

Maintenance Instructions

General Note — These instructions contain information common to more than one model of Bevel Gear Drive. To simplify reading, similar models have been grouped as follows:
 GROUP 1 — Models 11, 150, 165, 175, 66 (illustrated), 65, 88, 600, 800, 810, 850, 1000, 1010 and 1200.
 GROUP 2 — Models 790, 920 (illustrated), 950, 1050 and 1250.
 GROUP 3 — Models M2 and M3.
 GROUP 4 — Models AD1, AD2, AD3, AD4 & AD5.
 NOTE: For PINION SHAFT disassembly instructions for Models 1010 and 1200, follow the Group 2 instructions. For PINION SHAFT disassembly instructions for the Model 790, follow the Group 1 instructions.

It is advisable to periodically inspect your Bevel Gear Drive for any signs of impending service. Spare or replacement parts can often be ordered and obtained before disassembly is necessary, thus minimizing machine down-time. The following symptoms can be inspected visually without disassembly and may, in some cases, indicate extensive maintenance procedures.

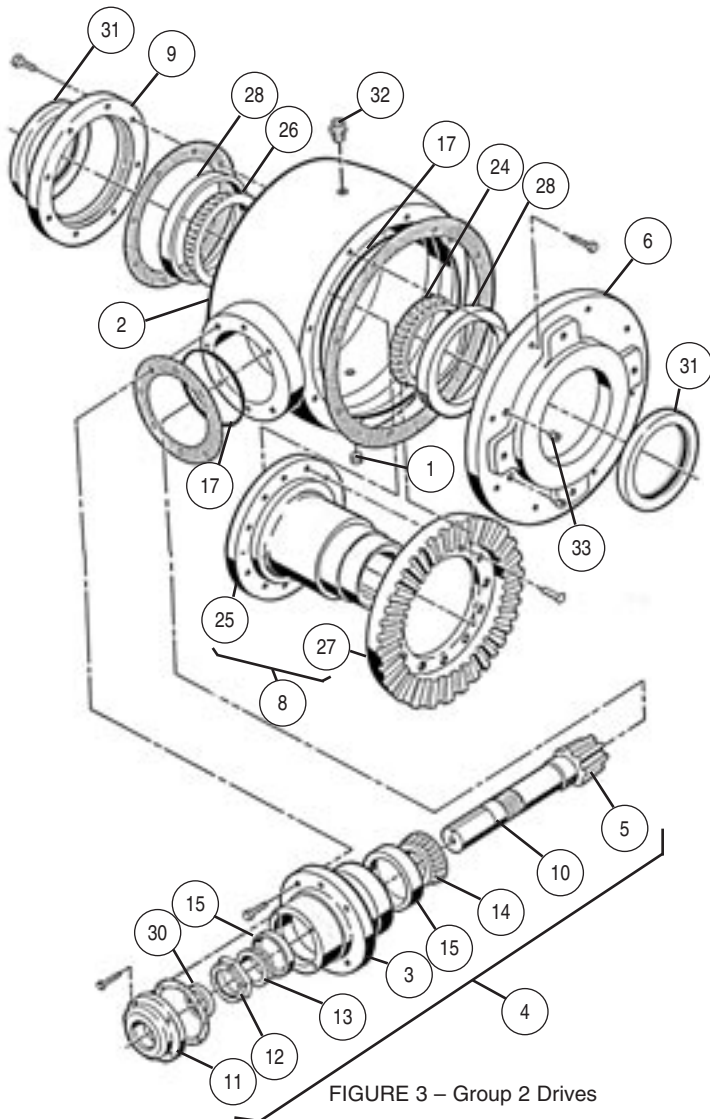


FIGURE 3 – Group 2 Drives

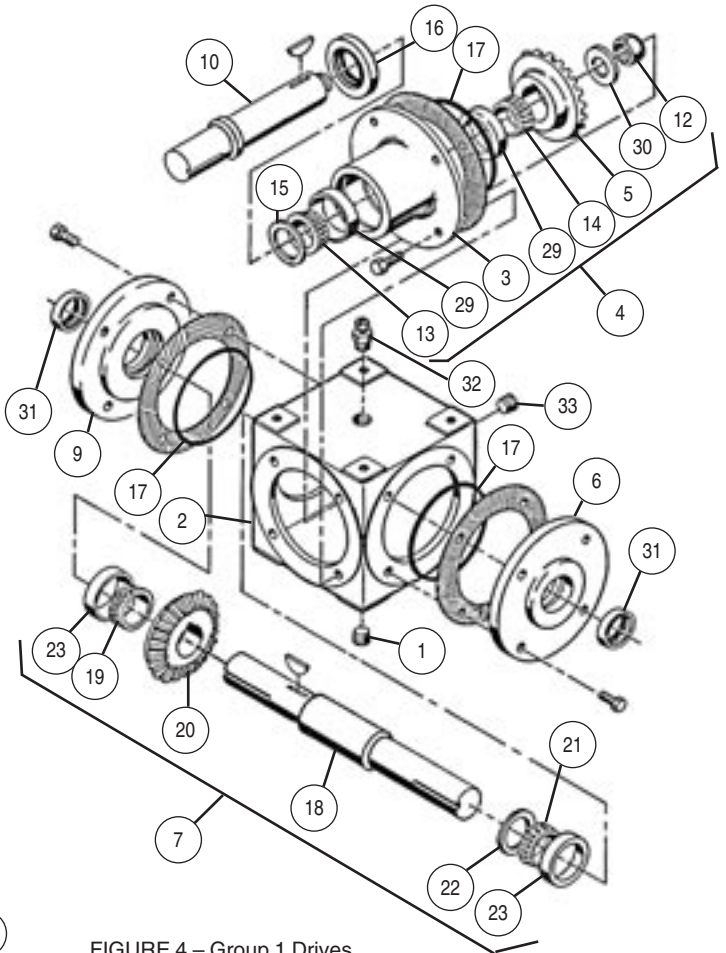


FIGURE 4 – Group 1 Drives

Oil leaking from pinion housing, caps, cap screws or pipe plugs—might be corrected by retightening or removal and recoating with pipe sealant before tightening. If this does not correct the leaking condition, disassembly will be necessary to replace O-rings.

High internal operating temperature (above 200° F.)—could indicate that unit was being overloaded and should be replaced entirely with a larger capacity unit. Damaged bearings or inadequate oil level can also cause heat build-up.

Oil leaking from seals—indicates that shaft and/or seals are worn and need replacing. Keep dirt and foreign particles off shafts in the area of the seals to minimize wear. Note: On initial run of new unit or after a new replacement of seals, some lubricant leakage is normal for the first few hours of running time until seals seat against the shafts. If condition persists, seal replacement will be necessary.

