

BRAKE SYSTEMS

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BRAKE SYSTEM

DESCRIPTION AND OPERATION

The front brakes and the rear brakes fitted to HQ - HZ Holden models are a drum brake system and the hand operated parking brake operates via a lever and cable to the rear drum brake system. The front brakes fitted to the models fitted with a V8 engine use a disc brake system which is also available as an option on all other models. Later vehicles are fitted with a slightly different disc calliper, however the operating principle is similar.

The master cylinder has a twin fluid reservoir system, connected to the bore by separate compensating ports. The bore contains primary and secondary pistons, both with primary and secondary seals.

Each of the outlet ports have a spring and rubber check valve, on vehicles with drum brakes only.

The master cylinder fitted to the disc brake vehicles is assisted by the function of vacuum operated brake booster. A dual diaphragm-type brake booster is a self-contained vacuum-hydraulic braking unit mounted on the engine side of the dash panel.

The brake booster is of the vacuum suspended type which utilizes engine intake manifold vacuum and atmospheric pressure for its power.

The booster unit is to be exchanged when it is inspected, checked and found to be defective.

OPERATION

The master cylinder has two separate systems, one for the front brakes the other for the rear brakes.

The front reservoir and outlet pipe supplies the front brakes, and the rear reservoir and outlet pipe supplies the rear brakes.

As the brake pedal is pushed down, the two pistons in the cylinder are forced forward, forcing the fluid into the brake pipes and the pressure differential warning unit, onto the brake wheel cylinders.

The master cylinder front piston forces the correct amount of fluid to the front brakes, as does the rear piston forces the correct amount of fluid to the rear brake cylinders, the pressure in the brake lines is the same, when the brakes are utilised.

As the brake pedal is released, the master cylinder pistons are returned to their correct position by the return springs, fluid flows from the area between the primary and secondary seals via a flow hole in the top of the piston and around the sides of the primary rubber seal. An extra fluid returns to the reservoirs by the compensating ports.

Drum Brakes: The wheel cylinders have two pistons with a spring between the pistons. The inlet pipe is situated in the centre of the wheel cylinder, hence when the brakes are applied both pistons are forced out equally, activating the brake shoes and linings against the brake drum.

The brake is cast iron machined so there is an ideal contact surface for the brake linings.

Each brake assembly has two shoes a primary (front) shoe and a secondary (rear) shoe. The primary shoe has a smaller brake lining contact surface, while the secondary shoe has a larger brake lining surface. These shoes are not to be installed any way except for the correct method. The hand brake is connected to the rear brakes and activates a lever connected to the secondary shoes.

The brakes have a self adjusting action, which occurs only when the brakes are applied as the vehicle is travelling backwards

The brake adjuster is located in the lower section of the brake assembly, with the brake shoes fitting into the ends of the screw type adjuster.

Disc Brakes: When the brake pedal is applied on vehicles fitted with disc brakes, brake fluid is displaced into the calliper bore moving the piston outwards. This action forces the inner pad assembly against the disc. The resultant reaction forces the calliper body and outboard pad assembly inwards against the disc. Braking torque is transferred from the outer and inner brake pads to the mounting plate.

When the brake pedal is applied on vehicles fitted with drum brakes, brake fluid is displaced into the wheel cylinders between the cups which causes the pistons and links to move outward forcing the brake shoes into the brake drums.

The piston seal retracts the piston a small amount allowing the pads to clear the disc, when the brake pedal is released.

Vacuum Brakes: The vacuum assisted brake booster is fitted between the brake pedal and brake master cylinder and supplements the driver's pedal effort. It derives power from permanent use of depression or vacuum existing in intake manifold of engine and controlled application of atmospheric pressure.

The booster consists of a vacuum chamber divided by a diaphragm to the brake pedal to control the application and release, and a push rod to apply the developed force to the brake cylinder which is bolted to the front of the brake booster.

Engine intake manifold vacuum is relayed to the unit through a hose fitted with a vacuum check valve.

When manifold vacuum falls below that in the power brake system the non-return valve closes to prevent loss of vacuum from the constant vacuum chamber.

In the case of engine failure and consequent loss of engine vacuum, two application of brakes are possible by using vacuum retained in the power unit. In case of complete vacuum loss, brakes can be applied in the conventional manner, although more effort is required due to loss of power assistance.

ROUTINE MAINTENANCE

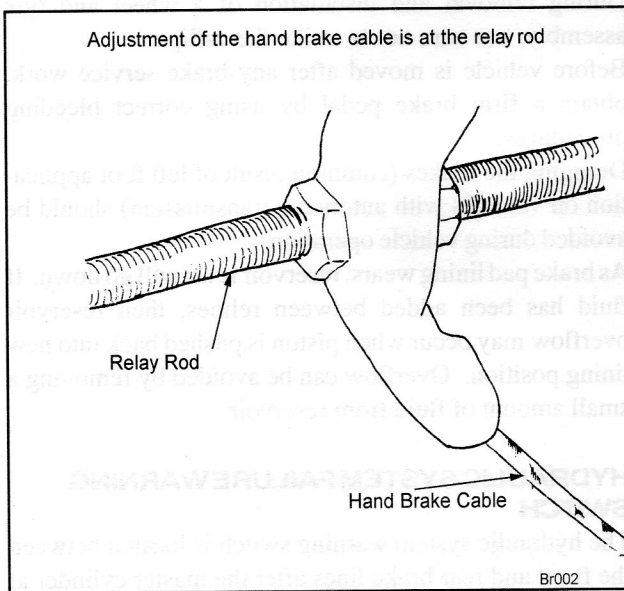
HANDBRAKE CABLE

Check

Place the transmission in neutral.
 Jack the rear of the vehicle and place on safety stands.
DO NOT START ENGINE.
 Place safety blocks both sides of both front wheels.
 Pull the hand brake lever up until there is sufficient resistance that the hand brake should be fully functional (this should be approximately 4-5 clicks from the full down position).
 Check the back wheels for resistance, there should be enough resistance that the wheels are impossible to turn by hand.
 Release hand brake lever and check the back wheels for resistance, there should not be any resistance.

Adjustment

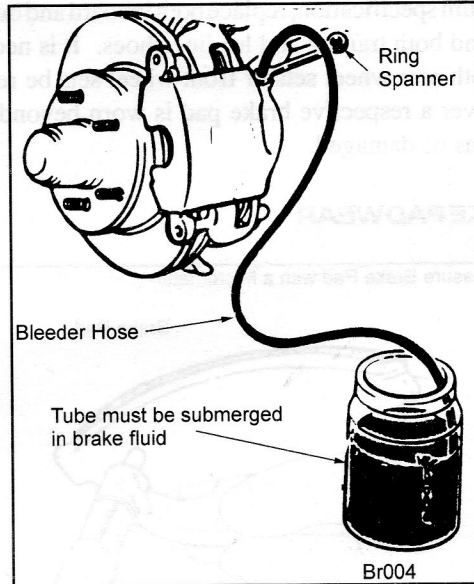
Place the transmission in neutral.
 Jack the rear of the vehicle and place on safety stands.
DO NOT START ENGINE.
 Place safety blocks both sides of both front wheels.
 Hand brake lever in the full down position, that is fully released.
 Loosen the lock nut on the relay rod, turn the adjusting nut 3 full turns up to tighten the hand brake cable.
 Check hand brake as described above, tighten the adjusting nut further if required, when the hand brake has been adjusted tighten the locking nut on the relay rod to specification.



Hand Brake Relay Rod Lock-nut Torque: 12-16Nm
 Lower back wheels, remove safety blocks

BLEEDING THE BRAKE SYSTEM

Clean dust grease and foreign matter from the brake bleeding valves on all four wheel cylinders.
 At the back left wheel prepare to start bleeding the brake system. Always bleed the brake with the longest length of brake fluid pipe first, this to help ensure there are no air traps in the brake pipe system.
 Use a ring spanner on the bleeder valve, then connect a clear plastic tube to the end of the bleeder valve, insert the other end of the plastic bleeder hose into a clean container half filled with clean brake fluid.



