Ball Joint Replacement for 2005 F-250 6.0L SuperDuty SRW, 4x4 with ESOF

Parts required:

two 5C3Z-4A322-AA = hub / steering knuckle o-ring (my originals were yellow, the replacements are black)

two AC3Z-1S175-A = updated axle shaft "dust seal"

two 5C3Z-3254-A = steering knuckle / axle shaft seal

upper and lower ball joints (I went with Moog from rockauto.com) = two K80026 and two K8607T

two 5C3Z-1K106-AB = hub lock service kit (optional, at your discretion)

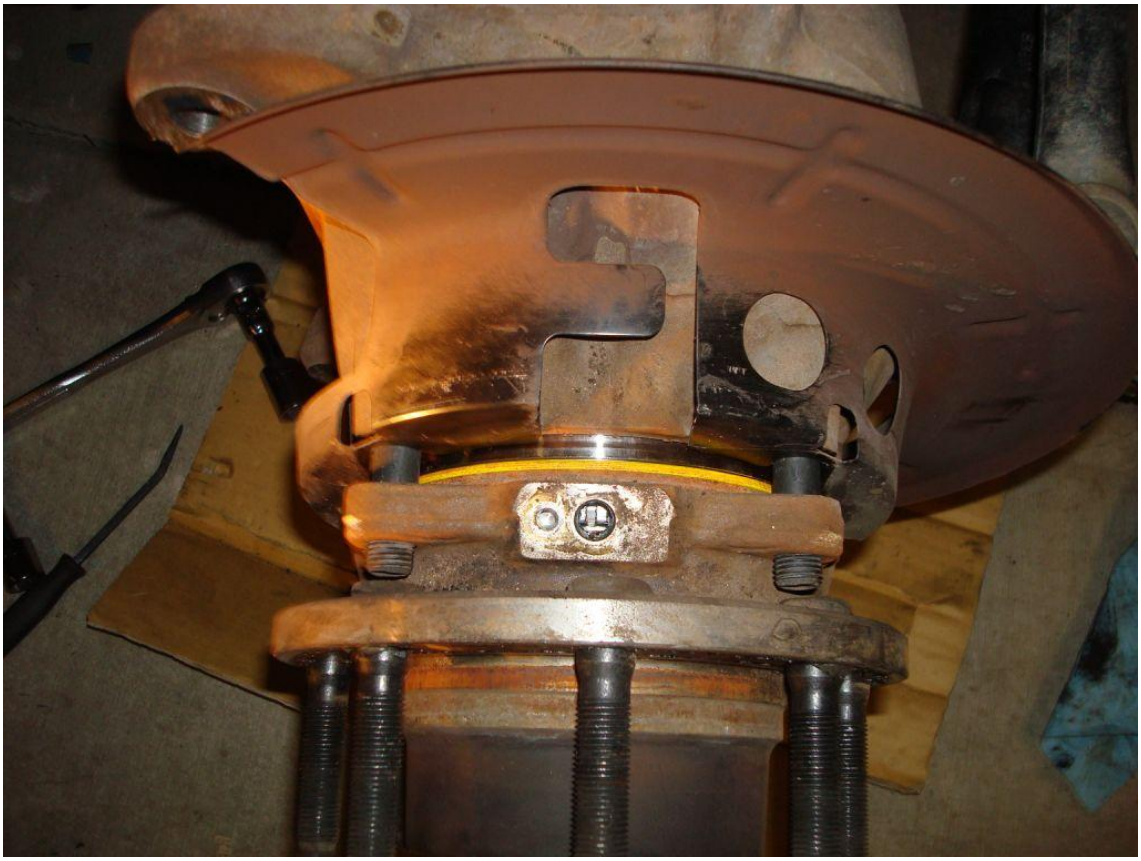
205-440* = Installer/Remover, Drive Pinion Oil Seal

