

# BRAKE SYSTEM

1994 Volvo 960

1994 BRAKES  
Volvo Brake System - Disc

960

## DESCRIPTION

All models use front and rear disc brakes with 3 makes of calipers: ATE, Bendix (DBA) and Girling. Service brakes are hydraulically-operated by a tandem master cylinder and vacuum power brake unit. Each rear brake line has a pressure valve to prevent rear wheel lock-up. Parking brake is mechanically operated, using rear wheel disc rotor internally mounted brake shoes.

NOTE: For information on Volvo anti-lock brake system, see ANTI-LOCK BRAKE SYSTEM article in the BRAKES section.

## BLEEDING BRAKE SYSTEM

NOTE: Use only DOT 4 grade brake fluid.

1) Raise and support vehicle. Fill master cylinder reservoir to maximum mark. Bleed brakes in sequence. See BRAKE LINE BLEEDING SEQUENCE table. After bleeding brakes, depress brake pedal with a force equal to an abrupt stop.

2) Pedal travel should not exceed 2.17" (55 mm). Brake warning light should not illuminate. If air is still present in system, repeat procedure.

BRAKE LINE BLEEDING SEQUENCE TABLE

Application	Sequence
960 .....	LR, RR, LF, RF

## ADJUSTMENTS

### BRAKE PEDAL HEIGHT

Brake pedal height should be equal to clutch pedal height. To adjust, loosen lock nut, remove cotter pin and turn push rod until pedal height is equal. Replace cotter pin and tighten lock nut. Pedal travel should be 6-6.5" (150-163 mm). Pedal travel can ONLY be measured during brake bleeding operation.

### PARKING/EMERGENCY BRAKE

Remove cover at rear of center console. Remove adjusting screw by carefully tapping on locking sleeve spring collar with a hammer and screwdriver. Adjust cable so that parking brake is fully applied when lever is pulled 3-5 notches. Install cover.

### STOPLIGHT SWITCH

Adjust switch so brakelights come on when pedal is depressed .30-.60" (8-14 mm).

## REMOVAL & INSTALLATION

### DISC PADS

NOTE: Use Remover (2917) to remove disc pads.

#### Removal & Installation (ATE Brake Calipers)

1) Raise and support vehicle. Mark position of wheel in relation to hub for reassembly reference. Remove tire and wheel. Remove brake pad retaining pins using drift and hammer. Remove brake pad retaining spring clips. Compress caliper pistons and remove brake pads.

CAUTION: It is possible brake fluid may overflow from reservoir when depressing pistons.

2) Seat pistons in caliper bore with Piston Tool (2809). To avoid brake squealing, check piston position by installing Template (2919). Piston recess should incline 20 degrees in relation to lower guide area on caliper. See Fig. 1.

