bleeder cap |
| 3. Piston | 6. Bleeder screw |
| Disassembly page P-42 | 7. Caliper |
| Inspect for wear or cracks | Inspect for damage |



97U0PX-052

Piston

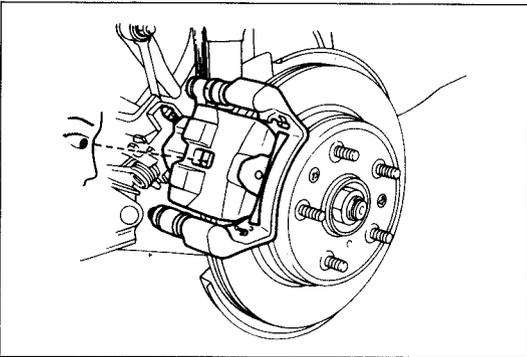
1. Place the **SST** in the caliper.
2. Blow compressed air through the flexible hose connection hole to force the pistons out of the caliper.



97U0PX-045

Piston seal

Remove the piston seal from the caliper with the **SST**.



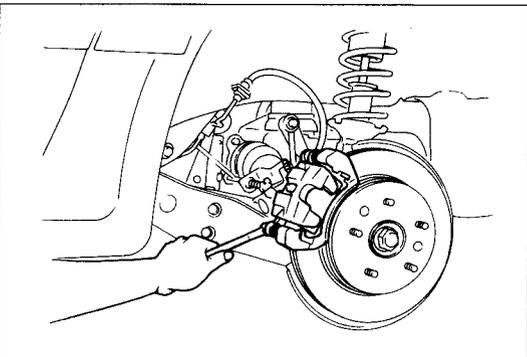
97U0PX-053

REAR DISC BRAKE

On-vehicle Inspection

Disc pad

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Sight through the caliper inspection hole and see if the remaining thickness of the pad is at least **1.0mm (0.04 in)**.



97U0PX-054

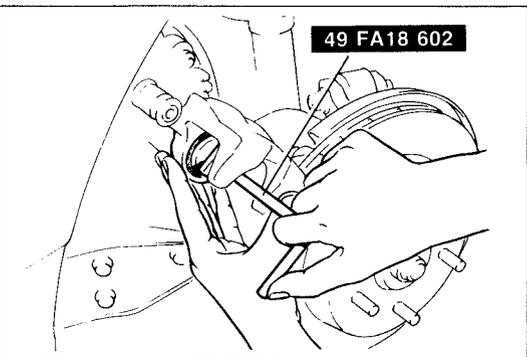
Replacement

Disc pad

Caution

Replace the left and right pads at the same time.

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Remove the lower lock bolt and pivot the caliper.
4. Remove the V-spring and the pads.
5. Rotate the piston clockwise with the **SST**.
6. Install the new pads and V-spring in the mounting support.



97U0PX-055

7. Lower the caliper onto the mounting support.
8. Tighten the lock bolts to the specified torque.

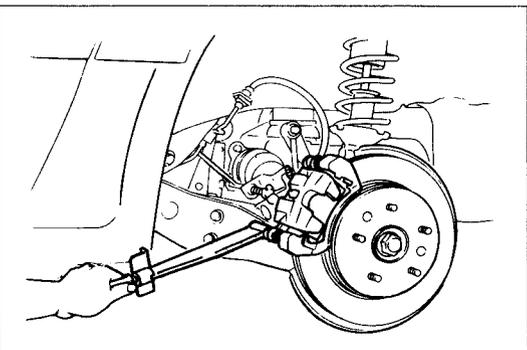
Tightening torque:

16—24 N·m (1.6—2.4 m·kg, 12—17 ft·lb)

9. Mount the wheels.

Caution

Apply the brakes 2—3 times. Rotate the wheels and check if the brakes drag.



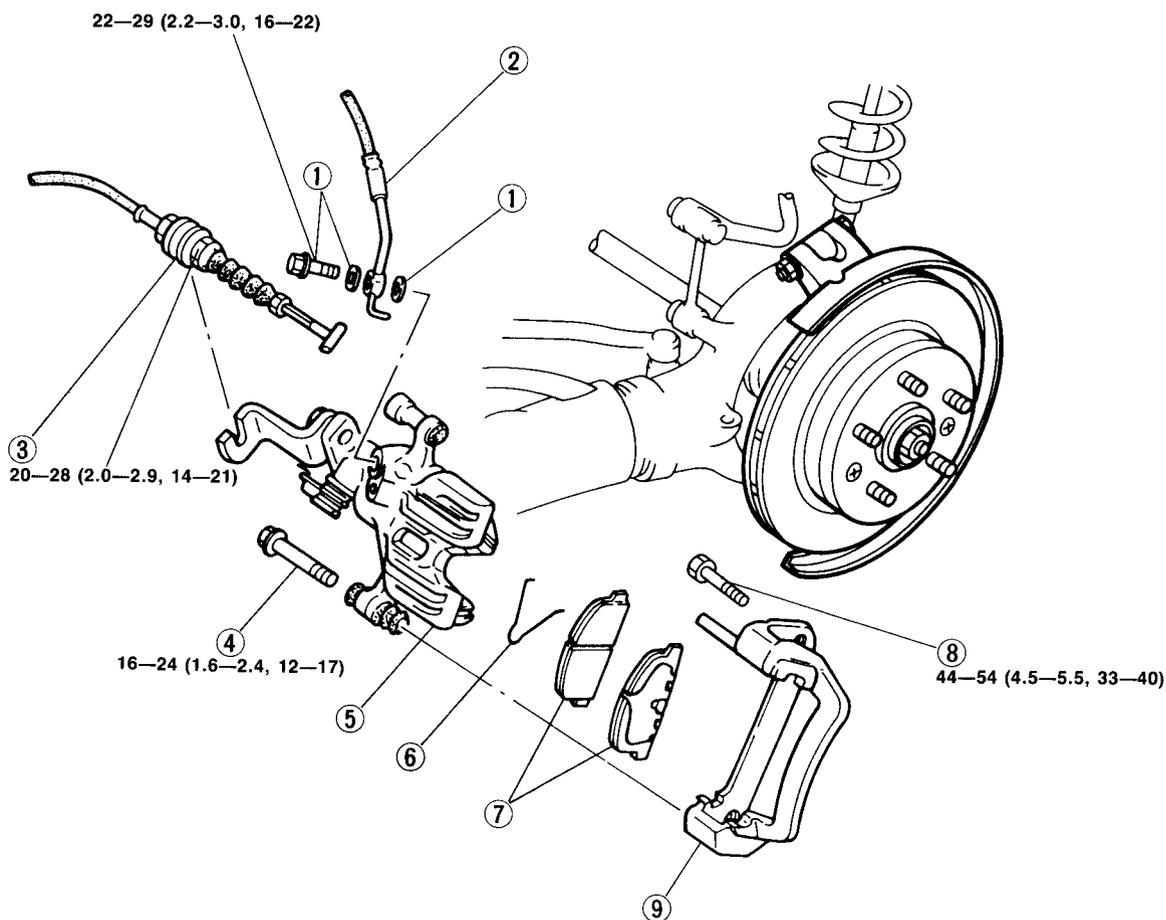
97U0PX-056

10. Lower the vehicle.

P CONVENTIONAL BRAKE SYSTEM

Removal and Installation

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels; then remove components in the order shown in the figure.
3. Install in the reverse order of removal.
4. Tighten all nuts and bolts to the specified torque, referring to the figure.

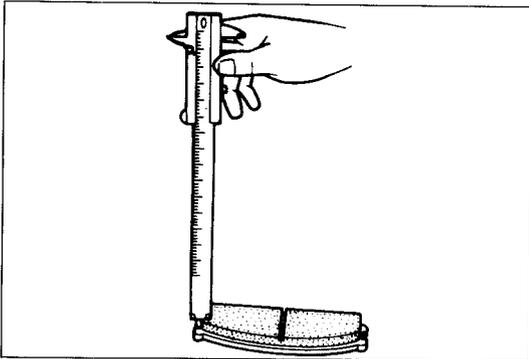


N-m (m-kg, ft-lb)

97U0PX-057

- 1. Bolt and washers
- 2. Flexible hose
- 3. Parking brake cable
- 4. Lock-pin bolt
- 5. Caliper assembly
Disassembly page P-46

- 6. V-spring
- 7. Pads and shims
Inspection page P-45
- 8. Bolt
- 9. Mounting support



97U0PX-058

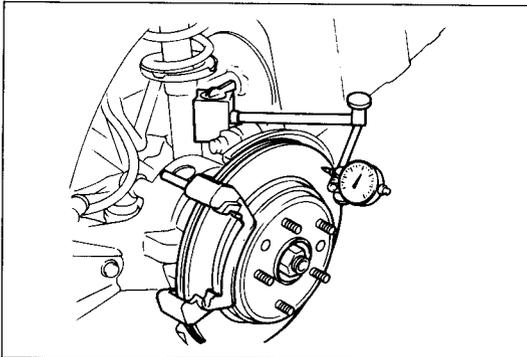
Inspection

Check the following and replace or repair any faulty parts.

Disc pad

1. Oil or grease on facing
2. Abnormal wear or cracks
3. Deterioration or heat damage
4. Remaining lining thickness

Thickness: 1mm (0.04 in) min.



9MU0PX-072

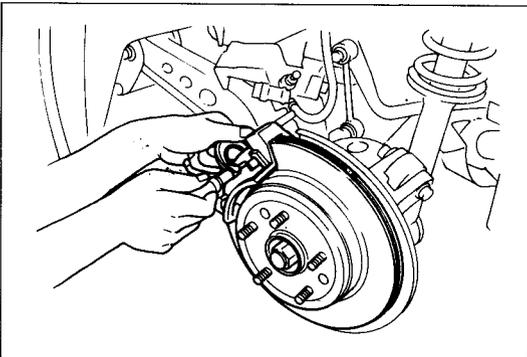
Disc plate

1. Runout.

Runout: 0.1mm (0.004 in) max.

Caution

- a) There must be no wheel bearing looseness.
- b) The measurement location is the outer edge of the disc plate surface.



97U0PX-059

2. Wear or damage

Thickness

Solid disc

Standard: 10mm (0.39 in)

Minimum: 8mm (0.31 in)

Ventilated disc

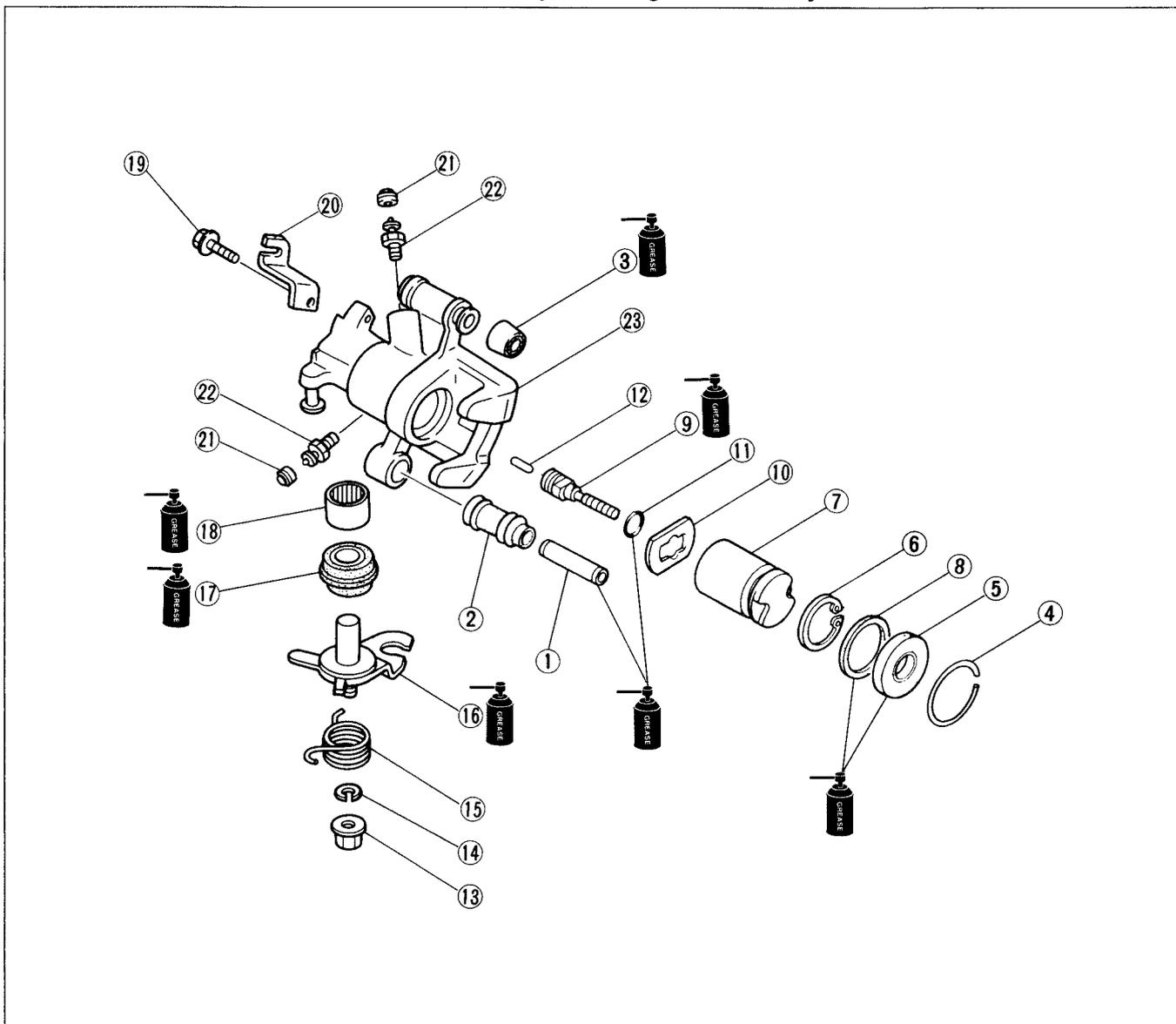
Standard: 20mm (0.79 in)

Minimum: 18mm (0.71 in)

P CONVENTIONAL BRAKE SYSTEM

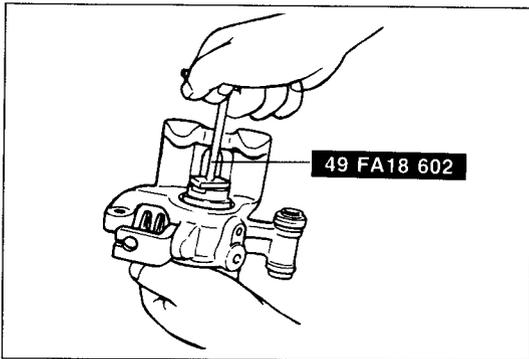
Disassembly, Inspection and Assembly

1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any faulty parts.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.