205-830* (F250/350); 205-831* (F450/550) = Installer / Wheel Knuckle Seal

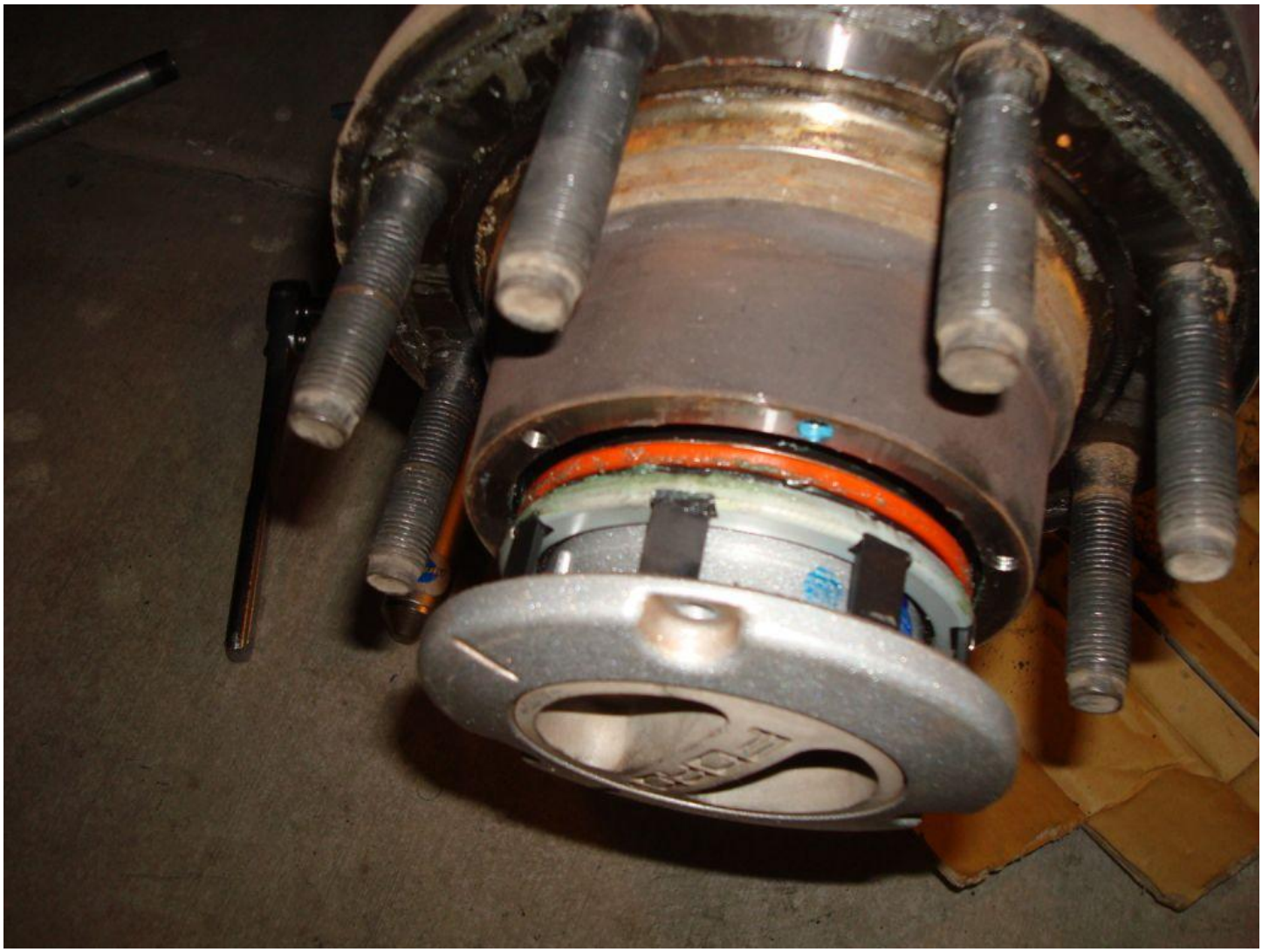
Special tools* - This job requires some special tools - ones you either make yourself, figure out close substitutions from a hardware store, or buy from Ford. If you have at your disposal the proper Ford tools, I would HIGHLY recommend them. The details below describe how you can complete the job with common parts from a hardware store, but great care must be taken to ensure each seal is seated properly and to the correct depth. If not, you run the risk of severe damage to the bearings, hub, axle shaft and knuckle. YOU'VE BEEN WARNED!

1) Brake caliper removed. You must not let the caliper hang by the hose; I use an old coat hanger to suspend the caliper. Be warned: the caliper bolts took an incredible amount of muscle not only to break them loose, but to fully extract them (mine were coated with a lot of thread lock). I had to use a pipe slipped over the end of my socket wrench to break them loose. 2 Brake caliper bolts reinstallation torque = 225 Nm (166 lb-ft).

