“Mandeville” Big Brakes
Rev A

Install information: DIY brake upgrades for a second gen Mazda RX7

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“Mandeville” big brakes:

The kit works with the 5 lug 4-piston front calipers found on several models of 1986-1991 RX7. If your car came equipped with 4-lug wheels and/or single piston brakes you must upgrade to a 5 lug setup prior to installation.

Notes on Overall Fitment

The goal: Increase of rotor mass to allow significantly more heat capacity. This is accomplished by the relocating and widening the stock calipers via the use of spacers and longer bridge bolts. The kit interfaces to rotors from the Brembo equipped Nissan 350z / Infiniti G35.

17” wheels are required to clear the new setup. However, not all 17” wheels have sufficient spoke clearance. The net caliper movement is very close to 1.0” radially and 1.0” toward the wheels spokes. You must confirm you have this clearance with your existing brake setup (pre-installation / modifications). If not you’ll be forced to run spacers or a different set of wheels.

The factory FC spare tire can no longer be used on the front wheels. If the spare still fits in the rear you may be able to juggle tires to use the factory spare. Otherwise a spare tire from an RX8, Mitsubishi Evo Lancer, or Brembo equipped 350z/G35 can be procured.

Due to stock caliper piston sizing there’s no need to run an upsized master cylinder. If a larger MC is desired a MC and booster from a Mazda 929 works well.

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Note on Front/Rear Bias:

Although adding Mandeville big brakes will greatly increase heat capacity, increasing the leverage at the front rotors will shift the brake bias forward. Minimizing braking distances is often about getting the rear brakes to do as large of a share of the work as possible. As such, it is recommended that A) an adjustable proportioning valve be installed and/or B) large brakes be run in the rear to match. Corksport (a Mazda specialty vendor) sells a 1999 "RZ" rear rotor kit will bring bias back very close to factory specs. Bias can also be adjusted through the use of varying brake pad compounds front/rear.

Kit Contents:

2—Caliper relocation brackets
4—Caliper spacers (2 each, left and right)
4—O-rings (for spacer to caliper sealing)
8—Upsized bridge bolts
2—Wheel spacers (account for decreased rotor thickness)
4—M12-1.25 x 35mm bolts (caliper to bracket mounting)
4—M12-1.25 x 30mm bolts (knuckle to bracket mounting)
8—"Nordlock" washers

Reminder: you need to source and modify your own rotors (much more on this shortly).

Specialty Tools Required:

Dremel tool with 1/4” sanding drums and 1/8” diameter steel cutting heads
Angle grinder with cutting and grinding discs
Machinist drill bits (fraction, letter, and numbered sizes)
400 grit sandpaper
Feeler gauges
Anti seize
Brake bleeding equipment
Machinist square
Basic sockets / end wrenches etc.

Optional:

Bench top style belt sander (very handy for one particular step)

Rotor Selection

You need to locate and purchase front rotors for the 2002-2005 Nissan 350z Track Edition. These are also often referred to as the the 350z/ Infiniti G35 rotors from “Brembo equipped” cars.

A wide variety of options are available (slotted, zinc coated, etc). There are also several versions of 2-piece “Direct Replacement Rotors” available for the 350Z. Stoptech, Ferodo, and Girodisc all make options. The up front cost of a two piece rotor will be higher but advantages include longer life and significantly better cooling in addition to the reduction in unsprung weight. 2-piece rotors also have the advantage that no machining will be required on future rotor replacements. The cost of replacing friction rings is similar to the cost of new 1 piece rotors.

Modifying Rotors for Hubcentricity

The stock Nissan rotor uses a smaller bore diameter than the Mazda pieces. As such you need to open up the rotors to maintain hubcentricity and match the Mazda hubs.

Mazda rotor register ID 77.01 mm (3.032”)
Mazda hub register OD 76.98 mm (3.031”)
Nissan rotor register ID 67.99 mm (2.677”)

Note: the normally quoted “hubcentric” measurement for the FC is 59.6mm. This applies to wheels only, the rotors use the above dimensions to center themselves.

The Nissan rotor bores must be opened up to 3.032”. This requires ~1/2 hour of your local machinist’s time so it should be able to be completed relatively inexpensively.

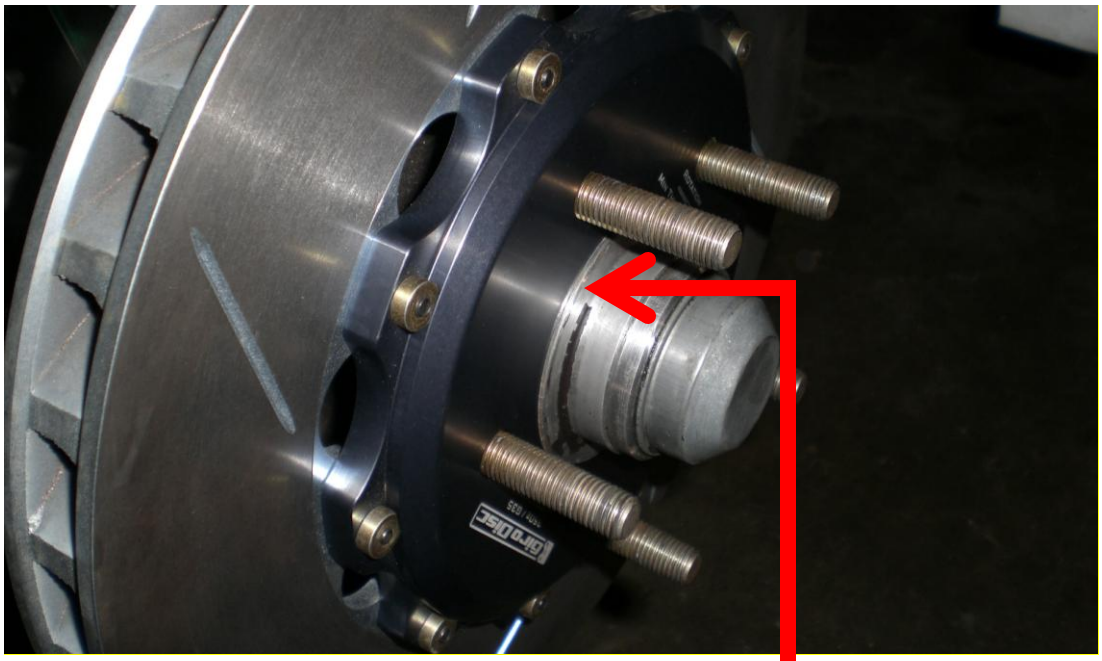
The end result is that the rotors should just clear. You don't want a press fit (AKA interference fit) but you don't want extra slop either. Have your machinist chamfer the rotor ID on the edge facing the hub so it won't bite into the radius on the hub side. The machinist's job will be easier if you take a hub (or even an entire knuckle) with you.