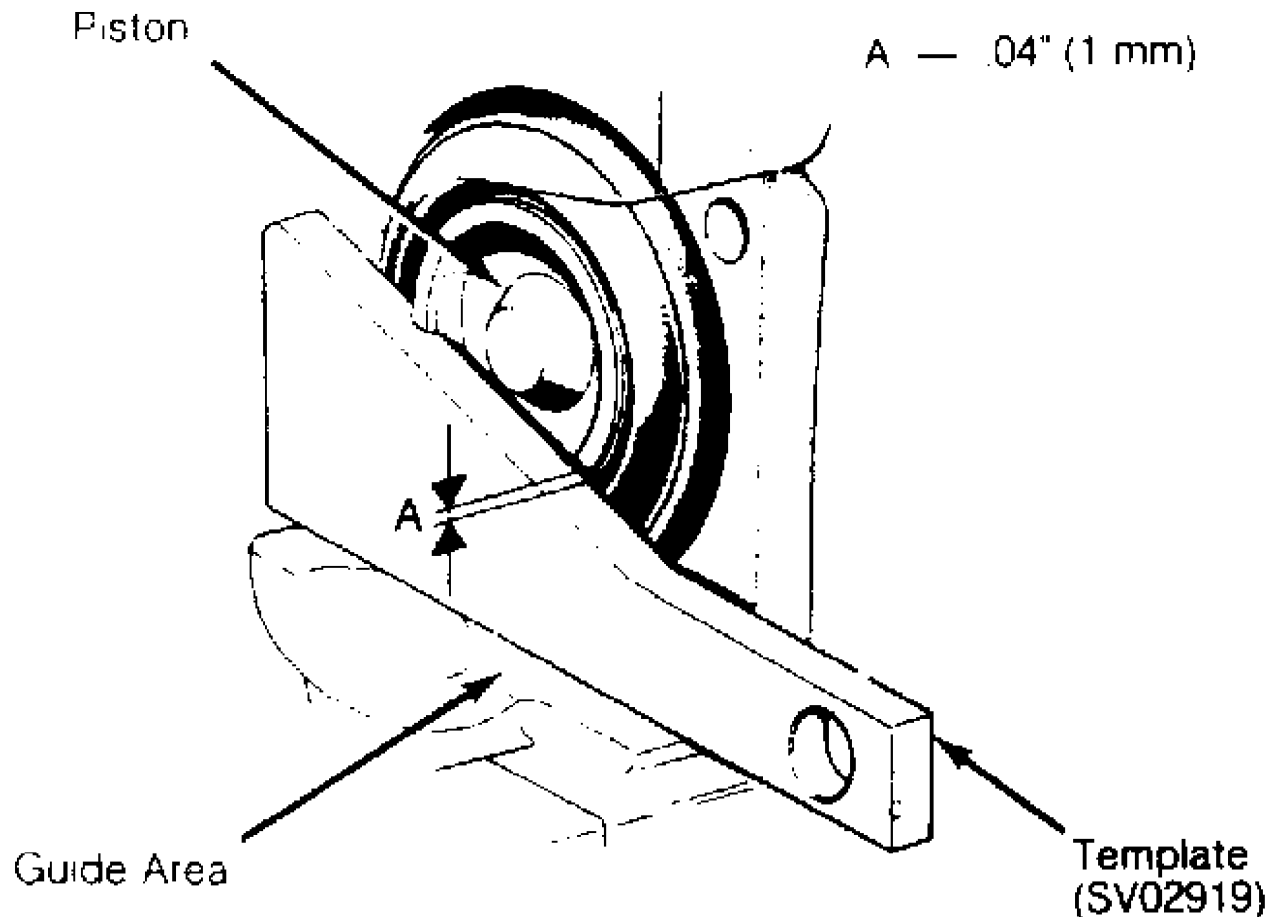


Fig. 1: Checking ATE Rear Caliper Piston Angle To Avoid Brake Squeal  
Courtesy of Volvo Cars of North America

3) If distance from one piston recess to the other recess at measurement "A" exceeds .04" (1 mm), adjust piston position using

Adjuster (2918) to rotate piston. See Fig. 1.

4) Install intermediate plates (if equipped) or damper washers (if equipped) in original positions. Install new brake pads and ALWAYS install new brake pad tensioning spring. Install and tap one retaining guide pin into position. Install new tensioning spring. Install other retaining guide pin while holding tensioning spring in position.

**NOTE:** Install damper washers with the small contact face toward pad. DO NOT install intermediate plates in calipers equipped with damper washers.

#### Removal & Installation (Bendix & Girling Brake Calipers)

1) Raise and support vehicle. Mark position of wheel in relation to hub for reassembly reference. Remove tire and wheel. Loosen caliper upper guide pin bolt and remove caliper lower guide pin bolt only from brake pad holder assembly. Swing caliper upward and remove pads. Compress caliper pistons.

**CAUTION:** It is possible brake fluid may overflow from reservoir when depressing pistons.

2) Inspect rubber guide pin covers and replace if defective. Install brake pads to holder and swing caliper into position. Ensure brake pad tension spring is in proper position. Tighten guide pin bolts to specification. See TORQUE SPECIFICATIONS.

## CALIPER ASSEMBLY

#### Removal

Raise and support vehicle. Remove wheel. Disconnect brake line connections at caliper. Cap lines to prevent entry of foreign matter. Remove caliper mounting bolts. Lift caliper from mounting bracket.

#### Installation

1) Position caliper assembly on mounting bracket, and install attaching bolts. After installing bolts, check clearance between disc pads and rotor on both sides of rotor.

2) Maximum deviation between sides should not exceed .004" (.10 mm) on front calipers or .010" (.25 mm) on rear calipers. To adjust clearance, add shims to caliper. Connect hydraulic lines and bleed hydraulic system. See BLEEDING BRAKE SYSTEM.

