# SERVICE MANUAL

DATSUN 280Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

## SECTION BR

# BRAKE SYSTEM

# BRAKE SYSTEM

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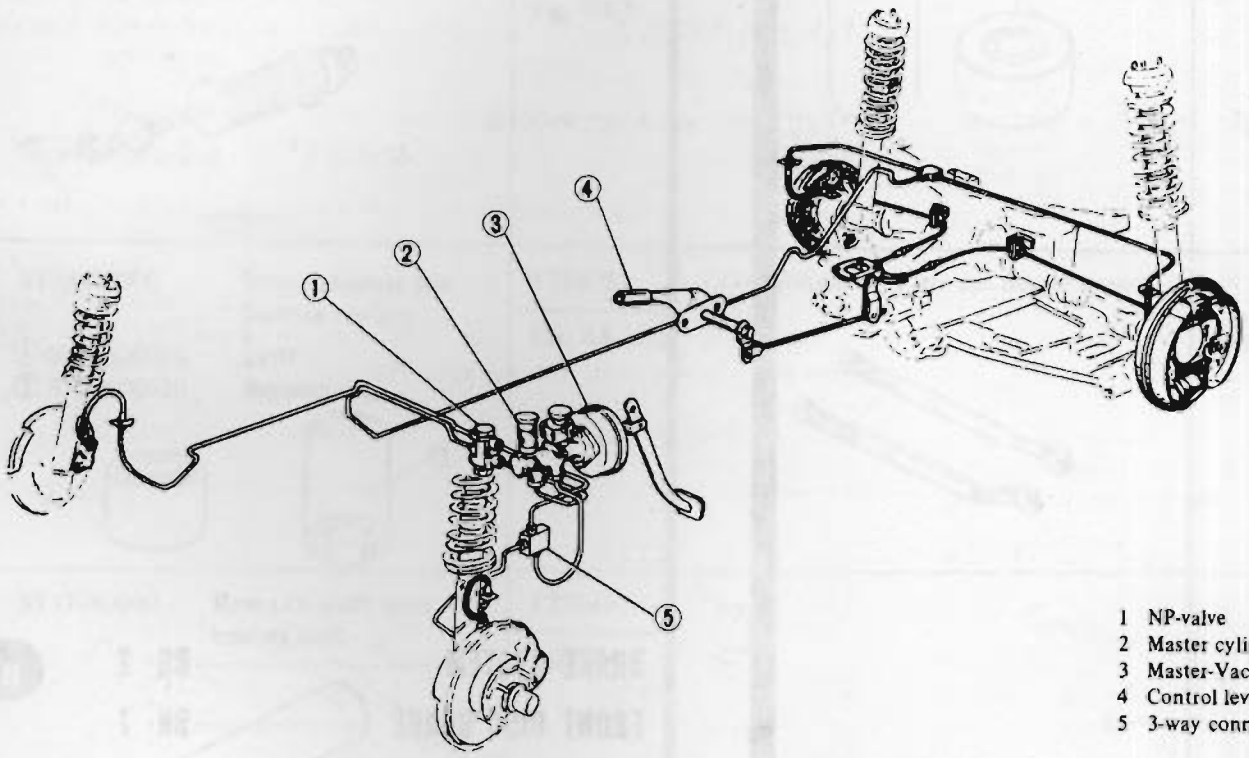



1 NP-valve
2 Master cylinder
3 Master-Vac
4 Control lever
5 3-way connector

BR071A

*Fig. BR-1 Brake system*

## DESCRIPTION

The S30 series cars are equipped with disc brake for front, drum brake for rear, and a Master-Vac, to get great braking force.

The front disc brake is Girling-Sumitomo model S-16, and the pad is operated with two pistons.

The leading-trailing type rear drum brake is equipped with auto-adjuster, and in order to get enough cooling effect, aluminum finned brake drums are installed.

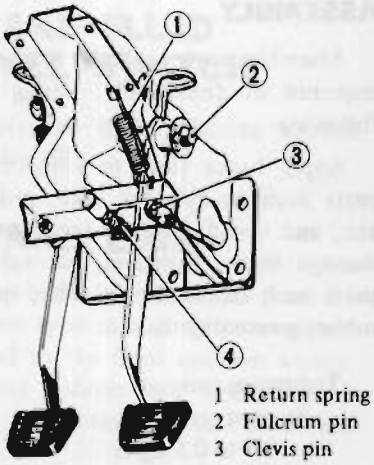
Moreover, the brake system is equipped with a NP-valve to prevent skid due to early rear wheel locking.

The hand brake is of a mechanical type, which brakes rear wheels, and is operated by the control lever through linkage and wire.

The control lever is located in the seat side center. The hand brake may also be used as an emergency brake.

# BRAKE PEDAL

The brake pedal is installed on the bracket which also supports the steering column, and the bracket is secured under the dash panel. The stop lamp switch is installed on the pedal bracket, and is operated by pedal arm.




1 Return spring
2 Fulcrum pin
3 Clevis pin
4 Stop lamp switch

*Fig. BR-2 Brake pedal mounting*

## REMOVAL

(For parts item numbers, refer to Fiugre BR-2.)

1. Remove return spring ①.
2. Remove clevis pin ③ from the push rod, and separate pedal from Master-Vac.
3. Remove fulcrum pin ② and remove the pedal.

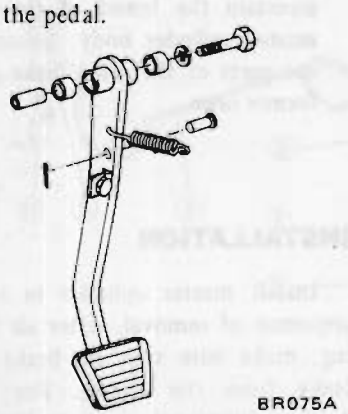



*Fig. BR-3 Brake pedal components*

## INSPECTION

Check brake pedal for the following items, and correct or replace if required.

1. Pedal bushing and sleeve for wear, deformation, and/or damage.
2. Pedal arm for twisting, bending, and/or cracking.

## INSTALLATION

Install brake pedal in reverse sequence of removal, noting the following:

1. Be sure to fill pedal shaft sleeve unit and clevis pin unit with recommended multi-purpose grease sufficiently.
2. Be sure to tighten fulcrum pin under tightening torque of 3.5 to 4.0 kg-m (25 to 29 ft-lb).

# ADJUSTMENT

## ADJUSTING BRAKE PEDAL

1. Loosen lock nut, turn the push rod clevis, and adjust push rod length properly so that height of pedal pad upper surface is 206 mm (8.11 in) with pedal stopper non-effected.
2. Next, turn back stopper, and depress pedal so that pedal pad height is reduced from 206 mm (8.11 in) to 203 mm (7.99 in). See Figure BR-4.

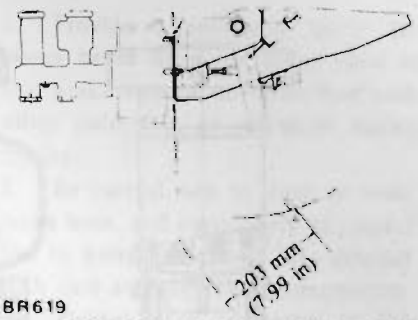


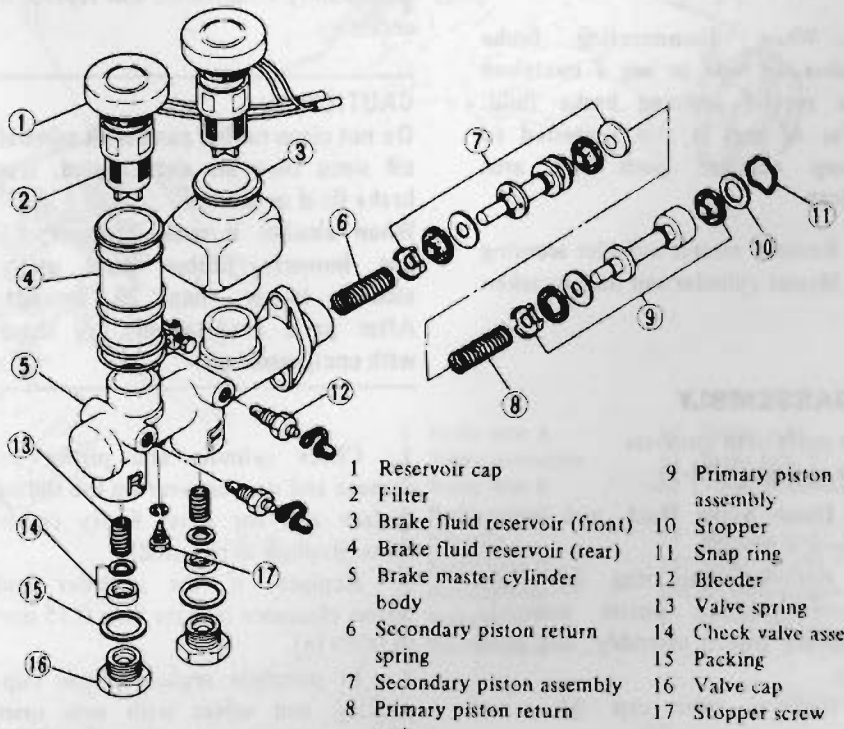

*Fig. BR-4 Adjusting brake pedal*

Note:

a. Install stop lamp switch so that installation screw end surface is flush against bracket.
b. After the above processes, make sure that lamp is on when pedal is pushed down by 15 mm (0.59 in) at the place of the brake pedal pad and it is off when pedal is released. Repeat it for several times.

# MASTER CYLINDER

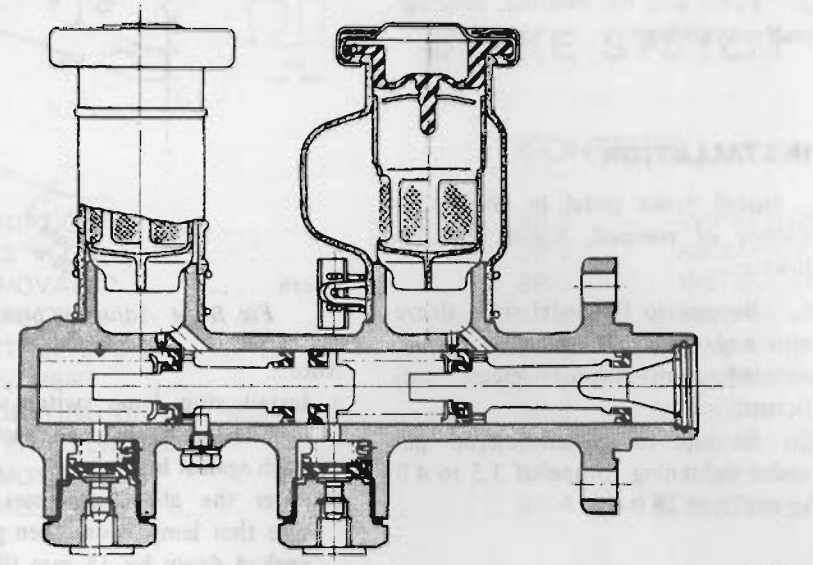
The brake system adopts a tandem type master cylinder. Even the front or rear hydraulic circuit falls into a faulty condition, sufficient braking force can be obtained by another. For the front wheels, the disc brake is used, and thus, a large capacity reservoir is used.




