

MERITOR®

HYDRAULIC BRAKE COMPONENTS "DID YOU KNOW SERIES"



Volume I

The Brake Caliper: Keeping it Right

One of the most common replacement items in a disc brake system is the brake caliper. When performing this maintenance procedure, flushing the system and lines with new brake fluid should be done prior to replacement. This step is often overlooked and can be mistaken as a way to save both time and expense. In the long run, it could potentially be a costly mistake.

DID YOU KNOW

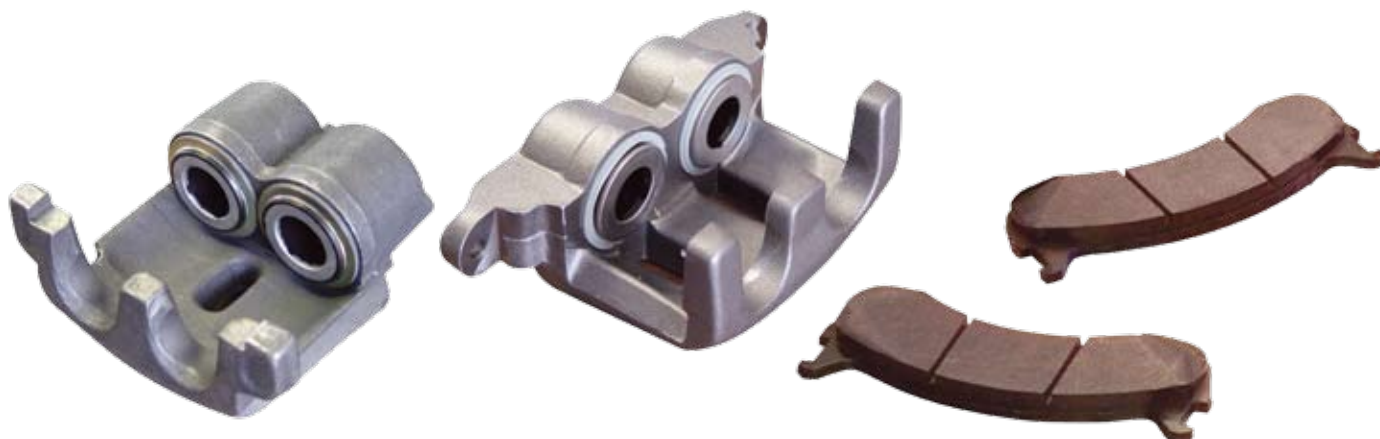
Hydraulic Disc Brake Systems

A hydraulic disc brake system consists of three major components: calipers, pads, and rotors. As the brake pedal is depressed, pistons in the caliper start a clamping force from hydraulic pressure created within the master cylinder squeezing the rotor between the disc pads creating friction to slow or stop the vehicle. As pressure is released from the brake pedal it is also released from the caliper pistons allowing them to retract, disengaging the pads from the rotor.

Disc Brake Caliper Designs

Medium-duty vehicles use 3 basic caliper designs: sliding, floating, and fixed (see figures).

- **Fixed Caliper** assemblies are bolted in a fixed position and do not move when the brakes are applied (example Meritor® Quadraulic™ Calipers). This caliper has opposing pistons applying pressure equally/ evenly to both sides of the rotor. This type of caliper can have two pistons (one on each side of the rotor), three pistons (two pistons on one side of the rotor and two on the other) or, four or six pistons (2 or 3 pistons on each side of the rotor). The combinations for this caliper type continue to expand as the need for braking dynamics are constantly changing.
- **Floating Caliper** assemblies mount with bolts or pins which the caliper in turn slides or floats on. Most of these calipers are of a one-piece design (examples being the Bosch pin slide and Kelsey Hayes or TRW pin slide calipers).
- **Sliding Caliper** assemblies are designed with opposing V-way grooves which fit into an anchor plate mounted to the vehicle's axle wheel end. Support keys and springs may be used in mounting these units. This style of caliper slides along the mated surface during brake applications. Most sliding calipers are a one-piece casting with either one or two pistons on the same side of the rotor (example: Bendix® rail slide or Dayton rail slide calipers).



Disc Brake Caliper Inspection Procedures

Before any service is performed, inspect the wheel and brake assembly for obvious damage that could affect braking.

Keep it Tight - Keep it Right

(Proper Torque)

Meritor® Quadraulic™ Calipers

- Brake pad retainer spring bolt
(M10 – 16 thread 28 - 32 lb-ft/12.2 - 16.3 N·m)
- Lining wear plate bolt
(M8 – 14 thread 9 - 12 lb-ft/12.2 - 16.3 N·m)
- Brake hold down bolt
(5/16" – 18 thread 9 - 12 lb-ft/12.2 - 16.3 N·m)
- Bleeder screws
(7/16" – 24 thread 17 - 22 lb-ft/23 - 30 N·m)
- Inlet port
 - (7/16" – 24 Thread banjo bolt:
30 - 40 lb-ft/40.8 - 54.4 N·m)
 - Inverted flair nut (17 - 22 lb-ft/23 - 30 N·m)
- Crossover tube nuts
(7/16" – 24 thread 10 -17 lb-ft/14 – 23 N·m)
- Mounting bolts
 - 4 Bolt mount
(M20 thread 320 - 360 lb-ft/435.2 - 489.6 N·m)
 - 6 Bolt mount
(M14 thread; refer to the vehicle manufacturer's torque specifications)