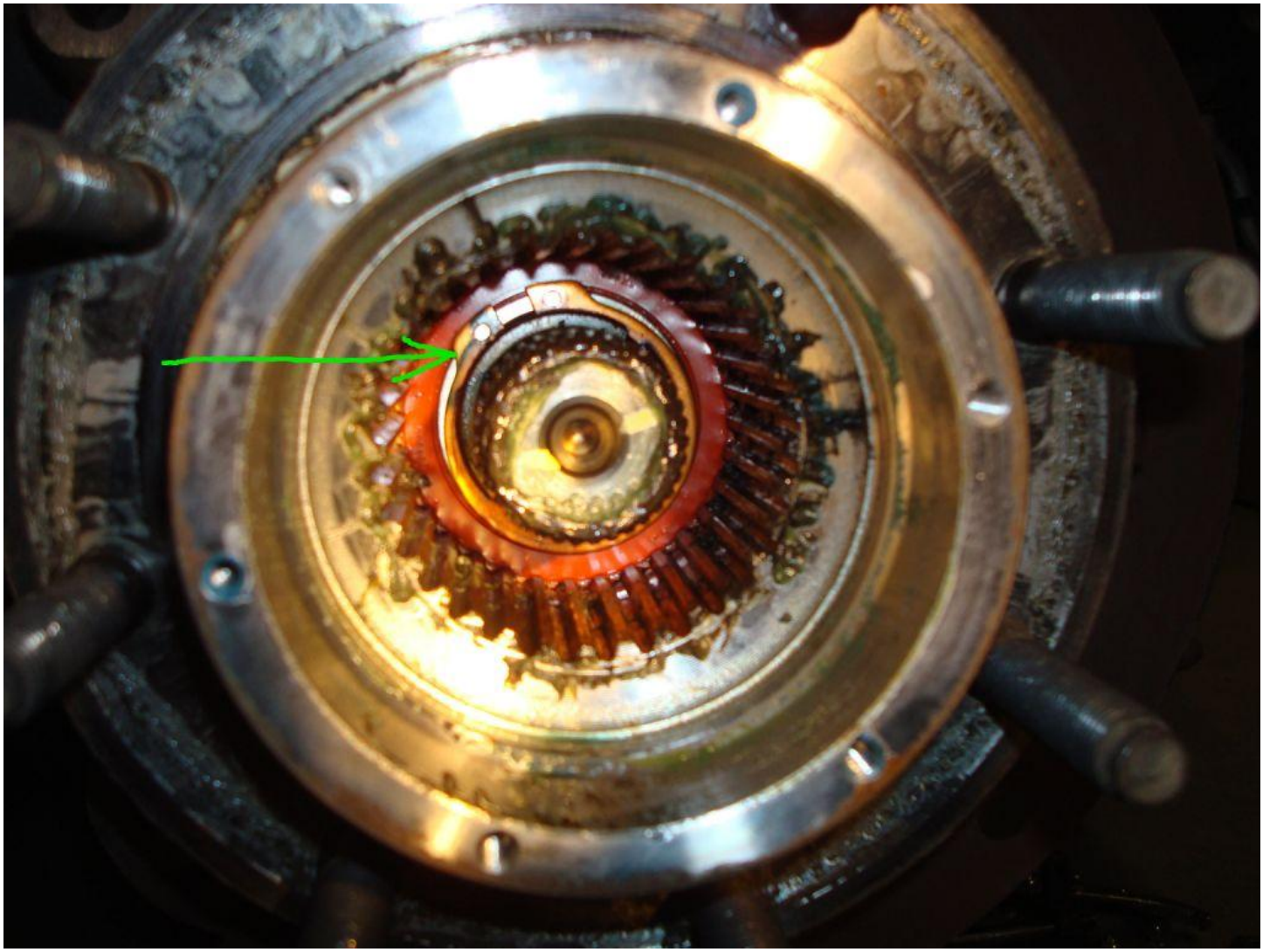
2) Removing the ABS sensor. There was so much brake dust and dirt on the outside of mine, that I initially had a hard time figuring out what portion of it actually separated from the hub. I suppose you could leave it in place and just unfasten enough retaining clips to set the hub off to the side, but I found it far easier to remove it. There is a small sealing o-ring that provides a little bit of resistance when first pulling it out. The bottom photo shows it removed completely, and the hub is actually pulled out a bit from the steering knuckle. 1 ABS sensor reinstallation torque = 18 Nm (13 lb-ft)



3) Hub lock pulled free. This is held in with three small Torx screws. The service manual says you might have to jiggle the drive shaft a bit to loosen the spline fit, though mine came out with ease. You might have to gently pry it loose from the hub face, the gasket can sometimes be a little sticky. There is a Ford service kit for the hub lock which includes a new o-ring (orange one seen below) and a new gasket that fits between the hub face and the hub lock flange. They claim a new o-ring and gasket should be used when removing and installing the hub lock - you might be able to get away without replacing it, but you run the risk of creating a vacuum leak, which will cause your hubs not to automatically lock when selecting 4x4 from the dash. 3 hub lock Torx screws reinstallation torque = 6 Nm (55 lb-in)

