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FIELD REPAIR INSTRUCTIONS

HEAVY DUTY BLADE DRIVE – REPAIR WITH ASSEMBLIES/KITS USE CAUTION AND PROPER SAFETY EQUIPMENT WHEN WORKING

[Face and splash protectors, gloves, back braces, proper lifting equipment, etc.]

GENERAL:

1. Instructions for use of assemblies rather than individual piece parts during repair. Each assembly includes all required parts for replacement including screws, o-rings, plugs, etc. If more detailed instructions are required, one that steps through the breakdown of the assemblies by individual parts, refer to FIELD REPAIR INSTRUCTIONS - PARTS.
2. Repair instructions are based on VRM P/N 26-456-1-SD. Use methods for all models of Von Ruden drives. *Figure 1*
3. To replace a gearbox or connector tube assembly requires removing the screws from the drive unit joints and slipping apart at those joints. The replacement assembly will then slip back into the same space noting that the orientation or timing of blade shafts and shaft flats are correct. Once aligned, torqued and filled with oil, you are up and running. *Figures 2,3*



Figure 1



Figure 2



Figure 3

EVALUATION PROCEDURE:

1. Most evaluations can be completed without removal of drive unit from the deck housing or disassembly of the drive unit. For faster and easier evaluation, we recommend removal of the drive unit from the deck housing.
2. From left-to-right as looking from the tractor seat, perform external inspections.

| REASON | | CAUSE |
|--------|----------------|---------------------------|
| O-RING | LEAKING | HEAT - ASSY DISTORTION |
| | | HEAT - INTERNAL FAILURE |
| | | CRACKED CASE/FLANGE |
| | | BAD O-RING |
| SEAL | LEAKING | HEAT - INTERNAL FAILURE |
| | | INTERNAL DEBRIS |
| | | SHAFT ENDPLAY |
| | | OVERFILL OF OIL |
| | | EXTERIOR DEBRIS |
| | | BAD SEAL |
| SHAFT | THREAD DAMAGE | IMPROPER NUT INSTALLATION |
| | FLATS DEFORMED | LOOSE HUB |
| | | DEFORMED HUB |
| | | SHEARED OFF |

3. Visually inspect to identify seal or o-ring leaks. Trace the actual source of the leak. Performing an air test will locate possible leaks [Tools 23,24,25,26]. Inspect shafts for wear, deformation or excessive endplay. Rotate the drive unit feeling for any binding, roughness or excessive force to rotate.
4. Remove retaining ring, access cover and o-ring from gearbox assemblies for internal inspection. [Tools 14,15] *Figure 24*
5. From left-to-right as looking from the tractor seat, perform internal inspections.

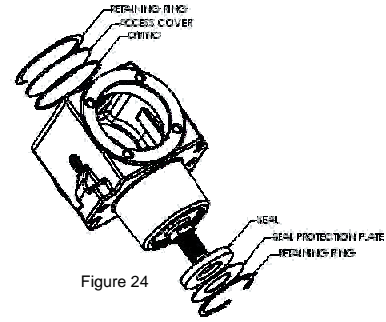


Figure 24

| REASON | | CAUSE |
|---------|------------------------------------------------|---------------------|
| SHAFT | ENDPLAY | RETAINING RING FLEX |
| | | MISSING LOCKNUT |
| | | BEARING FAILURE |
| | | GEAR FAILURE |
| GEAR | SINGLE TOOTH BROKE | SUDDEN IMPACT |
| | | INTERNAL DEBRIS |
| | MULTIPLE TEETH BROKEN | SUDDEN IMPACT |
| | | REPEATED IMPACTS |
| | | INTERNAL DEBRIS |
| | ALL OR MULTIPLE TEETH WORE DOWN OR FOLDED OVER | GEARBOX DISTORTION |
| | | BEARING FAILURE |
| | | INTERNAL DEBRIS |
| | | LACK OF LUBRICATION |
| BEARING | ROLLER / BALL DISTORTION | SHAFT ENDPLAY |
| | | SUDDEN IMPACT |
| | | REPEATED IMPACTS |
| | | ASSEMBLY DISTORTION |
| | | GEAR FAILURE |
| | | LACK OF LUBRICATION |
| | BEARINGS SKIDDING | ASSEMBLY DISTORTION |
| | | INTERNAL DEBRIS |
| | | SHAFT ENDPLAY |
| | | BAD BEARING |
| | | IMPROPER FIT |

6. If drive unit is for warranty consideration. Complete the VON RUDEN WARRANTY CLAIM REPORT as required and submit under normal procedure prior to further disassembly.