Excessive end play of shafts—if there is a noticeable (.005" or more measurable) shaft movement when couplings are removed and shaft is moved back and forth, it is an indication of bearing wear. Removing shims between caps and gear case can usually correct the condition and avoid bearing replacement.

Excessive backlash—might indicate worn gears which often may be readjusted, instead of replacing.

IMPORTANT

In the initial factory assembly, Loctite® was used on the threads of all cap screws. If any screws are removed, a new application of Loctite® is necessary or lock washers must be installed. Note—Screw threads and threaded hole must be degreased before the application of Loctite®.

Maintenance Instructions

⚠ WARNING

For safe operation and to continue the unit warranty, when installing, reinstalling, or replacing a factory installed fastener for servicing purposes, or to accommodate the mounting guards, shields or other light load imposing devices, or for mounting the unit, it becomes the responsibility of the customer or user to properly determine the quality, grade of fastener, thread engagement, load carrying capacity, tightening torque, and the means of torque retention.

DISASSEMBLY PROCEDURE

⚠ CAUTION

The exterior threaded holes on this drive are for mounting the drive or drive accessories (couplings, sprockets, etc.). They are not to be used for lifting the drive or any driver/driven equipment.

⚠ WARNING

Make certain that the power supply is disconnected before attempting to service or install the unit, or remove any components. Lock out the power supply, and tag it to prevent unexpected application of power.