97U0PX-060

- | | |
|--|---|
| 1. Guide | 11. O-ring |
| 2. Boot
Inspect for wear | 12. Connecting link
Assembly page P-48 |
| 3. Bushing
Inspect for wear | 13. Nut |
| 4. Piston ring | 14. Washer |
| 5. Dust boot
Inspect for cracks | 15. Return spring |
| 6. Snap ring | 16. Operating lever |
| 7. Piston
Disassembly page P-47
Assembly page P-48 | 17. Lever boot
Assembly page P-48 |
| 8. Piston seal
Disassembly page P-47 | 18. Needle bearing
Disassembly, Assembly page P-47 |
| 9. Adjuster spindle
Assembly page P-48 | 19. Bolt |
| 10. Stopper | 20. Cable bracket |
| | 21. Rubber cap |
| | 22. Bleeder screw |
| | 23. Caliper
Inspect for damage |



96U11X-043

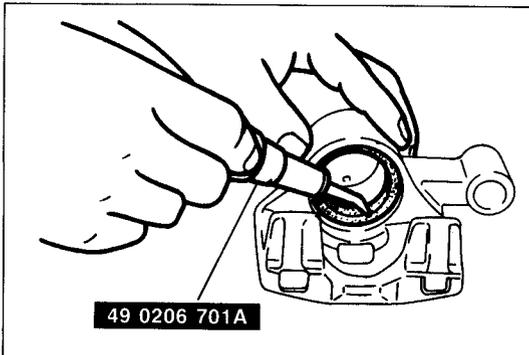
Disassembly note

Piston

Remove the piston with the **SST**.

Note

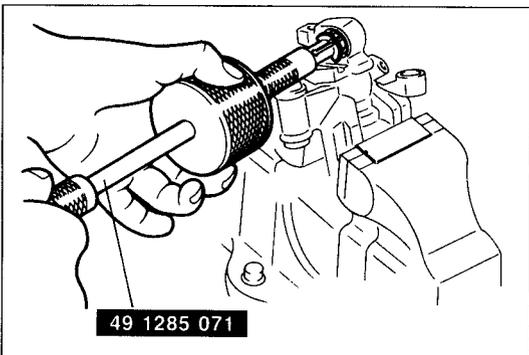
The piston is removed by turning the **SST** counter-clockwise.



86U11X-093

Piston seal

Remove the piston seal with the **SST**.



86U11X-094

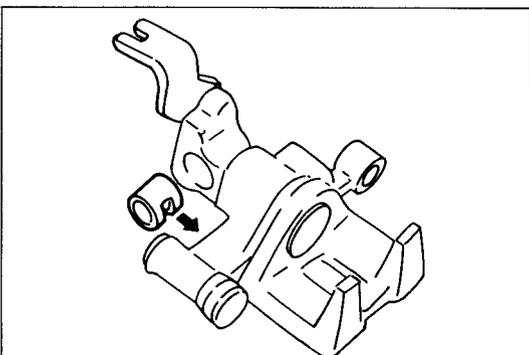
Needle bearing

1. Secure the caliper in a vise.

Caution

Insert a soft, protective material (such as copper plates) in the jaws of the vise.

2. Remove the needle bearing from the caliper with the **SST**.

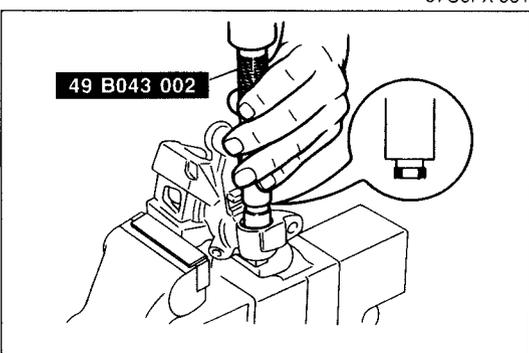


97U0PX-061

Assembly note

Needle bearing

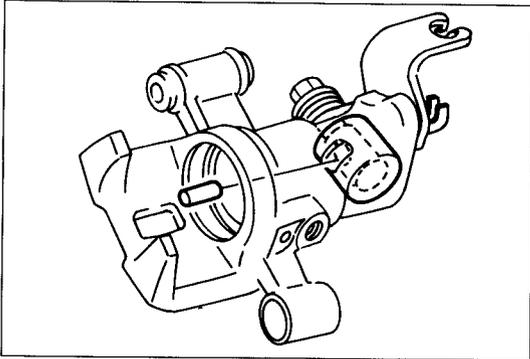
1. Set the needle bearing in the caliper with the needle bearing hole facing the caliper cylinder.



86U11X-098

2. Press the needle bearing into the caliper with the **SST** until the **SST** bottoms against the caliper.

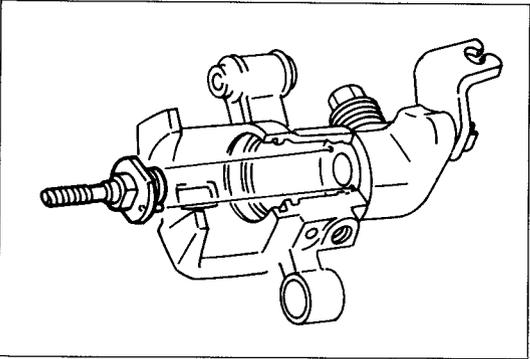
P CONVENTIONAL BRAKE SYSTEM



97U0PX-094

Connecting link

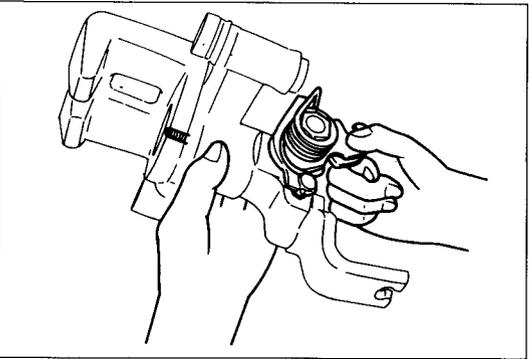
Install the connecting link into the needle bearing hole.



86U11X-100

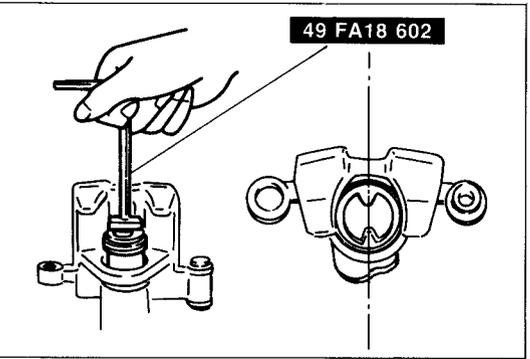
Adjuster spindle

1. Assemble the adjuster spindle and the stopper.
2. Install the adjuster and stopper straight into the caliper cylinder with the two stopper pins fit into the caliper.
3. Install the snap ring.



86U11X-101

4. Move the operating lever and check that the adjuster spindle moves smoothly.



96U11X-045

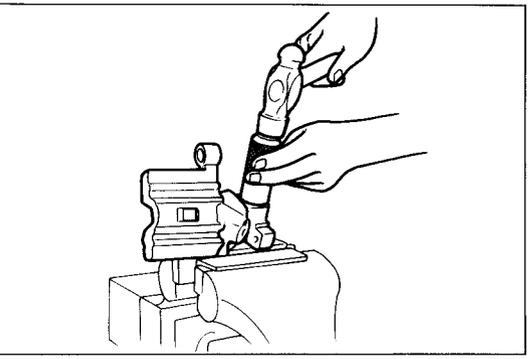
Piston

1. Clean the piston.
2. Install the dust seal in the piston groove.
3. Turn the piston into the caliper cylinder by rotating the **SST** clockwise.

Note

Turn the piston in fully, and align the piston grooves as shown in the illustration.

4. Fit the dust seal into the caliper cylinder.



97U0PX-095

Lever boot

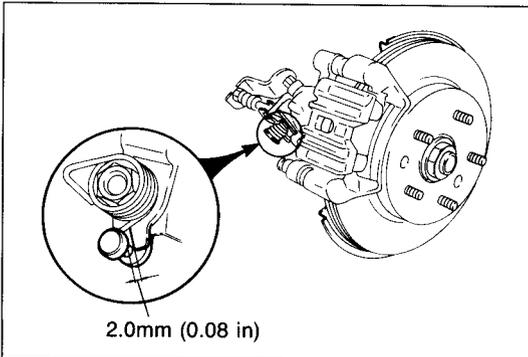
Press the lever boot onto the caliper with a suitable pipe.

PARKING BRAKE SYSTEM

TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Brakes do not release	Improper return of parking brake cable or improper adjustment	Repair or adjust	P-49
Parking brake does not hold well	Excessive lever stroke Brake cable stuck or damaged Brake fluid or oil on pad Hardening of pad surface or poor contact	Adjust Repair or replace Clean or replace Grind or replace	P-49 P-51 P-35,39,43 P-35,39,43

97U0PX-062



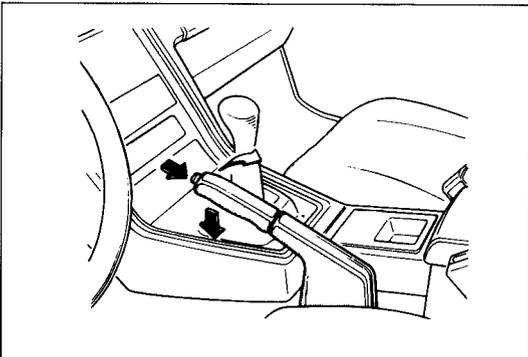
97U0PX-063

PARKING BRAKE LEVER

On-vehicle Inspection (lever stroke)

Inspection

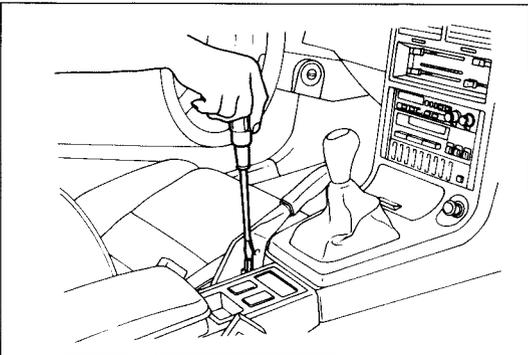
1. Depress the brake pedal several times.
2. Check that the clearance between the lever and stopper pin at the rear brake caliper is less than **2mm (0.08 in.)**. If the clearance is not less than **2mm (0.08 in.)**, turn the adjusting nut counterclockwise to lengthen the parking brake cable.



97U0PX-064

3. Check that the stroke is within specification when the parking brake lever is pulled with a force of **98 N (10 kg, 22 lb)**.

Stroke: 5—7 notches



97U0PX-096

Adjustment

1. Jack up the rear of the vehicle until the wheels are free to turn, then support it with stands.
2. Depress the brake pedal several times.
3. Turn the adjusting nut to adjust.
4. Check that the parking brake warning light illuminates when the brake lever is pulled one notch.
5. Lower the vehicle.

