1989 Mazda RX-7 Factory Service Manual

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BRAKING SYSTEM

97U0PX-001

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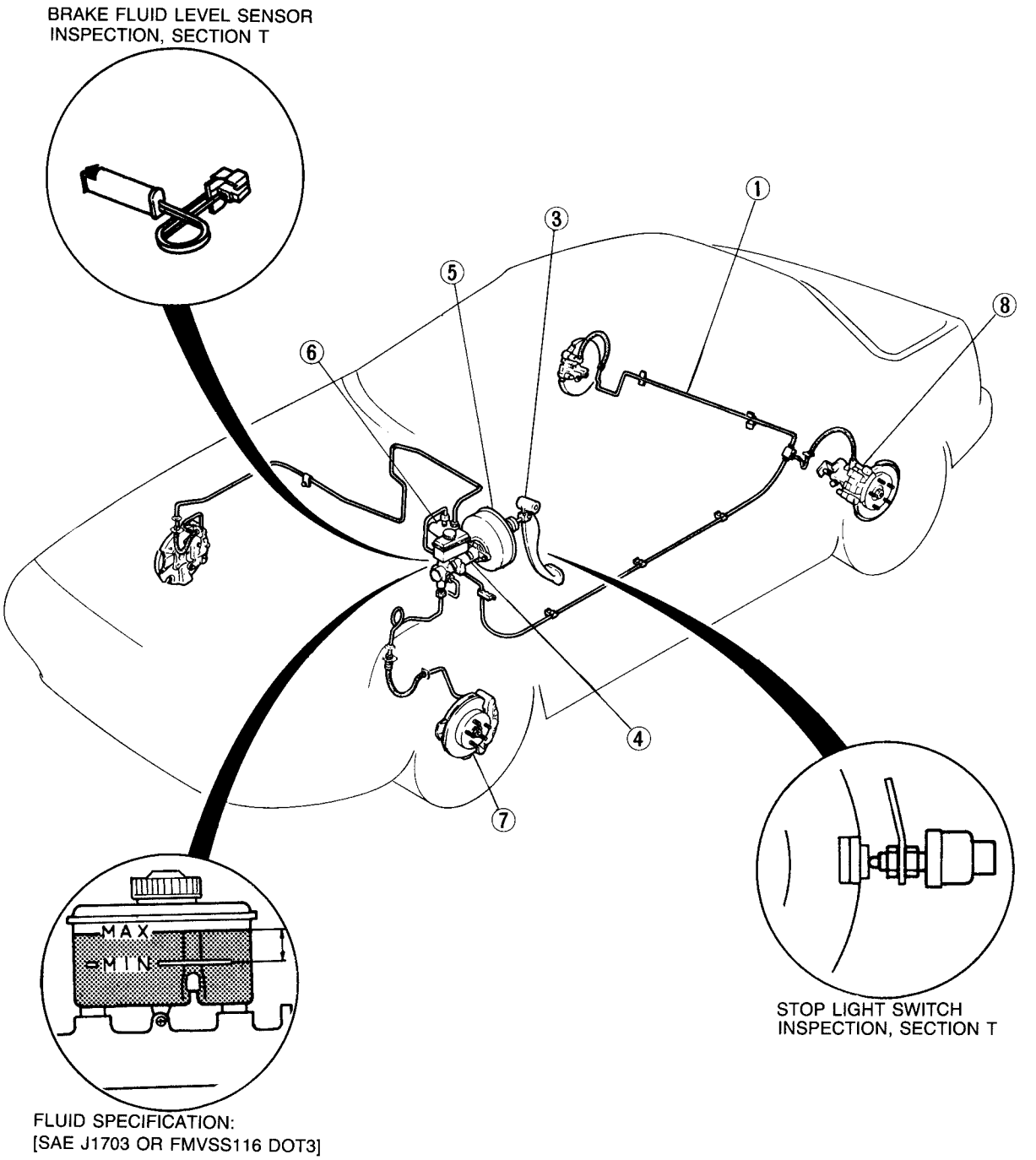
CONVENTIONAL BRAKE SYSTEM



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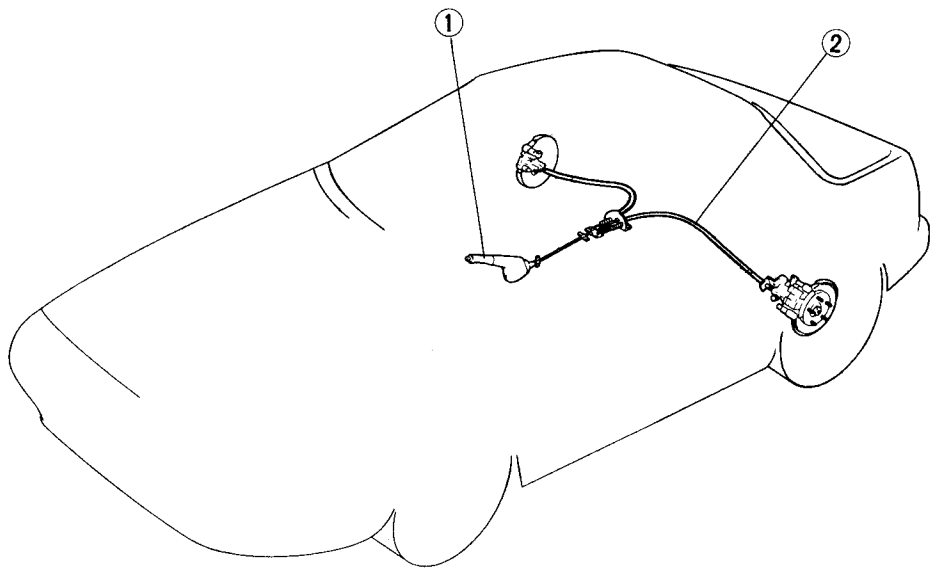
PARKING BRAKE SYSTEM



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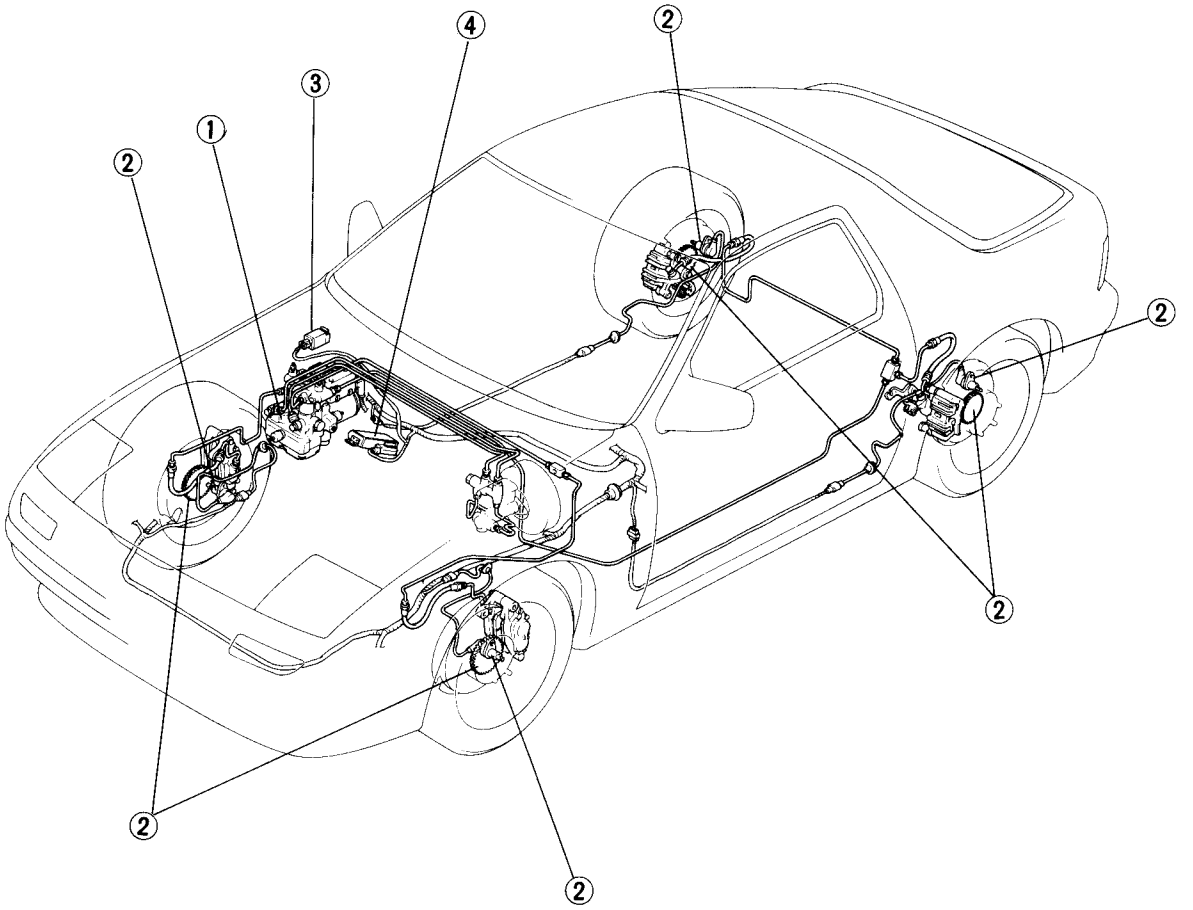
ANTI-LOCK BRAKE SYSTEM (ABS)



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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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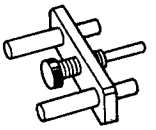
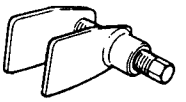
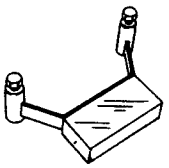
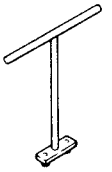
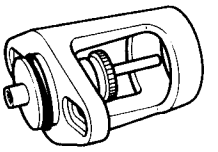
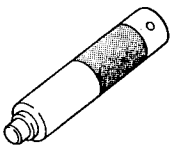
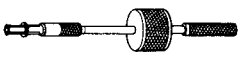
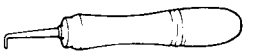
CONVENTIONAL BRAKE SYSTEM

PREPARATION
SST

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

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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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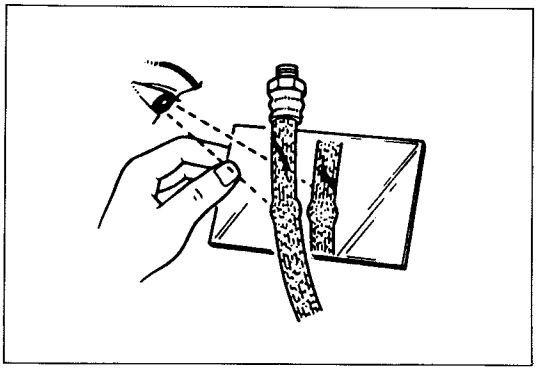

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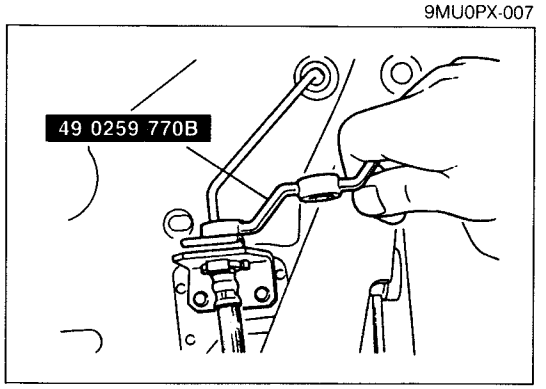

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BRAKE HYDRAULIC LINE

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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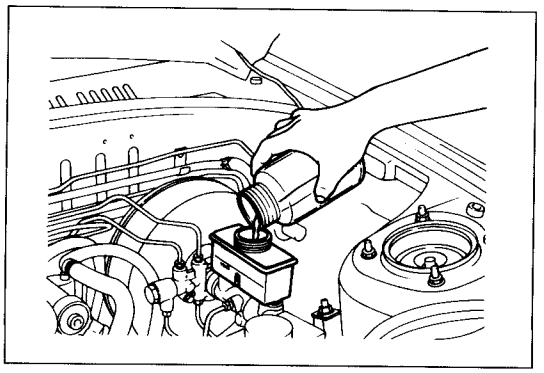

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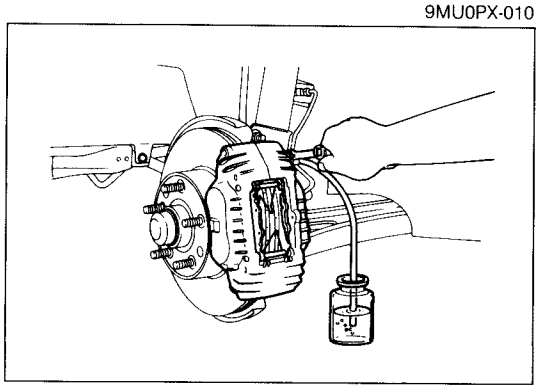

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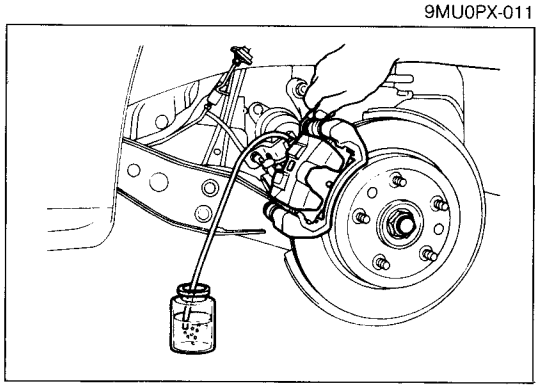

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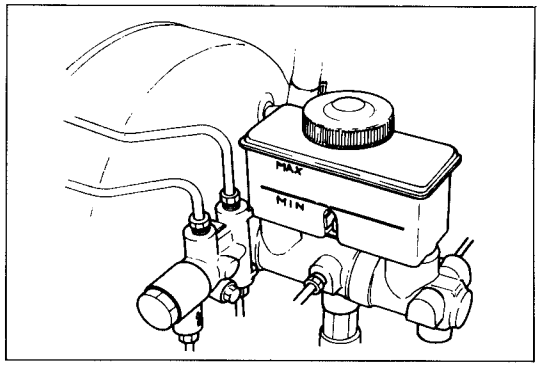

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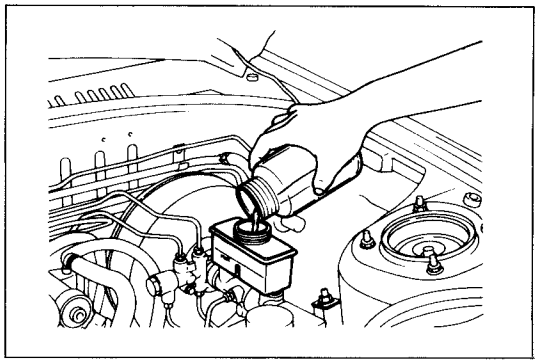

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Bleed air as described below.

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

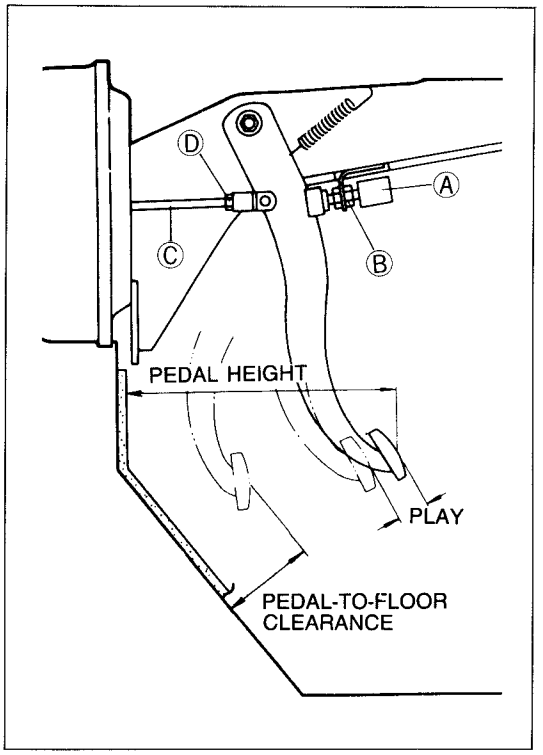
Inspection

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.



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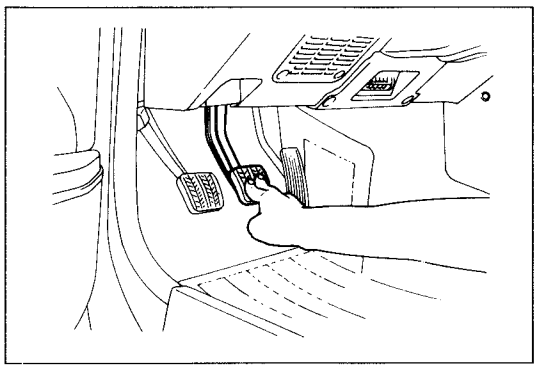

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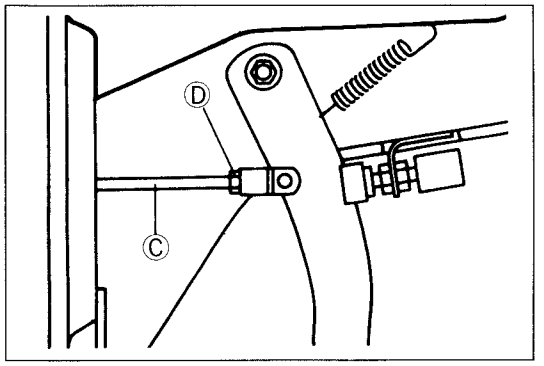

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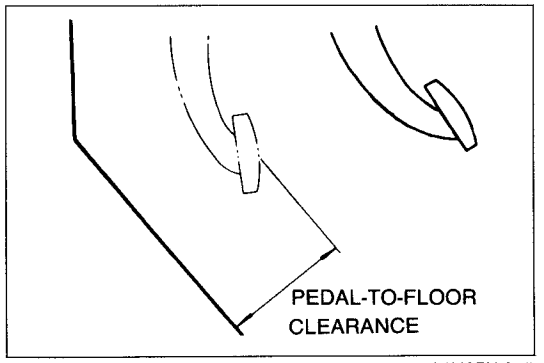

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BRAKE PEDAL

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)

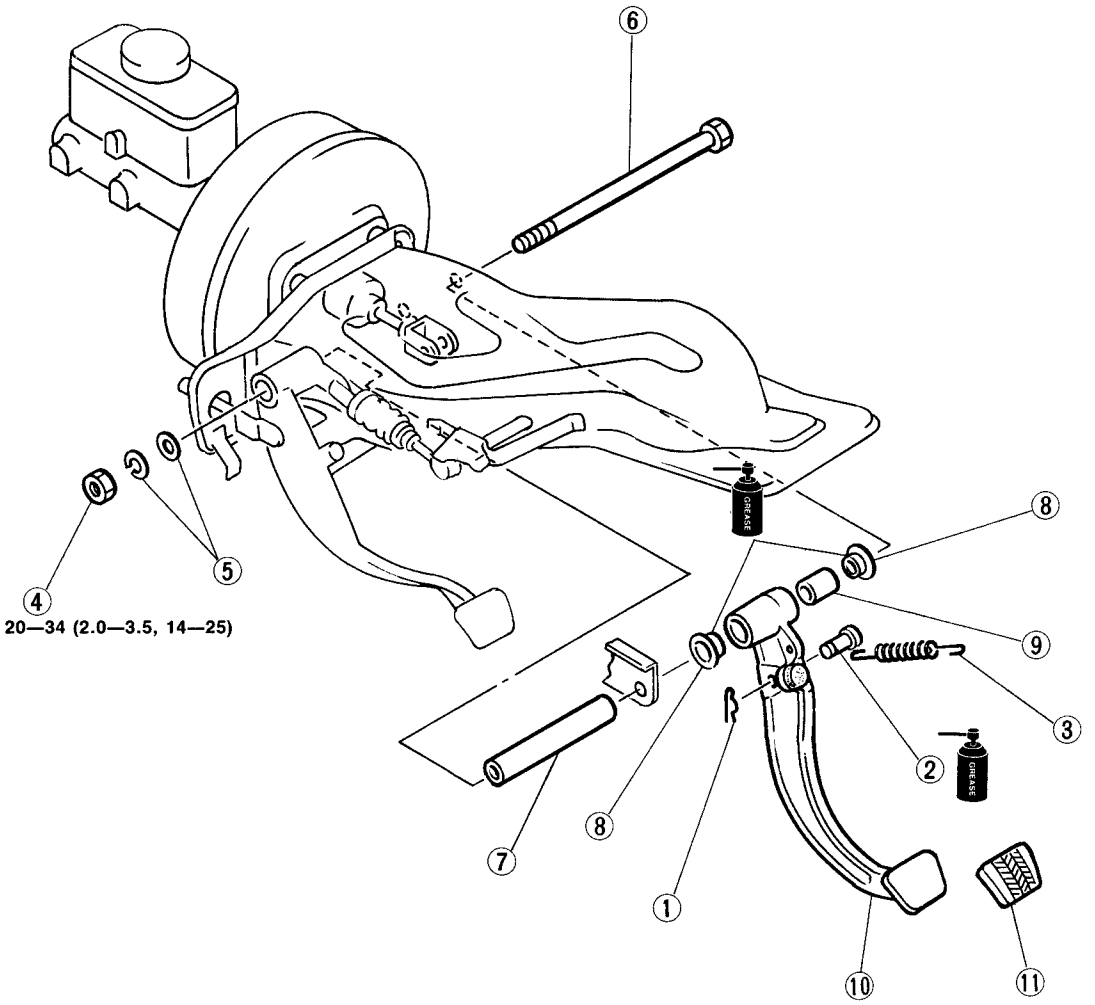
If the distance is less than specified, check for the following problems:

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 foulty 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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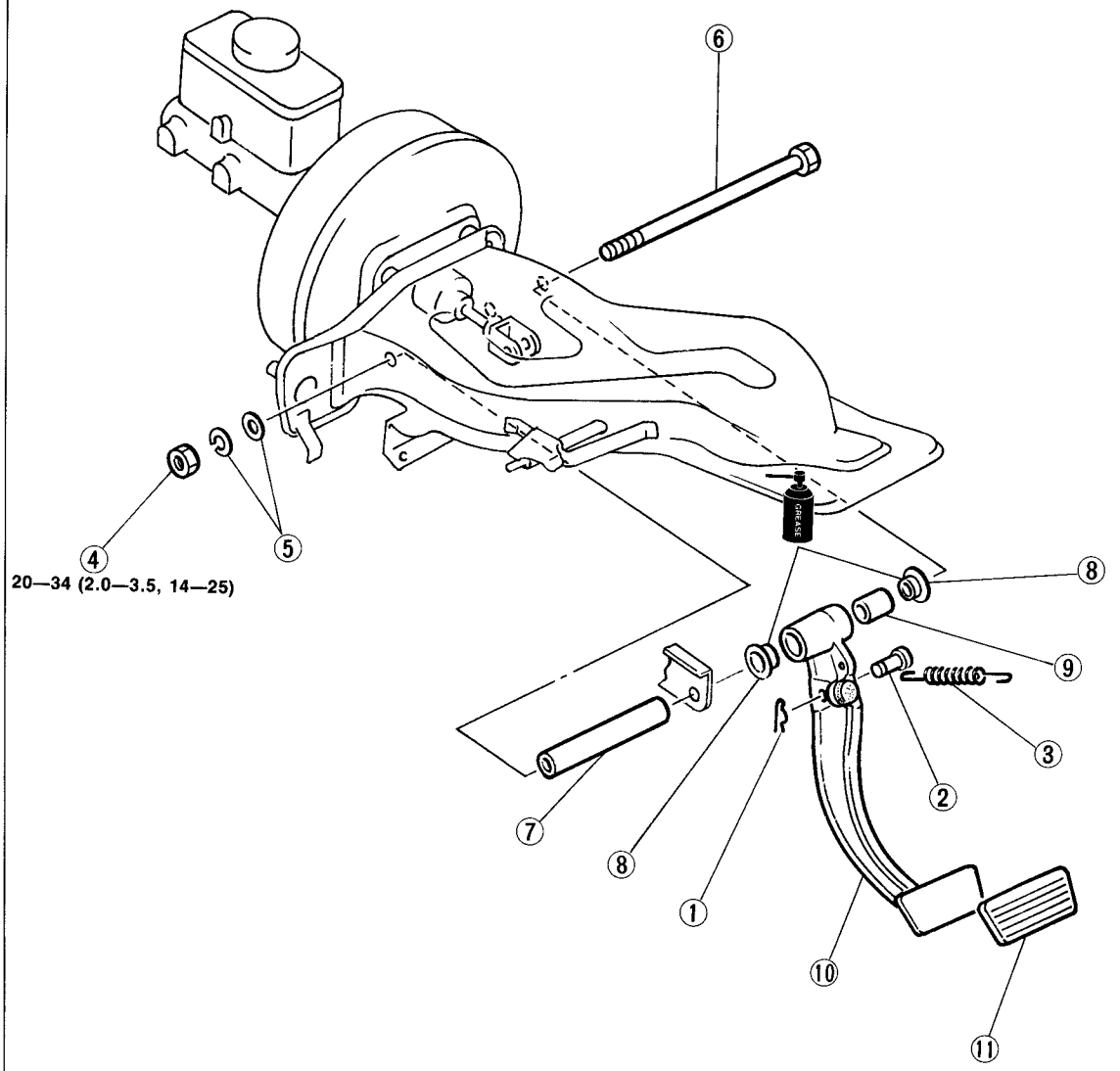
1. Cotter pin
2. Clevis pin
3. Return spring
4. Nut
5. Washers
6. Bolt
7. Spacer
8. Bushing
   Inspect for wear
9. Pedal pipe
10. Brake pedal
    Inspect for bending
11. Pedal pad
    Inspect for wear or damage

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

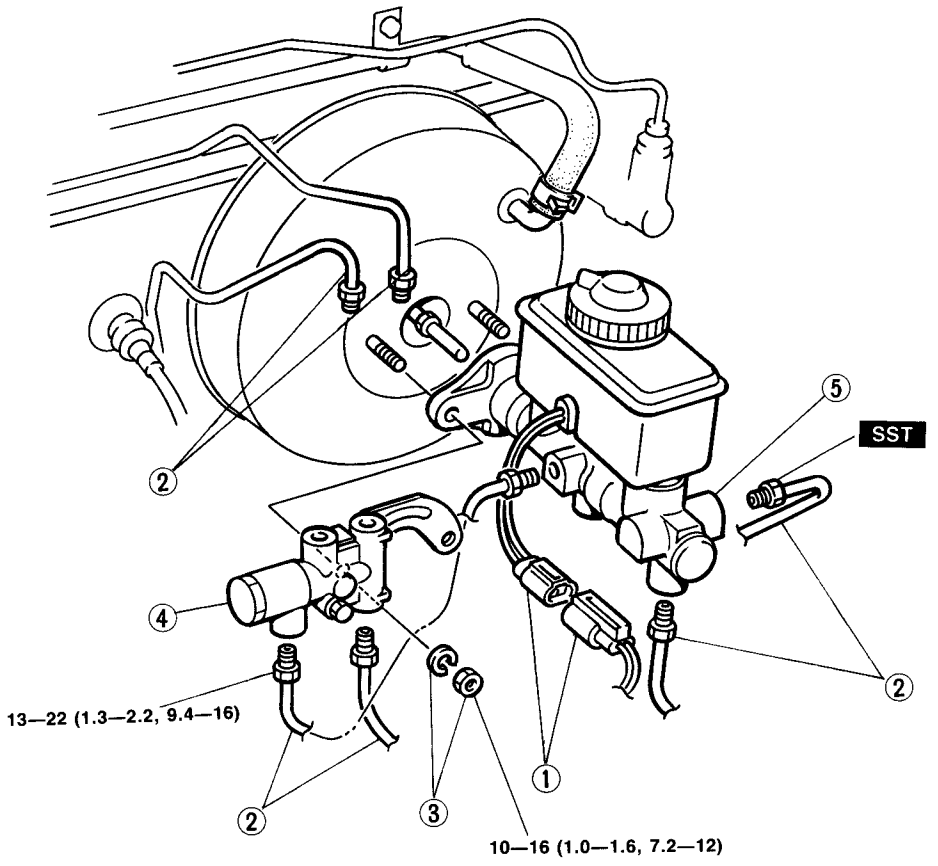
MASTER CYLINDER (NON-TURBO)

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.



