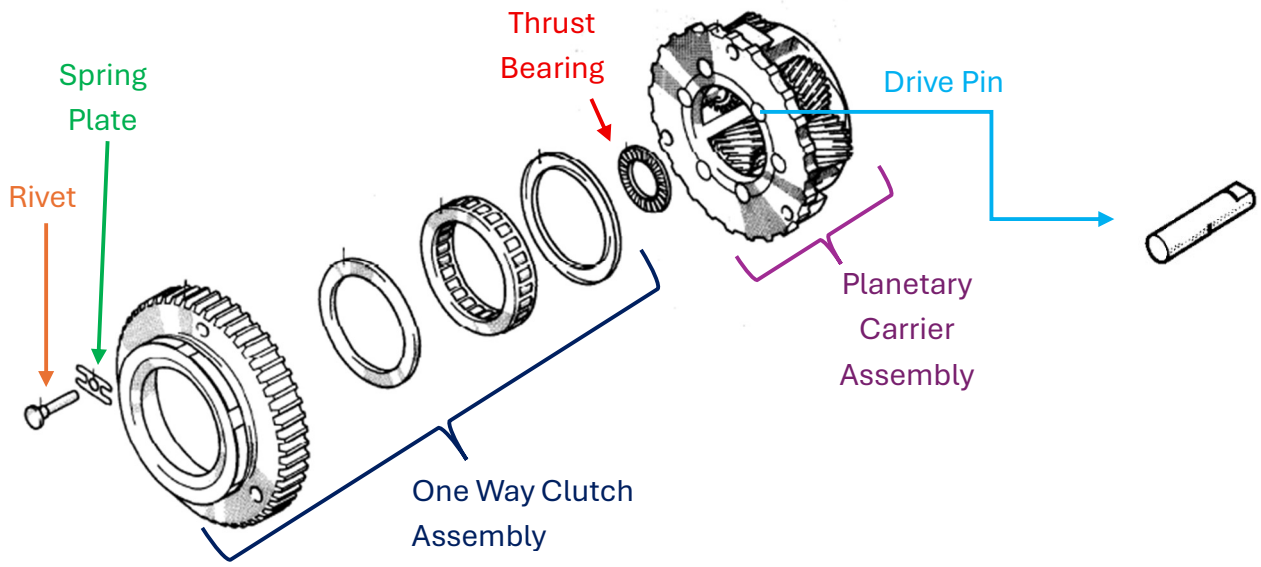
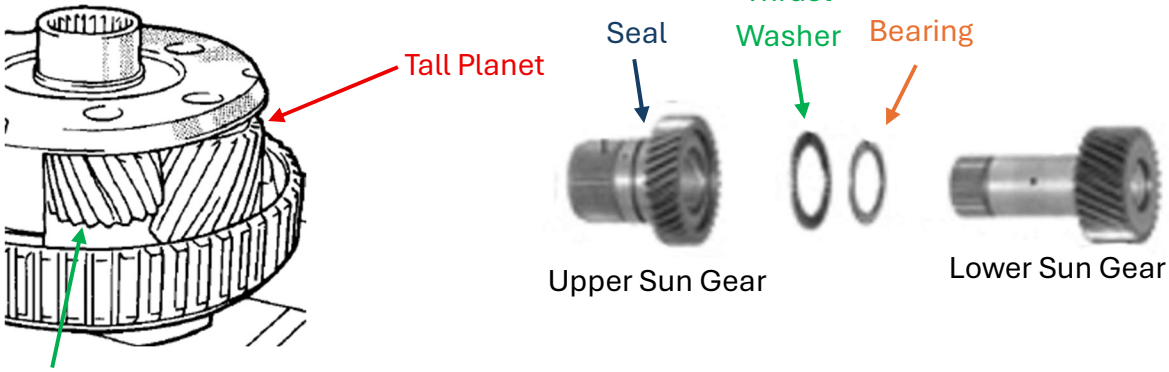
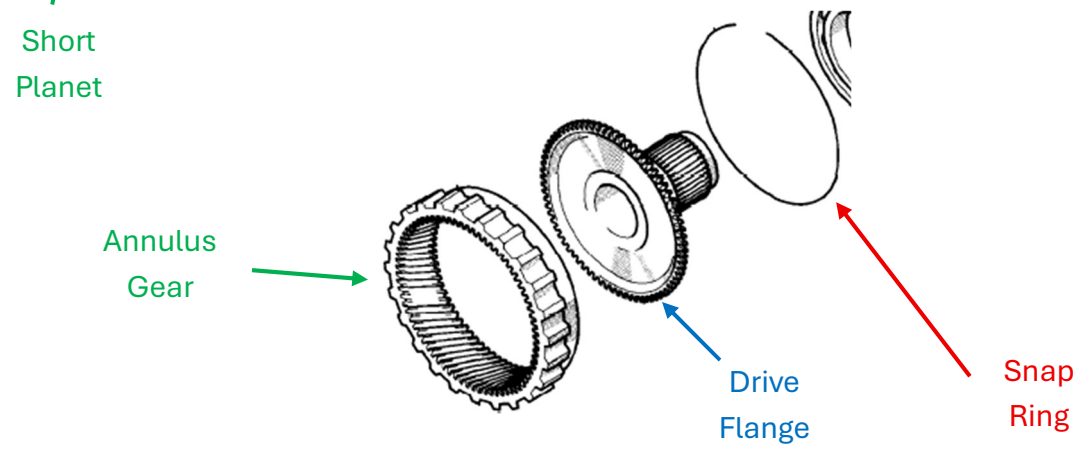
Read these instructions fully before proceeding. While the assembly process is not challenging labor, many steps require attention to detail and care to not lose parts!