To date I'm not aware of any users who have experienced or an eccentric balance problem with this minor machining. However, if you experience vibration you'll need to have the rotor balanced (many hot rod shops have the correct equipment to do this if required).

Wheel Spacer

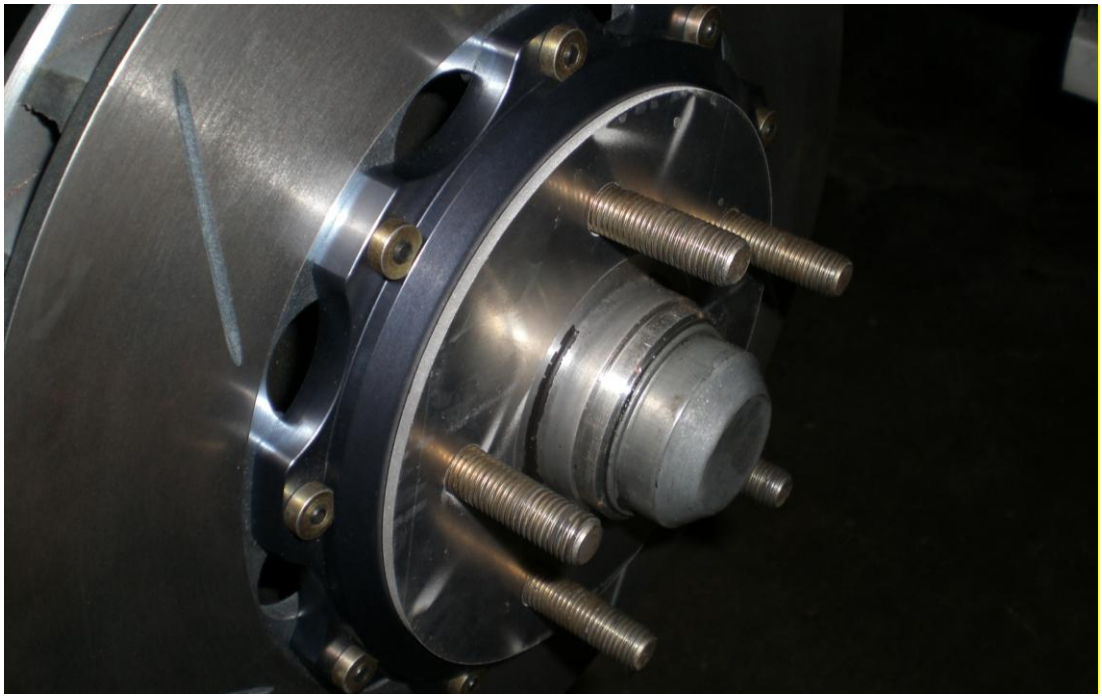
Wheel spacers are provided because the Nissan rotor is thinner at the mounting surface than is the hub register.

Nissan rotor thickness at lugs: 7.45 mm
Mazda hub register width: 9.5 mm



Note the register of the hub extending through the rotor hat.

The provided wheel spacers must be installed between the rotor and wheel to ensure proper clamping of the rotor (failure to install wheel spacers results in the wheel clamping to the hub and the rotor being unsupported.)



Rotor with spacer creates a proper clamping surface

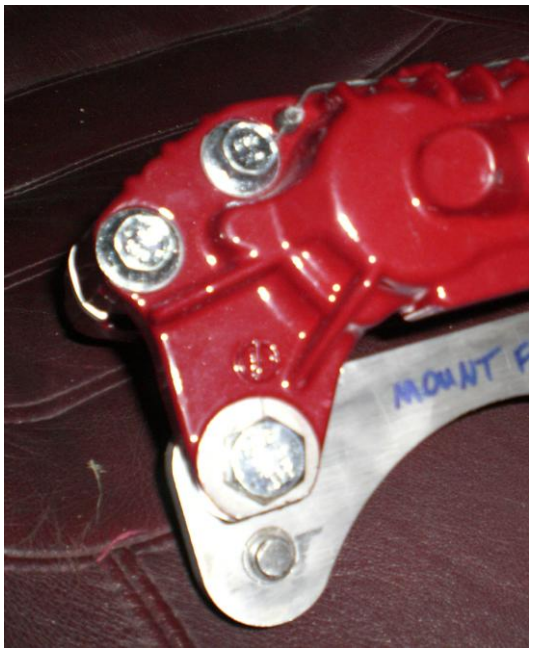
Caliper Modifications

Overview:

1) Modify caliper mount points (knuckle will be addressed separately).
2) Unbolt caliper halves and insert spacers such that you have a void on each side of the spacer—one in the caliper body, one in the spacer itself. No o-rings as of yet.
3) Reinstall used OEM bridge bolts and snug tighten only
4) Grind opening to match spacer. **WARNING:** this can easily be done wrong. See detailed notes below.
5) Conduct trial install on vehicle to verify clearance w/ feeler gauges.
6) Use sanding drums for a final pass to ensure that your finished surface is smooth, flat from side to side and free of burrs.
7) Install O-rings and new bridge bolts. Torque to specs.
8) Countersink pad retention pins
9) Widen pad springs
10) Assemble and prep for final installation on vehicle. (Now would be a good time for "G2 caliper enamel" if you want some bling).