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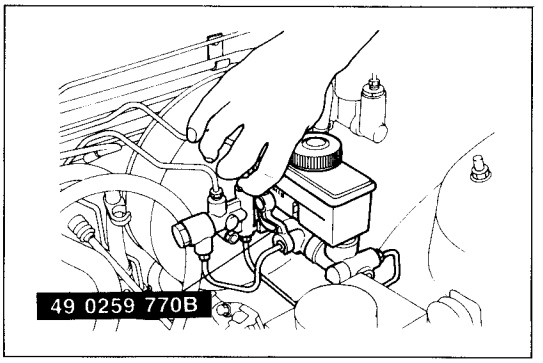
1. Fluid level sensor connector
2. Brake pipes
   Removal..... page P–13
3. Nut and washer
4. Proportioning bypass valve (PBV) and bracket
5. Master cylinder assembly
   Disassembly, Inspection and Assembly..... page P–15



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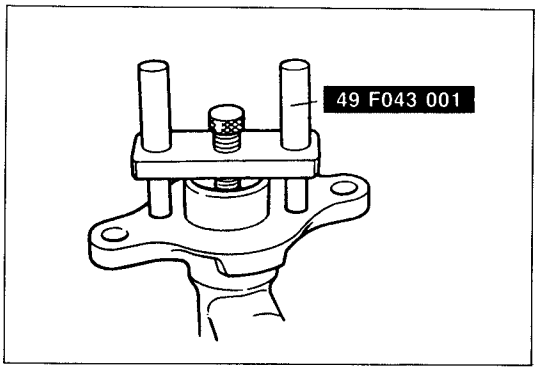
Removal note

Brake pipe

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



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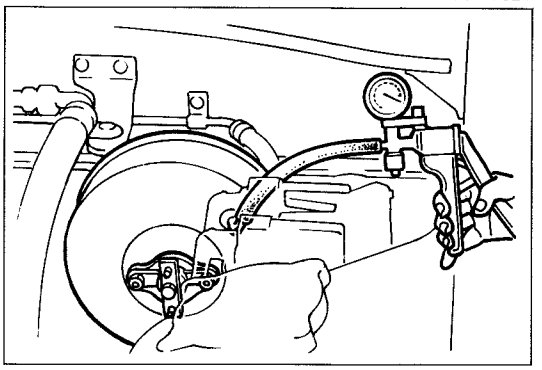

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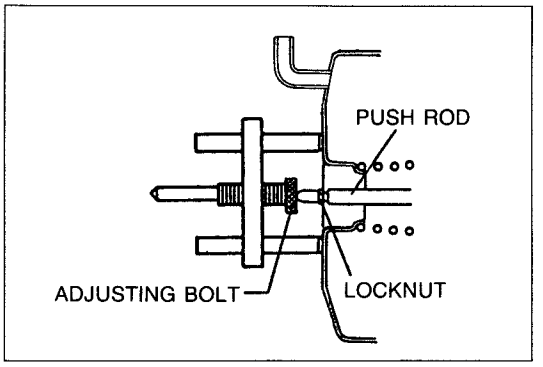

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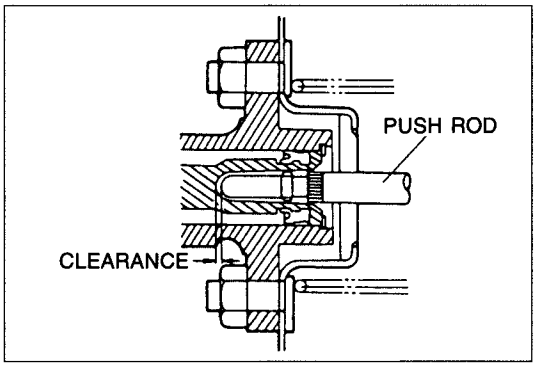

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Installation note

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.

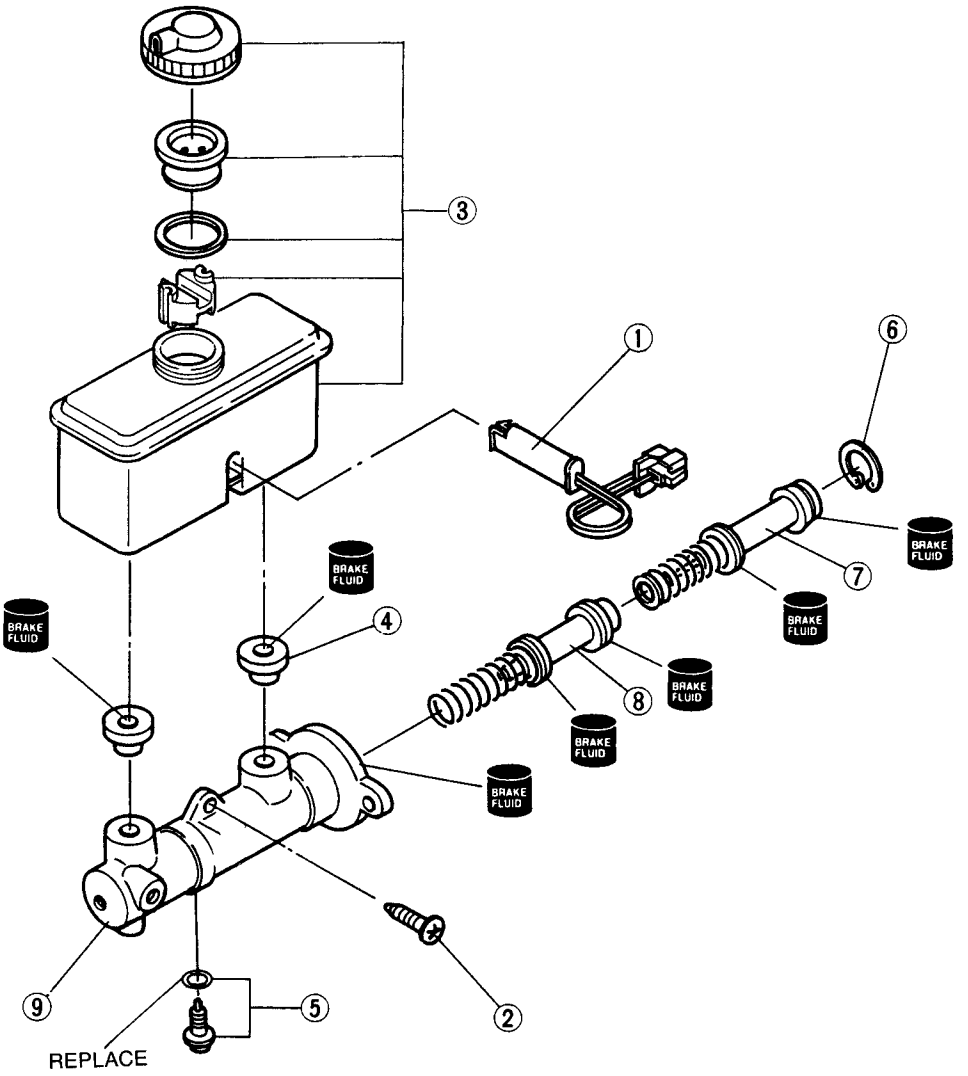
	Push rod-to-piston clearance
When vacuum applied to unit is approx. 500 mmHg (19.7 inHg)	0.1—0.3mm (0.004—0.012 in)

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**.

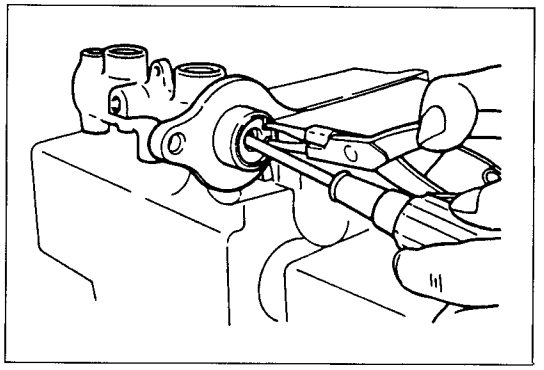
Caution

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.



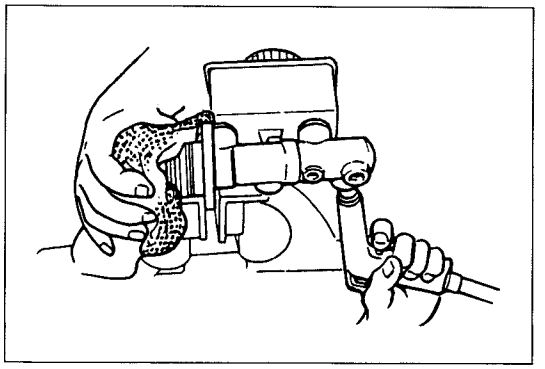
97U0PX-019

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



9MU0PX-027

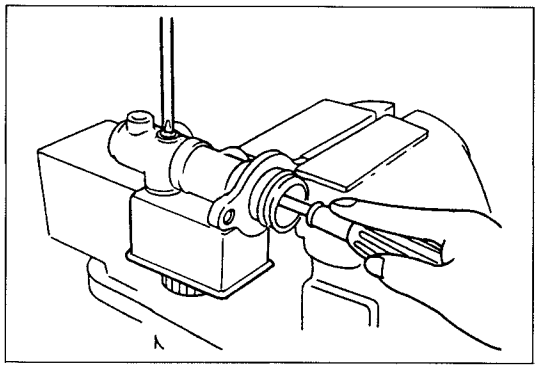
Disassembly note
Snap ring
Push the piston in to remove or install the snap ring with snap-ring pliers.



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

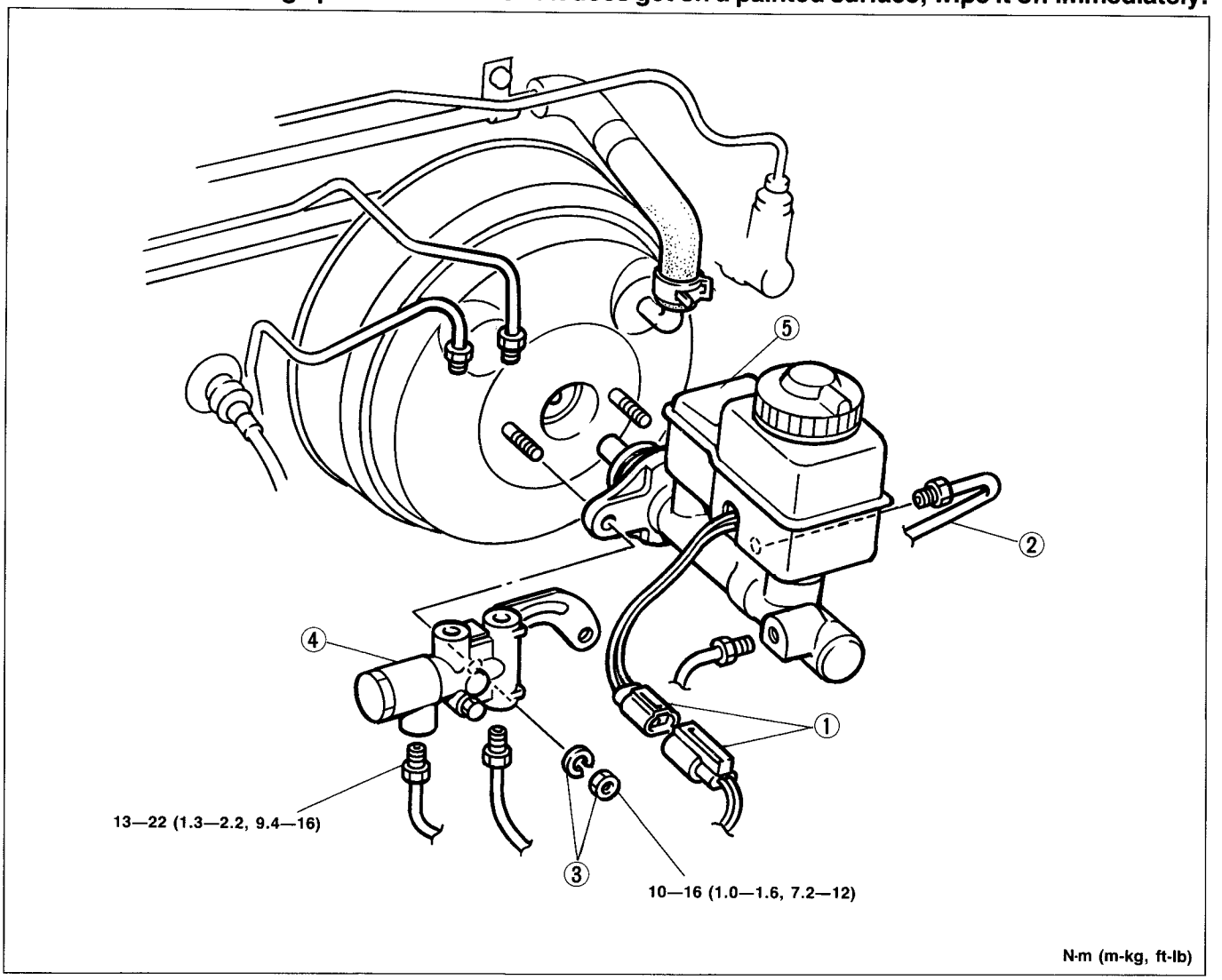
Assembly note
Stopper screw
1. Push the primary piston assembly in fully.
2. Install and tighten the stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.

MASTER CYLINDER (TURBO)

Removal and Installation

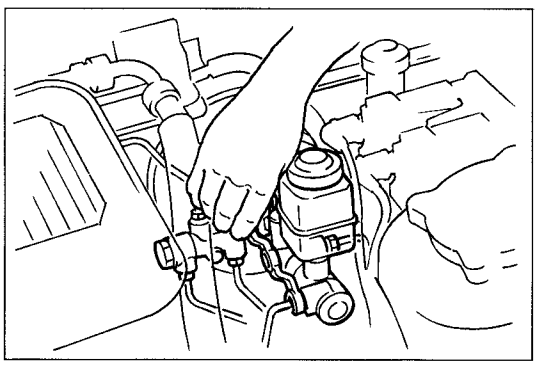
1. Remove in the order shown in the figure, referring to **Removal Note**.
2. Install in the reverse order of removal, referring to **Installation Note**.
3. After installation, add brake fluid, bleed air, and check for fluid leakage.

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



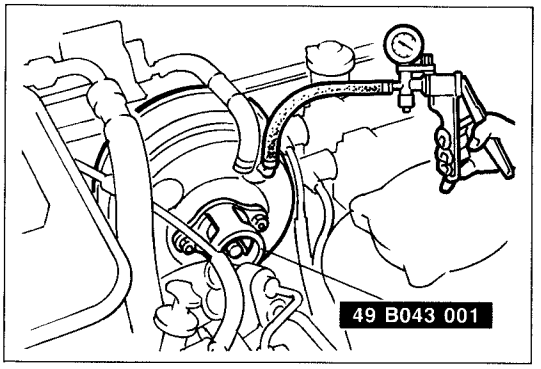
97U0PX-020

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

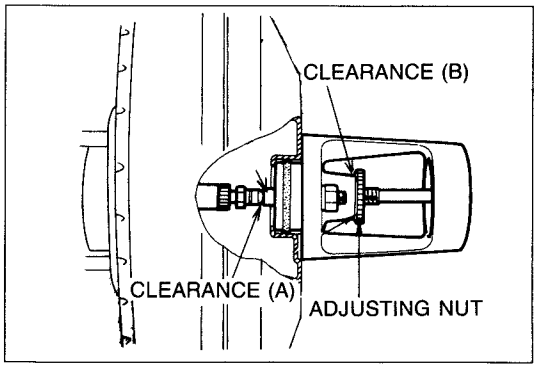


9MU0PX-020

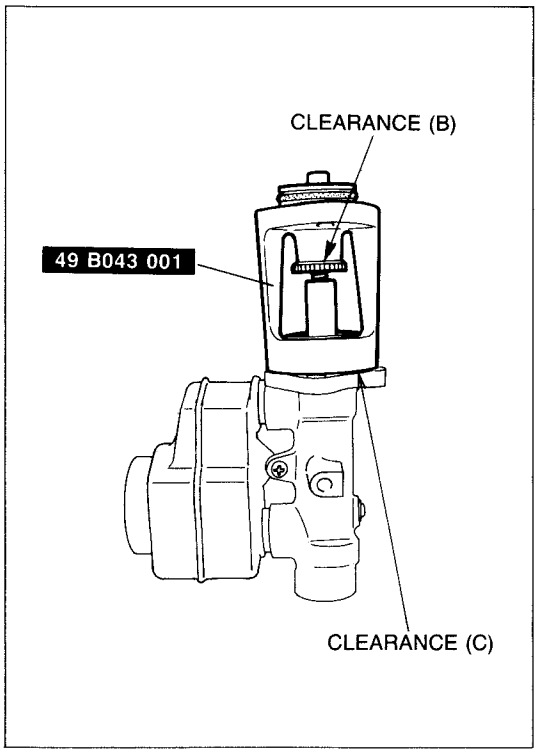
Removal note
Brake pipe
Disconnect/connect the brake pipe from/to the master cylinder with the **SST**.



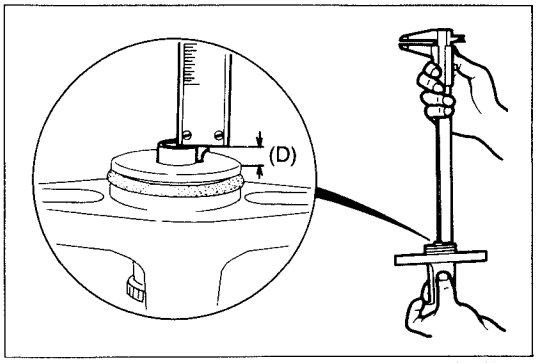
97U0PX-021



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

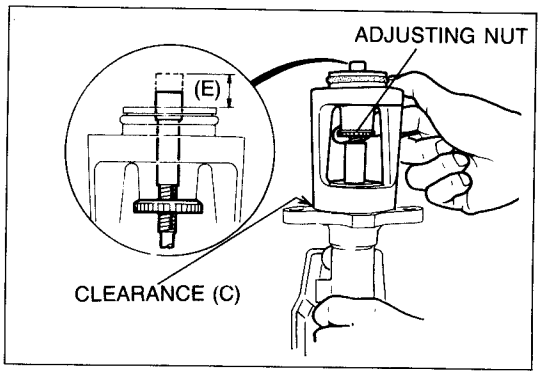
	Measurement	Necessity of adjustment
(a)	Clearance at (C)	Yes
(b)	Clearance at (B)	Yes
	Both clearances of (C) and (B) are 0mm (0 in)	No

(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.

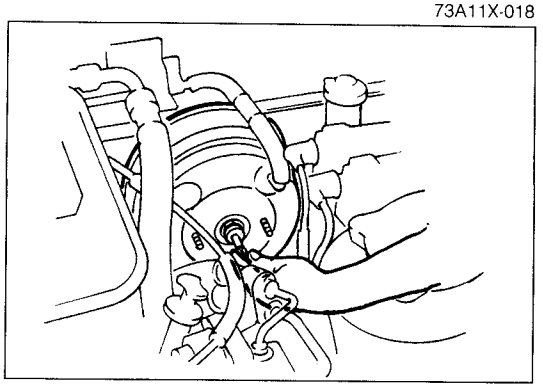
1. For **(a)** of judgement table:
   (1) Measure the height of (D) and record after removing the **SST** from the master cylinder.



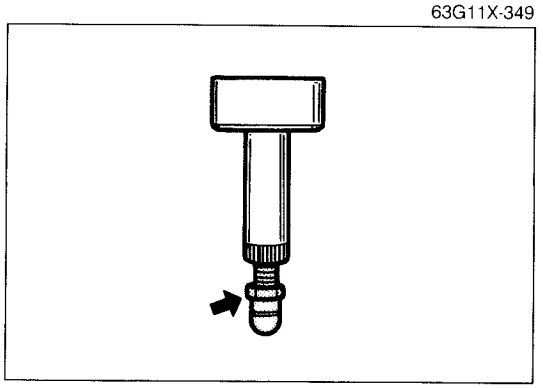
73A11X-018

(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).


63G11X-349

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

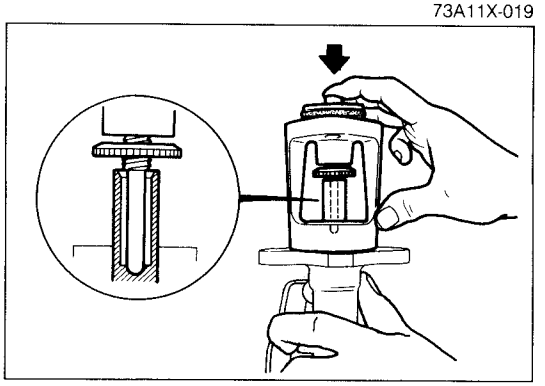

73A11X-019

(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.

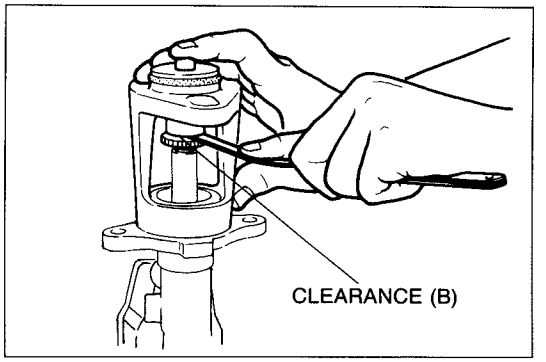
2. For **(b)** of the judgement table:
(1) Push the push rod of **SST** lightly by hand until the push rod end touches the buttom of the primary piston in the master cylinder.

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.

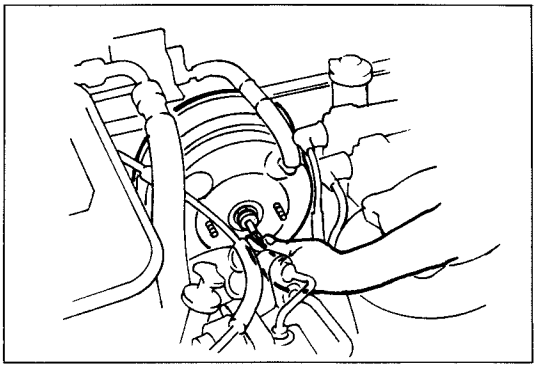

73A11X-020

(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).

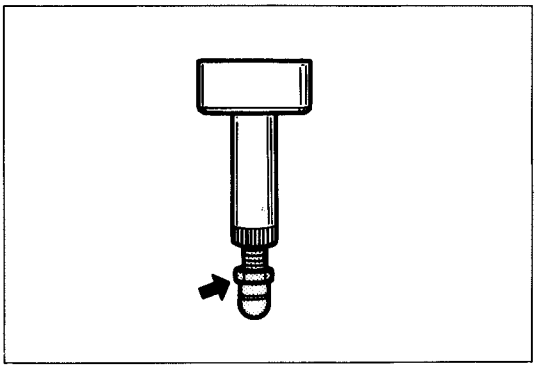


73A11X-021



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).

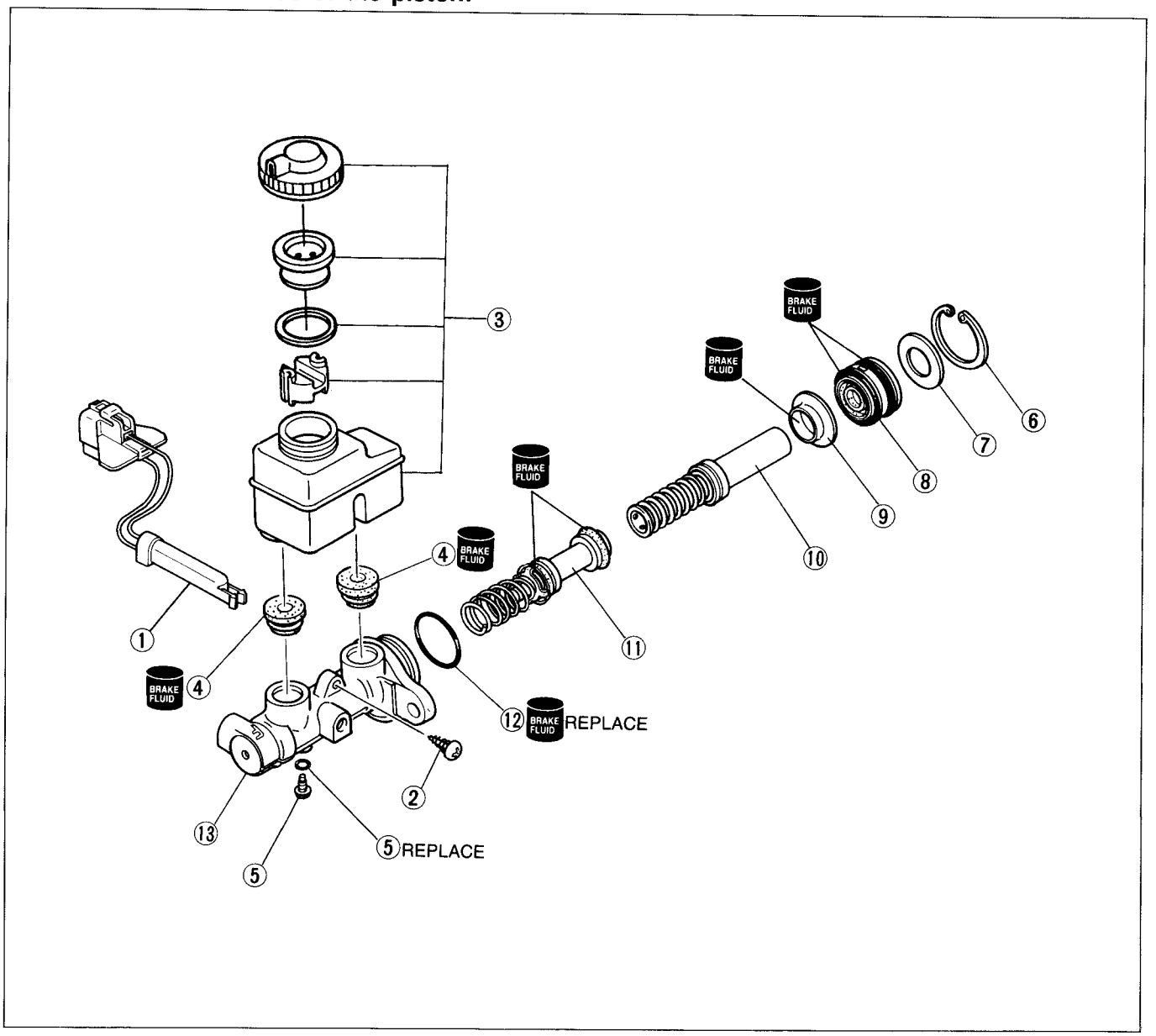
Note
The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point to prevent loosening of the bolt. Turn the bolt only within this range when adjusting.

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

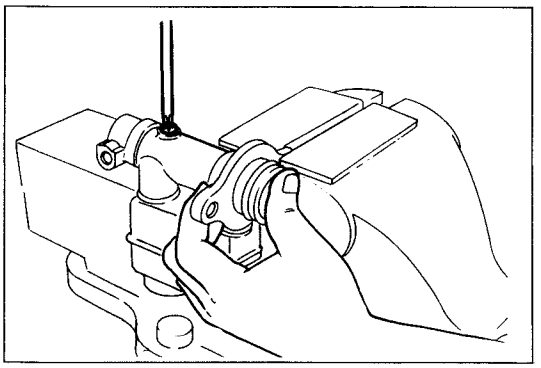
a) Secure the master cylinder flange in a vise when necessary.
b) Replace the piston assembly, if necessary.
c) Do not let foreign material enter the cylinder, and do not scratch the inside of the cylinder or the outer surface of the piston.



97U0PX-022

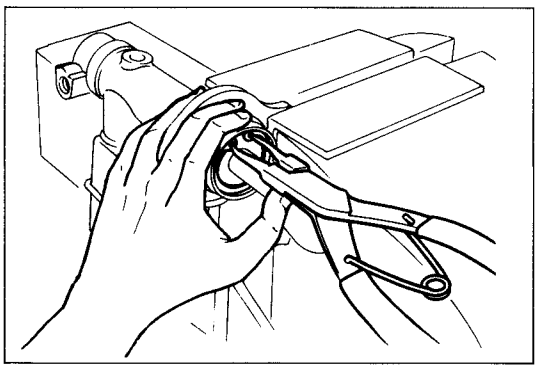
1. Fluid level sensor
2. Screw
3. Reserve tank assembly
   Inspect for damage or deformation
4. Bushing
   Inspect for damage
5. Stopper screw and O-ring
   Disassembly ..... page P–22
   Assembly ..... page P–23
6. Snap ring
   Disassembly ..... page P–22
7. Spacer
8. Piston guide assembly
   Assembly ..... 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



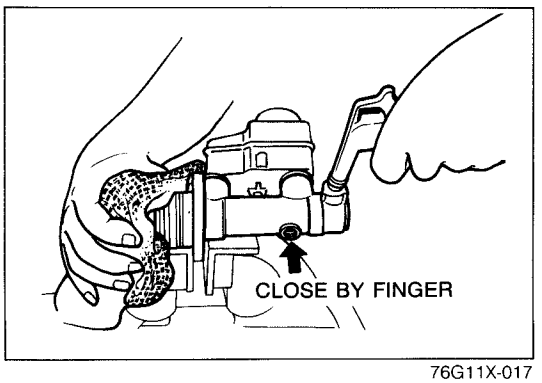
76G11X-015

Disassembly note
Stopper screw
Push the piston in by hand and remove the stopper screw.