Background – Component Names







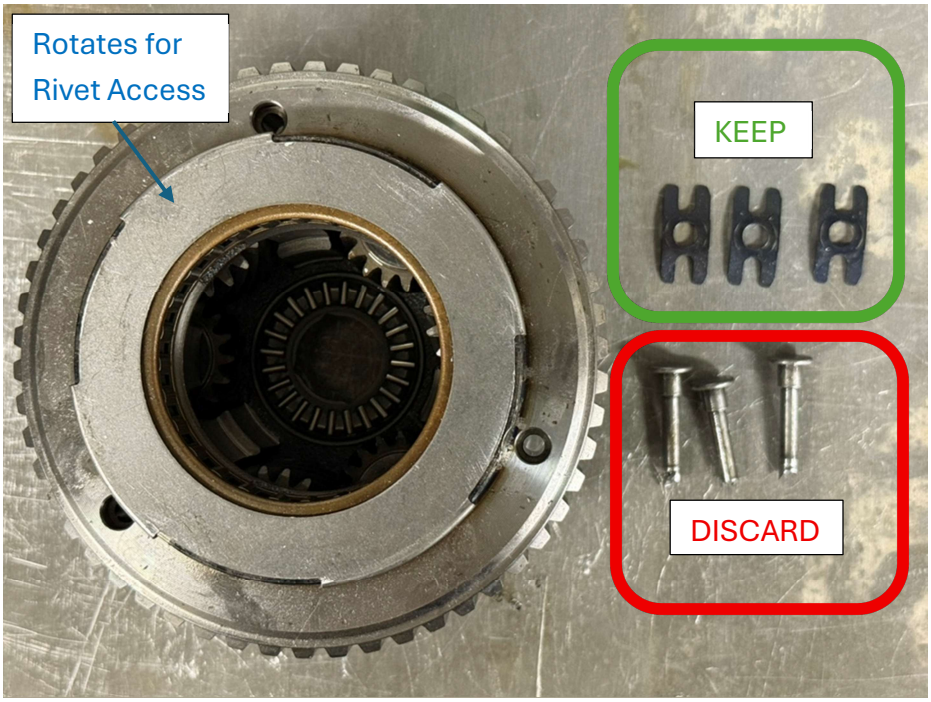
Kuggly Racing

Step 1 – OEM Planetary Disassembly

Drill out the OEM rivets, a 3/16” drill bit works well. As soon as you drill through the staked portion of the rivet it will loosen up and can easily be removed.