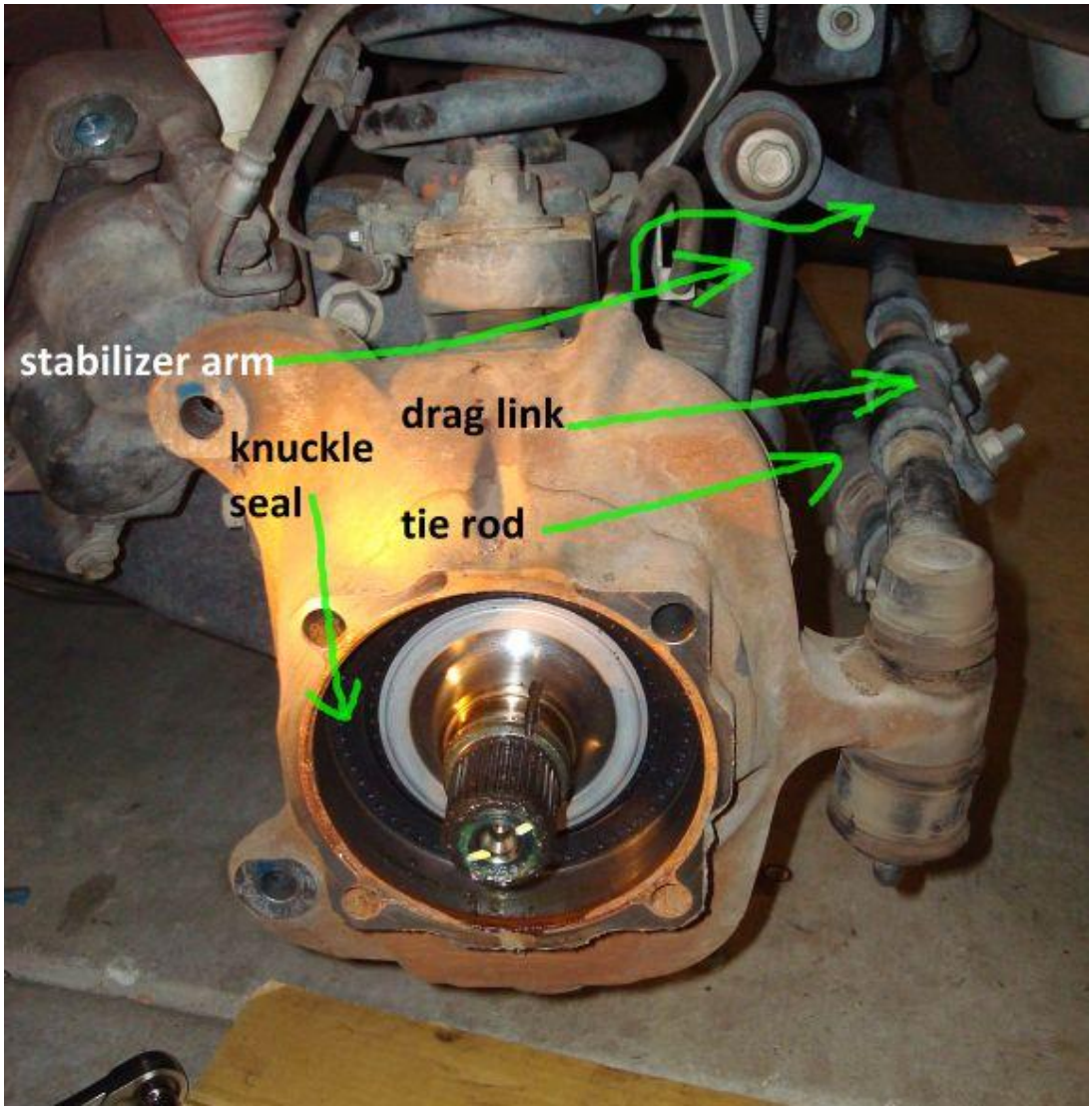


4) Snap ring. Oh the dreaded snap ring. This is what's visible when the hub lock is removed. Out of this entire job, this snap ring was one of the two most frustrating aspects (the other being the ball joints themselves, more on that later). There is not a lot of clearance between the OD of the spline on the drive shaft and the ID of the spline on the hub. This, combined with the depth that the snap ring sits at, makes it difficult to extract.