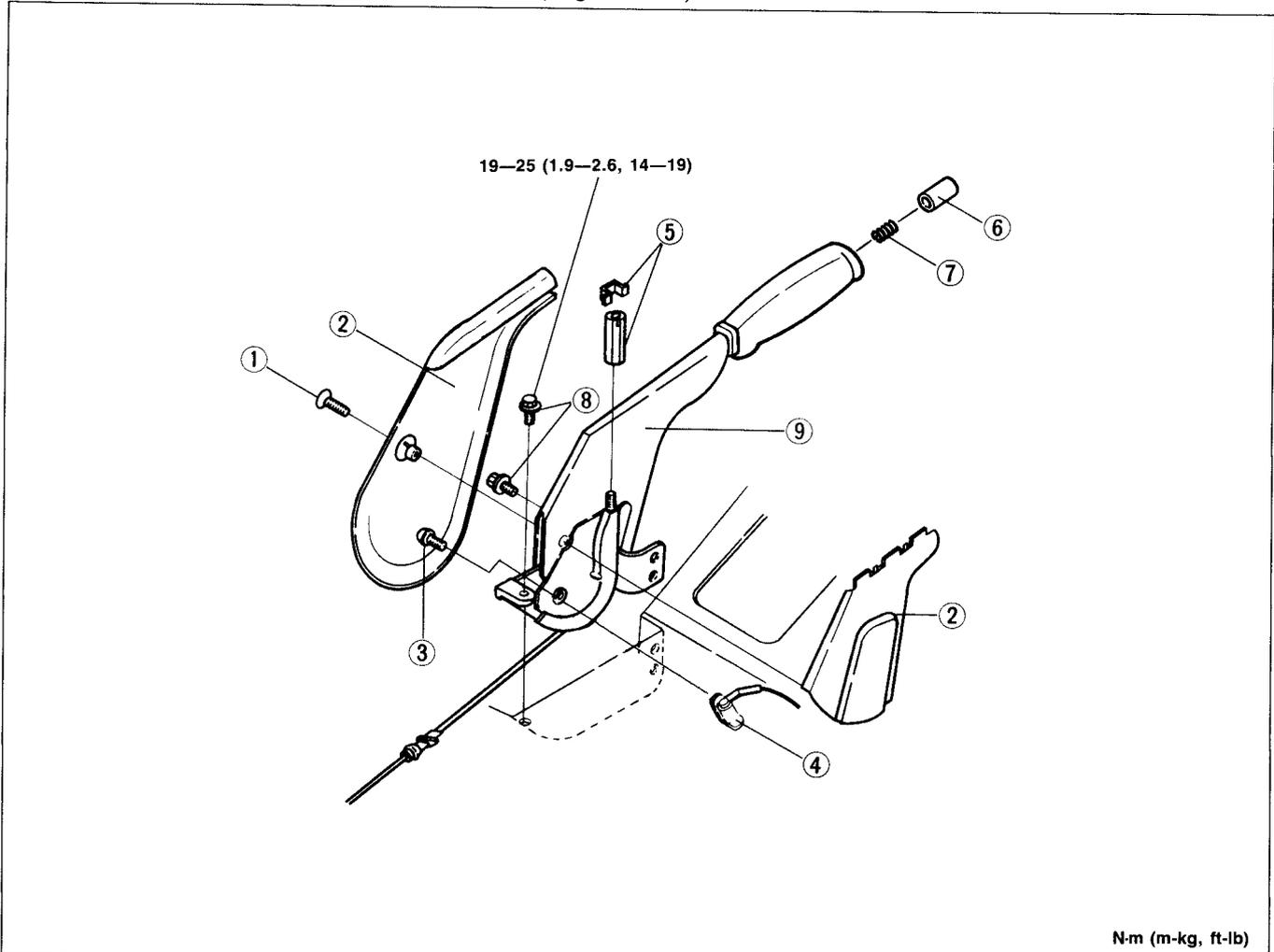
Caution

Check that the brakes are not dragging.

P PARKING BRAKE SYSTEM

Removal, Inspection and Installation

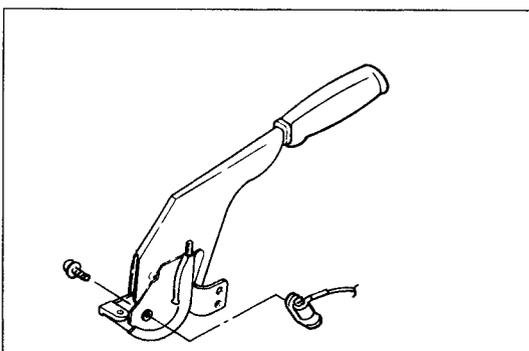
1. Block the wheels firmly.
2. Release the parking brake.
3. Remove in the order shown in the figure.
4. Inspect all components and parts. Replace parts if necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. After installation:
Adjust the parking lever stroke. (Refer to page P-49.)



N-m (m-kg, ft-lb)

97U0PX-065

- | | |
|--|--|
| 1. Screw | 6. Cap |
| 2. Cover | 7. Spring
Inspect for weakness |
| 3. Bolt | 8. Bolt |
| 4. Parking brake switch
Installation..... page P-50 | 9. Parking brake lever
Inspect for damage or cracks |
| 5. Adjusting nut and clip | |



9MU0PX-110

Installation note

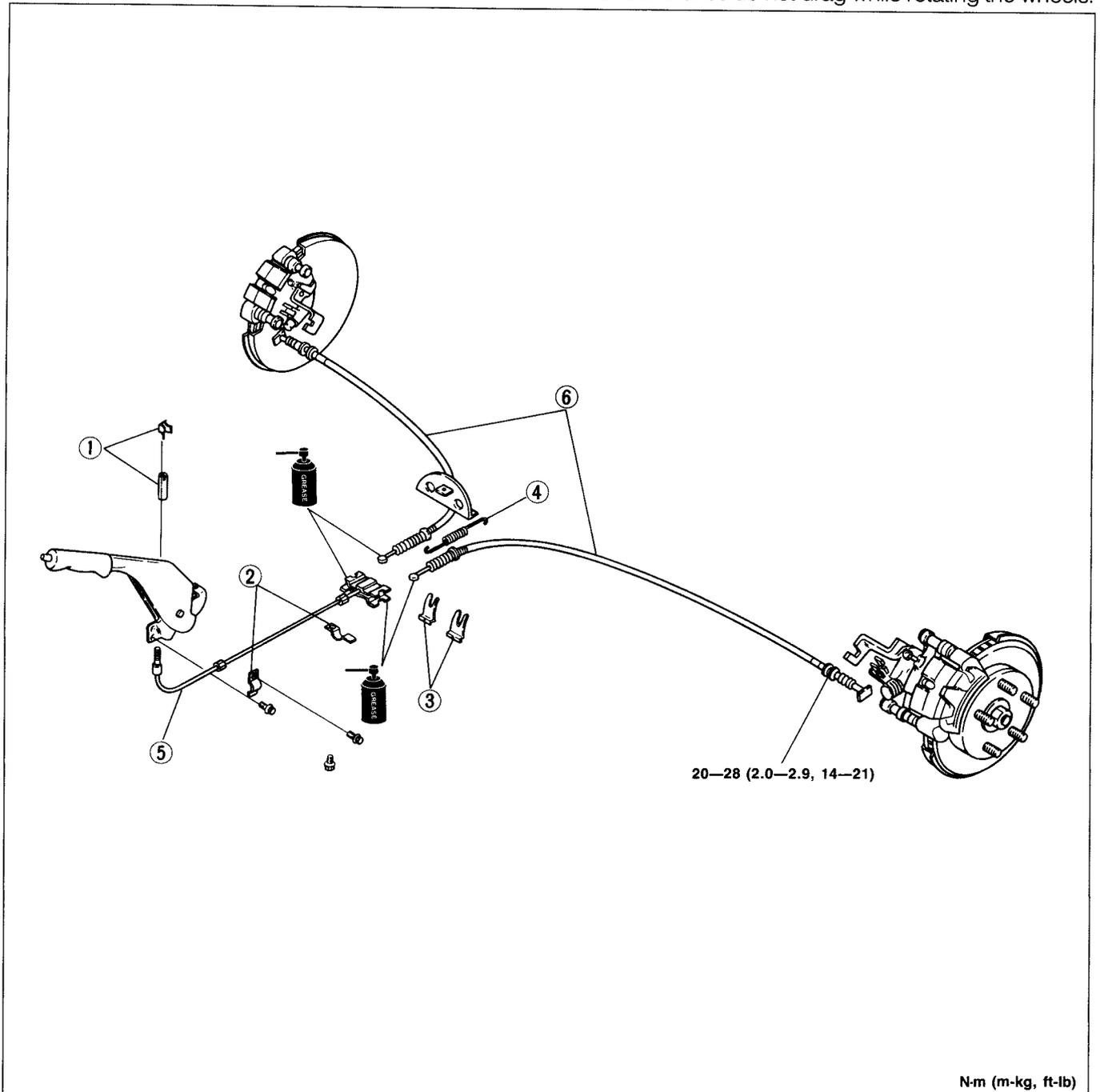
Parking brake switch

1. Install the parking brake switch so that it contacts the parking brake lever when the lever is fully released.
2. Turn the ignition switch ON, and check that the parking brake warning lamp illuminates with the lever pulled one notch.

PARKING BRAKE CABLE

Removal Inspection, and Installation

1. Block the wheels firmly.
2. Release the parking brake.
3. Jack up the vehicle and support it with safety stands after removing the parking brake lever.
4. Remove the parking brake cable in the order shown in the figure.
5. Install in the reverse order of removal.
6. After installation:
 - (1) Adjust the parking brake lever stroke.
 - (2) Depress the brake pedal a few times and check that the rear brakes do not drag while rotating the wheels.



97U0PX-066

1. Adjusting nut and clip
2. Bracket
3. Clip
4. Spring
Inspect for weakness

5. Front cable
Inspect for damage
6. Rear cable
Inspect for damage

P ANTI-LOCK BRAKE SYSTEM (ABS)

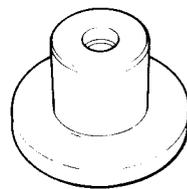
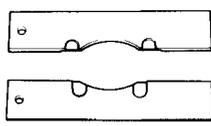
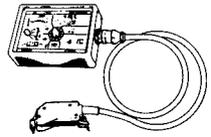
ANTI-LOCK BRAKE SYSTEM (ABS)

DESCRIPTION

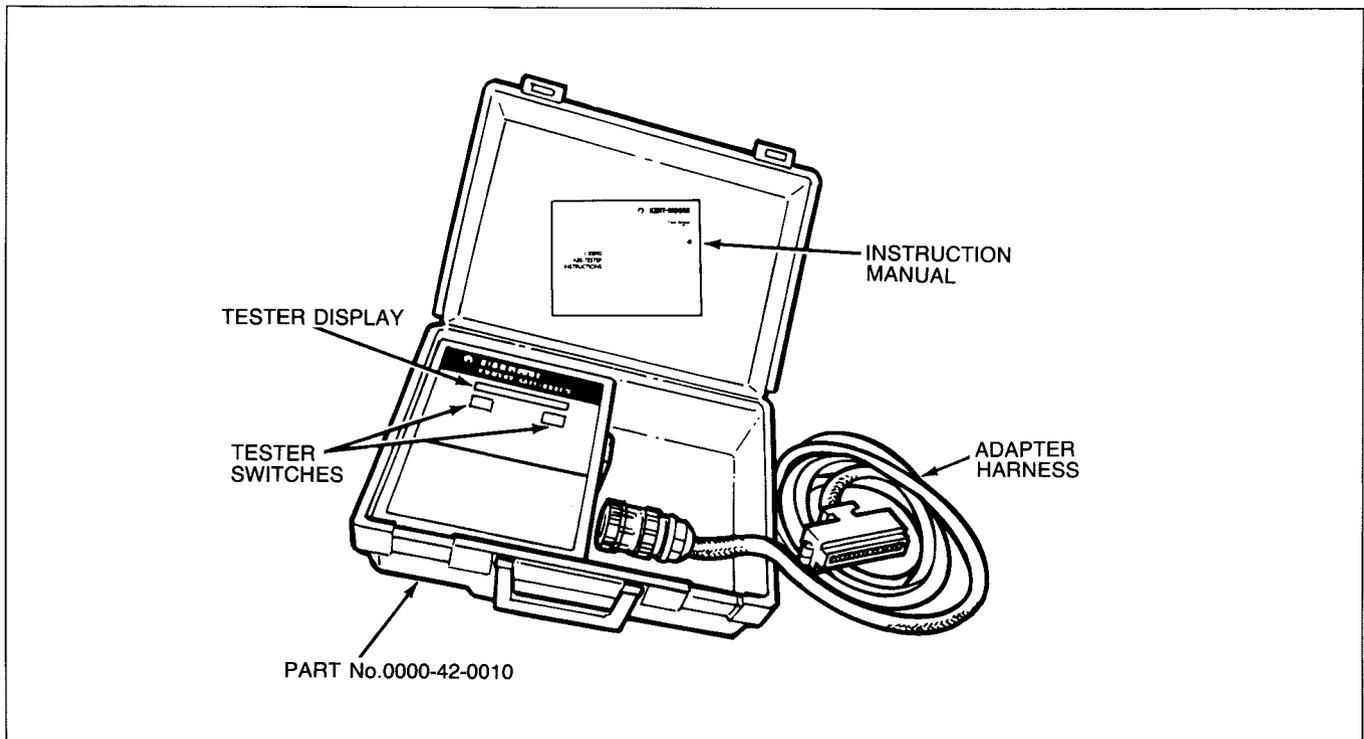
1. There is the following distinctive characteristics in the ABS vehicles compared with the non-ABS vehicles. Note that it does not indicate malfunction.
 - When the brakes are applied rapidly or on a slippery road surface, the ABS will activate; the brake pedal will pulsate slightly and the vehicle and the steering wheel will vibrate slightly.
 - When the vehicle speed reaches approx. 6 km/h (3.8 mph), the pump motor sound is heard momentarily. This sound is due to the self-diagnosis of ABS.
2. By retaining or reducing the hydraulic fluid pressure in the hydraulic unit, the ABS tester is used to locate the cause of a problem within the anti-lock brake system. Because there is no way to check the ABS control unit itself, replace the control unit assembly only after first confirming that the other electrical parts operate normally.

