

THE QUICK 'n DIRTY ON

BRAKES



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Most riders are at least familiar with brakes, because brakes require frequent adjustment for proper function and safety. There are some features common to all brakes, but there are also many unique styles.

BRAKE ANATOMY

All brakes have four things: 1) a **brake lever** to control the brakes, 2) a **cable and housing** (or hydraulic hose) to link the brake lever to the caliper, 3) a **caliper** which holds and moves the brake pads, and 4) a **braking surface**, either the rim or a disc rotor.

Brake Levers



Cables & Housing (and hose)



Brake Calipers



Braking Surface



THE FRAME & FORK DICTATE THE BRAKE STYLE

Can I put disc brakes on my ten speed? No way José! You need the right caliper mounts and cable routing.

Side-pull or center-pull



Cantilever or V-brake or U-brake



Disc brake





Brakes aren't working quite right? Start here to diagnose the problem.

TROUBLESHOOTING Expanded from the Bike Kitchen's guide to "Why your brakes suck"

1) Poor friction

Brake pads wear and weather while rims and rotors accumulate braking compound, dirt, and debris. File rubber brake pads to remove the weathered surface. Clean the rim with dish soap and a Scotch-Brite pad. Sand disc brake pads with high grit sand paper, then clean the pads and rotors with rubbing alcohol to remove oils.

2) Brake pads are poorly aligned

After dirty pads and rims, this is the most common cause of poor brake function. With rim brakes, make sure the pad is not too low (causing an L to wear into the pad) or too high (causing the pad to wear the tire). Make sure the pads aren't crooked, which may reduce the surface area of the pad in contact with the rim. **NOTE:** it is typical to "toe-in" the leading edge of brake pads to reduce braking noise (0.5mm at most). With disc brakes, the caliper itself is rotated in order to align the pads with the rotor; there are a variety of mechanisms for doing this that may vary between brands.

3) Brakes are too loose

If the pads contact the rims late in the lever pull, or not at all, then the brake cables need to be tightened. For small adjustments use the barrel adjusters first; turn to the left to tighten and turn to the right to loosen. For large adjustments, loosen the cable anchor bolt on the caliper, pull more cable through, and retighten the anchor bolt.

4) Pads don't release after braking

One cause may be pads with an L worn in them from improper vertical alignment that are catching on the rim. The other causes are worn/dirty/rusty cables and housing, which result in friction that the caliper return springs cannot overcome, or worn/gunky/rusty calipers. To diagnose, release the cable from the caliper. Test cable movement through the housing and caliper movement.

5) Pads are not horizontally symmetrical

One pad hits before the other, resulting in weak braking. For side-pull and center-pull, loosen the mounting nut, rotate the brakes to center, and retighten the mounting nut. For cantilever or V-brakes, adjust the spring tension screws (R to tighten, L to loosen). For mechanical disc brakes this is most common with the inner pad. Tighten the inner pad adjustment to move it towards the rotor.

6) Brakes feel squishy

The brake cable housing is worn and needs to be replaced. Brake cable housing is made up of steel coils. It is designed to resist compression, so power is transferred from the lever to the pads. Over time the coils wear and create a squishy feeling because they must be compressed before transferring power to the brake pads. This is especially apparent on longer cable housing runs.

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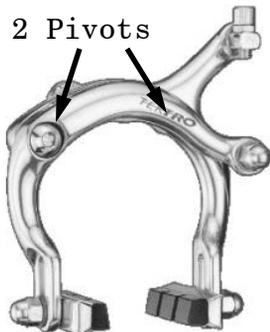