## DISC BRAKE ROTOR

#### Removal & Installation (Front)

1) Remove caliper. Remove hub cap. Remove cotter pin and castellated nut. Remove outer wheel bearing. Remove hub and rotor assembly.

2) To install, reverse removal procedure. Tighten castellated nut to 42 ft. lbs. (57 N.m). Back off nut. Tighten nut to 13 INCH lbs. (1.5 N.m). Install cotter pin.

#### Removal & Installation (Rear)

Remove caliper. Remove screws retaining rotor to hub. Remove rotor. To install, reverse removal procedure.

## REAR AXLE SEAL & BEARING

**NOTE:** Models have sealed wheel bearings. See appropriate SUSPENSION - REAR article in the SUSPENSION section.

## PARKING BRAKE SHOES

### Removal

Remove cover at rear of center console. Remove adjusting screw by carefully tapping on spring sleeve with a hammer and screwdriver. Unscrew adjusting screw so that cables are loose. Raise vehicle. Remove rear wheels. Remove brake caliper and wire out of way. Remove brake rotor. Unhook rear return spring. Remove brake shoes.

### Installation

Replace brake drum (rotor) if out-of-round exceeds .008" (.2 mm). Apply thin layer of heat resistant graphite grease on brake shoe contact surfaces. Assemble brake shoes. Install rear return spring. Using new bolts, install brake disc and caliper. Ensure that disc rotates without touching brake pads. Install wheels. Adjust parking brake cable. Lower vehicle.

## MASTER CYLINDER

### Removal & Installation

Disconnect hydraulic lines at master cylinder. Plug openings to prevent entry of foreign matter. Remove cylinder attaching nuts. Remove cylinder assembly from vehicle. To install, reverse removal procedure. Bleed hydraulic system.

## POWER BRAKE UNIT

### Removal

1) Disconnect master cylinder and move it aside. Leave brake pipes attached to master cylinder. Disconnect vacuum hose. Using screwdriver, pry check valve from unit. Remove fuel filter and move it aside.

2) Disconnect vacuum pump and move it aside. Remove soundproofing on left side of center console. Disconnect push rod from brake pedal. Remove 4 nuts and power brake unit. Remove check valve seal.

### Installation

Install seal in power brake unit. Ensure seal is correctly seated. Remove Sealing Ring (1272078-5) and install on new power brake unit. To complete installation, reverse removal procedure.

### Check Valve Replacement

Disconnect vacuum hose from check valve. Using 2 screwdrivers, lever out check valve. Remove seal. Install new seal, ensuring that flange is properly aligned in cylinder. Coat seal with grease. Press valve carefully into place. Ensure that seal does not move out of position. Reconnect vacuum hose so that highest point is attached to valve.

## OVERHAUL

### BRAKE CALIPER

#### Disassembly

Remove disc pads, piston dust covers, and retaining clips. Insert wooden block into caliper housing. Apply compressed air at fluid inlet ports to force pistons out of caliper. Remove piston seals from cylinder bore.

NOTE: DO NOT separate caliper halves.

Cleaning & Inspection

Clean all parts in brake fluid or alcohol. Inspect cylinder bores for scoring, rust or corrosion. Replace if defective. Replace rubber seals and dust covers during overhaul. See Figs. 2-6.

