DIY brake upgrade

by adam wolf

Before you do anything, clean any dirt off the outside of your brake fluid master cylinder reservoir so it's as transparent as possible. If yours is so old that it's become opaque enough that you can't see the level inside, then get a new one. Next, use a turkey baster, syringe, or similar suction device to empty all fluid from the reservoir. You can see my own state-of-the-art brake fluid sucker in action here. It might look humble, but my little ear wax sprayer is the best tool I've ever used for this job. I have no problems wiggling its tip into the little crevasses within the reservoir. Once it's sucked dry, wipe out the inside with a paper towel and remove any sediment at the bottom.

Choose a level surface to work on the car. Put chocks on both

sides of at least one tire to keep the car from rolling. Put the shifter into neutral and release the parking brake. Slightly loosen all the lug nuts on your wheels. Jack up the car one side at a time, placing two jack stands under each door between the notches per factory specs. Before proceeding, give the car a good shake to make sure it's stable. Remove all four wheels.

Let's do the rear brakes first. The head of the lower caliper bolt is behind a small plastic cap with a tab on it. This pulls out easily with a pair of pliers. Once the bolt is uncovered, remove it using a 10 mm socket. A low-profile ratchet works well for this one.

With the lower bolt removed, you can now pivot the caliper upward, then slide the assembly off the upper slider pin. I like to rest the caliper on the lower control arm to minimize tension on the brake line.

With the caliper out of the way, you can remove the brake pads. This shot shows how the M-shaped tensioner springs fit in place. They can be tricky to get back in, so you'll want to refer to this later when replacing the pads. Also notice the anti-rattle clips on the edges of the caliper. These and the M-springs only come with Mazda factory pads, so don't lose them, you'll need to swap them over to your new pads.

If you're going beyond replacing your pads, you'll need to remove your caliper brackets. They're held in place with two 14 mm head bolts on the back side.

Now comes the fun part of our project: separating the rotors from the hubs. Fronts usually present little drama, but the rears often rust into place and can be a major PITA to remove. Some rotors have a threaded hole in the hat that you can screw a bolt into to pop the rotor off. If that doesn't work, try a few firm taps to the back of the rotor with a rubber mallet (not a metal hammer, if you plan on re-using the rotor!). If you're striking out, I feel your pain.

PB Blaster is your friend. Spray liberally through the stud holes on the front of the rotor. Find an access point around the splash shield behind the rotor and while rotating the rotor, spray the corner of the backside of the rotor hat where it meets the hub. Strap on your safety goggles while doing this. PB Blaster in your eyes sucks. Don't ask how I know that…

After a few minutes of letting the PB penetrate, get to wailing with your rubber mallet. Repeat as needed.

If you're installing a spiffy brake kit like the one in this article, you'll be eager to swap out your stock brake lines for the steel ones. Now is as good a time as any.

Adjacent to your right rear upper control arm, you'll find the brake line distribution block. It splits the fluid coming from the master cylinder between the left and right rear

calipers. The factory block has the right rear rubber brake line permanently crimped onto it, so there's no means to attach the new braided line. Hence, it needs to go away.

Brake line fittings need to be super-tight (for hopefully obvious reasons). Regular open-ended wrenches may strip the hex in the fittings when loosening or not provide enough grip to tighten them sufficiently, so…

ALWAYS USE A PROPER 10 MM FLARE NUT WRENCH TO LOOSEN AND TIGHTEN HARD LINE FITTINGS!

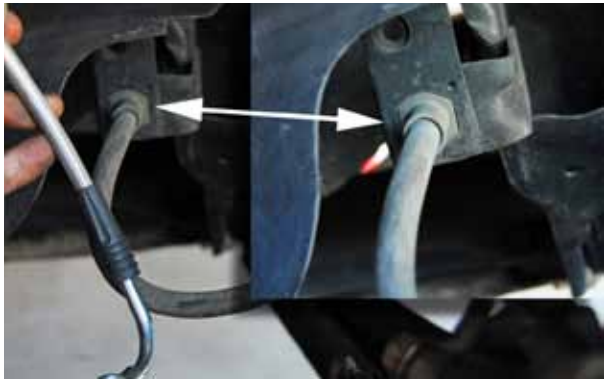
To optimize leverage on the fittings, leave the block attached to the chassis before removing the two 10 mm nuts.

Before mounting the new braided line in place of the rubber line, we have to install the new distribution block.

Before mounting it in place, attach the two hard lines. It's much easier to get the fitting threads engaged if the block is free to wiggle around a bit. Once you get the lines located you can tighten the two 10 mm nuts holding the block to the chassis. Then tighten up those fittings with your flare nut wrench.

The banjo bolt torque spec is

16-22 F/P for all calipers. Make sure you use the kit's new banjo bolts and crush washers.



The left side is somewhat different than the right. The flexible hose connects to the end of the hard line crossing under the chassis from the distribution block. Where they meet, they pass through a hole on a tab coming off of the chassis.