Have an assistant press the brake pedal 3 or 4 times and hold his foot on the pedal, this is pumping the brakes. After your assistant has pumped the brakes, with his/her foot still on the pedal, loosen the bleeder valve with the ring spanner approximately half a turn. This will allow fluid and air to pass out of the bleeder valve through the bleeder hose into the container with the brake fluid. When the assistants foot on the brake pedal has travelled to the floor, tighten the bleeder valve before the assistant allows the pedal to rise from the floor, otherwise old fluid and air will be sucked back into the brake system. Check the level of the master cylinder and keep topping it up with fluid otherwise air will enter the system.
 Repeat the above procedure (pumping the brakes) until all of the air has been released from the back left brake bleeder valve. Tighten the bleeder valve, remove the hose and spanner.
 Repeat the bleeding procedure on the right rear wheel, left front wheel then right front wheel.
 Then repeat the pumping and bleeding procedure on the left back wheel and right back wheel, this is to ensure the pedal will not be spongy.
 Check the level of the master cylinder.
*** Do not use the old brake fluid as a top up into the master cylinder.**

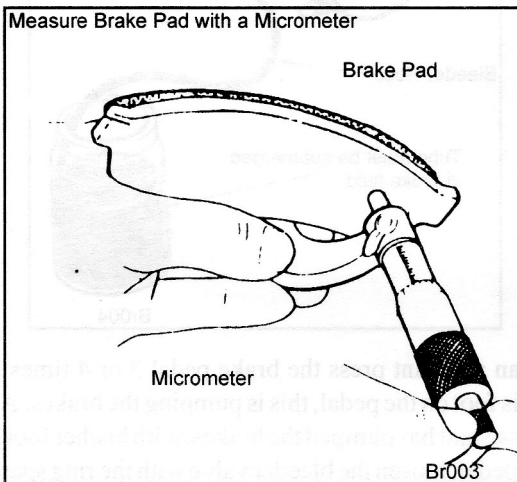
CHECKING BRAKE LINES, HOSES AND LININGS

Raise the rear of vehicle, position on safety stands and remove rear wheels. Inspect braking cylinder/disc, linings and calliper. Check all brake tube connection for possible leaks and flexible hoses for deterioration. Install new flexible hoses if required.

NB: Ensure hose is not twisted more than 15° after final fitting.

If a brake pad lining or drum shoe lining has worn to the minimum specification, replace both inboard and outboard pads and both trailing and leading shoes. It is necessary that both rear wheel sets or front wheel sets be replaced whenever a respective brake pad is worn beyond specifications or damaged.

BRAKEPAD WEAR



If a visual inspection doesn't adequately determine condition of lining, a physical check will be necessary. To check amount of lining wear, remove brake pad assemblies (see "Pad Replacement"). Three thickness measurements with a micrometer should be taken across the centre of each pad assembly; one reading at each end and one in the centre.

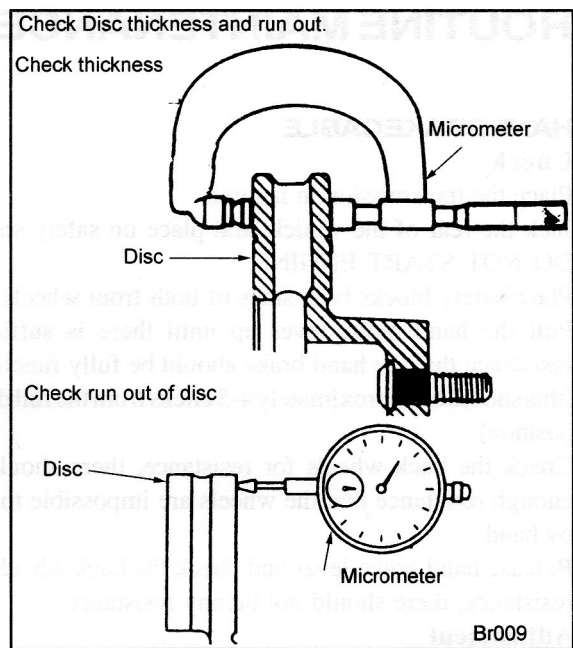
BRAKE ROUGHNESS

The most common cause of brake roughness (or chatter) with disc brake is excessive disc face run-out. This is easily checked with a dial indicator. If measurement is out of specification, disc must be re-surfaced or replaced.

Maximum Disc Runout specification: 0.004 in.

Minimum Disc Thickness stamped on Hub: e.g., 1.000 in.

Other less prevalent causes of roughness can be the use of some type of non-standard lining material and extreme abrasion of the disc faces. Vehicles which stand unused for periods of time in areas of high humidity or salt air may incur rust on the disc which could cause a temporary brake surge and roughness. Normally, however, this condition



should correct itself after a short period of usage. If rust is severe enough, roughness will not clear up and the disc must be resurfaced or replaced.

DISC BRAKE SERVICE PRECAUTIONS

Grease and any foreign material must be kept off calliper assembly and surfaces of braking disc during service procedures. The braking disc and calliper should be handled, avoiding deformation of the disc and scratching or nicking of the pad linings.

If inspection reveals square sectioned calliper piston seal is worn or damaged, it should be replaced immediately. During removal and installation of a wheel and tyre assembly, use care not to strike the calliper.

Before vehicle is moved after any brake service work, obtain a firm brake pedal by using correct bleeding procedures.

Dragging the brakes (common result of left foot application on vehicles with automatic transmission) should be avoided during vehicle operation.

As brake pad lining wears, reservoir level will go down. If fluid has been added between relines, then reservoir overflow may occur when piston is pushed back into new lining position. Overflow can be avoided by removing a small amount of fluid from reservoir.

HYDRAULIC SYSTEM FAILURE WARNING SWITCH

The hydraulic system warning switch is located between the front and rear brake lines after the master cylinder at a separating block. The switch is used to warn the vehicle operator that one of the hydraulic systems has failed.

A failure in one circuit doesn't result in an entire brake system failure.

As pressure in one circuit falls, the uneven pressure on the

spool switch piston forces the piston to move and contact switch terminal thus lighting the brake and failure warning lamp on instrument cluster.

The warning lamp switch piston needs to be reset once the appropriate repairs have been made. The switch block needs to be removed, which resets the piston into place, then the block switch is replaced, with the piston centralised.

MAJOR REPAIRS

MASTERCYLINDER

Remove

1. Remove the brake tubes from the outlet ports of the master cylinder.
2. Remove two bolts and two lock washers attaching the master cylinder to the fire wall on drum brake vehicles and to the booster on disc brake vehicles. Lift the master cylinder from the vehicle.
3. The bore size valve is stamped on the master cylinder body, and it is important that, if a cylinder needs replacing, a cylinder the same may be used.

Caution: With disc brakes take care not to disturb the pushrod and not to depress the brake pedal after the cylinder is removed, or when removing the master cylinder. Failure to observe this may result in the reaction disc becoming dislodged inside the booster.

Dismantle

1. Place the master cylinder on a clean bench, any dirt that may enter the unit, could cause a brake failure. Unclip the

reservoir cap and remove. Empty fluid from reservoir.

2. Secure the cylinder body into a vice fitted with soft jaws, to enable the tube fitting inserts to be removed.
3. Use a 13/64 drill piece to drill out the inserts, then use a 1/4in x 20 tap to tap the hole.
4. From the drilled hole remove check valves and springs.
5. Remove the secondary piston stop screw from the front reservoir or under the master cylinder assembly.
6. From just inside the inner diameter of the bore remove the small lock ring with a pair of lock ring pliers.
7. With the aid of a air gun apply low pressure through the front main bore opening, remove the primary piston, secondary piston, spring and retainer.

Note: The front piston is the secondary, while the rear piston is the primary.

