



Motorcycle Brake Maintenance

How to Clean, Care For and Install Brake Pads

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The following tools are required to service your calipers:

* High-Temperature Silicone Brake Grease * One ten millimeter twelve point socket * One 1/4" (inch) socket * One flat head screwdriver * One Phillips screwdriver * One spray can high quality brake cleaner * One torque wrench * One Pair Lyndall Z-Plus pads * One bottle of Harley-Davidson brake fluid * One container of High Temperature Brake Lubricant (made for brakes only), [Always follow the supplier's recommendations as to how to use their product.](#)



Step 1 L@@L @ The Caliper

There are two bolts holding each caliper on Harley-Davidson motorcycles. There are also two pins that hold the pads in place. If your motorcycle has two front calipers, please start by removing the caliper furthest away from the master cylinder, which on most Harley-Davidson motorcycles is the one on the left side of the motorcycle, or in other words on the side of the clutch lever.



The First Step:

is to loosen the two pins that hold the pads in place with the 1/4 inch twelve point socket. Once this has been accomplished, remove the two bolts that secure the caliper to the front forks with your ten millimeter twelve point socket.



Removing The Caliper

*Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components. *Remove banjo bolt and two steel/rubber washers to detach front brake line from caliper. Discard washers. *Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper removal.

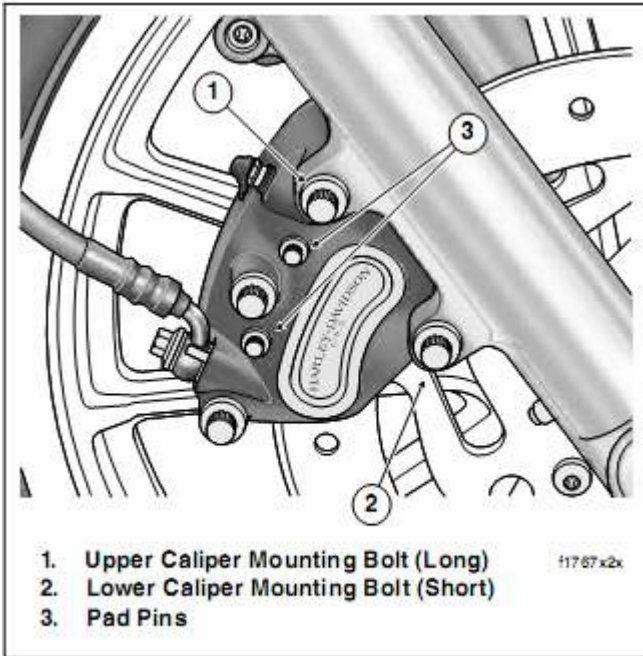


Figure 2-57. Loosen Pad Pins and Remove Caliper Mounting Bolts (Right Side View)

The caliper can then be gently removed from the rear of the forks of the motorcycle. Inspect the Disc Brakes Caliper points include the mounting bosses. Look for cracks, stripped threads and slide pins, and check for corrosion and galling. If one is present, inspect the dust boot on the caliper piston, and check for cracks and tears. Caliper problems often make themselves known through accelerated brake-pad deterioration. If there seems to be an **inordinate amount** of drag on the wheel, or if you begin to burn through pads more often than you should, chances are a caliper piston is sticking or a floating caliper is seized on one slide.



Caliper Removed, Turn the Caliper Over

Once the caliper has been removed, turn the caliper over so that you can see the condition of the pads. Leave the pads secured within the caliper.

Pull On The Front Brake Level.

Have someone else assist you to pull on the front brake level. Put a disk/shim in between the pistons/pads as you would have to force the pistons apart with a flat object. As they do, notice how the pistons in the calipers are moving as hydraulic fluid will move initially while the pistons that are furthest away from the source of hydraulic pressure will in all probability hardly move at all. Purpose; you have extended the pistons out further so you can clean the pistons without having to **disassemble** the calipers. Make sure you inspect the pistons and **remove** all caked on

brake dust and make sure the pistons are not pitted with previous corrosive sinister brake pad dust.