1 Reservoir cap
2 Filter
3 Brake fluid reservoir (front)
4 Brake fluid reservoir (rear)
5 Brake master cylinder body
6 Secondary piston return spring
7 Secondary piston assembly
8 Primary piston return spring
9 Primary piston assembly
10 Stopper
11 Snap ring
12 Bleeder
13 Valve spring
14 Check valve assembly
15 Packing
16 Valve cap
17 Stopper screw

BR072A

*Fig. BR-5 Master cylinder*



BR212

*Fig. BR-6 Cross-sectional view of master cylinder*

## REMOVAL

1. Disconnect wiring to brake fluid level gauge.
2. Disconnect front and rear brake tubes from master cylinder.

**CAUTION:**
**When removing brake tubes, use suitable tube wrench.**
**Never use open end or adjustable wrench.**

Note: When disconnecting brake tubes, be sure to use a container to receive draining brake fluid. Use of rags is also suggested to keep adjacent parts and area clean.

3. Remove master cylinder securing nut. Master cylinder can then be taken out.

## DISASSEMBLY

*(For parts item numbers refer to Figure BR-5)*

1. Drain brake fluid, and remove stopper screw (17).
2. Remove snap ring (11), and remove primary piston assembly, secondary piston assembly, and other parts.
3. Remove valve cap (16), and remove check valve (14).

Note: Disassemble master cylinder carefully so that the sliding surface of the piston and piston cup are not damaged. Do not remove fluid reservoir unless really necessary. Moreover, do not remove piston cup unless piston is replaced.

## INSPECTION

Thoroughly clean all disassembled parts, check for wear, damage, and other faulty conditions, and replace if necessary.

**CAUTION:**
**Do not clean rubber parts with mineral oil since they are deteriorated. Use brake fluid or alcohol.**
**When alcohol is used, however, do not immerse rubber parts under alcohol longer than 30 seconds. After parts are cleaned, dry them with compressed air.**

1. Check cylinder and piston for damage and uneven wear on the sliding surface and for other faulty conditions. Replace as required.
2. Replace, if the cylinder and piston clearance is more than 0.15 mm (0.0059 in).
3. In principle replace piston cup, packing and valves with new ones whenever the master cylinder is disassembled. Be sure to replace, if damaged, worn, weakened, or expanded.
4. Check return springs for wear, damage and other faulty conditions, and replace as required.
5. Replace others, if deformed, damaged, or faulty.

## ASSEMBLY

Assemble master cylinder in reverse sequence of disassembly, noting the following:

Apply brake fluid to component parts such as cylinder bore, piston, etc., and install carefully so as not to damage them. Moreover, for rubber parts such as piston cup, etc., apply rubber grease slightly.

Tightening torque:
Stopper screw
0.4 to 0.5 kg-m
(2.9 to 3.6 ft-lb)
Valve cap
8 to 9 kg-m
(58 to 65 ft-lb)

Note: The brake master cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes. When replacing the repair kit or component parts, ascertain the brand of the brake master cylinder body. Be sure to use parts of the same make as the former ones.

## INSTALLATION

Install master cylinder in reverse sequence of removal. After air bleeding, make sure that no brake fluid leaks from the circuit. For pedal height adjustment, refer to the paragraph of pedal adjustment.

**CAUTION:**
**When installing brake tubes, use Flare Nut Torque Wrench GG94310000.**

Tightening toruqe:
Brake tube
1.5 to 1.8 kg-m
(11 to 13 ft-lb)
Master cylinder installation nut
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)

## BRAKE FLUID LEVEL SWITCH

Refer to Brake Warning System (Section BE).

## BRAKE LINE

The brake lines branched from the tandem type master cylinder are extended to the front and rear wheels, forming independent hydraulic circuits. In addition, the rear wheel side circuit is equipped with the NP-valve so as to protect the rear wheels from locking during rapid braking. The brake line is a galvanized double-layer steel tube.

### INSPECTION

Check brake lines (tubes and hoses) for crack and/or damage, and replace, if faulty. When brake fluid leaks from joint, retighten or replace.

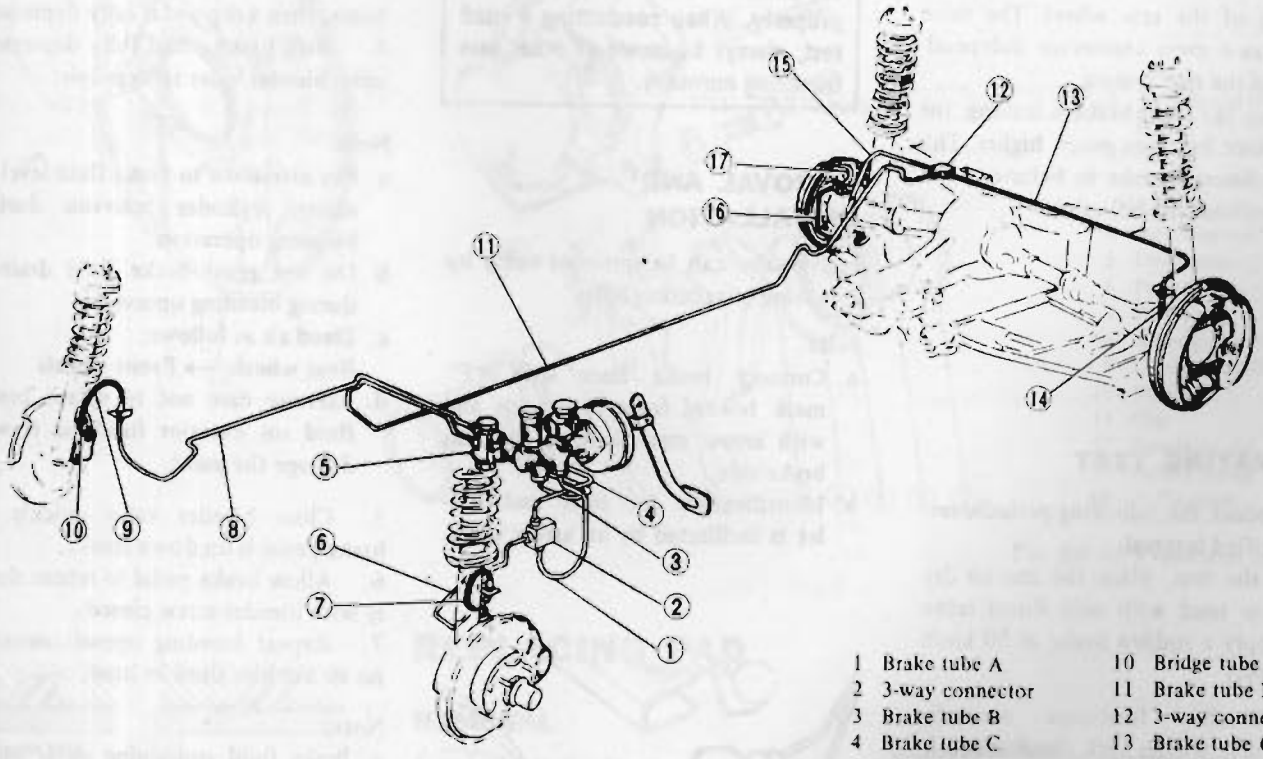
**CAUTION:**
**When removing brake tubes and hoses, use suitable tube wrench. Never use open end or adjustable wrench.**

Pay attention to the following when installing brake lines.

1. Provide a sufficient space between brake lines and other parts so that brake lines are not interfered with other parts due to vibration during driving.
2. Be careful not to warp or twist brake hose, and particularly be careful not to bring brake hose into contact with tires and suspension components.
3. Tighten each connector to the specified torque.

**CAUTION:**
**When installing brake tubes, use Flare Nut Torque Wrench GG94310000.**

4. Upon completion of brake line installation, be sure to bleed the air.




1 Brake tube A
2 3-way connector
3 Brake tube B
4 Brake tube C
5 NP-valve
6 Brake tube D
7 Pressure hose
8 Brake tube E
9 Pressure hose
10 Bridge tube
11 Brake tube F
12 3-way connector
13 Brake tube G
14 Pressure hose
15 Brake tube H
16 Pressure hose
17 Bridge tube

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*Fig. BR-7 Brake line*

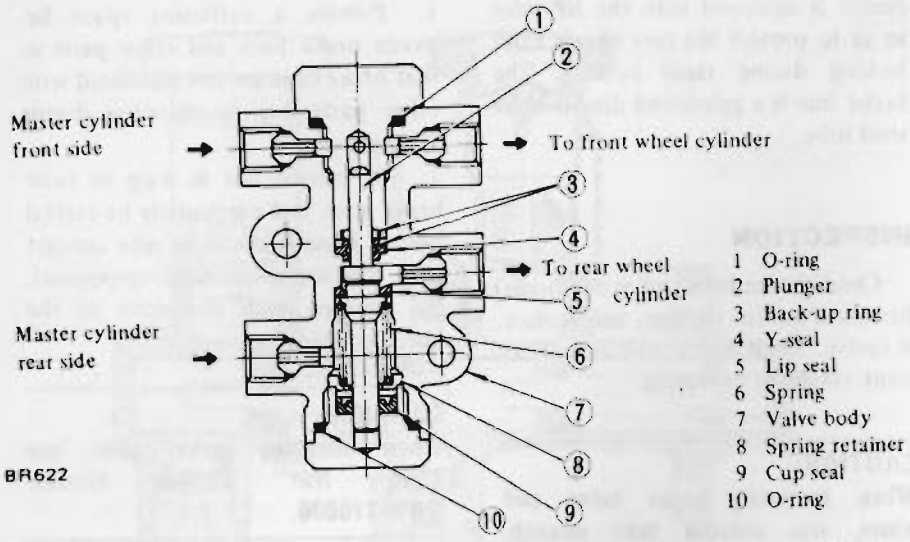


*Fig. BR-8 Cross-sectional view of NP-valve*

## NP-VALVE

This valve controls the pressure of the rear wheel cylinder to prevent the earilier locking of the rear wheel. The valve serves as a mere connector earlier locking of the rear wheel. The valve serves as a mere connector independently of the rear system.

When the front brake is leaking, the split point becomes much higher. This causes the rear brake to behave as if it were without the NP-valve.

### OPERATING TEST

Conduct the following periodic test at specified interval.

At the test, place the car on dry concrete road with only driver laden and apply a sudden brake at 50 km/h (30 MPH).

1. NP-valve functions normally when rear wheels lock simultaneously with front wheels lock ahead of rear wheels.
2. If the rear, instead of front, wheels have locked in advance, it may be attributable to malfunctioning of NP-valve. Replace NP-valve with a new one as an assembly.