⚠ WARNING

Wear protective clothing and eye shields when installing or maintaining unit and machine.

Group 1, 2 and 3 Drives (Refer to Figures 3 and 4 unless otherwise noted.)

1. Disconnect Bevel Gear Drive from drive motor, couplings or driven shafts to guard against personal injury. Remove all sprockets, or sheaves from Bevel Gear Drive shafts with a puller tool to prevent accidental damage to shafts. Remove all keys from keyways.
2. Remove Pipe Plug (1) from bottom of Gear Case (2) and drain all lubricant from unit, preferably while unit is warm.

⚠ WARNING

Oil, housing, and other components can reach high temperatures during operation, and can cause severe burns. Use extreme care when removing lubrication plugs and vents while servicing the unit.

3. If old seals are to be salvaged, cover keyways with cellophane tape, plastic shim stock or paper. Remove cap screws from Pinion Housing (3) and CAREFULLY remove Pinion Shaft Assembly (4). Be careful to keep bearings clean and not to damage Gear (5) teeth.
4. Remove cap screws from Open Cap (6) which is opposite the gear side of Cross Shaft Assembly (7, Figure 4) and Output Sleeve Assembly (8, Figure 3) and remove, being careful to keep bearings clean and preventing damage to gear teeth. Slip open cap with seal off cross shaft or output sleeve.
5. Remove cap screws from Open Cap (9) on the gear side of Gear Case (2) and remove cap and shims. This completes disassembly of sub-assemblies.

PINION SHAFT DISASSEMBLY

Group 1 Drives—Secure Pinion Shaft (10, Figure 4) with a vise, and remove Lock Nut (12) and washer from shaft. Place pinion assembly in a press with threaded end of shaft up and back side of Bevel Gear (5) supported. Remove gear by pressing out.

Support outer flange surface of Pinion Housing (3) on press anvil and push threaded end of pinion shaft through housing, thereby removing Inner Bearing Cone (14), Outer Bearing Cone (13) Spacer Washer (15), Seal (16) and Shaft (10) from pinion housing. Note—disassembly of the pinion shaft from the housing will cause damage to the seal and seal must be replaced. If bearings are to be replaced, see Group 2 instructions below.

Group 2 Drives—Secure Pinion Shaft (10, Figure 3) with a vise, on shaft extension and remove cap screws from Seal Carrier (11), and remove it and gasket from Pinion Housing (3). Loosen Lock Nut (12) and remove from pinion shaft. Remove remaining pinion assembly from the vise and place inner flange surface of the Pinion Housing (3) on the anvil of a press. Push shaft through pinion housing, thereby releasing Outer Bearing Cone (13). Whenever gear set is changed, it is recommended that the Inner Bearing Cone (14) be replaced. If bearings are to be replaced, remove Bearing Cups (15) from Pinion Housing (3) with a puller tool or if one is not available, gently tap opposite back sides of the bearing cups with a flat punch so that they are removed evenly and no damage occurs to pinion housing.

Group 3 Drives (not illustrated)—Disassembly of the pinion shaft assembly is essentially the same as Group 1 Drives above except a snap ring must be removed instead of a lock nut so that bevel gear can be removed. M2 and M3 Drives have ball bearings instead of tapered bearings and they may be removed easily from pinion housing after shaft has been pressed out. It is necessary to replace pinion housing seal due to probable damage during disassembly procedure.

CROSS SHAFT DISASSEMBLY

Group 1 Drives—Cross Shaft Assembly (7, Figure 4) is disassembled by placing Shaft (18) in a press with sleeve between anvil and gear.

Figure 5 shows the use of a sleeve to support gear at hub. On certain types of bevel gears it is recommended that this tool be used to protect gear teeth. This tool may be obtained from Hub City or machined for the purpose in your shop.