REMOVAL AND DISASSEMBLY PROCEDURE:

1. Remove drive unit from deck housing. *Figure 2*
2. Wash down drive unit to remove dirt and residue. Be sure to replace any parts previously removed prior to cleaning.
3. Remove retaining ring, access cover and o-ring or oil plugs and drain oil. [Tools 14,15,22,28]
4. Carefully separate damaged gearbox or connector tube assembly from drive unit by removing required screws and slip assemblies apart at those joints. [Tools 4,5,9,22] *Figure 3*
5. Mark all respective parts and note orientation at this time to ease re-assembly. If present, keep shims with connector tube assemblies for re-assembly or count and measure if replacing.
6. If a gearbox assembly has an end-cap, it cannot be separated from the tube assembly at this point. Further disassembly procedures are required. *Figure 3*



Figure 2



Figure 3

CONNECTOR TUBE & GEARBOX & END-CAP DISASSEMBLY:

1. The following steps are for disassembly of the connector tube assemblies with adjacent gearbox and end-cap. *Figure 13*
2. Securing the bottom exposed gear in the vise with the assembly mounted vertical. Remove end-cap and connector tube screws. [Tools 4,5,6,7,22] *Figure 14*
3. Remove end-cap. Use two screwdrivers inserted into notched areas. Work end-cap from gearbox assembly applying equal force to both sides. Bearing should remain in end-cap. If bearing needs replacement, replace with a new end-cap and bearing. If bearing is on shaft, it will be removed along with the gear in the following steps. [Tool 33] *Figure 14*
4. Remove o-ring from end-cap to prevent accidental damage during repair. If present, remove shims only after the o-ring is removed. [Tool 15]
5. Remove gear from shaft and separate assemblies. Gears located next to end-caps are the only gears with slip-fit. All other gears are press-interference fit. If gear cannot be removed by hand, then removal of the gear on the opposite side is required with the following steps.
6. Remove gear on the opposite end of the tube/gearbox assembly. Place gear with lock-nut into vise and secure the gear. Remove lock-nut and washer from connector tube shaft. [Tools 6,7,12,15,22] *Figure 15*
7. Attach bearing puller to gear. Place connector tube into a press with gearbox housing down and support on bearing puller approximately 3" above the base on the press. Press on shaft to remove gear and key. [Tools 8,11] *Figures 16,17*
8. Support outer flange of connector tube in press with gearbox assembly down. Press shaft through top bearing cone in tube. The key will separate from the shaft. [Tool 8] *Figure 18*
9. Remove connector shaft from gearbox assembly and tube.
10. Remove remaining o-ring on connector tube to prevent accidental damage during repair. If present, remove shims only after the o-ring is removed. [Tool 15]

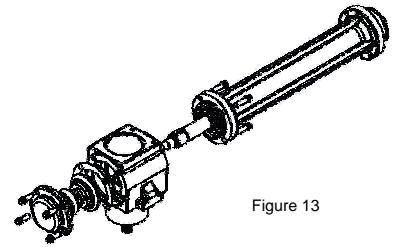


Figure 13

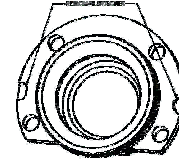


Figure 14



Figure 15



Figure 16



Figure 17



Figure 18

CONNECTOR TUBE & GEARBOX & END-CAP RE-ASSEMBLY:

1. The following steps are for assembly of connector tube assemblies that are adjacent to gearbox assemblies with end-caps. *Figure 13*
2. Place tube assembly in press with gear side down. Install any shims, if present. Lightly grease o-ring and install.
3. Each tube assembly has three gussets running its full length. All need to be rotated to a position that the side without a gusset will face towards blade shafts and deck mounting surface. Orientate tube notches properly. *Figures 79,80,81*
4. Place gearbox assembly onto tube assembly so that the two tapped holes on top of the housing will be closest to the input gearbox assembly. This is to allow for proper alignment when mounting the drive unit cover. *Figures 13,81*

5. Fasten tube assembly to gearbox assembly using the 12-point screws. 3/4" long screws are used for tubes with thin flanges about .29" (7.5mm) thick and all end-caps. 1" long screws are used elsewhere. Tighten screw but do not torque at this point. Use Loctite® 262, 277 or equivalent applied to threads. [Tools 2,5]
6. Align keyway of gear to key on shaft. Install slip-fit gear. A light press may be required. [Tool 8] *Figures 77*
7. Install washer onto shaft.
8. On end-cap, install any shims, if present. Lightly grease o-ring and install. Press end-cap onto shaft. [Tool 8] *Figure 78*
9. Fasten end-cap to gearbox assembly using the 12-point screws. 3/4" long screws are used for all end-caps. Use Loctite® 262, 277 or equivalent applied to threads. Torque screws connecting end-cap to the gearbox assembly to 260-300 lb.-in. (29-34 Nm). [Tools 2,4,5,20]
10. Check that assembly rotates freely and has a small amount of backlash or play between gears. Shim as required.
11. On opposite end of connector tube, install any shims, if present. Lightly grease o-ring and install.