76G11X-016

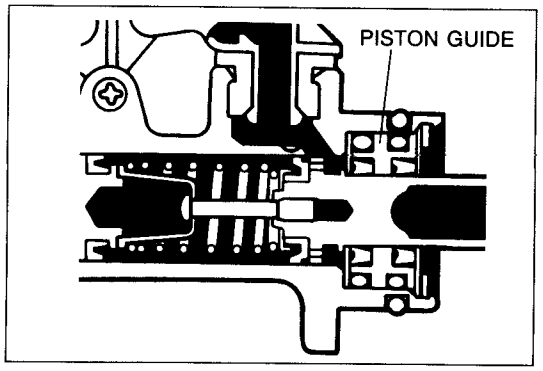
Snap ring
Push the piston in fully with a rod and remove the snap ring using snap ring pliers.



76G11X-017

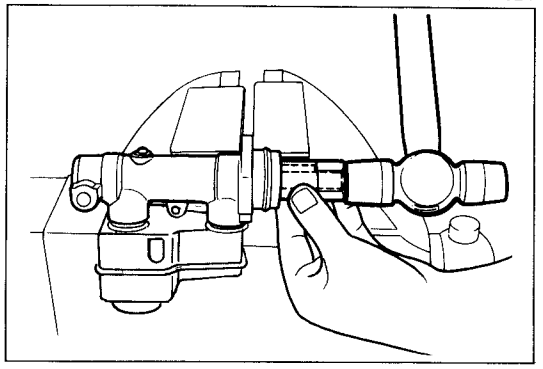
Secondary piston assembly
Remove the secondary piston assembly by gradually blowing compressed air into the cylinder.

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



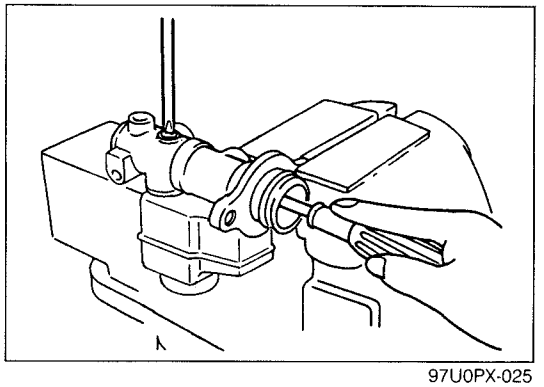
97U0PX-024

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.



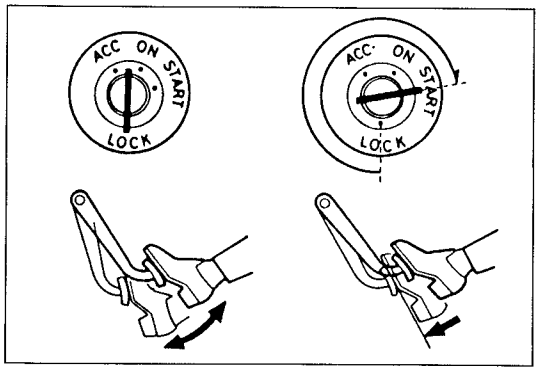
76G11X-022

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

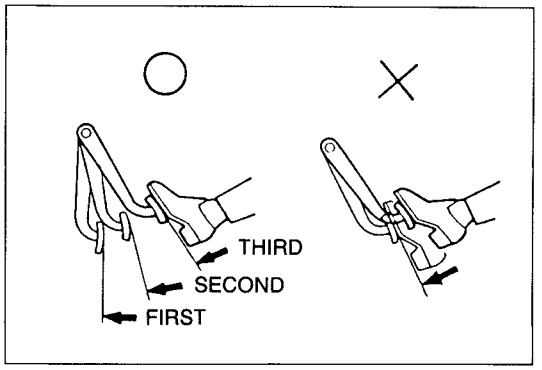


97U0PX-025

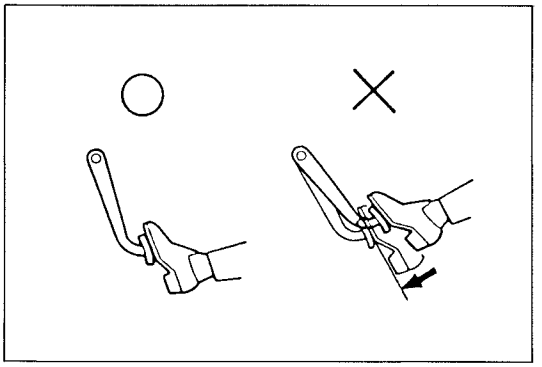
Stopper screw
1. Push the primary piston assembly in fully.
2. Install and tighten the stopper screw.
3. Push and release the piston to verify that it is held by the stopper screw.

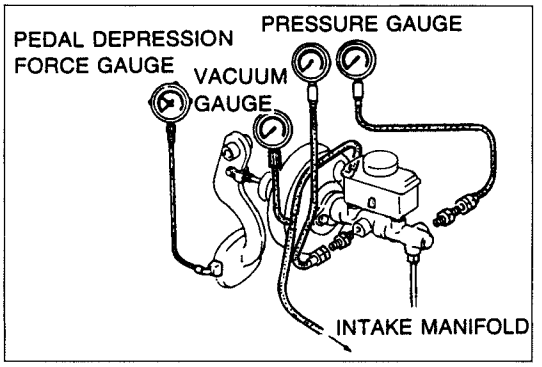


97U0PX-026

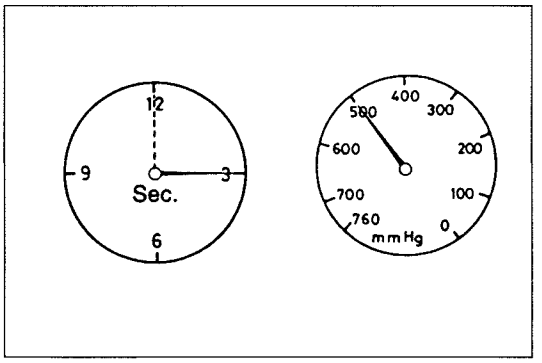


9MU0PX-031


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)

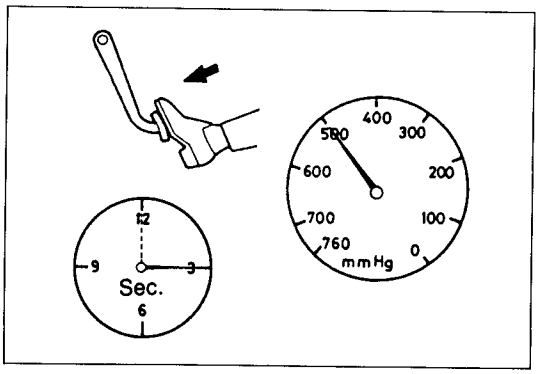
Connect a pressure gauge, vacuum gauge, and pedal depression force gauge as shown in the figure. After bleeding the air from the pressure gauge, conduct the test as described in the 3 steps below.

Note
Use commercially available gauges and pedal depression force gauge.

a) Checking for vacuum loss

Unloaded condition

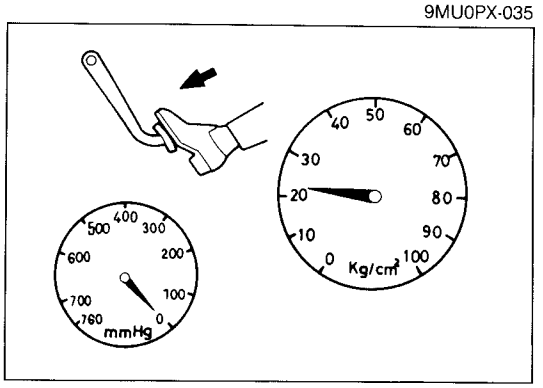
1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **500 mmHg (19.7 inHg)**.
3. Observe the vacuum gauge for **15 seconds**. If the gauge shows **475—500 mmHg (18.7—19.7 inHg)**, the unit is operating.



9MU0PX-035

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.

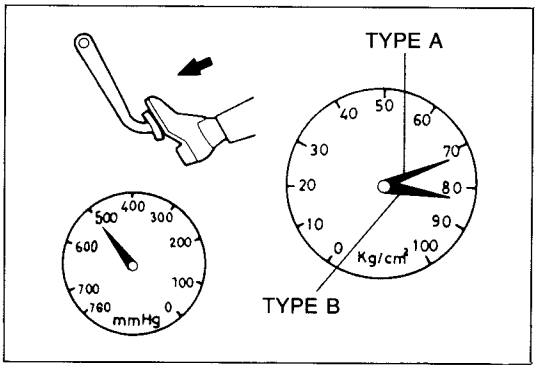


97U0PX-027

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/cm², 312 psi)

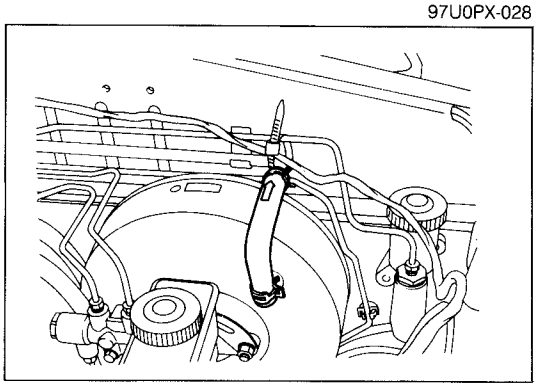


97U0PX-028

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/cm², 1,024 psi) min...*Type A 8,339 kPa (85 kg/cm², 1,209 psi) min...*Type B

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



9MU0PX-038

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.

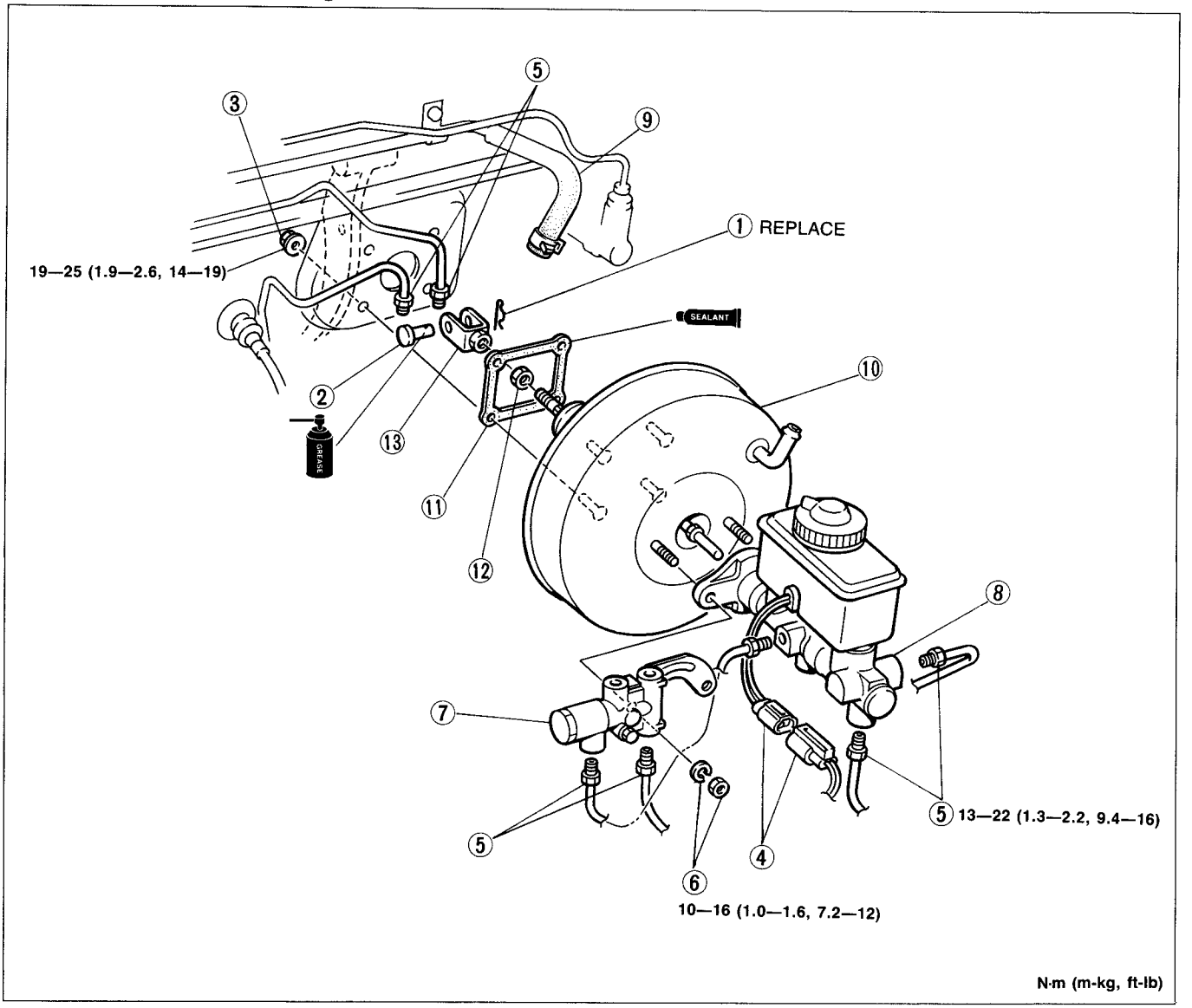
Inspection

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).

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.

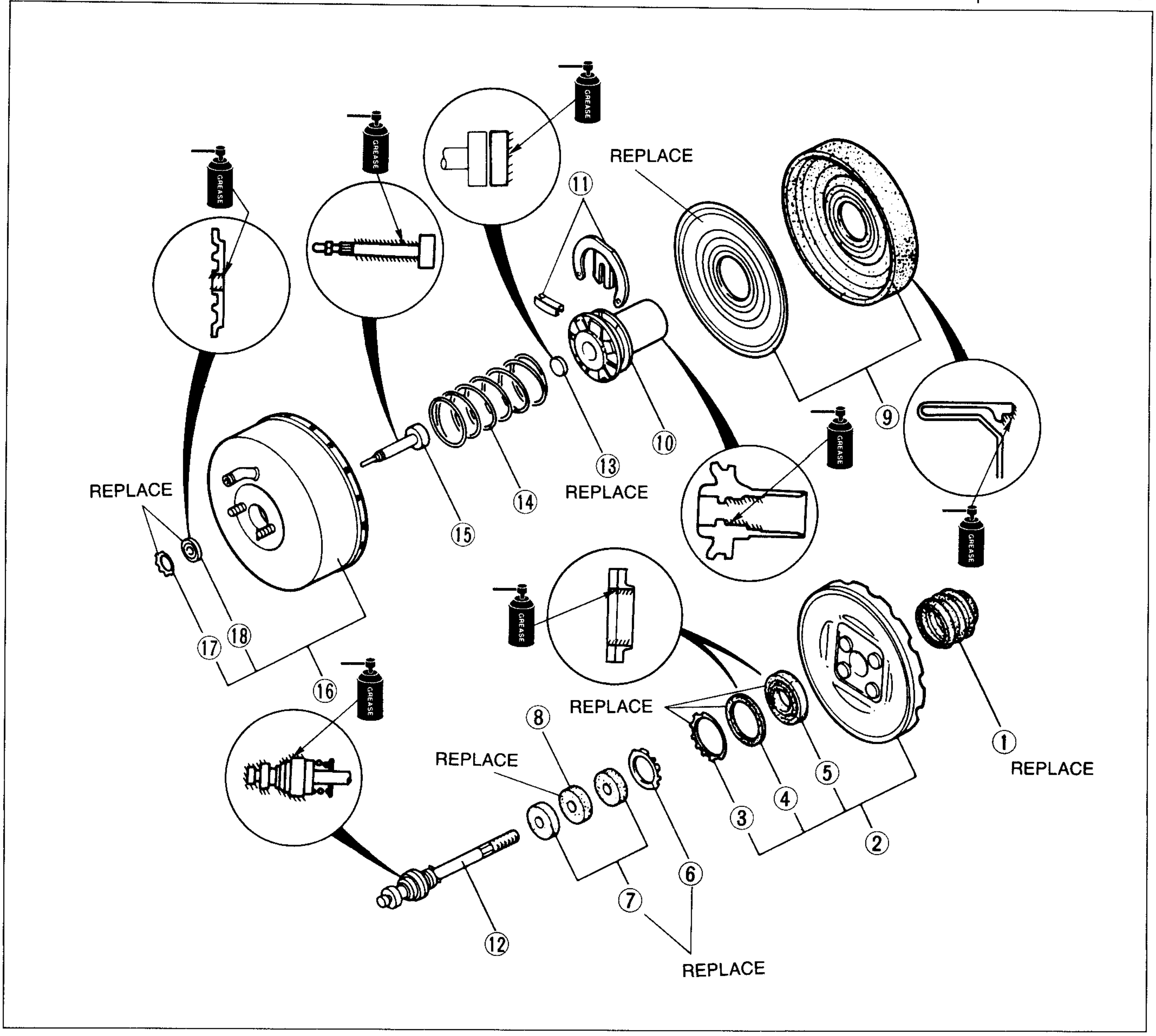


97U0PX-029

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

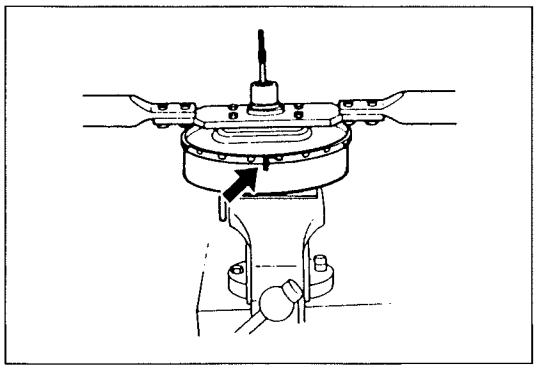
Disassembly, and Inspection

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

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
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

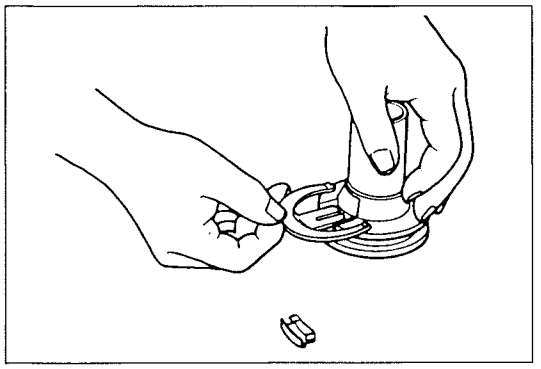


9MU0PX-041

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.

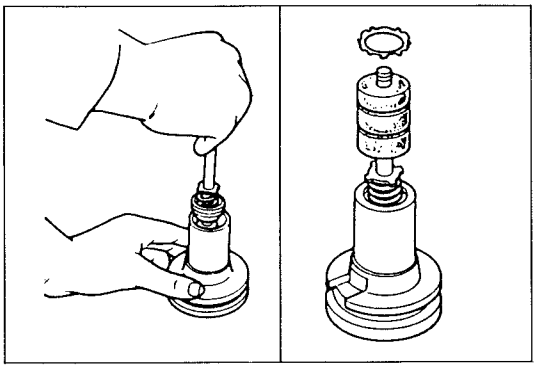


9MU0PX-042

Retainer key

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

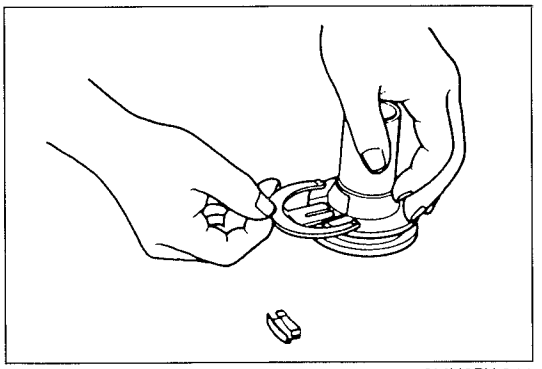
Caution
The valve rod and plunger must be serviced as an assembly.



9MU0PX-043

Assembly

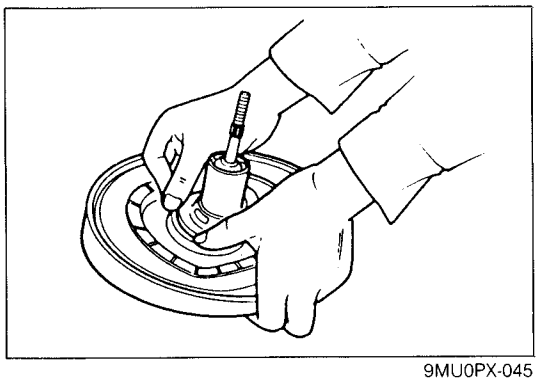
1. Install the valve rod and plunger assembly.
2. Install the air filter and silencer.
3. Install the retainer.



9MU0PX-044

4. Install the retainer key.

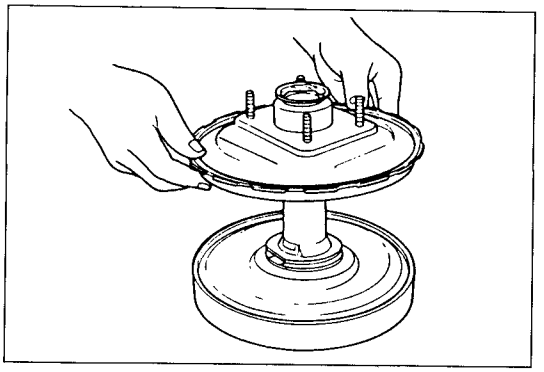
Caution
Push down the valve rod, align the groove in the valve plunger with the slot of the power piston, and insert the valve retainer key.



9MU0PX-045

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

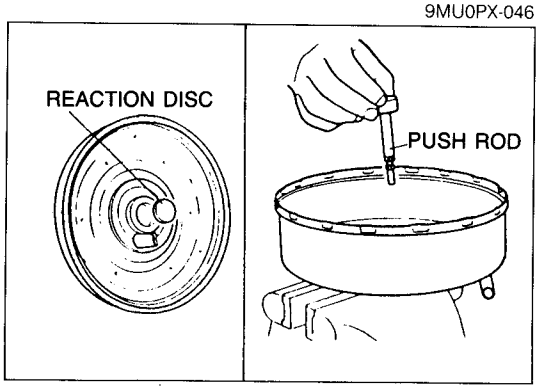
Caution
Make certain the diaphragm is well seated in the groove.



9MU0PX-046

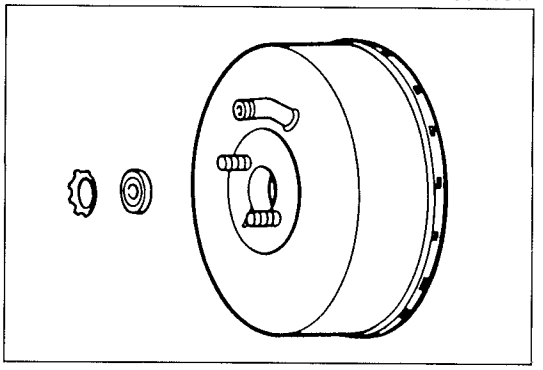
6. Assemble the rear shell assembly.

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



9MU0PX-047

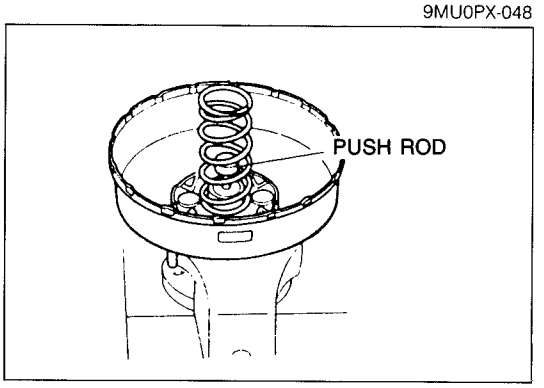
7. Push the reaction disc into the power piston with the push rod.



9MU0PX-048

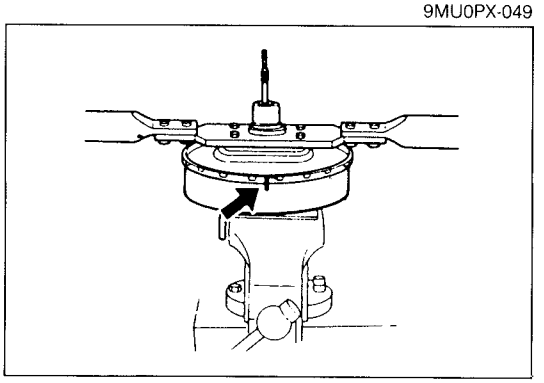
8. Put the dust seal and retainer into the front shell.

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



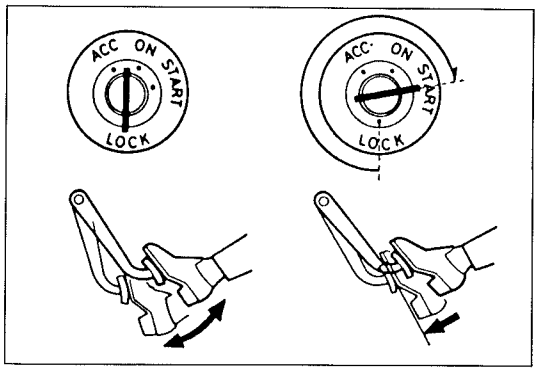
9MU0PX-049

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

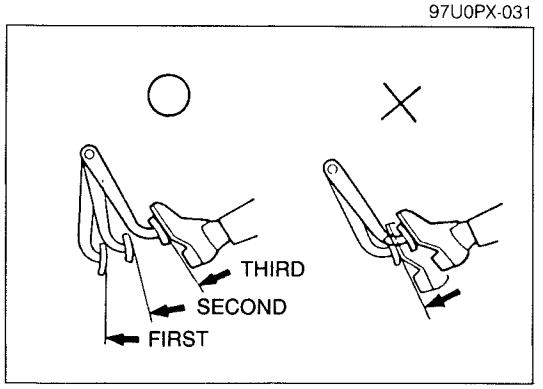


9MU0PX-050

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.



97U0PX-031



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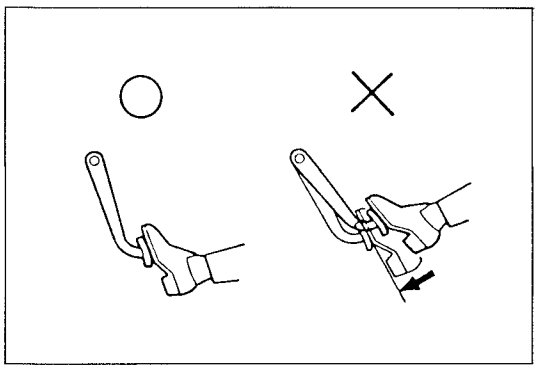

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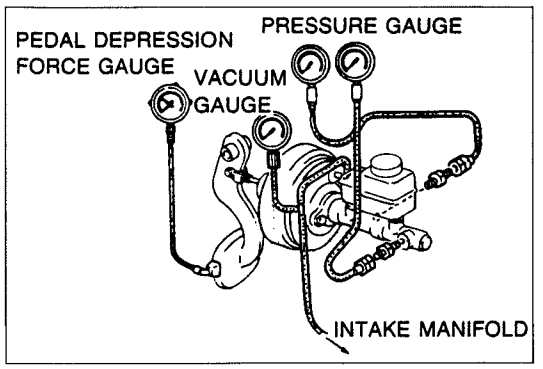

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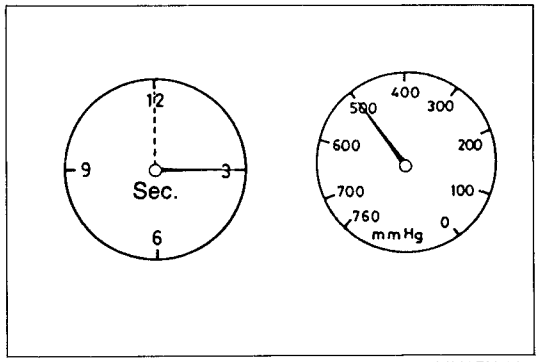


9MU0PX-034

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)

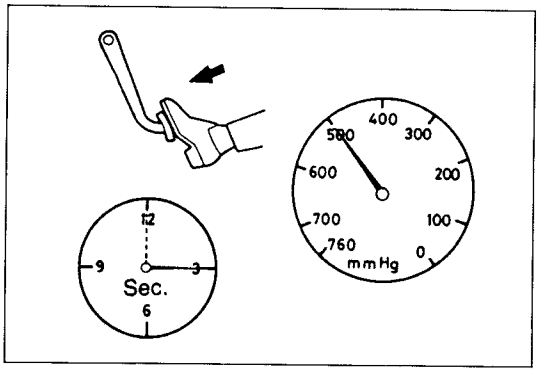
Connect a pressure gauge, vacuum gauge, and pedal depression force gauge as shown in the figure. After bleeding the air from the pressure gauge, conduct the test as described in the 3 steps below.

