

1928 Durant Model D75 Differential unit rebuild and upgrade

By: Steven Blomquist

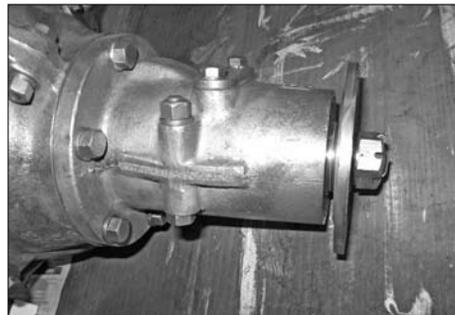
During the frame off restoration process of my Durant model D75, I made the decision to rebuild the differential unit since I was going through all the other mechanical units of the car. I wasn't sure the present condition of the differential as I acquired the car in a partially dismantled condition and the motor in pieces. I like a challenge and this seemed to be an easy one for me to tackle. After draining the thick fluid and removing the wheels, driveshaft, brake hardware, and backing plates, the unit was then removed from the leaf springs and placed on a suitable surface. I began the process of cleaning all the dirt, grease, and buildup from the many years of driving on the past years dirt roads. Every seal and gasket that was part of the differential unit had the typical grease trails originating from them, indicating the poor quality of sealing materials and techniques used in the late 1920's with regard to today's standards. Before the disassembly process began, I set up a sandblasting area in my driveway to remove all the rust and stubborn crud. I used a blue tarp to make a large tub with sides and a bottom to reclaim the sandblasting media for later recycling through the system. The advantages to sandblasting the unit beforehand assured me that there was only a small chance that any amount of sandblasting media would find its way into the unit and that it would be ready for paint after the final assembly. Later in the cleaning process solvent solutions would be used to remove any residual sandblasting media on the surfaces.

As I worked through the task of the disassembly, I found a safe area in the garage to lay out the various parts of the differential unit in the order they came apart so there was no ambiguity as to how they would fit back together.



I borrowed a camera to give me assurance that upon reassembly the details could be viewed as to where the parts previously fit together.

The differential unit is basically made up of two parts, the pinion housing assembly which is bolted to the split axle housing assembly. After removing the pinion housing assembly and mounting it in a large shop vise, I removed the driveshaft flange mounting nut with a breaker bar and removed the flange from the pinion shaft. On the side of the pinion housing is a small locking plate held on by two bolts that were removed to reveal an access hole for the adjustment of the pinion shaft end play. Next to this access area is a locking bolt with nut that passes through a flanged slotted



section of the pinion housing to clamp the adjustment ring securely in place. After removing the locking bolt and turning out the shaft adjustment ring, the pinion shaft with its bearings were able to be removed from the large open end of the housing. The parts for this assembly were initially inspected for wear and condition and set aside for later cleaning and inspection. The photo below shows the pinion housing

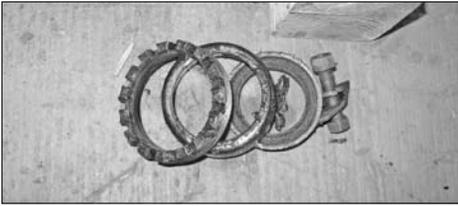
assembly in place just before painting the unit.

The axle housing assembly has seven bolts that hold the two casted halves together. Once the axle housing is apart, the carrier unit within the axle housing was removed from the axle shafts and set on a suitable work area. It was disassembled further by removing the locking bolt and shaft that secures the spider gears and thrust washers in place. After initial inspection the carrier unit with the parts was set aside for later cleaning and inspection.



Each wheel end of the axle housing has a large threaded adjustment ring that is clamped by a locking bolt and locking pawl that couples into one of the adjustment notches on the ring. They were disassembled to allow the axles to be taken out from their respective housing sections. The photo below shows the layout of the original axle seal, adjustment nut, axle bearing outer race, and locking bolt.

The bolts were removed holding the two adjustment locking plates located close to the carrier area on the axle housing shown in the first photo which



reveals the access holes for the end play and backlash adjustments to the carrier unit. The carrier adjustment rings were turned counter clockwise to push the carrier bearing outer races out of the housing bores. The differential unit is now disassembled completely and ready for cleaning and inspection.

Donning a pair of latex mechanics gloves, I began the task of cleaning the eighty plus years of crud and grime from the parts and housings using solvents and then blowing them off using compressed air. I used a flat file on all the flat mating gasket surfaces to eliminate any nicks and burrs on the surfaces for later fitting and sealing. After thorough inspection of all the parts for the differential unit I found most of them in relatively good condition for their age. One of the carrier unit tapered roller bearings was found to be in bad shape and needed to be replaced. After some research and visits with other Durant club members, I found the original tapered roller bearings obsolete and the "new old stock" no longer available. Further investigations led me to find modern tapered roller bearings of the same outside and inside dimensions as the originals but with a wider installed bearing width of sixty two thousandths of an inch. I decided this would be a perfect opportunity to replace both the old bearings with the modern ones and have a big margin of assurance against any future bearing issues. The next photo shows the carrier unit with the modern tapered roller bearings in place.