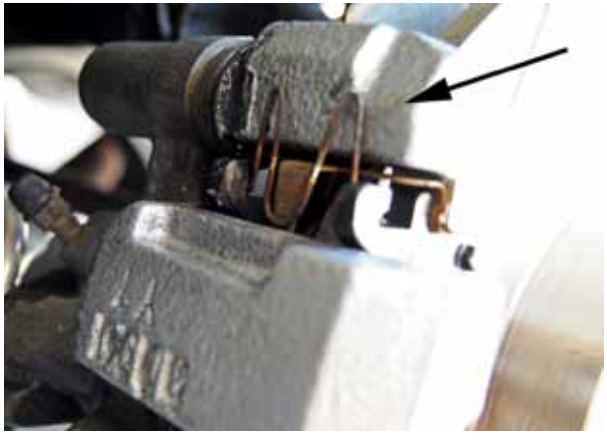
Use your brake line wrench to loosen the hard line from the end of the rubber hose. A U-shaped flat metal spring clip holds the hoses in place on the tab. The spring clip has a groove on its end. Slip it out using the end of a flat-blade screwdriver or a needle-nosed pliers. Replace the rubber line with the steel line.

Now is the time to mount your new rotors. Before you do so, don't forget to give them a good cleaning with a spray brake cleaner (Brakleen or something similar). Rotors are usually packed with some grease to keep them from rusting. You want to clean that grease off.

Next, reinstall the caliper brackets. Torque to 36-49 ft/lbs.

Time to give those tired old slider pins some love. A good coating of brake caliper grease will help the calipers to not seize up between now and your next brake job. Make sure to use grease that's meant for this purpose and not just any old black grease.

Lube up the top pin and then slide the caliper over top. Then install your brake pads and anti-rattle clips. Close your caliper over the brake pads partially. You won't be able to close the caliper completely without retracting the piston a bit.



With the back brakes, you don't have to install the M-clips until after you have the caliper in place over the pads. Here, you can see the correct alignment of the clip.

At this point you might be screaming "I can't get the caliper to fit over my new pads!!!" Well yeah. The new pads are thicker than your old ones, so you'll have to suck the piston back into the caliper body a bit. You need a 4mm hex key to do this.

There's a small bolt on the back of your caliper that's actually just a cover for the piston adjuster (12mm head, I believe). Remove it and you're on your way to getting your caliper to fit over the new pads. The piston adjuster works just like a screw. Lefty-loosey. Back it out a lot, then slide the caliper over the pads, and finish up by greasing up and installing the lower slider pin. Torque it 25-29 ft/lbs. And then reinstall the small plastic cover for your lower slider pin.

To set your handbrake tension, turn the piston adjuster all the way tight. Then back off 1/3 of a turn. Once you do this adjustment, make sure you can still turn the rotor by hand and there's not excessive drag coming from the brakes.

You're now done! With one corner anyway. Repeat all of these steps on the other rear corner.

The front brake procedure is exactly the same. Remove pad and rotor.

Install new lines. Install pad and rotor.

The lower front slider pin (17mm head, I believe) has the highest torque of any bolt you'll be touching in this whole job. You'll probably need a breaker bar to get it free.

Just like the rears, you'll rotate the caliper up and then slide it off the top slider pin. Set the caliper carefully on the lower A-arm.

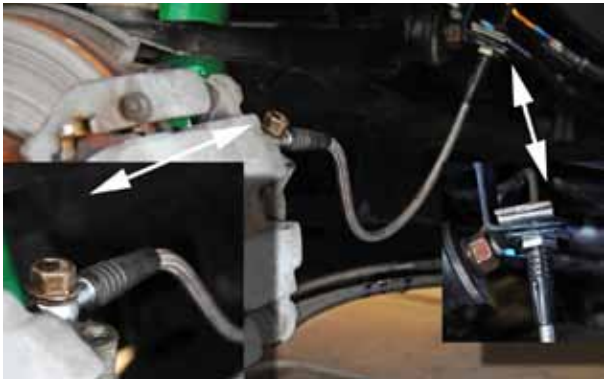
This is a reference photo to show you all of the extra bits associated with the front pads. There are four anti-rattle clips, two U shaped spring pins, and one squealer that clips on the back pad (not pictured). Each front brake pad also has a shim that fits between the pad and the caliper. Performance pads

tend to destroy these shims in short order, but if you still have a good set like I have in the above photo, you might as well reuse them.

You can now remove the brake pads and all these extra bits and lay them neatly in a pile.

Remove the caliper mount bracket. There are two bolts on the back, just like the rear calipers have.

And, just like the rear, you'll get to use your mallet to break the rotor free. I've never personally had much trouble with the front rotors, but I do live in a fairly dry environment. Folks in the Rust Belt might need to get out the PB Blaster again.



Changing out the lines on the front half of the car is much more

straight forward than the back half. Both lines are the same. Both are secured with non-hidden clips. Neither have any parts like that rear distribution block that can leak. But just like the rears, the front banjo bolts are torqued to 16-22 ft/lbs each.

Don't forget to clean your shiny new rotors with Brakleen. Even if they don't seem slimy or oily, there's a good chance there's a coating on there that you'd like to clean off before you add pads to the mix.