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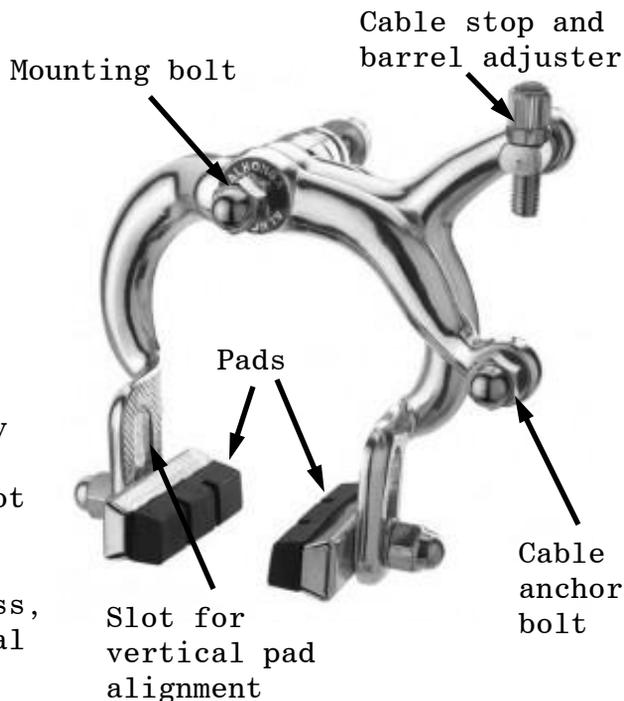
Side-pull and center-pull brakes are interchangeable on most bikes. They share the same mounting interface – a single hole drilled in the fork or seatstay bridge. They are most common on road bikes.

SIDE-PULL

Single-pivot side-pulls are the simplest brakes. They are most common on road bikes, but are also found on the cheapest department store mountain bikes. They have limited adjustability: centering via the mounting bolt assembly and vertical pad alignment.

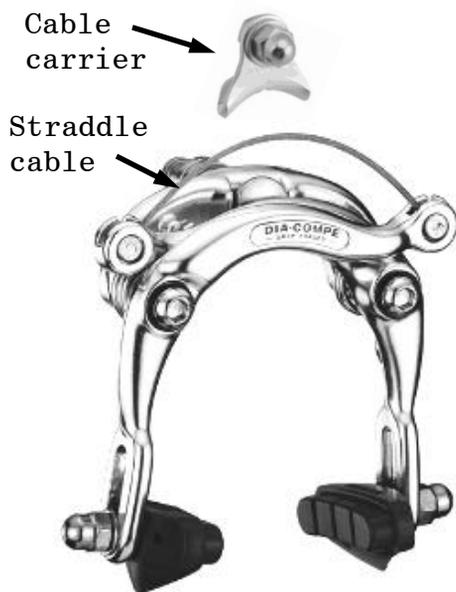


Dual-pivot side-pulls are slightly better due to an offset second pivot which allows for better centering, increased stiffness, and more mechanical advantage.

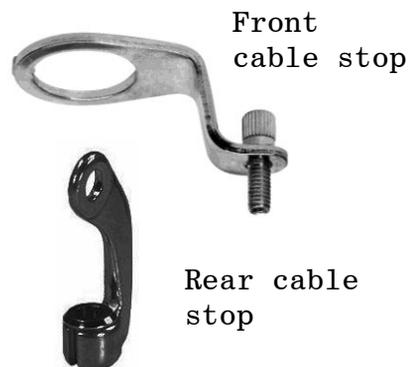


CENTER-PULL

Center-pull brakes are common on vintage road bikes. They are similar to side-pull brakes, but are pulled from the center via a **cable carrier** clamped to the brake cable. There are dual independent spring that control the return so they stay centered better than single-pivot side-pulls.



Center-pull brakes can be used on any frame that accepts side-pulls, but may require extra cable stops.