97U0PX-067

PREPARATION SST

<p>49 0259 770B Wrench, flare nut</p> 	<p>49 F026 102 Installer, bearing</p> 	<p>49 F026 103 Puller, wheel hub</p> 
<p>49 9200 164 Tester, anti-lock brake system</p> 	<p>97U0PX-068</p>	

TROUBLESHOOTING GUIDE Troubleshooting Guide with ABS Tester ABS tester

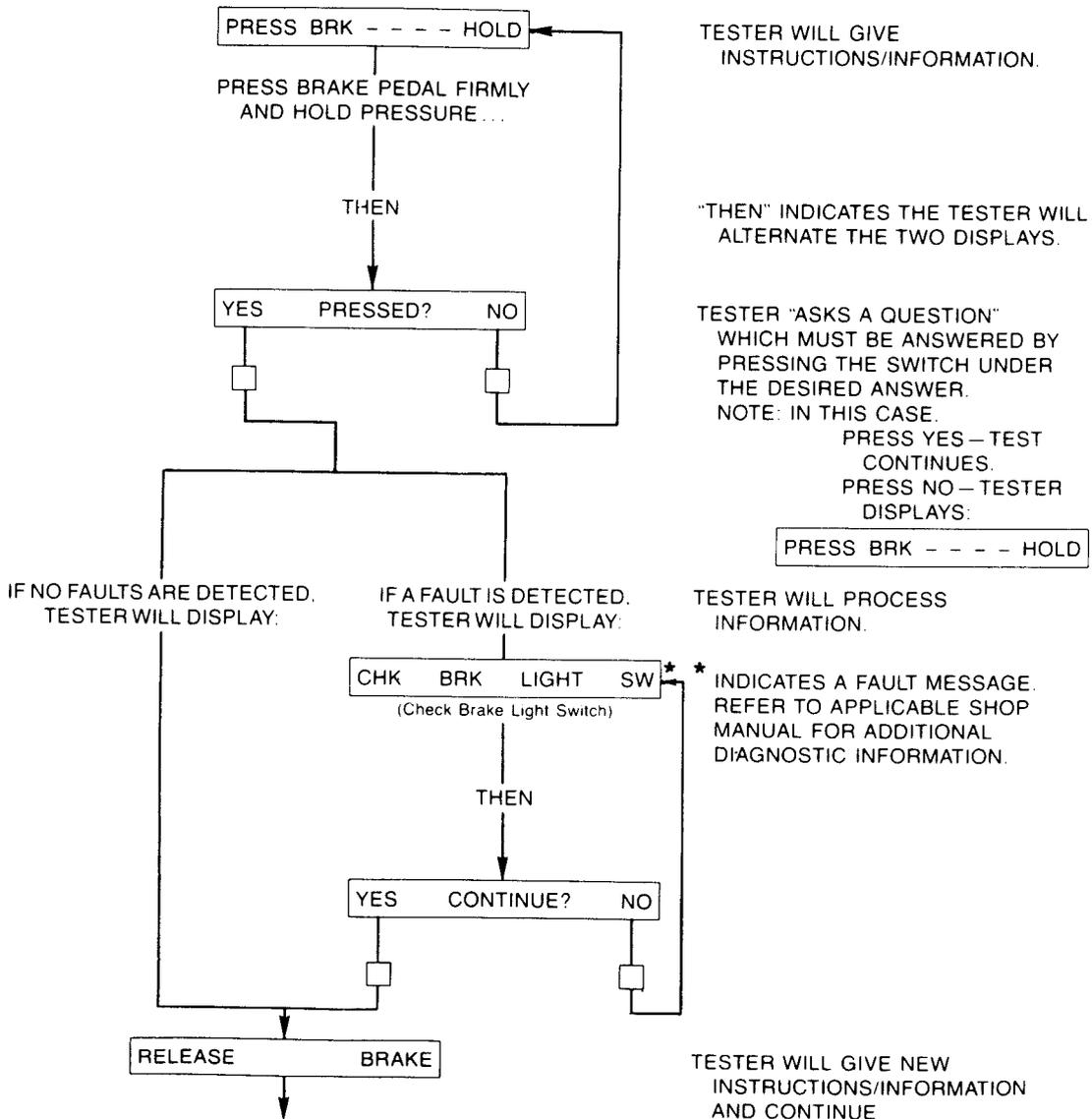
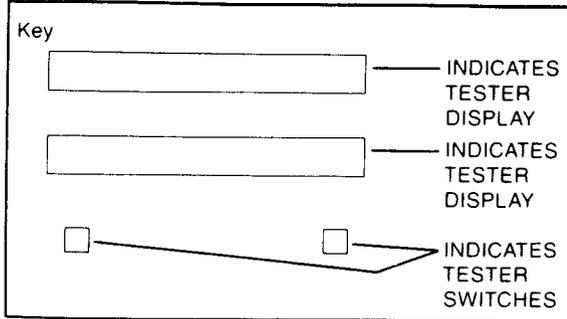


97U0PX-069

Explanation of instruction procedure

EXPLANATION OF INSTRUCTION PROCEDURE

LISTED BELOW IS AN EXPLANATION OF THE 5B. BRAKE LIGHT SWITCH TEST PROCEDURE



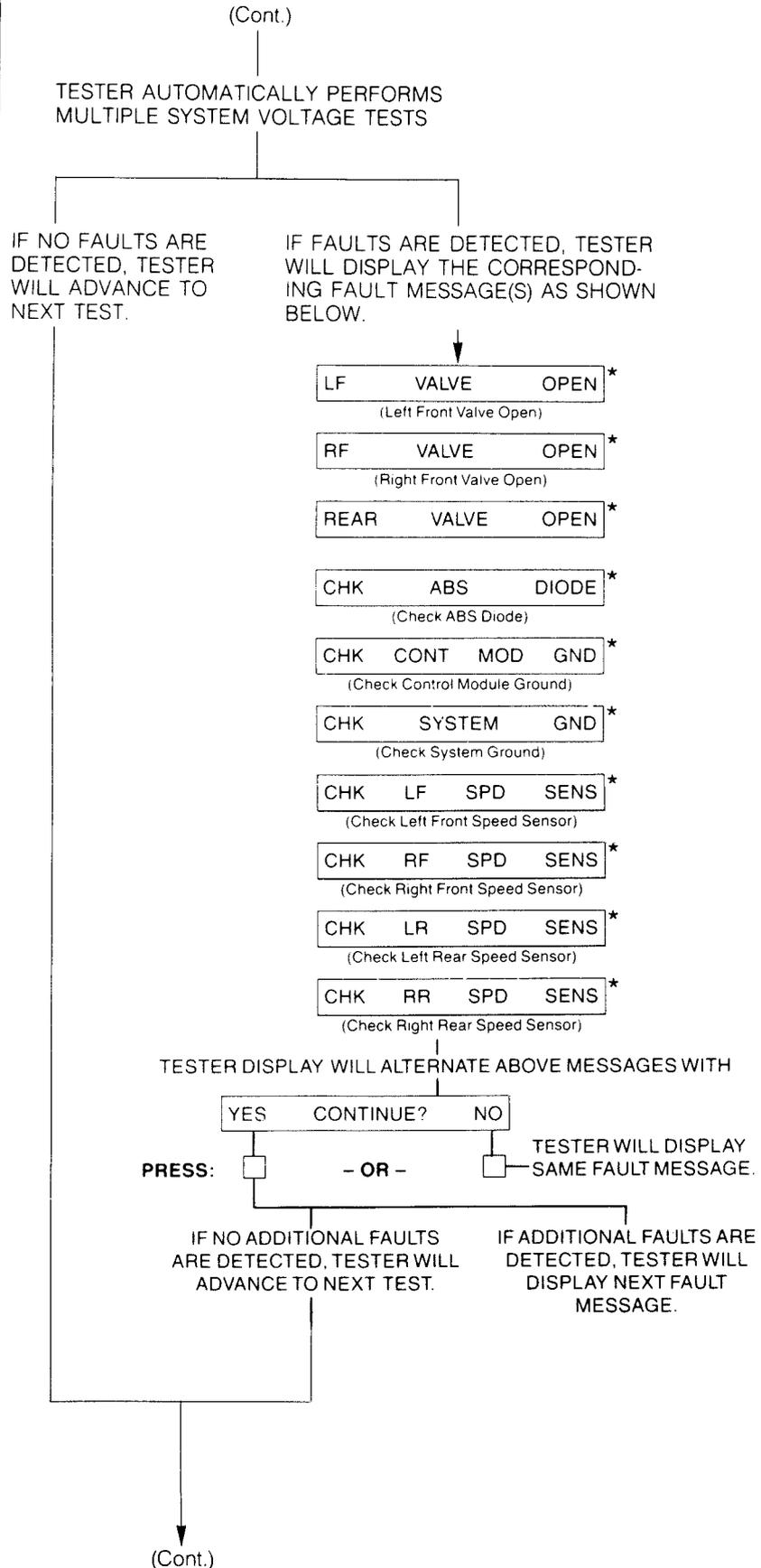
P ANTI-LOCK BRAKE SYSTEM (ABS)

Troubleshooting procedure

ITEM	
<p>1. CONNECTION/POWER-UP</p>	<p>1. LOCATE ABS CONTROL UNIT. 2. DISCONNECT CONTROL UNIT HARNESS CONNECTOR FROM CONTROL UNIT. 3. CONNECT ABS TESTER HARNESS TO CONTROL UNIT HARNESS CONNECTOR. 4. TURN IGNITION KEY TO ON POSITION.</p>
<p>2. ALTERNATOR TEST START ENGINE (ALTERNATOR TESTED BY RUNNING ENGINE)</p>	<p>TESTER WILL RAPIDLY DISPLAY SEVERAL MESSAGES DURING AN INITIAL SEGMENT CHECK.</p> <pre> graph TD Start(()) -- THEN --> Box1[MAZDA ABS 2 TEST] Box1 --> Box2[YES ENG RUN? NO] Box2 --> Box3[MAZDA ALT TEST] Box3 --> Box4[CHK ALTERNATOR] Box4 --> Box5[YES CONTINUE? NO] Box5 -- NO --> Box4 Box5 -- NO --> Box6[NO FAULT DETECTED] Box6 --> Box7[TURN OFF ENGINE] </pre>
<p>3. ABS SYSTEM TEST TURN IGNITION KEY ON (DO NOT RUN ENGINE)</p>	<p>TESTER WILL RAPIDLY DISPLAY SEVERAL MESSAGES DURING AN INITIAL SEGMENT CHECK.</p> <pre> graph TD Start(()) -- THEN --> Box1[YES ENG RUN? NO] Box1 --> Box2[MAZDA ABS 2 TEST] Box2 --> Cont((Cont.)) </pre>

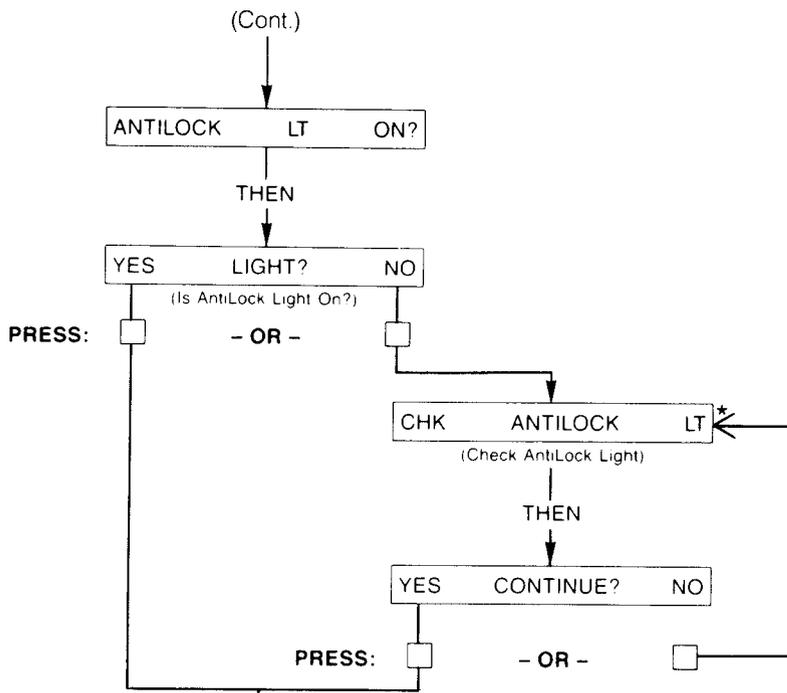
4. SYSTEM VOLTAGE CHECKS

* AFTER DISPLAY INDICATES A FAULT MESSAGE. REFER TO APPLICABLE SHOP MANUAL FOR ADDITIONAL DIAGNOSTIC INFORMATION.

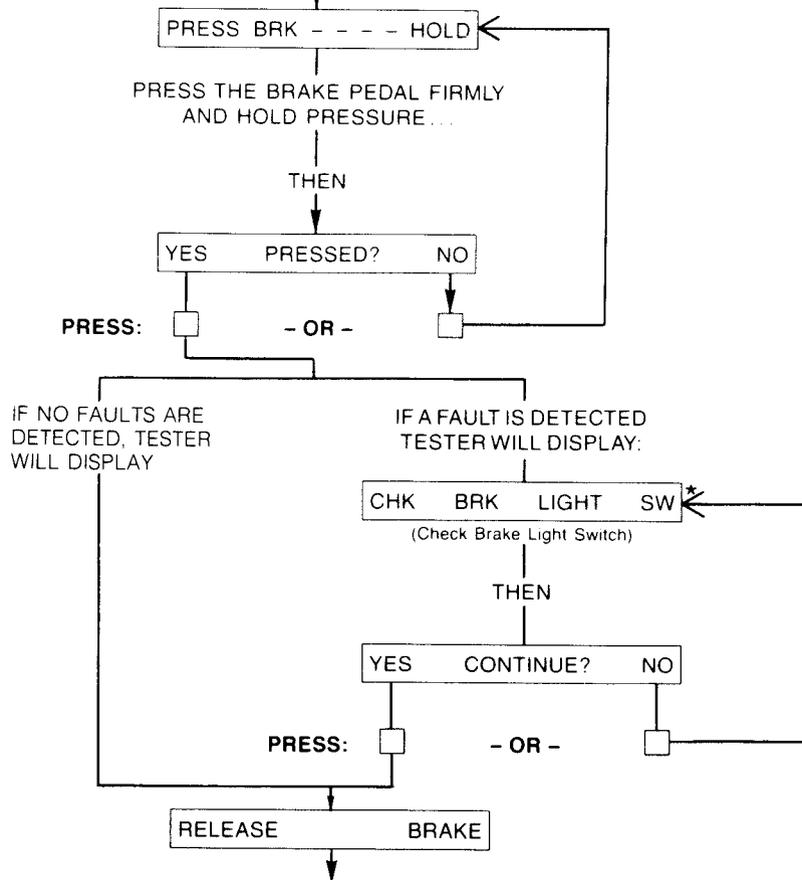


P ANTI-LOCK BRAKE SYSTEM (ABS)