CAUTION

Do not use metal objects to remove parts from caliper piston bores or damage will occur. Damaged pistons or bores will leak when reassembled. Use a wooden toothpick to assist in the removal of parts, if necessary.

7. Using a wooden toothpick, remove wiper and square seal from each piston bore. Discard wipers and seals.

CLEANING AND INSPECTION

WARNING!

Use denatured alcohol to clean brake system components. **Do not** use mineral-based solvents (*such as gasoline or paint thinner*), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury.

1. Clean all parts with **denatured alcohol** or **DOT 4 Brake Fluid**. Wipe parts dry with a clean, lint free cloth. Blow out drilled passages and bores with a clean air supply. Do not use a wire or similar instrument to clean drilled passages

If your pistons are pitted than replace, if your bike has more than a few miles on it, this is a good opportunity to remove the pistons, re-seal and drain all brake fluid. Water can intrude but not mix with the brake fluid. It is important to R&R with the same brake fluid. Under no circumstances should Dot 4 & Dot 5 be mixed. When changing from either fluid, it is recommended to flush all parts out thoroughly before reassembly.

Note* The piston should retract smoothly. If it's stubborn and there's evidence of a caliper problem, such as dragging brakes or premature pad wear, a piston may be sticking in the bore. If that's the case, repairs should be made before the new pads are installed. Consult your favorite mechanic or the manual before proceeding. Don't forget that retracting the pistons will displace some brake fluid. If you've been topping off the reservoir along the way, it **may overflow**, so keep an eye on it in case some needs to be drained out.

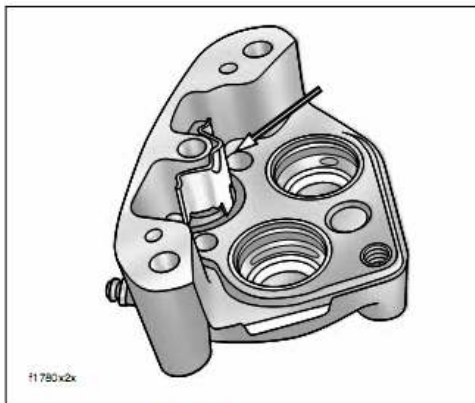


Figure 2-63. Install Anti-Rattle Spring

Brake Fluid is like Paint Stripper. If you spill any on your paintwork it will eventually strip the paint. Buy New Dot 4 Brake Fluid. It breaks down with time (absorbs water). DOT 3, DOT 4 and DOT 5.1 are all water based. DOT 5 is different, and not recommended. Mason #631 - 97ST in PA. Added Note* Racing Brake Fluid has a higher boiling point, it can heat more without "Brake Fade". **Do not be tempted, unless you KNOW what you are doing as it MAY have other considerations you are not aware of.**

Take the Time to Look At Your Pistons

As someone pulls on the lever, take the time to see the pistons move. All of the pistons in a Twin Cam Harley Davidson caliper are virtually the same size. The further the piston is away from the source of hydraulic pressure the more pressure it requires to move at the same rate as the pistons that are closer to the source. The only way that this can be accomplished where both pistons front and rear move at the same rate is with differential bore, meaning that the pistons furthest away from the source are smaller in diameter so that less hydraulic pressure is required to move as freely as the pistons that are nearest to the source of hydraulic pressure.



The other problem that **causes** pistons to drag and hang-up is that since there are no dust boots on the pistons, brake dust and general road dirt accumulates around the pistons. Once the brake cleaner spray has successfully removed all of the debris, take your flat headed screw driver and place the blade in between the old pads and force the pistons back into the caliper. Have your *assistant* pull on the brake lever once again and repeat the process as described above until all four pistons move relatively freely.