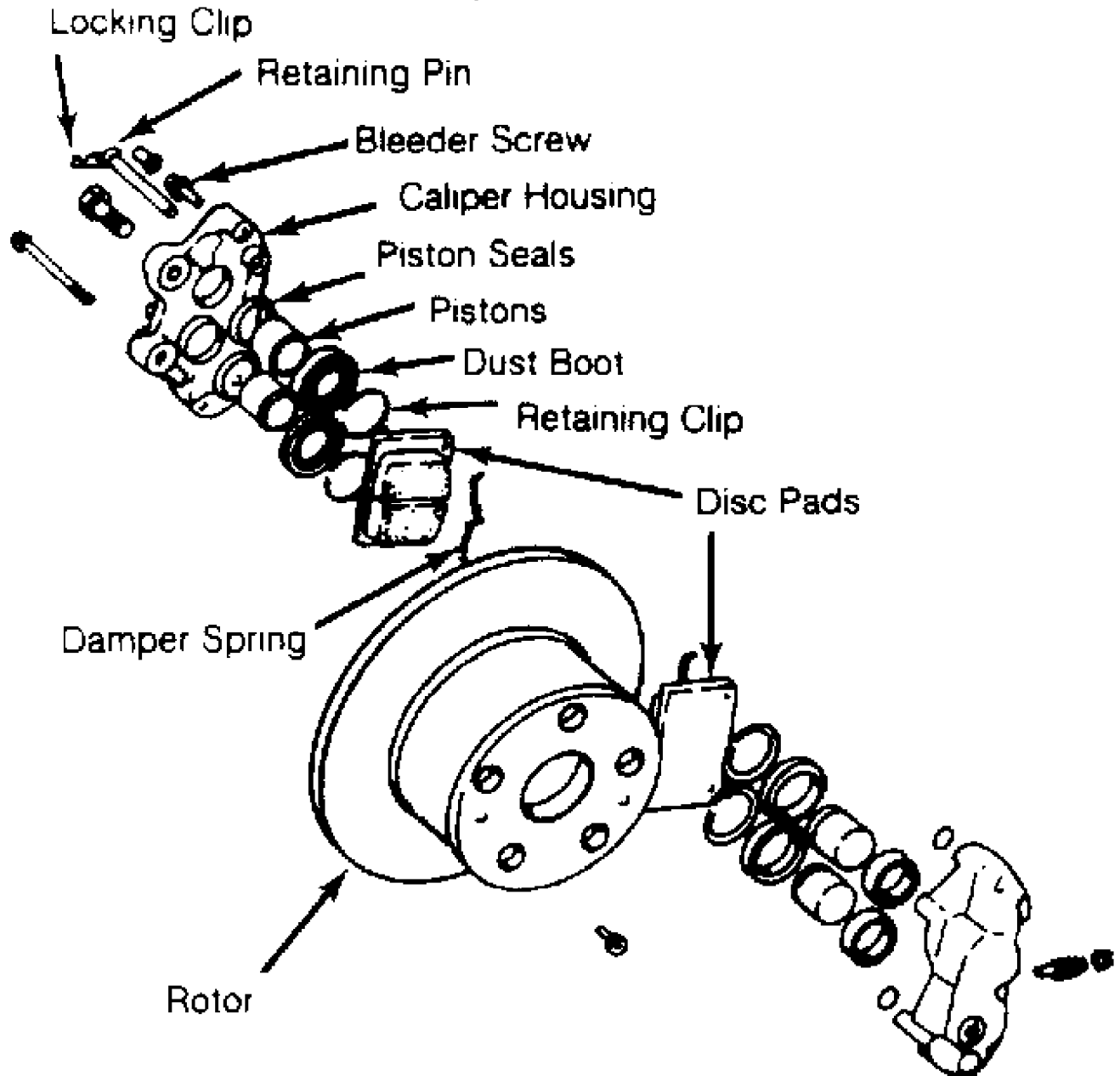


Fig. 2: Identifying Girling Front Caliper Components  
Courtesy of Volvo Cars of North America