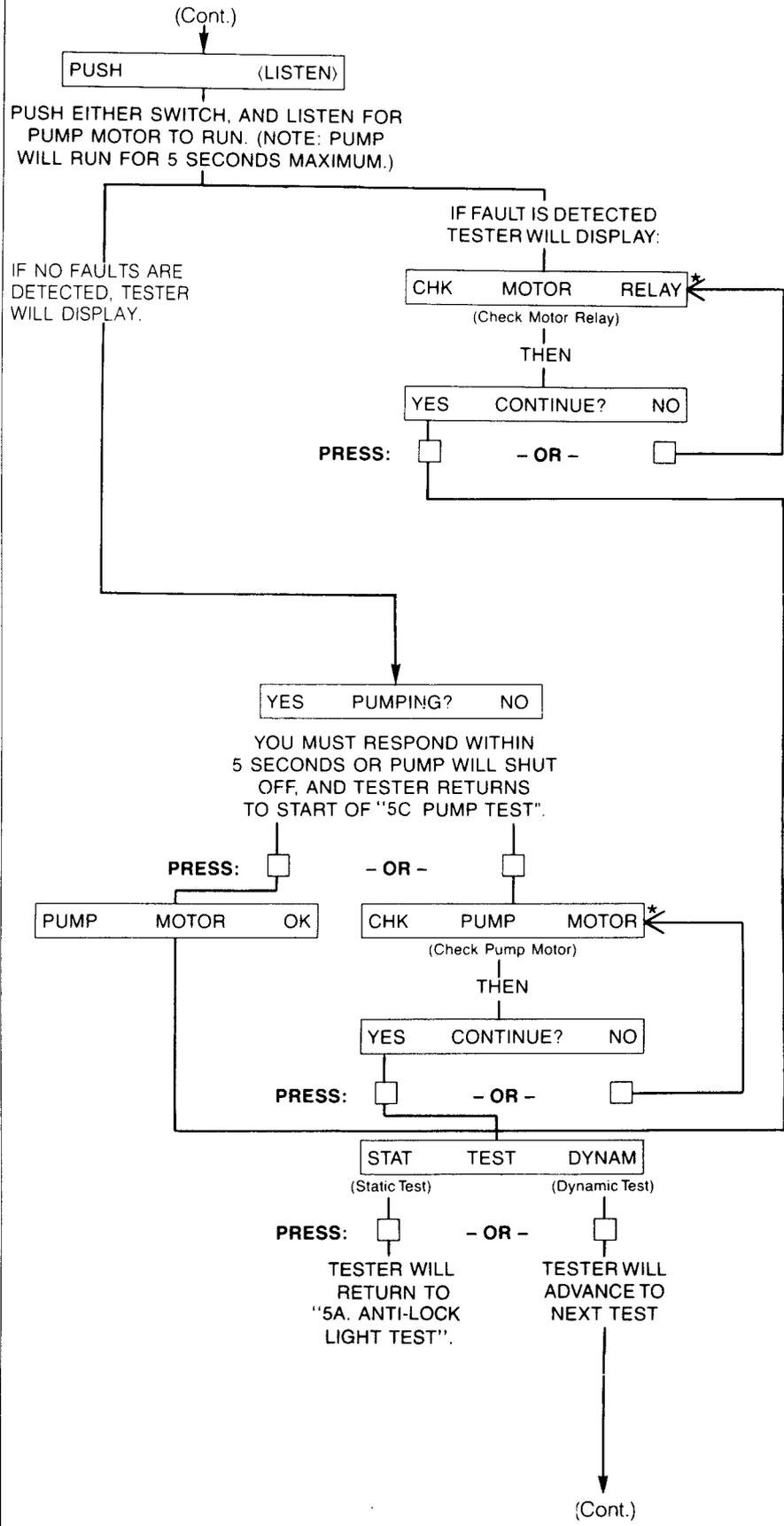
5. STATIC TESTS 5A. ANTI-LOCK LIGHT TEST



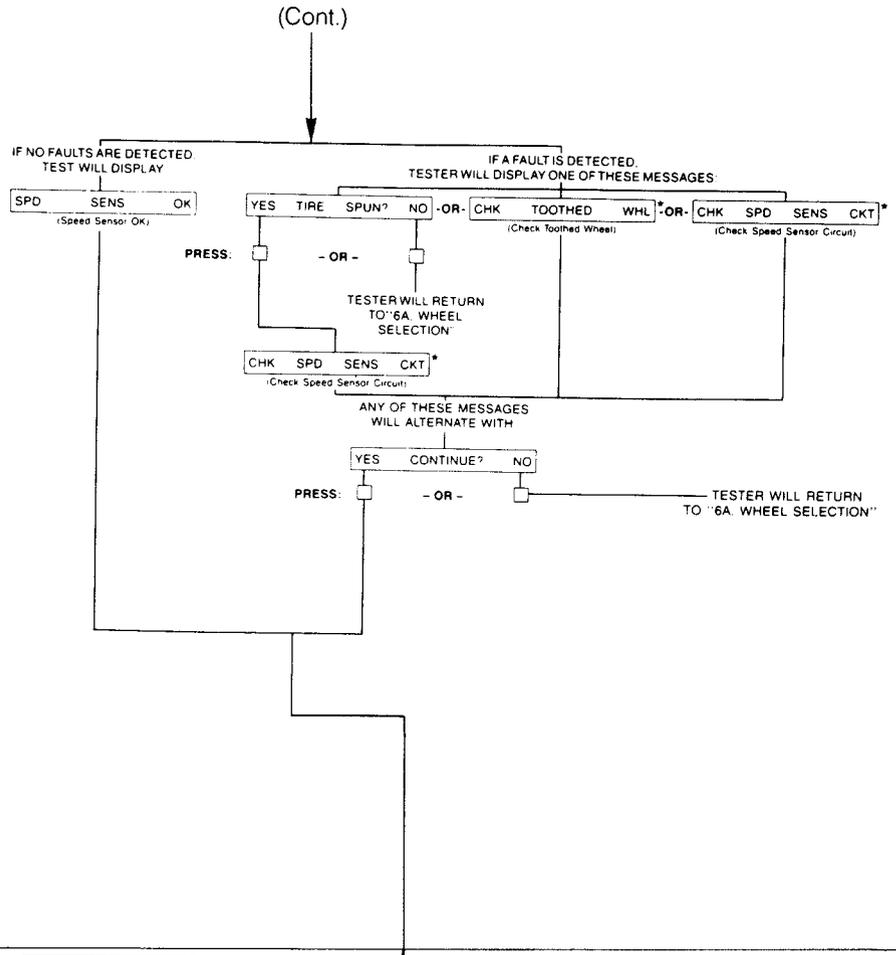
5B. BRAKE LIGHT SWITCH TEST



5C. PUMP TEST



6B. WHEEL SENSOR TEST



6C. SOLENOID TEST

NOTE: EACH OF THE TWO SOLENOID TESTS FOR EACH WHEEL CAN BE CONDUCTED FOR A MAXIMUM OF 15 SECONDS. IF TIME LIMIT IS EXCEEDED, TESTER WILL DISPLAY:

TIMEOUT EXPIRED

THEN

TRY TEST AGAIN

PUSH TEST 1

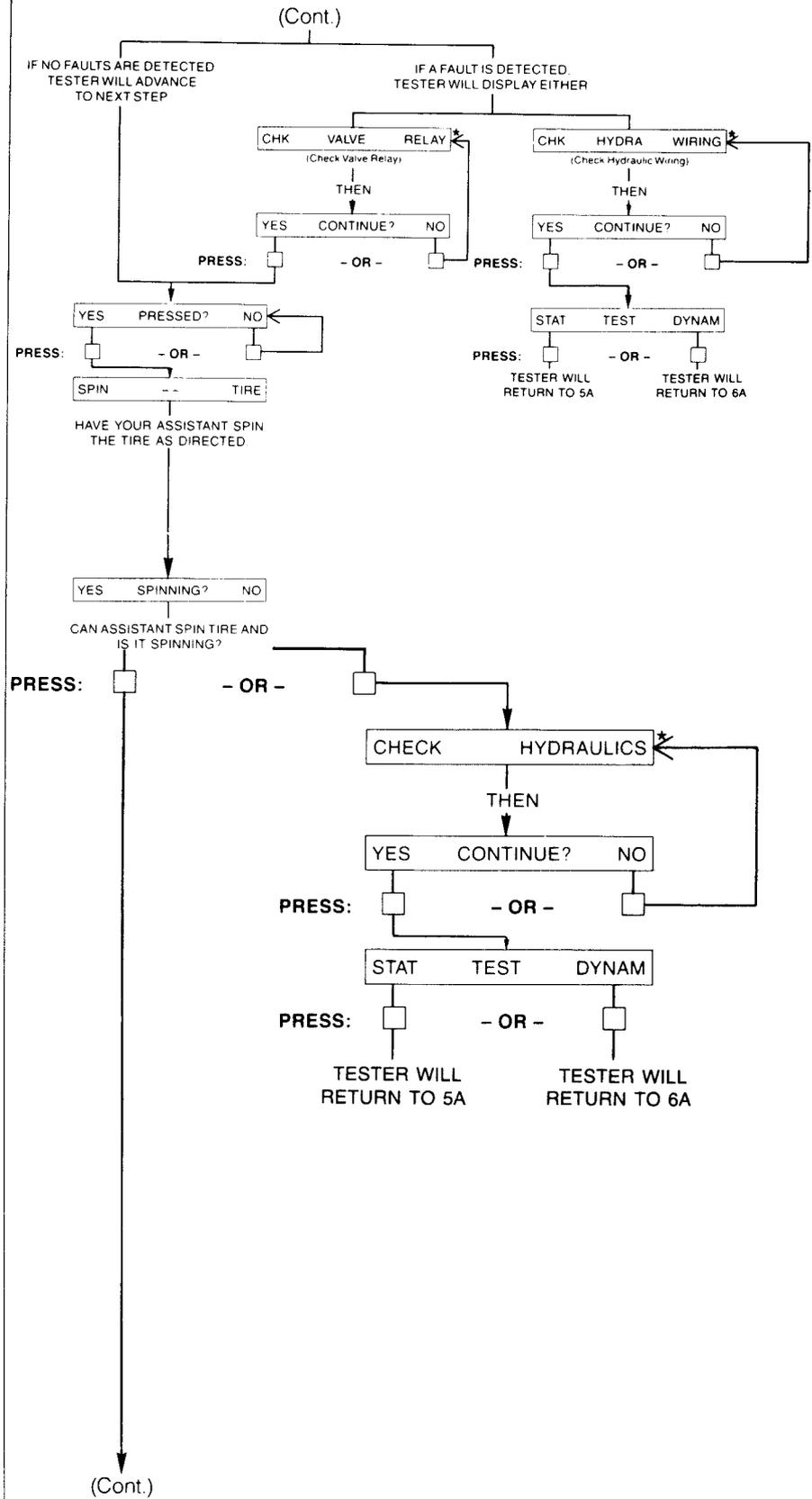
PUSH EITHER SWITCH TO START THIS TEST. TESTER WILL DISPLAY:

PRESS BRK... HOLD

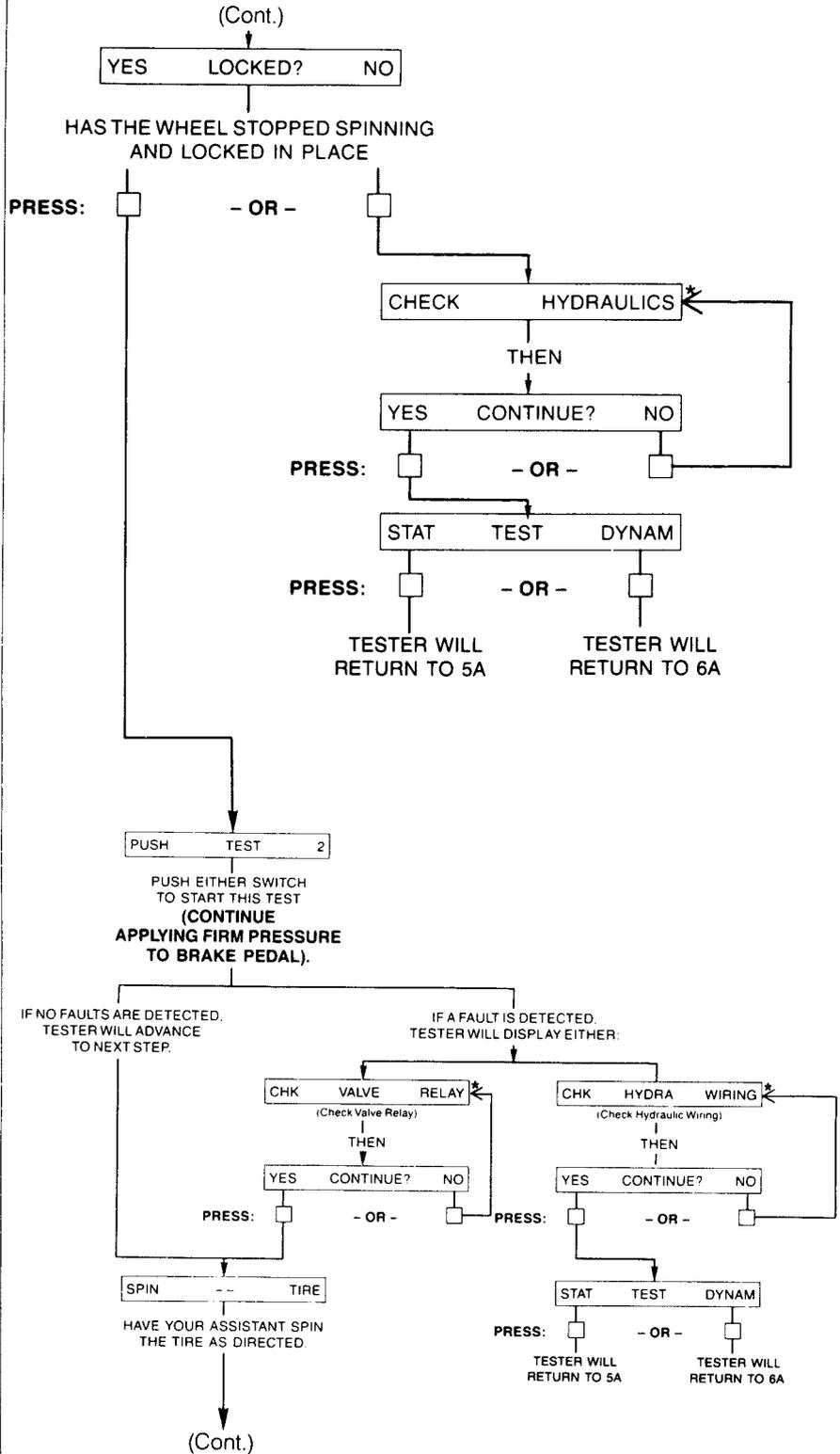
APPLY FIRM PRESSURE TO BRAKE PEDAL, AND HOLD FIRMLY THROUGH SOLENOID TEST 1 AND TEST 2.