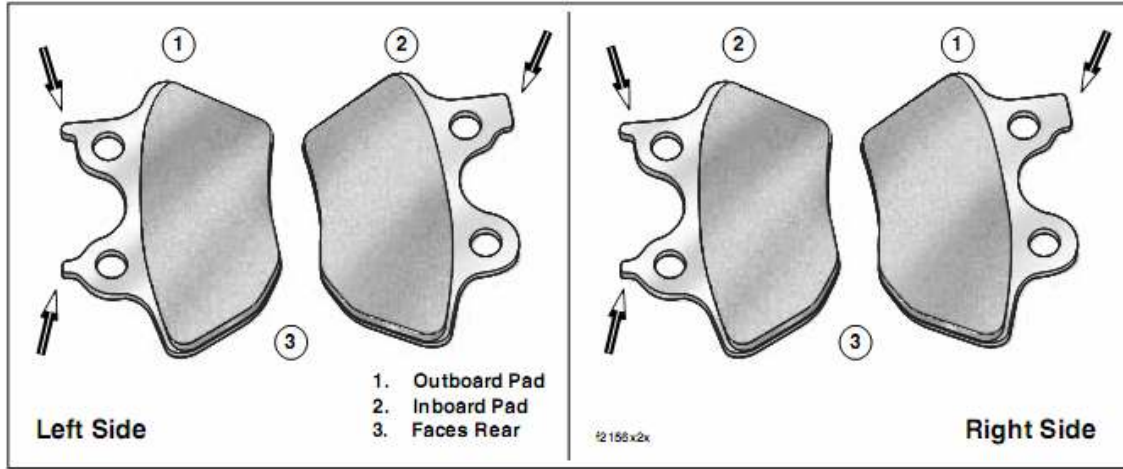
Remove The 2 Pins

Once you are satisfied in their performance, remove the two pins that secure the pads in place with the 1/4 inch twelve point socket.



Notice How The Pads Were Installed

Once the pins have been removed, gently remove the pads that were secured within the caliper. Take notice how the pads were installed since they may be different in configuration.



Installing the Two New Pads

Before reinstalling the calipers, clean and lubricate any slides or pivot points using a high-temperature silicone brake grease. Grease may find its way onto the rotor at some point, so give it a once-over with a clean rag and some brake cleaner. Install the two new pads. Once in place, re-insert the two pins and loosely tighten

Spread The Two Pads Apart

Gently spread the two pads apart with your fingers until there is sufficient space between the two pads to allow you to re-install the caliper on the rotor. Once the caliper has been successfully re-installed, place a few drops of Blue-Loctite (242) on each bolt (R&R each bolt to do this) and tighten each mounting bolt between 28-38 pounds of torque. Once all mounting bolts is tightened, install the two lock pins that hold the pads in place with a 1/4", twelve-point socket.



After You Have Successfully Accomplished All:

Top off the master cylinder if necessary by removing the master cylinder cover with a Phillips screwdriver and replacing it when finished.



Pump The Brake Lever:

until all of the air has been removed from the system. I have found that after pulling on the lever a number of times if you flick the lever a number of times you will notice that there will be little movement in the lever before full pressure can be applied to the pistons.

You may either print or view in PDF or on my Web Page the information below, your choice. If not, just print pages one through four (1 – 4).

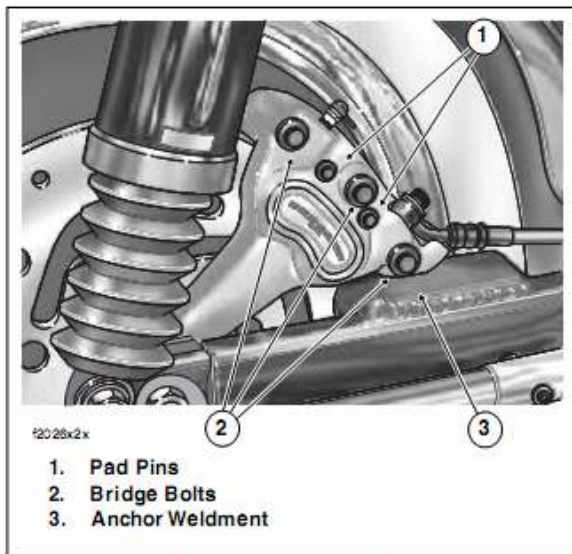


Figure 2-65. Loosen Both Pad Pins

Rear Brake Caliper

1. Remove banjo bolt and two steel/rubber washers to detach rear brake line from caliper. Discard washers.
2. Remove rear wheel. See Section 2.4 REAR WHEEL, REMOVAL, steps 2-7.
5. Remove caliper from anchor weldment on rear swing- arm.