Push shaft through Bearing Cone (19) and Bevel Gear (20). Invert shaft and rest Bearing Cone (21) on sleeve and anvil or, on some models, on Spacer (22) and push shaft through bearing cone. If bearings are to be replaced, remove Bearing Cups (23) from Open Caps (6 and 9) with a puller tool or, if one is not available, gently tap opposite back sides of the bearing cups with a flat punch so that they are removed evenly and no damage occurs to caps.



FIGURE 5 – Pressing Shaft out of Bearing and Gear

Maintenance Instructions

NOTE: All cross shafts in Group 1 Drives are shouldered. Bearing Cones and Gears must ALWAYS be removed by moving them away from the shoulder.

Group 3 Drives (not illustrated)—Disassembly procedure for Models M2 and M3 cross shafts is similar to Group 1 above except that a spacer is located between the bevel gear and the bearing. The spacer is removed with the gear. These models have ball bearings which are easily removed from caps.

OUTPUT SLEEVE DISASSEMBLY

Group 2 Drives—Bearing (24, Figure 3) is removed from Output Sleeve (25) on the side opposite the gear (G.O. side) by placing inner bearing race on the press anvil and pushing sleeve out of bearing. If Bearing (26) on the gear side needs to be replaced, it can be removed by tearing apart bearing and removing inner bearing race with a gear puller.

If gear side Bearing (26) is to be salvaged and reused (because of a replacement of ring gear or output sleeve), it must be gently tapped off sleeve with a flat punch after drilling several opposing holes (max. 3/16" dia.) in flange of output sleeve as shown in Figure 6. When enough clearance is obtained between bearing and output sleeve, insert a bearing puller and complete bearing removal. It is good practice to remove the gear side bearing from the output sleeve if Ring Gear (27) has to be replaced because the bearing could easily be contaminated with metal fragments when ring gear rivets are removed.

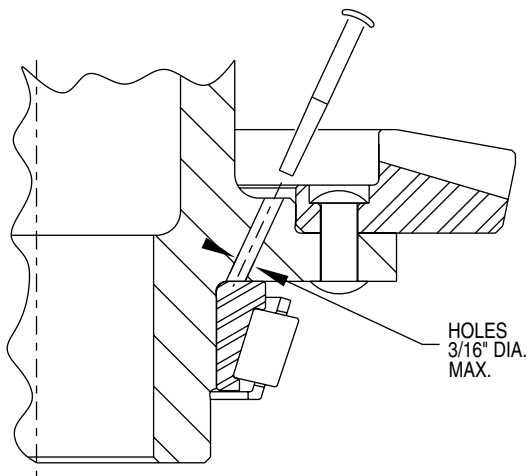


FIGURE 6 – Gear Side Bearing Removal

Ring Gear Removal—Rivets must be removed by either drilling through rivet heads on one side and tapping them out or machine off rivet heads in a lathe and then tap them out. Important — extreme care should be taken to prevent damage to output sleeve.

NOTE: On model 790 the Ring Gear is keyed to the output sleeve.

INSPECTION

Examine all seals for wear or damage and press out of open caps, pinion housings and seal carrier if replacement is necessary. Inspect all other part for damage or wear before proceeding to reassembly.

ASSEMBLY PROCEDURE

1. All parts including the gear case, should be cleaned thoroughly with an approved, non-flammable, non-toxic solvent. Any accumulation of sludge deposits or corruptions should be removed. Whenever pinion housing and caps are removed, it is recommended that seals and gaskets be replaced. These and other miscellaneous items are included in each Drive Repair Kit. (See Parts Lists).

Before reassembly, examine pinion and cross shafts or output sleeve for grooving in the shaft seal areas. If the shafts are to be reused, polish out any imperfections with a fine grade of Emery Cloth. The polishing motion should be circumferential, not axial or spiral in direction.

2. Replace Bearings Cups (15 and 28, Figure 3) and (23 and 29, Figure 4) in pinion housing and open caps being careful to remove any foreign particles in the counterbore. Bearing cup must seat squarely in counterbore (Groups 1 and 2 only). If cup must be tapped into place, use a rubber hammer or piece of wood to protect cup surfaces. Do not insert seals at this time.