Figure 77



Figure 78

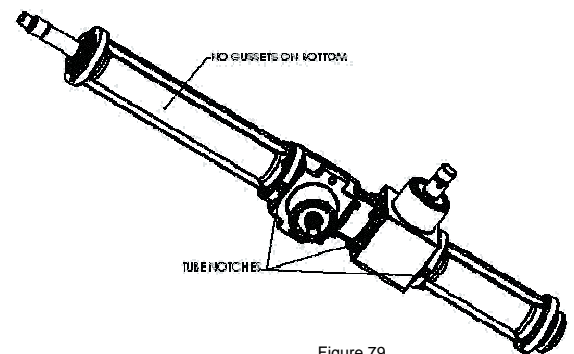


Figure 79

RE-ASSEMBLY:

1. Make sure all tube assemblies have o-rings and shims, if required. All tube assemblies should be installed so their notches are directed towards the input gearbox assembly. Lightly grease all bores, necks and o-rings. *Figure 79,80*
2. Each tube assembly has three gussets running its full length. All need to be in position so that the side without a gusset will be facing towards blade shafts and deck mounting surface. *Figures 79,80,81*
3. Then install gearbox assemblies so their two tapped holes on top of the housing are closest to the input gearbox assembly. This is to allow for proper alignment when mounting drive unit cover. *Figure 81*
4. Flats on blade shafts need to be 90° to flats on adjacent blade shafts. Blade shafts need to be 90° from input gearbox shaft. *Figure 80,81,82*
5. For gearbox assemblies, install so that the final drive unit has all oil plugs on the same side and above centerline.
6. Fasten connector tube assemblies to gearbox assemblies using 3/4" long 12-point screws for tubes with thin flanges about .29" (7.5mm) thick and all end-caps. 1" long screws are used elsewhere. Finger-tighten at first. Screws must have Loctite® 262, 277 or equivalent applied to threads during installation. [Tools 2,5]
7. Check that the drive unit rotates freely and has a small amount of backlash or play between all gears. Shim as required.
8. Torque screws connecting tube and gearbox assemblies to 260-300 lb.-in. (29-34 Nm). [Tools 4,20]

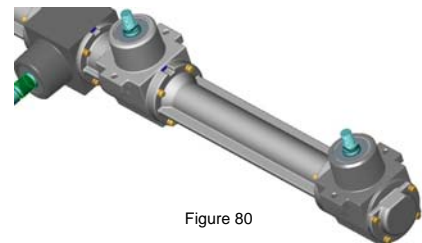


Figure 80

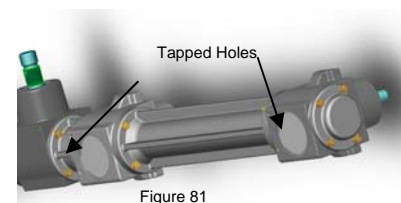


Figure 81



Figure 82

9. Blade shafts must be parallel to each other to prevent blade height mismatch on final mower assembly. Check to insure all blade shafts are parallel within .025" (.64mm) of each other.
10. Use a torque wrench to rotate the drive unit. Unit should rotate with a maximum torque of 7 lb.-in. (0.79 Nm) per gearbox assembly or [36-48" at 21 lb.-in. (2.37 Nm); 56" at 28 lb.-in. (3.16 Nm); 74" at 35 lb.-in. (3.96 Nm)]. [Tools 19,27,28,T8]



Figure 83

11. Completed drive unit should be air tested at 15 PSI (1 Bar) to check for leaks. With only one oil plug removed, insert air gage into a drain hole and pressurize. Allow air to penetrate entire drive unit. Check to see that gauge reading does not fluctuate or decrease. [Tools 23,24,25,26] *Figure 84*



Figure 84

12. Add 8 oz. (1/2 pint or .24 liter) of 75W-90 synthetic lubricant to each gearbox assembly in the drive unit and install oil plugs. If you're unable to accurately measure lubricant, you may fill entire drive unit to 1/2 full or at level of oil plugs. Pour the oil slowly to allow flow throughout the drive unit to ensure proper fluid level. Do not overfill.
13. A) Place blade drive assembly onto deck. All gearbox mounting flanges should contact the deck evenly and only at the mounting points. If all contact, then no further action is required. *Figure 85*

