FC 8.8 Kit Parts and Install Instructions

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Revision H

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Kit Includes:

- Front Mount Support Cantilever (weld in)
- Redundant Front Mount Strap (bolt on)
- 2X Mazda subframe gussets (weld in for vertical link ear reinforcement, not shown)
- Rear Mount Diff Cradle (bolt on)
- 2X Custom 4340 heat treated axle bars (Ford to Mazda conversion)
- 2X EMPI CV boot kit 86-2127 (outer CV joints)
- 2X EMPI CV boot kit 86-2103 (inner CV joints)
- Hardware
    - 5/16-18 bolts w/ washers support the Rear cradle
    - M10x1.5 bolts w/ washers tie down the Redundant Front Mount Strap
    - M12x1.75 long bolt w/ deformed metal nut is the primary front mount hardware
        - 1 regular M12 washers
        - 1 extra heavy M12 washer (bottom side since it gets yanked on so hard)
    - 1x Ford lower isolator bushings, large washers w/ a bonded rubber face

(Note, axles are now zinc plated, early revisions were not)

Separate instructions are available for "Grande" Axles and Hubs that use both Explorer inner and outer CVS, if you chose that variation. We do offer Grande with a trade in option (unused shafts only) if you bought the standard 8.8 and then find the T2 CVs are too hard to come by.

Donor Parts (Supplied by Users):

- 02-05 Ford Explorer Diff and complete inner halfshaft assembly (you need everything up to the axle bar on the inboard end). Halfshafts may be any year 2002-2010.
    - 02-06 Lincoln Aviators and 02-05 Mercury Mountaineers have the same diff
- T2 outer CV assembly (again everything short of the axle bar)
- **WARNING: donor shafts must be OEM parts** (made by Mazda or Ford). The aftermarket has been flooding the market with shafts that use alternate shaft splines. It's now so prevalent that no known aftermarket shafts are deemed a reliable fit. As an example, you cannot buy shafts FOR an Explorer, they must be FROM an Explorer.

Purchased Parts (Supplied by Users):

- Rear diff mounts of the style of your choice
    - We recommend Mazda Comp mounts for a firm compliant setup.
    - Delrin bushings can be used but are not generally recommended. They will minimize all motion but may bind on the chassis pins.
- Driveshaft and sub-components (much more on this follows)

Special Tools Required:

- Clamp style CV boot band tool: One option: KD CV Boot Clamp Tool KD3955
- Circ clip pliers
- Three jaw puller (sometimes required for CV disassembly)
- CV removal tool (optional but helpful for outer CV removal)
- Press (to address "crown washer" clearancing and install of rear diff mounts)
- Angle grinder
- Welder

Torque Specs

- New Hardware
    - Diff Cover Bolts — 25 ft-lbf
    - Front Mount Main Bolt — 65 ft-lbf
    - Redundant Front Mount Strap — 34 ft-lbf
- OEM Hardware
    - Diff Rear Mounts (vertical chassis pins) — 63 ft-lbf
    - Rear Suspension Knuckle (non-DTSS bolts) — 54 ft-lbf
    - Rear Suspension Knuckle (DTSS bolt) — 95 ft-lbf
    - Axle Nut — 200 ft-lbf
    - Rear brakes (main bolts) — 36 ft-lbf
    - Rear brakes (floater bolt) — 15 ft-lbf

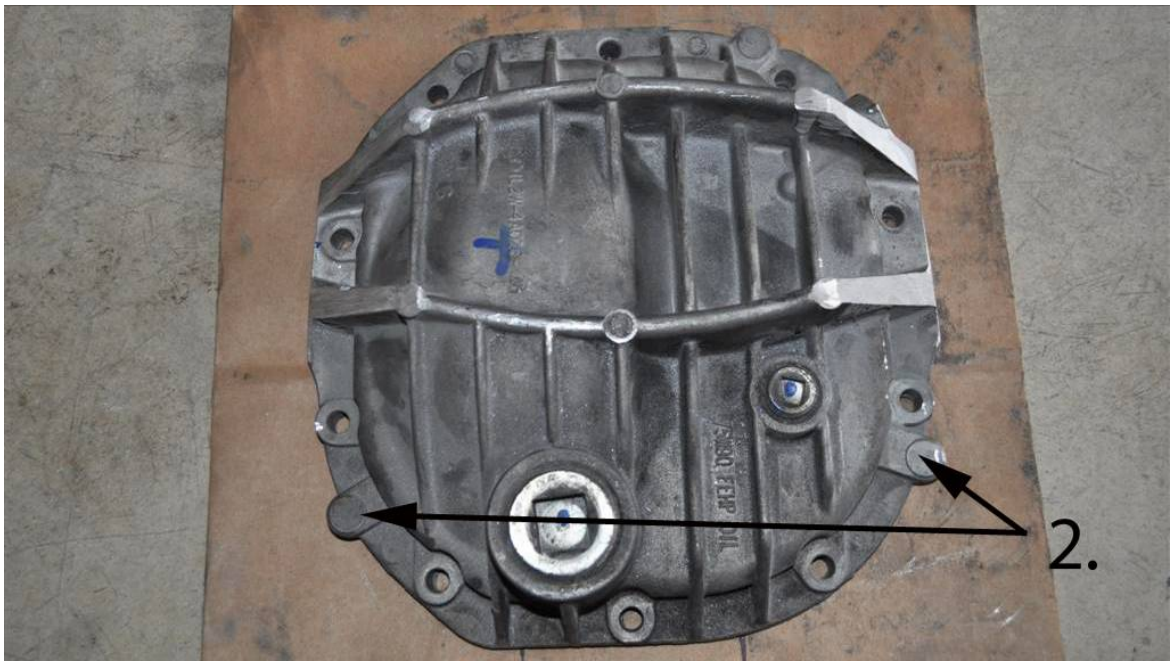
- Rear suspension strut lower bolt (to LCA) 54 ft-lbf
- Rear subframe main bolts 80 ft-lbf
- Rear subframe cover bolts 25 ft-lbf
- Rear subframe vertical link bolt 61 ft-lbf