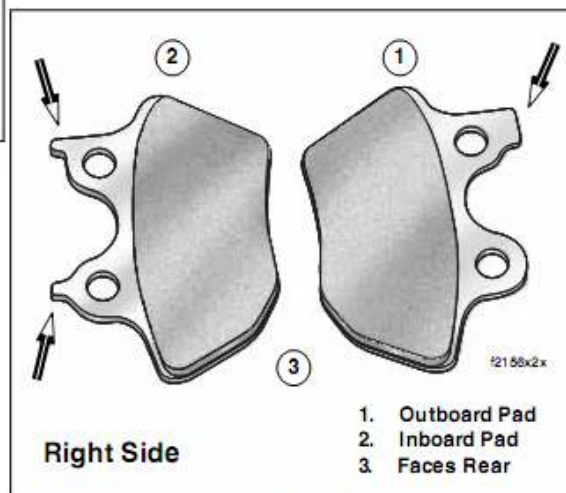


Figure 2-66. Rear Brake Pad Locations

Why Put All Of That Effort In Pulling My Calipers And Splitting Them To Clean Them?

See my web page for this in living color & not to waste your ink.

Link: <http://motorcyclemetal.com/subpage5.html>

* My local bike wrench said that this procedure is not necessary. He told me it was a waste of time and effort.

* I was told/read by an expert that just: spread the pads with a putty knife and insert the pads right through the top of the caliper.

* If you think your life is not worth the extra effort and some guy that will not be on your bike when the inevitable will happen, be your own counselor.

Disc brake systems for motorcycles have been standard equipment for over a decade. By design, all disc brakes are self adjusting and therefore, they require no periodic re-adjusting to compensate for brake shoe wear. However, certain malfunctions may cause a disc brake to drag. This drag will reduce mpg and result in premature brake pad and rotor wear. It is critical for both safety and maximum fuel economy that disc brakes operate properly!

What causes disc brakes to drag? Several malfunctions are possible. On the floating caliper, single piston design, the most likely culprits are a build-up of dirt, corrosion, or loss of the protective lubrication on the guide pins, sleeves or ways. These cause the caliper to not fully retract when the brake lever is released.

Cross sectional view of single-piston caliper. Note that the hydraulic pressure pushes the piston outward and pulls the cylinder inward.

The four piston, non-floating design is used on Current/late model HD's (see Fig Disk 2). Four piston types tend not to retract as a result of corrosion build up in the caliper hydraulic. Small incremental increases in corrosion inside the caliper bores prevent the pistons from fully retracting after each brake application. If one or more pistons fail to fully retract, the shoe will drag the rotor resulting in excessive drag and reduced mpg.

1. Caliper Assembly
2. Outboard Piston Housing (Caliper Half or Caliper Casting)
3. Inboard Piston Housing (Caliper Half or Caliper Casting)
4. Internal Fluid Passages
5. Piston Assembly
6. Piston Seal
7. Piston Boot (Dust Boot)
8. Brake Pad Assembly
9. Disc Brake Rotor

How are these problems corrected? If external corrosion, dirt, or lack of lubrication is the problem, disassemble in accordance with manufacturer's shop manual procedures or refer to the How-To section provided. Clean parts with appropriate solvents. Inspect for wear, metal fatigue, and failure. Lubricate using the recommended lubricant and reassemble. If brake drag results from a piston or pistons not fully retracting, then caliper disassembly, inspection, and rebuilding will be necessary. Observe manufacturer's cautions in the shop manual. Note: the recommended bleed down procedures for hydraulic systems in antilock braking systems.