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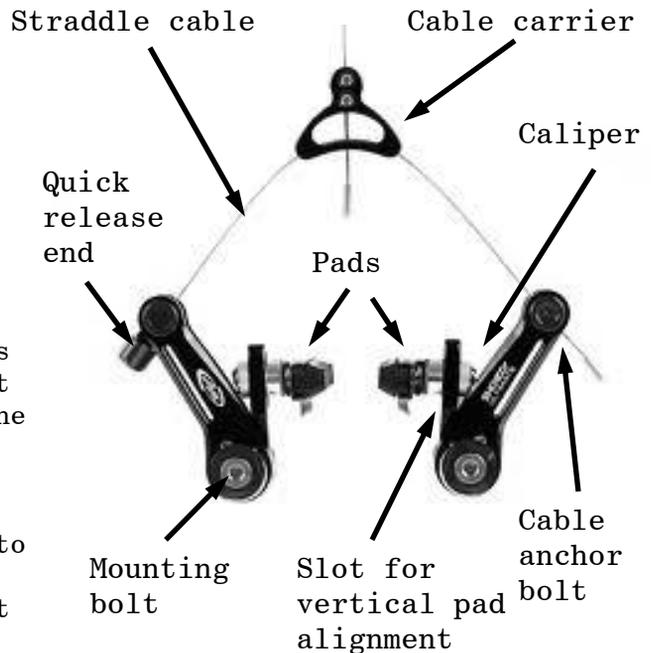
Cantilever and V-brakes both mount via canti bosses which are welded or brazed onto the blades of the fork and the seatstays.

CANTILEVER

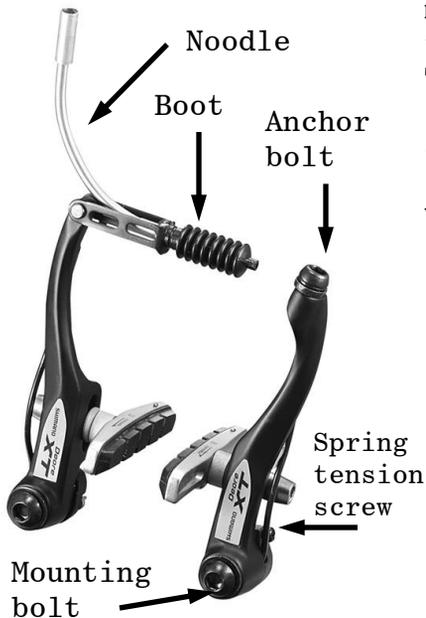
Cantilever brakes have been around for a long time, and consequently there are many variations on the general form. Most have an L-shaped caliper where the pad attaches somewhere near the apex of the bend while the straddle cable attaches at the end of the caliper.



Most cantilever brakes have pads and hardware as pictured on the left, but some use V-brake pads. The traditional pads are difficult to adjust as they require an allen wrench and a hex wrench to tighten. The design also allows for pad adjustment in all three dimensions.



V-BRAKE



V-brakes or linear-pull brakes are common on mountain and commuter bikes. They are the easiest-to-adjust and most effective style of rim brake. The tension on each spring can be adjusted independently to center the calipers. Pad adjustment is simple because the pad can be held in place by pressing the caliper with one hand while tightening the single nut with the other.

V-brake pads have 6 pieces of hardware. On each side of the caliper are one convex and one concave washer, which allow for angle adjustment. The two convex washers have different widths to allow for different pad spacing.



Always grease the canti bosses when installing brakes!

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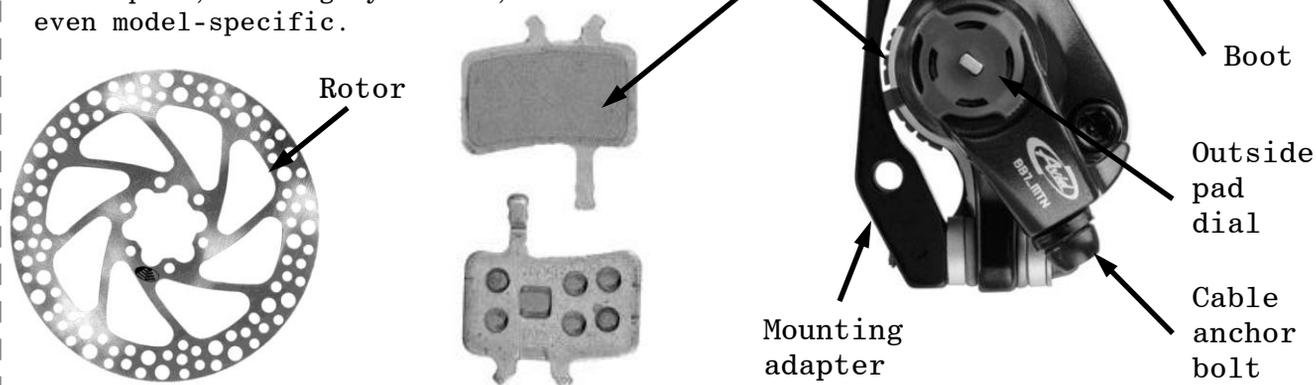