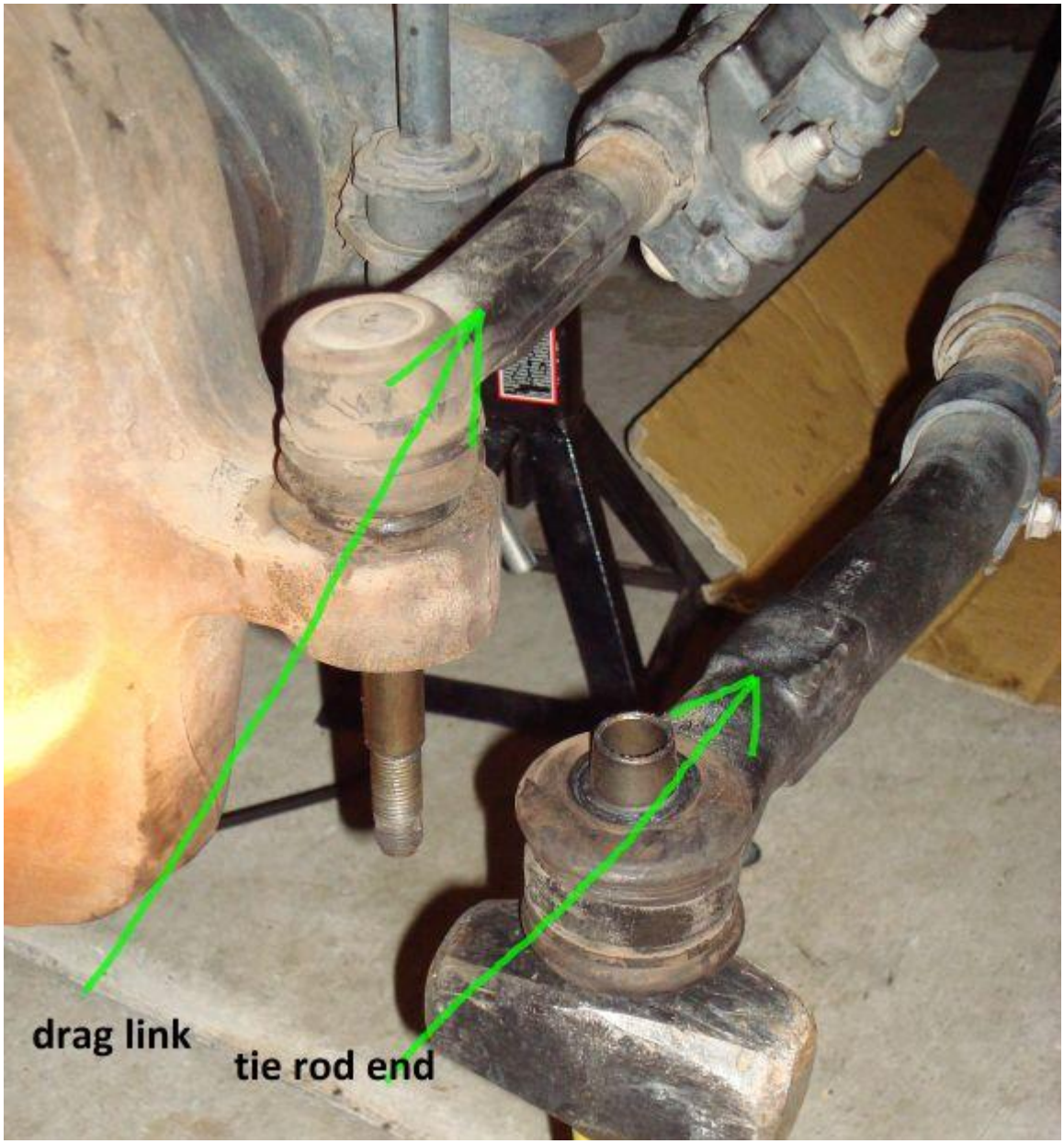


Adding to the frustration is that **none** of the normal, readily available sources of inexpensive auto tools (AutoZone, Checker, Napa, Carquest, Craftsman, Pep Boys, etc) carry a set of snap ring pliers that are long enough. Trust me. I spent all day Saturday driving around to these places. The only place that had something viable was Harbor Freight. A friend of mine classified Harbor Freight as "a great place to get a tool if you need it to last just for the day". That couldn't be more true when it comes to their snap ring pliers. They did have a large set of snap ring pliers that are deep enough, but I bent the first set, and had to go back and get another set (I was more gentle this time). Note the required length of the pliers below - the pliers need to reach about 4 inches in to get to the snap ring. If I were to do this job again, I would get with a local Snap-On or Matco rep and spend the money for the correct tool. It will turn 30 min of cursing and swearing (per side) into a simple 5 second task.

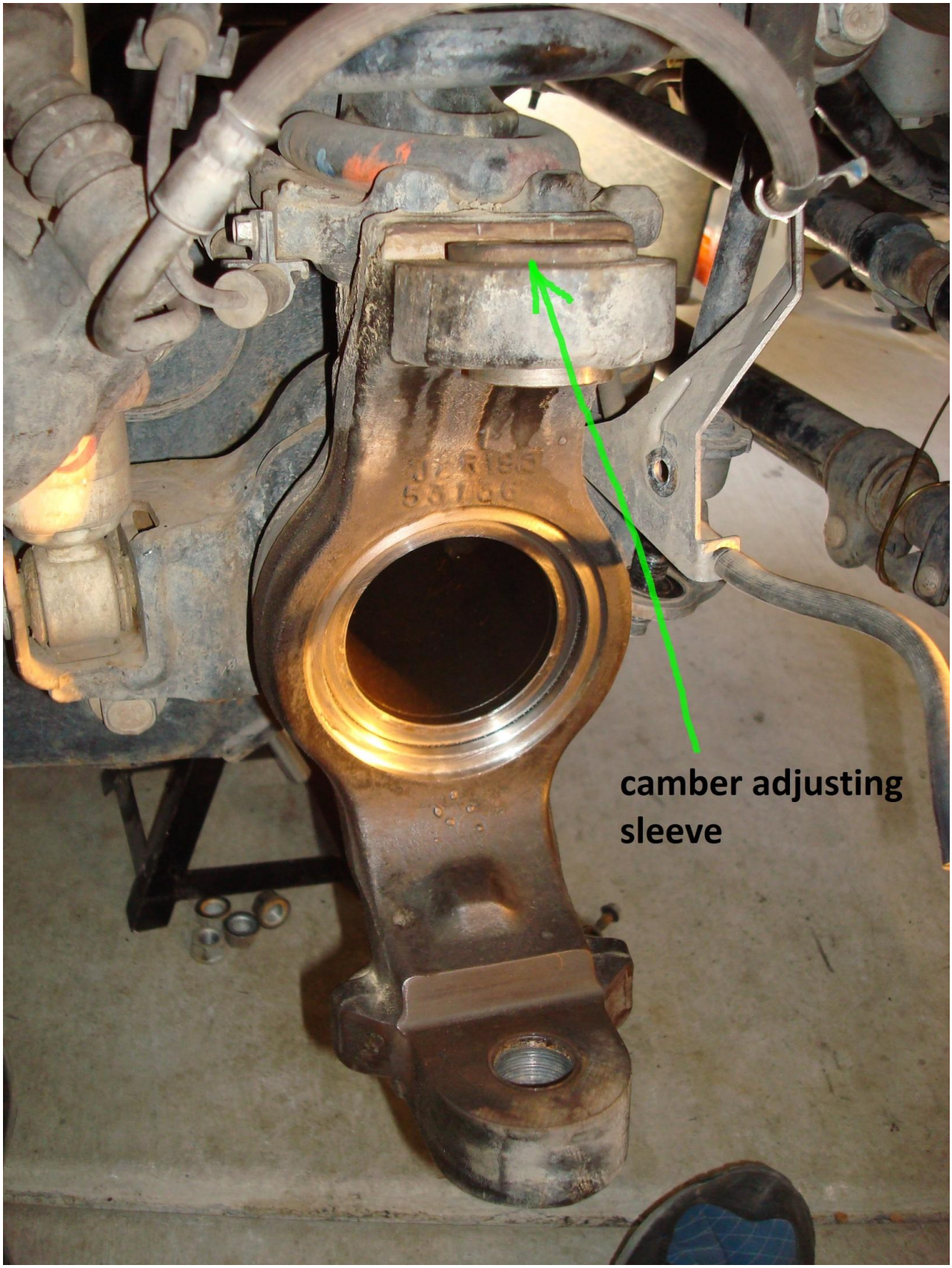
5) Now that the !@$# snap ring is removed, remove the 4 nuts on the backside of the steering knuckle and the hub can be pulled free and set to the side. Note the large black seal inside the steering knuckle. This is a very tight fit, and needs to be pounded on from the back side to remove it (which subsequently destroys it, requiring a new one for re-assembly). Before removing it, measure the depth where the seal sits - this will come in handy when installing the new one. In order to get better access to the back side, I found it easier to disconnect the tie rod end first, allowing the knuckle to swing about on the ball joints. This way you can pound a couple times on one side, swing it, pound on the other side, etc. This seal may be harder to remove than you think. Keep pounding, it will eventually come out. 4 hub nuts reinstallation torque = 180 Nm (133 lb-ft)