After the rivets are drilled out they can be pulled from the top of the planetary with a pair of pliers or various other means. The stamped sheet metal cover rotates to provide clearance for rivet removal.

Discard the removed rivets and keep the H-shaped spring plates.



After the rivets are removed the one way clutch assembly and outer race will lift freely off the planetary housing.

Step 2 – Planetary Gear Assembly

Important: be sure to have a clean work area with a lip or edges so no small parts will be lost as they fall out. A baking pan works great for this. Every planetary needle roller bearing needs to be reused.

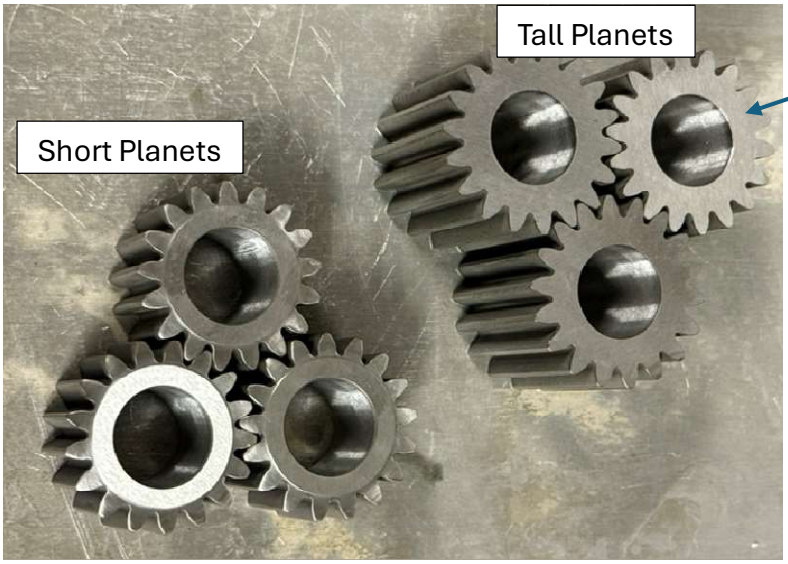
The planetary drive pins should freely slide up and out. It is easiest to do these one at a time by using a screwdriver in the top groove of the neighbor drive pin to rotate the assembly.

Preferred disassembly method to keep parts intact:

1. Remove a tall planet drive pin with the planetary in a vertical position
2. Rotate the gear out using a screwdriver in the neighboring short planet pin
3. Slide the drive pin in with the gear sitting on the alignment plate, outside the housing
4. Rotate the whole assembly so the planetary is horizontal and then remove this pin-bearing-planetary assembly and set it aside
5. Rotate assembly back to vertical and remove the short planet pin

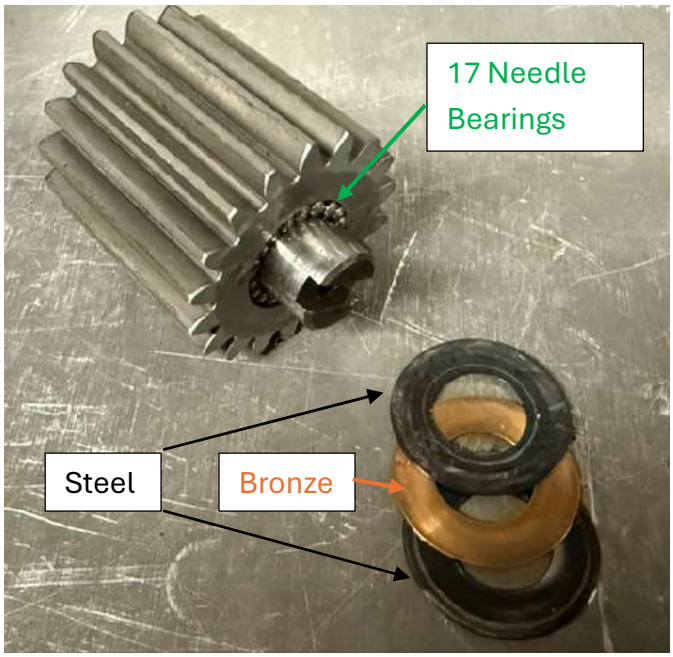
6. Slide the short planet-bearing assembly out using the alignment plate as a handle
7. Put the pin back in this pin-bearing-planetary assembly and set it aside