In order to use these new bearing sets, I compensated for the difference in width by machining sixty thousandths of an inch off the face of each of the carrier adjustment rings where they mate with the outer bearing races. This machining allowed the unit to have an adjustment of the same range and overall assembled width as the original setup. This modification was an easy decision to make as



the original tapered roller bearings were no longer available and the new replacements were of a more robust design. The next photo was taken of the width modified adjustment ring and outer bearing race prior to the assembly.



Another challenge was to investigate the possibility of replacing all the original seals with modern ones so the differential unit would not leak using modern day gear oil. The original axle seals installed in the axle adjustment rings at the brake backing plate locations were fairly easy to accommodate with modern day ones. I found the modern National brand neoprene seals with a part number of 471424 that have the same inside diameter and width as the originals but have a slightly larger outside diameter.



To solve this issue, I machined the inside diameter of the axle adjustment rings slightly larger where the new standard seals would press into the ring bores. The photo shows the new seal in

place during the final assembly of the axle adjustment ring.

The pinion shaft seal used required a little more thought as the shaft sealing diameter and the housing bore seal diameter were not of the standard modern day sizes. I machined the pinion housing seal bore slightly larger and to a depth to receive this new seal. This allowed a National brand modern day seal with a part number of 473448 to be pressed into the housing bore to the correct depth. For the inside diameter sealing surface, I machined a steel sleeve of the right length having the correct sealing diameter for the new seal. It was press fit onto the driveshaft flange hub seal surface which allowed the new seal inside diameter to seal the unit. The photo below was taken after painting the final differential assembly and shows the seal part number used.



The first process in reassembly after cleaning the differential unit was to put together the carrier unit. It was assembled in the reverse order by first installing the spider gears, thrust washers, and pressing the new tapered roller bearings with the Timken part number of 30209A in place. Next was to install the carrier adjustment rings and the tapered roller bearing outer races in their respective positions. The adjustment rings should turn freely throughout the adjustment range and the races should slide in the bores having a snug fit.



The easiest way to continue with the next step of assembly is to support the driver's side half of the axle housing in the vertical position as shown and then set the carrier unit into the bearing race. Be certain the carrier unit is positioned with the ring gear teeth facing the correct side otherwise the axles will rotate in the wrong direction with respect to the pinion gear rotation.



Next, install the passenger side differential housing with a gasket if applicable (mine had no gasket) and secure with the housing bolts to the proper torque. Do not put sealer on the surfaces at this time as the housing might need to be taken apart several times to get the pinion depth adjustment correct. Next move the adjustment rings pushing the carrier bearing races toward the carrier unit to set the end play in the carrier unit. With an indicator, check the ring gear run-out on the flange side face of the gear and verify that it is within the standard run-out specifications. Make certain the carrier unit adjustment position is such that the pinion assembly can be installed without interference or bind when mounting bolts are tightened.

The next process in the reassembly of the differential unit was to put together the pinion shaft assembly. It is not wise to install the pinion shaft seal at this time given the possibility of adjustment to the pinion depth with a shim rearrangement on the pinion shaft. After inspection of the associated parts and finding them in real good condition, I assembled them in the reverse order and making the end play adjustment according to standard pinion shaft adjustment practices. Be certain that all the shims are installed in their original positions for the initial pinion depth verification. Keep in mind that the pinion gear has to be checked

for proper mesh with the ring gear a little later in the assembly process. Install the pinion shaft housing along with the proper thickness gasket and torque the bolts to the proper specifications. Because of the split differential design, any adjustments will have to be verified with a dial indicator through the large drain plug hole opening. At this time check that the carrier bearing end play is set by moving the adjustment rings toward each other to attain the proper bearing adjustment. The backlash adjustment is then set to the proper specifications by moving the carrier bearing adjustment rings simultaneously the same number of adjustment notches. The pinion and ring gear mesh contact pattern is checked at this time by painting some white lithium grease on several consecutive ring gear teeth as a visual verification of the mesh contact pattern. If the pattern is not correct and centered within the tooth flanks make the adjustment by adding or rearranging the pinion shaft shims to allow the position of the pinion gear to be the right depth relative to the ring gear. Verify the backlash and end play measurements to correct specifications and check the visual mesh contact pattern again using the same procedures. Once the correct mesh contact pattern and backlash adjustments are achieved the pinion housing assembly is removed and the split axle housing parted to apply gasket sealer or install sealing compound to the housing surfaces. Assemble the axle housings having the sealing compound or gasket installed for the final assembly and torque to specifications. Disassemble the pinion housing assembly, install the pinion shaft seal, assemble the unit with the drive shaft flange and torque the nut to specifications. The pinion housing assembly is mounted with a gasket, bolts, and tightened to specifications. Verify the mesh contact pattern, end play, and backlash adjustments in the final assembly. Install the three locking plates at the adjustment ring locations on the housings using new gaskets to prevent any leaks of the unit. The assembly is now ready to be degreased and prepped for painting.

Install the axles, outer axle bearing races, new seals, and axle adjustment



rings into the housing. Follow the adjustment procedures for the bearings to the proper axle end play and lock the adjustment rings after the brake backing plates are in place. As shown in the next photo, the differential assembly is ready to be installed on the vehicle's leaf springs and filled with the modern day gear oil. ❖



Article written December 2012