8.8 Differential Trimming

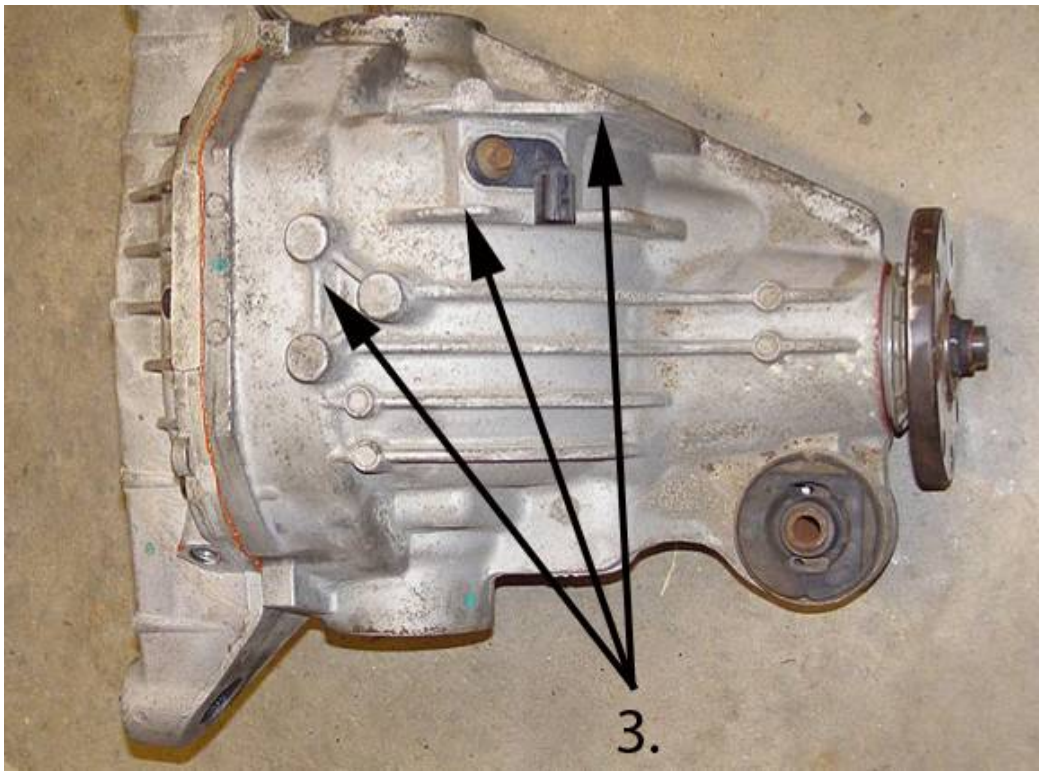
Trim the 8.8 diff housing and diff cover to match Rear Mount Diff Cradle. This involves cutting in a few locations:

1. Cut off both factory mount ears of the cover using an angle grinder or saw as shown.

Flatten the two blank bosses of on the face diff cover just outboard of the 10 bolt pattern (these last location needs only be shaved ~1/16” so the cradle can interface to a flat surface.

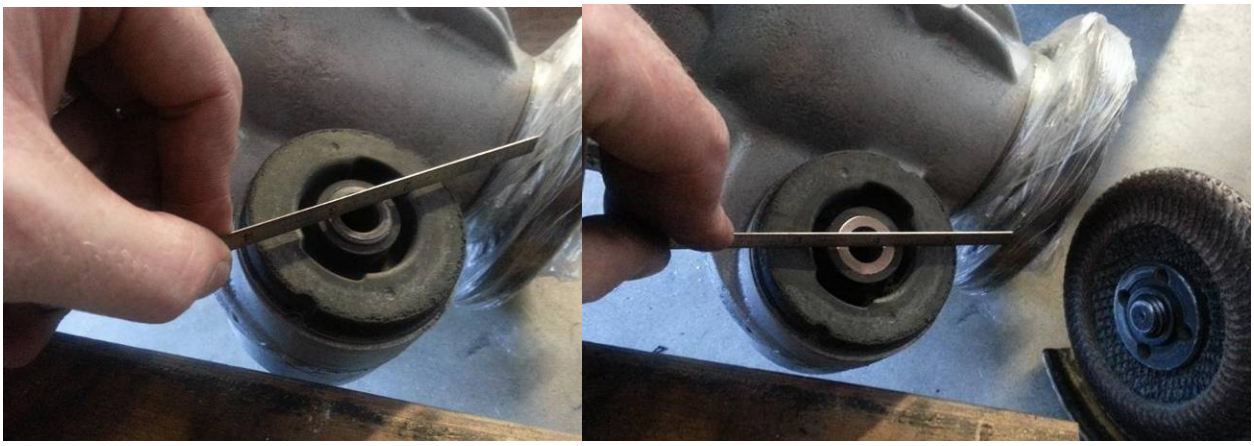


2. Cut off the protrusions on the top surface of the diff housing (there’s a three boss pattern and several guard fins for the sensor, all of which must go)



3. Bottom of front mount. A small trim to help give clearance vs. the tie rod mount point on the FC subframe. You may want to wait to do this after first diff fitment under the car.

4. Optional. This is a personal preference issue. I like rubber mounts but I also want this to be quite firm. Like most rubber bushing the center section of the ford mount sticks out beyond the surrounding rubber area (note the shadows of light leakage).