These gears will replace the OEM helical planet gears. The lower (shorter) planet gears do not have a specific up/down orientation. The upper (taller) planet is assembled with the lip facing down and the ground side facing up.

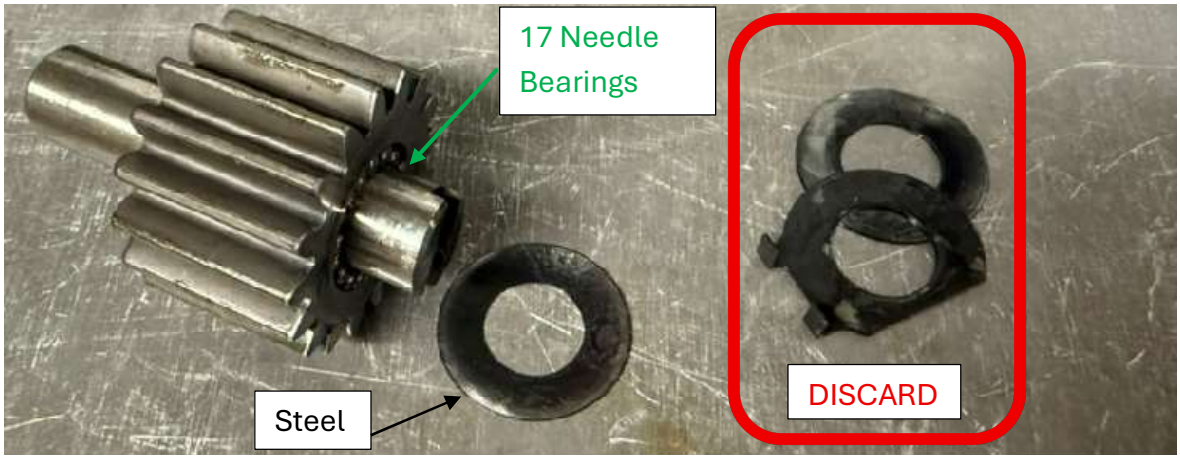


The drive pins and needle bearings should be removed from each OEM gear and inspected before assembly in the new straight cut gears. These parts are normally in good shape, but if any show damage another core will be needed. Damage could include discoloration, scoring, scrapes, etc. Use vasoline or assembly lube to keep the needle bearings in place during reassembly.

The tall planet gear reuses the OEM thrust washer stack as-is, 3 washers above the sun gear as shown below. The order is steel-bronze-steel.



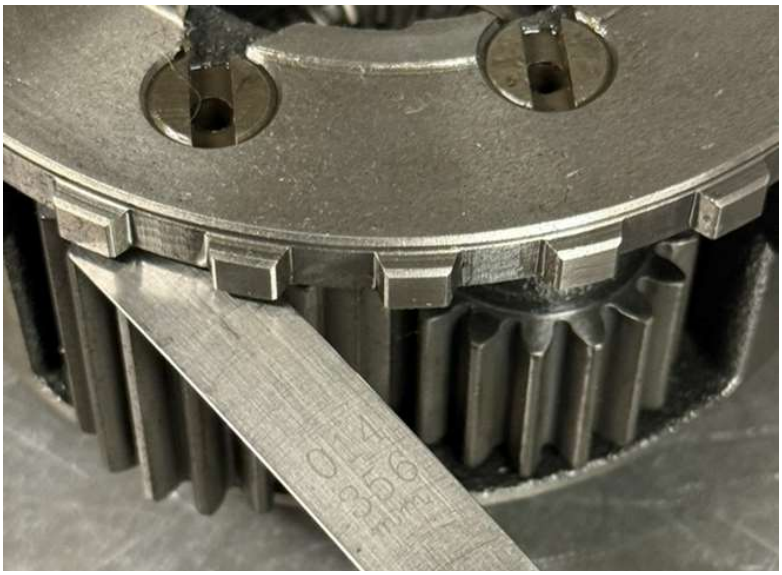
The lower planet gear only reuses one thrust washer on top of it. The keyed plate and second thrust washer are not reused. These were not necessary with the lowered thrust load of a straight cut gear and were removed to make the gear face width larger (in the OEM assembly these always show distress first).