6) The driver's side tie rod end is easy, but the passenger side is a little more difficult since it's attached to the drag link. I found it easiest to loosen the nut so it's flush with the bottom of the drag link stud and give it a couple whacks from the bottom with a small sledgehammer. I tried a couple different pullers that I rented, but there's no good spot for all the puller arms to grab on to. The drag link will not pull completely free from the steering knuckle without loosening the stabilizer bar nut (both sides) and swinging the stabilizer bar up and out of the way. When you're done, grab another wire hanger and secure both the tie rod and drag link out of the way. In the picture below, the tie rod end is precariously balanced on the sledgehammer just for the picture, don't leave it this way! 1 Tie rod end nut reinstallation torque = 70 Nm (52 lb-ft)



7) Loosen the nuts on the ball joints to be flush with the stud, then start whacking with the sledgehammer. With the nuts still on the stud, this will retain the steering knuckle (very heavy) and keep it from crashing to the floor. This is what it looks like with the steering knuckle removed:



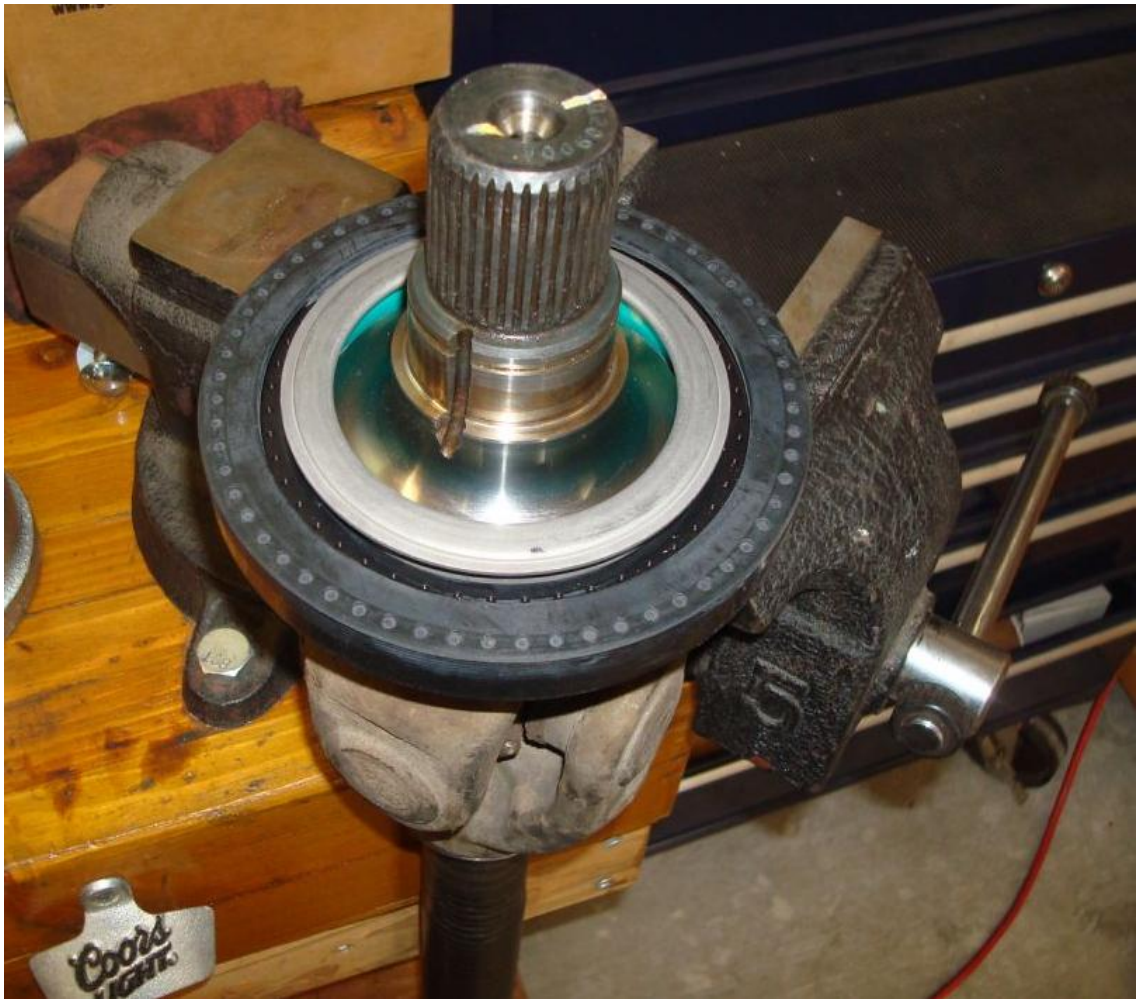
8) Unlike earlier model years, you don't have to worry about messing up the position of the camber adjusting sleeve upon reinstallation of the steering knuckle. As long as the flat edge is facing inward, that's all you have to worry about.