Inspection

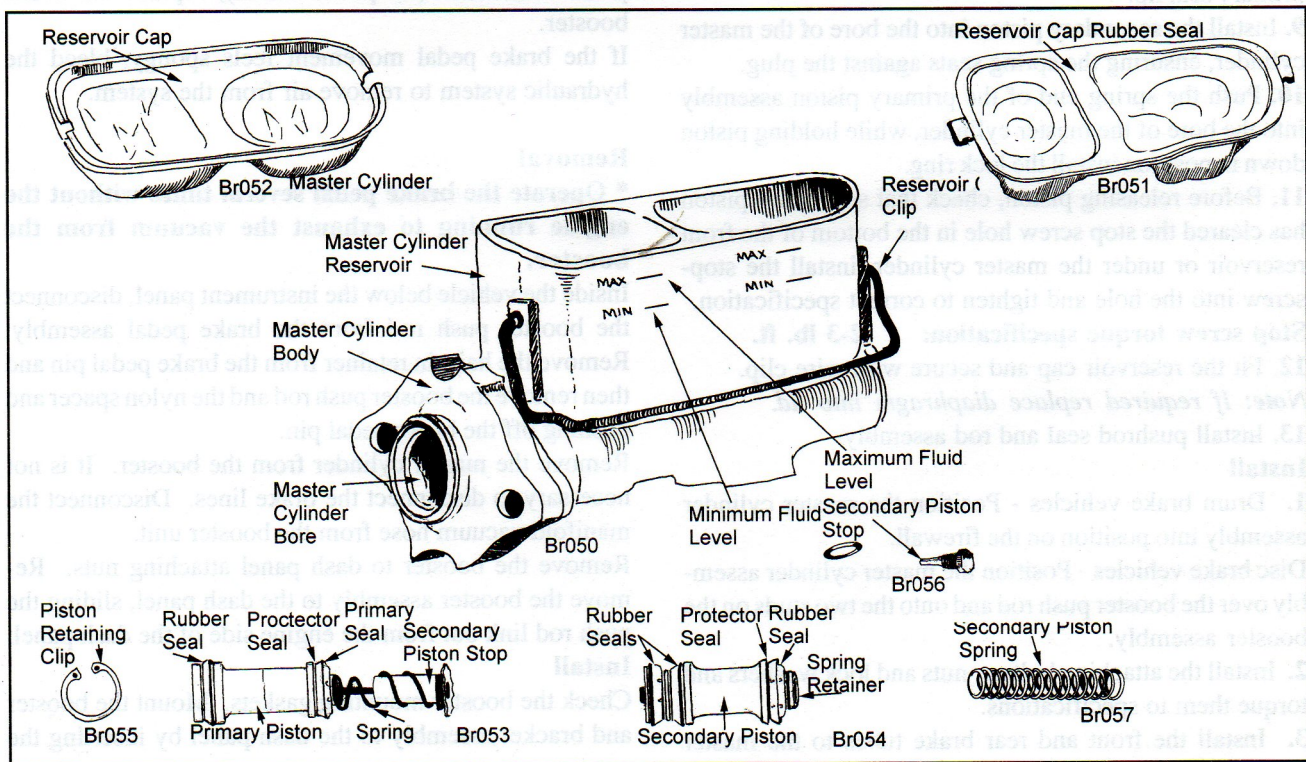
Inspect the master cylinder bores for signs of etching, pitting or scoring and if in poor condition, replace the cylinder assembly.

DO Not Hone This Cylinder.

Wash all internal parts in clean brake fluid and inspect the parts for excessive wear damage. Place all parts on clean pan or paper prior to assembly.

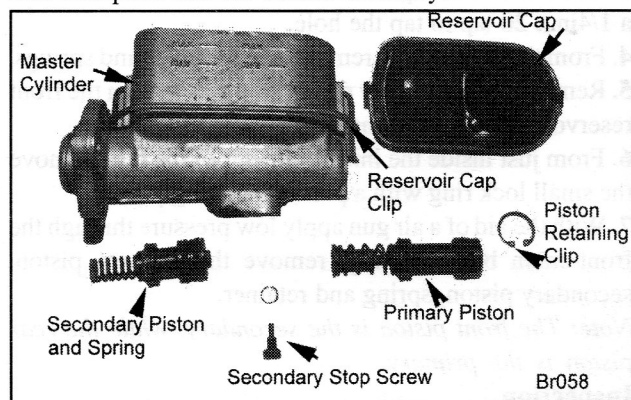
Assembly

1. Secure the master cylinder assembly into the vice fitted with soft jaws.
2. Install the check valve springs back into holes ensuring they seat into position, then install the new valves over the springs.
3. Position the new tube seats into position then carefully press into place ensuring the seat is pressed in square.



4. Secondary piston.

- a) Install new seals to the two grooves in the end.
- b) Install a new primary seal and protector, ensuring the seal and protector are seated correctly.



5. Primary piston.

- a) To the pushrod end of the piston install a new secondary seal.
 - b) To the piston install a new primary seal and protector, ensuring the seal and protector are seated correctly.
6. To the primary piston spring install a spring retainer in one end and a secondary piston stop in the other end, ensuring the spring retainer seats inside primary seal lip.
7. Through the secondary piston stop and the primary spring retainer install the extension screw and tighten to correct torque specification.

Extension screw torque specification: 2-3 lb. ft.

8. Insert the secondary piston spring retainer into piston spring, then install the spring and retainer over end of the secondary piston, ensuring the retainer seats inside the primary seal lip.

9. Install the secondary piston into the bore of the master cylinder, ensuring the spring seats against the plug.

10. Push the spring end of the primary piston assembly into the bore of the master cylinder, while holding piston down in position install the lock ring.

11. Before releasing piston, check that secondary piston has cleared the stop screw hole in the bottom of the front reservoir or under the master cylinder, install the stop-screw into the hole and tighten to correct specification.

Stop screw torque specification: 2-3 lb. ft.

12. Fit the reservoir cap and secure with wire clip.

Note: If required replace diaphragm into lid.

13. Install pushrod seal and rod assembly.

Install

1. Drum brake vehicles - Position the master cylinder assembly into position on the firewall.

Disc brake vehicles - Position the master cylinder assembly over the booster push rod and onto the two studs on the booster assembly.

2. Install the attaching bolts or nuts and lock washers and torque them to specifications.

3. Install the front and rear brake tubes to the master

cylinder outlet fittings.

4. Fill the master cylinder with the specified brake fluid to the level marked on the side of the dual reservoirs.

5. Bleed the brake system. Operate the brake several times, check for external hydraulic leaks.

VACUUM BRAKE BOOSTER

On Vehicle Test

Check the hydraulic brake system for leaks or insufficient fluid.

With the transmission in neutral, stop the engine and apply the parking brake. Depress the brake pedal several times to exhaust all vacuum in the system. With the engine shut off and all vacuum in the system exhausted, depress the pedal, and hold it in the applied position. Start the engine. If the vacuum system is operating, the pedal will tend to fall away under foot pressure and less pressure will be required to hold the pedal in the applied position. If no action is felt, the vacuum booster system is not functioning.

Remove the vacuum hose from the brake booster check valve connection. Manifold vacuum should be available at the check valve end of the hose with the engine at idle speed and the transmission in neutral. Operate the engine a minimum of 10 seconds at fast idle. Stop the engine and let the vehicle stand for 10 minutes; then, depress the brake pedal. The pedal feel (brake application) should be the same as that noted with the engine operating. If the pedal feels hard (no power assist), replace the brake booster.

If the brake pedal movement feels spongy, bleed the hydraulic system to remove air from the system.

Removal

*** Operate the brake pedal several times without the engine running to exhaust the vacuum from the booster.**

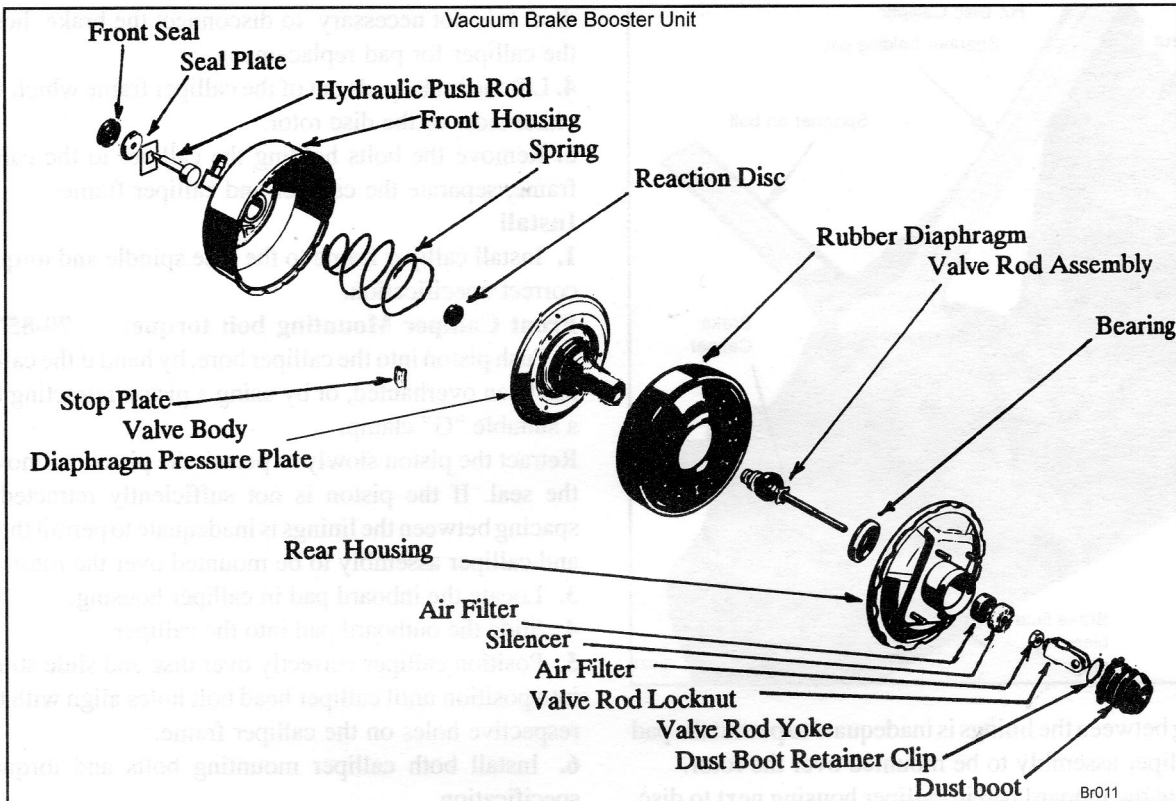
Inside the vehicle below the instrument panel, disconnect the booster push rod from the brake pedal assembly. Remove the hairpin retainer from the brake pedal pin and then remove the booster push rod and the nylon spacer and pushing off the brake pedal pin.