SUMMARY:

Disc brake system failures are infrequent. Disc brakes can and do drag. Obvious indications of disc brake drag are:

1. Excessive wear of one brake pad (Note: it is normal for the inner pad of a single piston, floating type disc brake system to have a slightly higher wear rate than the outer pad.)
2. Dragging noise or hard to push if a disc brake drags.
3. Tapered pad wear. This failure, most common on four/six piston, fixed caliper type, is caused by one or more pistons failing to fully retract.

CAUTION: ALL BRAKE WORK HAS THE POTENTIAL FOR ASBESTOS HAZARDS. USE THE CORRECT EQUIPMENT AND PROCEDURES.

If you are interested in maintaining maximum braking performance as well as brake longevity it is recommended that you follow the above cleaning procedure every 2,500 miles. If you prefer having others service your motorcycle, please consider giving them a copy of this document and have them perform this process for you.

What Your Mother Did Not Tell You About Braking

There is a lot of mis-information about or general misconception concerning brakes. First of all, **I believe brakes are a good thing!** There is never enough stopping ability to halt you from hitting something. Either way you will stop.

The three limiting factors are; 1-Road and Surface Conditions due to weather or actual physical surface. 2- Actual Tire Traction which is effected by contact patch, tire temperature, compound and tread design. 3- Physical attributes of a combination of rotor, caliper, and brake pad design. A land based traveling objects can not stop any faster using tire friction than the moment just before a skid is induced. Lets take these factors and review them.

Road and Surface Conditions

Self explanatory. Loses gravel, sand snow, water or poor road surface

Actual Tire Traction

There is many factors that are included under this heading. Traction friction concerns the ability of a wheel or tire to start, stop, and not skid sideways.

Tires

a-Tire compound, for maximum traction, racers use rubber that is soft and almost sticky to the road. This is a form of molecular friction, and it is related to the surface area on the road. The warmer the tire gets, the better its traction. Of course there is a tradeoff. The softer the material the less the mileage. A rock hard tire generally last for more mileage at the expense of possibly comfort and traction.

b- load rating, Load Range is another way of indicating the ability of a tire to handle stress and weight. Remember, load range indicates horizontal and sidewall strength.

Consider the following questions:

- How far do I typically drive during the summer months? Driving a heavy vehicle, fully loaded, during the summer, at high rates of speed puts much more stress on a tire than light-duty low-speed driving.
- Do I typically drive with my vehicle fully loaded ie: Combined Driver Passenger weight and cargo carried. The higher center of gravity of a “Bagger” tends to put more stress on tires due to body roll and load transfer. This kind of stress is exerted in a horizontal direction.
- How fast do I drive? (Interstate, high crosswinds) As it turns out though, the higher the tire speed rating, the less likely you will have catastrophic sidewall or tread failure. It makes sense that higher speed-rated tires hold up better than lower speed-rated tires. This is not to say that you can overload a tire safely, or that you can safely have a blowout at 200 miles-per-hour - this just means that if a failure does occur at normal speeds, higher speed-rated tires generally handle the failure better.
- What kind of vehicle do I have? You should select the tire with the highest load rating and speed rating (and highest PSI) that you can afford that is in the size needed for your vehicle.
- Do I tow a trailer?
- If you choose a tire that is of a lower load rating that required, the tire heats up and wears out in less miles. A 21” front wheel/tire is fine with some bikes. A heavier bike such as a “Bagger” only weighs for the heaviest bike 865 aprox. The problem occurs when you sit on it, bring aboard a passenger, load up the tour pack and saddle bags, ride on a hot summer day and try to stop using the front brake. Guess where the weight transfer goes, ya the front wheel. The largest load rating for a Metzler ME880 BIAS-PLY IP Code: 1716100 120/70-21 TL 62H is 584 lbs as versed to a standard MT90B16 72H is 783lbs. Do the math and you can see what will happen.

Contact patch

The shape of a tire's contact patch or "footprint" greatly influences its performance and is dependent on its profile or "aspect ratio". A short and wide contact patch is effective in

converting the driver's input into very responsive handling, cornering stability and traction...especially on dry roads. A long and narrow contact patch which helps to provide predictable handling and a smooth ride.



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