(Cont.)

6C. SOLENOID TEST

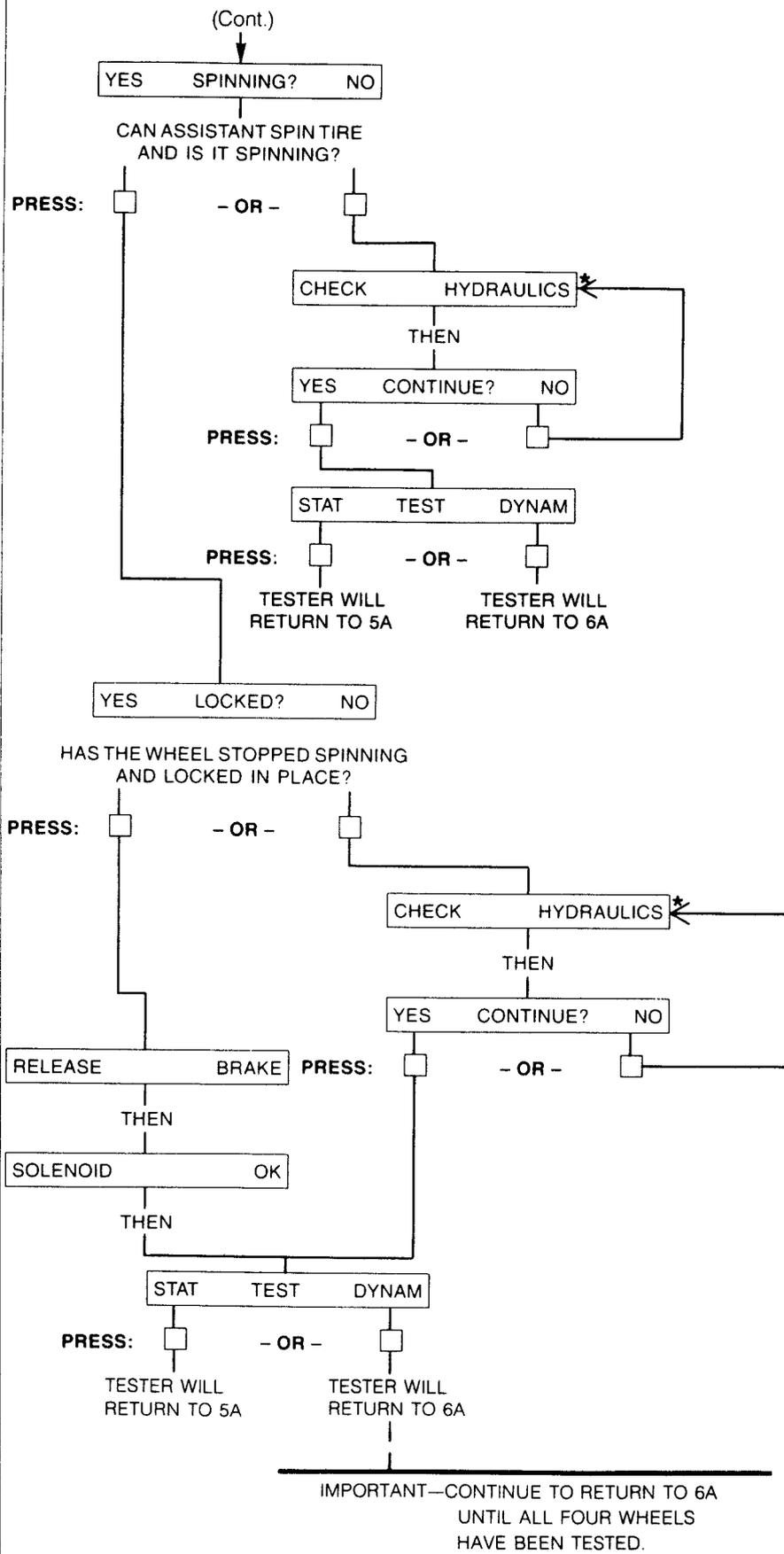


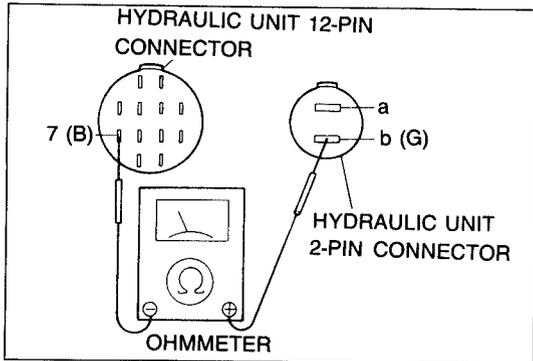
6C. SOLENOID TEST



P ANTI-LOCK BRAKE SYSTEM (ABS)

6C. SOLENOID TEST

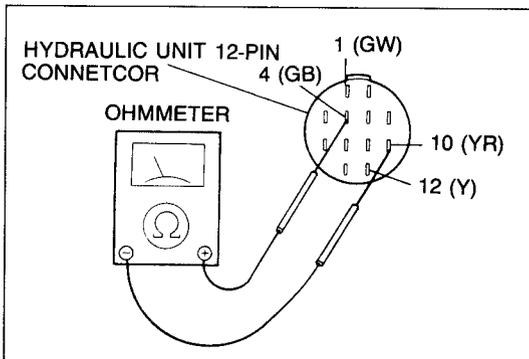




97U0PX-072

HYDRAULIC UNIT On-vehicle Inspection Pump motor

1. Disconnect the hydraulic unit 12-pin connector.
2. Check for continuity between terminal 7 (B) wire of 12-pin connector and ground.
3. If OK, check for continuity between terminal 7 (B) wire of 12-pin connector and terminal b (G) wire of 2-pin connector.
4. If OK, connect the hydraulic unit connectors.
5. Disconnect the control unit connector and check for continuity between terminal b (G) wire and ground.
6. If OK, check for poor connection of the control unit connector or faulty control unit.



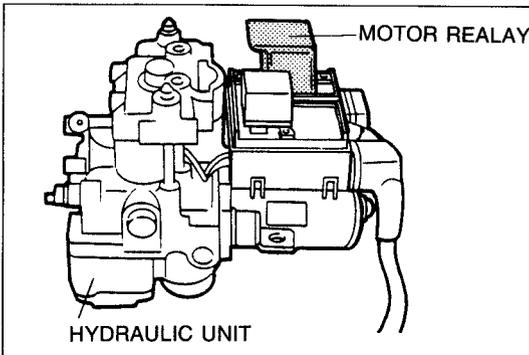
97U0PX-073

Solenoid valves

1. Disconnect the hydraulic unit 12-pin connector.
2. Using an ohmmeter, check for resistance of the terminals.

	Resistance (Ω)
4 (GB)-10 (YR) (Left Front Valve)	Approx. 1.0—1.2
(GW)-10 (YR) (Right Front Valve)	Approx. 1.0—1.2
12 (Y)-10 (YR) (Rear Valve)	Approx. 1.0—1.2

3. If resistance is as specified, check the wiring harness between the hydraulic unit and ABS control unit.



97U0PX-074

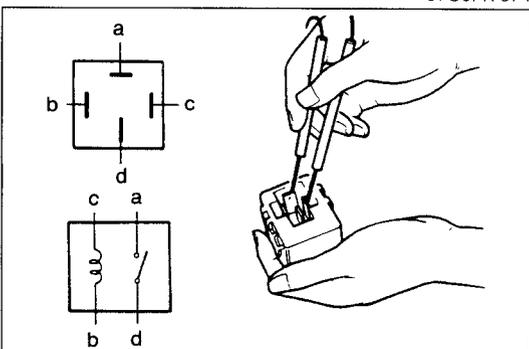
Motor relay

1. Disconnect the negative battery cable.
2. Release the motor relay lock from the hydraulic unit and remove the motor relay.
3. Connect an ohmmeter and check for continuity at the relay terminals.

Connect to		a	b	c	d
12V	Ground				
—	—		○—○		
c	b	○—			○—

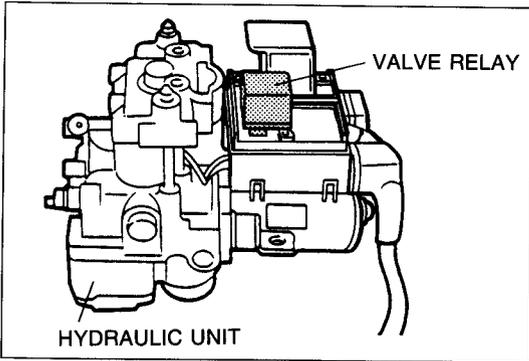
○—○: Indicates continuity

4. If continuity is not as specified, replace the motor relay.
5. If OK, check the wiring harness between the motor relay and control unit main fuse (ABS 60A).

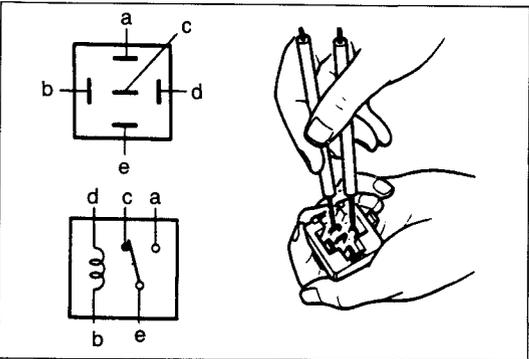


97U0PX-075

P ANTI-LOCK BRAKE SYSTEM (ABS)



97U0PX-076



97U0PX-077

Valve relay

1. Disconnect the negative battery cable.
2. Release the valve relay locks from the hydraulic unit and remove the valve relay.
3. Using an ohmmeter, check continuity of the relay terminals.

Connect to		a	b	c	d	e
12V	Ground					
—	—		○	○	○	○
b	d	○				○

○—○: Indicates continuity

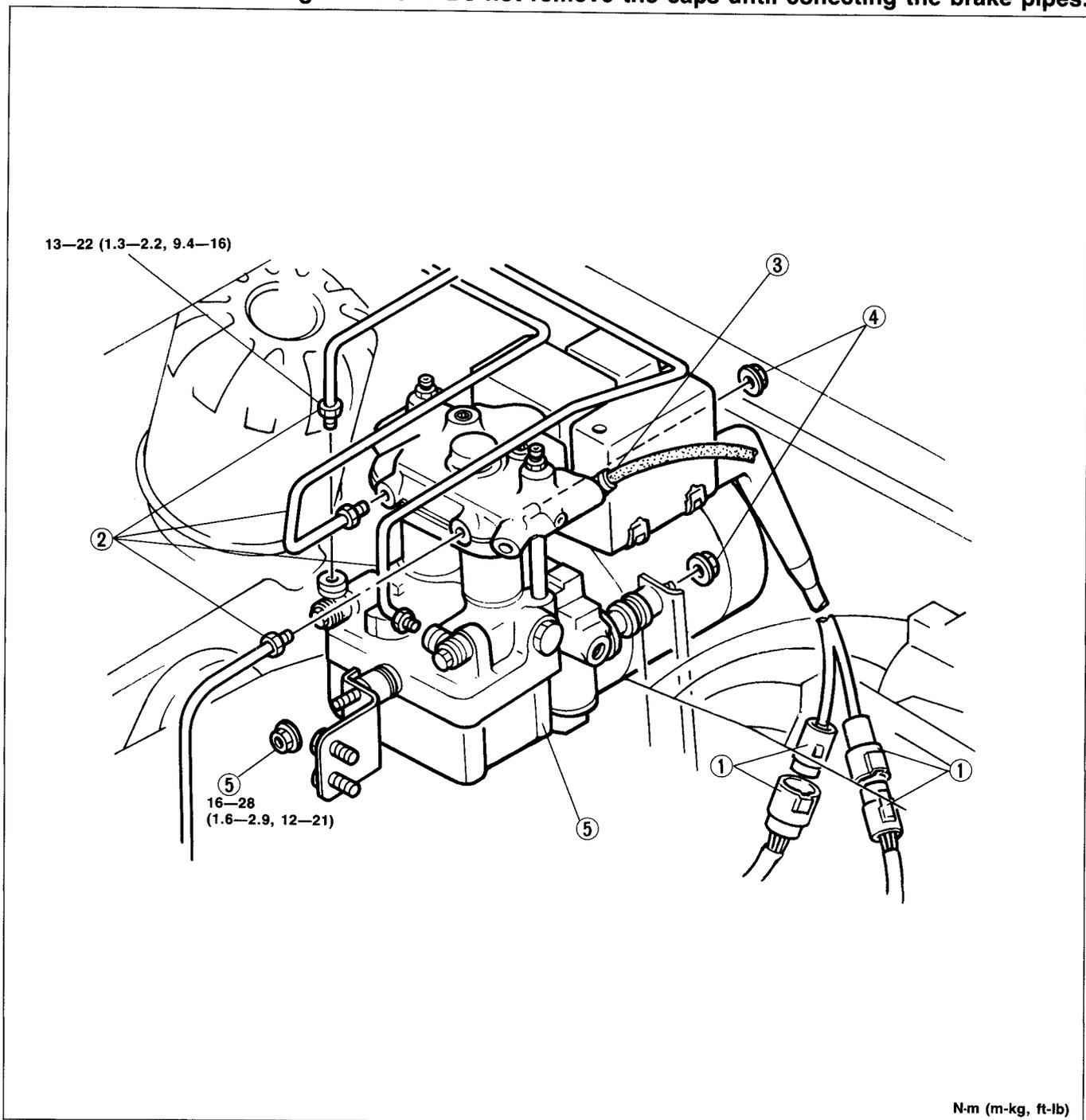
4. If continuity is not as specified, replace the valve relay.