**WARNING:**
**Before driving, test brake by depressing brake pedal. It should not bottom. Then, while driving slowly, pump brakes several times to ensure that they function properly. When conducting a road test, always be aware of other cars travelling normally.**

### REMOVAL AND INSTALLATION

NP-valve can be removed easily by removing installation bolts.

Note:

a. **Connect brake lines with "F" mark toward front brake side and with arrow mark toward the rear brake side.**
b. **Identification for inlet and outlet is facilitated by an arrow mark.**

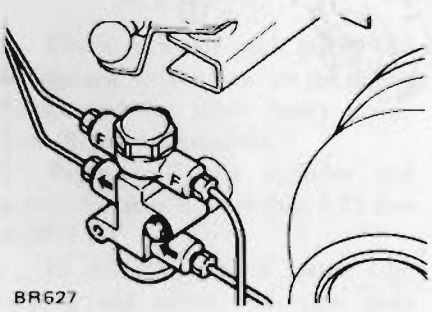


*Fig. BR-9 NP-valve*

## BLEEDING HYDRAULIC SYSTEM

Hydraulic brake system must be bled whenever any line has been disconnected or air has entered into system.

When pedal action has a "spongy" feel, it is an indication that air has entered the system.

Bleeding the hydraulic system is an essential part of regular brake service.

1. Clean all dirt around master cylinder reservoir, remove cap and top up reservoir with recommended brake fluid.

**Note: Do not mix two different brand oils.**

2. Thoroughly clean mud and dust from bleeder valve so that outlet hole is free from any foreign material. Install a bleeder hose on bleeder valve.

Place the other end of hose in a container filled with brake fluid.

3. Depress brake pedal two or three times, then keep pedal fully depressed.
4. With brake pedal fully depressed, open bleeder valve to expel air.

Note:

a. **Pay attention to brake fluid level in master cylinder reservoir during bleeding operation.**
b. **Do not reuse brake fluid drained during bleeding operation.**
c. **Bleed air as follows;**
   **Rear wheels ⟶ Front wheels**
d. **Exercise care not to splash brake fluid on exterior finish as it will damage the paint.**

5. Close bleeder valve quickly as brake pedal is on down stroke.
6. Allow brake pedal to return slowly with bleeder screw closed.
7. Repeat bleeding operations until no air bubbles show in hose.

Note:

a. **Brake fluid containing air is white and has visible air bubbles.**
b. **Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles.**

8. Repeat above steps on the remaining brake lines to expel all air.

# FRONT DISC BRAKE

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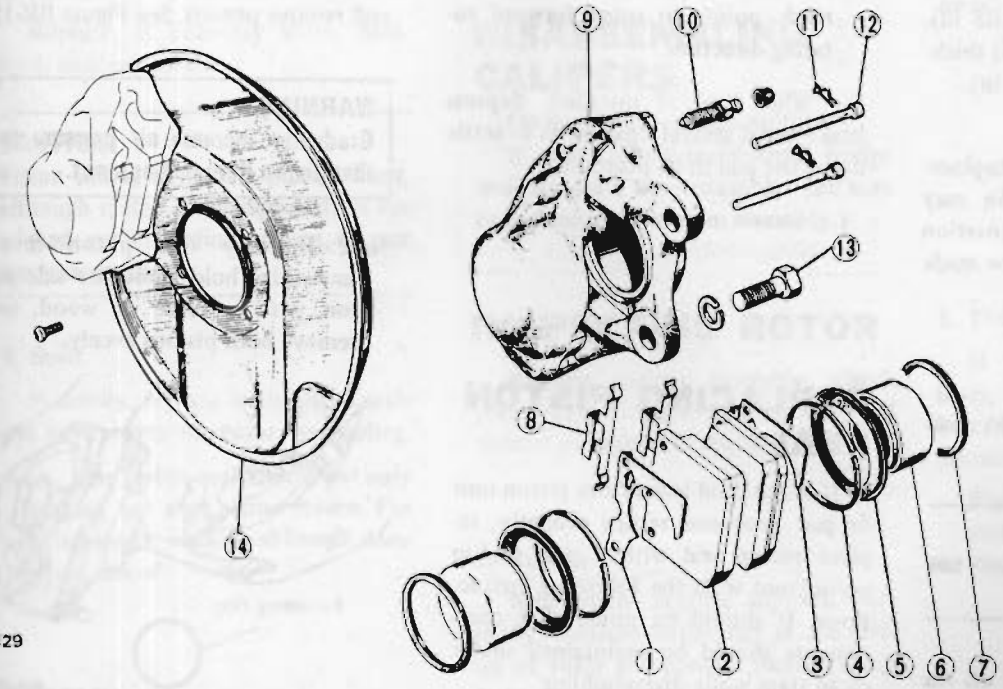
Girling-Sumitomo model S-16 disc brake is used. Rigidity of the caliper is high, brake pedal feeling is adequate, and the pad dragging is minimized. The pad is returned by elasticity of the piston seal. When the pad is worn, the piston operating stroke increases, slipping occurs on the piston seal surface, and thus, clearance is adjusted automatically. See Figure BR-11.

Moreover, in order to prevent brake squealing, a shim is inserted behind the pad.




BR629

1 Anti-squeal shim R.H.
2 Pad
3 Anti-squeal shim L.H.
4 Retaining ring
5 Dust cover
6 Piston
7 Piston seal
8 Anti-squeal spring
9 Caliper assembly
10 Bleeder
11 Clip
12 Retaining pin
13 Caliper fixing bolt
14 Baffle plate

*Fig. BR-10 Front disc brake*

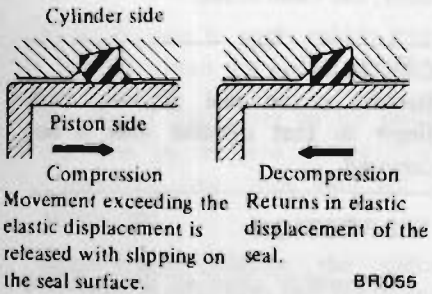


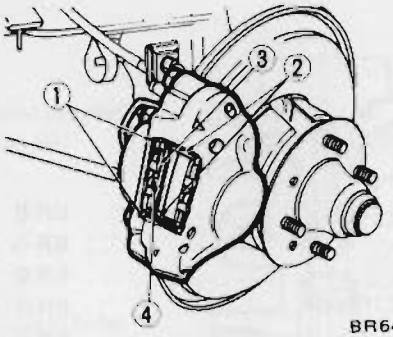

*Fig. BR-11 Piston seal automatic adjusting operation*

## REPLACING PAD

### REMOVAL

1. Jack up the front side of car, and remove wheel.
2. Remove clip ①, retaining pin ②, and anti-squeal spring ③, and remove pad ④ together with the shim as shown in Figure BR-12.

**WARNING:**
**After removing pads, do not depress brake pedal, or pistons will jump out.**



BR645

*Fig. BR-12 Removing pad*

## INSPECTION

1. Clean pad with carbon tetrachloride.
2. When oil and/or grease is heavily sticked on pad, or when deteriorated or deformed due to overheating, replace pad with a new one.
3. When thickness of the friction material is less than 2 mm (0.08 in), replace. Replace, when total pad thickness is less than 7.5 mm (0.295 in).

**Note: Replace pads as a set. Replacement at only one position may cause uneven brake effect. Rotation of pads is recommended to be made periodically.**

## INSTALLATION

1. Clean calipers and piston pad installing parts.

**CAUTION:**
**Use brake fluid to clean. Never use mineral oil.**

**Note: Be careful not to get oil on rotor.**

2. Depress piston into cylinder so that new pad can be installed.

**Note: Note that brake fluid may overflow from reservoir. Carry out operation by loosening breather to release brake fluid.**

3. Apply pad grease to working portions of caliper and both sides of shim (portion marked with oblique line in figure). See Figure BR-13.

**Note: Do not grease friction face of pad.**

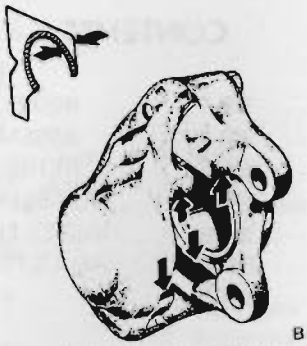

BR680

*Fig. BR-13 Applying grease*

4. Install pad and anti-squeal shim, assemble anti-squeal spring and retaining pin, and secure them with clip.

**Note: Install shim so that the arrow mark points to rotor forward rotating direction.**

5. When pad is installed, depress brake pedal several times so as to settle down the pad in its position.

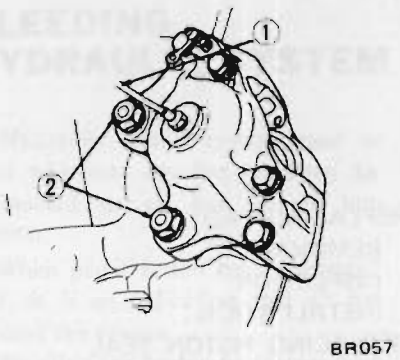
# REPLACING PISTON SEAL

If brake fluid leaks from piston unit or pad does not return properly, replace piston seal with a new one in accordance with the following instructions. It should be noted that components should be maintained under clean state while disassembling.

## REMOVAL

1. Remove pad.
2. Disconnect the brake line (1) and caliper installation bolt (2), and remove caliper assembly from knuckle spindle.

**CAUTION:**
**When removing brake tube, use suitable tube wrench. Never use open end or adjustable wrench.**



BR057

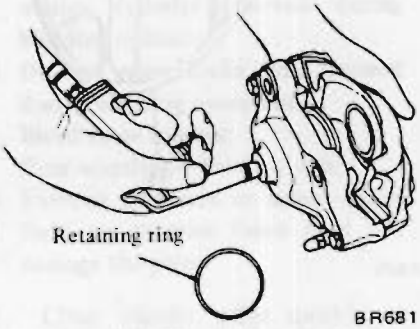
*Fig. BR-14 Removing calipers*

## DISASSEMBLY

1. Remove mud and dust from caliper assembly before disassembly.
2. Remove retaining ring (4) and dust cover (5) in that order. (Refer to Figure BR-10.)
3. Hold caliper with hand, apply compressed air from brake line joint, and remove pistons. See Figure BR-15.

**WARNING:**
**Gradually increase air pressure so that piston does not pop out.**

**Note: If only one piston moves smoothly, hold smoother side piston with a piece of wood, and remove both pistons evenly.**



BR681

*Fig. BR-15 Removing piston*

4. Remove piston seal from cylinder, and clean inside.

**CAUTION:**
**Remove piston seal carefully with finger so that cylinder wall is not damaged.**

## INSPECTION

Thoroughly clean all disassembled parts, and check them for the following items.

**CAUTION:**
**When cleaning rubber parts, use alcohol or brake fluid. If rubber parts are cleaned with mineral oil, they will be deteriorated.**

1. Calipers

If cylinder wall is damaged or worn, replace. If cylinder wall is rusted or foreign matters are accumulated on cylinder wall, carefully polish with fine emery paper so that cylinder wall is not damaged. If rusted or roughened excessively, replace.

2. Pad

See paragraph covering replacement of pad.