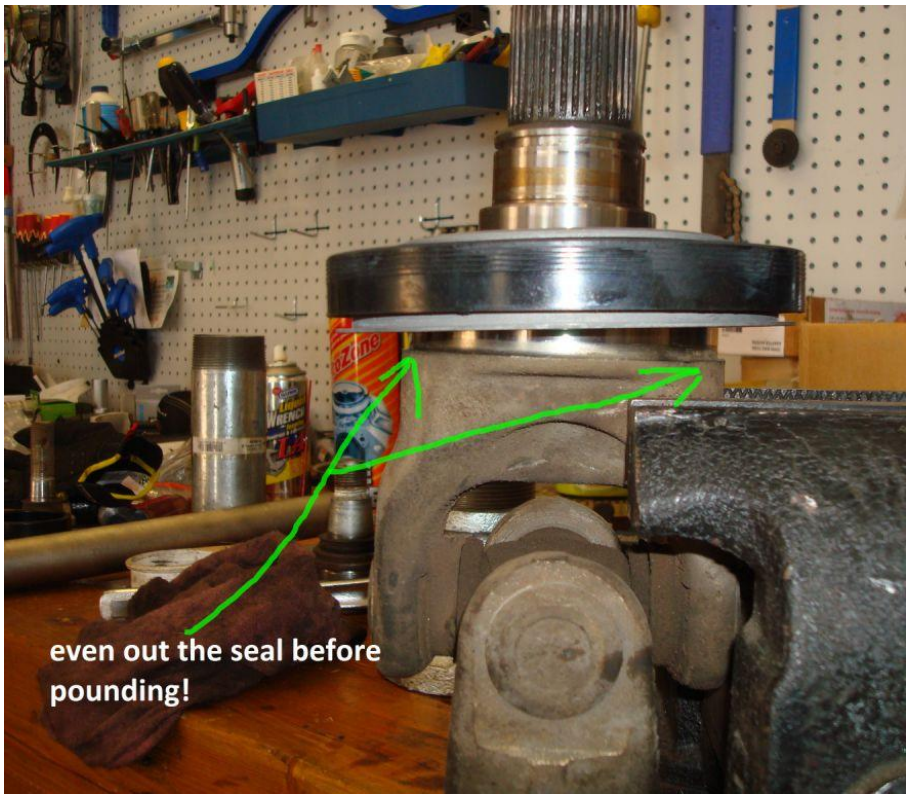
9) Removing and installing and the ball joints from the steering knuckle - the other single most frustrating aspect of the job. Not that it's particularly hard, if you have the right tools. The ball joint press kits and oversized 4WD adapter kits that you can rent from the auto parts stores don't have the right sized (diameter and depth) adapters to make this part of the job go smoothly. I solved it by rigging up a combination of adapters and plate steel to finally get it to work, but not after several attempts of trying different combinations (and more cursing). It was kind of like working on a puzzle with pieces from another puzzle, but trying to force them together anyway. Depending on what you have lying around your garage, you might have something that will work in a similar fashion:

10) This is just a shot of a good tip I read in one of the other write-ups. When you first begin to tighten the lower ball joint nut, eventually the stud will begin to turn in the joint instead of the nut turning on the stud shaft. By placing a floor jack under the knuckle and providing a bit of pressure, the stud will begin to seat in the knuckle, keeping it from turning and allowing the nut to turn on the stud shaft once again. You can also see in this shot the stabilizer arm that was loosened to provide room for the drag link to be removed from the steering knuckle. Carefully follow the torque instructions that came with the new ball joints.

11) I forgot to take a picture of the top ball joint nut during install, but this is important to note. Surprise! On the Moog ball joints, it's a 33mm nut, bigger than the OEM nut. What does this mean? Because the centerline of the upper ball joint is angled towards the coil spring, the larger nut means that you will not be able to get a socket and a torque wrench on this larger nut (at least I couldn't). Solution? A crowfoot. Problem is, good luck finding that 33 mm crowfoot. I poked around on eBay and scored this handy dandy item for a mere $25:

12) Installing the new drive shaft / steering knuckle seal. At my local Ace Hardware store I found some plumbing pieces that ended up working adequately as a seal installation tool. A galvanized 2" cap, pipe, and 3" X 2" reducer screwed together to fit the job nicely. Just be careful to get the seal started evenly. This is where the Ford tool would save some headaches - I'm assuming it pilots on some portion of the shaft to seat the seal evenly. I hung the axle from my vice just above the u-joint - I can't imagine trying to do it any other way.