Remove the master cylinder from the booster. It is not necessary to disconnect the brake lines. Disconnect the manifold vacuum hose from the booster unit.

Remove the booster to dash panel attaching nuts. Remove the booster assembly to the dash panel, sliding the push rod link out from the engine side of the dash panel.

Install

Check the booster mounting gaskets. Mount the booster and bracket assembly to the dash panel by inserting the



push rod and boot through the hole in the dash panel. Loosely install the booster to dash panel attaching nuts. Install the inner nylon spacer, the booster push rod, and the bushing on the brake pedal pin. Secure these parts to the pin with the hairpin retainer.

*** Don't pull the booster into position on the dash panel by pulling rearwards on the brake pedal.** Tighten booster to dash panel attaching nuts, then connect the manifold vacuum hose to the booster. Install the master cylinder and torque the attaching nuts.

Do not remove the brake line or completely empty the reservoir or it will be necessary to bleed the hydraulic system. Discard the brake fluid.

*** It is necessary to remove brake fluid, this will stop the reservoir overflowing when the calliper piston is forced into the bore when changing pads.**

2. Remove the wheels. If more than one brake requires service, work on only one brake at a time. Pad assemblies must always be replaced as sets either front or rear.
3. Remove the two mounting bolts which hold the calliper to the calliper frame, lift the calliper away from the disc and calliper frame. It is not necessary to disconnect the brake hose at the calliper for pad replacement.
4. Lift the brake pads out of the calliper frame from either side of the disc.

Install

1. Push piston into the calliper bore, by hand if the calliper has been overhauled, or by using a piston retracting tool, a suitable "G" clamp.

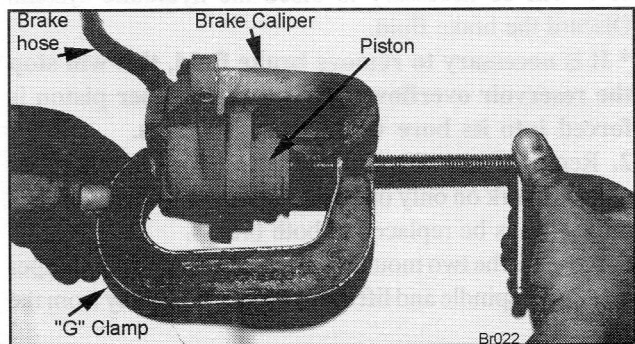
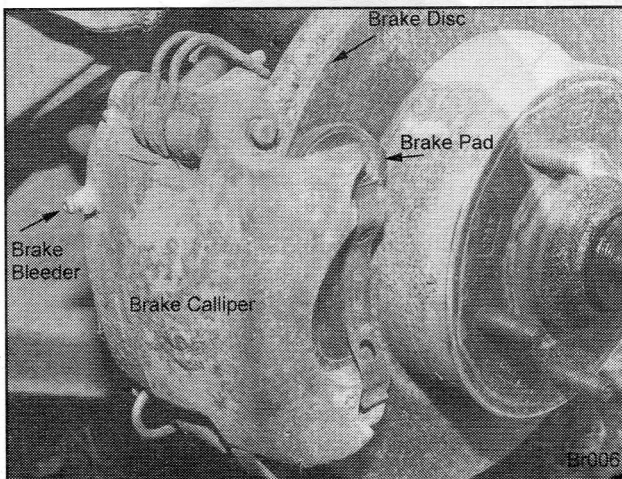
Retract the piston slowly to permit the piston to move in the seal. If the piston is not sufficiently retracted the

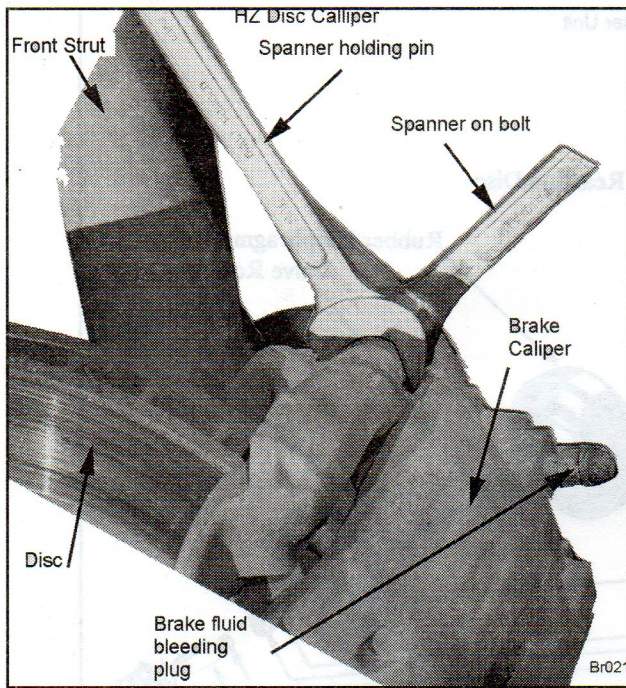
DISC BRAKES

Disc Pads

Remove

1. Remove one half of the fluid from the fluid reservoir.





spacing between the linings is inadequate to permit the pad and calliper assembly to be mounted over the rotor.

2. Locate the inboard pad in calliper housing next to disc.
3. Slide the outboard pad into the calliper.
4. Position calliper correctly over rotor and slide straight into position until calliper head bolt holes align with their respective holes on the calliper frame.
5. Install both calliper mounting bolts and torque to specification.

Front Brake Calliper Mounting Bolts: 70-80Nm

6. Replenish the brake fluid in the master cylinder. Pump the brake pedal several times to position the shoe and pad assemblies.

7. Check for leakage of fluid at all connections under pedal pressure. Check fluid level, install wheel and tighten wheel nuts, tighten nuts to specification.

Wheel Nut specified torque: 100-108Nm

8. Road test vehicle make several light stops to seat linings

Brake Callipers and Disc Pads

Remove

1. Remove one half of the total fluid capacity. Do not remove the brake line or completely empty the reservoir or it will be necessary to bleed the hydraulic system. Discard the brake fluid.

*** It is necessary to remove brake fluid, this will stop the reservoir overflowing when the calliper piston is forced into its bore when changing pads.**

2. Remove front wheels. If more than one brake requires service, work on only one brake at a time. Pad assemblies must always be replaced in both brakes.

3. Remove the two mounting bolts which hold the calliper to the axle spindle and lift the calliper radial away from the

disc. It is not necessary to disconnect the brake hose at the calliper for pad replacement.

4. Lift the brake pads out of the calliper frame which were either side of the disc rotor.

5. Remove the bolts holding the calliper to the calliper frame, separate the calliper and calliper frame.

Install

1. Install calliper frame to the axle spindle and torque to correct specification.

Front Calliper Mounting bolt torque: 70-85Nm

2. Push piston into the calliper bore, by hand if the calliper has been overhauled, or by using a piston retracting tool, a suitable "G" clamp.

Retract the piston slowly to permit the piston to move in the seal. If the piston is not sufficiently retracted the spacing between the linings is inadequate to permit the pad and calliper assembly to be mounted over the rotor.

3. Locate the inboard pad in calliper housing.

4. Slide the outboard pad into the calliper.

5. Position calliper correctly over disc and slide straight into position until calliper head bolt holes align with their respective holes on the calliper frame.