Removal and Installation

1. Remove the negative battery cable.
2. Remove in the sequence shown in the figure, referring to **Removal Note**.
3. Install in the reverse order of removal, referring to **Installation Note**.

Caution

- a) The only serviceable parts of the hydraulic unit are the valve relay and the pump motor relay; if there is a failure of any other part, the hydraulic unit must be replaced as an assembly.
- b) Brake pipe caps are attached onto the pipes in a new hydraulic unit to prevent dust or foreign material from entering into them. Do not remove the caps until connecting the brake pipes.

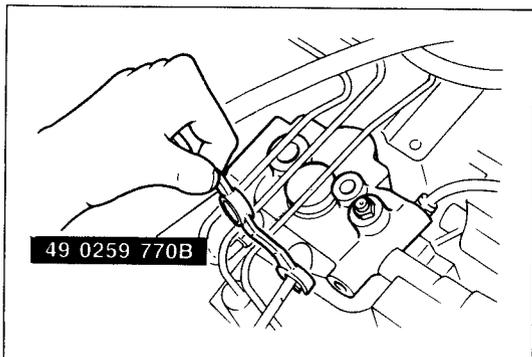


N-m (m-kg, ft-lb)

97U0PX-078

- | | |
|------------------------|---------------------------------------|
| 1. Harness connectors | 4. Nuts |
| 2. Brake pipes | 5. Hydraulic unit |
| Removal..... page P-66 | On-vehicle inspection page P-63 |
| 3. Flexible hose | Installation..... page P-66 |

P ANTI-LOCK BRAKE SYSTEM (ABS)

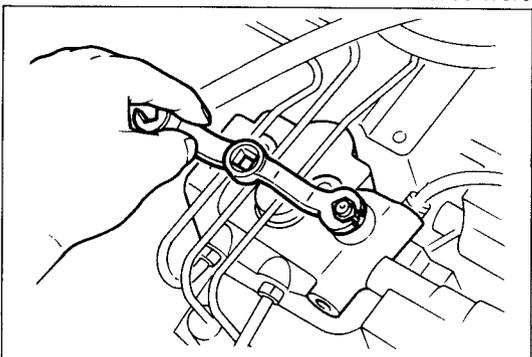


97U0PX-079

Removal note

Brake pipes

Remove the brake pipes from the hydraulic with the **SST**.



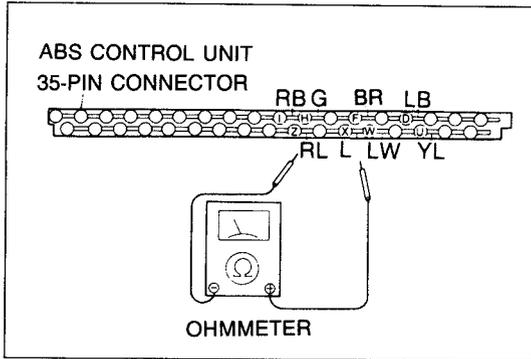
97U0PX-080

Installation note

Hydraulic unit

After installing the hydraulic unit, bleed air in the following order.

1. Rear left wheel cylinder
2. Rear right wheel cylinder
3. Front left wheel cylinder
4. Front right wheel cylinder
5. Hydraulic unit (two bleeders)



97U0PX-081

SPEED SENSOR AND ROTOR

Inspection

Speed sensor

- Using an ohmmeter, check for continuity at the control unit connector terminals.

Sensor \ Terminal	D	F	H	I	U	W	X	Z
Left front	○—○							
Right front					○—○			
Left rear			○—○					
Right rear							○—○	

○—○: Indicates continuity

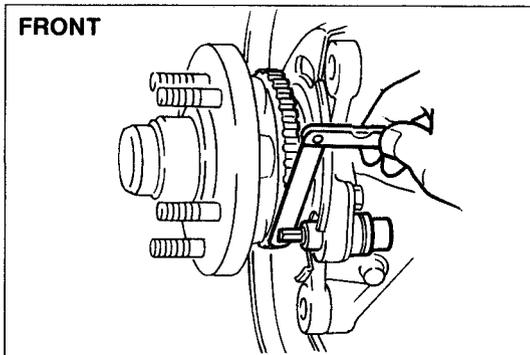
- If the continuity is not as specified, check the wiring harness between the wheel-speed sensor and control unit.
- If the continuity is OK, check voltage between D and F, H and I, U and W, and X and Z while rotating the wheel one rotation per second by hand.
- If voltage is not approx. 50 mV—60 mV, the wheel-speed sensor is faulty.
- If voltage is approx. 50 mV—60 mV, the control unit is faulty.

97U0PX-082

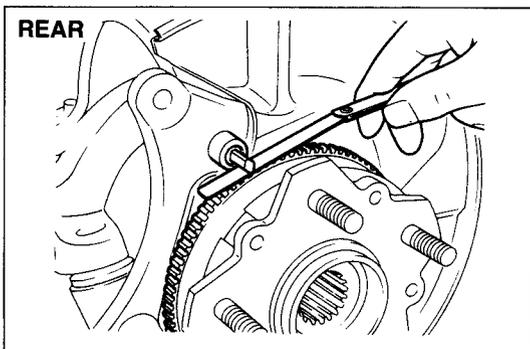
Caution

When checking control unit terminals, do not use ordinary tester pins. Use only very thin pins to prevent damage to the terminals.

97U0PX-083



97U0PX-084



77U11X-037

Speed sensor and rotor

- Remove the front and rear wheels.
- Remove the front and rear disc plates.
- Check the clearance between the speed sensor pickup and the rotor.

Specified clearance:

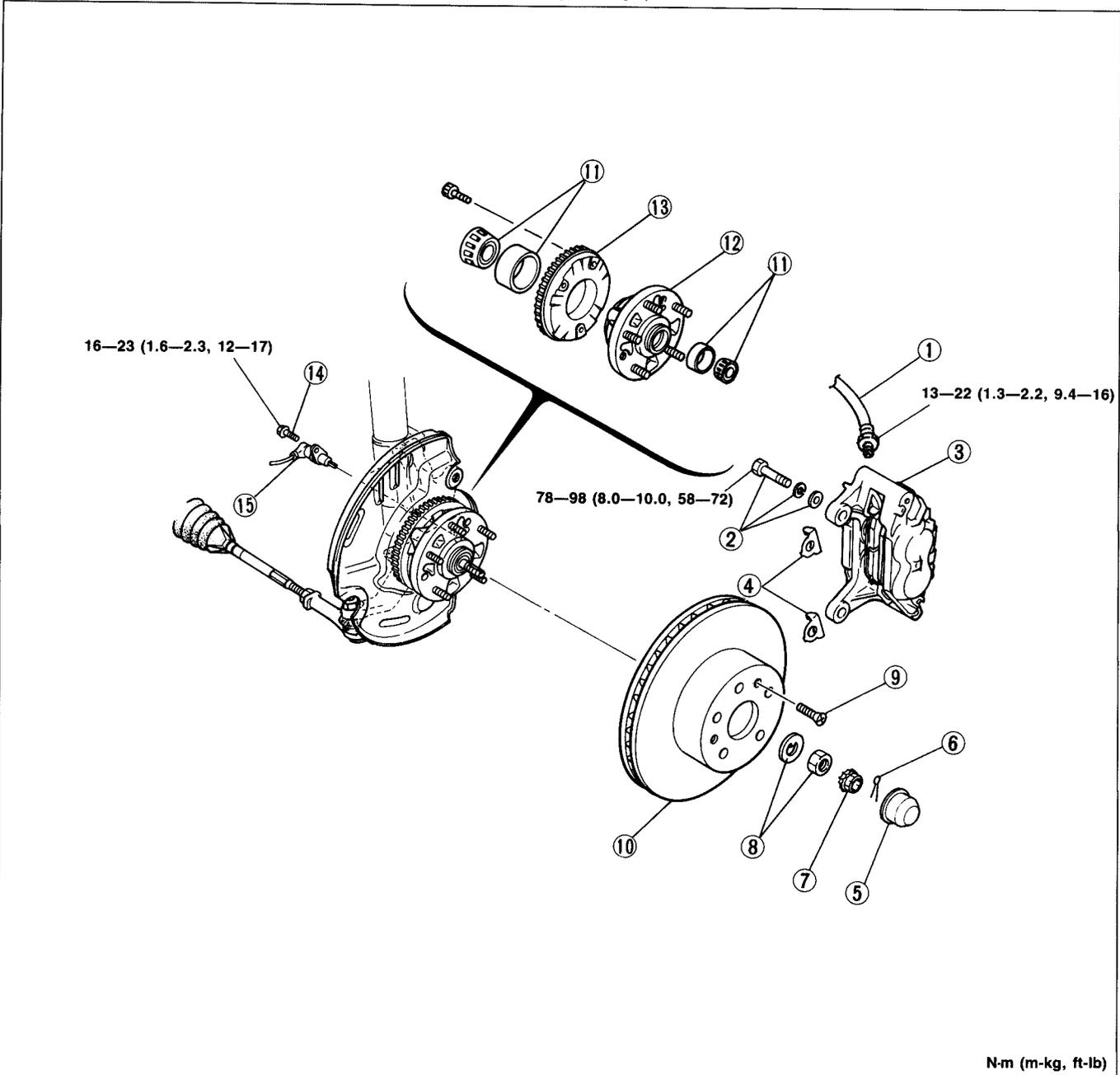
0.4—1.0mm (0.0157—0.0394 in)

- If the clearance is not within specification, replace the speed sensor or rotor.

P ANTI-LOCK BRAKE SYSTEM (ABS)

Removal, Inspection and Installation (Front)

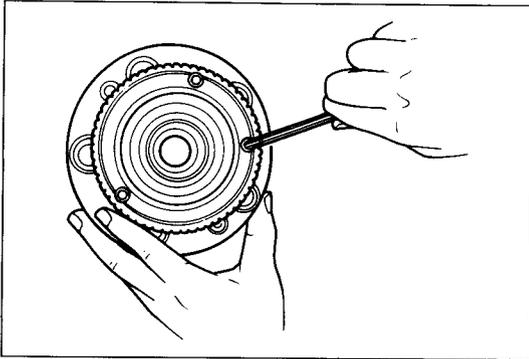
1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheel.
3. Remove in the sequence shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Visually inspect all parts and repair or replace any faulty parts.



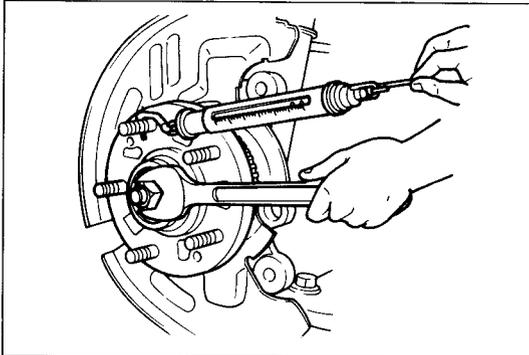
N-m (m-kg, ft-lb)

97U0PX-085

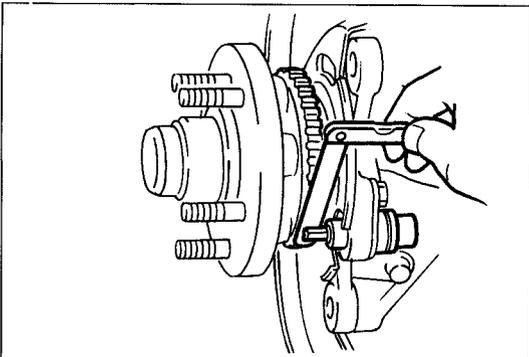
- | | | | |
|--|-----------|--|-----------|
| 1. Brake pipe
Removal..... | page P-40 | 10. Disc plate
Inspect for damage or wear | |
| 2. Bolt and washers | | 11. Bearing and race
Inspect for damage or wear | |
| 3. Caliper assembly | | 12. Front hub | |
| 4. Guide plate | | 13. Sensor rotor
Removal..... | page P-69 |
| 5. Hub cap | | Inspect for damage or wear | |
| 6. Clip | | 14. Bolt | |
| 7. Set cover | | 15. Speed sensor
Installation..... | page P-69 |
| 8. Locknut and washer
Installation..... | page P-69 | | |
| 9. Screw | | | |



97U0PX-086



97U0PX-087



97U0PX-088

Removal note

Rotor

Remove the bolts with an allen wrench and remove the rotor from the front hub.

Installation note

Locknut

1. Loosely tighten the new locknut.
2. Adjust the front wheel bearing preload. (Refer to Section M.)

Speed sensor and rotor

Check the clearance between the speed sensor and rotor.