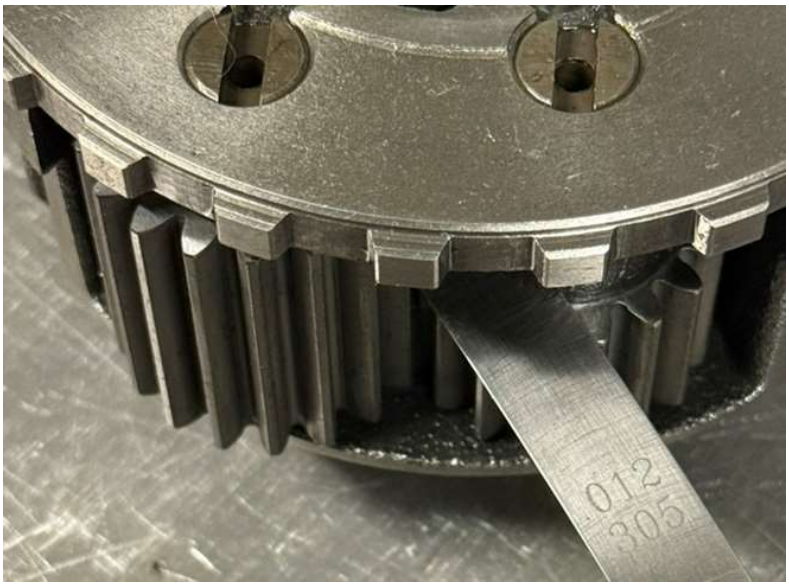
The OEM alignment plate is re-used and assembled underneath the planet gears.

Reverse the disassembly process to reassemble the gears. After they are installed in the carrier, thrust clearance must be measured above each gear with a feeler gauge. The planetary carrier height tolerance range is incredibly wide. We have seen this vary by 0.010” and the dimensions below are minimum clearance; it is fine to have more.

Upper planet thrust clearance should be a minimum of 0.014” measured with a feeler gauge between the upper thrust washer and the carrier