6. Install both calliper mounting bolts and torque to specification.

Bolts to Guide Pins spec torque: 38-48Nm

7. Replenish the brake fluid in the master cylinder. Pump the brake pedal several times to position the shoe and pad assemblies.

8. Check for leakage of fluid at all connections under pedal pressure. Check fluid level, install wheel and tighten wheel nuts, tighten nuts to specification.

Wheel Nut specified torque: 100-108Nm

9. Road test vehicle make several light stops to seat linings

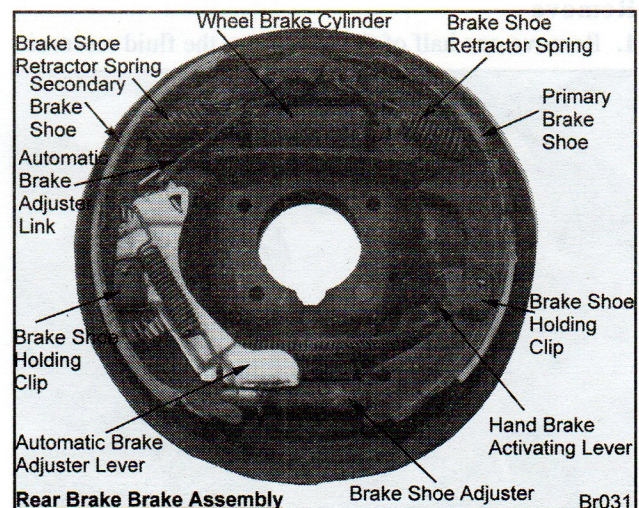
Rear Drum Brakes

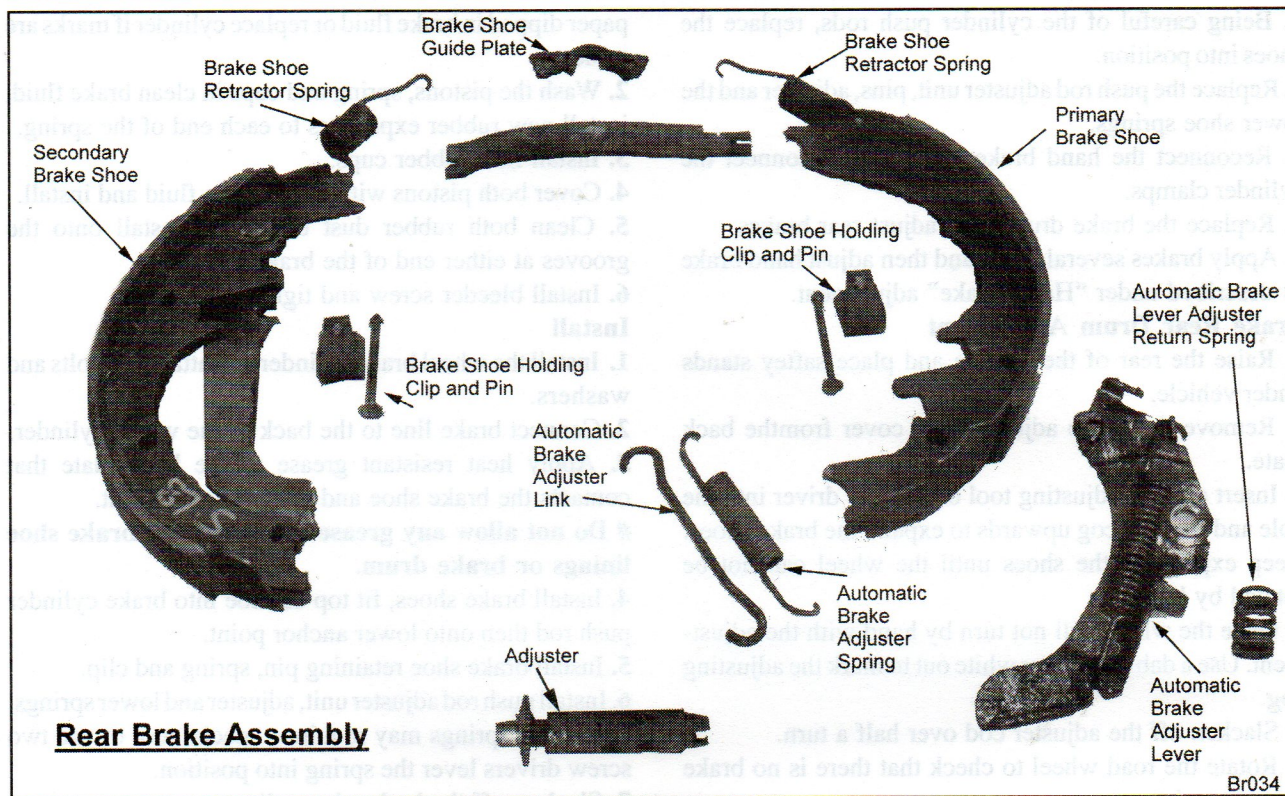
Drum

Remove

1. Jack up and support rear of vehicle.

2. Remove the road wheel.





3. Remove the brake drum. It may be necessary to slacken off shoe adjustment. Also slacken off hand brake pressure, by removing inspection plug from back plate, use a screw driver to force the hand brake lever outwards, this will cause the hand brake pin to disconnect from the brake shoe, allowing the shoe to move away from the drum.

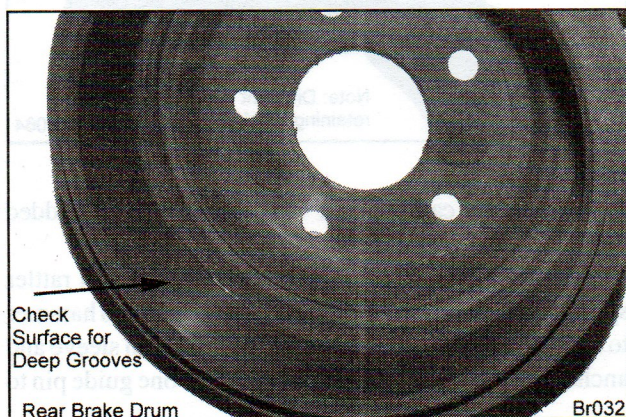
Inspect Drum

Inspect the drum, if the inner surface is scoured or grooved, it may be necessary to replace the drum. Drum can have the inner surface machined, if grooves are not excessively deep. Check specifications.

Drum Inside Diameter	10 in.
Drum Max. out of round (new)	0.005 in.
Drum Max. out of round (worn)	0.010 in.

Install

1. Replace drum over shoes, push firmly into position. (If hand brake lever was disconnected from brake shoe reconnect lever.



2. Replace road wheel, tighten wheel nuts to specification.

Road Wheel Nut Specification: 55-60 ft.lb

3. Adjust brakes, and lower vehicle from safety jacks.

Brake Shoes

Remove

1. Jack up and support rear of vehicle.
2. Loosen hand brake cable rear brakes only.
3. Remove the road wheel, then remove the brake drum, it may be necessary to slacken off shoe adjustment. Also slacken off hand brake pressure, by removing inspection plug from back plate, use a screw driver to force the hand brake lever outwards, this will cause the hand brake pin to disconnect from the brake shoe, allowing the shoe to move away from the drum.

4. Remove lower shoe springs, adjuster, and push rod adjuster unit.

5. Remove retaining clip, spring and pin then brake shoes from brake cylinder push rods and lower anchor point.

Brake Lining Replacement.

1. Drill the brake lining rivets from the shoes to remove old linings.
2. Inspect the drums to determine if standard linings are to be used or if oversized linings are required.
3. Install the new linings to the shoes. When install lining rivets use a suitable vice, punch and hammer, ensure the linings are firmly against the brake shoe.

Install

1. All metal to metal parts are to be lightly coated with grease, including the backing plate pads and the adjuster. Use high temperature grease.

2. Being careful of the cylinder push rods, replace the shoes into position.
3. Replace the push rod adjuster unit, pins, adjuster and the lower shoe springs.
4. Reconnect the hand brake cable and disconnect the cylinder clamps.
5. Replace the brake drums and adjust rear brakes.
6. Apply brakes several times and then adjust hand brake as described under "Hand Brake" adjustment.

