



RX8 8.8 (Series 1 Optimized) Kit Parts and Install
Instructions

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Revision C

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Kit Includes:

- Front Mount Support Bridge (weld in)
- Rear Mount Diff Cradle (bolt on)
- 2X Custom 4340 heat treated axle bars (Ford to Mazda conversion)
- 2X EMPI CV boot kit 86-2404 (outer CV joints)
- 2X EMPI CV boot kit 86-2215 (inner CV joints - was 86-2103 through mid 2022)
- Hardware
 - 9x 5/16-18 bolts w/ washers support the Rear cradle
 - 2x M12x1.75 bolt w/ washers and metal lock nuts are the primary front mount hardware
 - 2x Ford lower isolator bushings, large washers w/ a bonded rubber face
- Instructions and specs (this document, hosted online)



Note, we've adjusted the rear cradle slightly since this pic was taken.

Donor Parts (Supplied by Users):

- 06-10 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.
 - Note 2006 appears to have been a crossover year as some diffs came with one front mount and some with two. You want the IRS diff with TWO front mounts.
 - While the single front mount style can be used (02-05 explorers) this is not preferred.
- RX8 outer CV assembly (again everything short of the axle bar) **from a manual trans car.**
- **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
 - Most styles of OEM mounts work.
 - We recommend polyurethane mounts for a firm compliant setup. Superpro and Powerflex both make decent versions
 - We recommend Delrin mounts to minimize all motion (comes at the expense of added noise/vibration/and harshness.
 - Note, Whiteline bushings are not recommended as the heavy metal shell used by those bushings is challenging to press fit.
- 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)
- Angle grinder
- Welder

Torque Specs

- New Hardware
 - Diff Cover Bolts 25 ft-lbf
 - Front Mount Main Bolts 65 ft-lbf
- OEM Hardware
 - Per Factory Specs

8.8 Differential Trimming

Trim the 8.8 diff housing and diff cover to match Rear Mount Diff Cradle. Cut off both factory mount ears of the cover using an angle grinder or saw as shown. (Pics from the 02-05 Explorer cover, 06+ covers will be similar)



Rebuilds (if needed, or yoke desired instead of pinion flange)

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 is the specific 8.8 rebuild DVD available through Bad Shoe Productions:

<http://www.badshoe productions.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 Detroit TrueTrac (as of the time of this writing).

<http://www.drivetrainamerica.com/p-3902-913a561-detroit-truetrac-limited-slip-ford-88-31-spl.aspx>

All 2002 -2010 Explorers use the larger 31 spline differential internals.

Halfshaft Teardown and Re-Assembly

You need to start by removing the CV equipment and bearings from the inside of the Ford halfshafts and the outside of the Mazda FD 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 matters. 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 FD 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=46zHkn4lhK4>
 - Hummer removal http://www.youtube.com/watch?v=p7Blq5_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 plywood works well. A few pictures follow for how we do it.

- 1) Clamp the axle in a vice dangling it downward off the table. 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.

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 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):