3. Piston

Replace, if unevenly worn, damaged, and/or rusted.

**CAUTION:**
**Piston sliding surface is plated. Thus, although rusted or foreign matters are sticked on the sliding surface, do not use emery paper.**

4. Seals

Primarily, replace both piston seals and dust covers whenever overhauling.

Note: **The piston seal affects not only leaking but also piston return. For this reason, replace although damage is minor.**

## ASSEMBLY

1. Install the piston seal carefully so that the seal is not damaged.

Note: **Be sure to apply rubber grease to the piston seal before installing.**

2. Install dust cover on the piston, and the piston into the cylinder. Clamp the dust cover with the retaining ring.

Note: **When inserting the piston, apply brake fluid to the piston sliding surface.**

3. After assembly is completely accomplished on one cylinder, assemble another side in the same manner.

## REINSTALLATION

Reinstallation is in reverse sequence of removal. After pad is installed completely, bleed hydraulic line.

Tightening torque:
Caliper installation bolt:
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

**CAUTION:**
**When installing brake tubes, use Flare Nut Torque Wrench GG94310000.**

# DISASSEMBLING CALIPERS

Do not remove bridge bolt.

If brake fluid leaks from bridge seal, replace a new assembly: **(Be sure to replace calipers as an assembly.)**

# INSPECTING ROTOR

Remove caliper assembly, check rotor for deflection and damage, and correct or replace as required.

1. Runout

With wheel bearing adjusted correctly, measure deflection at the center of rotor pad contact surface using dial gauge. See Figure BR-16.

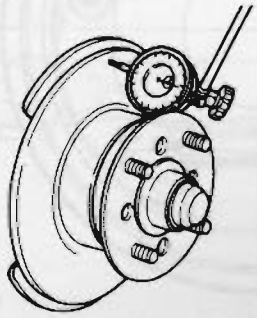



*Fig. BR-16 Measuring runout*

Runout limit:
0.10 mm (0.0039 in)
Total indicator reading

2. Parallelism

Measure thickness toward the entire periphery on the same circumference using a micrometer. See Figure BR-17.

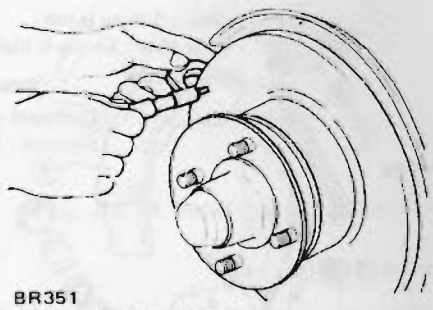



*Fig. BR-17 Measuring parallelism*

Parallelism:
Less than 0.03 mm (0.0012 in)

3. Thickness

If the rotor thickness is out of limit, replace. When correcting thickness, be sure that the thickness after correction does not exceed the limit.

Standard thickness: 12.5 mm (0.492 in)
Wear limit: 10.5 mm (0.413 in)

# ADJUSTING FRONT BRAKE

Ordinarily, adjustment is not required because clearance between pad and rotor is adjusted automatically by elasticity of piston seal.

# REAR BRAKE

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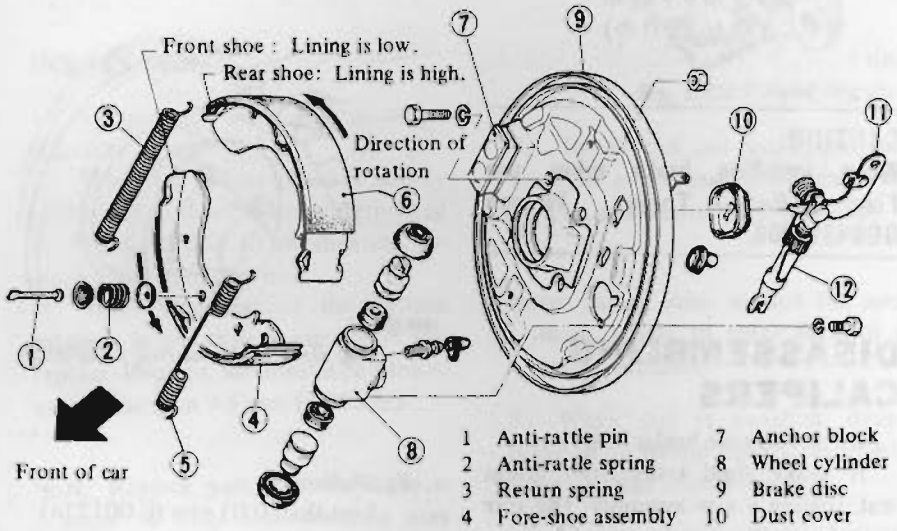
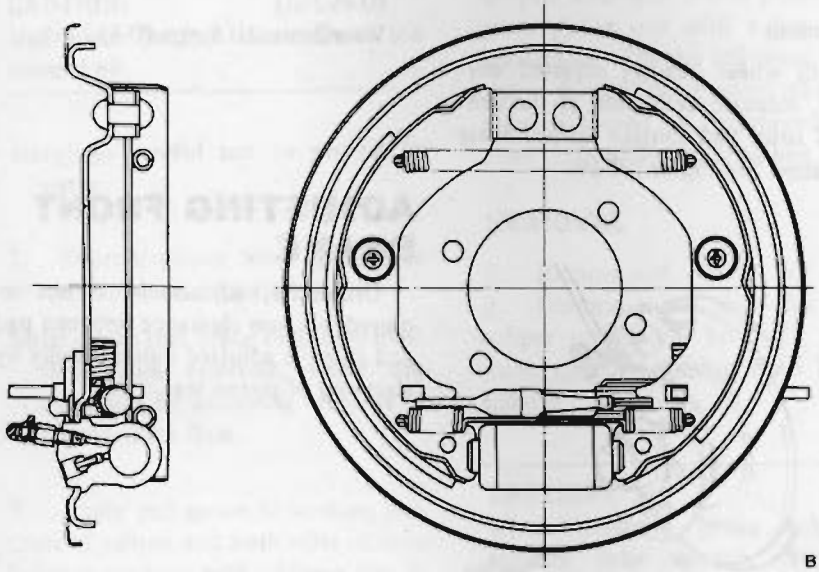



| | | | |
|---|---|---|---|
| 1 | Anti-rattle pin | 7 | Anchor block |
| 2 | Anti-rattle spring | 8 | Wheel cylinder |
| 3 | Return spring | 9 | Brake disc |
| 4 | Fore-shoe assembly | 10 | Dust cover |
| 5 | Return spring | 11 | Toggle lever |
| 6 | After-shoe assembly | 12 | Adjuster |

BR079A

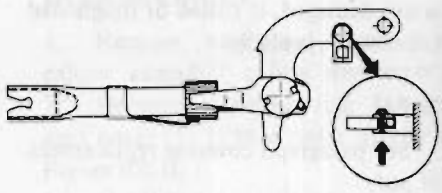
*Fig. BR-18 Rear brake*

The rear brake system is a leading-trailing type with aluminum finned drum. Parking brake is of an auto-adjusting type. When the hand brake is operated, the toggle lever turns the adjusting nut, and thus, clearance between the brake shoe and brake drum is adjusted automatically.



BR886

*Fig. BR-19 Sectional view of rear brake*



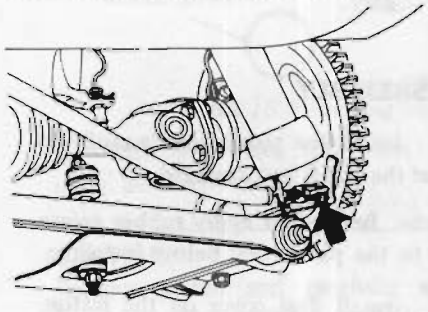
BR887

*Fig. BR-20 Adjuster assembly (Left-hand side)*

## REPLACING BRAKE SHOE

### REMOVAL

1. Jack up car, support it with a stand and remove tire.
2. Remove brake drum. When it is hard to remove brake drum, apply the following instructions.
   (1) Fully pull up center brake lever.
   (2) Push out or tap out cotter pin and remove stopper from toggle lever.



RA286

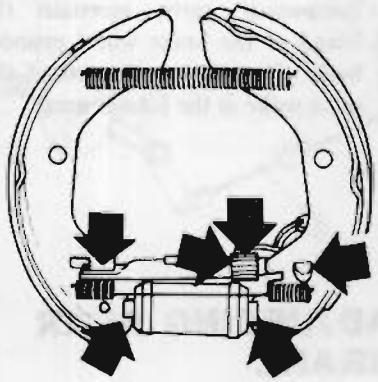
*Fig. BR-21 Removing toggle lever stopper*

   (3) Release center brake lever.
3. Remove anti-rattling spring, and then remove both brake shoes.

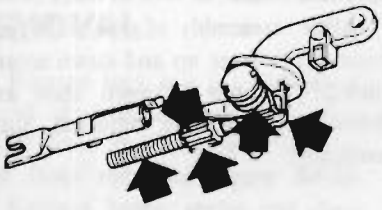
## INSTALLATION

Before installing brake shoe, check wheel cylinder operation. If it does not operate properly, disassemble and adjust. For details, see the paragraph covering disassembly. When replacing brake shoe, be sure that fore-shoe is in trailing side and after-shoe is in leading side.

1. Apply brake grease to adjuster, adjusting nut and threaded portion of adjusting nut.



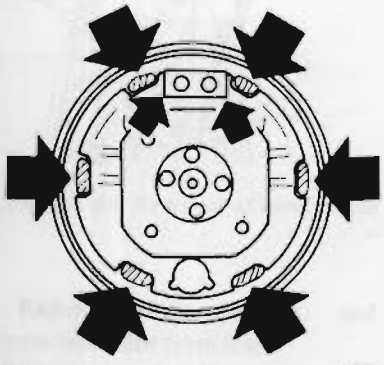
BR888



BR889

*Fig. BR-22 Applying brake grease*

2. Apply brake grease to brake disc and anchor block.



BR890

*Fig. BR-23 Applying brake grease*

3. Install brake shoe, return spring, and anti-rattling spring.

Note: Be careful not to allow grease to stick on brake shoe lining.

4. Install brake drum, pull hand lever several times, and with the automatic adjusting operation, adjust brake shoe and brake drum clearance.

Note: Continue the adjustment until click is eliminated from adjusting wheel claw.

# DISASSEMBLY AND INSPECTION

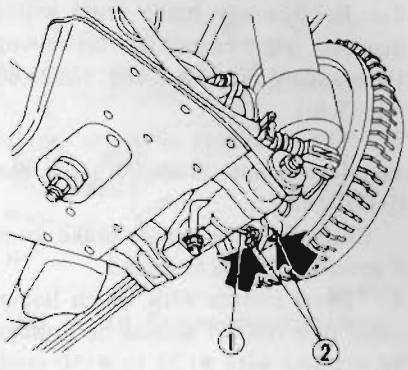
## REMOVAL

1. Jack up car, and remove wheels, brake drum and brake shoe.

Note: For details, refer to the paragraph covering brake shoe replacement.