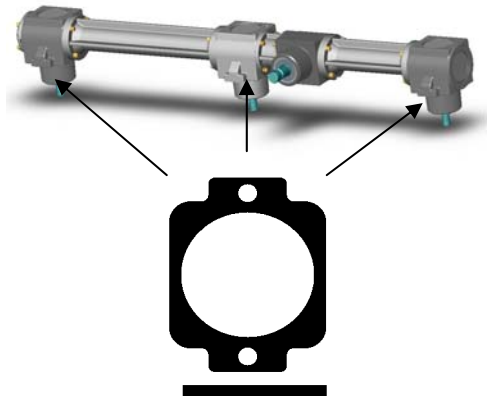


Figure 85

- B) If there is no contact, then attempt to slide one shim between the mounting pad areas of the gearbox and deck where there is no contact. If the shim fits between the pad and the deck then leave it there.
 - C) Repeat Step B until no further shims fit. It is acceptable for a small gap to remain if less than the thickness of a shim. If several shims are required at a specific mounting point, attempt to balance out the shims by spreading them across other mounting points to keep a parallel mount as possible. The greater number of shims required for mounting is a direct indicator that flatness correction is needed on the deck housing.
 - D) Repeat Steps B and C at remaining mounting positions.
 - E) Secure gearbox to the deck keeping the selected shims in place. Then finger-tighten deck drive mounting screws to drive unit
14. Torque mounting screws holding drive unit to deck.
 15. Lastly, one final torque test to rotate the drive unit after assembled to deck housing. If the reading increases, the verify deck mounting and drive unit mounting flatness are acceptable. [Tools 19,27,28,T8] *Figure 83*

PREVENTATIVE MAINTENANCE:

A lubrication change should be done 100 running hours after repair, as is recommended after initial 100 hours of operation. Evaluate oil every 400 hours after that.

TOOLING:

The following tools are for proper assembly and disassembly procedures.



Tool 2



Tool 4



Tool 5



Tools 6 & 7



Tool 8



Tool 9



Tool 11



Tool 12



Tool 14



Tool 15



Tool 20



Tool 22



Tools 23,24,25,26



Tool 27



Tool 28



Tool 33



Tool T8

| Tools | Description | Purpose |
|-------|-------------------------------------------------------------|----------------------------------------------------------|
| 2 | Threadlock, Loctite Threadlock #277 | Assembly, apply to screws and shaft threads |
| 4 | Wrench, 5/16 12 point torque adapter | For screws, drive disassembly and assembly |
| 5 | Wrench, 5/16 ratcheting wrench | For screws, drive disassembly and assembly |
| 6 | Bench vise jaw caps, use with bench vise | Disassembly and assembly of drive box and tubes |
| 7 | Bench vise to hold 6 inch material | Disassembly and assembly of drive box and tubes |
| 8 | Press, compound arbor, table with 4 inch slot required | Disassembly and assembly of drive box and tubes |
| 9 | Hammer, 3 pound rubber hammer | Drive box and tube assembly |
| 11 | Bearing separator | Gear removal from connector tube |
| 12 | Socket, 6 point deep 3/4, 3/8 square drive | Locknut removal and assembly |
| 14 | Magnet, Horseshoe, rectangle, round | Shaft seal protector removal, access cover removal |
| 15 | Screwdriver, standard flathead screwdriver 1/8 tip | Shaft seal protector removal, access cover removal |
| 20 | Wrench, 3/8 drive torque wrench, 150 - 750 in-lb. range | Torque screws |
| 22 | Ratchet, 3/8 drive long handle ratchet | Use with sockets |
| 23 | Adapter, SAE -4 to 1/4" NPT, Parker Hannifin | Air leak tester |
| 24 | Air hose coupler, male plug, 1/4 | Air leak tester |
| 25 | Air regulator adjustable with gauge, 1/4 NPT | Air leak tester |
| 26 | NPT black pipe nipple, 1/4 x 4 | Air leak tester |
| 27 | Dial torque wrench | Check gear assembly rotational torque |
| 28 | Socket, 3/8 drive 3/16 hex bit | Check gear drive rotation, plug assembly and disassembly |
| 33 | Screwdriver, standard, 1/4" tip, 6" shank (2) | Disassembly, drivebox, tube, endcap |
| T8 | Input shaft tool, 1.5 OD x 2" with .95 hole and .26 pinhole | Vice fixture to hold input shaft, rotational test |