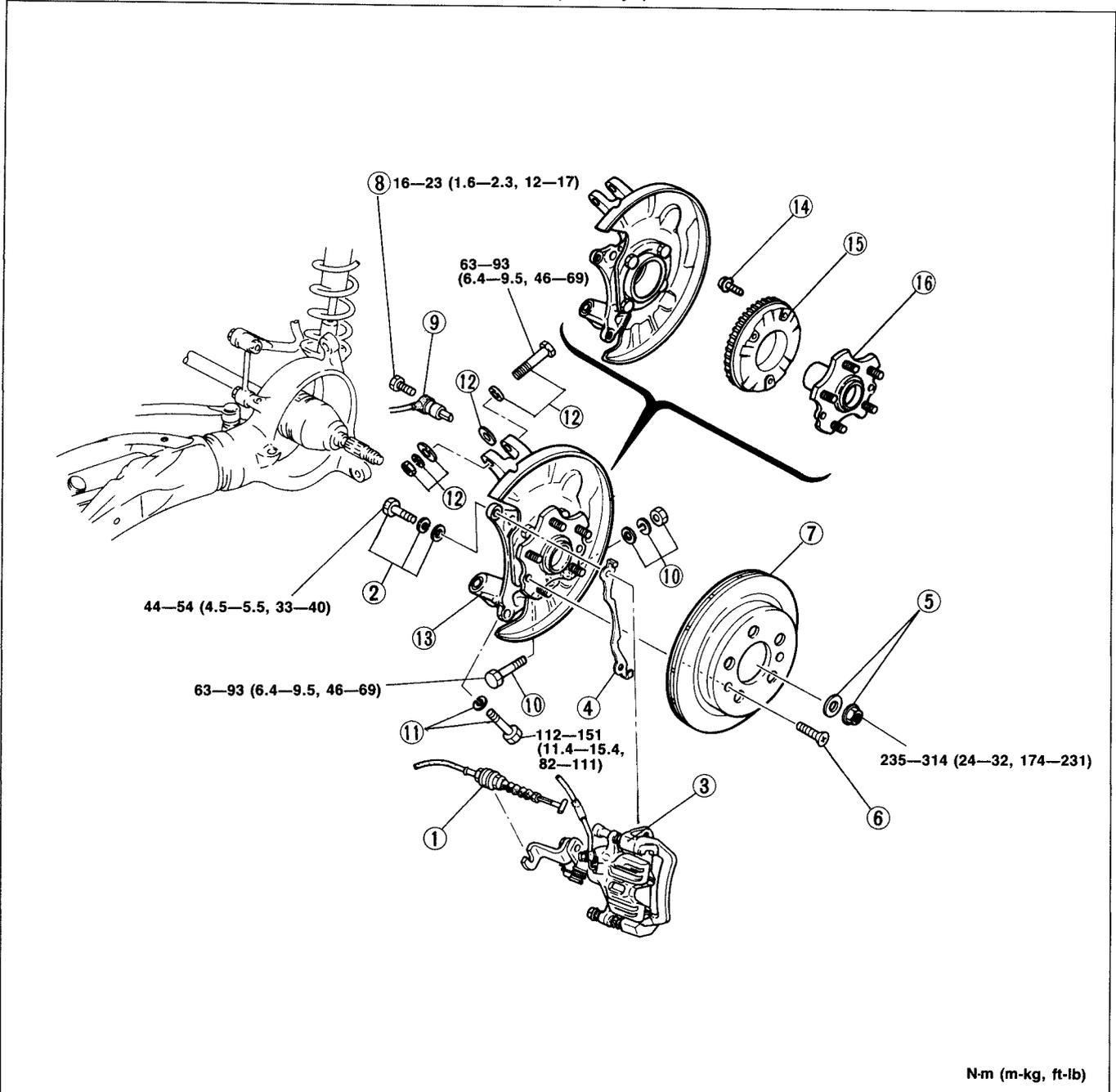
Specified clearance:

0.4—1.0mm (0.016—0.039 in)

P ANTI-LOCK BRAKE SYSTEM (ABS)

Removal, Inspection and Installation (Rear)

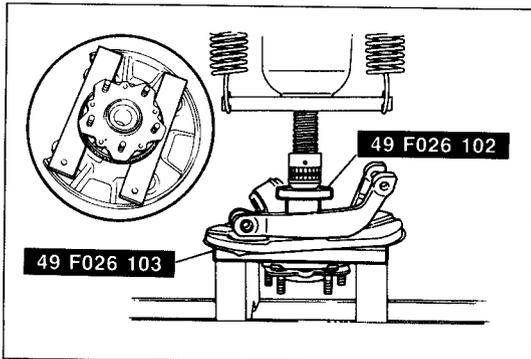
1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheel.
3. Remove in the sequence shown in the figure, referring to **Removal Note**.
4. Install in the reverse order of removal, referring to **Installation Note**.
5. Visually inspect all parts and repair or replace any faulty parts.



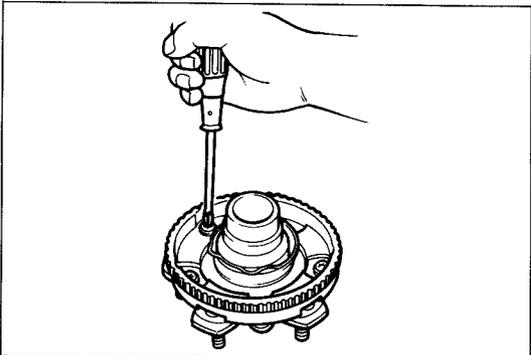
97U0PX-089

1. Parking brake cable
2. Bolt and washers
3. Brake caliper assembly
4. Guide plate
5. Locknut and washer
6. Screw
7. Disc plate
8. Bolt

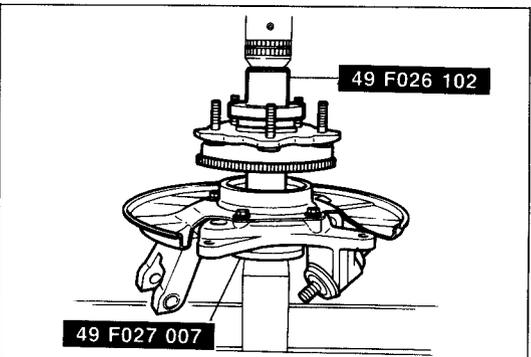
9. Speed sensor
Installation..... page P-71
10. Bolt, washers and nut
11. Bolt and washer
12. Bolt, washers and nut
13. Control hub assembly
14. Bolt
15. Sensor rotor
Removal/Installation..... page P-71
16. Hub



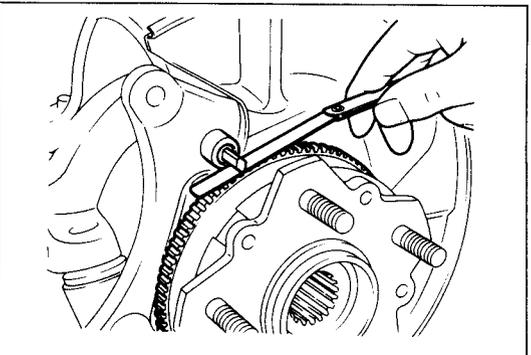
97U0PX-090



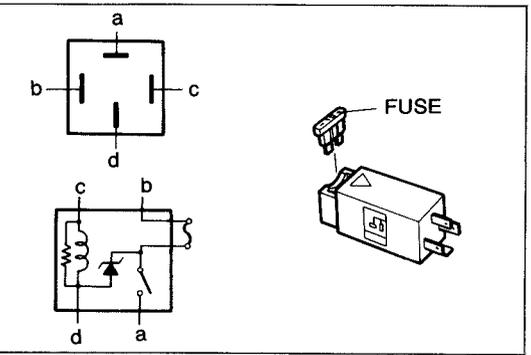
77U11X-035



97U0PX-091



97U0PX-088



97U0PX-092

Removal note

Rotor

1. Remove the wheel hub from the outer toe control hub with the **SST**.

2. Remove the screws and the rotor from the wheel hub.

Installation note

Rotor

1. Install the rotor onto the wheel hub.
2. Install the wheel hub onto the outer control hub with the **SST**.

Speed sensor and rotor

Check the clearance between the speed sensor and rotor.

Specified clearance:

0.4—1.0mm (0.016—0.039 in)

MAIN RELAY

On-vehicle Inspection

1. Disconnect the negative battery cable.
2. Disconnect the main relay connector.
3. Connect an ohmmeter, check for continuity of the terminals.

Connect to		a	b	c	d
12V	Ground				
—	—		○	○	○
c	b	○	○		

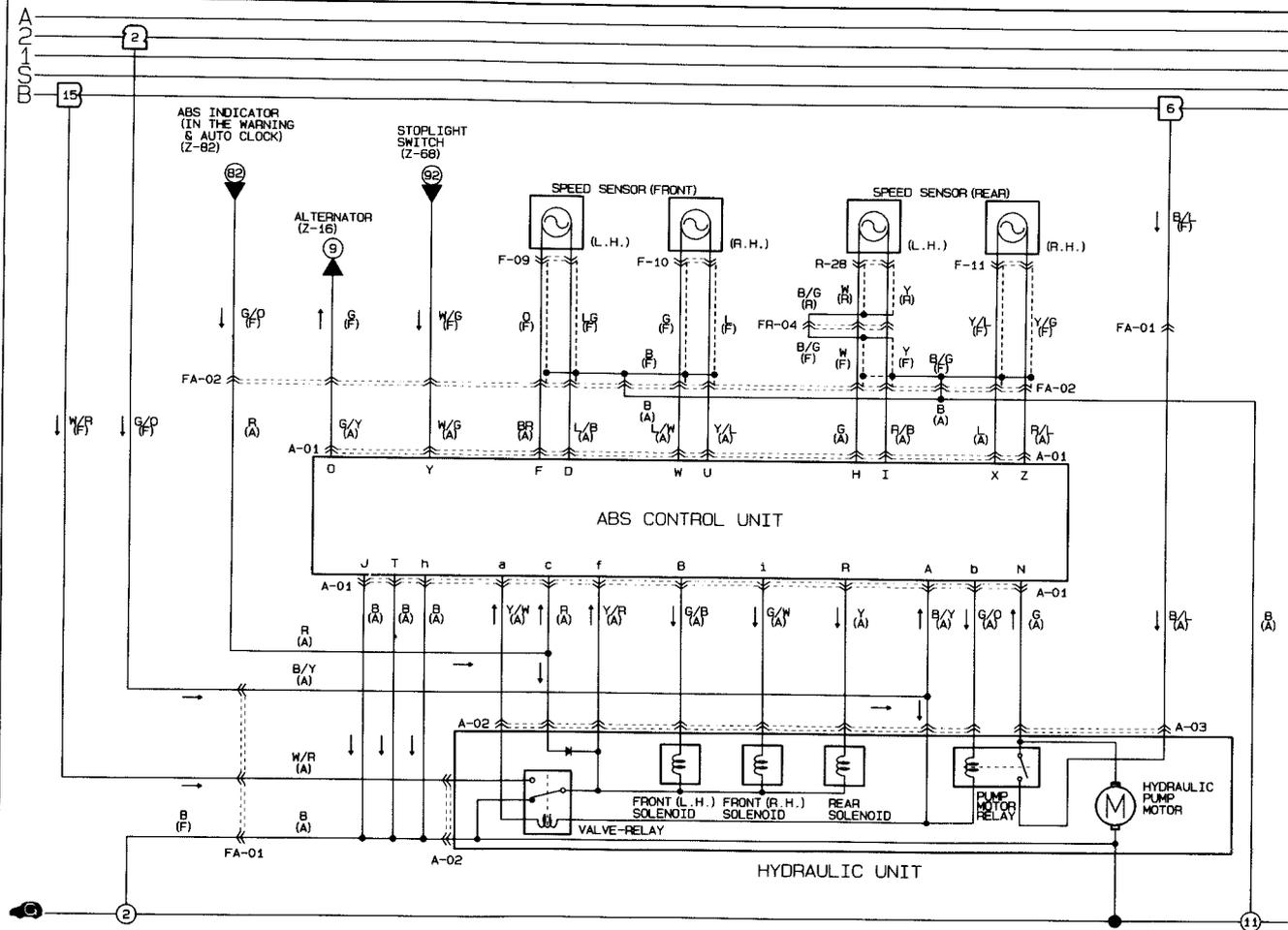
○—○: Indicates continuity

4. If continuity is not as specified, replace the main relay.

P ANTI-LOCK BRAKE SYSTEM (ABS)

CIRCUIT DIAGRAM

■ ABS (ANTI-LOCK BRAKE SYSTEM)



F-09 SPEED SENSOR FRONT (L.H.) (F)



F-10 SPEED SENSOR FRONT (R.H.) (F)



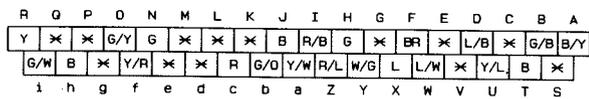
F-11 SPEED SENSOR REAR (L.H.) (F)



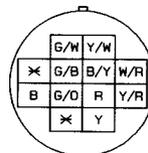
R-28 SPEED SENSOR REAR (R.H.) (R)



A-01 ABS CONTROL UNIT (A)



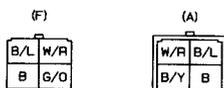
A-02 HYDRAULIC UNIT (A)



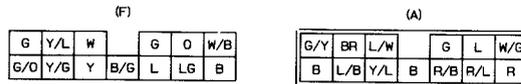
A-03 HYDRAULIC UNIT (A)



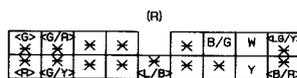
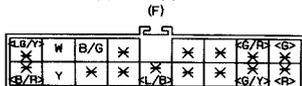
FA-01 FRONT (F) - ABS (A)



FA-02 FRONT (F) - ABS (A)



FR-04 FRONT (F) - REAR (R)



< > ... WITH REAR WINDOW WIPER & POWER DOOR LOCK