Bosch Pin Slide Calipers

- Caliper to anchor plate heavy hex head mounting bolt; for brakes manufactured prior to June 3, 2002
(70 - 80 lb-ft/95 - 108 N·m)
- Caliper to anchor plate flange head mounting bolt; for brakes manufactured after June 3, 2002
(93 - 107 lb-ft/126 - 145 N·m)
- Caliper bleeder screws (7.5 - 15 lb-ft/10 - 20 N·m)
- Anchor plate tie bar mounting bolt for 2 x 73 mm only
(40 - 50 lb-ft/54 - 68 N·m)
- Anchor plate bolt plug (2 x 66 mm only)
(16 - 27 lb-ft/22 - 37 N·m)
- ABS sensor bracket to anchor plate mounting bolts
(12 - 16 lb-ft/17 - 21 N·m)
- Splash shield to anchor plate mounting bolts
(12 - 16 lb-ft/17 - 21 N·m)

Meritor and Bendix® Rail Slide Calipers

- Caliper bleeder screws
(7.5 - 15 lb-ft/10 - 20 N·m)

Refer to the vehicles manufacturer's service manual for all proper torques and adjustments

DANGER

Identify the vehicle's hydraulic system and refer to the appropriate service manual for procedures before you perform any brake service. Some brake systems are fully-pressurized and you cannot reduce this pressure by turning the ignition off or removing the battery. To prevent death or serious personal injury, and damage to components, you must carefully follow procedures for the hydraulic brake system you are servicing.

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

WARNING

Do not remove the bridge bolts to perform service procedures. If the bolts have been removed, discard them and correctly install new bridge bolts to prevent loss of braking control during operation. Serious personal injury and damage to components can result.

CAUTION

Always install new brake fluid into the caliper. Discard old brake fluid, and do not reuse it. Damage to components can result.

CAUTION

The outside diameter of a caliper piston, which is manufactured to very close tolerances, is the caliper's primary sealing surface. Replace a piston if its outside diameter is damaged. Do not refinish a piston. Do not use abrasives, including an emery cloth, on the piston. Damage to components can result.

16 key inspection points

Safe maintenance practices include repair or replacement of any components within the system that are worn or damaged.

1. Brake Fluid

- DOT 3 & DOT 4 brake fluid is a hydroscopic material (absorbs moisture from the atmosphere readily). A contaminated brake can cause multiple problems. This brake fluid is either clear or amber in color. If discolored, dirty, or streaked, it needs to be replaced.

2. Tires – excessive wear and improper inflation

- Improperly worn or inflated tires can potentially cause stopping problems.
- Vibration – if left unchecked, can potentially cause steering component premature wear, caliper mounting wear, brake disc pad vibration wear, driver fatigue, along with potential premature failure of other safety-related items.
- Wheel end over-heating

3. Wheels – bent or warped rims

- Vibration – if left unchecked, can cause potential steering component premature wear, caliper mounting wear, brake disc pad vibration wear, driver fatigue, along with potential premature failure of other safety-related items.

4. Loose Wheel Bearings

- Can potentially cause premature wear to disc pads, wheel offs, caliper failure, rotor failure, or brake pull.

5. Suspension Components – improper lubrication, wear or broken components

- Can affect stopping distances, axle alignment and brake pull.
- Can damage caliper, brake lines.

6. Mounting Bolts

- Check for overall condition, corrosion, and torque.
- For best results, slide pins, bolts and bushing should be replaced when servicing disc pads.

7. Bridge Bolts

- **▲ WARNING:** Do not remove the bridge bolts to perform service procedures. If the bridge bolts are removed, they should be replaced with new bolts. They must be re-installed correctly (serious personal injury, brake loss or damage to components can result).

• Inspect for

- Damage caused from corrosion around and under head and washer area.

8. Brake Pad Retainer

- Clean and inspect for wear that leaves the pads loose or causes the pads to bind. If worn or damaged, replace.

9. Lining Wear Plate

- Clean and inspect for wear or damage that could prevent pads from movement. If worn or damaged, replace.

10. Crossover Tube

- Inspect for corrosion or road hazard damage.

11. Disc Pads

- Inspect for abnormal wear, premature wear or contamination from foreign substances.

12. Piston Boots

- Check for damage, flexibility and leaks.

13. Piston

- Check for damage from high heat temperatures and age which can be leading causes of delamination of phenolic composite-type pistons.

14. Rotor

- Inspect for blue discoloration and heat checks, parallelism wear, radial run-out, safe working thickness (check the manufacturer's recommendation for minimum thickness), cooling fin corrosion, pad damage from foreign substance contamination and hub bearing axial play.

15. Lines

- Flexible lines: check for cracking, wear spots, soft spots, bulging areas, fluid leakage and positioning of steel line fasteners.
- Non-flexible lines: check for kinks, rust deposits, positioning of steel line fasteners; leakage points should be repaired.

16. Bleeder Screw

- Check for leaks and overall condition of bleeder screw.