Brake Rear Drum Adjustment

1. Raise the rear of the vehicle and place safety stands under vehicle.
2. Remove the brake adjuster hole cover from the back plate.
3. Insert a brake adjusting tool or a screw driver into the hole and turn the cog upwards to expand the brake shoes. Keep expanding the shoes until the wheel can not be rotated by hand.
4. Once the wheel will not turn by hand with the adjustment. Use a dab of paint or white out to mark the adjusting cog.
5. Slacken off the adjuster cog over half a turn.
6. Rotate the road wheel to check that there is no brake drag or resistance.
7. Apply the hand brake to ensure the brake is operating, if not adjust the hand brake cable.

Wheel Cylinder

Remove

1. Raise vehicle and support on safety stands.
2. Loosen hand brake cable rear wheels only.
3. Remove the road wheel, then remove the brake drum, it may be necessary to slacken off shoe adjustment.
4. Remove lower shoe springs, adjuster, and push rod adjuster unit.
5. Remove retaining clip, spring and pin then brake shoes from brake cylinder push rods and lower anchor point.
6. Disconnect brake line from the back of the wheel cylinder.
7. Remove the wheel brake attaching bolts and washers, remove the wheel cylinder.

Dismantle

1. Remove wheel cylinder rubber dust boots.
2. Remove the pistons, cups, and spring, it may be necessary to use (low pressure) compressed air at the brake line hole to remove the pistons if both pistons are jammed.
3. Remove the bleeder screw.
4. Wash all components in clean brake fluid, inspect all parts for wear, damage and cracks in rubber boots.

Inspection and Assembly

1. Wash cylinder bore with clean brake fluid, check for score marks or corrosion pits in bore. Light score marks or corrosion pits can be polished out with 400 wet and dry

paper dipped in brake fluid or replace cylinder if marks are too deep.

2. Wash the pistons, spring and cups in clean brake fluid, install new rubber expanders to each end of the spring.
3. Install new rubber cups.
4. Cover both pistons with clean brake fluid and install.
5. Clean both rubber dust boots and install onto the grooves at either end of the brake cylinders.
6. Install bleeder screw and tighten.

Install

1. Install the wheel brake cylinder and attaching bolts and washers.
2. Connect brake line to the back of the wheel cylinder.
3. Apply heat resistant grease to the back plate that contacts the brake shoe and lower anchor point.

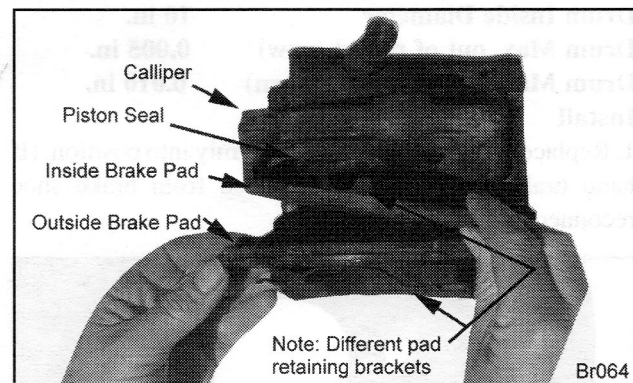
Do not allow any grease to contact the brake shoe linings or brake drum.

4. Install brake shoes, fit top of shoe into brake cylinder push rod then onto lower anchor point.
5. Install brake shoe retaining pin, spring and clip.
6. Install push rod adjuster unit, adjuster and lower springs. The lower springs may require a special tool or use two screw drivers lever the spring into position.
7. Slacken off the brake shoe adjuster.
8. Install brake drum over the brake shoes then bleed the hydraulic system and adjust brakes.
9. Install road wheel.

Wheel Nut specified torque: 55 - 60 lb.ft.

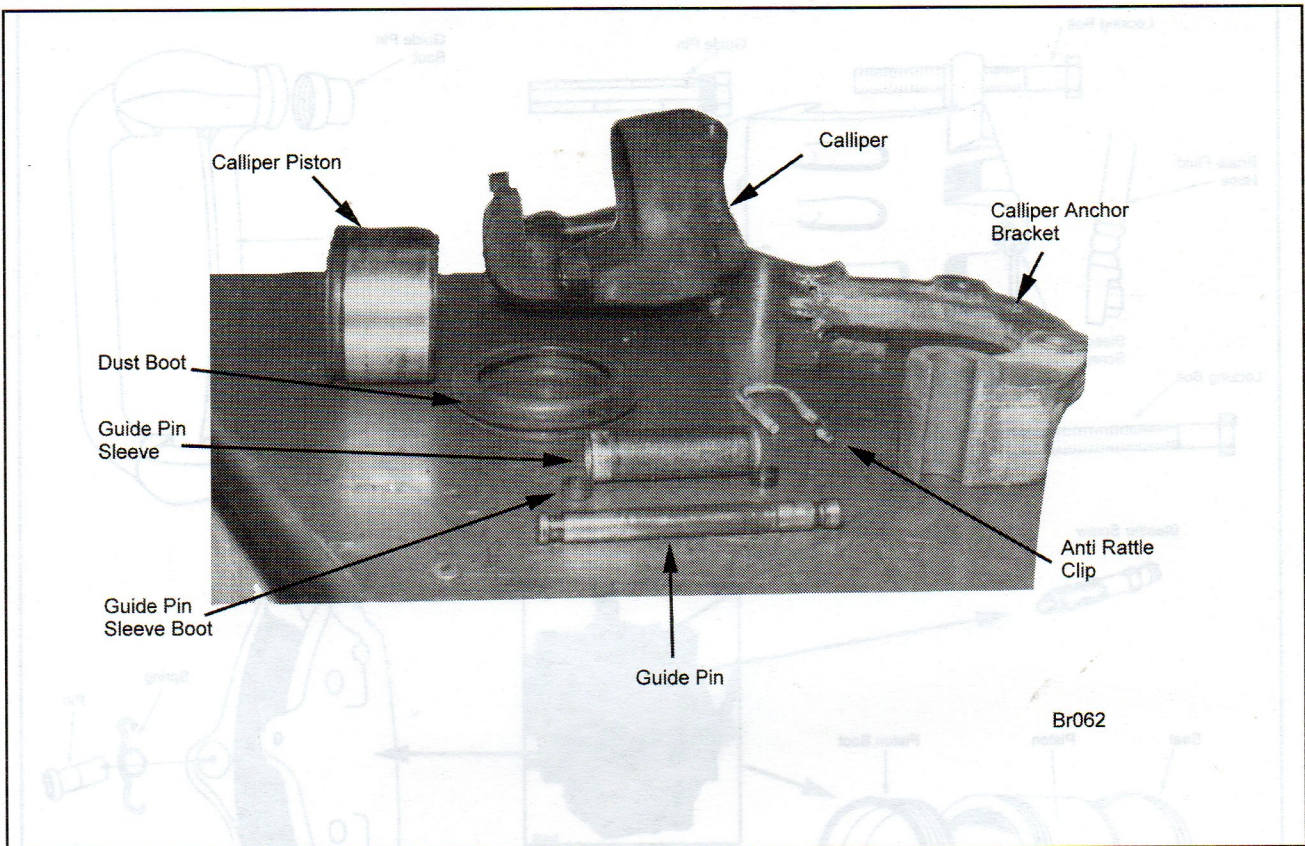
10. Road test the vehicle and make several light stops to seat the linings.
11. Apply pressure to the brakes several times and then adjust brakes as described.
12. Adjust the hand brake cable.

Calliper Overhaul and Disc Pad Replacement

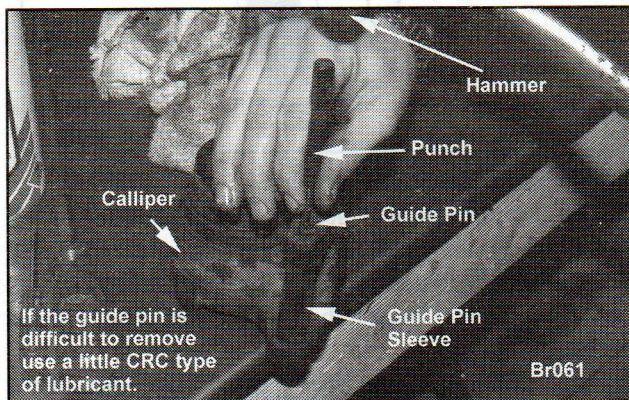


Dismantle

1. Position the calliper in a vice equipped with padded jaws.
 - (1): Earlier model disc callipers. Remove the anti rattler springs, split pin from guide pins. Use a punch and hammer to tap out the guide pins. Remove the guide pin sleeve and anchor bracket, only necessary to remove one guide pin to



Br062



Br061

remove the anchor bracket.