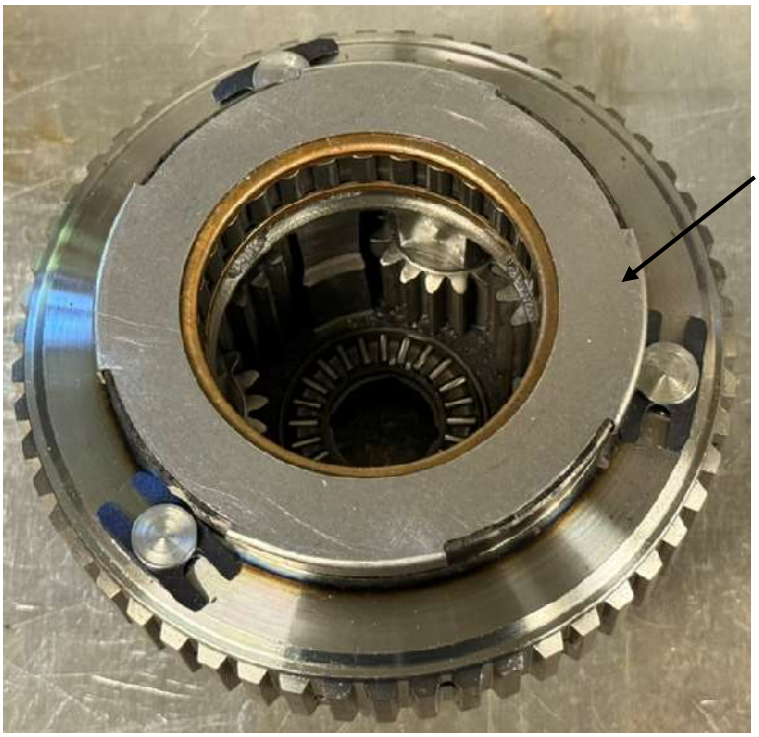


Lower planet thrust clearance should be a minimum of 0.012” measured with a feeler gauge between the upper thrust washer and the carrier

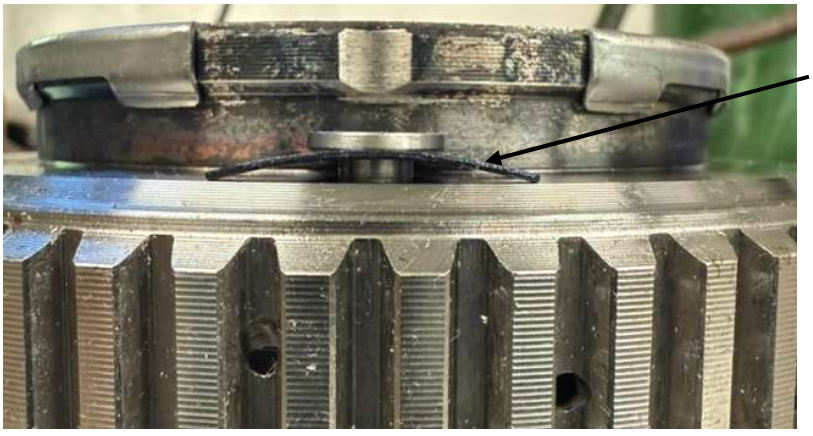


Step 3 – One way clutch and Planetary carrier system reassembly

Remember, the retainer plate on top of the one way clutch rotates for rivet access.

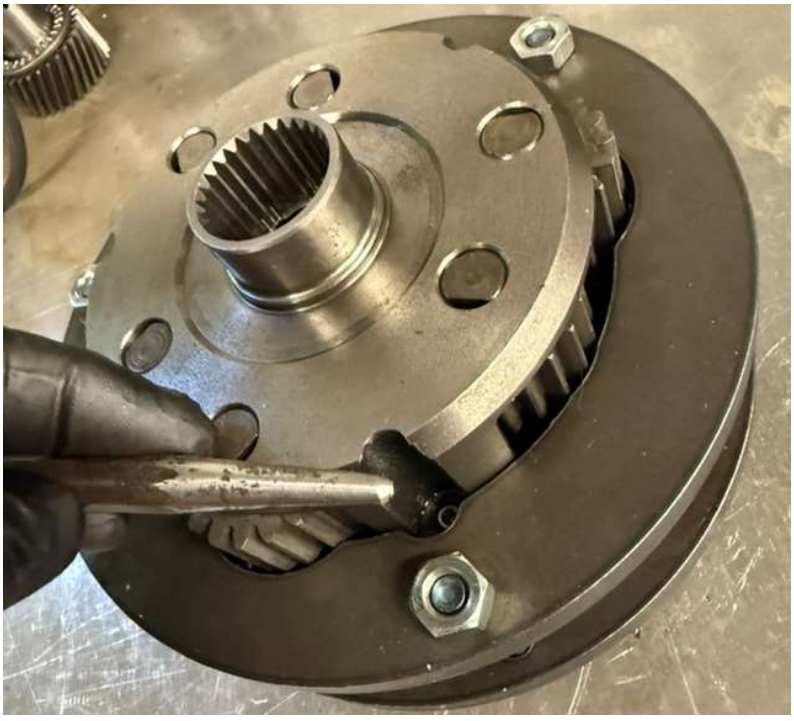


The spring plates go under the rivets with the center pushing the rivets up.