Before After

I take and cut down the center sleeve so it's just a bit below flush thereby bringing all the surrounding rubber into contact with the Ronin bent strap for the 8.8 front mount. Note, I do this same process to the top of the rear diff mounts when using Mazda "Comp" Isolators as well.

New 8.8 Pinion Flange (or Yoke)

The intent of the Ronin kit is to minimize required trimming on the Mazda subframe. This prevents Ronin customers from having to deal with the downtime associated with shipping subframe cores back and forth. However achieving this goal requires substitution of a smaller effective diameter pinion flange or pinion yoke. (**See Appendix A:** Driveshaft for greater detail on choosing components.)

No great efforts will be made to detail rebuilding procedures for the Ford 8.8 itself. If you want to rebuild this yourself, one good resource appears to be a specific 8.8 rebuild DVD available through Bad Shoe Productions:
http://www.badshoeproductions.com/products.html

There's also a decent write up here:
http://www.explorerforum.com/forums/showthread.php?t=144780

That said, I found that the cost of time and tools involved were high enough that if I had to do it again I'd just pay someone to get this done. Sub-contracting this portion of the work is probably money well spent. We recommend setting backlash to the tight end of the tolerance.

Several companies sell rebuild kits but if you want Timken bearings (high end) I recommend this one:
http://www.drivetrainamerica.com/p-1831-drk311amk-ford-88-irs-master-timken-bearing-kit.aspx

If you decide you want to run a torsion style differential, Drivetrain America has the best pricing on the Detriot TrueTrack (as of the time of this writing).
http://www.drivetrainamerica.com/p-3902-913a561-detroit-truetrac-limited-slip-ford-88-31-spl.aspx

Tear Down:

1. Place car on jackstands with the rear end about as high as the jackstands allow. Place jackstands under the body so the subframe is free to be removed. 2x4s may help distribute the load.
2. Remove rear wheels and brakes. Tie brakes up out of the way to the suspension. You only need to remove the middle clamping portion. The perimeter caliper frame can be left in place and there's no need to disconnect the brake lines or E-brake.
3. Remove exhaust and driveshaft.
4. Drop entire rear subframe. A 2x4 running fore-aft and spanning between both subframe and diff can be balanced so you lower the whole thing at once with one jack.
5. Remove Mazda rear diff and halfshafts from the now removed subframe assembly.

Building the New Halfshafts

You need to start by removing the CV equipment and bearings from the inside of the Ford halfshafts and the outside of the Mazda T2 axles.

The Ford is the easier of the two the inside slides off the stub axle once the boot bands have been cut. Bearing disassembly from the axle requires removal of a circ clip from the extreme end of the axle. Be careful taking this off as we'll be re-using the circ clip. If the tripod bearing assembly is stubborn it may required use of a three jaw puller.

Note, orientation of the tripod bearing maters. One side has a chamfer that must be correctly positioned relative to the axle during reinstallation on the new bar.

Next is removal of the T2 outer CV's from the Mazda halfshaft. The challenge is that the spring circ clip which holds the outer CV in place is installed blind inside the assembly and must be overcome via a driving force on the CV since we don't have access to the affected clip.

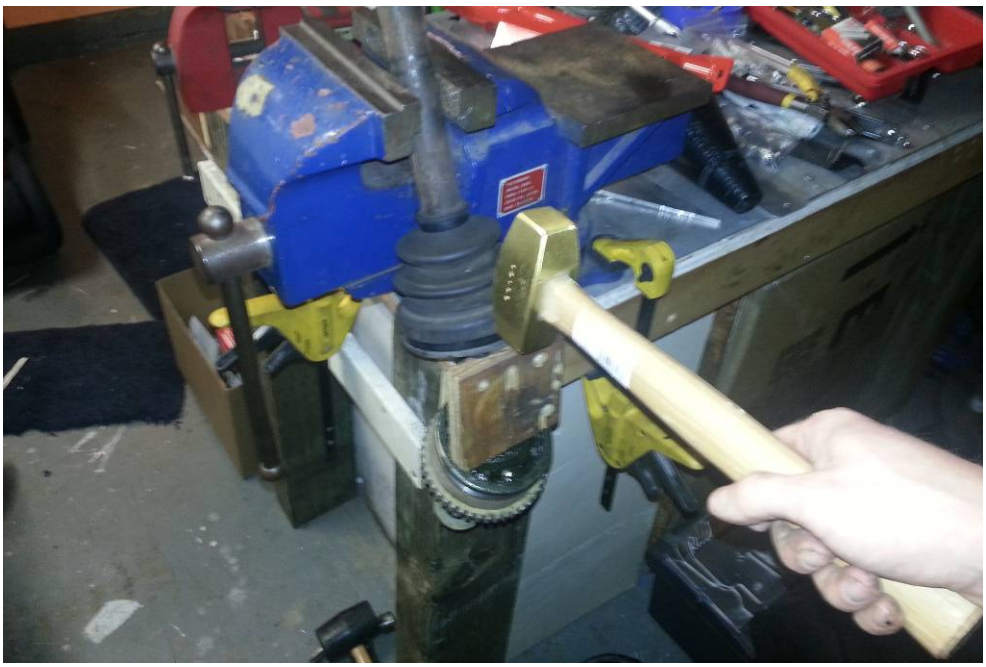
Option #1, The big hammer.

- A write up from www.thecvman.com
  - http://thecvman.com/index.php?option=com_content&view=article&id=58:removing-an-outer-cv-joint&catid=34&Itemid=27
- Videos:
  - ATV outer CV removal http://www.gorilla-axle.com/videos.php?vck=2&vcik=10
  - Honda removal video http://www.youtube.com/watch?v=46zHkn4IhK4
  - Hummer removal http://www.youtube.com/watch?v=p7Bltq5_J5I

I've torn down several axles using a hammer with good success. I do recommend you hammer on an intermediate object a small chunk of wood or plastic works well. A few pictures follow for how we do it.