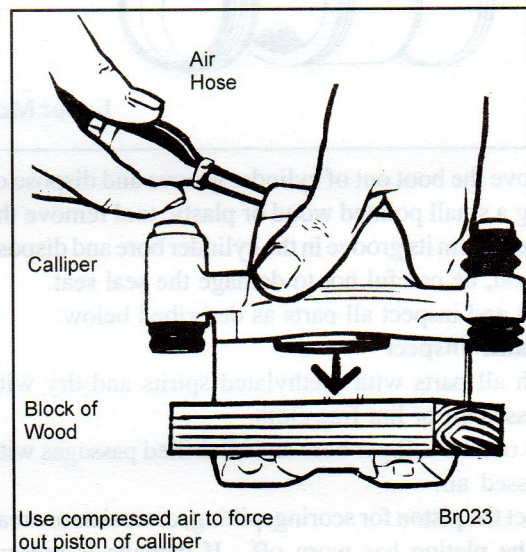
(11): Later model disc callipers. Unscrew the two guide pins and boots from the calliper body.

Caution: Do not hit the guide pins with a hammer, if they will not unscrew, as this will damage the calliper.

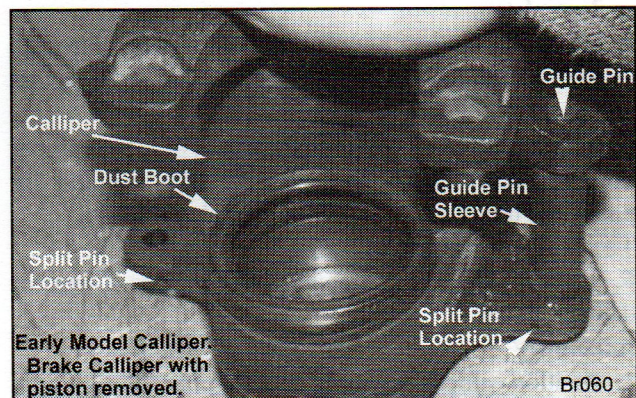
2. Remove piston by carefully gradually increasing compressed air at the fluid inlet port of the calliper until the piston is forced out of the bore. A block of wood or hardboard or a wad of cloth located in the position of the outboard pad will guarantee the piston is not damaged.

Caution: Keep fingers from the inside of calliper when removing the piston using air pressure.

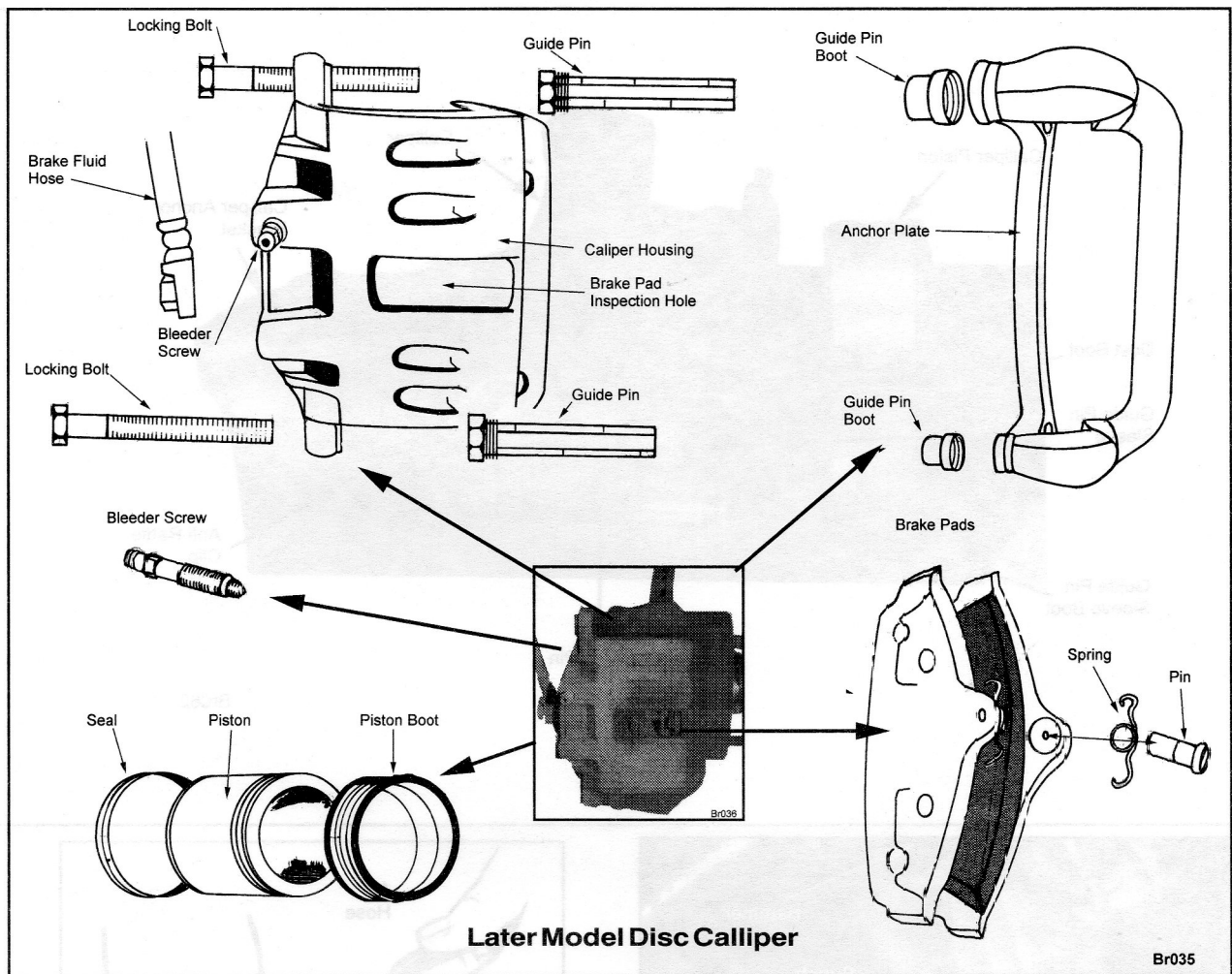
3. While the piston slides out, the I.D. of the rubber boot in the groove of the piston should stretch out around the large portion of the piston allowing the piston to slide out and be removed.



Br023



Br060



4. Remove the boot out of cylinder groove and dispose of it. Using a small pointed wood or plastic tool remove the piston seal from its groove in the cylinder bore and dispose of the seal, be careful not to damage the seal seat.

5. Clean and inspect all parts as described below.

Clean and Inspect

1. Wash all parts with methylated spirits and dry with compressed air or lint free cloth.

2. Blow out the calliper bore and all drilled passages with compressed air.

3. Inspect the piston for scoring, pitting, corrosion or areas where the plating has worn off. If damage is present replace piston.

4. Inspect the calliper bore for scoring, pitting, corrosion or damage and replace the calliper if any of these factors are present.

5. If light scuff marks exist on the piston or in the calliper bore, rub down lightly by hand with '600' wet and dry paper and thoroughly rinse with methylated spirits. The calliper must not be honed.

6. Inspect all other components and replace if wear or damage exists.

Assembly

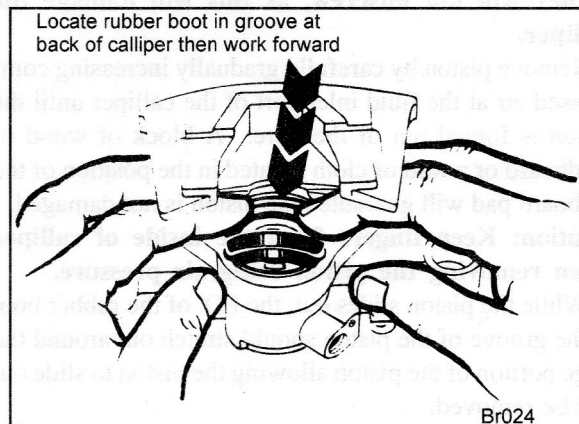
1. Position calliper assembly on a clean bench area with

the open end of cylinder up.

2. Dip new piston seal in clean disc brake fluid and install in cylinder groove. Place seal in the groove and gently work around cylinder bore with a finger until the seal is properly seated. Check to be sure the seal is not twisted or rolled in its groove.

3. Coat piston boot in rubber grease. Place piston boot over end of piston. Liberally coat the outside diameter of piston with rubber grease.

4. Locate boot into groove in calliper body. Start this procedure at the rear of the body and gradually feed boot



around groove until completely assembled.