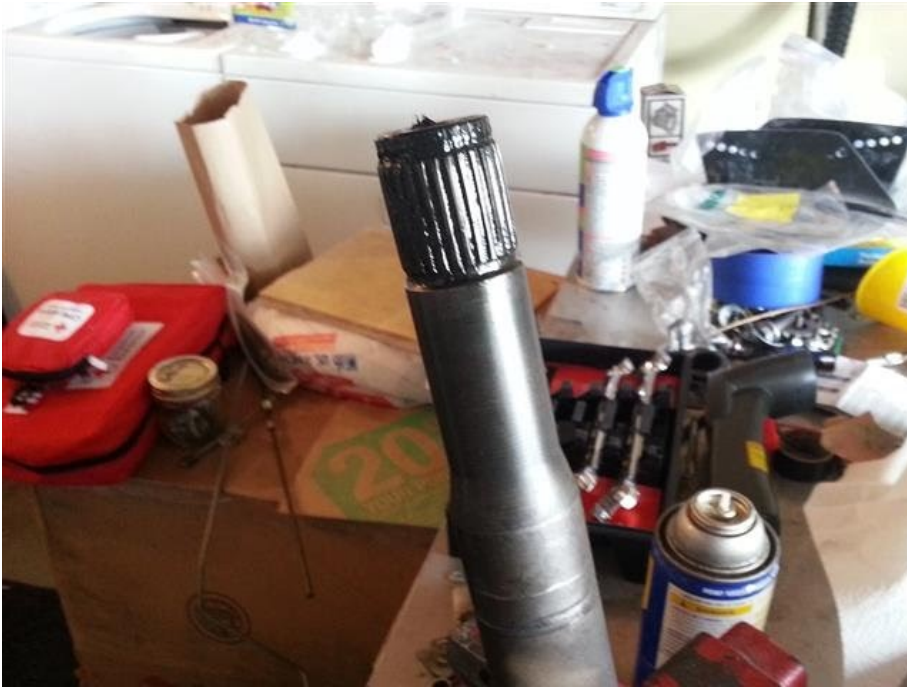


At the other end of the shaft you just have to be sure the chamfer on the underside of the tripod bearing goes on first. Otherwise it's pretty straightforward. No inner snap ring at this end, just the outboard one.



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, this set from an FC, the RX8's are unequal length.



Rear Diff - Ring Cradle

1. Paint rear cradle support in the color of your choice. Note, we recommend paint rather than powder coat for the rear cradle to ensure flatness is maintained. For greatest longevity of paint we recommend the following sequence:
 - a. Sand lightly
 - b. Wipe down all metal parts with acetone or denatured alcohol
 - c. Primer
 - d. Paint
 - e. Clearcoat
2. Assemble diff and Rear Cradle. The rear cradle installs behind the diff housing and cover with mount bores toward the rear of the diff. Torque all 5/16-18 hardware and washers in a star pattern. One OEM fastener (1 ¼" length will be used in the bottom center position).



3. Press rear mounts into the bores using grease if needed to aid the process. This is intended to be a close fit so you may find you need to trim the bushings slightly to clear the vertical faces.



Front Cradle – Subframe interface + Series 1&2 Notes

Note subframes for Series 1 RX8s (04-08) are slightly different than Series 2 (09+). Series 1 has a main front member on the OEM cradle with an open cavity on the bottom that the Ronin front diff support is intended to tuck up into. Our diff support will work with Series 2 but you need to do some extra trimming to clearance either the subframe OR new cross member so that the two can tuck together. It works but its some effort so we're going to be launching a custom setup for Series 2 in the future.

1. Remove rear brakes and tie them up out of the way to the suspension.
2. Disconnect driveshaft, remove exhaust and any other associated equipment
3. Drop entire rear subframe (can be done with A-arms still attached)
4. The front cradle spans the subframe and is located as follows:



We recommend the install be completed with subframe removed.

5. When situated the bridge should nest into a groove at the upper forward edge of the subframe. The two protruding mounts should point toward the front of the car. It should only land one way, but minor trimming may be required for an optimized fit.

Here's a couple more views of the fit with the subframe on a bench.



6. Clamp the cradle up as high as it'll go. We're looking to minimize corner gaps before welding.

Minimize gaps



7. Remove all paint from affected surfaces. A flap wheel with an angle grinder works well.
8. Front cradle welds in at the rear facing corners and stitch welds across the front face (makes up most of the accessible perimeter). We recommend you leave the diff in place while tacking to ensure alignment is maintained.