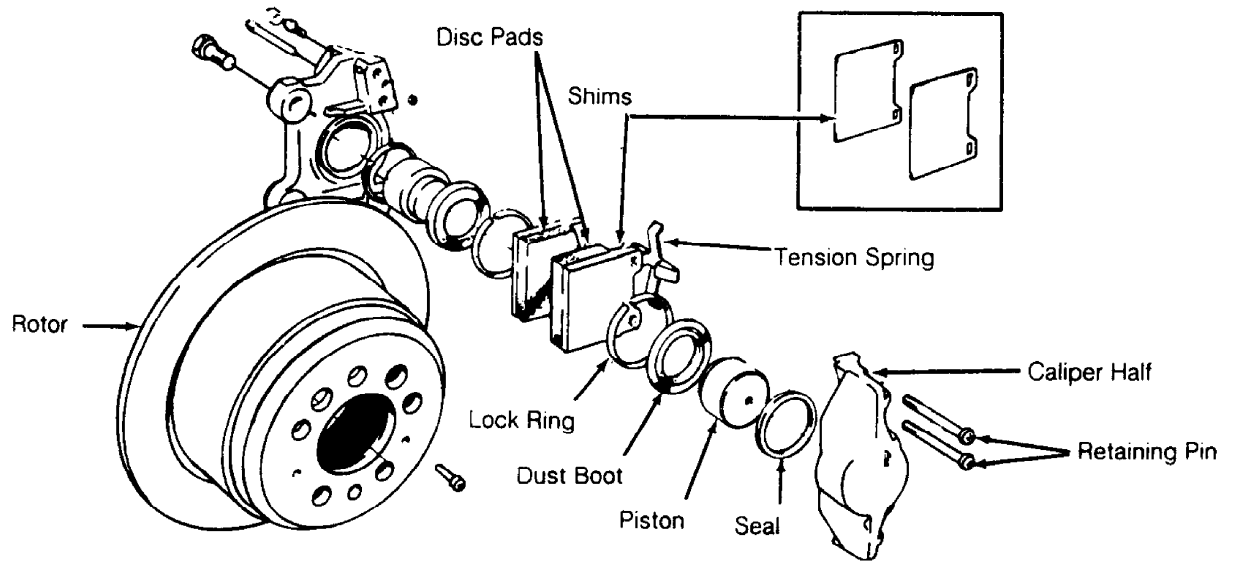


Fig. 3: Identifying ATE Rear Caliper Components  
 Courtesy of Volvo Cars of North America

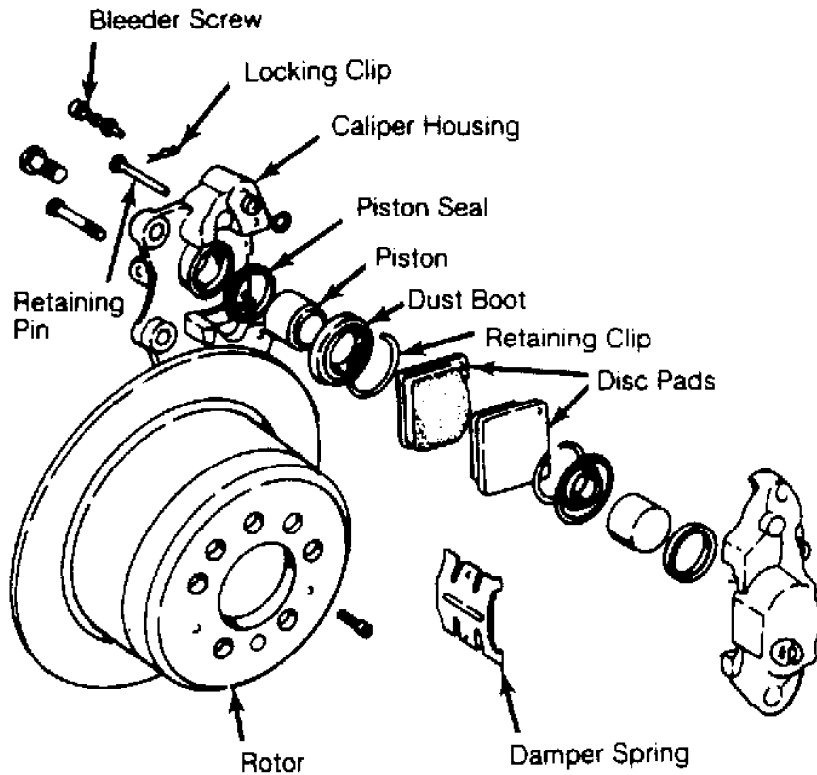


Fig. 4: Identifying Girling Rear Caliper Components  
 Courtesy of Volvo Cars of North America

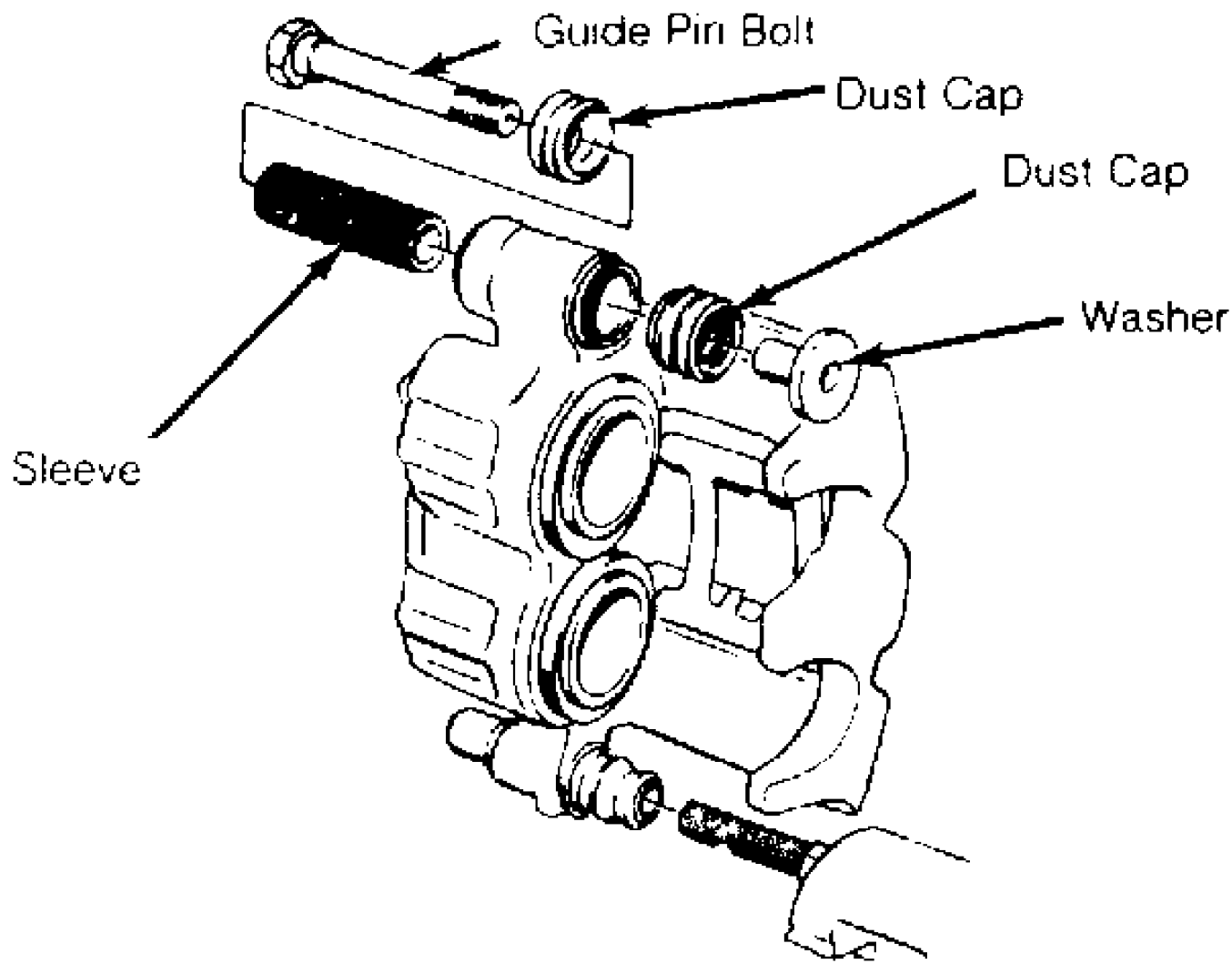


Fig. 5: Identifying Bendix (DBA) Front Caliper Components  
 Courtesy of Volvo Cars of North America

#### Reassembly

Coat all parts with clean brake fluid. Install new piston seals in cylinder bores. Carefully install pistons into cylinder bores. On ATE rear brake calipers, check piston position. See DISC PADS under REMOVAL & INSTALLATION. See Fig. 1. Install dust boots and retaining clips. Install bleeder screw and disc pads.

### MASTER CYLINDER

#### Disassembly

Remove master cylinder from vehicle. Clamp mounting flange in a vise. Remove reservoir from cylinder. Remove rubber sealing rings. Remove retainer ring from end of cylinder bore. Remove pistons from cylinder bore. See Fig. 6.

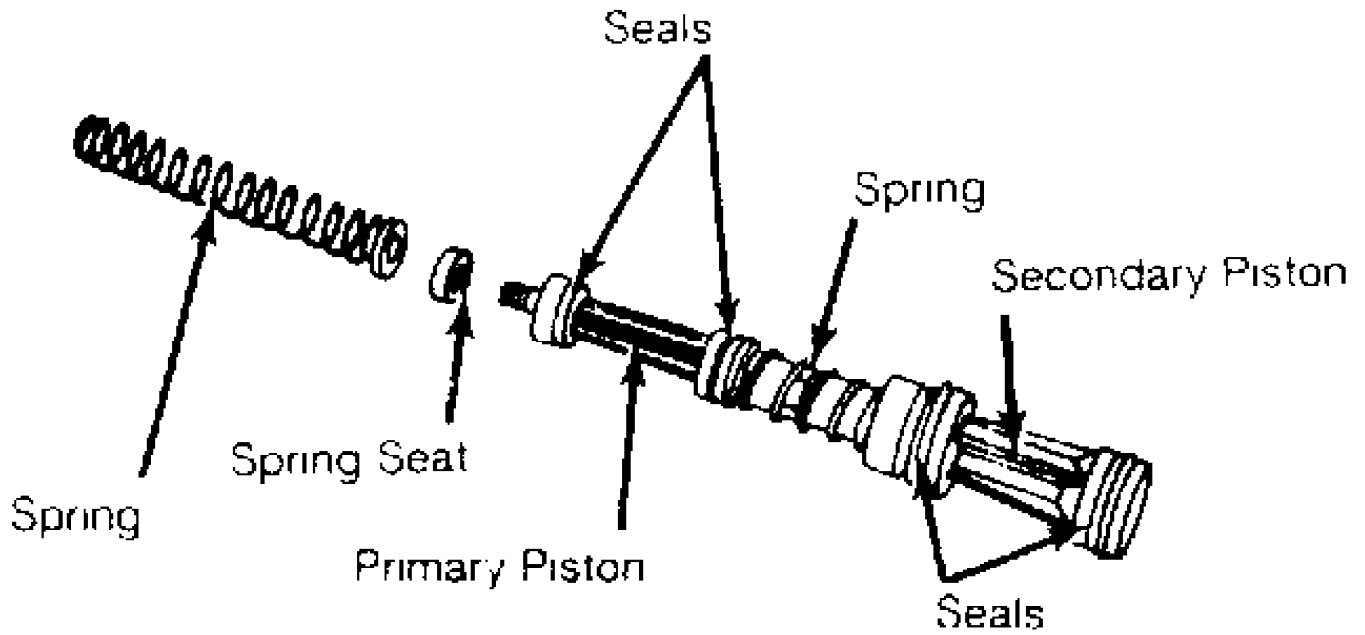


Fig. 6: Identifying Master Cylinder Piston Components  
 Courtesy of Volvo Cars of North America

**Cleaning & Inspection**

Wash all parts in clean brake fluid or alcohol. Blow dry with compressed air. Inspect cylinder bore for scratches, rust or corrosion. Replace if defective. Replace both pistons with connector sleeve as an assembly.

**Reassembly**

1) Lubricate all parts with clean brake fluid prior to reassembly. Position washer, seal, and back-up ring on secondary piston. Install spring thrust washer on piston. Install piston assembly into cylinder bore. Install washer, seal and back-up ring on primary piston.

2) Install spring with plate and sleeve on piston. Install piston assembly into cylinder bore. Push piston into cylinder bore. Install retaining ring. Install reservoir sealing rings, and install reservoir.

**TORQUE SPECIFICATIONS**

**TORQUE SPECIFICATIONS TABLE**

Application	Ft. Lbs. (N.m)
Caliper Guide Pin Bolts .....	25 (34)
Front Caliper Mounting Bolts .....	74 (100)
Master Cylinder Mounting Bolts .....	22 (30)
Rear Caliper Mounting Bolts .....	43 (58)
Wheel Lug Nuts .....	63 (86)
	INCH Lbs. (N.m)
Rotor Retaining Stud .....	72 (8)

**DISC BRAKE SPECIFICATIONS**



DISC BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
Disc Diameter	
Front	
Solid .....	11.02 (280)
Vented	
Type 1 .....	11.30 (287)
Type 2 .....	10.33 (262)
Rear .....	11.06 (281)
Lateral Runout (Maximum)	
Front .....	.002 (.06)
Rear .....	.003 (.08)
Original Thickness	
Front	
Solid .....	.55 (14.0)
Vented (ATE) .....	.87 (22.1)
Vented (Girling) .....	1.02 (26)
Rear .....	.38 (9.6)
Minimum Refinish Thickness .....	
Discard Thickness	
Front	
Solid .....	.433 (11.0)
Vented .....	.79 (20.0)
Rear .....	.33 (8.4)
Parking Brake Drum (Inside Rotor)	
Maximum Diameter .....	6.32 (160.45)
Maximum Runout .....	.006 (.15)
Master Cylinder Diameters	
Primary .....	.94 (23.8)
Secondary .....	.66 (16.8)
Rear Brake Caliper Pistons (ATE) .....	1.5 (38)

(1) - Always use minimum thickness specification stamped on rotors.