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.



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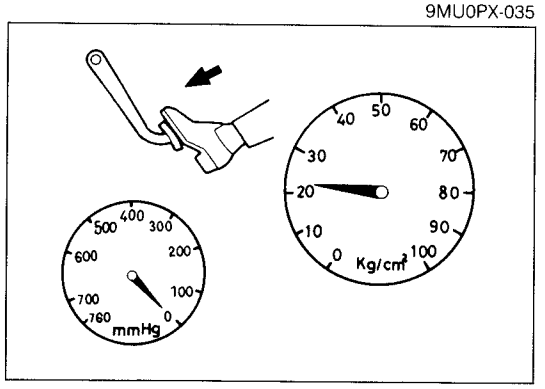

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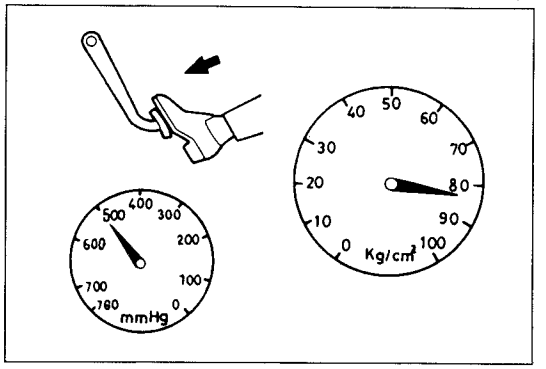

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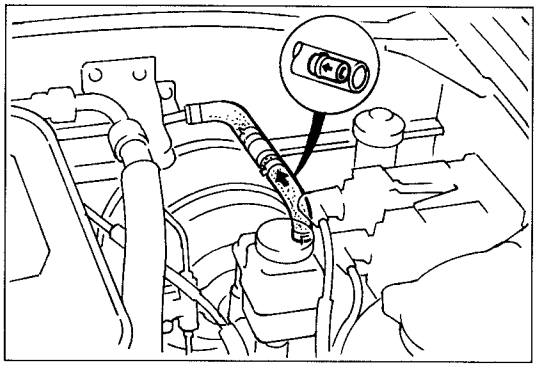


9MU0PX-038

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.

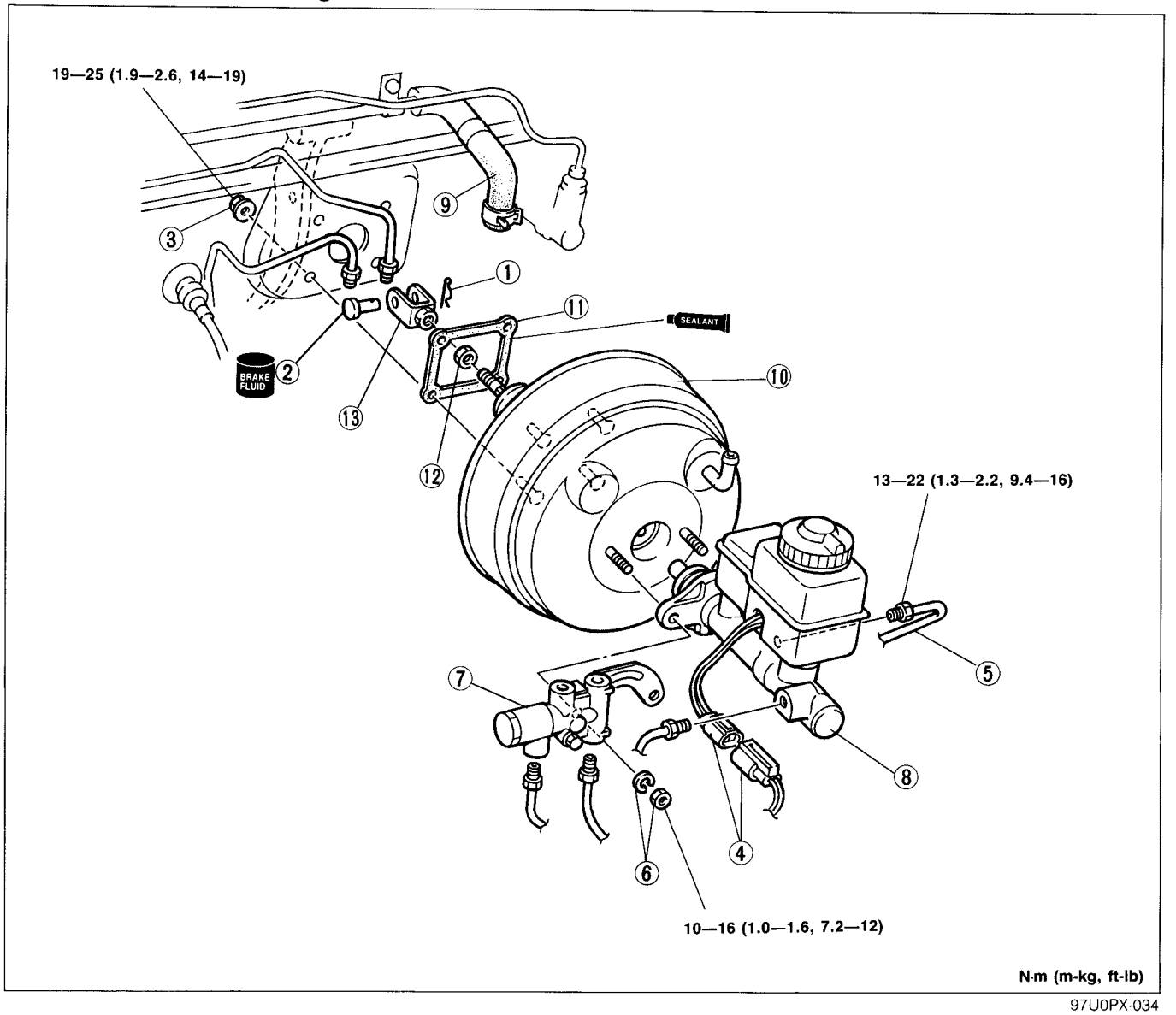
Inspection

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).

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.

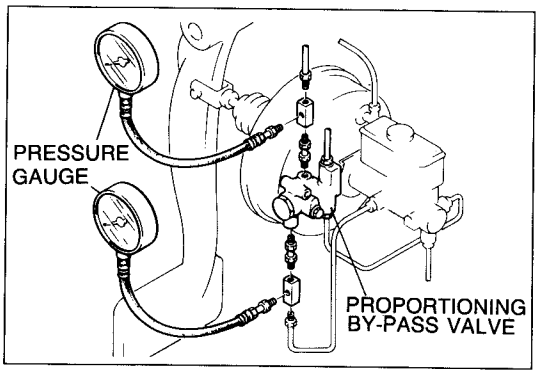


97U0PX-034

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



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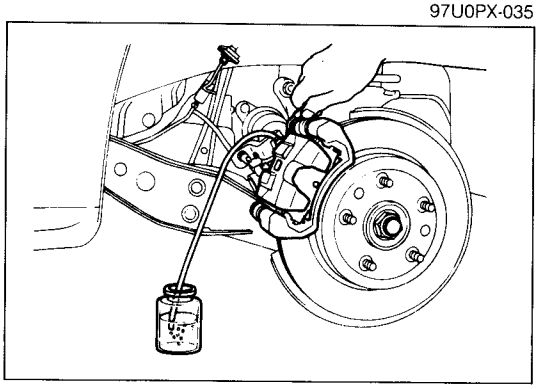
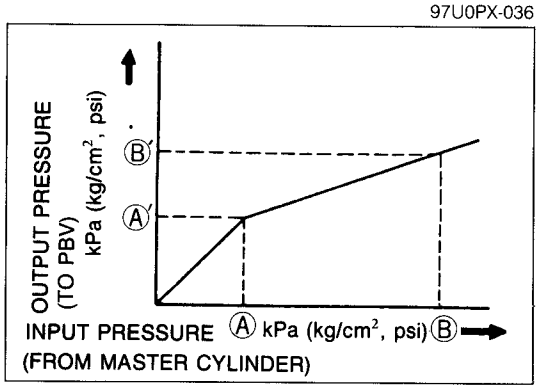


97U0PX-036



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/cm², 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.

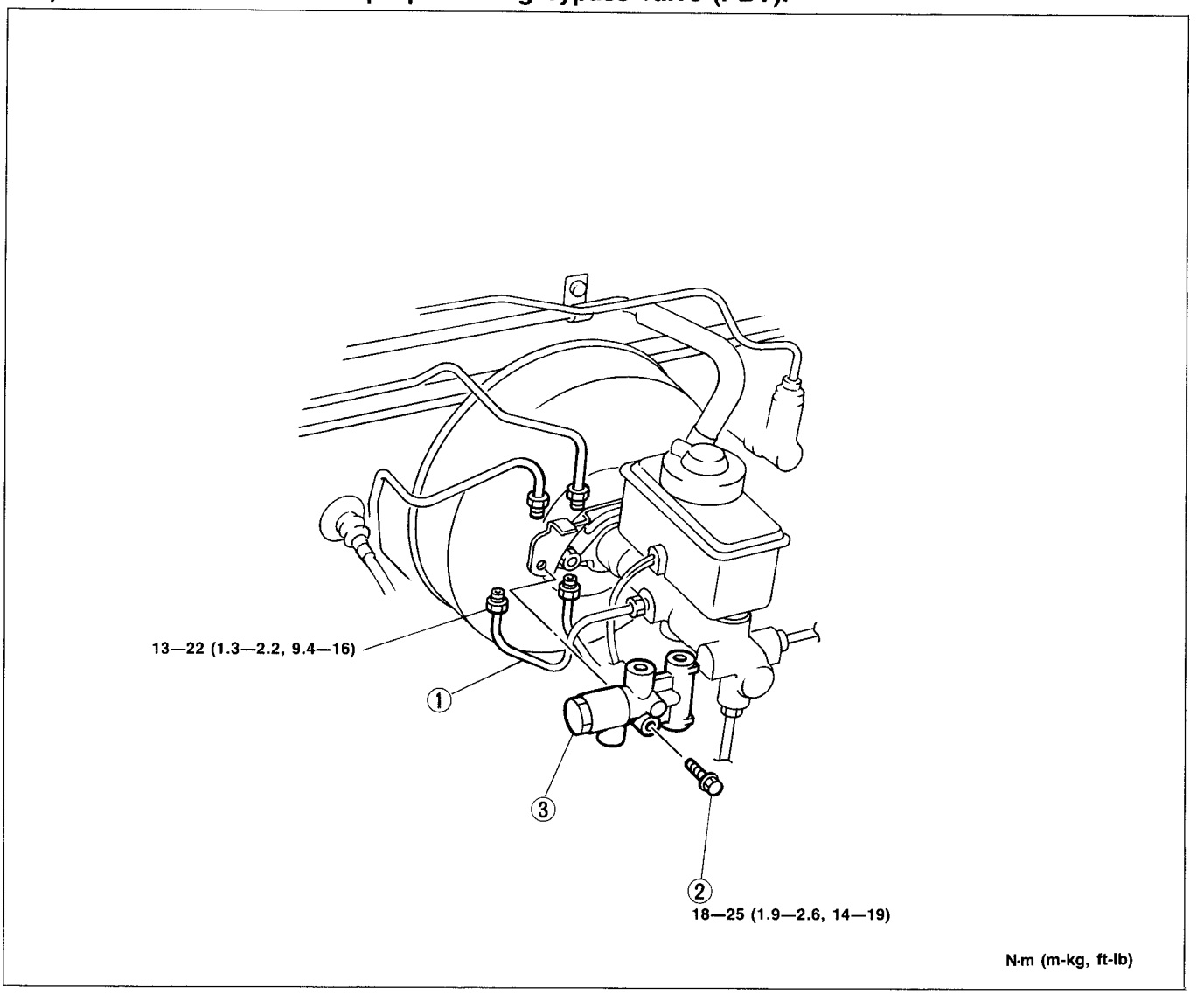
Removal and Installation

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

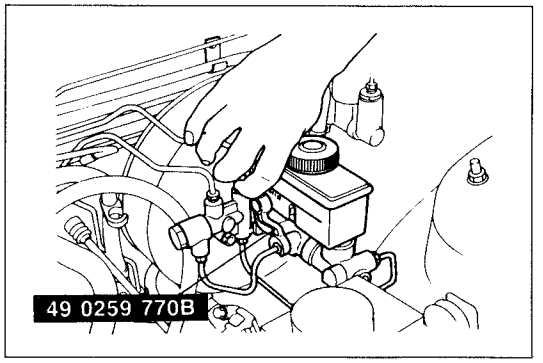
a) Brake fluid will damage painted surfaces. If it does get on a painted surface, wipe it off immediately.

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)

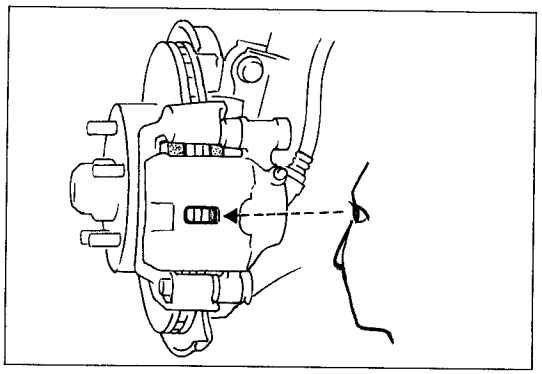


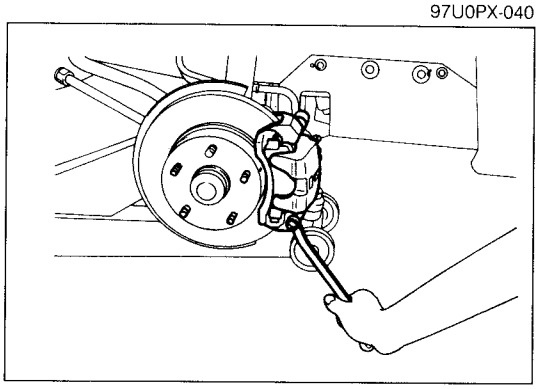
97U0PX-039

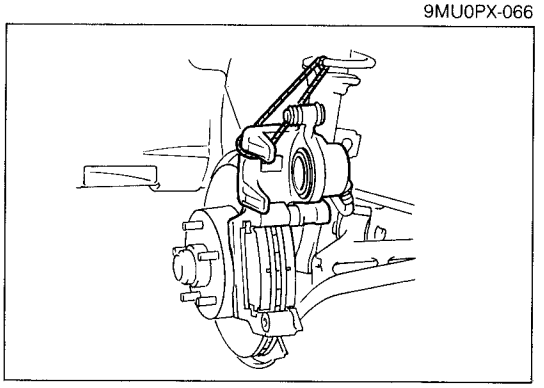
Removal note

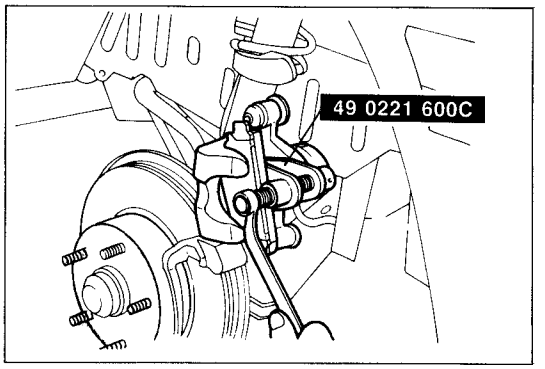
Brake pipe

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


97U0PX-040


9MU0PX-066


9MU0PX-067



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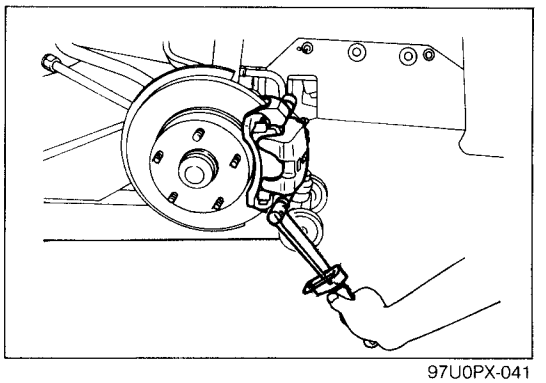

97U0PX-041

FRONT DISC BRAKE (SINGLE PISTON CARIPER)

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)**.

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

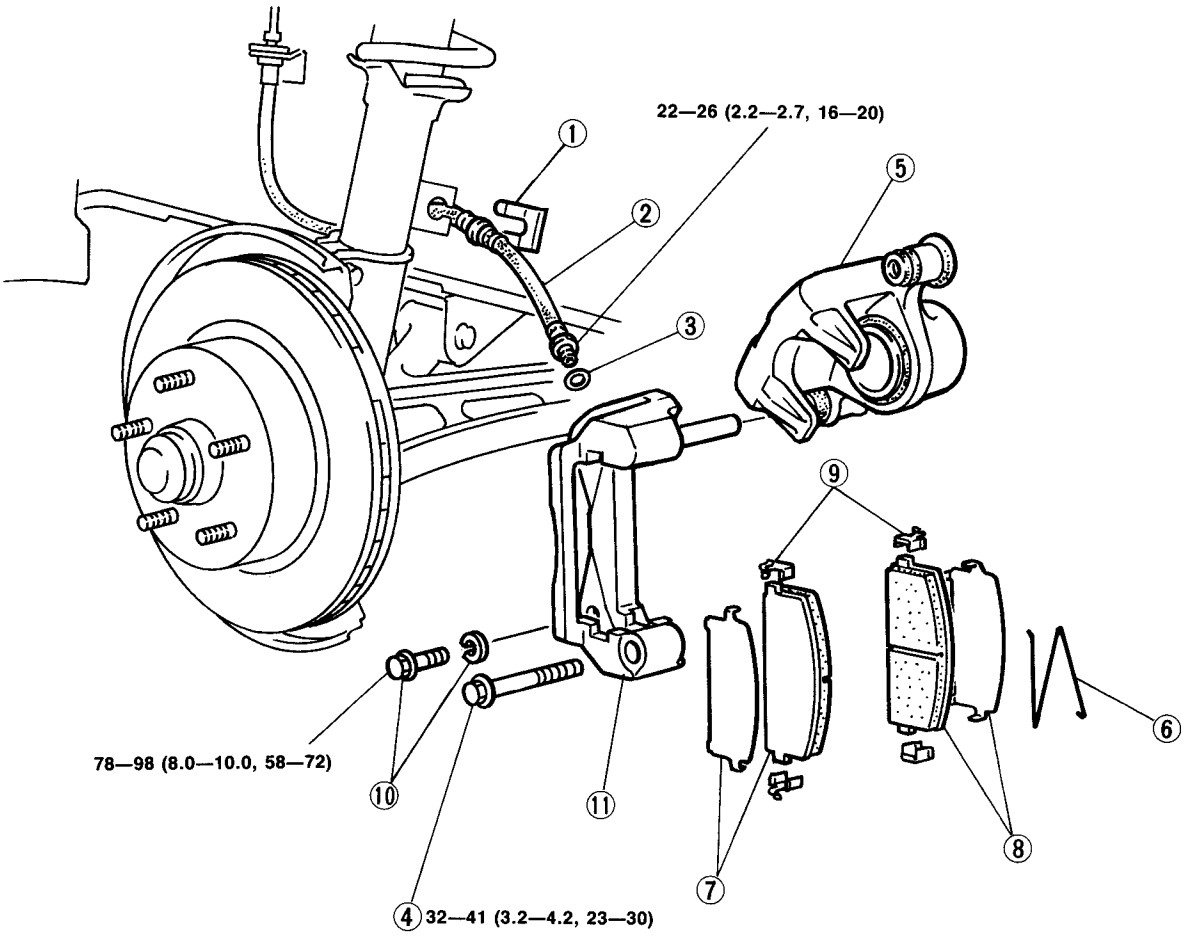
9. Mount the wheels.

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

10. Lower the vehicle.

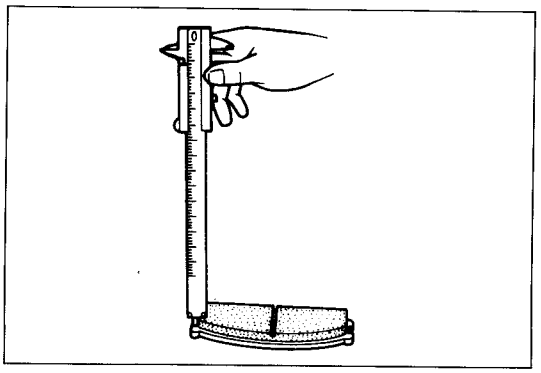
Removal and Installation

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.

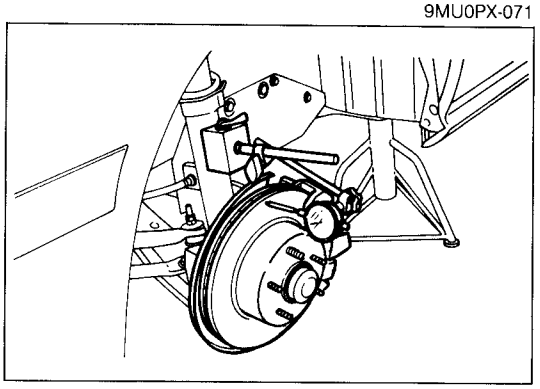


97U0PX-042

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



9MU0PX-071



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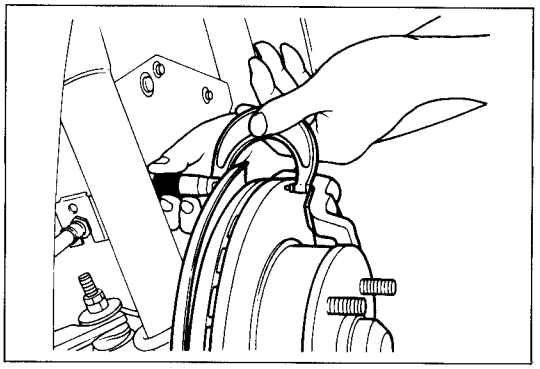


97U0PX-043

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.

Disc plate
1. Runout.

Runout: 0.1mm (0.004 in) max.

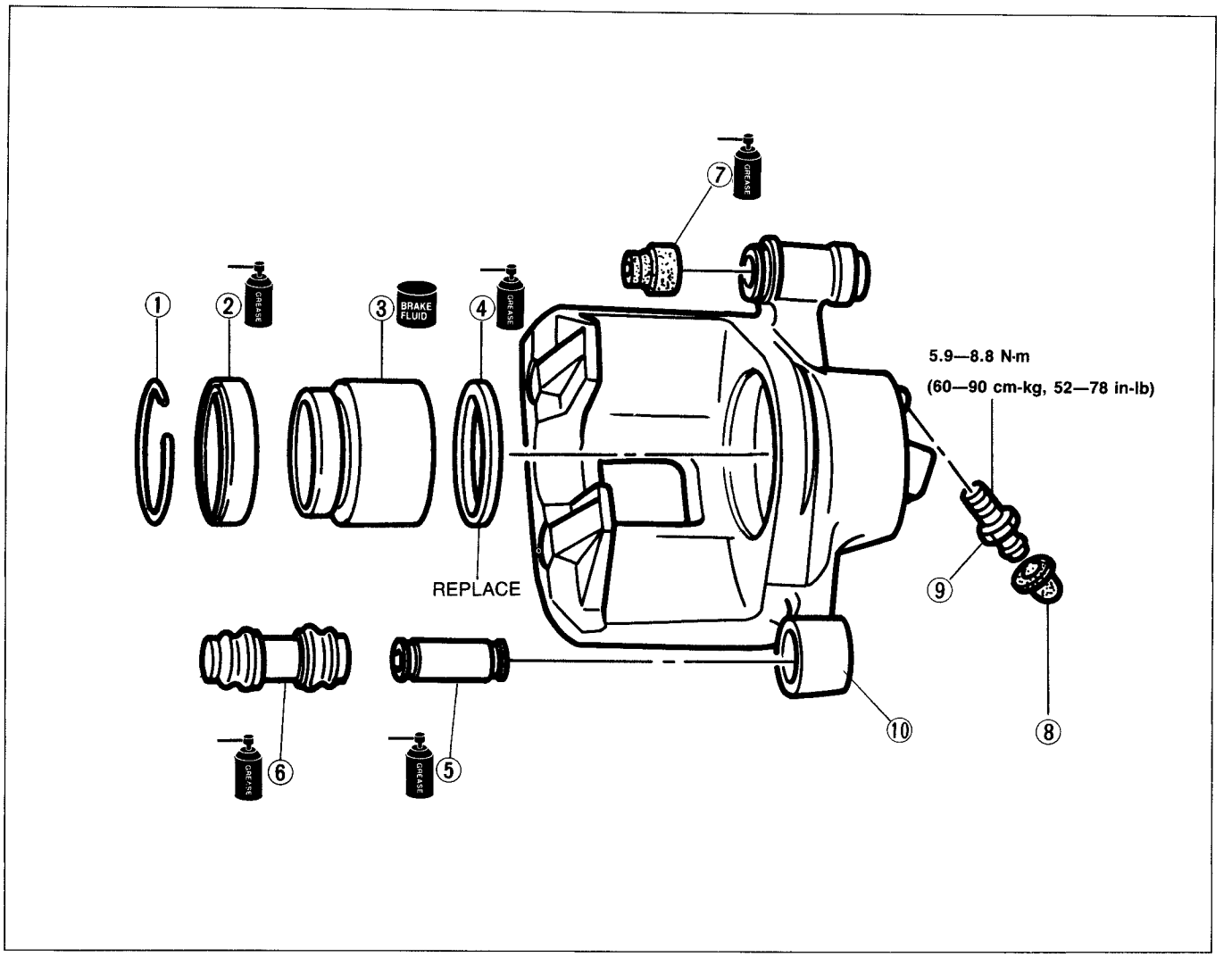
Caution
a) There must be no wheel bearing looseness.
b) The measurement location is the outer edge of the disc plate surface.

2. Wear or damage.

Thickness
Standard: 22mm (0.87 in)
Minimum: 20mm (0.79 in)

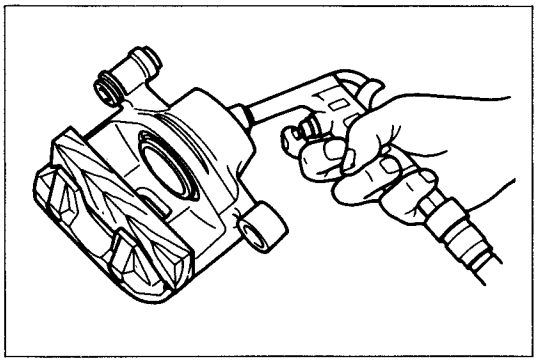
Disassembly, Inspection and Assembly

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



97U0PX-044

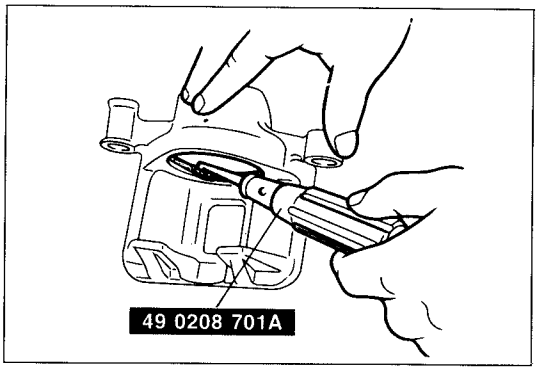
1. Piston ring
2. Dust boot
   Inspect for cracks
3. Piston
   Disassembly ..... page P–38
   Inspect for wear or cracks
4. Piston seal
   Disassembly ..... page P–39
5. Guide
6. Boot
   Inspect for wear or cracks
7. Bushing
   Inspect for wear or cracks
8. Rubber cap
9. Bleeder screw
10. Caliper
  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



9MU0PX-075

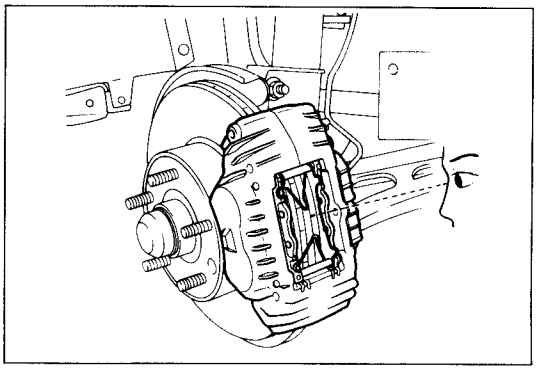
Disassembly note
Piston
Place a piece of wood in the caliper; then blow compressed air through the hole to force the piston out of the caliper.

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



97U0PX-045

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

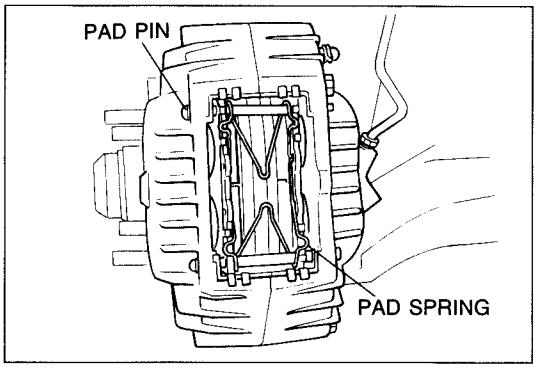

97U0PX-046

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)**.



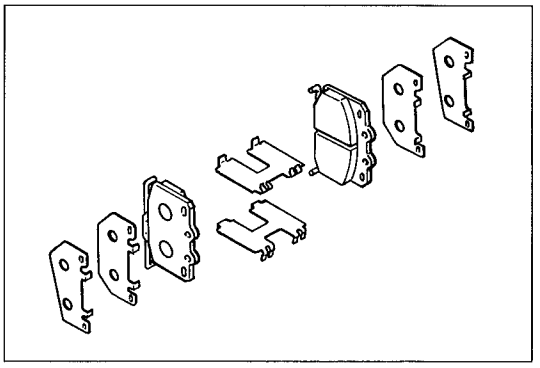
97U0PX-047

Replacement

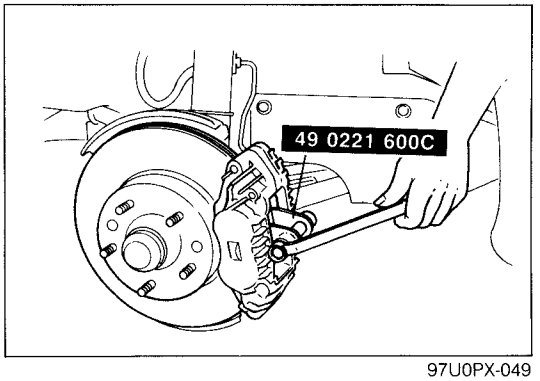
Disc pad

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.


97U0PX-048

4. Remove the pads and shims.



97U0PX-049

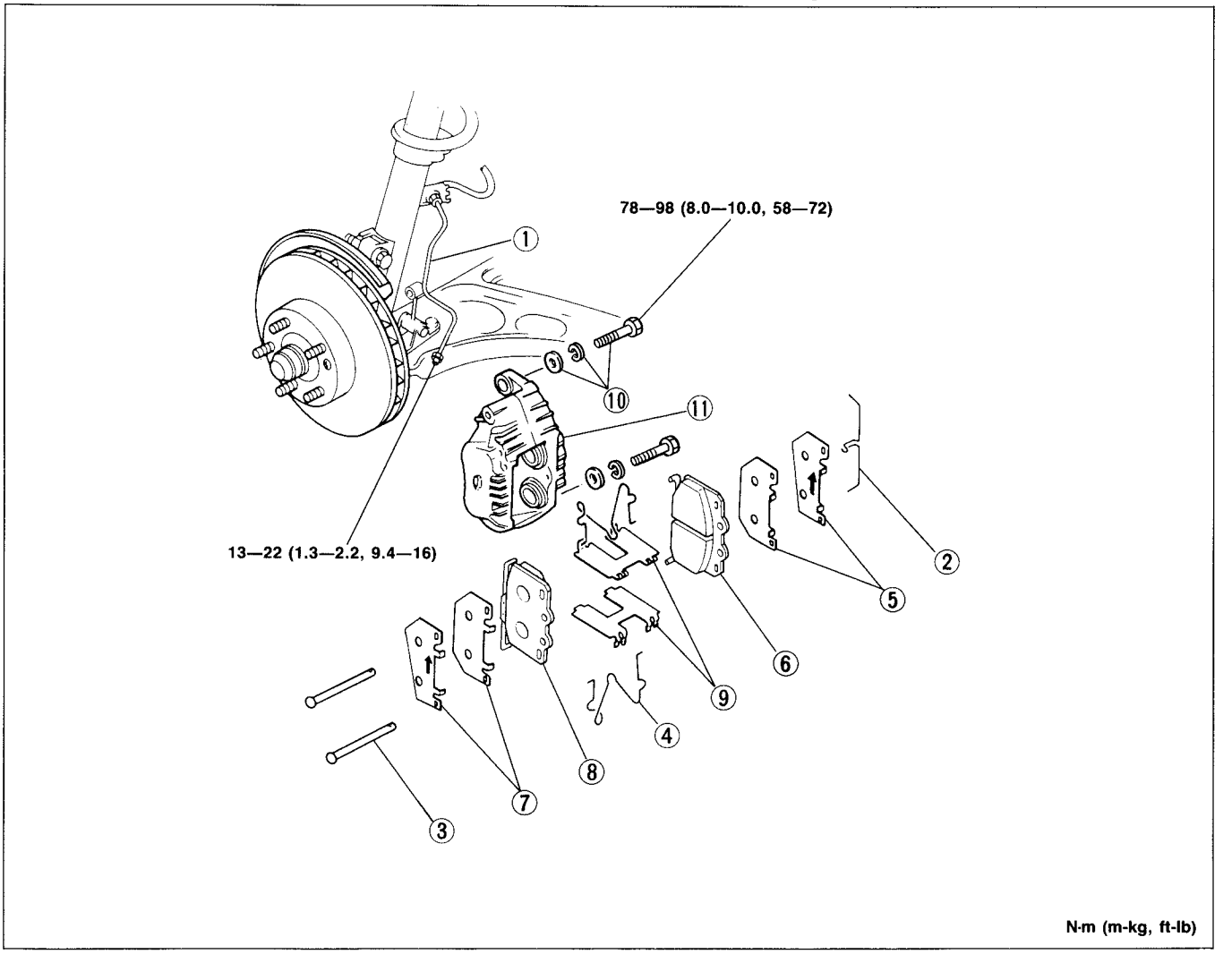
5. Push the piston inward with the **SST**.
6. Install the new pads.
7. Mount the wheels.

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

8. Lower the vehicle.

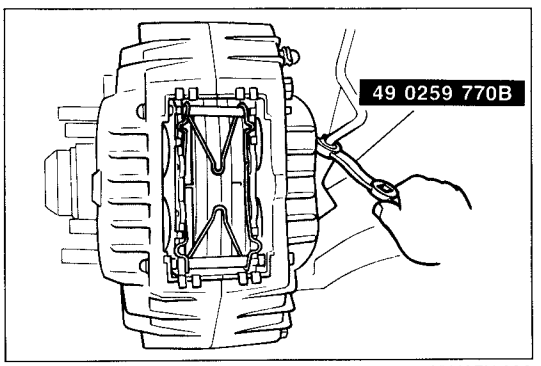
Removal and Installation

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.



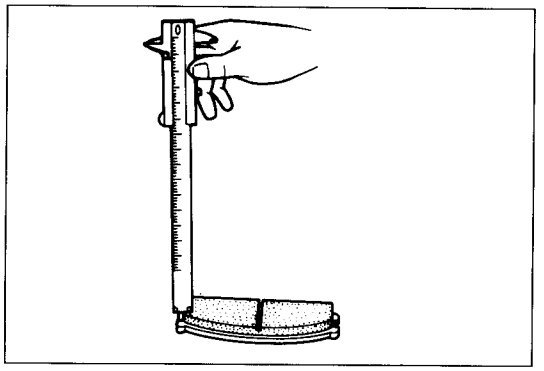
97U0PX-050

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

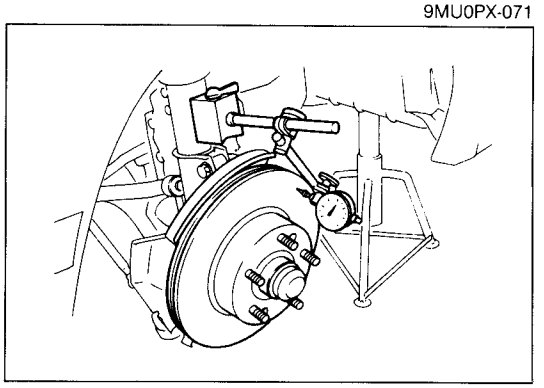


97U0PX-093

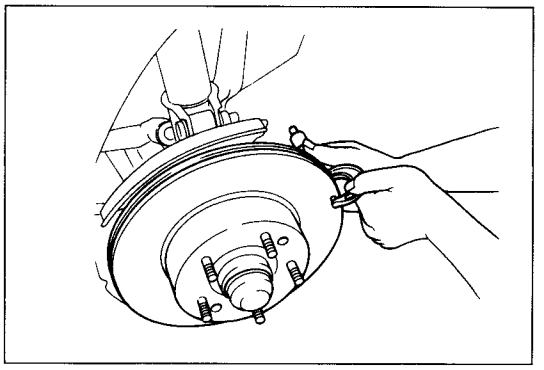
Removal note
Brake pipe
Remove the brake pipe from the caliper with the **SST**.



9MU0PX-071



9MU0PX-072



97U0PX-043

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.

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.

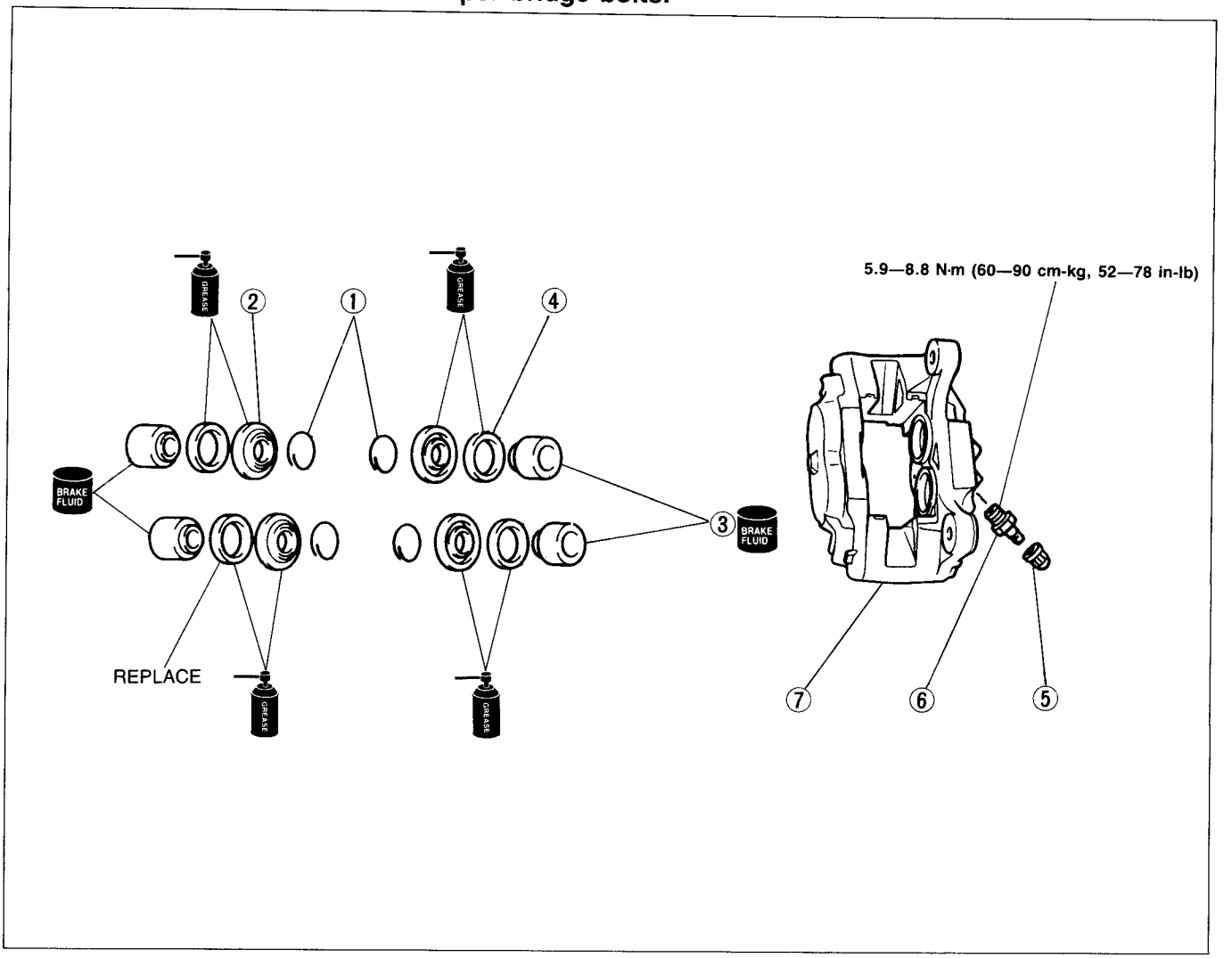
2. Wear or damage.

Thickness
Standard: 22mm (0.87 in)
Minimum: 20mm (0.79 in)

Disassembly, Inspection and Assembly

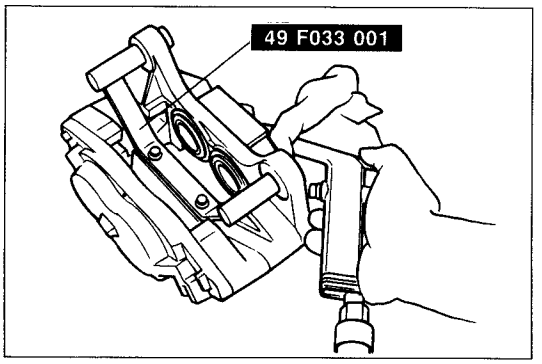
1. Disassemble in the order shown in the figure, referring to **Disassembly Note**.
2. Visually inspect all parts and repair or replace any fauty parts.
3. Assemble in the reverse order of removal.

Caution
Do not loosen or remove the caliper bridge bolts.



97U0PX-051

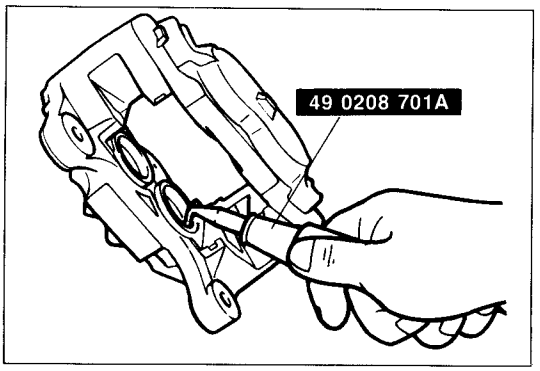
1. Piston ring
2. Dust boot
   Inspect for wear or cracks
3. Piston
   Disassembly ..... page P–42
   Inspect for wear or cracks
4. Piston seal
   Disassembly ..... page P–43
5. Bleeder cap
6. Bleeder screw
7. Caliper
   Inspect for damage



97U0PX-052

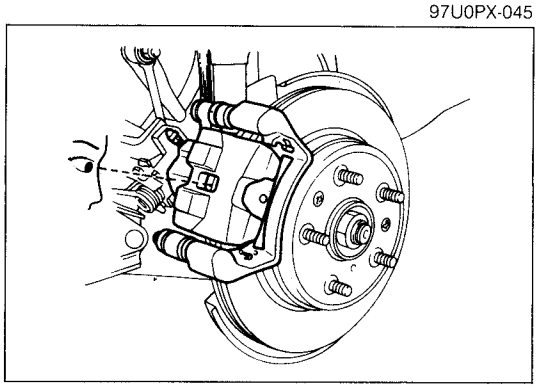
Piston

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.

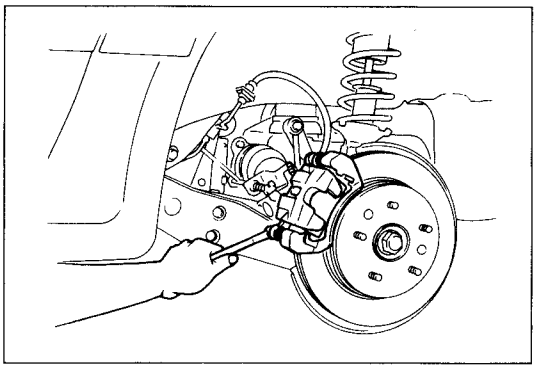


97U0PX-045

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


97U0PX-053

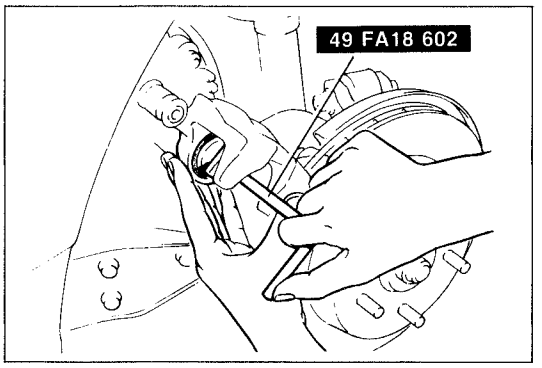
REAR DISC BRAKE
On-vehicle Inspection
Disc pad
1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the wheels.
3. Sight through the caliper inspection hole and see if the remaining thickness of the pad is at least **1.0mm (0.04 in)**.


97U0PX-054

Replacement
Disc pad

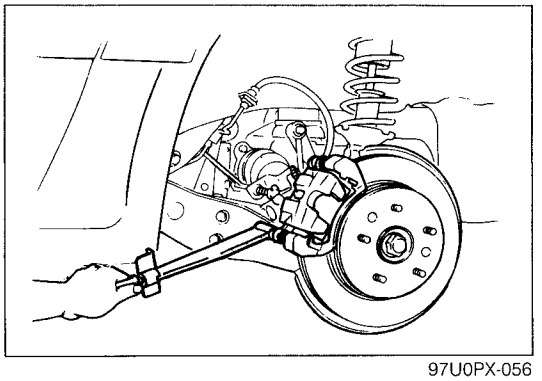
Caution
Replace the left and right pads at the same time.

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.



97U0PX-055

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-056

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)

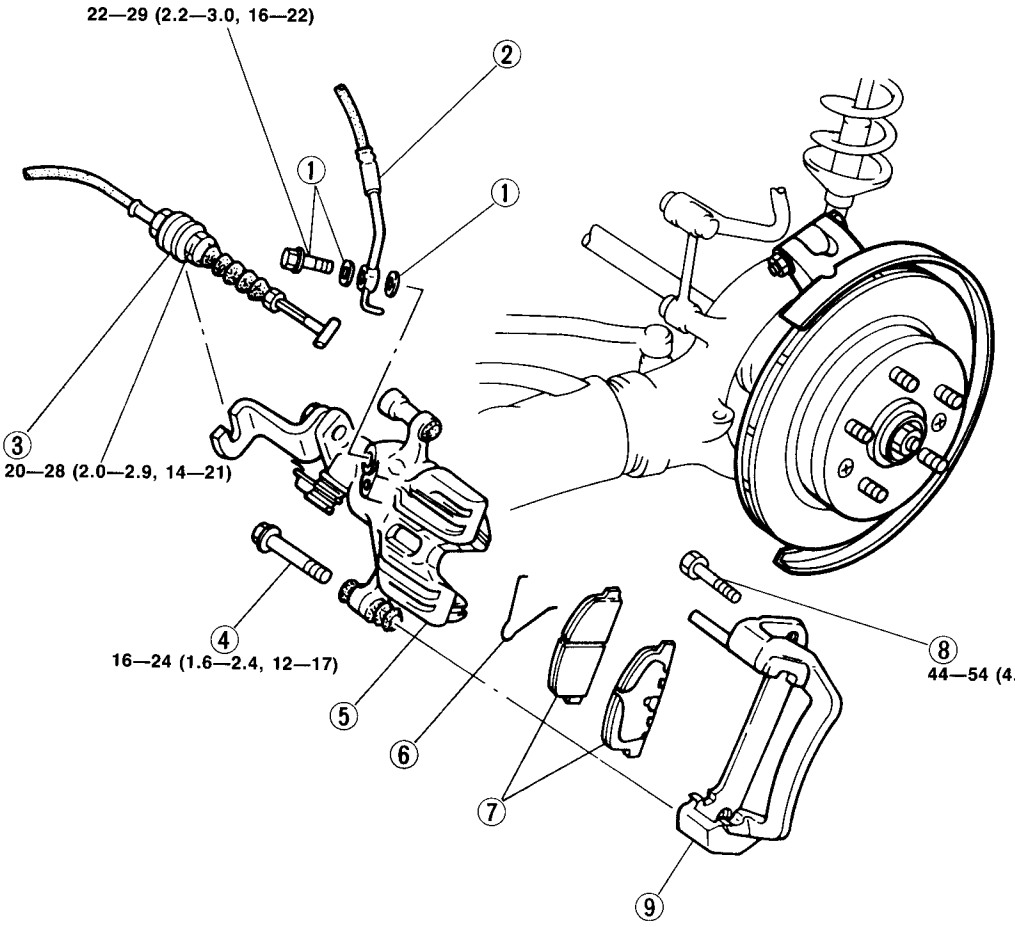
9. Mount the wheels.

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

10. Lower the vehicle.

Removal and Installation

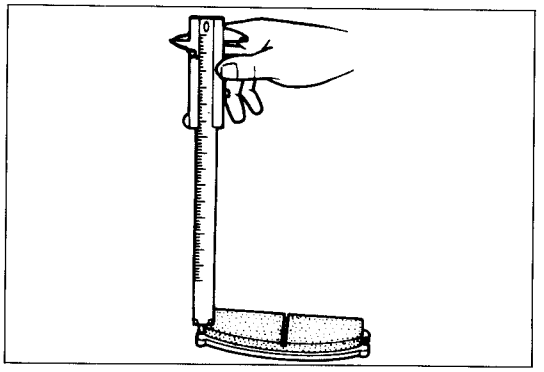
1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheels; then remove components in the order shown in the figure.
3. Install in the reverse order of removal.
4. Tighten all nuts and bolts to the specified torque, referring to the figure.

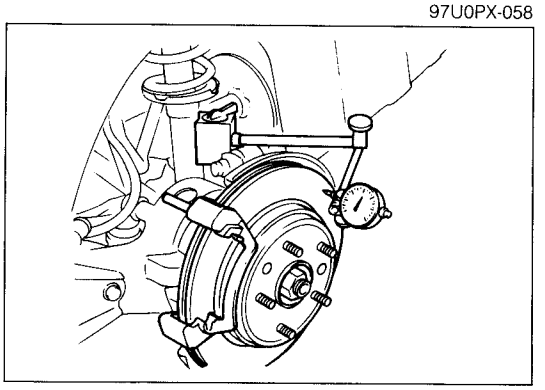


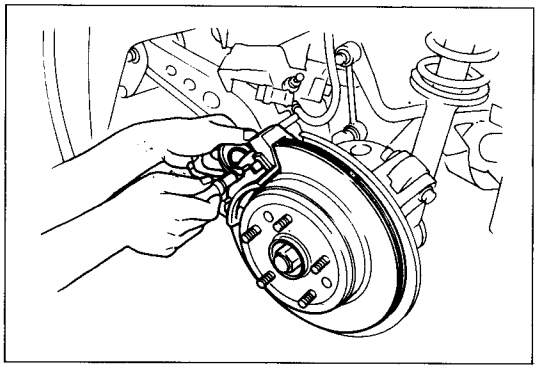
N·m (m-kg, ft-lb)

97U0PX-057

1. Bolt and washers
2. Flexible hose
3. Prarking 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


9MU0PX-072


97U0PX-059

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.

Disc plate
1. Runout.

Runout: 0.1mm (0.004 in) max.

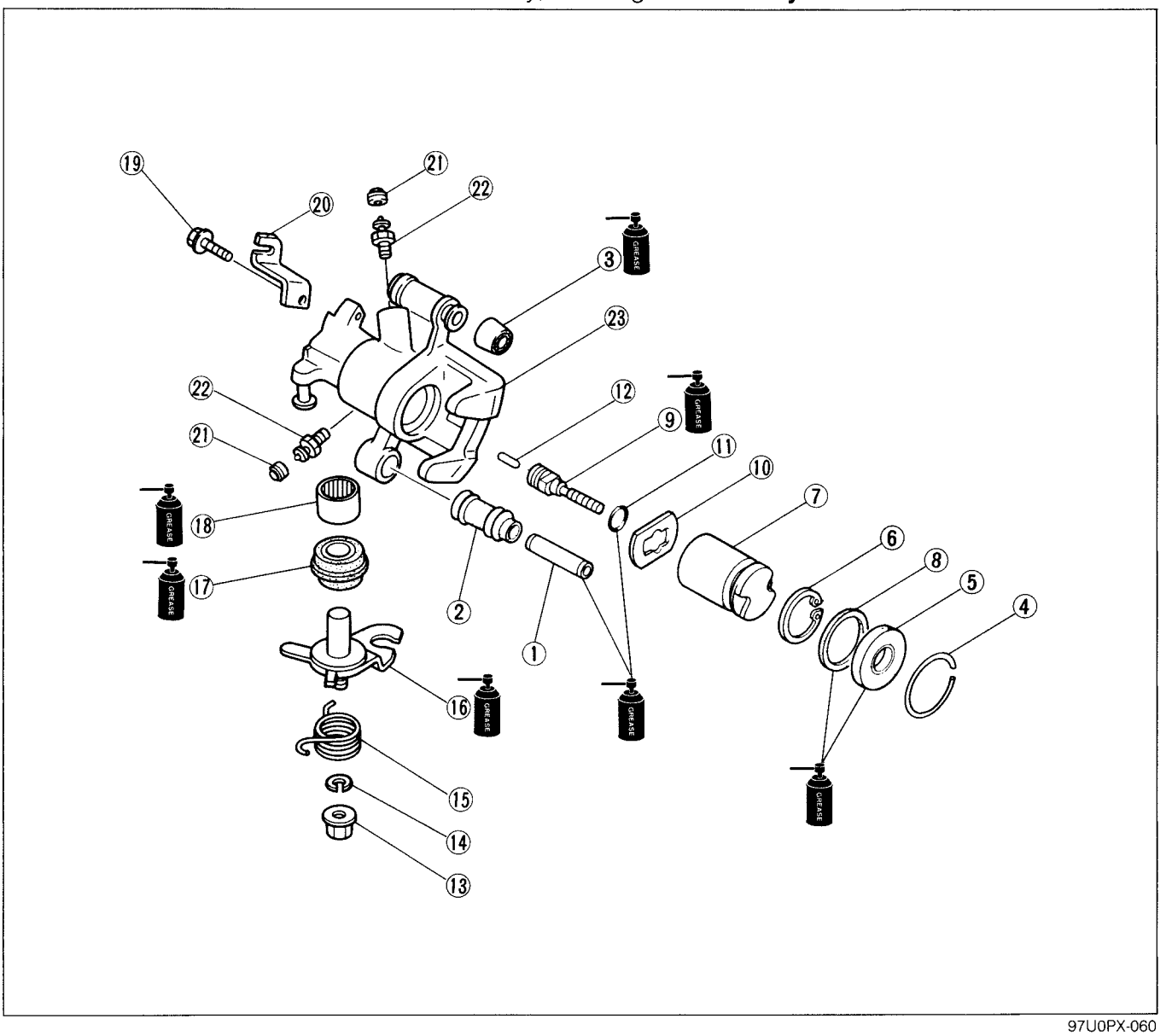
Caution
a) There must be no wheel bearing looseness.
b) The measurement location is the outer edge of the disc plate surface.

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)

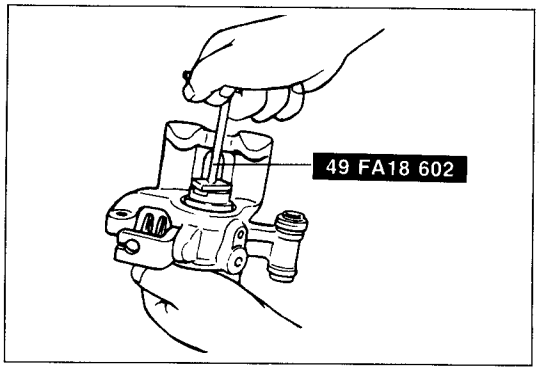
Disassembly, Inspection and Assembly

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

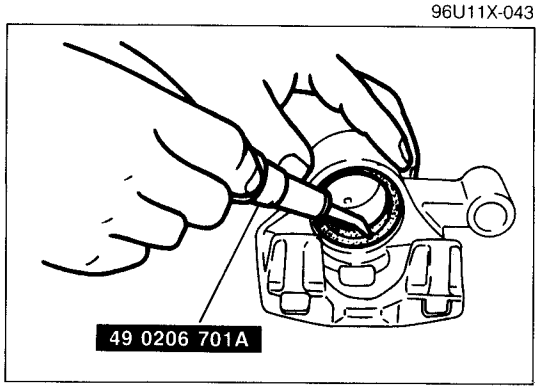
1. Guide
2. Boot
   Inspect for wear
3. Bushing
   Inspect for wear
4. Piston ring
5. Dust boot
   Inspect for cracks
6. Snap ring
7. Piston
   Disassembly ..... page P–47
   Assembly ..... page P–48
8. Piston seal
   Disassembly ..... page P–47
9. Adjuster spindle
   Assembly ..... page P–48
10. Stopper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



96U11X-043

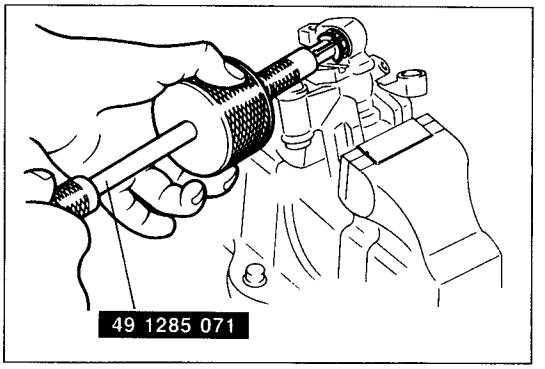
Disassembly note
Piston
Remove the piston with the **SST**.

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



86U11X-093

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

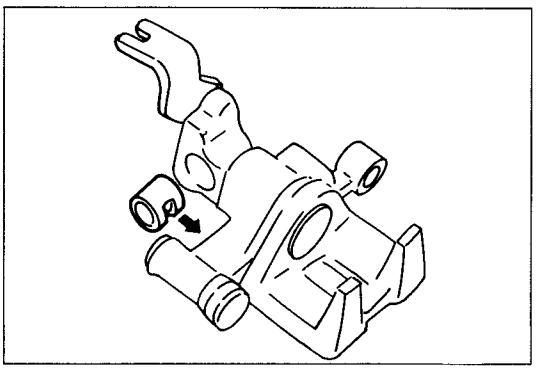


86U11X-094

Needle bearing
1. Secure the caliper in a vise.

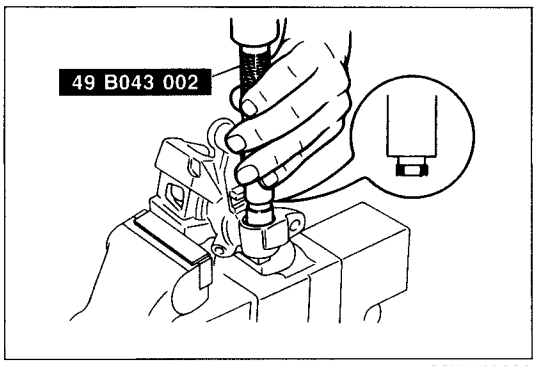
Caution
Insert a soft, protective material (such as copper plates) in the jaws of the vise.

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



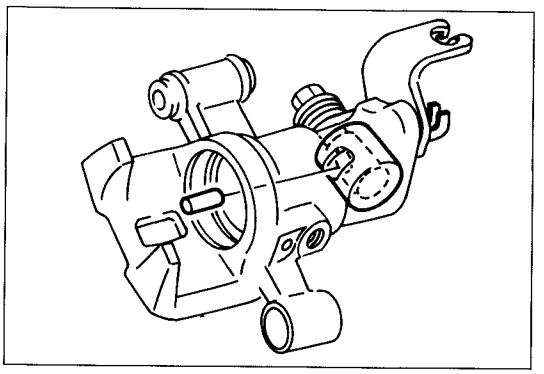
97U0PX-061

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



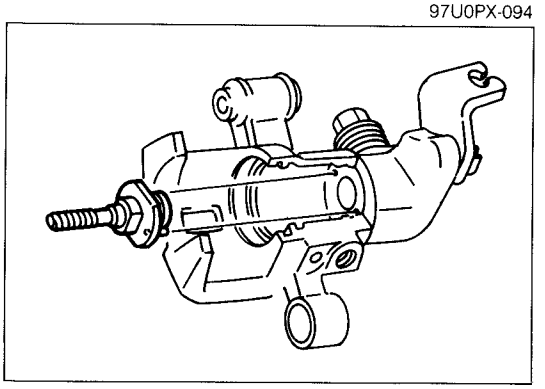
86U11X-098

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



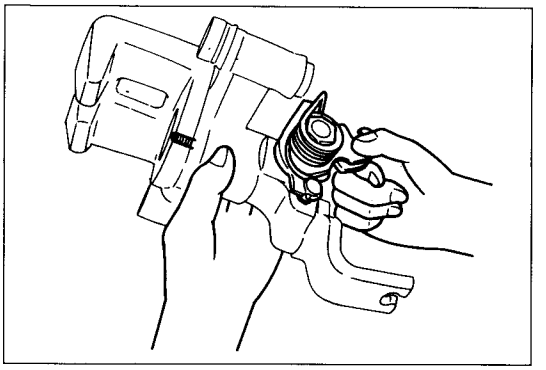
97U0PX-094

Connecting link
Install the connecting link into the needle bearing hole.



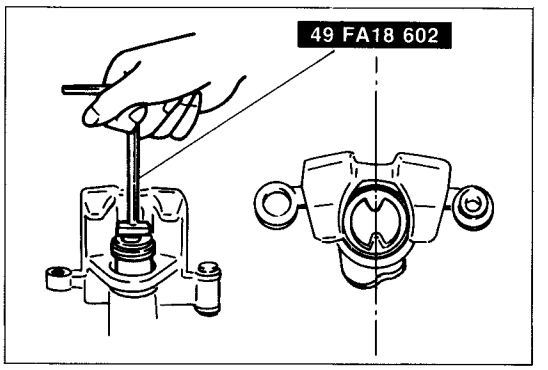
86U11X-100

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.

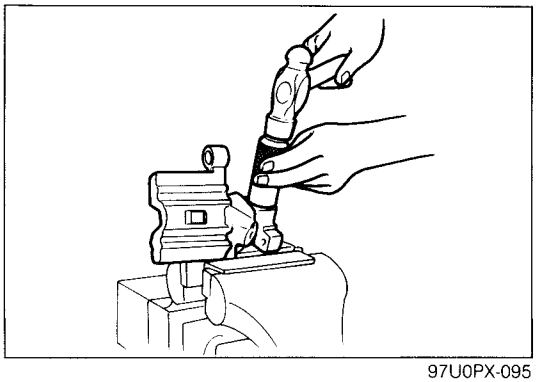


96U11X-045

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

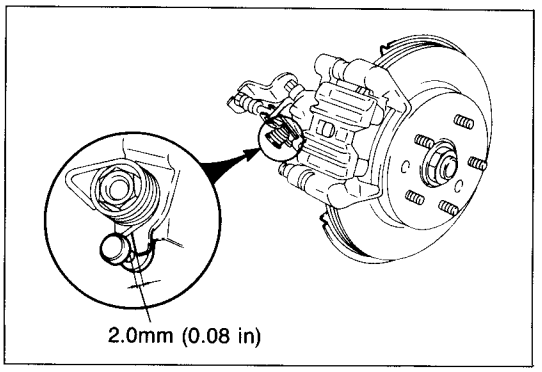
Lever boot
Press the lever boot onto the caliper with a suitable pipe.

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



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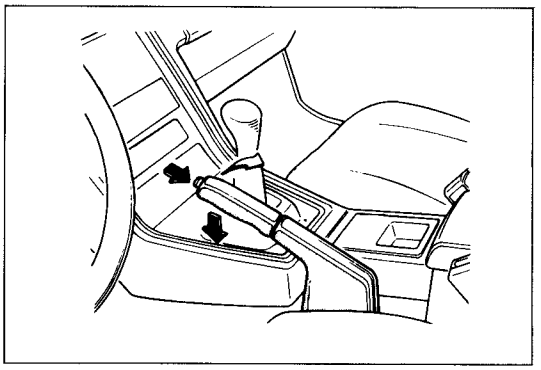

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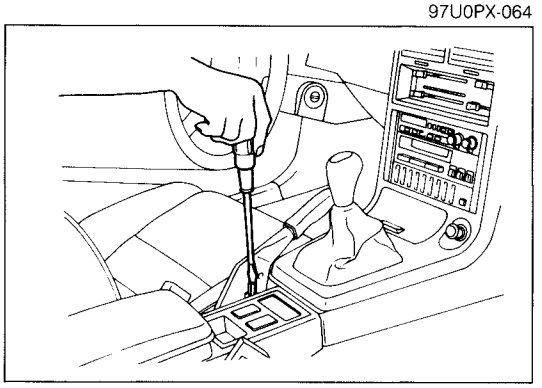


97U0PX-096

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.

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

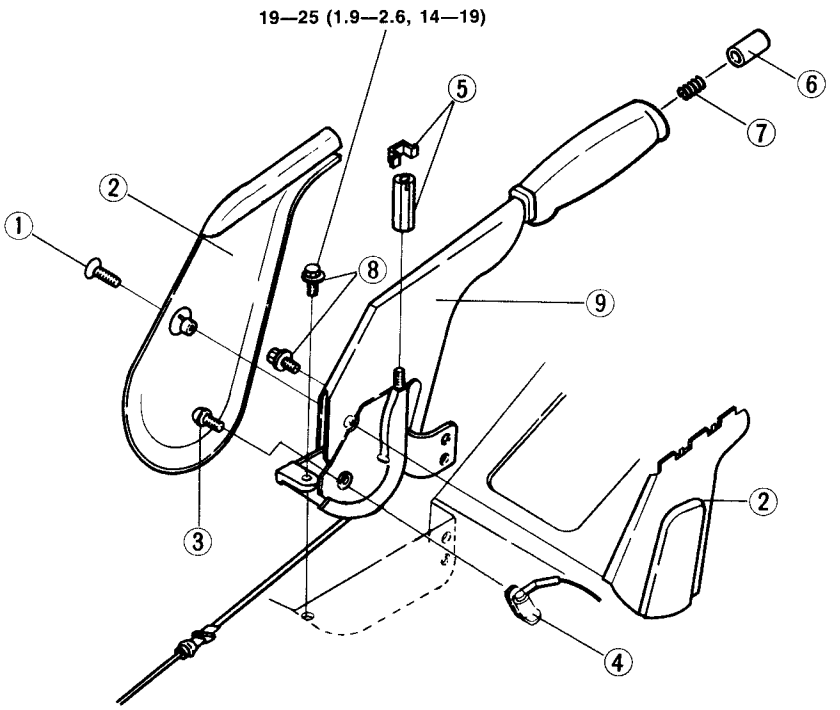
Adjustment

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.

Removal, Inspection and Installation

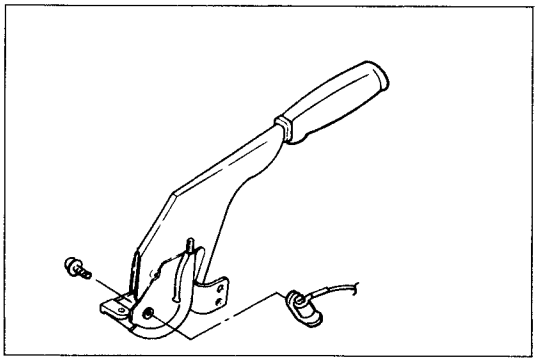
1. Block the wheels firmly.
2. Release the parking brake.
3. Remove in the order shown in the figure.
4. Inspect all components and parts. Replace parts if necessary.
5. Install in the reverse order of removal, referring to **Installation Note**.
6. After installation:
   Adjust the parking lever stroke.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



N·m (m-kg, ft-lb)

97U0PX-065

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



9MU0PX-110

Installation note

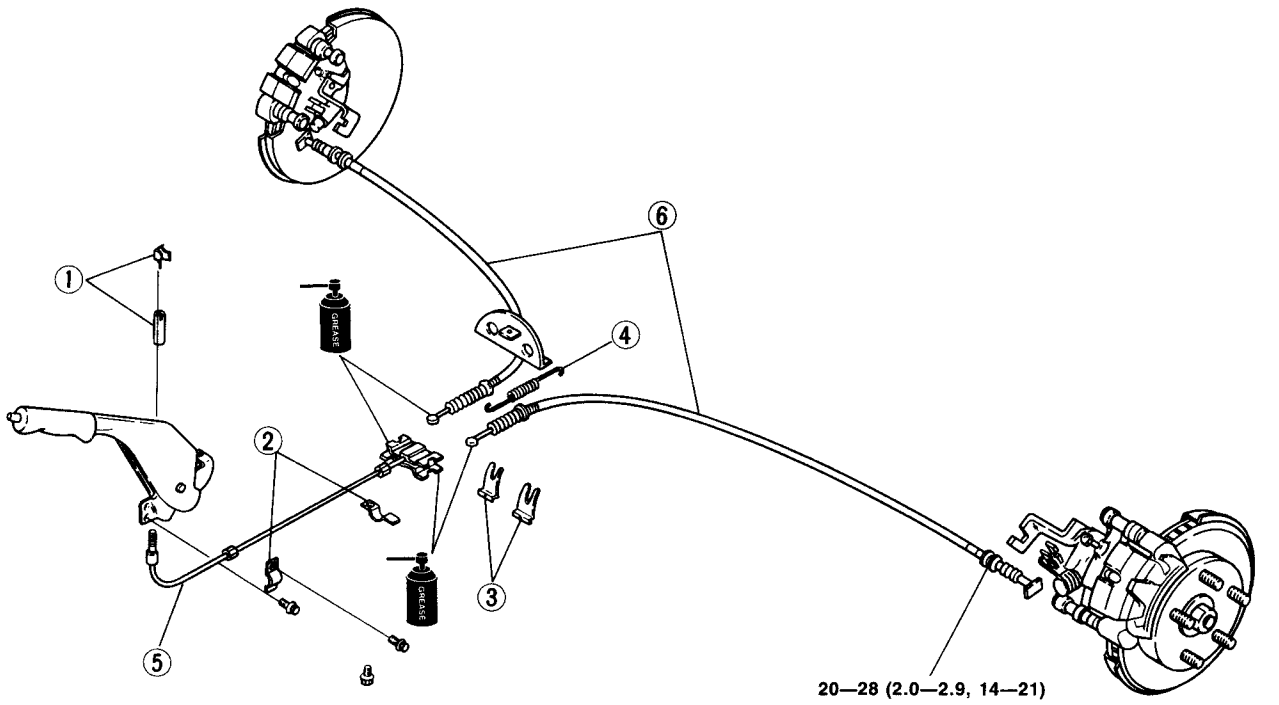
Parking brake switch

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.



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

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

ANTI-LOCK BRAKE SYSTEM (ABS)

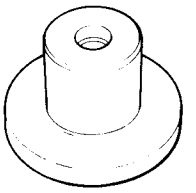
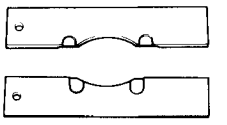
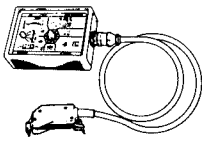
DESCRIPTION

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 moter sound is heared 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

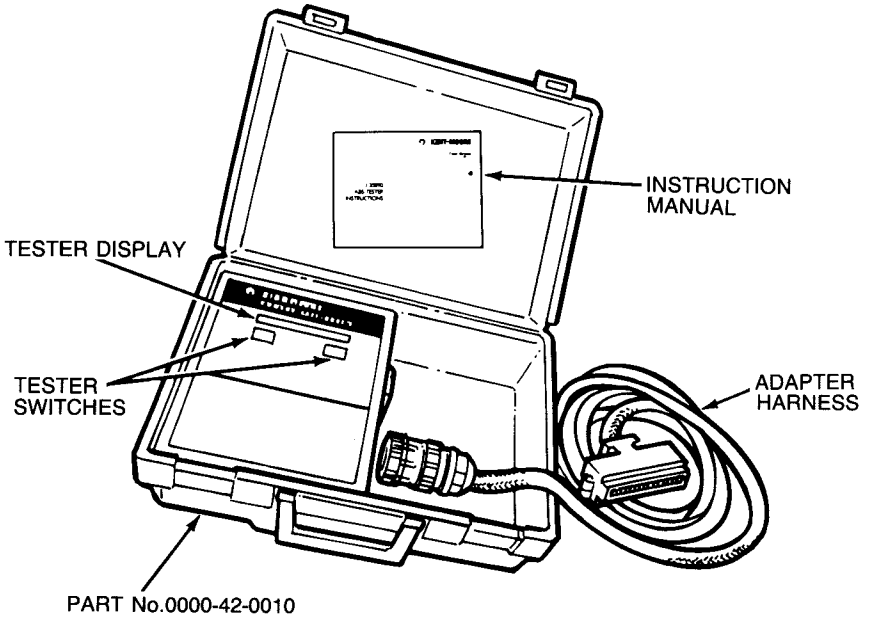
49 0259 770B Wrench, flare nut 	49 F026 102 Installer, bearing 	49 F026 103 Puller, wheel hub 
49 9200 164 Tester, anti-lock brake system 		

97U0PX-068

TROUBLESHOOTING GUIDE

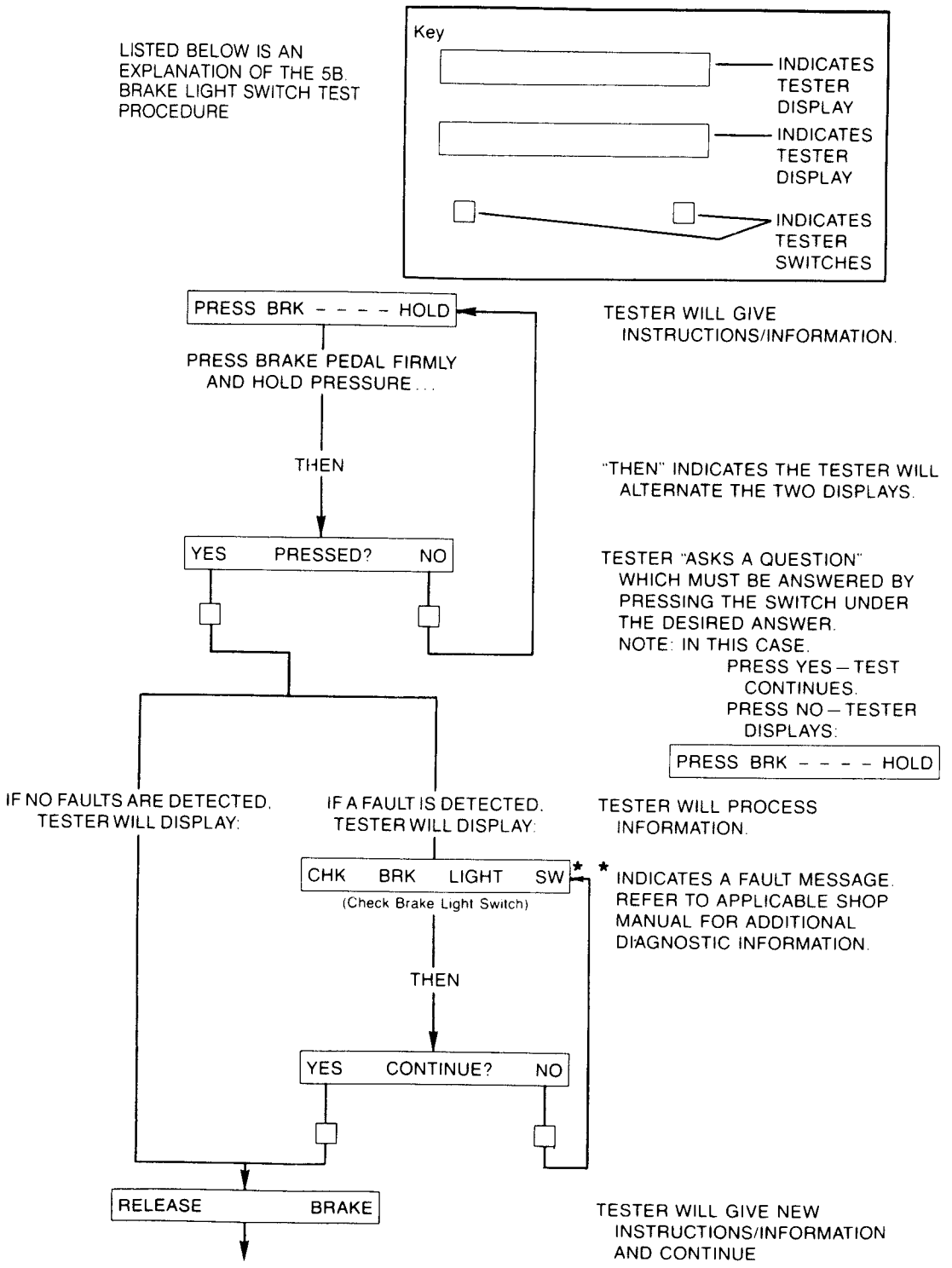
Troubleshooting Guide with ABS Tester

ABS tester

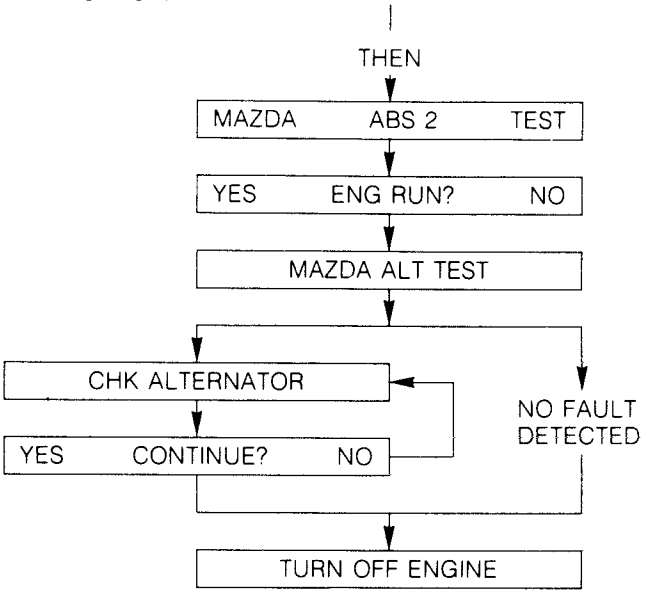
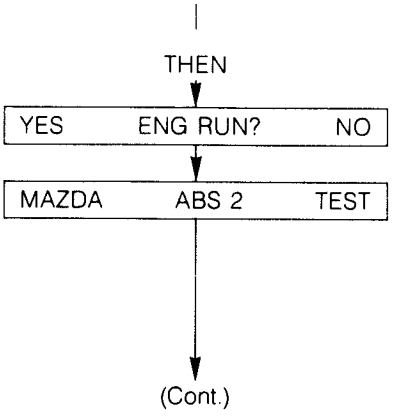


97U0PX-069

Explanation of instruction procedure



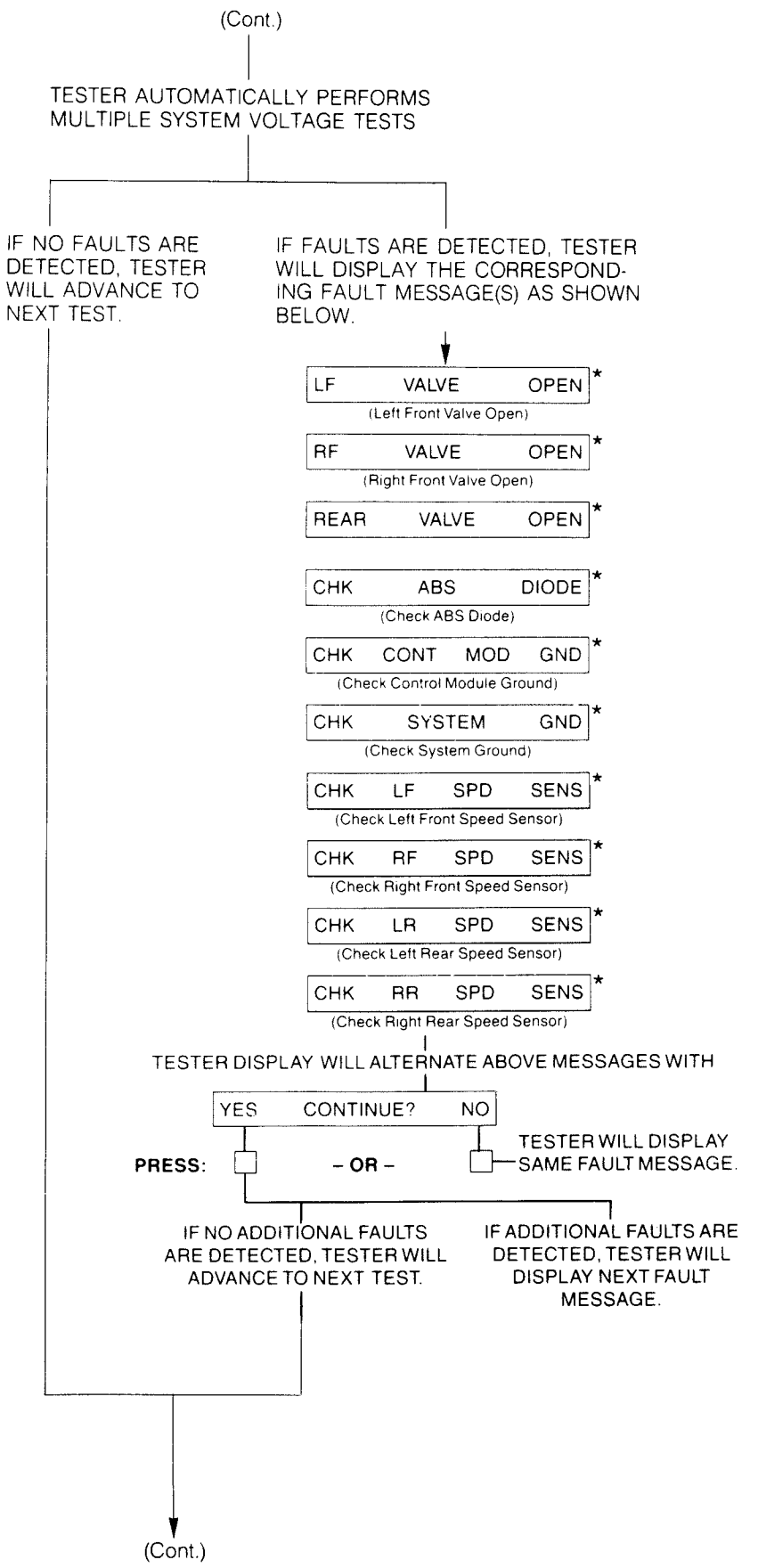
Troubleshooting procedure

ITEM	
1. CONNECTION/POWER-UP	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.
2. ALTERNATOR TEST START ENGINE (ALTERNATOR TESTED BY RUNNING ENGINE)	TESTER WILL RAPIDLY DISPLAY SEVERAL MESSAGES DURING AN INITIAL SEGMENT CHECK. 
3. ABS SYSTEM TEST TURN IGNITION KEY ON (DO NOT RUN ENGINE)	TESTER WILL RAPIDLY DISPLAY SEVERAL MESSAGES DURING AN INITIAL SEGMENT CHECK. 

97U0PX-071

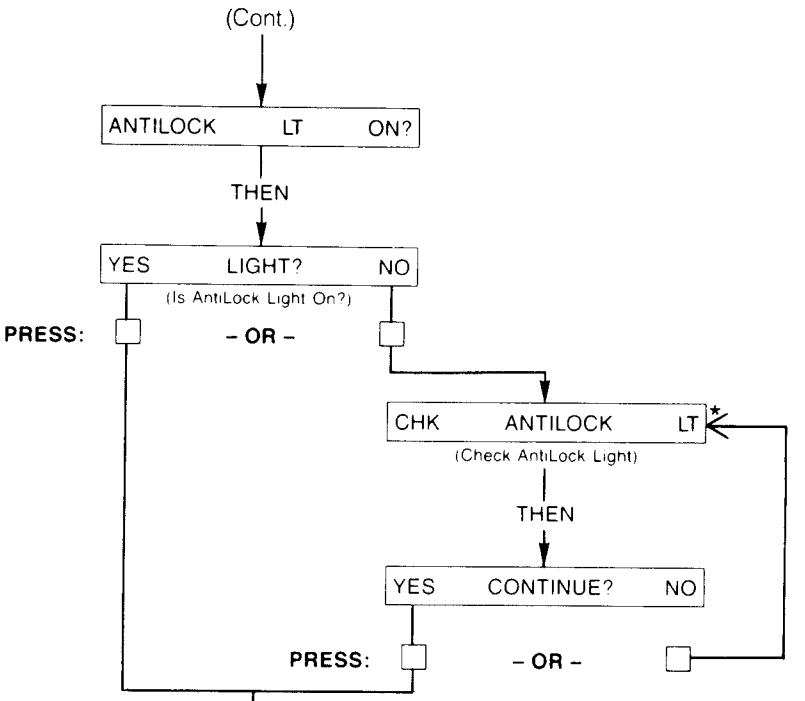
4. SYSTEM VOLTAGE CHECKS

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

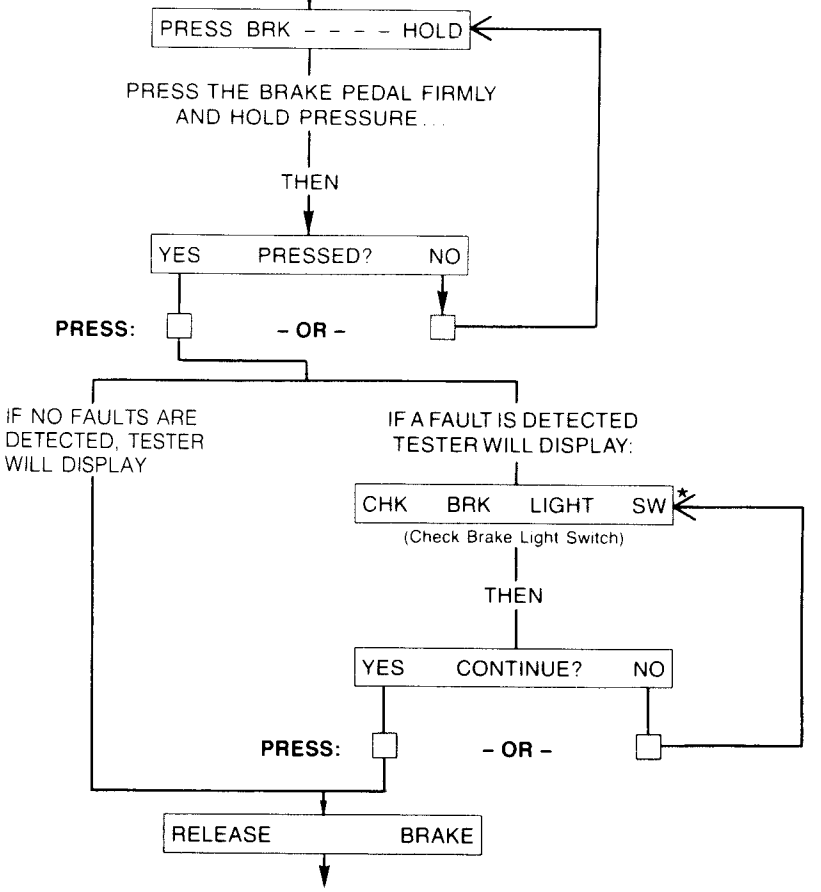


5. STATIC TESTS

5A. ANTI-LOCK LIGHT TEST

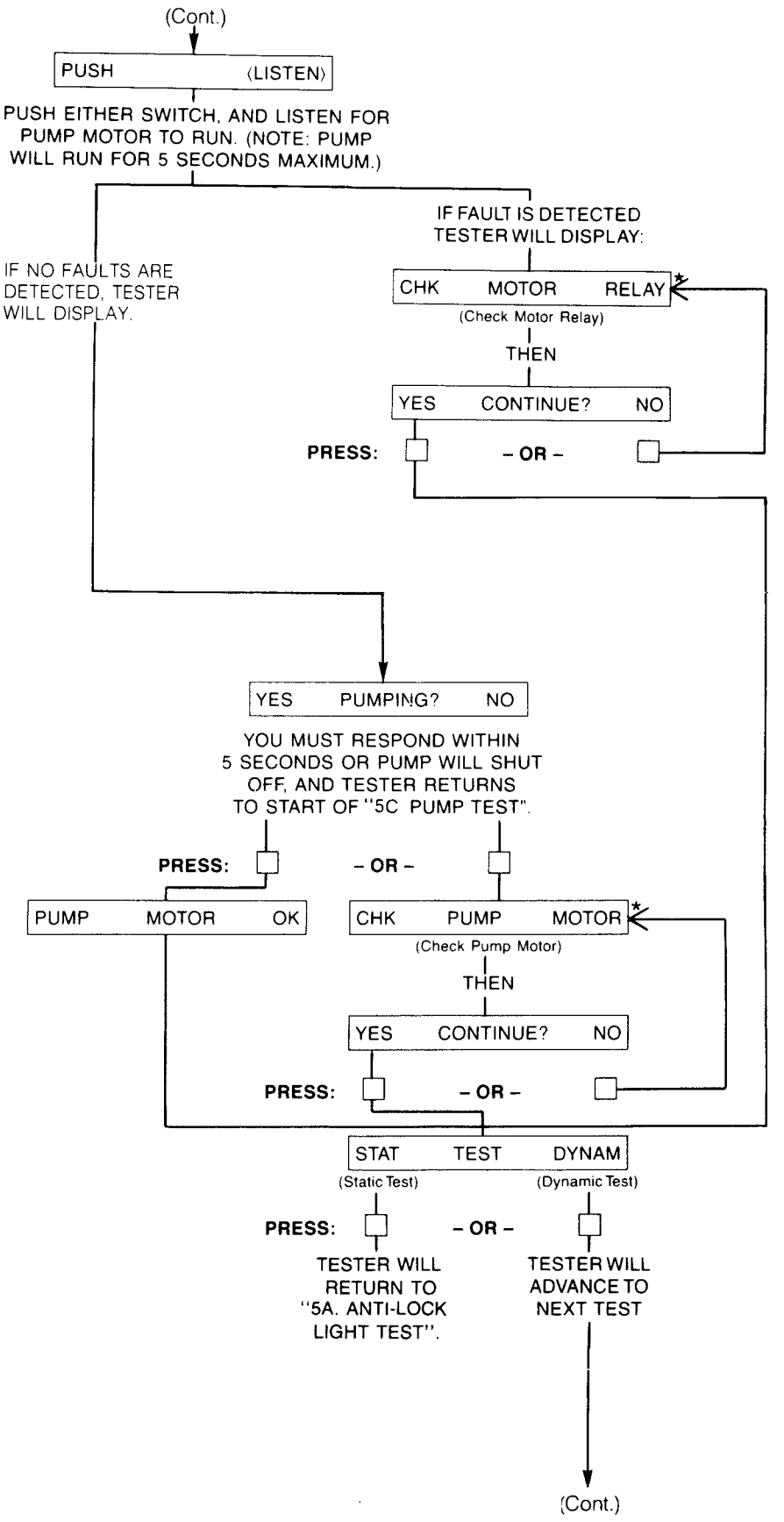


5B. BRAKE LIGHT SWITCH TEST



87U11X-012

5C. PUMP TEST


(Cont.)
PUSH (LISTEN)
PUSH EITHER SWITCH, AND LISTEN FOR PUMP MOTOR TO RUN. (NOTE: PUMP WILL RUN FOR 5 SECONDS MAXIMUM.)
IF FAULT IS DETECTED TESTER WILL DISPLAY:
IF NO FAULTS ARE DETECTED, TESTER WILL DISPLAY.
CHK MOTOR RELAY *
(Check Motor Relay)
THEN
YES CONTINUE? NO
PRESS:
- OR -
YES PUMPING? NO
YOU MUST RESPOND WITHIN 5 SECONDS OR PUMP WILL SHUT OFF, AND TESTER RETURNS TO START OF "5C PUMP TEST".
PRESS:
- OR -
PUMP MOTOR OK
CHK PUMP MOTOR *
(Check Pump Motor)
THEN
YES CONTINUE? NO
PRESS:
- OR -
STAT TEST DYNAM
(Static Test)
(Dynamic Test)
PRESS:
- OR -
TESTER WILL RETURN TO "5A. ANTI-LOCK LIGHT TEST".
TESTER WILL ADVANCE TO NEXT TEST
(Cont.)

6. DYNAMIC TESTS
6A. WHEEL SELECTION OR EXIT

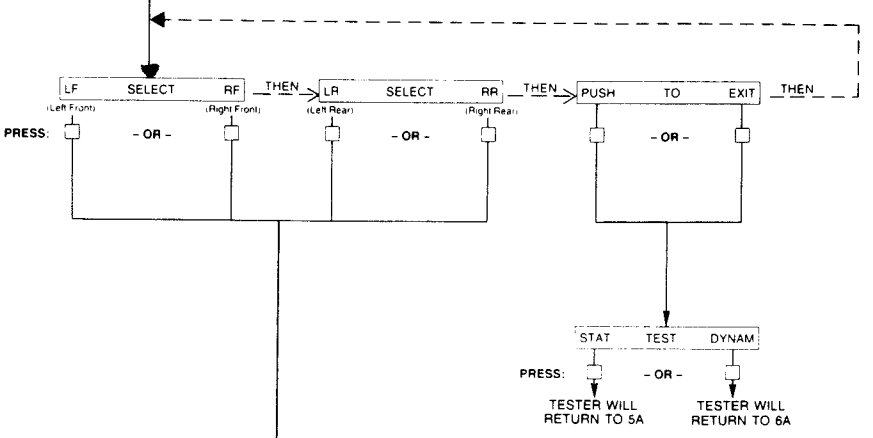
THESE THREE MESSAGES WILL ALTERNATE ON THE DISPLAY SCREEN AT 3 1/2 SECOND INTERVALS. NOW, SELECT ONE OF THE FOUR WHEELS TO BEGIN THE DYNAMIC TEST SEQUENCE.

OR

PRESS EITHER SWITCH UNDER "PUSH TO EXIT" DISPLAY TO RETURN TO "STAT TEST DYNAM" SELECTION.

IMPORTANT:
WHEN ENTERING THE DYNAMIC TEST SEQUENCE, YOU WILL SELECT ONE OF FOUR WHEELS TO BEGIN. WHEN YOU HAVE FINISHED WITH THAT WHEEL TEST, YOU SHOULD RETURN TO 6A "WHEEL SELECTION", TO SELECT ANOTHER WHEEL, AND REPEAT THESE TEST PROCEDURES FOR ALL FOUR WHEELS.

(Cont.)



NOTE: FOR EACH OF THE WHEEL TESTS, IT IS NECESSARY TO RAISE THE WHEEL(S) BEING TESTED OFF THE FLOOR. (WHEN TESTING REAR WHEELS, BOTH WHEELS MUST BE RAISED OFF THE FLOOR.) AN ASSISTANT WILL BE REQUIRED TO SPIN THE WHEELS.

6B. WHEEL SENSOR TEST

SPIN __ __ TIRE

DISPLAY WILL SHOW THE WHEEL WHICH YOU SELECTED IN TEST 6A

HAVE YOUR ASSISTANT SPIN THE WHEEL INDICATED WHILE YOU WATCH THE TESTER. IF SPEED IS INCORRECT, TESTER WILL DISPLAY:

SPIN FASTER

OR

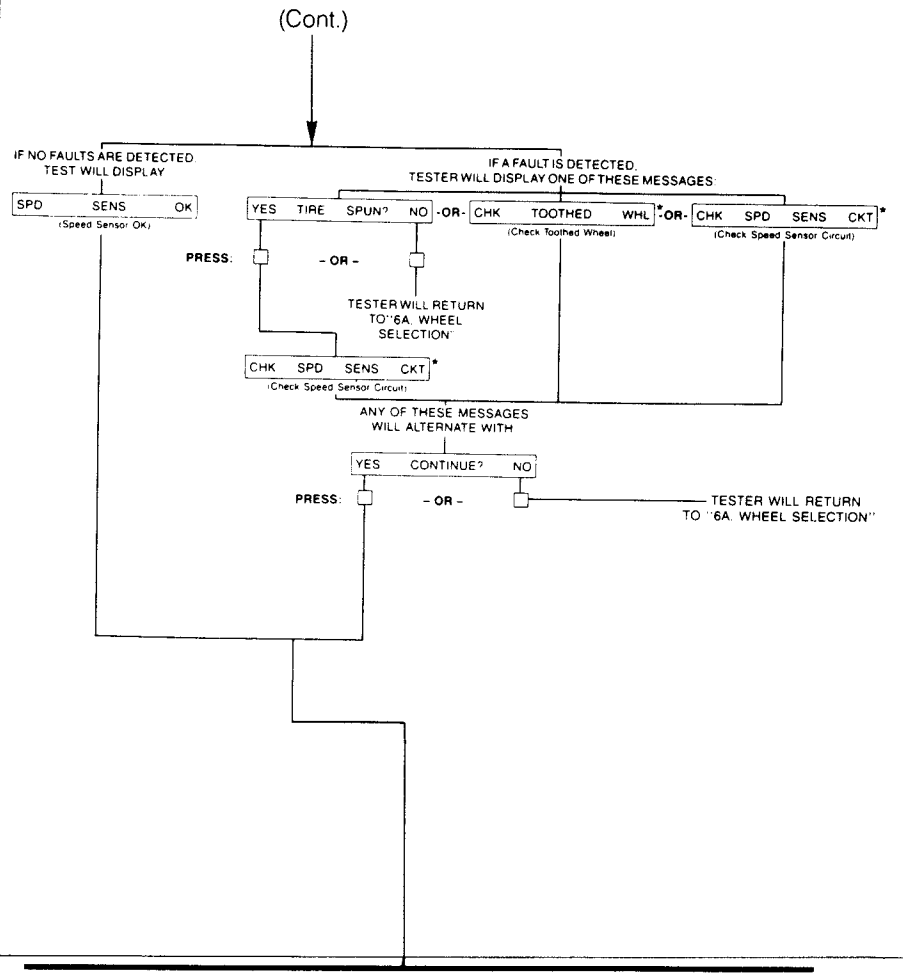
SPIN SLOWER

. . . ADVISE YOUR ASSISTANT AS INDICATED . . .

(Cont.)

87U11X-014

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

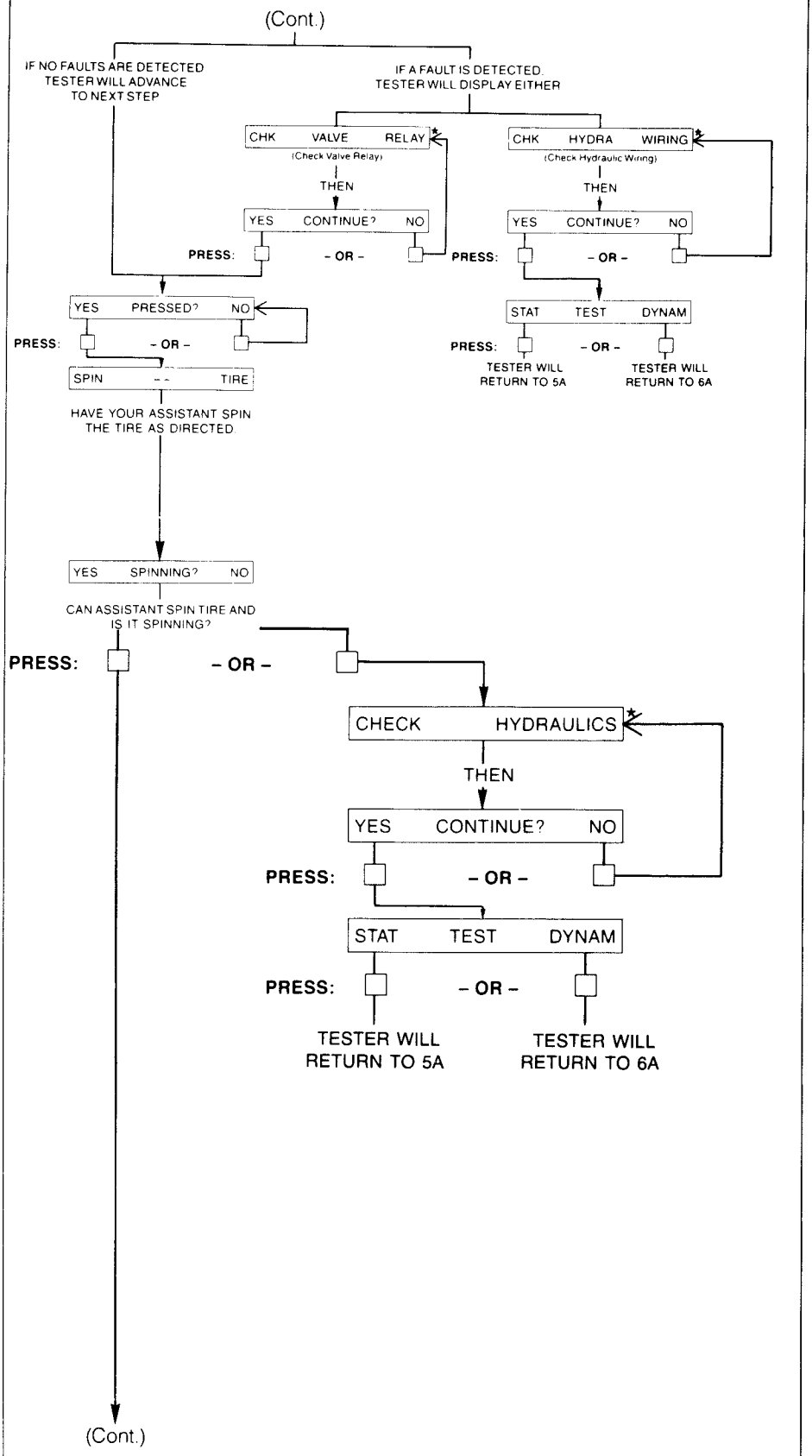
PUSH EITHER SWITCH TO START THIS TEST. TESTER WILL DISPLAY:

PRESS BRK . . . HOLD

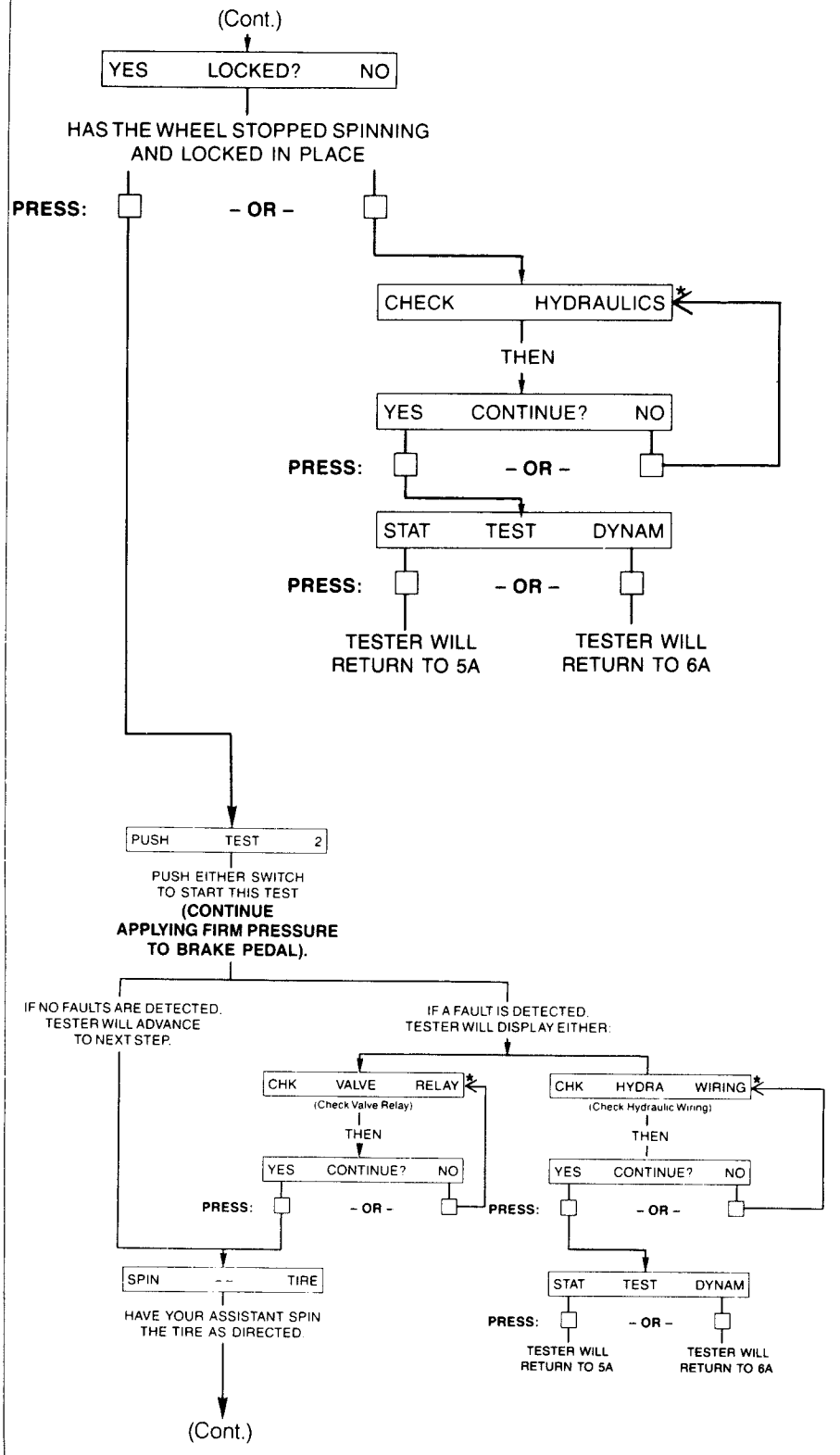
APPLY FIRM PRESSURE TO BRAKE PEDAL, AND HOLD FIRMLY THROUGH SOLENOID TEST 1 AND TEST 2.

(Cont.)

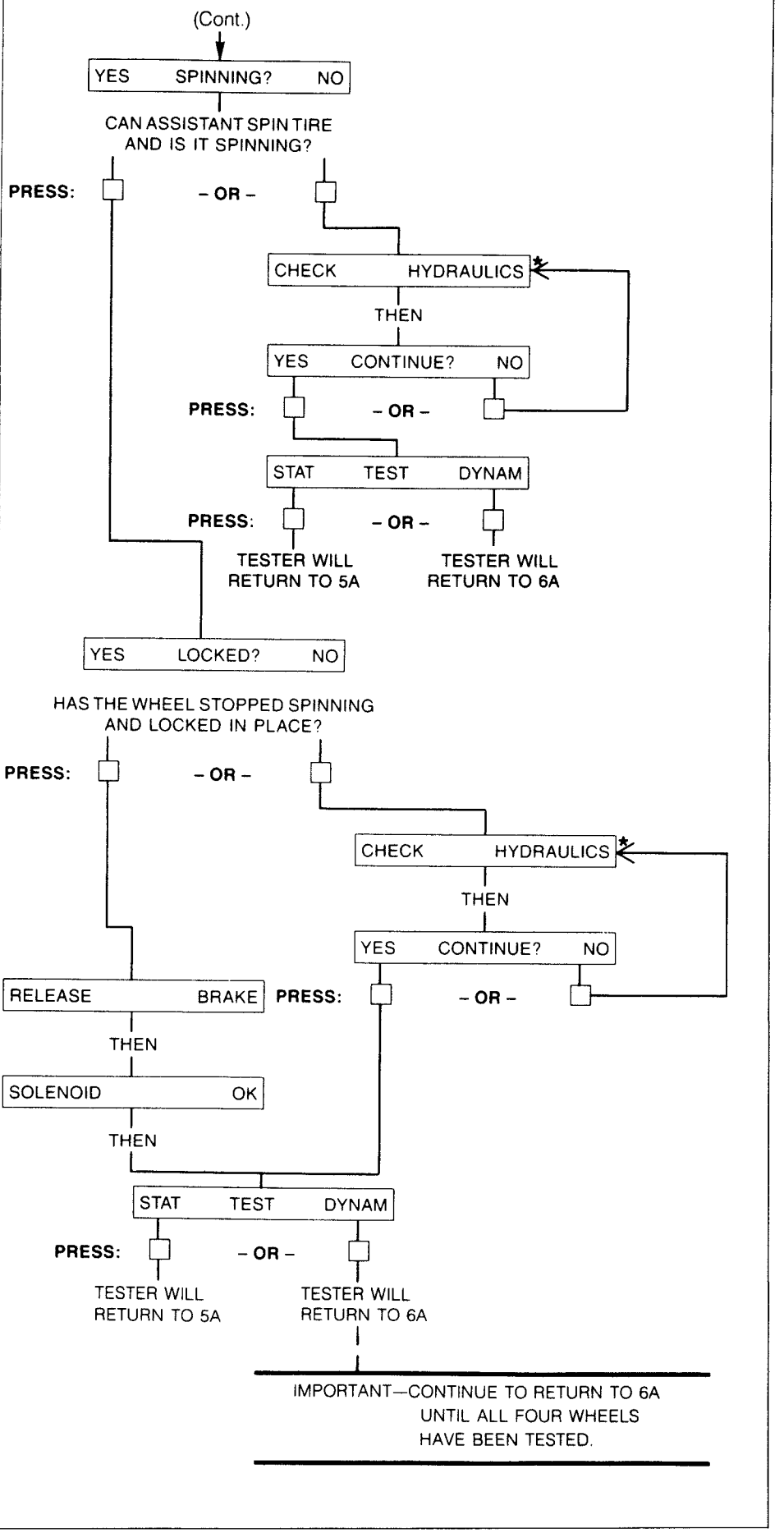
6C. SOLENOID TEST



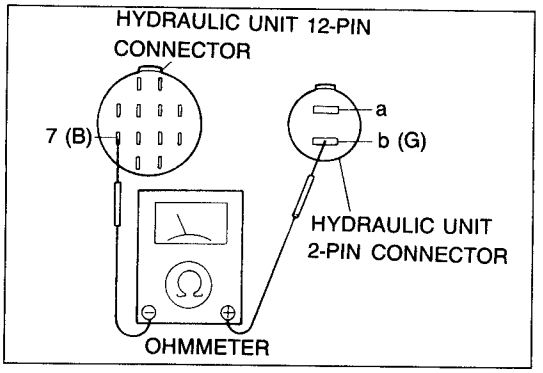
6C. SOLENOID TEST



6C. SOLENOID TEST



87U11X-018



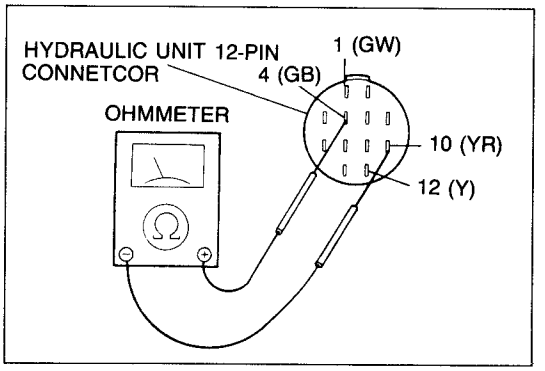
97U0PX-072

HYDRAULIC UNIT

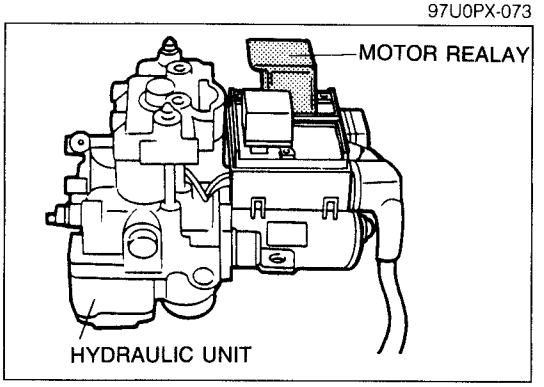
On-vehicle Inspection

Pump motor

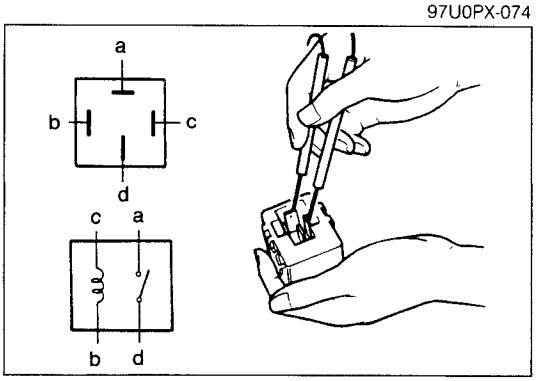
1. Disconnect the hydraulic unit 12-pin connector.
2. Check for continuity between terminal 7 (B) wire of 12-pin connector and ground.
3. If OK, check for continuity between terminal 7 (B) wire of 12-pin connector and terminal b (G) wire of 2-pin connector.
4. If OK, connect the hydraulic unit connectors.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



97U0PX-074



97U0PX-075

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.

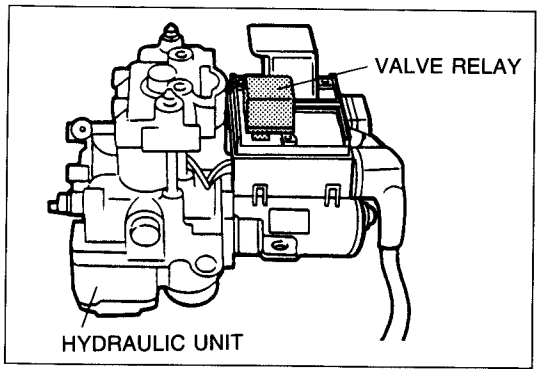
Motor relay

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.

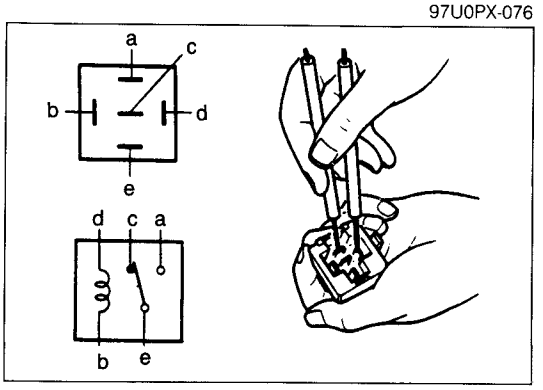
Connect to		a	b	c	d
12V	Ground				
—	—		○—○		
c	b	○			○

○—○: 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-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.

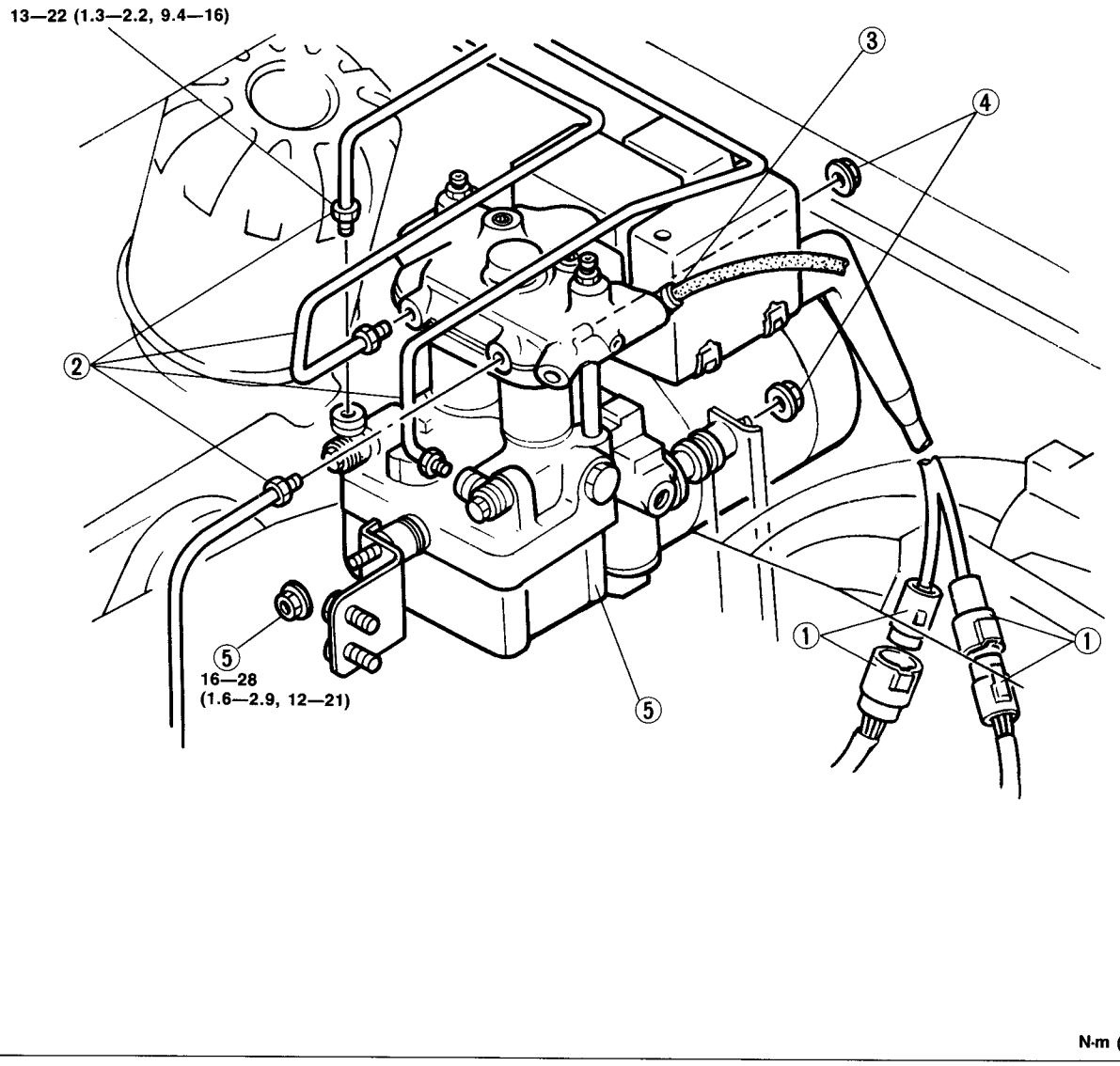
Removal and Installation

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

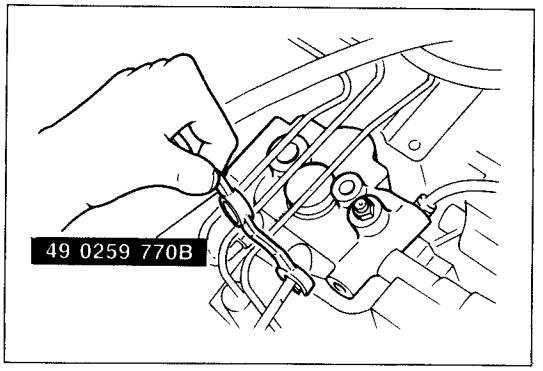
a) The only serviceable parts of the hydraulic unit are the valve relay and the pump motor relay; if there is a failure of any other part, the hydraulic unit must be replaced as an assembly.

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 conecting the brake pipes.

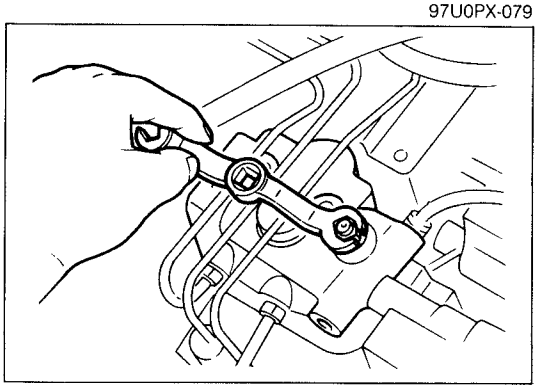


97U0PX-078

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



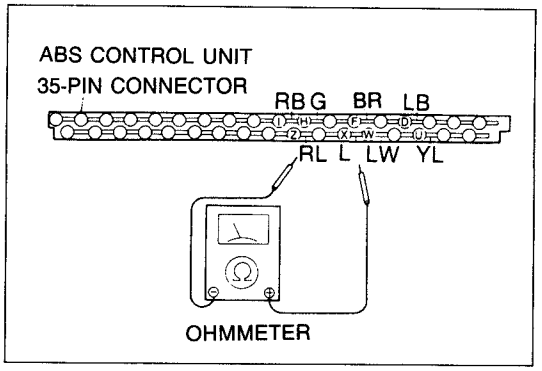
97U0PX-079



97U0PX-080

Removal note
Brake pipes
Remove the brake pipes from the hydraulic with the **SST**.

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

1. 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							○—○	

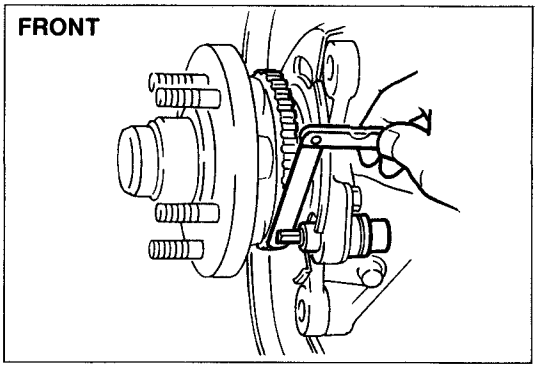
○—○: Indicates continuity

2. If the continuity is not as specified, check the wiring harness between the wheel-speed sensor and control unit.
3. 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.
4. If voltage is not approx. 50 mV—60 mV, the wheel-speed sensor is faulty.
5. If voltage is approx. 50 mV—60 mV, the control unit is faulty.

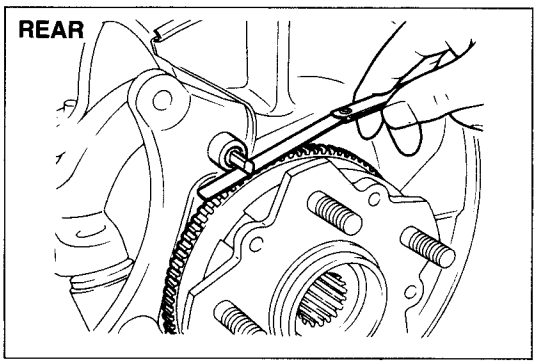
97U0PX-082

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

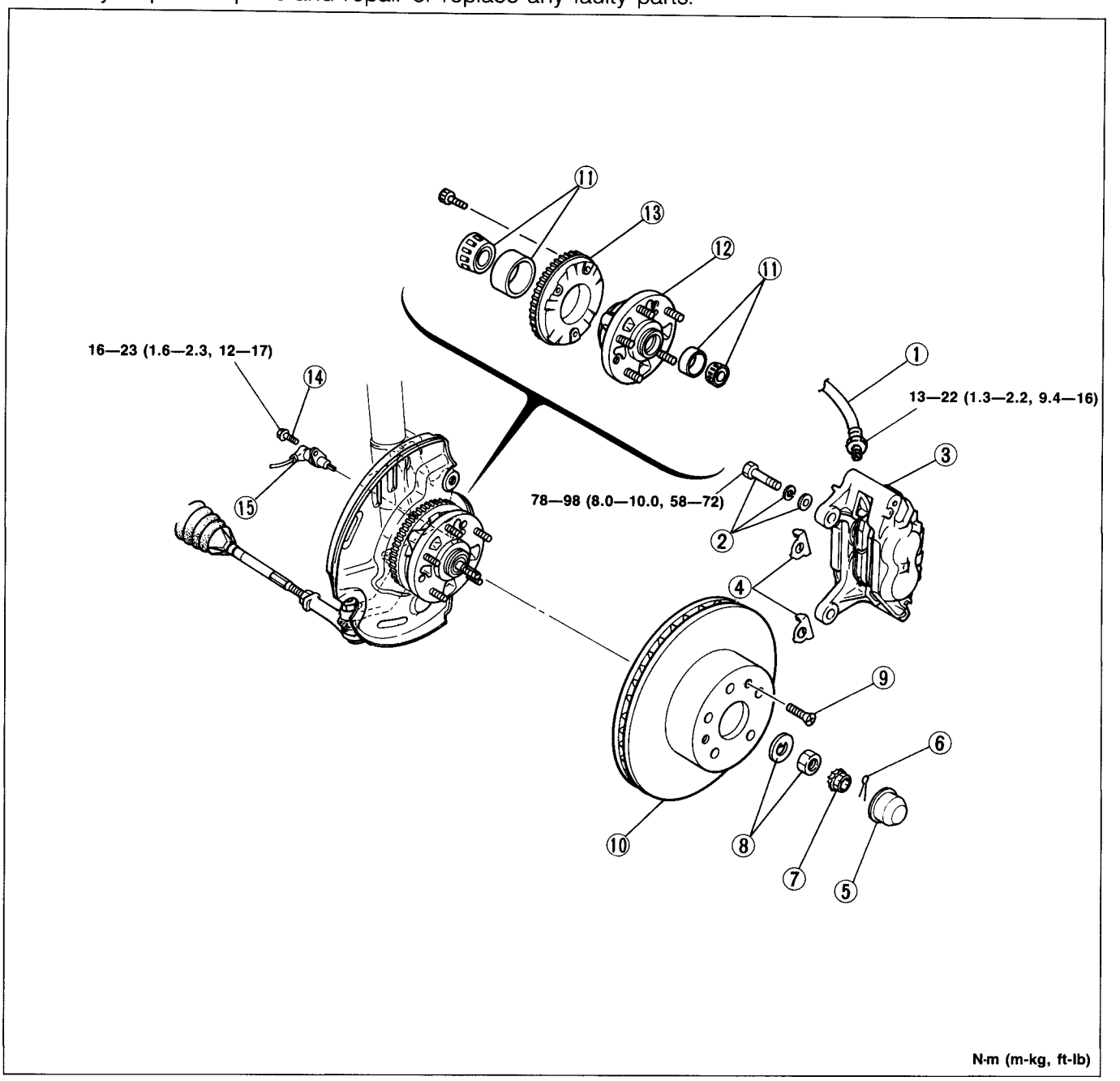
1. Remove the front and rear wheels.
2. Remove the front and rear disc plates.
3. Check the clearance between the speed sensor pickup and the rotor.

Specified clearance:
0.4—1.0mm (0.0157—0.0394 in)

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

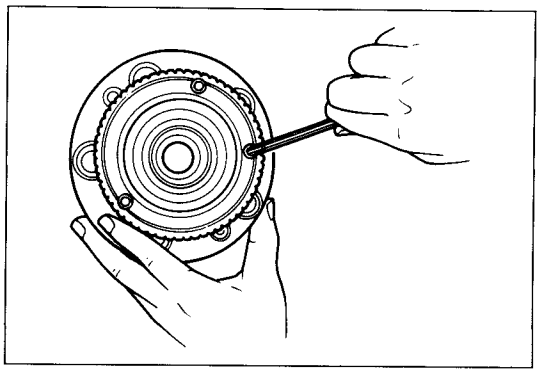
Removal, Inspection and Installation (Front)

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.

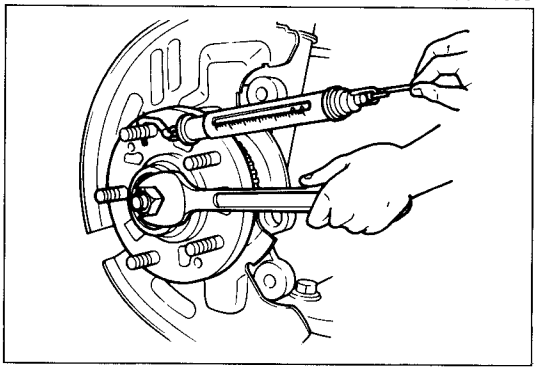


97U0PX-085

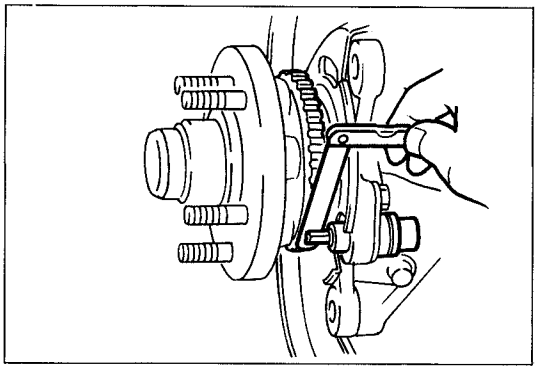
1. Brake pipe
   Removal..... page P–40
2. Bolt and washers
3. Caliper assembly
4. Guide plate
5. Hub cap
6. Clip
7. Set cover
8. Locknut and washer
   Installation..... page P–69
9. Screw
10. Disc plate
    Inspect for damage or wear
11. Bearing and race
    Inspect for damage or wear
12. Front hub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


97U0PX-086

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


97U0PX-087

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

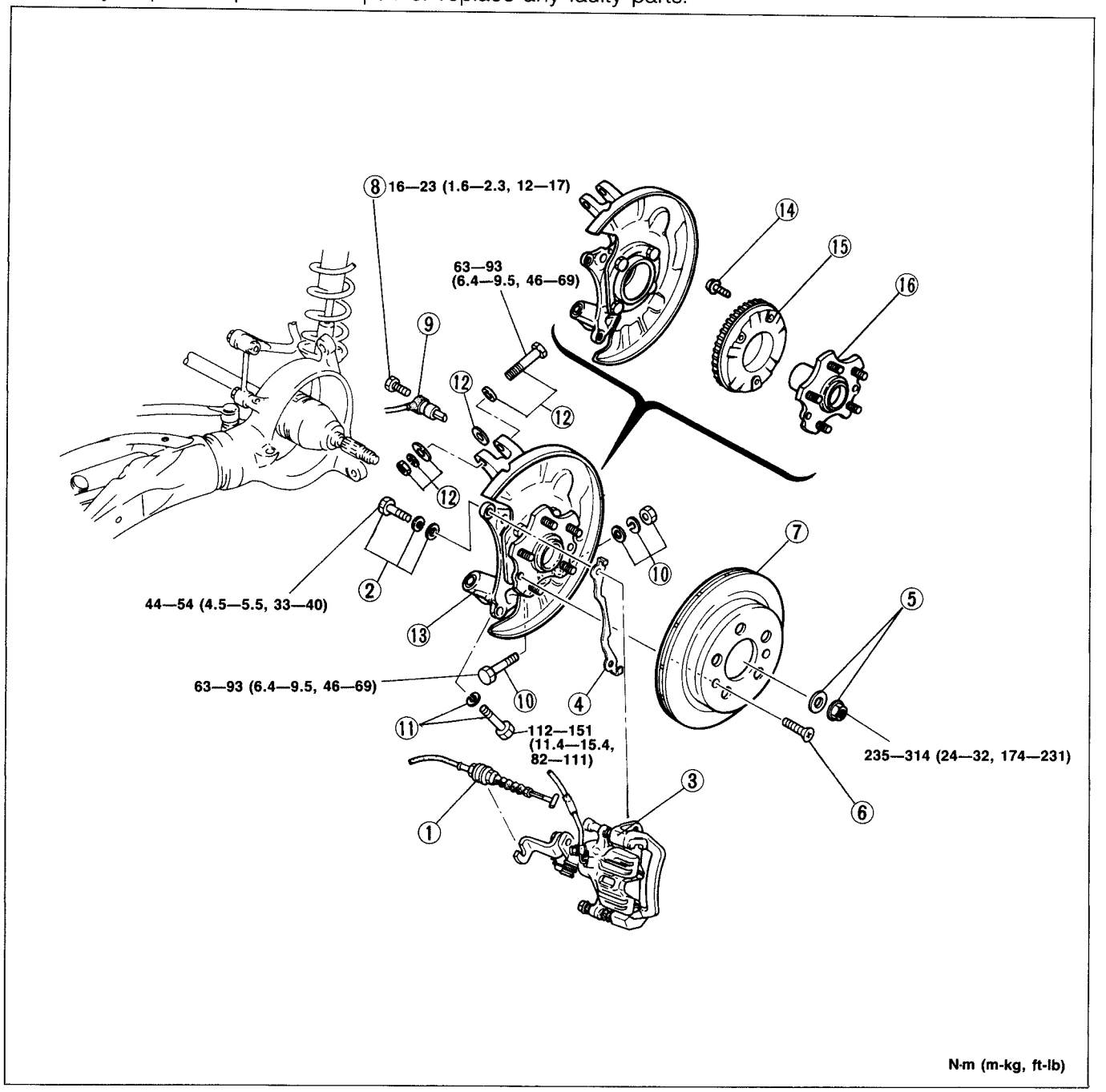

97U0PX-088

Speed sensor and rotor
Check the clearance between the speed sensor and rotor.

Specified clearance:
0.4—1.0mm (0.016—0.039 in)

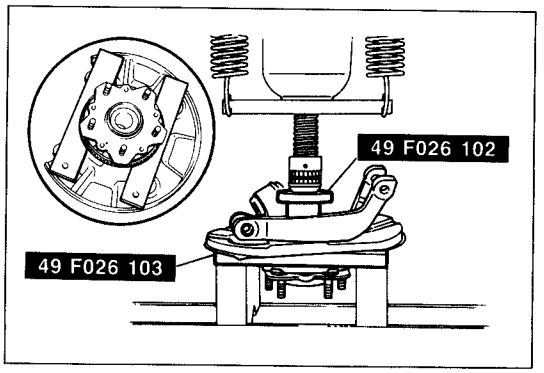
Removal, Inspection and Installation (Rear)

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

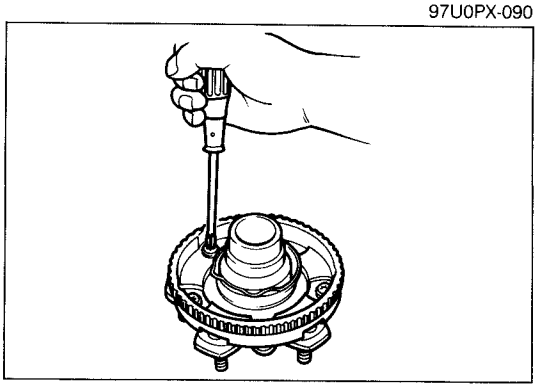
1. Parking brake cabel
2. Bolt and washers
3. Brake caliper assembly
4. Guide plate
5. Locknut and washer
6. Screw
7. Disc plate
8. Bolt
9. Speed sensor
   Installation ..... page P–71
10. Bolt, washers and nut
11. Bolt and washer
12. Bolt, washers and nut
13. Control hub assembly
14. Bolt
15. Sensor rotor
    Removal/Installation ..... page P–71
16. Hub



97U0PX-090

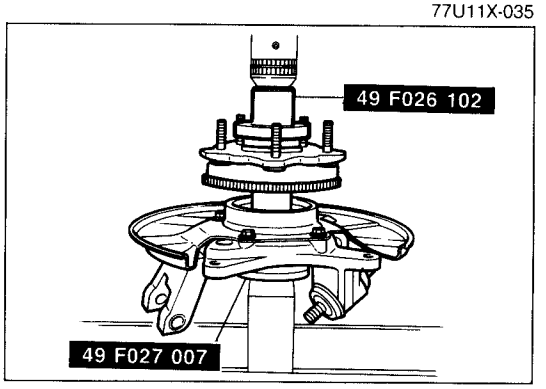
Removal note
Rotor

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



77U11X-035

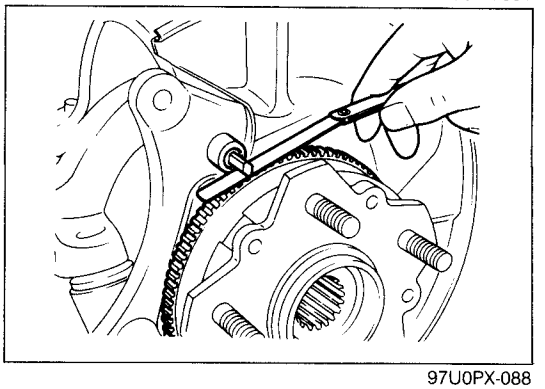
2. Remove the screws and the rotor from the wheel hub.



97U0PX-091

Installation note
Rotor

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

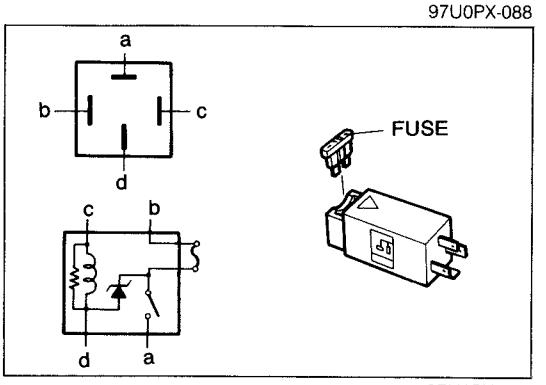


97U0PX-088

Speed sensor and rotor

Check the clearance between the speed sensor and rotor.

Specified clearance:
0.4—1.0mm (0.016—0.039 in)



97U0PX-092

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.

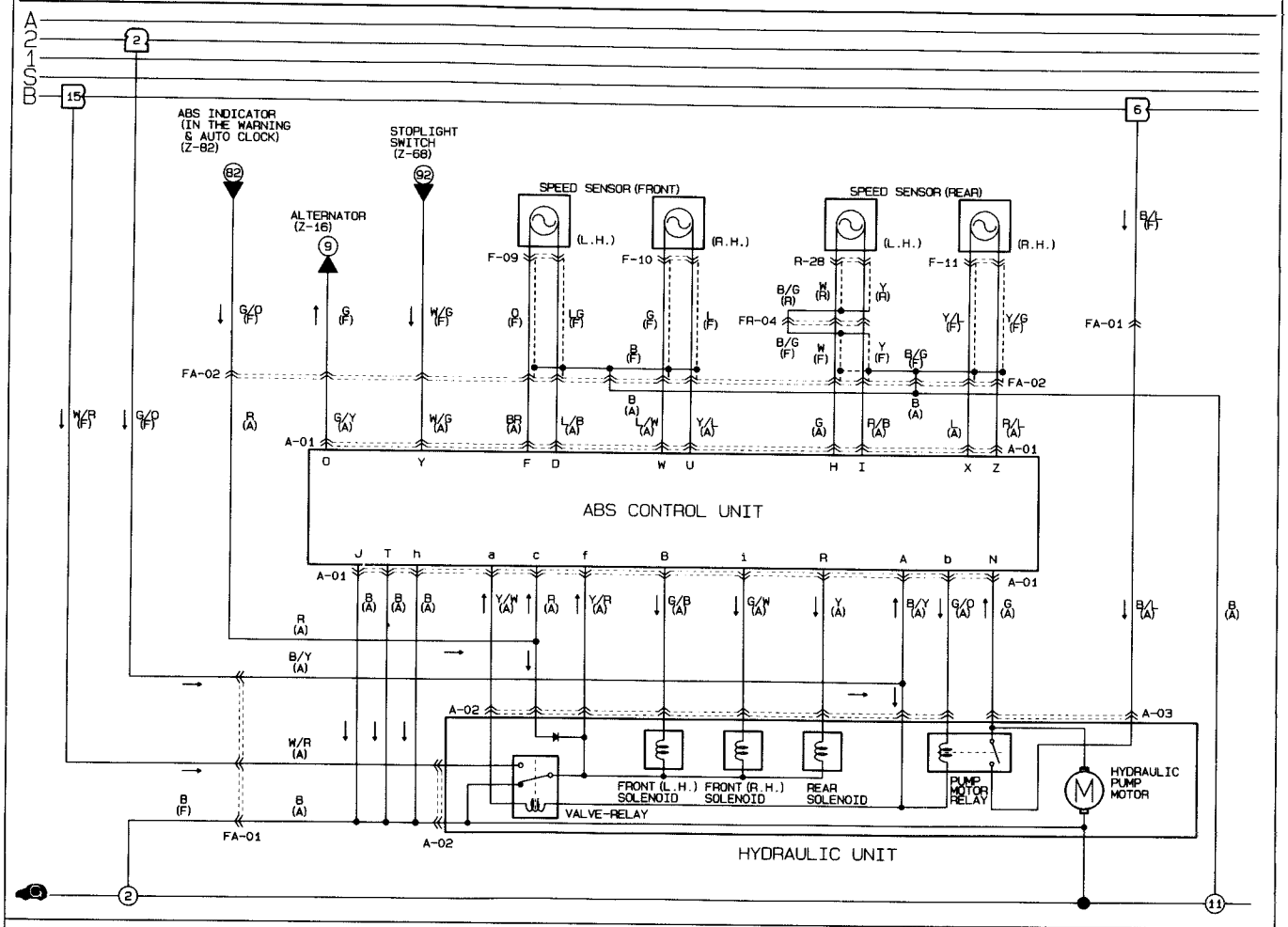
Connect to		a	b	c	d
12V	Ground				
—	—		○	○—▶—○	
c	b	○—○			

○—○: Indicates continuity

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

CIRCUIT DIAGRAM

■ ABS (ANTI-LOCK BRAKE SYSTEM)

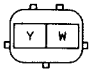


F-09 SPEED SENSOR FRONT (L.H.) (F)

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

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

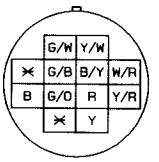
R-28 SPEED SENSOR REAR (L.H.) (R)



A-01 ABS CONTROL UNIT (A)

R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
Y	✕	✕	G/Y	G	✕	✕	✕	B	R/B	G	✕	BR	✕	L/B	✕	G/B	B/Y
G/W	B	✕	Y/R	✕	✕	R	G/O	Y/W	R/L	W/G	L	L/W	✕	Y/L	B	✕	
i	h	g	f	e	d	c	b	a	Z	Y	X	W	V	U	T	S	

A-02 HYDRAULIC UNIT (A)



A-03 HYDRAULIC UNIT (A)

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

(F)

B/L	W/R
B	G/O

(A)

W/R	B/L
B/Y	B

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

(F)

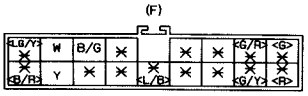
G	Y/L	W		G	O	W/B
G/O	Y/G	Y	B/G	L	LG	B

(A)

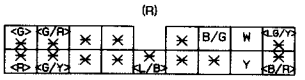
G/Y	BR	L/W		G	L	W/G
B	L/B	Y/L	B	R/B	R/L	R

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

(F)



(R)



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

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