1) Clamp the axle in a vice dangling it downward off the table (this is an FD axle but the idea is the same). I put a trash can filled with newspaper just below to catch the CV.

2) Bend the CV over at an angle to expose the race. My target chunk of wood then positioned on two fingers of the race. I use the old boot to provide a touch of pressure from above to hold the wood in place, then strike HARD vertically. It's a blow almost like you're splitting wood.



3) If it doesn't let go in 1-2 strikes rotate the axle 120 degrees and try again. Typically, it'll fly off into your trash can. In the below picture I hit it just hard enough that the clip popped and CV moved (note the gap to the retaining ring.)

Option #2, Slide Impact Hammer:

If you weld a spare outer axle nut to a large slide hammer you can yank on the CV rather than beat on it. Requires a little custom fab but works well most of the time.

Option #3, Pressure:

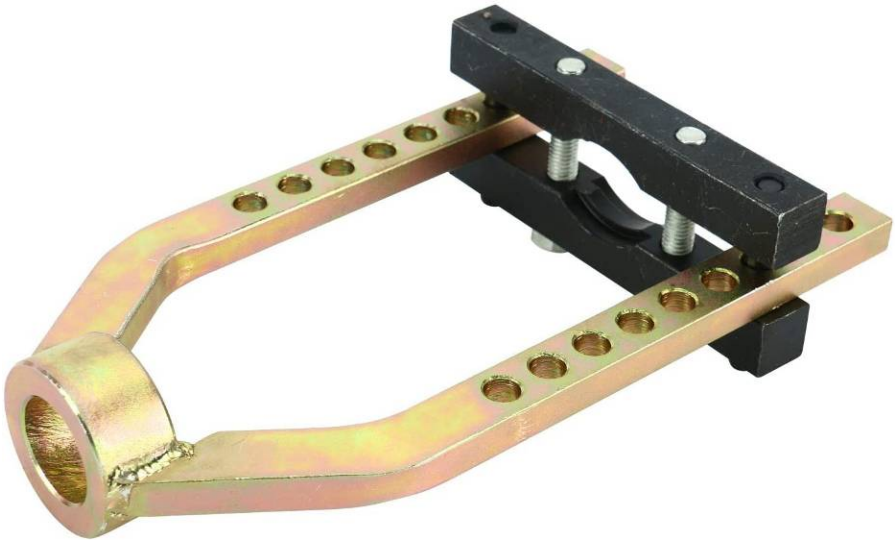
I built a tool to tear down axles that uses 2x 12 ton bottle jacks.

Option #4, Purchased Tool

In the years since having made my jig, I've since discovered a universal tool that seems to be working well for folks. You do want to make sure the threads are lubricated to minimize friction.

https://www.amazon.com/8MILELAKE-Propshaft-Separator-Universal-Removal/dp/B01MT1W7I5

Note, there seems to be a few brands available that are all basically the same thing.



Once you have everything apart clean all the old grease out using a healthy stack of paper towels. We don't recommend cleaning with solvents as the residue may be harder to clean out than the grease was.

Reinstallation is the reverse of disassembly. The outer CV boot comes with a replacement circ clip and will snap in blind. You may wish to paint the center portion of the new axle bars prior to assembly. Use the full provided grease packet on each joint and work it down into the bearings as possible.

NOTE: The factory Ford Inner CVs use a rubber conversion ring to fill the gaps between lobes of the stub axle and the round CV boot. Both the factory boots and the ones Ronin provided [through mid 2022] are round so you may need these pieces.

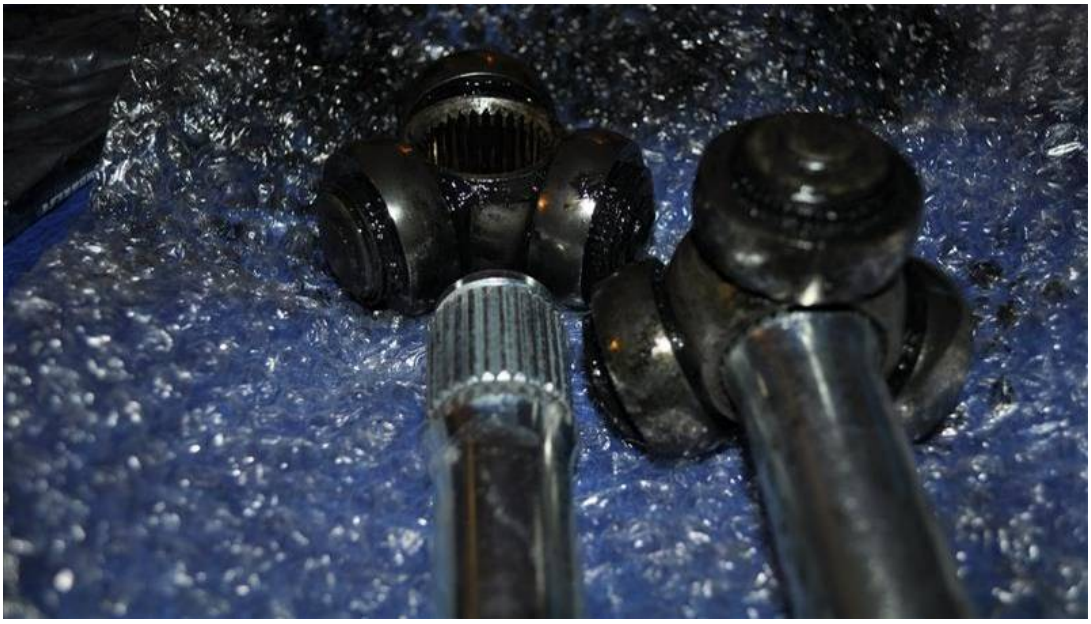
All our “Grande” axle kits--and now standard 8.8 shafts made after mid 2022--use a boot with the “trilobal” adaptor built in. If you don’t have the adaptor rings on an early Ronin kit these new boots can be used in a pinch (p/n EMPI 86-2215). EMPI provides NAPA white label boots so any of our boots can be sourced locally at a NAPA store if you only need a couple. IE https://www.napaonline.com/en/p/CTD6862215