Confirm no extra parts are on the bench before the rivet staking process. Assemble the riveting fixture with the bolts aligned with the rivets and torque to 10-15ft-lb (enough to clamp the rivets fully into place).

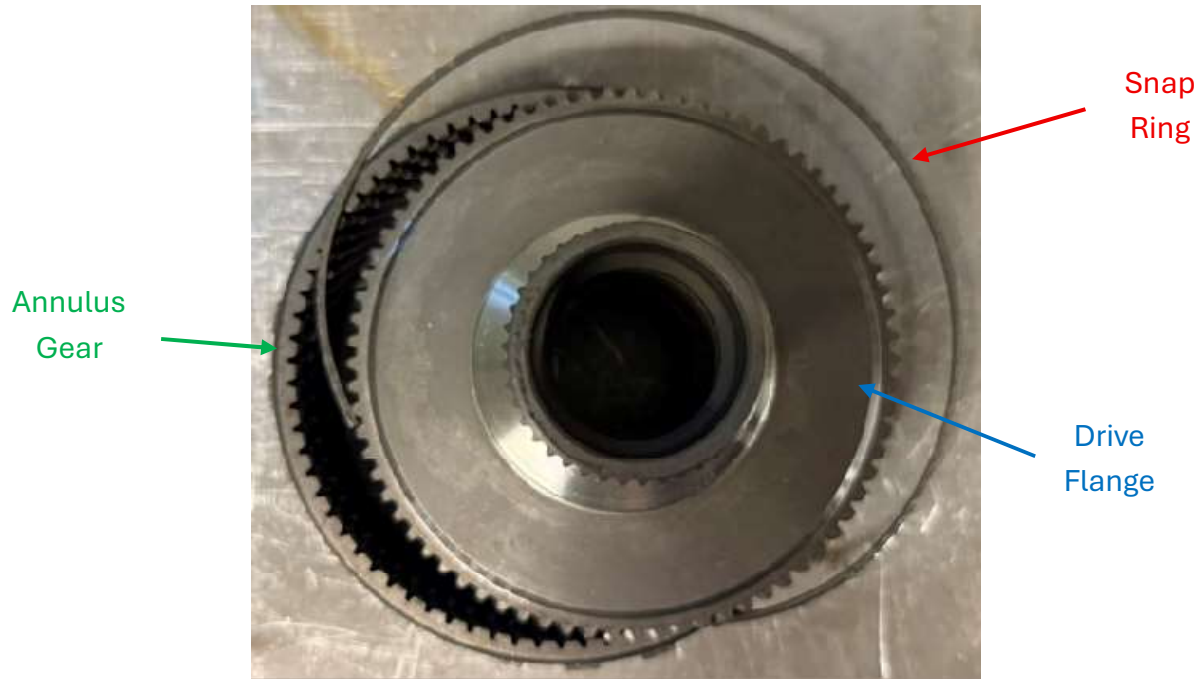
Use a standard 60deg punch to stake the rivets until they are seated (the sound will change as they finish staking).



Step 4 – Annulus gear transfer

The OEM annulus gear is held onto the drive flange with a thin section snap ring. It requires a very small tip instrument to unseat the snap ring.

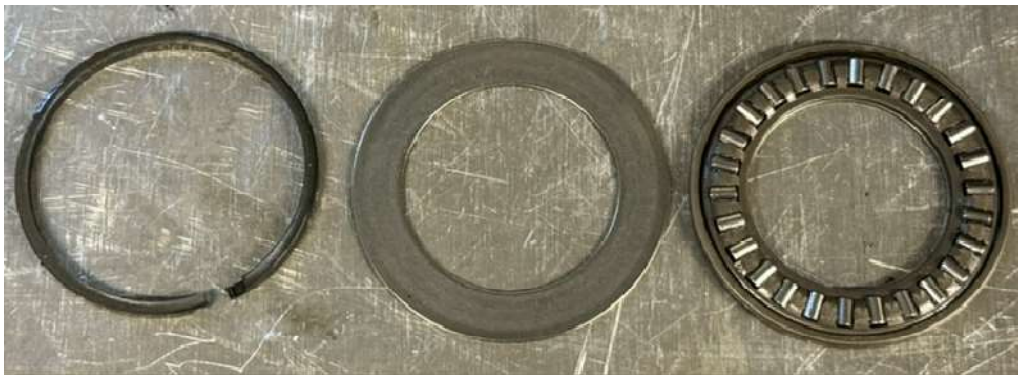
With the snap ring removed, the drive flange easily pulls free from the OEM annulus gear.