2. Remove brake tube ①, loosen bolts ② and remove wheel cylinder. See Figure BR-24.

**CAUTION:**
**When removing brake tube, use suitable tube wrench. Never use open end wrench or adjustable wrench.**

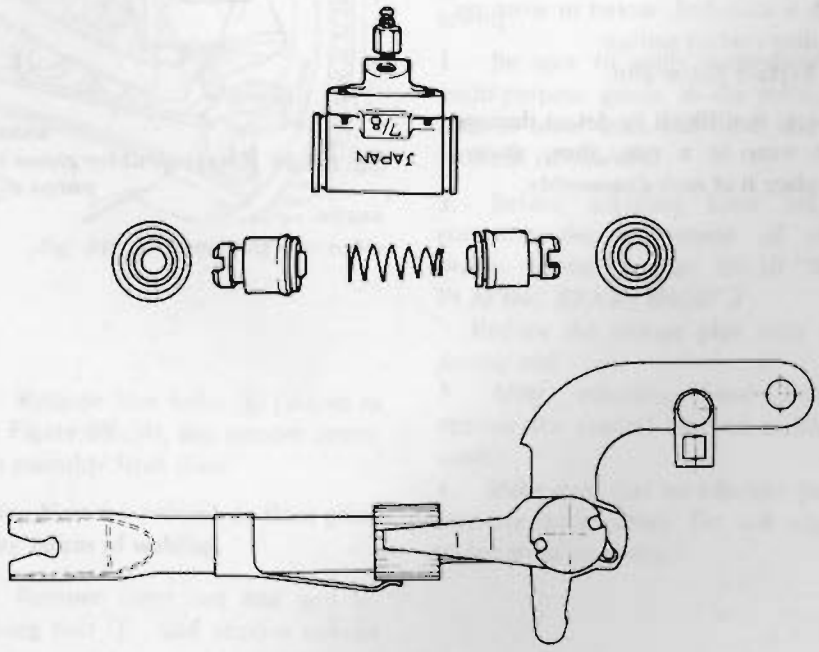



BR891

*Fig. BR-24 Removing wheel cylinder*

3. When removing brake disc, withdraw axle shaft, and remove attaching bolts. (Refer to Section "RA".)
4. Disassemble wheel cylinder (See Figure BR-25.)

Remove dust cover and withdraw piston.




BR892

*Fig. BR-25 Wheel cylinder and adjustor*

## INSPECTION

### Brake drum

1. Check brake drum for cracks, uneven wear or deflection, and replace as required.
2. Replace any brake drum whose diameter is 1.5 mm (0.059 in) beyond the standard inner diameter of 228.60 mm (9 in).
3. The maximum allowable out of round of drum inside is 0.05 mm (0.0020 in).

Recondition or replace brake drum if specified limit is exceeded.

4. Drum surface with which linings come into contact should be finished by grinding with #120 to #150 sandpaper.
5. If brake drum shows any sign of score marks or partial or stopped wear on its contact surface, machine finish it with a drum racer.

**Note: After brake drum has been completely reconditioned or replaced, check drum and shoe for proper contact pattern.**

### Wheel cylinder

1. Replace any cylinder or piston which is scratched, scored or worn on its sliding contact surface.
2. Replace piston cup.

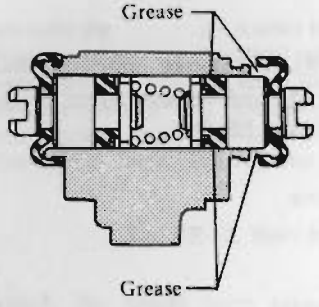
**Note: It is difficult to detect damage or wear in a cup; thus, always replace it at each disassembly.**

3. Replace cylinder if contacting face of cylinder is worn locally or stepped.
4. Replace if the cylinder and piston clearance is more than 0.15 mm (0.0059 in).
5. Replace dust cover if damaged.

## ASSEMBLY AND INSTALLATION

The rear brake can be assembled and installed in reverse sequence of disassembly and removal. However, note the following:

1. Apply brake fluid to piston cup and insert pistons into cylinder with spring.
2. Apply rubber grease to inside of rubber boot and install it to cylinder.




BR893

*Fig. BR-26 Applying rubber grease to piston cup*

3. When installing wheel cylinder and adjuster to brake disc, apply brake grease to cylinder, disc and the specified portion of adjuster as shown in Figure BR-22.

**Note: The brake wheel cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.**
**When replacing the repair kit or component parts, ascertain the brand of the brake wheel cylinder body. Be sure to use parts of the same make as the former ones.**

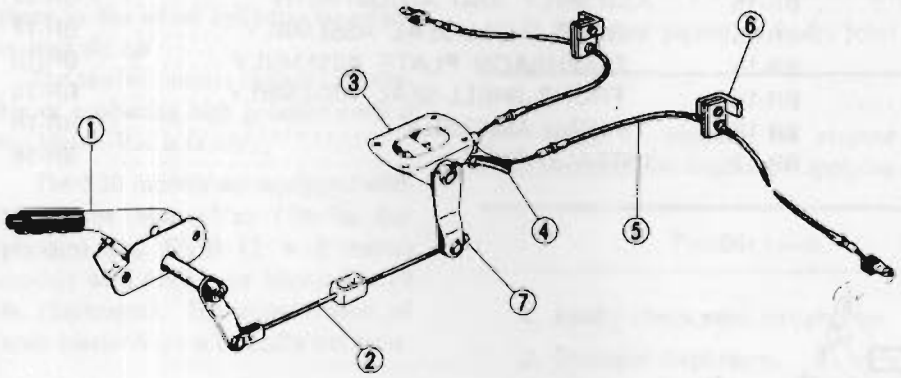
## ADJUSTING REAR BRAKE

Ordinarily, adjustment is not required because brake shoe clearance is adjusted automatically by operating the hand brake, as well as front brake.

After reassembly of rear brake, pull hand brake lever up and down several times. Clearance between shoe and drum will then be adjusted automatically.

# HAND BRAKE

The hand brake linkage is in floor tunnel. Hence, removal and other operations must be done after removing propeller shaft.



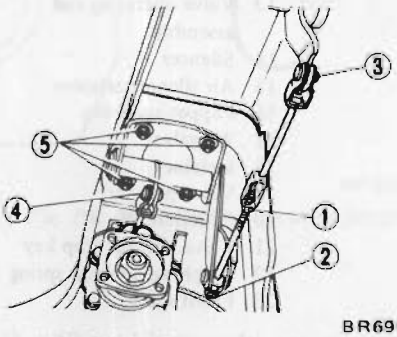

BR639

1 Control lever
2 Front rod
3 Center lever
4 Equalizer
5 Rear cable
6 Wire hanger
7 Adjusting rod

*Fig. BR-27 Hand brake linkage*

## REMOVAL

1. Remove lock nut ① and adjusting rod ② from the rear end, clevis pin ③ from the front end, and remove front rod. See Figure BR-28.
2. Remove hanger spring and clevis pin ④. See Figure BR-28.

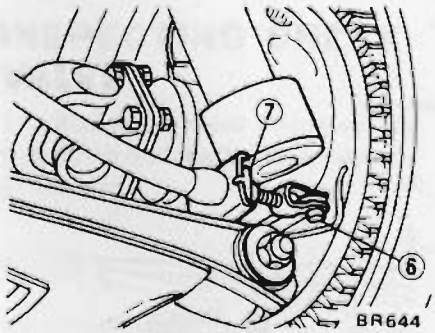



BR696

*Fig. BR-28 Removal of hand brake*

3. Remove clevis pin ⑥ and separate rear cable from lever.

Remove wheel side retainers ⑦ from both sides, and remove equalizer side retainer in the same manner. Rear cable can be removed. See Figure BR-29.




BR644

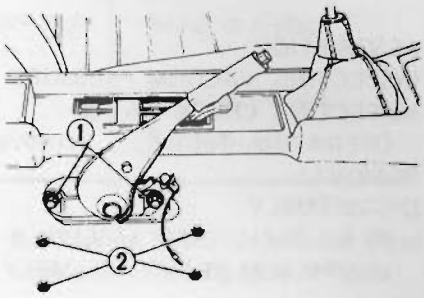
*Fig. BR-29 Removing rear cable*

4. Remove four bolts ⑤ (shown in the Figure BR-28), and remove center arm assembly from floor.

**Note: Nuts are secured on floor panel by means of welding.**

5. Remove front rod end and attaching bolt ①, and remove control lever toward passenger's compartment. See Figure BR-30.

**Note: When removing control lever, first, remove right side seat. Boot is secured with four fasteners ②.**




BR641

*Fig. BR-30 Removing control lever*

## INSPECTION

Check all parts for excessive wear and damage, and replace, if necessary.

## INSTALLATION

Install hand brake in reverse sequence of removal, noting the following.

1. Be sure to apply recommended multi-purpose grease to the pivot on control lever head and other sliding portions sufficiently.
2. Before adjusting hand brake, complete the adjustment of rear brakes. (Refer to page BR-10 "REPLACING BRAKE SHOE".)

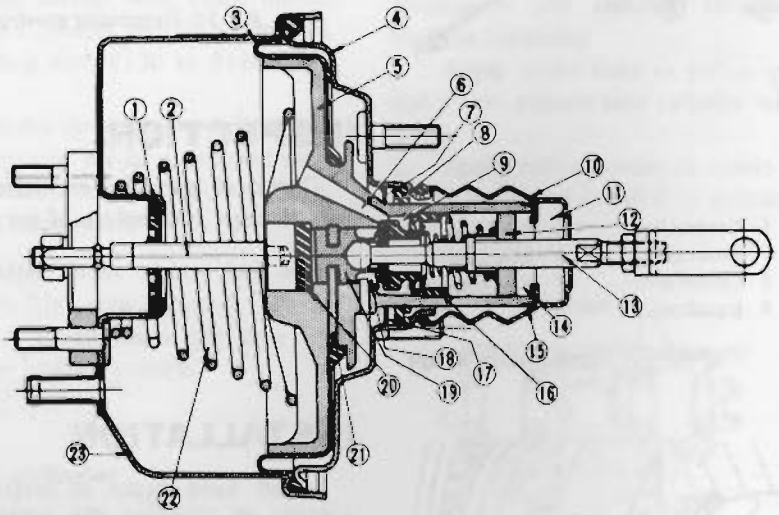
Reduce the linkage play with adjusting rod.

3. After adjusting hand brake, operate the control lever to stabilize cable.
4. Make sure that no adjacent parts interfere with cables. Do not apply undue stress to cables.

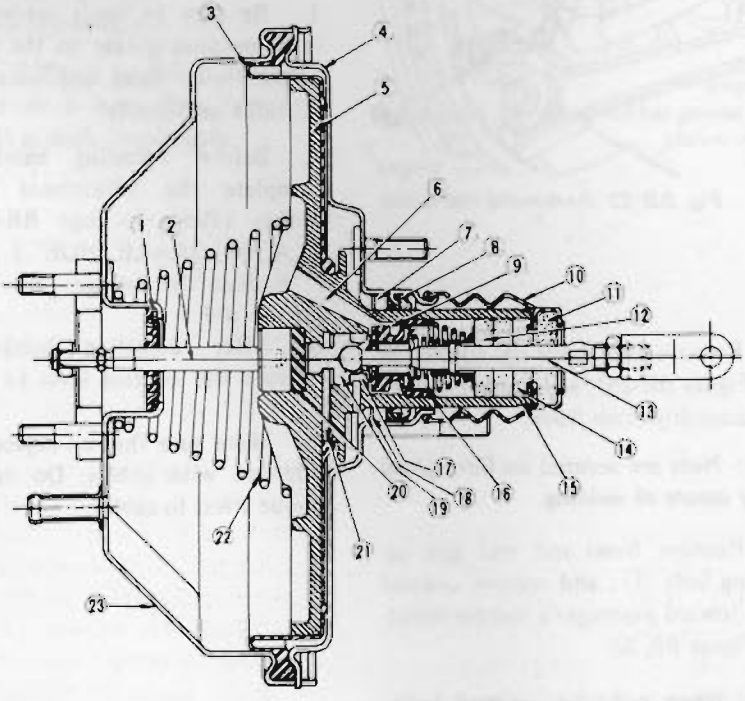
# MASTER-VAC

## CONTENTS





M75 type Master-Vac



M90 type Master-Vac

1 Plate and seal assembly
2 Push rod
3 Diaphragm
4 Rear shell
5 Power piston (Valve body and diaphragm plate)
6 Vacuum route
7 Bearing
8 Seal
9 Vacuum valve
10 Valve body guard
11 Air silencer filter
12 Air silencer filter
13 Valve operating rod assembly
14 Silencer
15 Air silencer retainer
16 Poppet assembly
17 Air valve
18 Retainer
19 Valve plunger
20 Reaction disc
21 Valve plunger stop key
22 Diaphragm return spring
23 Front shell

BR684

*Fig. BR-31 Cross-sectional view of Master-Vac*

## DESCRIPTION

A Master-Vac which decreases the pedal operating force and effectively and certainly brakes all wheels is installed between the brake pedal and the master cylinder. As the brake pedal is depressed, fluid is forced under high pressure through the brake pipes to the wheel cylinders to retard or stop the car.

The tandem master cylinder is capable of producing high pressure even if the Master-Vac is faulty.

The S30 models are equipped with M75 type Master-Vac (7½ in diaphragm) and GS30 (2 + 2 seater) models with M90 type Master-Vac (9 in diaphragm). The construction of both Master-Vacs is basically the same.

## INSPECTING VACUUM PRESSURE

1. Install a vacuum gauge between check valve and Master-Vac.
2. Increase engine speed, and stop the engine when the vacuum gauge indicates 500 mmHg (19.69 inHg). See Figure BR-32.

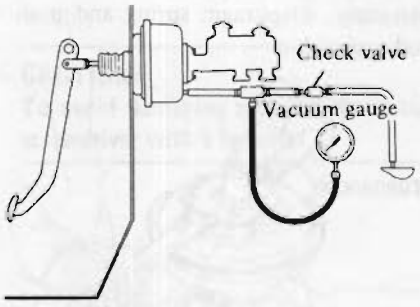



*Fig. BR-32 Installing vacuum gauge*

(1) When 15 seconds are elapsed after stopping the engine without braking and pressure drops more than 25 mmHg (0.98 in Hg);

| Possible cause | Corrective action |
|---|---|
| 1. Faulty check valve airtightness. | Replace. |
| 2. Faulty push rod seal airtightness. | Replace. |
| 3. Faulty airtightness between valve body and seal. | Repair or replace. |
| 4. Faulty valve plunger seat airtightness. | Repair or replace. |
| 5. Damaged piping or faulty joint airtightness. | Repair or replace. |

(2) When 15 seconds are elapsed after stopping the engine by applying full braking force, and pressure drops more than 25 mmHg (0.98 in Hg);

| Possible cause | Corrective action |
|---|---|
| 1. Faulty check valve airtightness. | Replace. |
| 2. Damaged diaphragm. | Replace. |
| 3. Dropped off reaction disc. | Reinstall and check the push rod for returning. |
| 4. Faulty airtightness on poppet assembly seat surface and valve body surface. | Repair or replace. |

**Note: When a replacement is required, be sure to replace Master-Vac as an assembly.**

## INSPECTING CHECK VALVE

1. Remove clip and disconnect the hoses from both ends. Check valve can be removed.

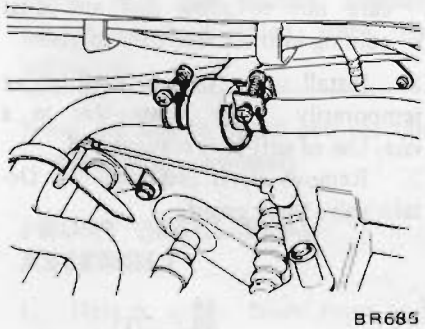



*Fig. BR-33 Removing check valve*

2. Using a Master-Vac tester, apply vacuum pressure of 500 mmHg (19.69 in Hg) to Master-Vac side of check valve. When pressure drops more than 10 mmHg (0.39 in Hg) within 15 seconds replace check valve with a new one.
3. When pressure is applied to Master-Vac side of check valve and valve does not open, replace check valve with a new one. See Figure BR-34.

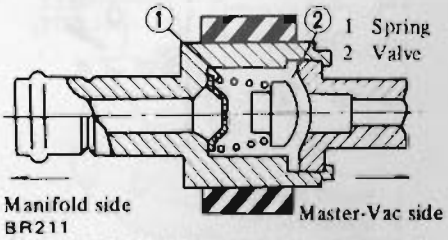



*Fig. BR-34 Cross-sectional view of check valve*

### OPERATING TEST

1. Connect an oil pressure gauge to brake line at master cylinder connection.
2. Start engine and increase engine speed until vacuum pressure gauge indicates 500 mmHg (19.69 inHg).
3. With the vacuum pressure constant at 500 mmHg (19.69 inHg), measure the oil pressure with respect to various pedal operating forces.
4. Relationship between oil pressure and pedal operating force is illustrated in Figure BR-35 or BR-36. If test results are not as specified in Figure BR-35 or BR-36, check Master-Vac as

described under "Inspection" before removal of this unit. Also check brake line for any evidence of fluid leakage.

**Note: Determine whether source of problem is in Master-Vac or check valve. Before coming to any final conclusion, always inspect check valve.**

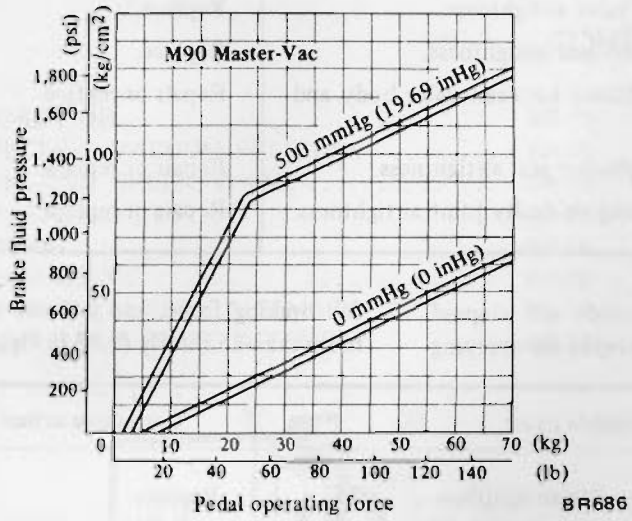



*Fig. BR-35 Performance curve of Master-Vac (M90 type)*

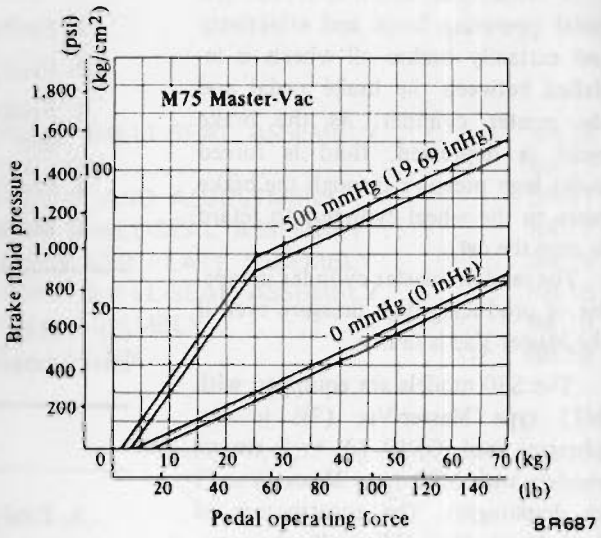



*Fig. BR-36 Performance curve of Master-Vac (M75 type)*

## REMOVAL

Referring to Figure BR-37, remove parts in numerical order enumerated.

Install these parts in reverse sequence of removal.

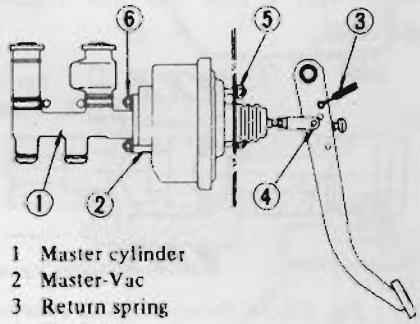



*Fig. BR-37 Removal method of Master-Vac*

**Note: After Master-Vac is properly installed on car, be sure to conduct an air-tight test and operation test described previously in this Section.**

## DISASSEMBLY

When disassembling Master-Vac, observe the following instructions.

a) Thoroughly clean mud or dust from Master-Vac.

b) Extreme care should be taken not to allow dirt, dust, water or any other foreign matter getting into any component-parts.
Be sure to select a clean place before disassembly or assembly.

c) Mark mating joints so that they may be installed exactly in their original positions.

d) Keep all disassembled parts arranged properly so that they may readily be assembled at any time.

e) Clean rubber parts and synthetic-resin parts in alcohol.

f) After all disassembled parts are cleaned in an approved solvent, place on a clean work bench. Use care not to allow dirt and dust coming into contact these parts.

1. Install spacer on rear shell spacer temporarily. Place Master-Vac in a vise. Use of soft jaws is suggested.
2. Remove clevis and lock nut. Detach valve body guard.

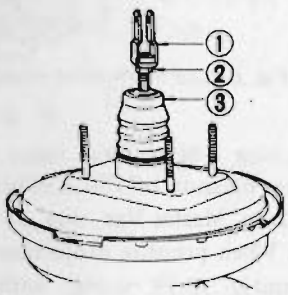



*Fig. BR-38 Removing rear shell*

3. Identify front shell and rear shell clearly so that they may be reassembled in their original positions from which they were withdrawn. (Bolts to be attached on dashboard are not same in pitch.)
4. Using special tool "Master-Vac Wrench ST08080000", remove rear shell-seal assembly, and disassemble diaphragm plate assembly, front shell assembly, diaphragm spring and push rod assembly.

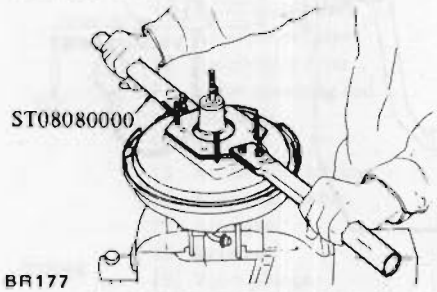



*Fig. BR-39 Removing rear shell*

### REAR SHELL-SEAL ASSEMBLY

Pry off seal assembly with use of a screwdriver as shown.

**Note: Do not disassemble seal assembly unless absolutely necessary. Whenever this is to be removed, use care not to damage it.**

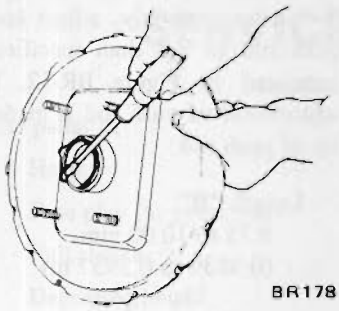



*Fig. BR-40 Removing seal*

## DIAPHRAGM PLATE ASSEMBLY

1. Place diaphragm plate assembly on a clean work bench. Detach diaphragm from groove in plate as shown.

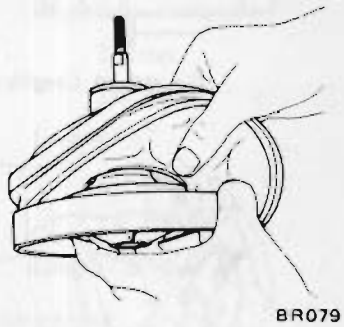



*Fig. BR-41 Separating diaphragm*

2. Using a screwdriver as shown, evenly pry air silencer retainer until it is detached from diaphragm plate assembly.

**CAUTION:**
**To avoid damaging retaines, never tap screwdriver with a hammer.**

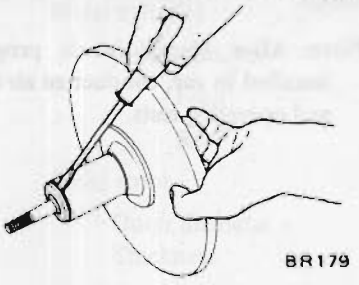



*Fig. BR-42 Removing air silencer retainer*

3. Pull out valve plunger stop key and withdraw silencer and plunger assembly.

**Note: To remove valve plunger stop key properly, proceed as follows: With key hole facing down, lightly push valve operating rod simultaneously while applying vibration to it.**

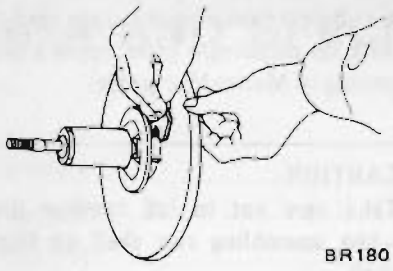



*Fig. BR-43 Pulling out stop key*

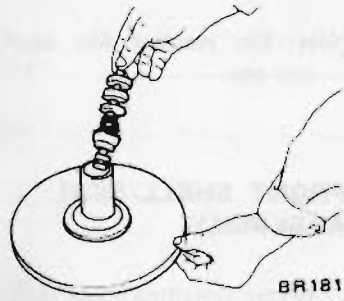



*Fig. BR-44 Removing valve operating rod assembly*

4. Withdraw reaction disc.

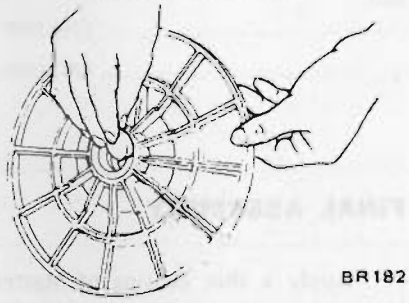



*Fig. BR-45 Removing reaction disc*

**CAUTION:**
**Valve rod and plunger assembly cannot be disassembled, since they are staked.**

**Note: Be sure to install new reaction disc at each reassembly.**

## FRONT SHELL-SEAL ASSEMBLY

1. Detach spacer from front shell assembly.

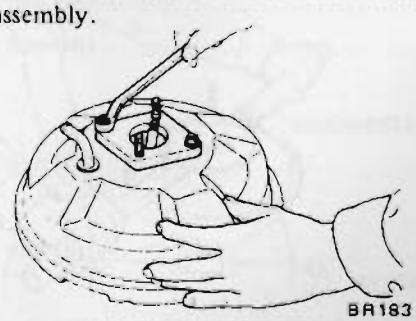



*Fig. BR-46 Removing spacer*

2. Withdraw front seal assembly.

# INSPECTION

1. Check poppet assembly for condition. If it shows evidence of wear or otherwise damage, replace it and valve operating rod assembly.
2. Check other component-parts for condition. If any part shows evidence of wear or otherwise damage, replace it with a new one.

# ASSEMBLY AND ADJUSTMENT

Assemble in reverse sequence of disassembly.

## REAR SHELL-SEAL ASSEMBLY

Apply a coating of Master-Vac grease to sealing surface and lip of seal, and install that seal in rear shell with the use of special tool "Master-Vac Oil Seal Retainer Drift ST08090000" [190.50 mm (7½ in) diameter diaphragm ST08060000)].

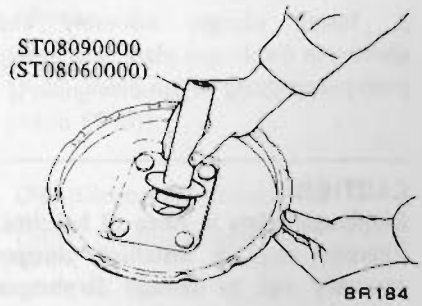



*Fig. BR-47 Installing oil seal*

**Note: Referring to Figure BR-48, install seal in place by properly aligning pawl of special tool with seal hole. Adjustment is correct when specified length at "A" is obtained.**

| Diaphragm dia. mm (in) | Length "A" mm (in) |
|---|---|
| 228.60 (9) | 10.2 to 10.8 (0.402 to 0.425) |
| 190.50 (7½) | 6.7 to 7.0 (0.264 to 0.276) |

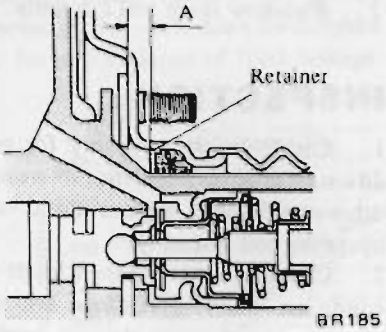



*Fig. BR-48 Length at "A"*

## DIAPHRAGM PLATE ASSEMBLY

1. Apply a thin coating of grease to sliding contact portion on periphery of plunger assembly.

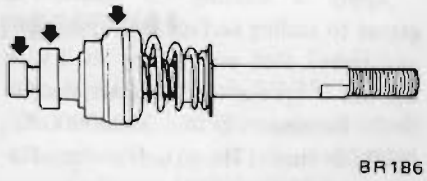



*Fig. BR-49 Requiring grease place*

2. Install plunger assembly and silencer in diaphragm plate, and lightly push plunger stop key in place.

**CAUTION:**
**Diaphragm plate is made of bakelite. Exercise care in installing plunger assembly not to damage diaphragm plate.**

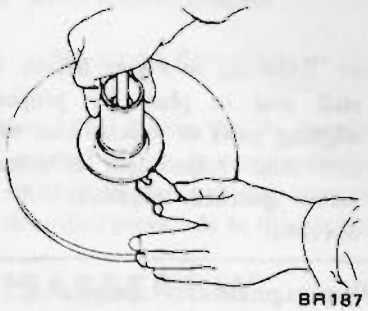



*Fig. BR-50 Inserting stop key*

3. Before installing diaphragm into position, apply a thin coating of micapower to it except outer diameter and seating portion with which shell comes into contact.

4. Before installing reaction disc in place on diaphragm plate, apply a thin coating of Master-Vac grease.

**CAUTION:**
**Take care not to fall reaction disc when assembling rear shell on front shell.**

**Note: The reaction disc must be a new one.**

## FRONT SHELL-SEAL ASSEMBLY

Before installing front shell-seal assembly, apply a coating of Master-Vac grease to inner wall of seal and front shell with which seal comes into contact.

## FINAL ASSEMBLY

1. Apply a thin coating of Master-Vac grease to outer edges of diaphragm with which rear and front shells come into contact, before installing diaphragm in position.
2. Before installing push rod assembly in place, apply a coating of Master-Vac grease to sliding contact surface of diaphragm plate.
3. Align marks scribed in rear shell and front shell. Carefully turn special tool "Master-Vac Wrench ST08080000" clockwise until it reaches notch in shell retainer.

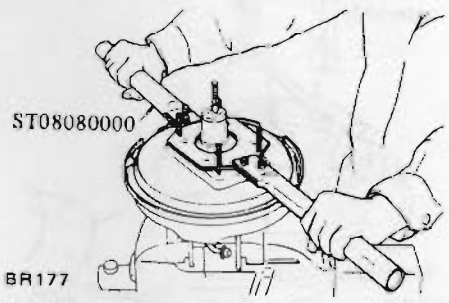



*Fig. BR-51 Tightening rear shell*

4. After assembly, adjust length of push rod to less than specified value indicated in Figure BR-52. Length adjustment of push rod is made at the tip of push rod.

Length "B"
9.75 to 10.00 mm
(0.3839 to 0.3937 in)

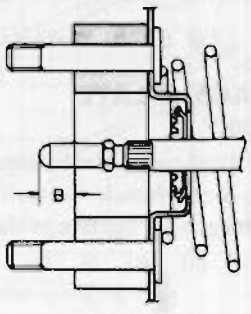



*Fig. BR-52 Length at "B"*

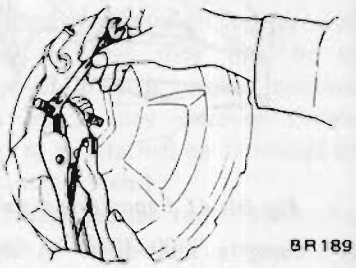



*Fig. BR-53 Adjusting push rod length*

# INSTALLATION

Install in reverse sequence of removal.

**Note: After Master-Vac is properly installed in car, conduct an air-tight and operating tests.**

# SERVICE DATA AND SPECIFICATIONS

| | | |
|---|---|---|
| Brake pedal | | |
| Height | mm (in) | 203 (7.99) |
| Free play (at pedal pad) | mm (in) | 1 to 5 (0.04 to 0.20) |
| Full stroke | mm (in) | 123 (4.84) |
| Depressed height | mm (in) | 92 (3.62) |
| Master cylinder | | |
| Inner diameter | mm (in) | 22.23 (7/8) |
| Allowable clearance between cylinder and piston | mm (in) | 0.15 (0.0059) |
| Master-Vac | | |
| Diaphragm diameter | | |
| 2 seater | mm (in) | 190.50 (7½) |
| 2 + 2 seater | mm (in) | 228.60 (9) |
| Length "A" | | |
| 2 seater | mm (in) | 6.7 to 7.0 (0.264 to 0.276) |
| 2 + 2 seater | mm (in) | 10.2 to 10.8 (0.402 to 0.425) |
| Length "B" | mm (in) | 9.75 to 10.00 (0.3839 to 0.3937) |
| Parking brake | | |
| Type | | Mechanical, operating on rear wheels |
| Notch | | 6th [Pulling force 20 to 25 kg (44 to 55 lb)] |
| Service brake | | |
| Type | | |
| Front | | Disc (Girling-Sumitomo S-16) |
| Rear | | Drum (Leading-trailing) |
| Wheel cylinder | | |
| Inner diameter | | |
| Front | mm (in) | 53.98 (2 1/8) |
| Rear | mm (in) | 22.23 (7/8) |
| Brake rotor | | |
| Outer diameter x Thickness | mm (in) | 271 x 12.5 (10.67 x 0.492) |
| Run-out | mm (in) | 0.10 (0.0039) |
| Wear limit thickness | mm (in) | 10.5 (0.413) |
| Brake pad | | |
| Dimension (Width x thickness x length) | mm (in) | 51.6 x 9.7 x 77.8 (2.031 x 0.382 x 3.063) |
| Wear limit (Min. thickness) | mm (in) | 2.0 (0.079) |

| | | |
|---|---|---|
| Brake drum | | |
| Inner diameter | mm (in) | 228.60 (9) |
| Wear limit of diameter | mm (in) | 230.0 (9.06) |
| Brake lining | | |
| Dimension (Width x thickness x length) | mm (in) | 40 x 4.5 x 219.5 (1.57 x 0.177 x 8.64) |
| Wear limit (Min. thickness) | mm (in) | 1.5 (0.059) |
| Brake adjustment notches | | |
| Front | | Not necessary |
| Rear | | Not necessary |

Tightening torque

| | | |
|---|---|---|
| Master cylinder to Master-Vac | kg-m (ft-lb) | 0.8 to 1.1 (5.8 to 8.0) |
| Master cylinder stopper screw | kg-m (ft-lb) | 0.4 to 0.5 (2.9 to 3.6) |
| Brake tube connector | kg-m (ft-lb) | 1.5 to 1.8 (11 to 13) |
| Brake hose connector | kg-m (ft-lb) | 1.7 to 2.0 (12 to 14) |
| Air bleeder valve | kg-m (ft-lb) | 0.7 to 0.9 (5.1 to 6.5) |
| Fulcrum shaft (Brake pedal) | kg-m (ft-lb) | 3.5 to 4.0 (25 to 29) |
| Connector mounting bolt | | |
| 6 mm dia. bolt | kg-m (ft-lb) | 0.5 to 0.7 (3.6 to 5.1) |
| 8 mm dia. bolt | kg-m (ft-lb) | 0.8 to 1.1 (5.8 to 8.0) |
| Caliper bolt | kg-m (ft-lb) | 7.3 to 9.9 (53 to 72) |
| Rotor bolt | kg-m (ft-lb) | 3.9 to 5.3 (28 to 38) |
| Wheel cylinder bolt | kg-m (ft-lb) | 0.6 to 0.8 (4.3 to 5.8) |
| Brake disc (Back plate) nut | kg-m (ft-lb) | 4.0 to 5.3 (29 to 38) |
| Master-Vac | | |
| Master-Vac to body nut | kg-m (ft-lb) | 0.8 to 1.1 (5.8 to 8.0) |
| Operating rod lock nut | kg-m (ft-lb) | 1.6 to 2.2 (12 to 16) |

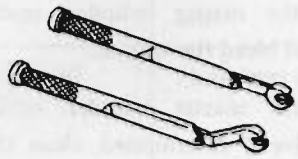
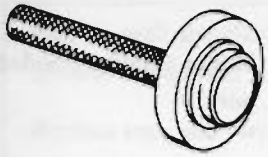
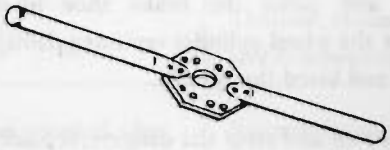
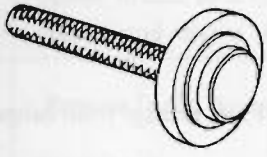
# TROUBLE DIAGNOSES AND CORRECTIONS

| Condition | Possible causes | Corrective action |
|---|---|---|
| Locked brake pedal | Swollen master cylinder seals due to poor fluid quality or contamination by kerosene, gasoline or mineral oil. | Flush the system, replace all rubber parts, refill with new fluid and air bleed the lines. |
| | Pistons or valve carrier locked by deposits of fluid, foreign matter, etc. | Clean and bleed the system. |
| | Seized master cylinder piston due to infiltrations of water through rear end due to faulty boot or seals. | Service the master cylinder, replace the piston and the boot and/or seals, to prevent water infiltration. |
| | Seized pedal shaft. | Smooth bushings, or if other sliding parts are damaged to a remarkable extent, replace them and lubricate. |
| | Clogged transfer port. | Disassemble and clean master cylinder. |
| | No compensation takes place.<br>Weak return spring. | Replace faulty spring. |
| Spongy pedal | Air in brake system because of imperfect bleeding. | Bleed thoroughly. |
| | Swollen hose due to deterioration. | Replace the hose and bleed the system. |
| | Hose swells under fluid pressure due to poor hose quality. | Fit new hoses and bleed the system. |
| | Use of a poor quality brake fluid (boiling point of which is too low). | Replace the fluid with the specified brake fluid and bleed the system. |
| | Clogged reservoir filler cap vent hole. This promotes a vacuum in master cylinder that sucks air through rear seal. | Clean reservoir filler cap and bleed the system. |
| Pedal yields under slight pressure | Deteriorated check valve. | Fit a new check valve, make sure that there are no burrs, roughness or blow holes in master cylinder, and bleed the system. |
| | Fluid leaks through connection. | Tighten connections, and if necessary, replace faulty parts. Bleed the system. |
| | Fluid leaks at wheel cylinders. | Replace the seals and packings being damaged. Wipe and clean brake shoe linings. |
| | Fluid leaks through hoses. | Replace the damaged hose, and bleed the system. |
| | Low fluid level in reservoir. | Add specified fluid up to correct level. |

| Condition | Probable cause | Corrective action |
|---|---|---|
| Poor pedal reserve | Master cylinder relief port clogged with foreign matter. | Clean and bleed the system. |
| | System has not been bled. | Bleed the system. |
| | Excessive clearance between shoes and drum. | Adjust auto-adjuster operation. |
| Excessive pedal reserve | Fluid level in reservoir is too low. | Top up with specified brake fluid, bleed the system, if required. |
| | Deteriorated rubber seals in master cylinder or in wheel cylinders. | Replace seals and bleed the system. |
| | Excessively swollen hoses due to poor hose quality. | Replace by designated hoses and bleed the system. |
| | Thermal expansion of drums due to excessive overheating. | Allow drums to cool off. Check brake shoe linings and drums. Replace damaged parts. |
| Brake locked after pedal return | Worn or broken return spring. | Replace faulty springs. |
| | Improper brake shoe return. | Grease brake shoe and wheel cylinder sliding surface. |
| | Clogged master cylinder relief port. | Clean and bleed the system. |
| | Swollen or stuck rubber seals due to contamination by kerosene, mineral oil, gasoline, etc. | Flush the system, replace all rubber parts, refill with new brake fluid and bleed the system. |
| Unbalanced brakes | Fluid leakage at one wheel cylinder only. | Wipe, clean or replace the brake shoe linings or lining pads, service the wheel cylinder and bleed the system. |
| | Rusted or corroded edges of a wheel cylinder. | Eliminate rust and replace the boots. |
| | Seized piston in wheel cylinder or caliper assembly. | Service the wheel cylinder, replace the rear wheel cylinder piston or caliper assembly and bleed the system. |
| | Hose obstructed due to swollen or clogged inner lining. | Replace or clean the hose and bleed the system. |
| | Obstructed flow in metal pipe due to crushing or clogging (if the brakes on one axle are excluded, weak braking may result). | Replace or clean the pipe and bleed the system. |
| | Faulty seals at one half caliper. | Take down and strip the half caliper, replace seals and dust covers. |

| Condition | Probable cause | Corrective action |
|---|---|---|
| Brake linings dragging all the time on drums or brake discs | Insufficient shoe-to-drum clearance. | Adjust clearance. |
| | Weak shoe return springs. | Replace the springs. |
| | Brake pedal has no free travel. | Set the push rod length as prescribed. |
| | Seized master cylinder piston. | Service the master cylinder, replace the piston and bleed the system. |
| | Master cylinder flooded due to clogged relief port. | Service the master cylinder, replace the check valve if deteriorated, clean the relief port and bleed the system. |
| | Brake disc run-out. | Check brake disc for run-out, and replace Faulty parts, if necessary. |
| Weak brakes | Fluid leakage from wheel cylinders. | Wipe and clean the brake shoe linings, service the wheel cylinder replacing damaged parts, and bleed the system. |
| | Fluid leakage from caliper cylinders. | Take down and strip the calipers; replace all rubber seals and clean lining pads. |
| | — Master-Vac — | |
| | This problem mainly results from improper function of Master-Vac. Please check as follows: | |
| | Improper Master-Vac function due to poor vacuum. | Check the pipe or hose connections, and fasten if necessary. Or replace a faulty vacuum hose. |
| | Required vacuum is not maintained. | Wipe, clean or replace the check valve and check the grommet for loose fit, re-fit or replace it. Replace seal or retighten plate and seal assembly-to-front shell bolts.<br>Clean or replace poppet rubber. Replace diaphragm and diaphragm plate. |
| | Weak pressure on shoes due to use of too thick fluid. | Flush the system and refill with specified fluid. Bleed the system. |
| | Dust on drums or linings soiled with oil. | Remove and clean drums thoroughly. |
| | Weak shoe return springs. | Check springs and replace as required. |
| | Drum out of round. | Correct drums by means of a lathe. |

# SPECIAL SERVICE TOOLS

| Tool number & tool name | Kent-Moore No.<br>Reference page or Fig. No.<br>Unit application | Tool number & tool name | Kent-Moore No.<br>Reference page or Fig. No.<br>Unit application |
|---|---|---|---|
| GG94310000 Flare nut torque wrench<br>  | —<br>Page BR-4<br>Page BR-5<br>Page BR-9<br>* | ST08060000 Master-Vac oil seal retainer drift (4.5", 6", 7.5")<br>  | J 25609<br>Fig. BR-47<br>7½"<br>Master-Vac |
| ST08080000 Master-Vac wrench<br>  | —<br>Fig. BR-39<br>Fig. BR-51<br>* | ST08090000 Master-Vac oil seal retainer drift (9")<br>  | —<br>Fig. BR-47<br>9"<br>Master-Vac |

*: Applicable to all S30 series models