Modifying the Caliper Mount Points

Both the calipers mounting ears and the corresponding knuckle mount points must be shaved down to allow each half to bolt to the bracket. This was the same situation with the original "Mandeville" brakes, so there's precedent for this procedure.



The goal: just enough material removal to allow both sides these to bolt up. We'd also like to remove a similar amount of material from both sides.

Grind/sand away material slowly and carefully, measuring often. Here's my first pass using a belt sander…

You will need to use the factory shim that engages this tip during assembly so the shim needs to be ground down too. I found it was easy enough to grind this down right along with the caliper tip but it can be done separately too.

I used a belt sander for the caliper grinding so I could grind both tips at once.

Check with a straight edge periodically to be sure it's cutting evening and nice and square. Calipers can be used to check each tip for remaining material. I found 0.290" at the arrows shown was close to right. At the end of the day it just has to fit and you don't want to remove more than you need to.

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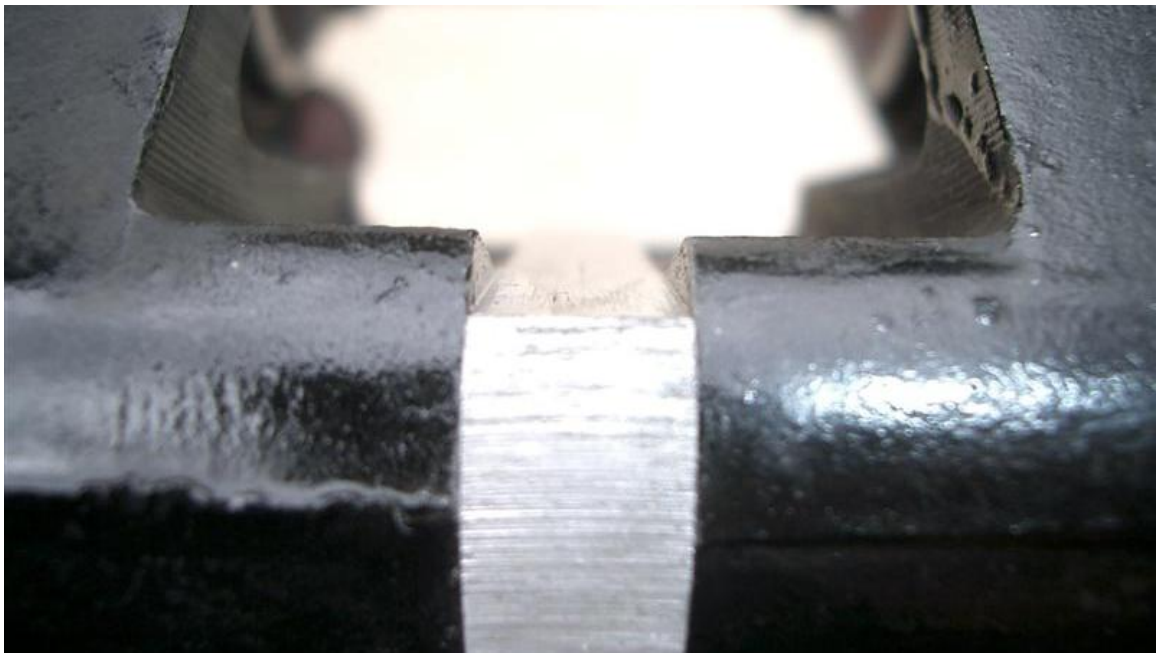
Widening Calipers (Front Caliper Spacers)

Caliper spacers are included in the kit to account for the added thickness of the new rotors (stock Mazda rotors were 22 mm when new, Nissan rotors are 30 mm.)

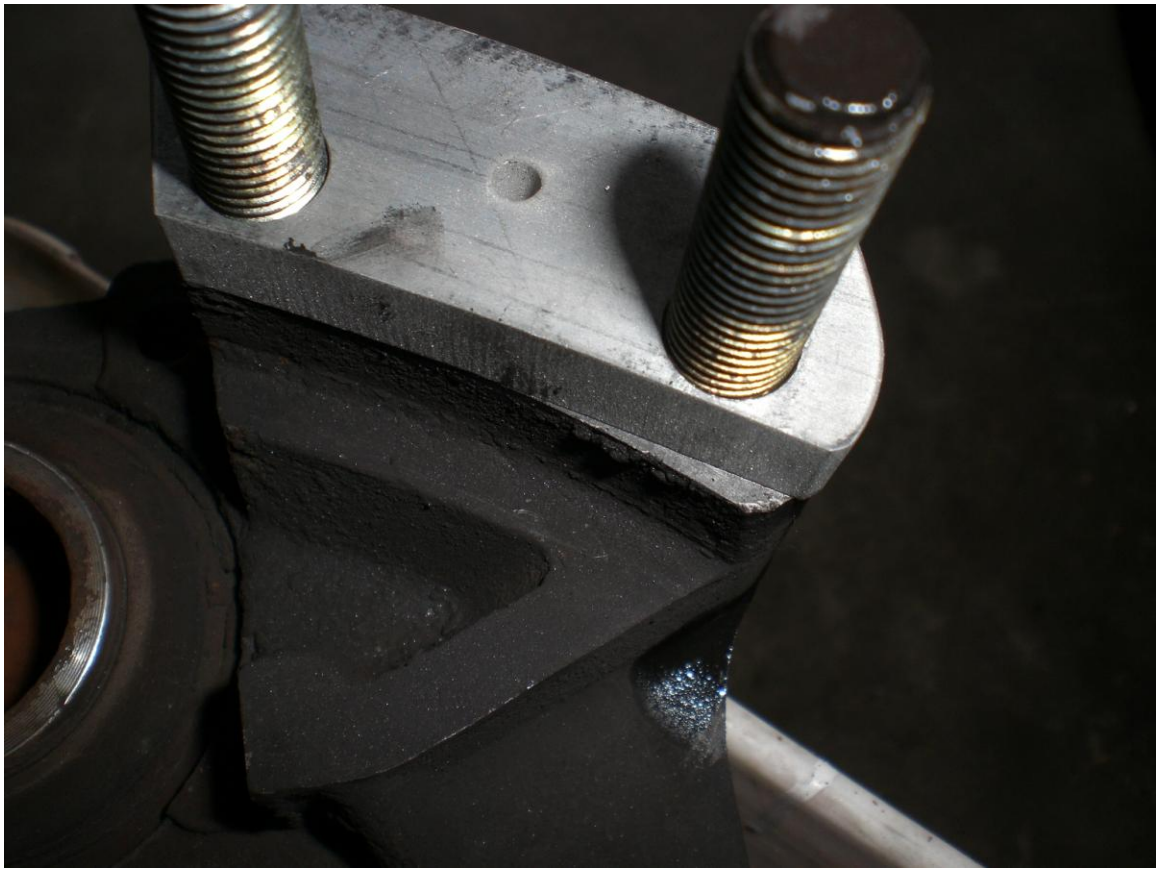
One face of the spacer houses an O-ring that seals to the caliper body, the backside of the spacer becomes the surface that the O-ring in the caliper body seals to. Prior to final assembly sand the faces using **400 grit sandpaper laid out on something hard and flat** to remove any burrs or imperfections.

Opening the Front Caliper Slot

You need to temporarily reassemble the front calipers using the spacers so you can widen the slot as you'll be grinding on the spacer as well. **Verify spacer assembly is oriented such that the new o-ring with face the non-recessed side of the caliper**. When you do this reassembly use your OLD caliper bridge bolts (wall thickness can get pretty thin and you don't want to knick a hardened steel bolt because you went too fast and broke through). When in doubt you can always take the two halves apart and see how much material you have left.



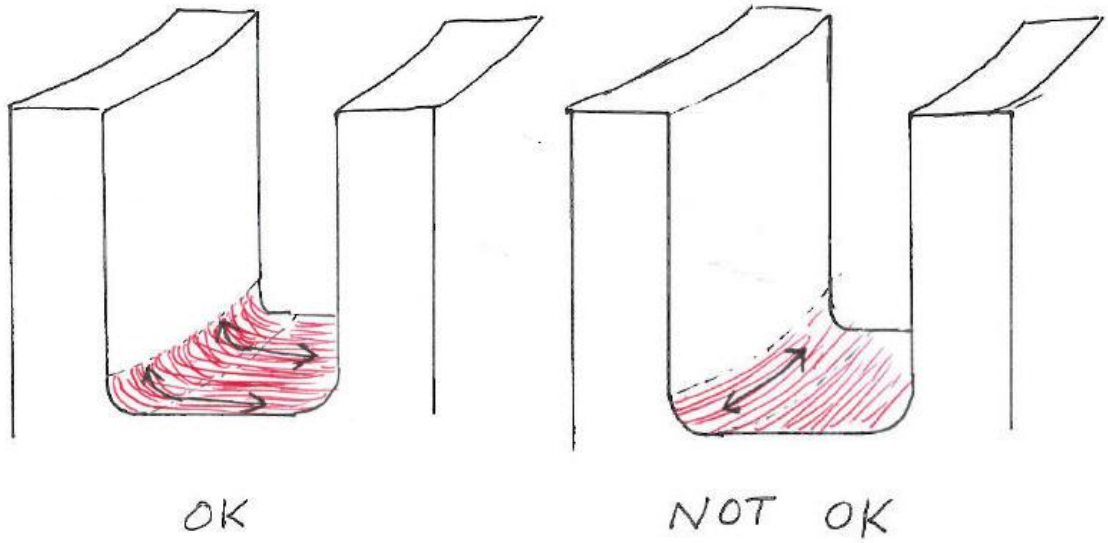
Caliper slot as found on initial bolt together with spacer.



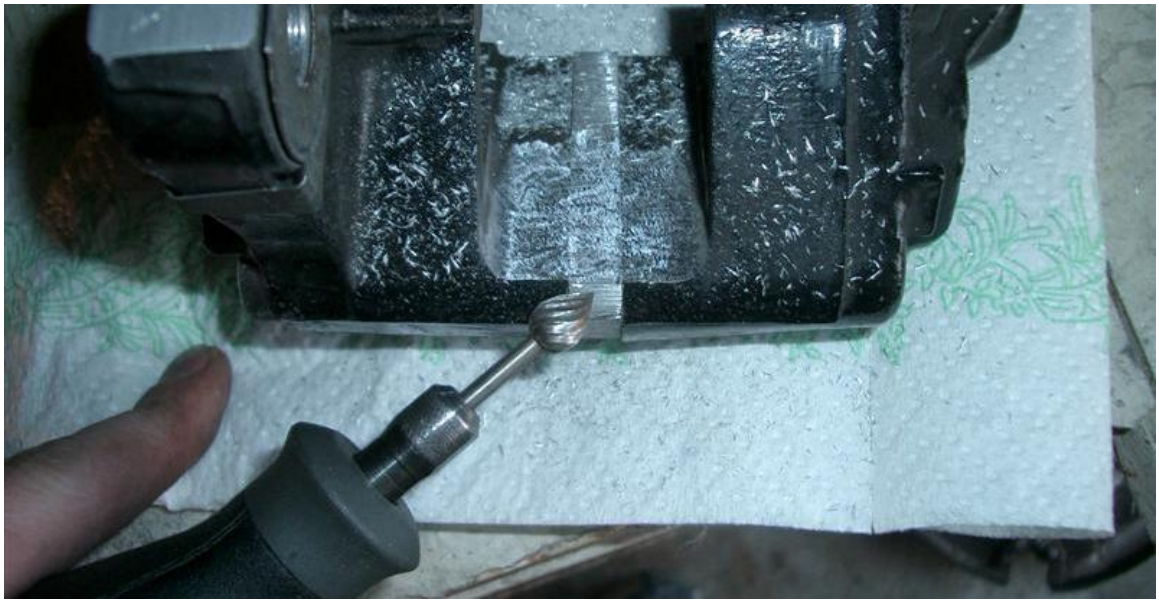
Note, **the shape of the spacer is intended as a guide** in how much material to remove.

The spacer itself should require almost no cutting however iterations of trimming and trial assembly are still required.

A rounded carbide cutting bit works well here with a Dremel tool because the front caliper is aluminum. You can use sanding drums too but it'll be doubly slow because they generate enough heat that you start to locally melt/smear the aluminum. It's still not a bad way to go to touch up your final pass. DO NOT USE AN ANGLE GRINDER TO OPEN THE SLOT. It cuts too fast/rough and the direction of grinding is wrong.



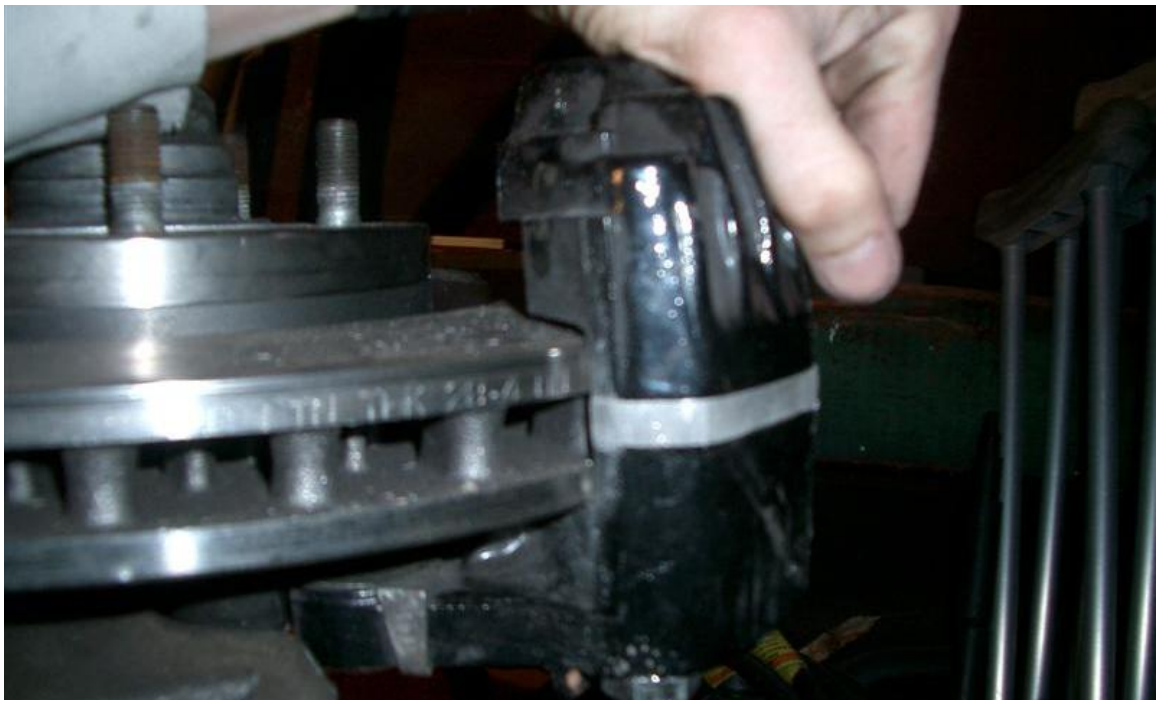
If don't heed this warning and insist on roughing things out with more powerful tools (yes I know there's a lot of material to remove and Dremels make for slow work) you should know that any grind marks left in the wrong direction create stress risers and seriously weaken the strength of the caliper. All the scratches that remain when you're done should be aligned with the forces in the caliper. In the location we're grinding those forces primarily run side to side as the pressure of the piston tries to bend the slot open. Don't screw this up because you're getting impatient whittling away for what seems like hours on end with your Dremel. It's important.



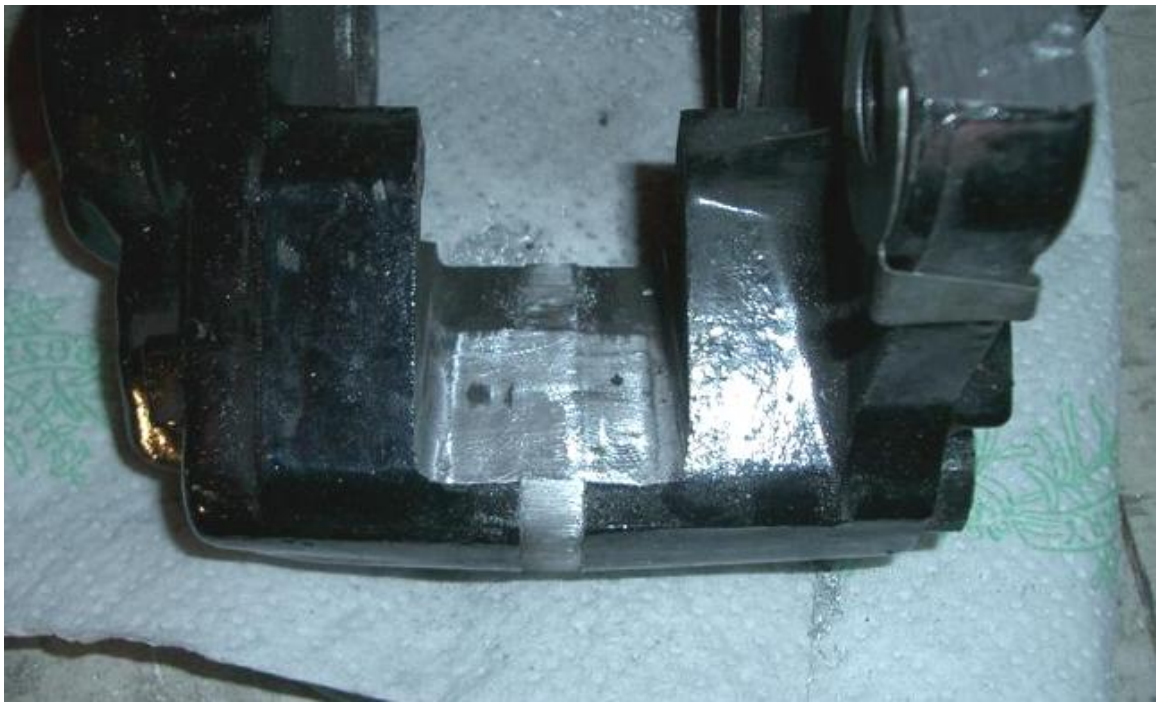
Rounded carbide cutting bit removes material at a good controllable speed.

Sanding drums remove material a lot slower (and wear out rapidly) but are nice for leaving a smoother surface. This also helps in checking where the high spots are.

The front caliper covers a pretty wide area so the opening in the slot you're making will want to be curved to match the edge of the rotor. I found it was helpful to grind a bit, sand with a drum, and then physically rub the slot on the edge of the rotor. The freshly sanded aluminum surface will show the rub mark and then you know what point stick up the highest and where you need to focus your efforts going forward.



Rub the caliper on the rotor…

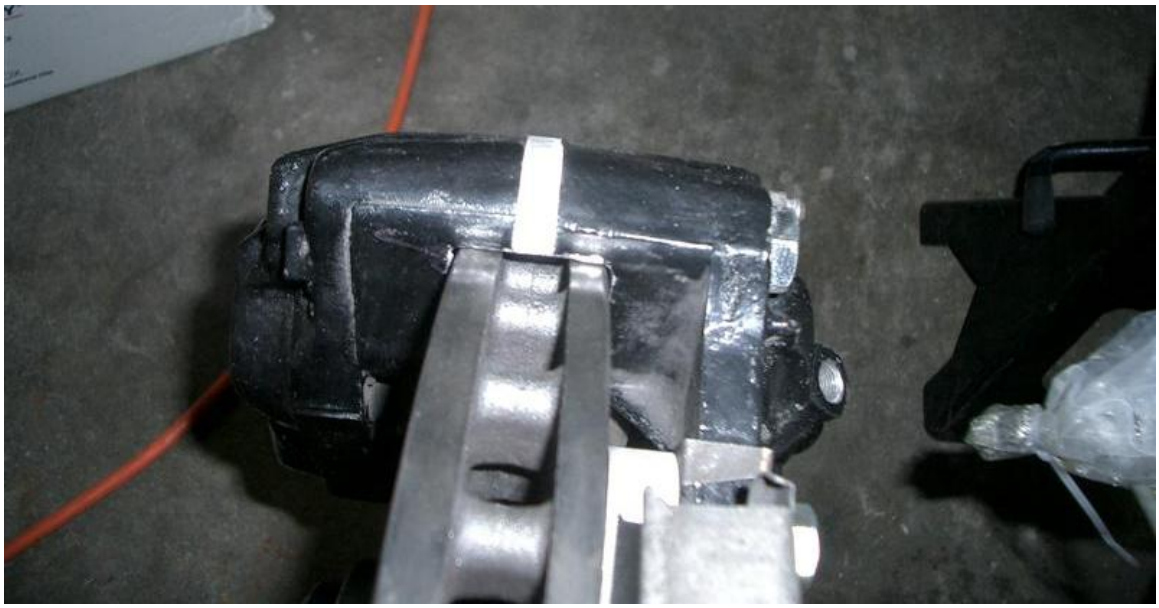


And the rub marks show you what still needs work.

A carbide tip with a small cylindrical head is useful for getting the corners of the slot.

As you start to get close to finished you may want to jump ahead and have the front rotor and relocation bracket already fully mounted at this point.

I test fit during the grinding stage dozens of times because I was pushing it so close to minimize pad overhang. The minimum numbers I recommend in the bracket section mean you should be able to achieve minimum 0.070" clear between caliper and rotor measured radially. Check it with feeler gauges to be sure.

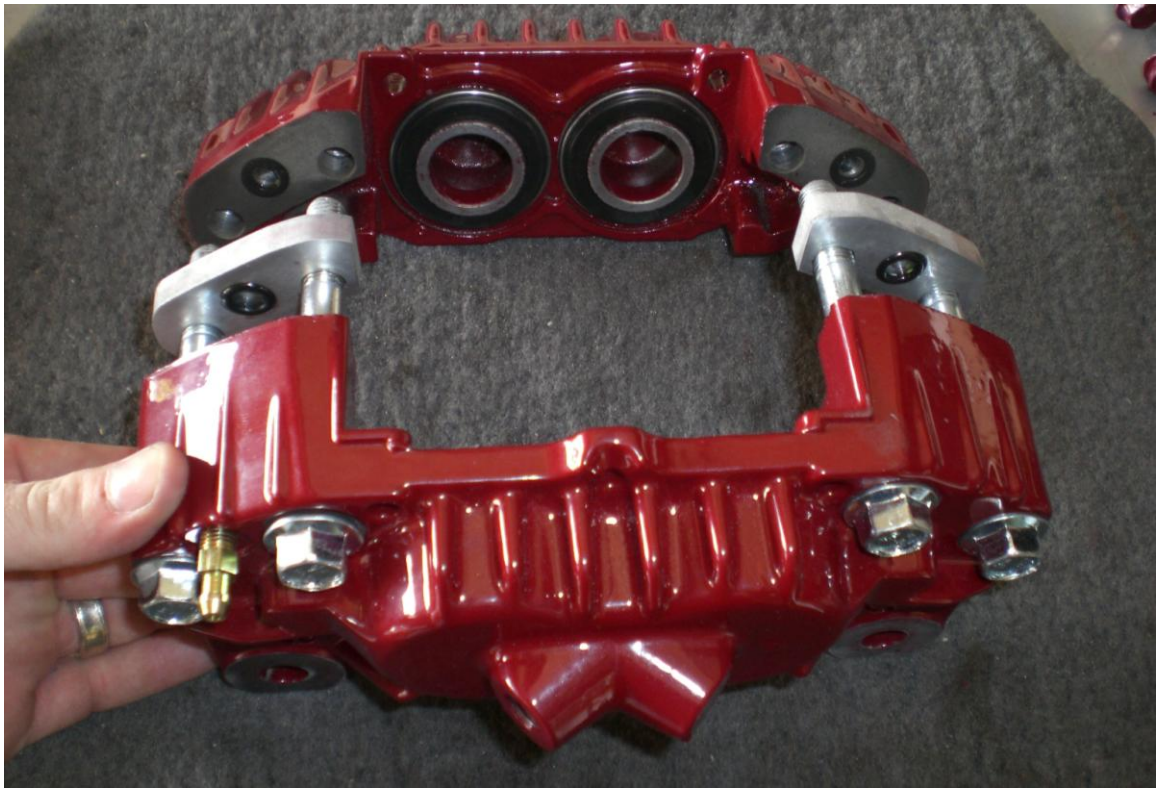


Bridge bolts

This is what physically holds the two halves of your brake calipers together so they're pretty damn important.

As mentioned earlier, DO NOT use the new bolts while grinding on your calipers… If you nick the surface of one of your new bolts you just created a stress riser dramatically weakened the bolt. Throw it away post haste and use a fresh one that's not damaged.

Caliper Assembly



When assembling the halves of the caliper for the final time make sure both all o-rings are in place: The factory o-rings are reused, o-rings with kit go in spacer faces. Double check that each side of the spacer has an o-ring to seal it.

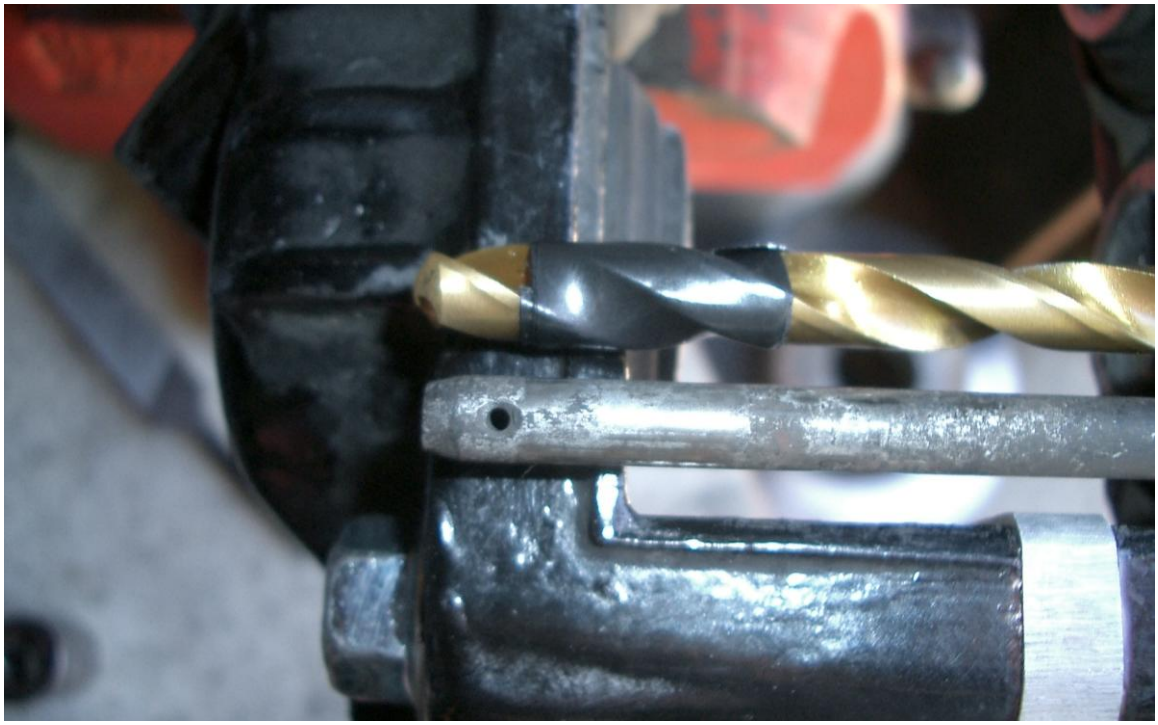
Torque the bridge bolts to 38 ft/lbs using anti-seize on the threads. Anti-seize is required to achieve the correct bolt preload and will help prevent galvanic corrosion down the road.

Pad Mounting (Pins and Springs)

By widening the calipers you now need to widen / increase engagement of the pins that hold the pads in place and the springs that keep the pads pushed back. I used a drill bit to counterbore the heads of the pad pins INTO the body of the caliper slightly.

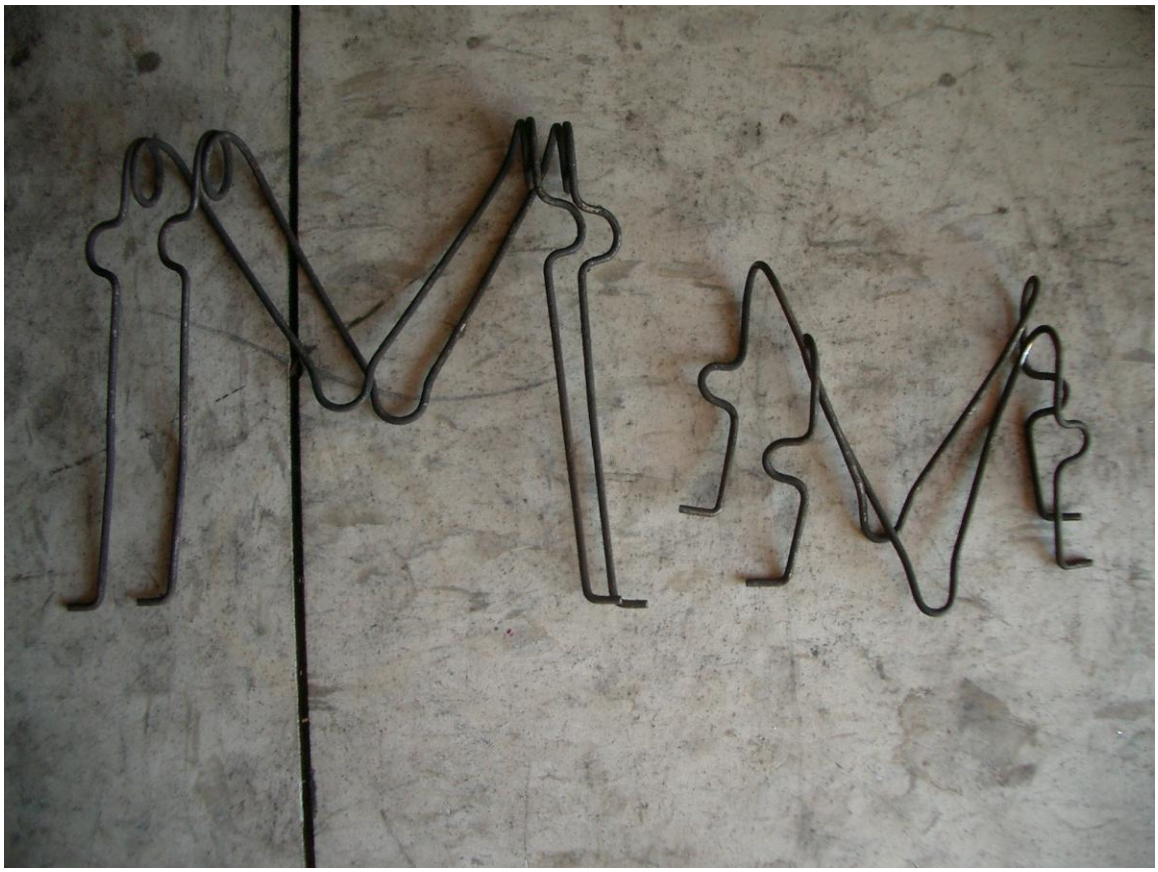
A 9/32 drill works well for this counterboring step. I marked the required depth using electric tape and then drilled down to the tape so I'd be consistent.

Note that the head of the pin is a HAIR bigger than 9/32. I broke out my handy sander and used it to lathe off a bit of material. You can use a larger drill but I really wanted the smallest hole possible considering where I was removing material.



Pin showing how much additional depth I needed.

It’s a good idea to coat the head in anti-seize to help prevent rust and to aid in future removals from what ends up being a pretty tight hole.



The last step, widening the springs, is simply done by hand . Don't forget this as you'll need the added tension now that the caliper void is that much larger.

Knuckle modifications:

Grinding mounting tips…

The knuckle side grinding is much the same. You can use the belt sander technique again if you're planning to remove the knuckle. However the knuckle is steel and therefore an angle grinder with grinding disc may be the easiest method for grinding this while mounted on the car. I don't recommend a "cut off" wheel because it's too easy to go awry. You want to check frequently with a straight edge as it's easy for your eyeball to get off from where you really want to be cutting.

Drill out mount point

The knuckle becomes your through hole and the bracket is the threaded part. Therefore we must drill out the mount points for of the knuckle to allow use of the m12 bolts.

Triple check perpendicularity of the drill and then drill out the threads using a 31/64th bit.

Final assembly…

The goal of this process is that the knuckle and the caliper will both be bolted to the bracket. There's no space for nuts so we have to thread the bracket itself (hence the keyed steel inserts that the kit uses)

- Two lengths of m12x1.25 bolts are provided because the caliper is thicker than the knuckle. **Warning:** If these bolts are reversed the longer bolts may protrude and rub the rotor while the short bolt will not have sufficient thread engagement.
    - The 30 mm bolts are for knuckle to bracket
    - The 35 mm bolts are for caliper to bracket

The assembly shown from the inside without rotor.

- Caliper tips continue to use the factory steel shims (with the ends ground down).
- Bracket and all the remaining assembly should be at least 0.050” clear of the rotor.
- You need to slightly straighten the factory brake hard line so it can be supported in the same position it had before. Many coilovers have a clamp on style of hard line support that may allow some adjustability as well.
- All mounting bolts assembly with nordlock washers (each washer has two halves). See www.nordlock.com for more information on these. Nordlocks can be reused up to 5 times. If you need replacements the McMaster Carr part number is 91074A133.
- **Torque all mounting bolts to 53 ft-lbs using anti-seize**.

Acknowledgements

Special thanks to Roger Mandeville at Mandeville Auto Performance for the idea behind my journey, for graciously offering to let me pursue this idea, and for letting me pick his brain in regards to some of the details. I call these "Mandeville" Big Brakes because of Roger's work on brakes for the 3rd gen RX7.

Thanks to Charlie Shatzen of Mazcare, one of the coolest Mazda shops ever, for being my sounding board. Charlie's a great thinker and down to earth kinda guy. If you ever want something amazing built for you, call Mazcare in Marietta GA. They won't steer you wrong.

Thanks also to all the friends/cohorts at www.norotors.com.

What an intelligent free-thinking crew! Stupid horsepower was what lead me to do the brakes project in the first place, but I was wasn't really expected the amazing friendships that came out of the car project at large.

Finally, thanks to my wife… for putting up with the car fixation and being my support when projects don't go so well.

Regards all,
Joel Payne / Ronin Speedworks