5. Lubricate inside of calliper head guide pin bores with approved high melting point grease.

6. Assemble the sleeve boot into the larger sleeve hole in the calliper body by squeezing with fingers into bore and pushing in.

7. Thoroughly lubricate inside of boot with High Melting Point Grease and assemble the straight slider sleeve and guide pins, make sure the boot and the slider and pin are lubricated and move freely.

8. Fit the calliper to the anchor plate.

9. Tighten guide pins bolts to specification, use a spanner to hold guide pins while tightening guide pin bolts.

Bolts to Guide Pins spec torque: 38-48Nm

10. Install the brake hose to the calliper, if applicable.

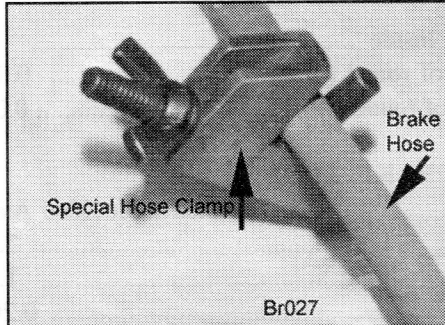
11. Install the bleeder screw valve.

Note: The unit does not have the pads fitted as they will be installed as the unit is fitted to the disc on the vehicle.

Front Disc

Remove

1. Remove the calliper assembly as described above. There is no need to disconnect the brake hose, if the calliper does not require servicing. If the brake hose is to be removed, use a brake hose clamp to stop brake fluid draining from brake hose.



Place the calliper out of the way, and support it with a wire to avoid damaging the calliper or the hose.

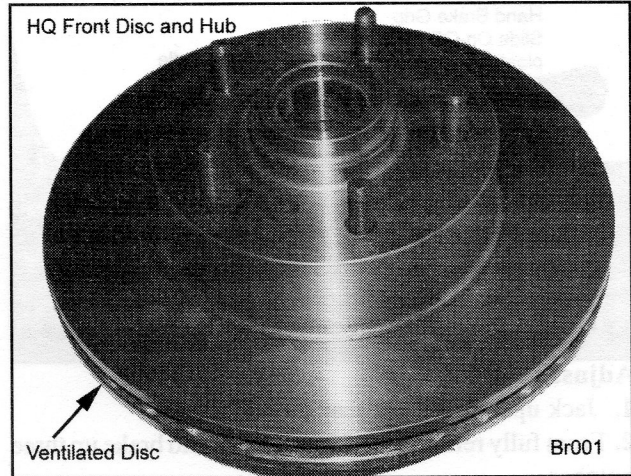
2. Remove the grease cap from the hub. Remove the cotter pin, lock nut, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly. Remove the hub and disc from the spindle.

Install

1. Pack either the original or a new set of bearings with specified grease and install. If the original disc is being installed, make sure that the hub is clean, that the inner bearing and grease seal are lubricated and in good condition, and that the rotor braking surfaces are clean.

2. Install the hub and disc on the spindle. Lubricate and install the outer wheel bearing, washer and adjusting nut. Adjust wheel bearings to specification, and then install the nut lock, cotter pin, and grease cap.

3. Replace the calliper assembly on the axle as previously

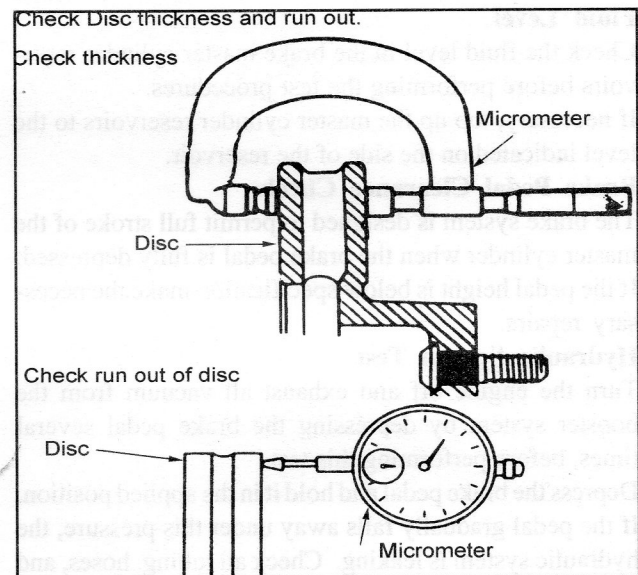


described.

HAND BRAKE

Adjust Hand Cable

Check the parking brake cables with the park brake handle fully released. If the cables are loose, adjust as described below.



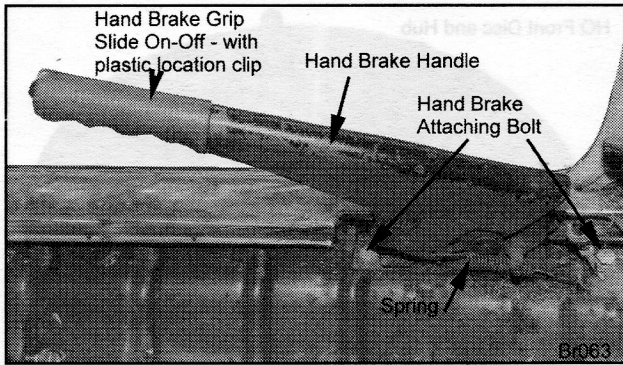
Hand Brake Lever Assembly

Remove

1. Disconnect the hand brake front cable from the relay equaliser beneath the vehicle.
2. Locate the mounting bolts and remove.
3. Lift assembly up to remove park brake switch, then lift out handle assembly.

Install

1. Replace the hand brake lever assembly to the vehicle and tighten the attaching nuts.
2. Install the dust cover to the hand brake lever and reconnect the hand brake cable to the equaliser.



Adjust

1. Jack up and support rear of vehicle.
2. From fully released position lift the hand brake up three notches.
3. Adjust the brake shoes till they firmly contact the drum.
4. Loosen off adjuster by 1 notch and then adjust cable to remove slack.
5. Release park brake fully and wheels should turn freely.

Problem Diagnosis and Tests

Preliminary Tests

Fluid Level

Check the fluid level in the brake master cylinder reservoirs before performing the test procedures.

If necessary, top up the master cylinder reservoirs to the level indicated on the side of the reservoir.

Brake Pedal Clearance Check

The brake system is designed to permit full stroke of the master cylinder when the brake pedal is fully depressed. If the pedal height is below specification make the necessary repairs.

Hydraulic System Test

Turn the engine off and exhaust all vacuum from the booster system by depressing the brake pedal several times, before performing this test.

Depress the brake pedal and hold it in the applied position. If the pedal gradually falls away under this pressure, the hydraulic system is leaking. Check all tubing, hoses, and connections for leaks.

If the brake pedal movement is spongy, bleed the hydraulic system to remove air from the brake system.

SPECIFICATIONS

BRAKE BOOSTER

Make	PBR Master -Vac
Type	Suspended Vacuum
Vacuum piston diameter	10.0 in. (min).
Output Cylinder Bore	1.0 in. (min).
Boost Ratio	3.2:1

MASTER CYLINDER

Make	PBR
Type	Tandem
Main Bore Diameter (nominal)	1.0 in.

Calliper (Front)

Make	P.B.R.
Type	Single Piston Sliding Calliper
Bore Diameter	2.5 in.

DRUM BRAKES

Type	Leading/Trailing shoes
Hand brake	Cable and lever
Foot brake	Hydraulic

DISC (Front)

Type	Cast Iron - Ventilated
Diameter (Standard)	10.88 in.
Thickness (New)	1.00 in.
Max. Runout	0.004 in.

DISC PADS (Front)

Material	Resin bonded asbestos
Contact Area	9.67 in. squared.
Lining Wear Limit	0.350 in.

DRUM

Diameter Inside	10 in.
Max. out of round (new)	0.005 in.
Max. out of round (worn)	0.010 in.

DRUM BRAKE LININGS

Type	Riveted - Moulded Asbestos	
Width	- Front	2.25 in.
	- Rear	1.75 in.
Thickness		0.201 in.

DRUM WHEEL CYLINDER

Diameter (Bore)	- Front	1.125 in.
	- Rear	0.875 in.

BRAKE FLUID

Brake fluid spec.	GMH - HN 1796
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TORQUE LIMITS

Nm

Master Cylinder to Fire Wall	30-35
Master Cylinder to Booster	30-35
Front Calliper Anchor Bracket to Knuckle	40-50
Wheel Cylinder Attaching Bolts	5-7