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Disc brakes are becoming increasingly common...so you better learn how to work on them. There are many brand-specific quirks, but the general form is pretty consistent.

DISC BRAKES

Disc brakes have been around for a long time on motorcycles and cars. To use disc brakes you need a frame and fork with disc mounts and disc-compatible hubs. The toughest part about working on disc brakes is that most replacement parts, especially brake pads, are highly brand-, and even model-specific.



DISC BRAKE BASICS



- 1) **NEVER EVER** pull a hydraulic lever when the rotor isn't in the caliper!
- 2) **Alignment** matters. One method is to loosen the positioning hardware, pull the lever, and then retighten the hardware.
- 3) **Pads and rotors** are highly sensitive to contamination by oil. Avoid touching the pads or rotors with your hands. The pads are very sensitive to dirt and debris (will wear fast). Keep the calipers clean! Rubbing alcohol is the best solvent.
- 4) **Rotor** mounting bolts can loosen over time – check them every few rides.
- 5) **Don't try the cheap stuff.** It's not worth it. Avid BB7s are cheapest you should buy.

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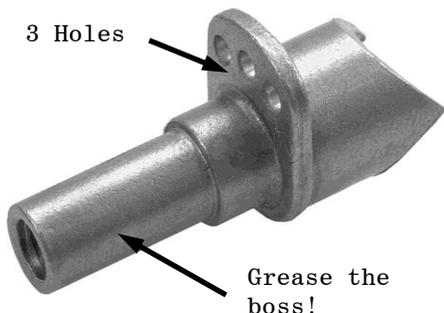
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We glossed over a lot of the details, since there are so many of them. Here are a few of the random helpful hints not covered with the specific brake styles.

RANDOM NOTES ON BRAKES

Not all brake levers are compatible with all styles of brakes. The most common mistake is to mismatch long and short-pull levers. Long pull should be used with V-brakes. Short pull should be used with everything else.

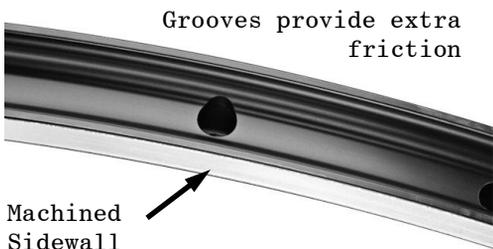


Cantilever bosses usually have three holes for setting the spring tension of the caliper. The highest hole will create the highest spring tension. As the caliper tension springs wear out, bump the springs up a notch to add more power to the return. Bumping the springs up can also be used to counteract friction in the cable and housing assembly.

Not all brake pads are created equal. When troubled with squeaks or poor braking performance the go-to brake pads are Kool Stop Salmon Red pads. They have excellent stiffness (to avoid feeling squishy) combined with excellent friction.



File pads and pick out aluminum shavings to bring pads back to life



Not all rims are created equal. Steel rims suck for braking. Aluminum rims without a machined braking surface aren't much better. Aluminum rims with a machined braking surface is necessary for any high performance braking situations, i.e. mountain biking, loaded touring, or urban riding.

Brake cable housing is made of steel coils. Shifter cable housing is made up of linear strands. Shifter housing is too narrow for most brake cables, resulting in too much friction. Brake cable housing isn't stiff enough for shifting. Don't mix the two!

Brake Ferrules

Shift Ferrule

Liners

Coils vs. Linear Strands

End Crimps