Mount the rotors and then install the caliper brackets. Torque the two bolts to 36-51 ft/lbs.

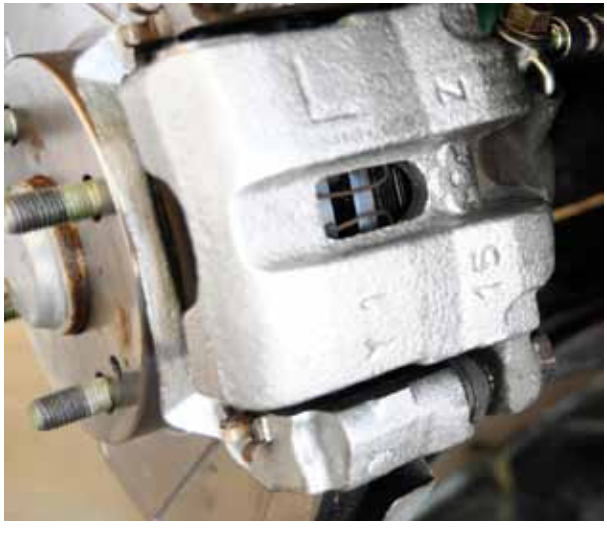
Transfer all the extra stuff from your old pads to your new pads. "Stuff" means the shims and the squealers. The squealers go best on the back pad.

Install the anti-rattle clips on each side of the rotor and then slide the pads in place. This can be a bit

tricky since they like to fall out, but persistence pays. You will indeed have to force the piston back into the caliper a bit to allow space for the new pads, but we'll worry about that in a moment.

Grease up the top caliper pin. Again, use grease that's meant to deal with brake heat. Then slide the caliper and pin onto the mounting bracket. Rotate the caliper down and partially over the pads. This will allow you to fit the U-shaped spring clips onto the pads without shooting the pads across your shop floor.

Next, you'll need to grab a large C-clamp. I find this to be the perfect tool to force the piston back into the caliper. Place it over the caliper and start twisting. Have the clamp pad go all the way into the piston and rest on the back wall. Then force the piston back into the caliper. Once you have enough clearance to close the caliper over the new brake pads (2-3 revolutions of the c-clamp), you can stop twisting and remove the C-clamp.



Grease up the bottom slider pin and install it in the caliper. Torque to 58-65 ft/lbs. And then look at the

back of your caliper. Does it look like this? If not, you possibly forgot your U-shaped spring clips.

All done! All done except for the bleeding that is. The brakes, not you. Hopefully you got through the job without bleeding at all.

Before you bleed your brakes, you'll want to check your fluid reservoir again. There's a chance you shoved some fluid back through the system when you forced pistons back into the caliper. If that's the case, suck the old stuff out before adding new.

For brake fluid, I like any old DOT 4 stuff. NAPA, Castrol, etc. Whatever the local parts store carries. I used to be a brake fluid snob and settle only for the best 600* dry boiling point stuff. But then I realized what a waste it was to hunt that stuff down when I was re-bleeding my system every 3 months. (Autocrossers tend to bleed their brakes pretty often).

But if YOU don't bleed your brakes very often, the good stuff might be worth it to you. Just keep in mind that all fluid absorbs moisture at the same rate. For optimal performance, even the best fluid needs to be flushed at least yearly.

Yes. I'm really sharing a photo of a modified Coke bottle with the whole world. THIS humble little device is what I use to bleed my brakes. It is about 10 years old. And it works better than anything else I've ever tried.

My DIY brake bleeder consists of a clear hose of just the right diameter, part of a wire hanger, and a drink bottle. No fancy seals. No power vacuum assist. Nothing. I just hang it on a nearby suspension component and go. A buddy (usually my wife) pumps the brakes while I open and close the valve. As I said before, this is a very humble little device, but it works amazingly well.

The bleeder valves have an 8mm head. Put an 8mm wrench over your bleeder valve and then hold the hose over that. You'll be able to see the bubbles shoot through the clear hose. You'll also be able to see the fluid change from yucky brown to clear yellow. And, if you've never bled brakes before, here's the secret.

1: Open the valve. 2: Have your assistant press the pedal down. 3: Close the valve. 4: Have your assistant raise the pedal. Many conversations in my shop consist of nothing more than the words "Open! Down! Closed! Up!" in that order, over and over.

Continually check on the fluid in the reservoir. Don't let the reservoir go dry. Add fluid often. And when you're done with one corner, add fluid to the reservoir again.

You should bleed brakes from the farthest corner to the closest corner. The farthest one from the master cylinder on a Miata is the driver's side rear. The next farthest is the passenger side rear. Then the passenger's side front. And finally, the driver's side front.

Protective glasses can really help. Over the years, I've sprayed brake fluid on myself enough by accident to come to expect it. So I reach for the eye protection pretty often.

And that's it! Nothing left to do but go out on a test drive. If you'd like to ask me any questions about this, hit my website at http://revlimiter.net and you'll find my email. Or go to http://ClubRoadster.net and send me a PM (private message).

'Til next time, keep those tops down and those revs high.