The straight cut annulus gear has a helical section to interface with the OEM drive flange (just like the OEM annulus gear). Slide them together and reinstall the snap ring.

Step 5 – Final Assembly

The upper sun center support seal, thrust washer and thrust bearing are all re-used. All parts go in the same location and orientation as OEM.

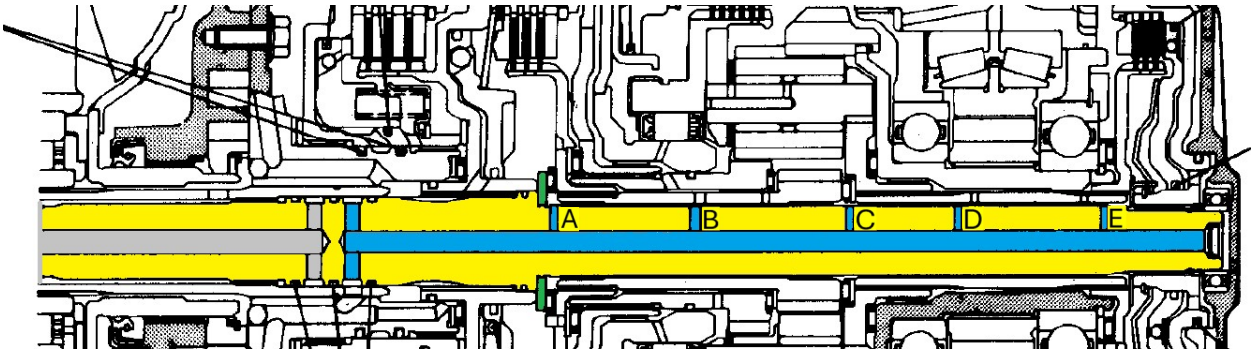


The final assembled planetary should now be ready for installation.

Congratulations, you've now completed assembling your planetary gear set! There are a lot of details, but hopefully it wasn't too hard. You should feel accomplished and ready to make sure you have the oiling system also up to the task to properly take care of lubricating and cooling your hard work.

Critical points for Straight Cut Planetary Gear usage

1. These gears are a stronger material than OEM with a larger tooth profile and wider lower sun and planets to reduce gear bending stress. The straight cut gears also distribute load significantly better across their face width. To properly utilize this added gear strength, good oil film strength and planetary cooling are critical.
2. Adequate lubrication flow is critical
    a. Minimum 50psi as measured at the rear port on the transmission, this can drop at high rpm so datalogging is necessary vs just a shop measurement.
    b. Supply fluid should be as cool as possible, directly lubricate from the RD circuit rather than the OEM flow path from the converter.
        i. An additional cooler can be added on this line to help oil temperature to the gears
    c. Confirm the input shaft has all lubrication holes, some aftermarket shafts were missing a feed hole to the planetary (hole C in figure below)
3. High film strength fluid is essential
    a. Many people use John Deere Hy Gard, which is a hydraulic fluid that is also a GL4 gear oil and provides good scuffing protection
    b. Some very high-power applications have experimented with blending GL5 hypoid gear oil for ultimate gear scuffing protection. Only modern GL5's that are non-corrosive to yellow metals should be used.



Input shaft oiling

- Input Shaft = Yellow with washer in Green
- Blue = lube oil flow path, feeds from top of trans to the planetary (and other items)
- Hole B feeds the sun gear bushings and some to the lower sun mesh
- Hole C can be missing and feeds the lower sun gear mesh
    - Add this hole if it is missing!!!