Getting the heavy circ clips off of the old shafts takes snap ring pliers and a couple small screw drivers. To get that heavy snap ring back on you can use a socket and mallet to get it to spring over the chamfer at the end of the shaft.

Setup:

Result (after a firm tap on the socket with a mallet):

At the other end of the shaft you just have to be sure the chamfer on the underside of the tripod bearing goes on first. Otherwise it's pretty straightforward. No inner snap ring at this end, just the outboard one.



One interesting detail to note. Explorer halfshafts come in two diameters, one of which is huge, but it actually tappers back down and all splines are common so far as I know. There are definitely some nasty

stress risers involved in Ford's design though (ours are better!)

Factory Ford halfshaft

When strapping down the CV boot clamps be aware that the clamp style has a finite range of tensioning ability so you need to get the teeth to clamp as tight as possible prior to clamping. If it's close, it's worth fighting for the extra tooth of tension. A variety of clamp tools exist. I use KD CV Boot Clamp Tool KD3955.

If you plan on road racing where heat can be an issue, installing a chunk of the spray straw from a can of WD-40 under the small clamp of each boot will let the boot "breathe" when it gets hot. It's an old Carroll Smith trick for racers.

Pretty pretty princess halfshafts ready to go:

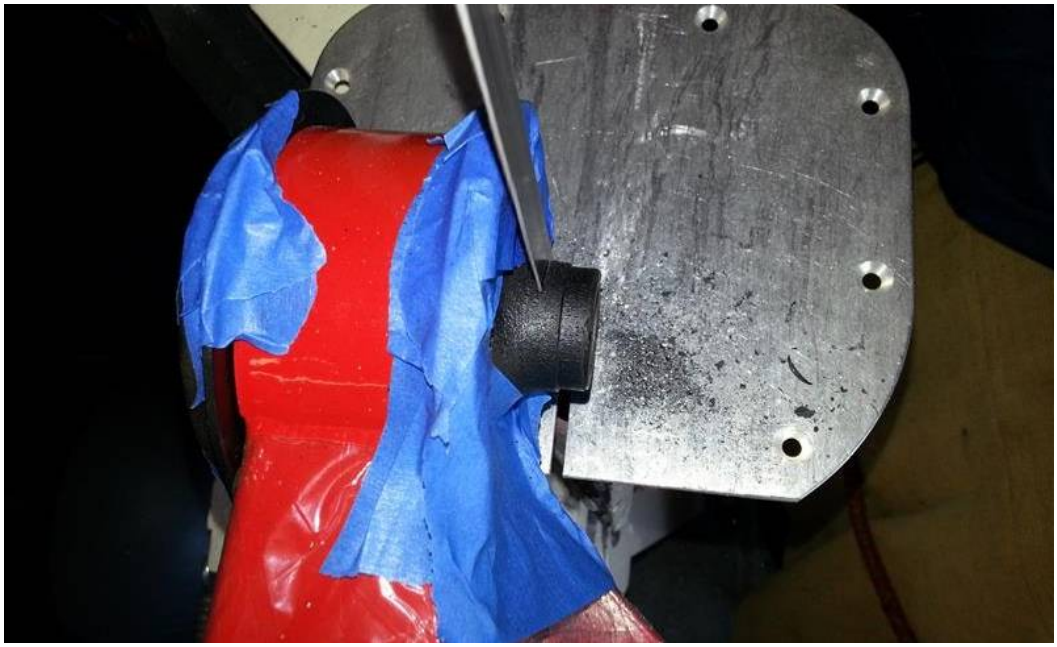
Installation of the New Rear End:

1. Paint or powder coat rear cradle.
2. Press rear mounts into the bores using grease. If you're using factory style rear bushing or Mazda "comp" bushings a worm gear hose clamp can be useful to help get the bushing started.

3. Adjust clearances of rear bushings vs. the factory with the "crown washers". Here's factory fitment of the Mazda comp bushing (note the gaps at top and bottom).

We also need to raise this crown washer for CV boot clearance and some pre-loading of the rubber is a good idea regardless.

Cut down both the inner metal sleeves and the tips of the crown to help it compress against the rubber. This was done with a band saw and disc sander respectively but an angle grinder works fine too.



Trim the tips of the "crown washers" as well (left piece is about what you want)

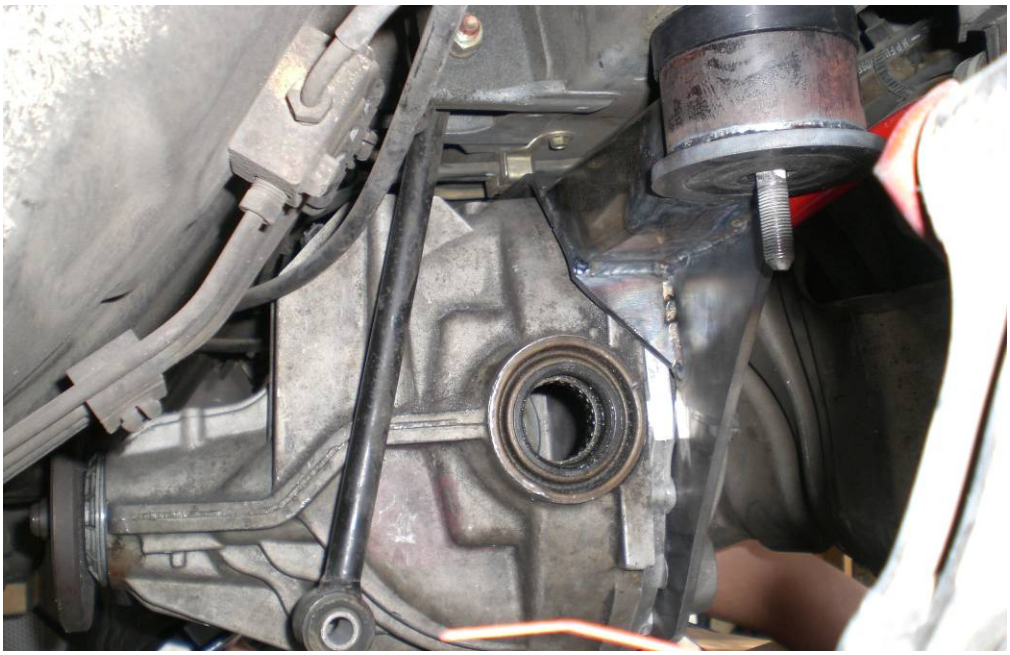
When you're done you'd like to end up with the leftover rubber tips seeing about an 1/8" of compression (note the gap shown in the hole here).

Before After

If you're using a delrin bushing you still want the crown washer to be raised relatively high as we'll be looking for ¾" clearance to the CV boots.

4. We can now assemble diff and Rear Cradle torquing the 5/16-18 hardware and washers

5. Lift the new diff assembly into its normal interface position with the two primary chassis studs, support with jack and/or jackstands.



WARNING: If you're using Delrin mounts, you will likely need to ream the rear bushings else the mounts may bind on the studs when you lift the nose to its correct pinion angle. Get it wrong and it is possible to fail the chassis pins which requires significant repair. If you insist on solid bushings, be careful!

6. Double check all clearances with the housing and cover trimming you did earlier.
7. Lift the bare Mazda subframe into position.
8. Check fit of Front Mount Support and trim edges as required to achieve a good fit). **The most common issue folks run into is failing to raise the pinion to the proper elevation**. If you don't have the nose raised it'll look like the hole won't line up. The top of the new mount should be fairly even with the lip of the subframe. You may need to jack the nose into position.

9. Mark the profile of the Front support and remove paint on the subframe as required (recommend sanding discs).
10. Assemble cradle to diff with the front mount hardware to ensure alignment, THEN (with hardware in place) tack weld front mount support the front subframe.
11. Front hardware assembly is as shown, washer on the bottom side uses the extra heavy version to be sure we don't see flex. Not shown: Ford isolator.

12. Note: the supplied Ford isolator bushing installs BELOW the Diff front mount of the housing and above the Ronin weld-on front mount. It sandwiches between the two and the direction should be obvious given the main front mount bushing sleeve protrusion.
13. With the diff installed, verify you have at least 3/16" clearance in the fore/aft direction at the lower surface of the Ford front mount at the exterior of the aluminum casting (trim point #4 in the prep instructions). You may need to hammer a small dent into the mount the point closest to the subframe's tie rod connection point.
14. Remove everything and weld 100% of the perimeter of the Front Mount Support.
15. While welding we also want to weld in two support gussets for the vertical link to the subframe. A few early users of the Ronin kit found that this was a weak link when using our kit.

16. If you plan to run 1350 u-joints **see Appendix B** as added clearancing will be required.
17. Paint the subframe and new welded extension.
18. Diff, subframe and halfshafts may now be combined. Torque the primary front mount bolt first, then lock down the Redundant Support Strap (slotted). This sequence ensures the Strap will carry its fair share of load.
19. Halfshafts installation requires removal and reinstallation of the outer suspension knuckles.
20. The complete rear end suspension and diff assembly may now be lifted into the car.

21. Fill to the upper port with diff fluid (car must be horizontal for this step): we recommend AMSOIL Severe Gear Oil 75w140. For a good read as to why see: http://www.amsoil.com/lit/g2457.pdf
22. Torque all remaining hardware.
23. Install driveshaft if you've already built one. Measure per the instructions below if you haven't. (Much more driveshaft information follows in **Appendix A**).
24. Put it back on the ground. You may need to retune your speedometer.
25. Send burnout picture to roninspeedworks@gmail.com

No wheelhop here!!!!! Thanks to lt1fc3s from norotors for the shot.

Appendix A: Driveshaft Specifications and Details:

First decision point is what size U-joints you intend to run 1310, 1330, or 1350:

1310 is about OEM size for many of ~400 hp muscle cars. 1310 u-joints are 3.25" wide (as measured at the tips of opposite bearings). 1330 and 1350 u-joints are larger (both 3.625" wide). However, the 1330 uses the same bearing size as the 1310, while the 1350 is larger. If you think you your car will be <500 hp for life 1310 should be fine (the first article car is running these). 1330 setups claim they're good for ~700 hp but we all know that wheel hop and service application mater. However, since to date we have not found an appropriate 1330 slip yoke, if your setup involves:

- a big stroker
- lots of drag racing
- forced induction / nitrous
- or you just want some healthy margin in your DS system

Then we recommend 1350 u-joints. Please note that cost differences are substantial so see the below before you decide.

Next we start selecting matching components for our U-joints… We provide links for quite a few, but plenty more options exist. Note: I don't have a special preference for Denny's Driveshafts, they just have a reasonably large selection and one of the easier to use websites around (hence lots of links from them). You can take this cheat sheet to your local DS shop and have them build you one, order all the stuff online and have someone assemble it, or send a few special pieces to someone like Denny's who can build you one. We recommend starting local because prices are liable to be a bit better. It's a good idea to look at the below so you have ballpark pricing for what things are worth as you pick and choose.

U-joints:

- Run the same size / type front and rear. No reason not to.
- http://www.dennysdriveshaft.com/c130_universal_joints.html

Slip Yokes:

- Since our DS extends over the subframe in the rear we need a multi piece slip yoke at the trans so we can disassemble the DS at the front end and can drop that first.

- 1310 series option = c3 corvette OEM or comparable, u-bolt style http://www.dennysdriveshaft.com/p9_corvette_transmission_slip_yoke_1310_series_u_bolt_style_27_.html
- 1350 series slip yoke has two known options, unfortunately the more common/cheaper choices aren't the two piece variety we need.
    - Strange U1677 http://www.strangeengineering.net/catalog/134.html
    - Mark Williams 39105 http://www.markwilliams.com/detail.aspx?ID=329

Driveshaft Tube:

- Cheapest option, F-body driveshaft cut down (stock u-joints are "Saginaw 3R" so you may need a conversion U-joint, Spicer 5-3022x looks like one option). Your DS shop can help you with this.
- For a basic scratch built setup, a 3" OD 6061-T6 aluminum tube should be fine. Several online vendors all recommend 0.125" wall.
- 3.5" OD is about the biggest that will fit , some shops may carry 3.25" as well…
- Obviously you can do Carbon Fiber or steel if you see advantages to alternate materials.

Pinion Flange Setup (rear connection option A)

- We need additional clearance vs. the Ford 8.8 "Large pattern" flange that comes stock on the Explorer.
- Running a pinion flange means we need 3 things: flanges on both sides (DS and Diff) as well as the special 12 point bolts that tie the two (if you didn't get these with your rear end)
- 1) DS Flange:
    - Ford 8.8", 1310 series, small pattern, DS flange http://www.dennysdriveshaft.com/p268_1310_series_flange_yoke_fits_ford_7.5_and_8.8_inch_rear_ends.html
    - Note, I haven't found any 1350 DS flanges that will mate to the "small pattern" Mustang pinion flange. **If someone finds one, please let us know.** A 1330 version exists so it should package the larger width I just haven't found it. Here's 1330 Flange for reference: http://www.dennysdriveshaft.com/p373_1330_series_flange_yoke_fits_7.5_and_8.8_inch_rear_ends_smal.html
- 2) Pinion Flange:
    - Ford 8.8, small pattern pinion flange is Ford OEM part number is E9SZ4851A.

- 3) If you need the bolt set: http://www.dennysdriveshaft.com/p359_bolt_set_for_pinion_flange_fits_ford_8.8_inch_rear_ends.html

Pinion Yoke Setup (rear connection option B):

- Lots of options exist here. We're looking for a 30 spline yoke made for the Ford 8.8.
- It looks like you can get them in all combinations of 1310, 1330, and 1350. A few I found in quick searching.
- 1310 http://eastcoastgearsupply.com/i-5767542-ford-8-8-forged-1310-u-bolt-yoke.html
- 1330 http://www.ronsmachiningservice.net/servlet/the-5779/BRAND-NEW-FORD-8.8/Detail or http://shaftmasters.com/fo88inpiyo13.html or http://www.ringpinion.com/ProductDetails.aspx?ProdID=2015&Product=YY_F880601&Brand=Yukon_Gear_and_Axle
- 1350 http://www.jegs.com/i/Moser/718/PY088/10002/-1?parentProductId=761006 or http://www.dennysdriveshaft.com/p35_ford_8.8_1350_series_chrome_moly_pinion_yoke_with_hardware.html . Mark Williams or Strange both have these too.

Rebuild Parts:

- You need a new crush sleeve for the diff rebuild but exact necessity of other parts is beyond the scope of this document.
- Since you're pulling the large pattern pinion flange you will want to consider a new seal: http://www.dennysdriveshaft.com/p871_ford_8.8_pinion_seal.html

DS Final Notes

- Until we have a bit more data taken I'm asking that all our users measure their own cars. I'll give you measurements from the first article car below but I just don't quite trust our accuracy and I'm worried that I might give you bad info if the tolerances between different cars turn out to be significant. (Plus with a bigger sample set I'll finally know something about the total tolerances myself).
- Depending on the setup you choose you'll be measuring in a couple of different ways. Please check out the following and choose the one most appropriate to your setup, fill it out and send me the specs as numbered on these. BTW thanks to Denny's Driveshaft one more time for creating the forms we'll be using.

    - Notes on setup prior to measuring: http://www.dennysdriveshaft.com/how_to_measure.html
    - With a pinion flange installed: http://www.dennysdriveshaft.com/app/webroot/img/File/how_to_measure_diagrams/k.html
    - With a pinion yoke installed: http://www.dennysdriveshaft.com/app/webroot/img/File/how_to_measure_diagrams/b.html
    - With a bare pinion (nothing installed): http://www.dennysdriveshaft.com/app/webroot/img/File/how_to_measure_diagrams/c.html
- The first article owner did a variation of form "K" with the new small pattern pinion flange already installed.
    - He measured 38 and 3/4" from the tip of the t56 output shaft to face of the pinion flange (while running Hinson engine and trans mounts.)
- To convert between motor setups we took transmission placement measurements from tip of trans to the leading edge of the rear subframe on different cars.
    - Hinson's setup measures 33 and 11/16"
    - Granny's (using rear holes) measures 33 and 1/16" (5/8" less than Hinson).
    - Granny's front holes vs. rear holes is a 7/8" difference.
    - Ronin mounts put the engine / trans in approximately the same fore/aft location as Granny's on rear holes.
- With the pinion flange setup this implies driveshaft lengths of
    - Hinson 38 and 3/4" as per measurements
    - Granny's rear holes and/or Ronin mounts = 38 and 1/8"
    - Granny's front holes = 39"
    - Again all these measurements are relative to form K (equal to dim 55 minus dim 53a)
- For a pinion yoke style we care about the face of the diff housing (add 7/8" to all above numbers get to this surface as per form "C".
    - User must then subtract out the horizontal length.

IF YOU GET LOST IN ANY OF THE DRIVESHAFT DETAILS, WE STRONGLY RECOMMEND YOU FINISH YOUR CRADLE AND DIFF INSTALL FIRST. THEN TAKE MEASUREMENT PER THE APPLICABLE DENNY'S DRIVESHAFT FORM.

Appendix B: For Users of 1350 U-Joints:

Well, I guess this means you're hardcore. Be proud, but going this way makes for a more work that you may or may not need. There's no magic to this you just want to maintain about 3/8" clear on all sides of the pinion, flanges, and hardware. You don't need to do exactly what I did but here's my version in case it helps you plan. We don't supply any of the referenced patch panels but if you're tackling this hammering a little steel to fit shouldn't be a big deal for you anyways.

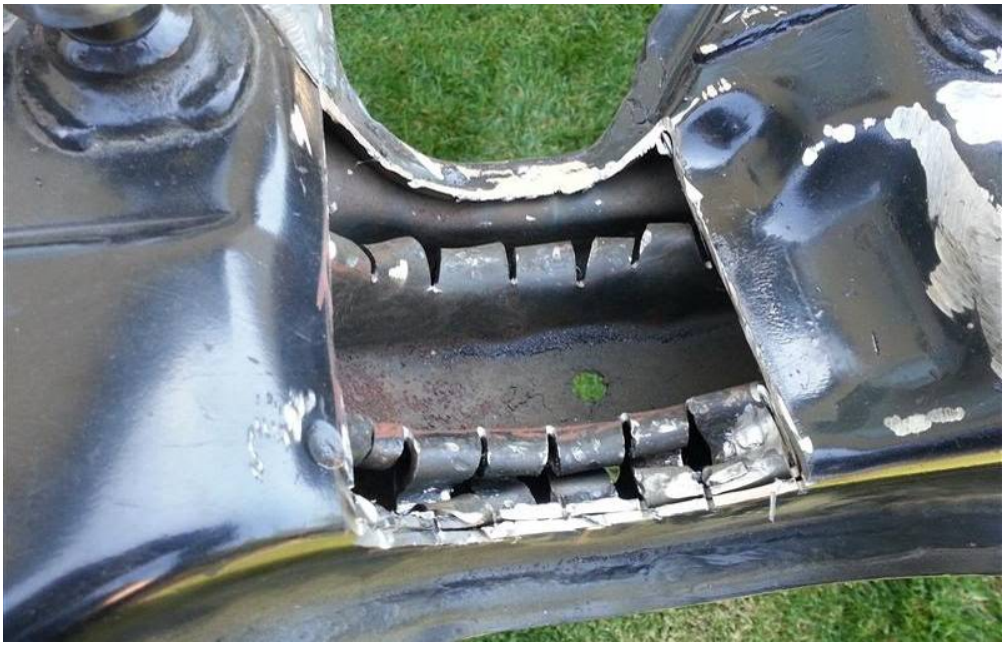
First off, recommend swapping from the stock pinion flange to a pinion yoke since it all tucks in a little tighter (hence less clearancing needed). I've been running a Strange Engineering U1630. You'll need U-joint straps separately and you may want to paint the exposed bits.

The subframe will require clearancing for the big U-joints (1310 makes your life much easier if you're 500 whp or less and/or don't really drag race).

Here's what the subframe looks like opened up (cut spot welds with a cutter and sliced perimeter open with an angle grinder).

The reinforcement inside is a bent section that forms an upturned L on one side and a upturned U on the other. Note the cut is strongly offset to the passenger side (most of these pictures are from the forward side of the subframe). **You need to cut down from near the tie rod end to about 1/4" above the pinch weld.** I used a 4 3/4" lid to mark the curves on both sides. I also ended up taking mine it all the way down to the pinch weld all the way across but it turned out to be a more than I needed.

You then can slice and hammer the bits inward.



We went a little nuts with my 110v mig, but since it was glowing hot anyways we just kept filling because it was getting good pentration so why not waste a little wire? Patch panel ready to go in. All my patch panels were 0.120” steel.

Patched and plug welded.

Ground smooth for better fatigue resistance. [Note, this ended up being imperfect. About 8 years later my welds cracked at the fore/aft seams, so I now recommend a patch and then doublers at the seams]

Even with it welded like crazy in the inside I decided to reinforce the bottom side too. Bending stiffness is the 3rd power of height (IE a box beam of 1/2 the height has only 1/8 the bending stiffness) so extra seemed like a good idea. Hammer formed 1/8" straps. I left the center hole open for drainage.

Like I said, this ended up being a bit more clearance than I needed (hence the extra doubler I eventually put on topside was fine) but it does clear well.

That extra topside doubler I added years later?

It's overkill, but I didn't want to do it again… You should be able to make this MUCH smaller if you are only reinforcing the welded seams of around the perimeter of the patch rather than doubling the entire area like I did. A couple little strips on top of your welds should do it.

Good luck and happy wrenching,
-Joel Payne (for the Ronin)