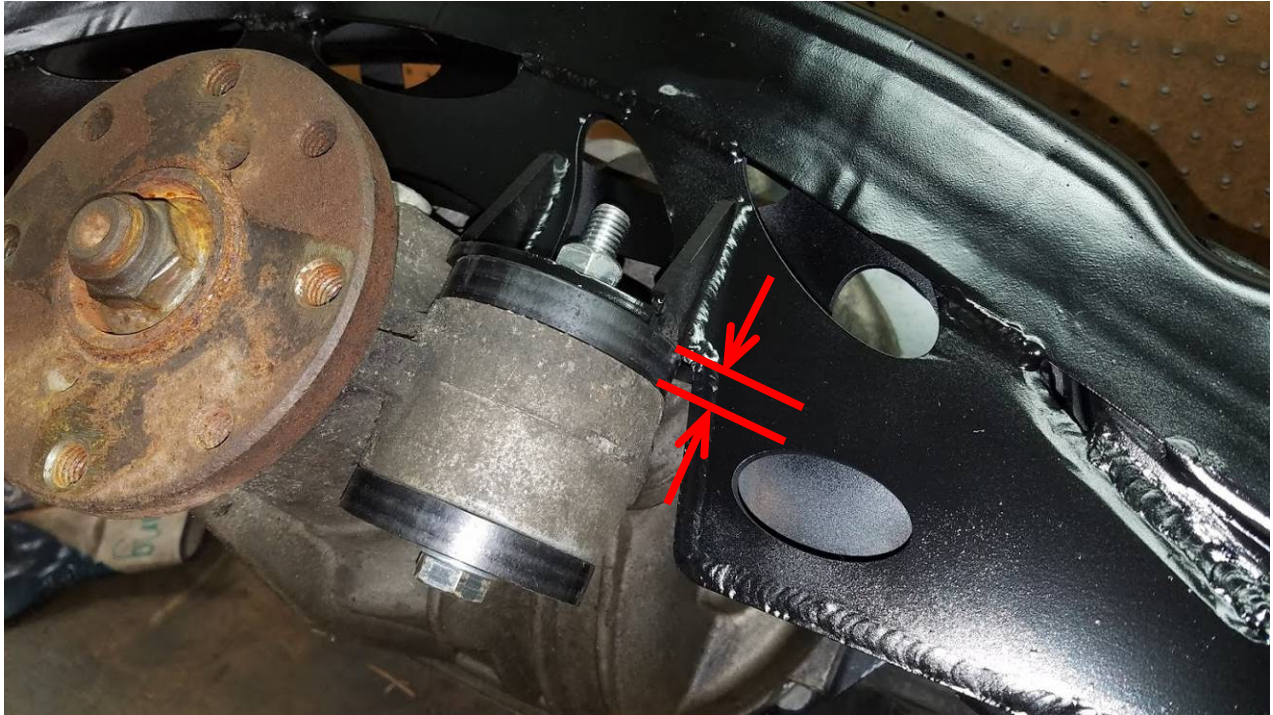


9. Follow up with paint... It's a good idea to shoot inside the profile of the cradle as well. The ends are intentionally left open for drainage (both paint if needed and water when in use).

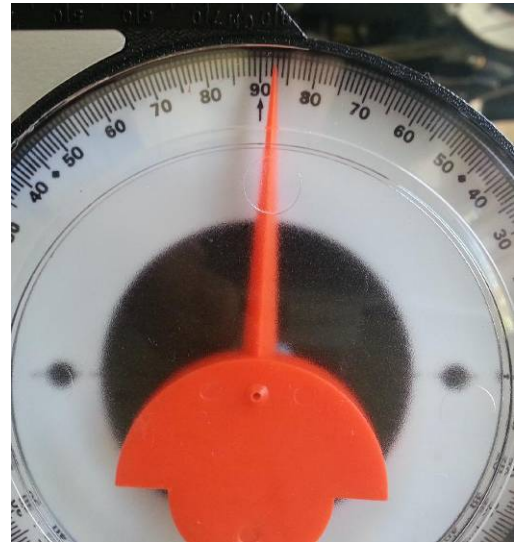
Result:



10. If you have the ability we do recommend verifying pinion angles. Test car predicted 2.5-3.0 degrees pinion up angle, but you can optimize by shimming or shaving the top of the front mount bushings.