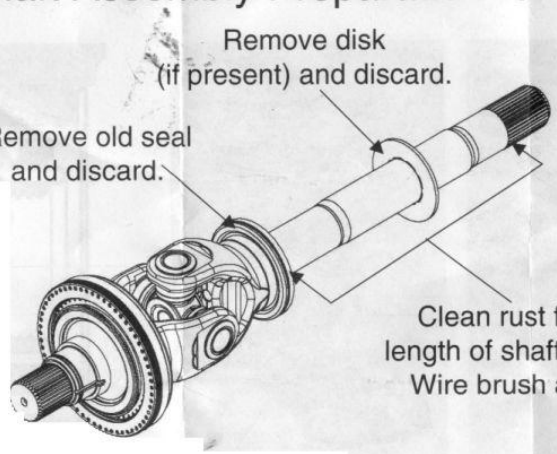

even out the seal before
pounding!

13) Axle tube seal (i.e. dust seal). This is an updated seal that superseded the one that was on my truck. Rather than fitting on the axle shaft, it lightly presses into the flange on the end of the axle tube. I found that a 4" PVC coupler with a piece of wood to lightly bang on made a perfect tool to press this in place:

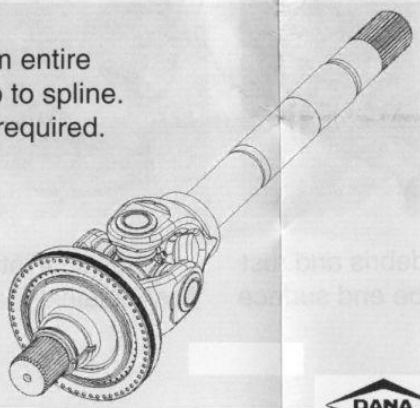
This is the seal before and after installation:

This is the documentation that came with the updated seal:

Shaft Assembly Preparation for Use of New Cartridge Seal



Clean rust from entire
length of shaft up to spline.
Wire brush as required.



Shaft assembly –
ready for installation.

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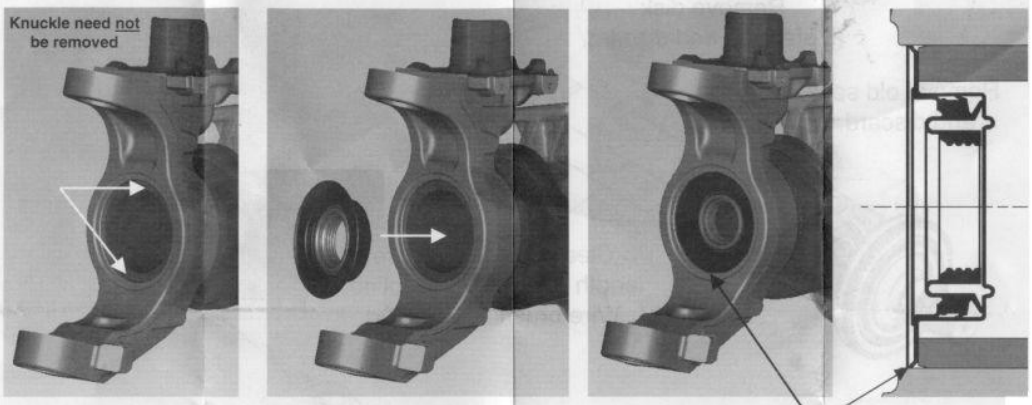
Rev. A 12/03/09

Service Bulletin: New Cartridge Seal – Installation Instructions



Clean debris and rust
from tube end surface

Press seal into yoke -
flush against the tube end

Installed position - Seal flange
OD pressed into yoke ID

Carefully, slide shaft assembly through newly installed seal.
See other side for shaft preparation.

DANA

Dana Light Vehicle Driv
Products Group
Bulletin 20148
Rev. A 12/03/

14) Installing the axle shaft / seal assembly. I apologize for forgetting to take a picture of this step, but I realized a lot of this stuff after the fact. If you remembered to measure the depth of the old seal, use that to determine how far to seat the new seal / axle assembly. If not, the outboard outer edge of the seal needs to sit right at or just a millimeter or two inboard of the second stepped diameter in the knuckle. I don't know if the inboard outer edge of the seal is structurally sound enough to stop itself at the right depth against the last, smallest diameter step in the knuckle. The installation tool from Ford seats it at a specific depth, so if you're making do without and you go too far, you're faced with tearing it out, buying a new seal, and trying again. So, what did I use to pound this seal in? A threaded 4" diameter PVC coupler and an end cap and a 3 lb sledge hammer. Pounding on PVC isn't the greatest (or probably safest) but I really wailed on it and it eventually got there.

In a write up for a 7.3L ball joint procedure, the author states he got the knuckle seal just deep enough to seat the hub, then used the hub nuts to draw everything together. YOU CANNOT DO THIS - at least not on the 6.0L. There needs to be space between the outboard face of the knuckle seal and the inboard side of the hub. If you use the hub to "press" the knuckle seal, the rotating hub will grind the face of the knuckle seal, filling the area with metal shavings, destroying the knuckle seal and causing a vacuum leak. When you think the seal is pressed deep enough, dry fit the hub and ensure it spins smoothly and freely.

Below is what I used to pound the seal in. The OD of the PVC coupler is just shy of the seal OD, so while not ideal, it works in a pinch.

15) This is a shot of the axle installed with the new dust seal. It's a little alarming at first because it looks like the axle isn't completely seated, but this is just because the old seal that was seated on the shaft isn't there anymore, exposing a fresh, shiny metal surface:

16) Sweet! The Moog ball joints come with Zerk fittings, and fortunately the upper one clears the u-joint on my model year. From the other ball joint write-ups, it appears this was a problem with earlier model years: