

JANA 76

To begin with this installation is not suggested to be done by a 1st time Ring and pinion Installer. I would suggest a minimum of 4 ring & pinion set-ups experience prior to doing this modification. This kit is designed to be installed without machine work if all the proper parts are purchased. Good metal fabrication skills are a must. If you do not have a collection of bearing pullers, drivers, grinders, micrometers, dummy bearings, press, torch, welder, vice etc. you probably should not be doing this job.

NOTE: This is just not one of those “do-it late Friday night to go wheeling Saturday morning jobs”. This Kit is designed to work with Stock Dana 60 standard housings and Dana 70, & 70U standard parts. Other manufactures’ parts may require machine work. Also if you are used to doing a set up in 3-4 hours, then plan double or triple time.

I as much as you, hate instructions that are either too detailed or not detailed enough. Generally I want to see a good picture and the basics and I’ll get right to it; however there are some steps in this conversion that must be done in the correct order or bearings and seals will be permanently destroyed. Now, I know you don’t want to review 16 pages of procedures to find two torque specs and a couple of critical dimensions. So I will provide a Three step set of instructions, 1st I will give an overview of operations, 2nd detail it all, and the reasons things are done in such order & some hints, and 3rd a check list so you can go along and not paint yourself in a corner, or more importantly discover you have to grind something and the only way to prevent getting grit into your new bearings & locker will be to completely disassemble the unit wasting hours of rework & clean up time.

OVERVIEW

The basic order of operations will be to:

- (1) Grinding the housing for ring gear clearance.
- (2) Grind the carrier bearing snout to clear a narrower bearing.
- (3) Differential cover reforming and clean up.
- (4) Partial pinion set up, Installing adapter bearings, & spacers, no seal
- (5) Carrier & ring gear set up, with adapter bearings & spacer
- (6) Gear pattern and carrier bearing preloads
- (7) Pinion preload setting
- (8) Seal and seal ring, with final install of pinion with seal
- (9) Ring gear final install
- (10) Install cover oil, etc.
- (11) Break-in

DETAILED INSTRUCTIONS

(1) Grinding the housing

- a. After removing all old D60 parts reinstall just the d60 ring gear on the D60 carrier with just 4 bolts, and reinstall.

Note: If you are going lower gears you can put washers between your carrier and your old ring gear to simulate the thickness of your new gear, and you can also add an 1/8" thick lock washer to simulate a low speed carrier if your carrier is high speed.

Hints: At this point I can't emphasize enough that having a set of dummy carrier bearings will save an immense amount of time, energy, and frustration.

- b. If you don't have dummy bearings a set can be made out of your old bearings by sanding or honing the insides out until the bearings glide on and off of the carrier bearing snouts. Glide means that you can slip it on and off by hand, but it would not fall off under its own weight, thus there is no clearance or play when slipped on. This can also be done with a hardware store flap wheel sander in a drill. I usually sand around evenly for a minute and then check for fit, repeating this step 3 to 10 or more times until I get the perfect slip fit. If your old bearings are worn a few thousands or are slightly different dimensionally you can adjust later with the new bearings and shims, at least you will be very close as you move towards final assembly.
- c. When using dummy bearings pull out a .010" shim from each side of the carrier, this removes preload making the carrier easy to take in and out.
- d. Place the D60 carrier assembly into the housing. You will notice that there is about 1/4" space all around it. Since the D70 gear is 3/4" larger in diameter you need 3/8" space all around it. Thus you will be grinding approximately 1/8" into the housing. The housing will clear the larger ring gear most the way around except at the very top, bottom, and front near pinion head bearing.
- e. Using the supplied 3/8" ball on a stick feeler gauge, dip it in gear marking compound, grease or paint then place it on the outside of the ring gear and it will leave a trail where you need to grind for top and bottom clearance. Then since you won't be able to exactly see what you need at the front, mark out each side of the ring gear, you will grind the housing down between these marks until the chamfer is gone for the pinion bearing, and about half of the cast in oil scraper.



1 MARKING AREAS TO GRIND

- f. Remove carrier

Safety: In the next step you could breathe in enough cast iron dust to make your nose bleed, this is normal and you will recover but it's certainly not necessary. I highly recommend a dust mask or at least a handkerchief over your nose. Ear protection is also a must.

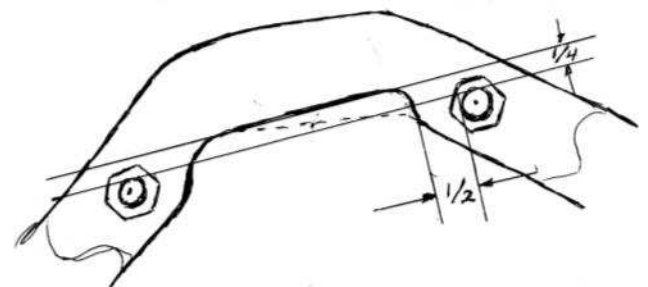
Safety: A full face grinding shield must be worn with goggles to protect your eyes. The wind created by a 4.5" angle grinder in the housing will hurl the grit right at your face.

- g. Take your time grind a little bit then reinstall carrier and using feeler gauge continue to mark and grind until you can tape the loose 3/8" ball anywhere on the OD of the ring gear and spin it and see about a 1/32 -1/16" clearance. At this point the D70 gear would be able to spin in the housing however it would not go in.



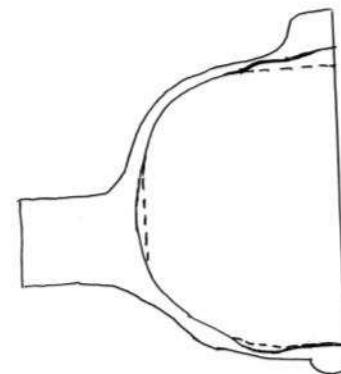
TYPICAL AREAS GROUND

- h. You now have to clear the housing tangent to the top and bottom clearance grinds to allow the D70 gear to fit in. These tangent lines are not perpendicular to the cover surface; they rise upwards about 1/4", Use the dimension from **sketch 1 and sketch 2** to scribe a line at the top of the housing.



SKETCH 1

Note: you will remove most of the material at the top of the housing keeping the bottom as thick as possible. Thus the ring gear is installed slightly above center line of axle and rolls down into the clearance pocket at the bottom of the diff.



SKETCH 2

- i. Use the D70 gear not installed on a carrier to start this part of the grinding procedure, once you can get it in by itself then we take a break, and clean the cast iron dust from our nostrils.

Note: there will probably be more grinding to actually fit the D70 parts in as an assembly but this way you can work your way to the proper clearances without over grinding.

- j. Check housing thickness with a caliper) you will get a small area at the bottom of the ring gear, about the size of an elongated quarter that is only 1/8" thick. This probably will not be a problem for a set of 4.56 gears but was with the thicker 5.86 gears.



2CHECKING THICK NESS

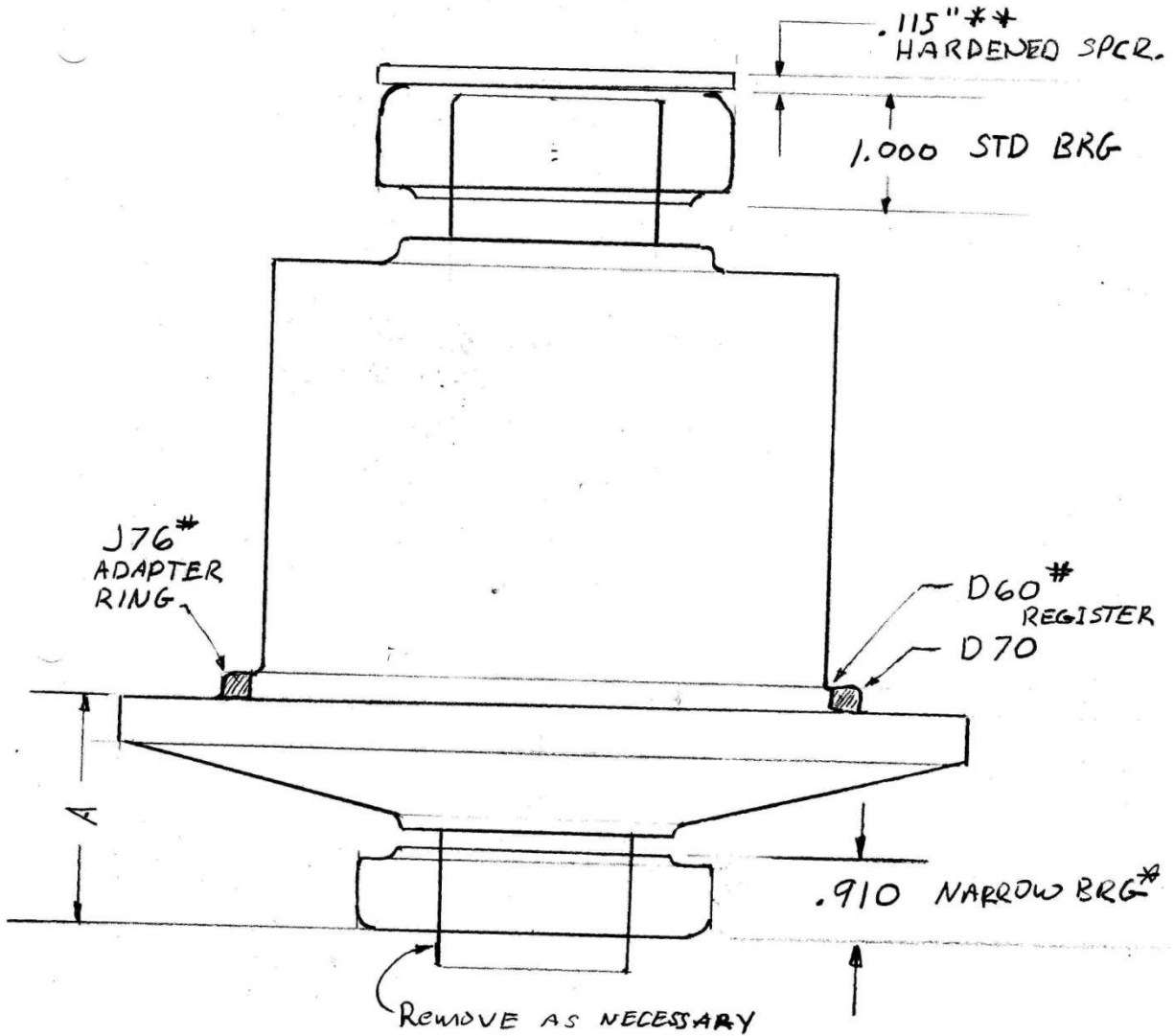
Note: Castings always vary a bit so if it gets thin it can be built back up to a minimum of 1/4" on the outside using a few passes with a wire feed welder. The housing is made of nodular cast Iron and welds nicely, but I still weld only 1" stringer beads at a time using the back stitch method and peen each stringer while still red with a small ball peen hammer to prevent any cracking. Don't get in a huff over losing ground clearance as this build up area will not be at the housings lowest point.



3WELD BUILD UP

Sketch 3

J76 FLANGE DIMENSIONS.



DIM A			} MACHINE - SHIM - CARRIER AS REQUIRED.
L.P.	4.10	↓ 2.265	
L.P.	4.56	↑ 2.390	
H.P.	ALL	2.165	

JANTZ ENGINEERING

JANA 76 SUGGESTED STARTING DIMENSIONS

- * SOME UNITS MAY NOT REQUIRE
- ** SOME UNITS MAY REQUIRE
- # REQUIRES NEW BOLT CIRCLE & CONCENTRIC RING

(2) Grinding the carrier

You will be placing a thin race and spacer assembly onto one side of the D70 carrier to get correct spacing. See sketch 3 as you read on. You can use a D70HD.

Now this gets rather interesting as you will need a D70 or D70U Carrier, but it does not matter whether or not it is a high or a low speed. Although the carrier offsets are the same amount on a D60 & D70 (1/8") the actual placement on the carrier is about 1/16" different. Thus by using a thinner bearing on one side of the D70 carrier and a thicker shim stack on the other side you can move it side to side quite a bit. D70HD carrier may require the removal of some of the bearing snout.

Read closely FOR USING STOCK TYPE D70 & D70U CARRIERS only, will not work with 70HD carriers.

Low on Low

If you are putting a Low speed Ring and pinion on a low speed carrier the flange on the carrier will be too close to the pinion thus a thin race and spacer is used on the ring gear side of the carrier and a thick shim stack is used on the pinion side of the carrier to move the flange away from the pinion.

Low on High

If you are putting a low speed Ring and pinion on a high speed carrier the flange on the carrier will be too far away from the pinion thus a thin race and spacer is used on the pinion side of the carrier and a thick shim stack is used on the ring gear side of the carrier to move the flange towards the pinion.

High on high

If you are putting a high speed Ring and pinion on a high speed carrier the flange on the carrier will be too close to the pinion thus a thin race and spacer is used on the ring gear side of the carrier and a thick shim stack is used on the pinion side of the carrier to move the flange away from the pinion.

High on low

Difficult but possible. Bearings will be placed as in High on High but you will also have to have a good machinist remove an 1/8" off of the Ring gear side bearing register or take 1/16" of the ring gear side bearing register and 1/16" off the ring gear mounting face. Also the housing and or carrier ribbing may need to be ground more to clear the side of the carrier on the ring gear side. Less grinding is required when doing the 1/16" & 1/16" machining process, but make sure ring gear bolts do not bottom out after removing 1/16" of material from carrier flange.

Read closely FOR USING AIR LOCKERS

For best results use a high speed carrier for low speed gears sets. A low speed can be used but extra shimming is required. And if you are installing high speed gears on a high speed carrier you may need some machine work.

Now the title of this section was grinding the carrier.

- a. So after deciding which of the ring gear carrier combinations you will be using grind about 1/16" off of the carrier bearing snout on the side that the thin bearing assembly will be going onto such that it does not protrude beyond the outer bearing race and shim assembly. If you grind the snout till the original chamfer disappears it should be sufficient.

The next hint is a Dummy carrier. If you are installing a Powerlock, or a Detroit and especially any Selectable locker, fighting the weight and complexity of these things will wear you out. Use a dummy carrier to get the basic ring a pinion set up done. It is worth while removing the spider gears and cross pins such that you save weight as well. You can even get the basic gear set up using an open High speed carrier, and then at the very end of all these steps put in your low speed locker for final assembly by switching the thin bearing assembly from side to side.

- b. Now it's time to try and install the gear on the carrier and see if you can actually get it in the housing. But first you'll want to just put the dummy carrier in the housing without a ring gear to establish the approximate shim pack starting thickness by installing the dummy bearings (with thick and thin races & the .100 thick spacer) on appropriate sides, Leave all shims out from under bearing on pinion side and place about .090" under bearing on gear side. Slip dummy carrier set up into housing, pry to one side and place a stack of shims in the gap between the race and the housing. Then remove carrier and place this shim stack under the ring gear side dummy bearing. Then test fit assembly into housing. At this point you don't want any bearing preload, so can you slip it in and out many times for fitment. Add or remove shims until you get a slip fit. I usually put enough shims in so that it just taps in and I can almost pull it out by hand.
- c. Now install the ring gear with just 4 bolts lightly torqued. Then place assembly into housing, Grind clearances again if/as necessary. Clearance should be checked with the ring gear positioned all the way to the max in each direction. To do this place all the shims on one side of the carrier only then check for clearance then switch all the shims to the other side and check for clearance. Note you may have to clearance the side of the carrier ribs, and or housing so that the carrier does not run into the side the housing.

(3) Differential cover

(Skip this if you have a D70 cover)

Now you have grinding grit all over everything. But don't worry about clean up yet.

Spraying a bit of paint on the inside of the cover place the cover on with 4 evenly spaced cover bolts about 2 threads screwed in. then spin the ring gear through the pinion hole and press the cover against the gear. The scratches in the paint will show the interference area. Transfer this area with marks onto the outside of the cover.

Note: the following is best performed with two people.

- a. Remove the carrier. Bolt the cover back on with all bolts tight. Heat up the area to be clearanced with a torch redish orange, then using a stout rod with a slightly rounded end beat out the cover through the pinion hole for ring gear clearance.
- b. After cover cools to room temp, remove it, replace carrier assy. back in and verify you have ring gear clearance. Repeat heat and beat steps if necessary.

Note: if you have an aftermarket cover, cutting sectioning and welding may be necessary



4AREA MODIFIED FOR RING GEAR CLEARANCE

(4) Partial pinion set up

See Supplement and Sketch 4. On the next page, do 1 first.

J76 PINION RACE INSTALL

Using scribe lay out a guide circle to grind to. Darken pocket shoulder with layout dye or black sharpie.

Die grind shoulder to edge of scribed circle. Use .100 step in gauge to verify depth. Casting must not touch stepped edge of gauge.

Clearance for housing bore is 3.300" plus

Step in race is machined to 3.295" giving .005" clearance.

When gauge goes completely around original bore without touching the casting you are ready.

Now I don't expect anyone other than a few tool & die makers to be able to grind within .005" So we will fill in the gap with epoxy having the same compressive strength as cast Iron.

Grind (4) 1/8" equally spaced notches in shoulder. (Or cut 1/8" 'V' with hack saw blade.)

These notches provide a relief for excess epoxy to squeeze out so as not to effect pinion depth.

Deburr edge of step with sand paper leaving slight chamfer .010".

Mix epoxy, approximately one teaspoon each tube.

Note: heating tubes in hot water for 10 minutes makes it mix smooth & creamy, making it more easy to apply, but also speeds up the curing of the epoxy, so work fast. You only have about 5 minutes to assemble. Have all tools necessary for the next steps laid out and ready to go, prior to mixing epoxy!

Place a smooth thin layer completely around each mating surface, both the step on the bearing and the ground out bore of the housing. Cover surfaces but do not use excessive amount. No epoxy is necessary in the original housing bore or on the original race OD.

Very carefully tap race into Pinion pocket, be very careful to go in evenly as the radius is not as generous as the factory bearing and will shave into the pocket wall if not installed strait.

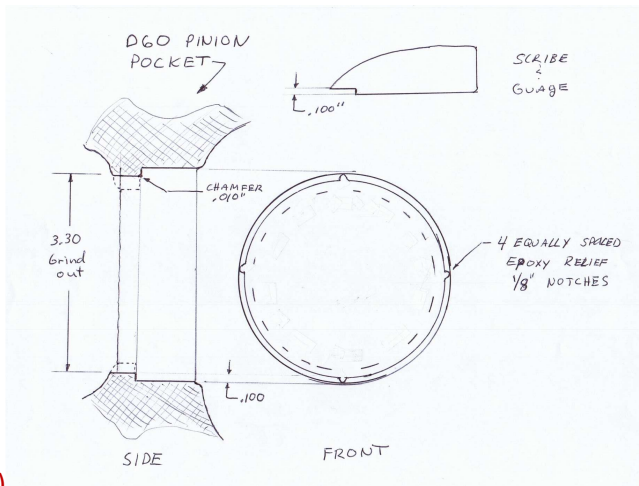
When the race is in about 75% to 90% in wipe out any excess epoxy, then

Take the pinion with a well greased bearing on it and install it with the tail bearing and yoke and 2 pinion nut washers, and the non locking pinion nut.

Torque down till you cannot rotate the pinion any more with two hands, (but no tighter)

Using a large center punch in the center of the pinion gear drive the head down with a couple of hard blow with a large hammer. If the pinion now rotates you squeezed a little more epoxy out from behind the shoulder, repeat torque and hammer steps until bearing race is fully seated. Take a 20 minute break while epoxy cures then disassemble and clean off excess epoxy.

Note: this new design places the pinion depth shims between the head of the pinion and the pinion bearing instead of between the pinion race and housing. (Sketch



4)

Do A first:

- a. Now it's time to clean up all the messes and reorganize your bench. Thoroughly wash all grinding residue from all housing cavities and axle tubes. Clean out your dummy bearings and carrier. Get things clean like you're going to assemble an engine!
- b. Install adapter pinion head bearing race into housing with a starting shim pack of .020".
- c. Install pinion tail bearing cup spacer with large beveled side against shoulder, then install tail bearing cup.
- d. Assemble bearings on pinion as usual and install into housing with yoke and 2 (yes 2) pinion nut washers and plain nut. The double washers keep the nut from running out of threads and galling into the corner of the pinion shaft.

Note: Due to clearance issues this system does not use any Slingers or baffles.

Note: **do not** install the seal, pinion bearing preload shims or seal ring at this time or you will just ruin them. Tighten the pinion nut until you are close to proper pinion preload. This is close enough for a starting point to install ring gear and get the pattern set up.

(5) Carrier

- a. Install as typical of any ring pinion set up. I suggest removing all the shims out from under the dummy bearings. But keep track of the total shim pack. Place the ring gear side dummy bearing all the way on, then the pinion side dummy bearing 3/4s the way on. While installing carrier pry the dummy bearings outboard, and simultaneously pry the ring gear till it just touches the pinion then
- b. Take your shim pack and divide it up side to side between the bearings and the carrier for a preliminary back lash and preload setting.

(6) Gear Pattern

- a. For this step, set up the ring and pinion as you would normally do, shimming the pinion in or out for correct gear wear pattern keeping the back lash in specs.
- b. Don't worry about pinion preload shims yet but keep nut tightened for proper pinion bearing preload.
- c. Once you are happy with the pattern, remove the dummy carrier and install your Locker with the dummy bearings to get the backlash correct again, and then switch to the final bearings setting your carrier preload. Dam that thing is heavy! Then unfortunately remove it again and set it aside.

(7) Pinion Preload setting

Note: In order to keep from snapping D70 pinion shafts off at the shoulder where the preload shims go, the radius was increased; unfortunately the bearings available have a smaller radius. To remedy this issue Dana used an 1/8" thick pinion preload spacer formed with a large radius so as not to ride up the radius at the shoulder. This 1/8" spacer is not used here for space reasons but its function must be kept.

- a. Install the chamfered .030" shim on first with chamfer to radius.

This shim **must always** be placed in shim pack 1st with chamfer to radius **or failure will occur**.

- b. After installing modified 1st shim, add about .025" more shims and use this as a starting point to set up the correct Pinion preload. Add and subtract shims until torque to rotate pinion is between 17-30 in-lbs. Remember to use the plain nut and two washers for this step.

(8) Seal and seal ring final install

The following steps must be done in exact order to prevent seal damage.

- a. Remove Pinion yoke,
- b. Install seal,
- c. Install seal ring, through seal flush against tail bearing with suitable driver. Be extremely careful with the outside diameter of this ring as the inner Oil lip seal rides on it. The outer seal lip rides on your pinion yoke just past the chamfer. Make sure this area is free from nicks, and polish.
- d. Install yoke, using only 1 washer, a new pinion nut & torque to 240-300 ft-lbs.

(9) Ring & carrier install

- a. Install as normal



(10). Cover Install

- a. Install cover

Note: Add break-in oil. I recommend using standard 90wt GL5 for the 500 mile break-in period then Amsoil



severe gear 75W140 (SVT) for general use, or Severe Gear 250 (**SRT**) for rock crawling and desert racing. If you didn't purchase this with the kit it can be ordered at <http://www.amsoil.com/> search for SVT or SRT and use sponsoring dealer # 1704698 at checkout. Typically arrives in 1-2 days.

(11) Break in

- a. Follow standard break in procedures, 500 miles before hard use and never more than 25 miles at a time without a 15 min cool down.

Note: for a good dissertation on break in procedures please go to <http://www.4x4now.com/gt0999.htm>.

(12). You are now JANA HYGRADED

- a. Now go out and wheel it like you stole it and enjoy the strength of the *JANA HYGRADE*

CHECK LIST

(1) Grinding the housing

- a. Install just the d60 ring gear on the D60 carrier with just 4 bolts.
- b. Make dummy bearings
- c. Place the D60 carrier assembly into the housing.
- d. Mark out where you need to grind for clearance. **see picture.**
- e. Remove carrier
- f. Grind a little bit then reinstall carrier and using feeler gauge continue to mark and grind until you can tape the loose 3/8" ball anywhere on the OD of the ring gear and spin it and see about a 1/32 -1/16" clearance
- g. Clear the housing tangent to the top and bottom clearance grinds to allow the D70 gear to fit in. **sketch 1 & 2.**
- h. Use the D70 gear not installed on a carrier for check fits for this part of the grinding procedure.
- i. Check housing thickness with a caliper (**see photo**) build up to 1/4" with weld if necessary.

(2) Grinding the carrier

- a. Grind about 1/16" off of the D70 carrier bearing snout on the side that the thin bearing assembly will be going onto.
- b. Determine approximate shim stack with dummy bearings.
- c. Install ring gear on dummy carrier and check, fit and grind clearance again if/as necessary.

(3) Differential cover

(Skip this if you have a D70 cover)

- a. Spray paint on the inside of the cover & mark for ring gear clearance. Transfer this area with marks onto the outside of the cover.
- b. Remove the carrier. Bolt the cover back on with all bolts tight.
- c. Heat & beat & clearance cover.

(4) Partial pinion set up

- a. Clean up & reorganize your bench.

Note: Due to clearance issues this system does not use any Slings or baffles.

- b. Install adapter pinion head bearing race into housing with a starting shim pack of .020".
- c. Install pinion tail bearing cup spacer and then tail bearing cup.

d. Assemble bearings on pinion as usual and install into housing with yoke and 2) pinion nut washers and plain nut.

Note: **do not** install the seal, pinion bearing preload shims or seal ring at this time or you will just ruin them. Tighten the pinion nut until you are close to proper pinion preload. This is close enough for a starting point to install ring gear and get the pattern set up.

(5) Carrier

- a. Install as typical of any ring pinion set up.
- b. Set preliminary back lash and preload setting.

(6) Gear Pattern

- a. Set up the ring and pinion as you would normally do, for correct pattern & backlash
- b. No preload shims yet but keep nut tightened for proper pinion bearing preload.
- c. Remove the dummy carrier and install your Locker with the dummy bearings to get the backlash correct again,
- d. Switch to the final bearings setting your carrier preload.
- e. Remove carrier and set it aside.

(7) Pinion Preload setting

- a. Install the chamfered .030" shim on first with chamfer to radius.

NOTE!!!! This shim **must always** be placed in shim pack 1st with chamfer to radius **or failure will occur**.

- b. After installing chamfered 1st shim, add about .025" more shims and use this as a starting point to set up the correct Pinion preload. Add and subtract shims until torque to rotate pinion is between 17-30 in-lbs. Remember to use the plain nut and two washers for this step.

(8) Seal and seal ring final install

The following steps must be done in exact order to prevent seal damage.

- a. Remove Pinion yoke
- b. Install seal
- c. THEN Install seal ring, through seal flush against tail bearing with suitable driver. Be extremely careful with the outside diameter of this ring as the inner Oil lip seal rind on it. The outer seal lip rides on your pinion yoke just past the chamfer. Make sure this area I free from nicks, and polish.
- d. Install yoke, using 1 washer only, a new pinion nut & torque to 240-300 ft-lbs.

(9) Ring & carrier install

- a. Install as normal

(10) Cover Install

- a. Install cover
- b. Add oil. I recommend Amsoil severe gear 75W140 for general use, and Severe gear 250 for rock crawling and desert racing.

(11) Break in

Follow standard break in procedures, 500 miles before hard use. Yeah, like that ever happens.

(12) Drive it like your King of the Hill.