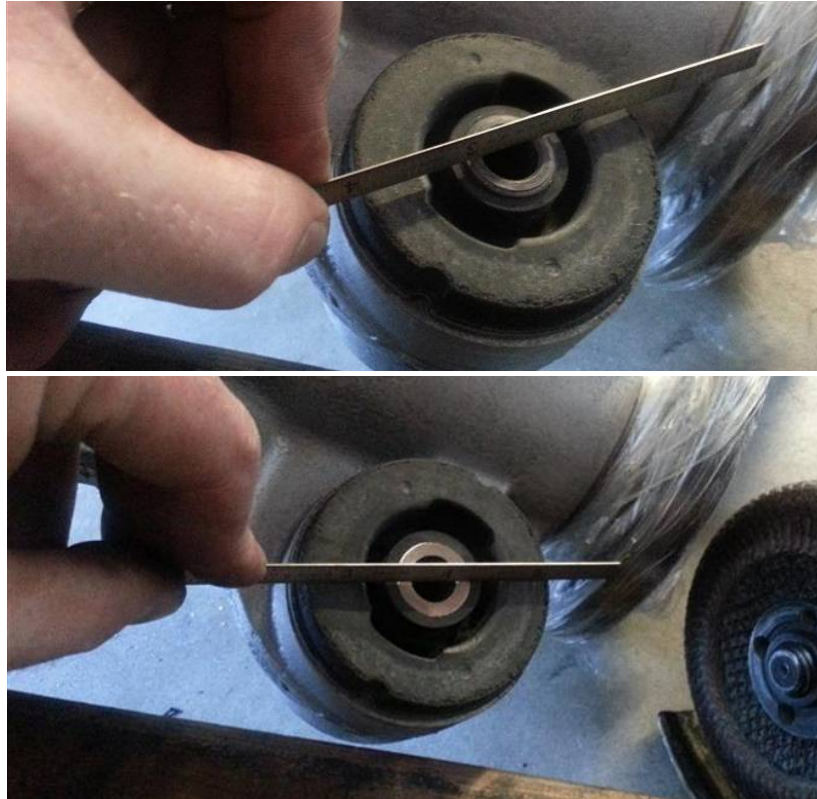


The key to pinion angle is that it wants to be equal and opposite the angle coming out of the transmission (IE transmission output should be parallel with the pinion shaft axis). A magnetic angle finder works well. The below are pics from setting up an FD...



Final Assembly

1. The Ronin supplied Ford isolators install below each diff front mount. If extra support is desired use an angle grinder and deck the internal sleeve on the top of the Ford front mount bushing to just BELOW flush with the surrounding rubber. This will preload the exterior of the front mount and help control the bushing. You'll want to do this at the same time as setting pinion angle.



2. Diff, subframe and halfshafts may now be combined. Torque all four main support bolts. The factory rear hardware is reused. It may require socket extensions and wobbly head socket attachments to access the rear mount bolts.



3. Halfshafts installation requires removal and reinstallation of the outer suspension knuckles.
4. The complete rear end suspension and diff assembly may now be lifted into the car.
5. Fill to the upper port with diff fluid (car must be horizontal for this step): we recommend AMSOIL Severe Gear Oil 75w140.
6. Torque all remaining factory hardware.
7. Note, e-brake cables will route through the holes in the front cradle, but it should be obvious where they want to run. Brackets may need to be bent slightly



8. Install driveshaft if you've already built one. Measure per the instructions below if you haven't. (Much more driveshaft information follows in the Appendix).
9. Put it back on the ground and enjoy your new setup. You may need to retune your speedometer.

Appendix A: Driveshaft Specifications and Details:

Note, we place the new Pinion flange very close to the OEM location. You may be able to re-use your existing DS with new mating flanges.

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 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 matter. 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.

Next we start selecting matching components for our U-joints... We provide links for quite a few, but plenty more options exist. Note: I do not 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:

- Any slip yoke intended for your transmission will work. Just be sure to select a yoke sized for the correct U-joints.

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 up to about 550 whp. Several online vendors all recommend 0.125” wall.
- 3.5” OD in a 0.125” wall aluminum will be good for something on the order of 1100 hp
- Obviously you can do Carbon Fiber or steel if you see advantages to alternate materials.

Pinion Flange Setup (rear connection option A)

- The Explorer IRS differentials all come by default with a Ford 8.8 “Large pattern” pinion flange.
- 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)
- Any drive shaft flange which mates to the “Large Pattern” Ford 8.8 will work.
- If you need the bolt set:
http://www.dennysdriveshaft.com/p359_bolt_set_for_pinion_flange_fits_ford_8.8_inc_h_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.iegss.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:

- Having now done one rebuild I can say that there are enough special tools involved that for 99% of the population it's going to be simpler and cheaper to have someone else rebuild your rear end for you.
- 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

- Note, if you've already had a driveshaft built with another V8 swap kit, you should check whether it can be used with only a new rear flange. We are receiving preliminary reports that the lengths are correct for a direct replacement between RX8 diff and Ford 8.8 (both pinion flanges land in an approximately common location).
- Until we have a bit more data taken I'm asking that all our users measure their own cars. 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

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.

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