3. When reassembling Pinion Shaft Assembly (4, Figures 3 and 4), Cross Shaft Assembly (7, Figure 4) and Output Sleeve Assembly (8, Figure 3), refer to Figures 3 and 4 so that all parts are included in their proper position. Be sure that parts are pressed tightly against one another and that no foreign material is included between them.



FIGURE 7 – Reassembly of Gear and Bearing Cone



FIGURE 8 – Pinion Assembly Adjustment

Figure 7 shows the recommended method of pressing the Bearing Cone (1) onto Shaft (2). An Inserting Tool (3) is shown pressing evenly on the bearing inner race. This tool may be obtained from Hub City or machined for the purpose in your shop. A substitute inserting tool may also be made from tubing which would have an I.D. sufficient to accept the shaft and an O.D. no larger than the inner bearing race.

CAUTION

Contact on the cage of the bearing or using the bearing cup to press the bearing on will **damage bearing**. If it is impossible to install the bearings as recommended above, the alternate method would be to heat the bearing (to increase the I.D. temporarily) and gently tap opposite sides of the bearing inner race with a flat punch without damaging bearing.

Maintenance Instructions

Group 1 Drives—Assembly of Cross Shaft Assembly (7, Figure 4) is essentially the reverse of the disassembly procedures except that when installing Bevel Gear (20) on shaft, first insert woodruff key. Gear is then heated in hot oil and then installed on shaft where it will cool and shrink fit.

The Pinion Shaft Assembly (4, Figure 4) is assembled as follows: Insert Spacer (15) on Pinion Shaft (10). Press Outer Bearing Cone (13) on shaft using inserting tool. Place threaded end of shaft into Pinion Housing (3) and press Inner Bearing (14) over shaft and into pinion housing with inserting tool. Install woodruff key and press Pinion Gear (5) on shaft. Assemble Pinion Washer (30) and Lock Nut (12) on shaft. Secure assembly in a vise as shown in Figure 8 and tighten lock nut enough to draw down gear and washer until the bearings bind. Nut is then backed off slightly (approx. 1/4 turn). Release pinion shaft from the vise and rap nut and shaft end sharply with a rubber mallet while supporting pinion housing on vise (see Figure 9). This will free up the bearings so that they will rotate freely with no noticeable end play. Do not install seals at this time. See FINAL ASSEMBLY AND BACKLASH ADJUSTMENT section to complete assembly.



FIGURE 9 – Pinion Assembly Adjustment



FIGURE 10 – Oil Seal Installation

Group 2 Drives—The Output Sleeve Assembly (8, Figure 3) is assembled as follows: Ring Gear (27) must be riveted squarely and firmly to output sleeve. Position ring gear on flange of output sleeve and temporarily fasten with four cap screws and nuts. Position screws 90° apart and tighten in a crisscross sequence until gear is drawn down evenly. Rivet the holes between the cap screws in a crisscross sequence. Remove cap screws and rivet remaining holes. Riveting force must be sufficient to expand the rivet tightly in the holes and form a good rivet head.

NOTE: Model 790 ring gear is keyed to output sleeve.

Place insertion tool and Bearing (24) on press anvil and press output sleeve into bearing. Reverse sleeve assembly and install Bearing (26).

Assembly of Pinion Shaft Assembly (4, Figure 3) is essentially the reverse of the disassembly procedure. Use 1 gasket between Seal Carrier (11) and Pinion Housing (3). Bearing adjustment is similar to Group 1 Drives and Figures 8 and 9 should be referred to. Do not install seals at this time. See FINAL ASSEMBLY AND BACKLASH ADJUSTMENT section to complete assembly.

Group 3 Drives (not illustrated)—Assembly of cross shaft and pinion assemblies is essentially the same as Group 1 Drives except a snap ring holds the pinion shaft assembly together instead of a lock nut. No bearing adjustment is necessary on pinion shaft because ball bearings are self adjusting. Assembly of components in their proper order can be checked by referring to the sectional view on the parts list sheet. Do not install seals at this time.

FINAL ASSEMBLY & BACKLASH ADJUSTMENT

Group 1, 2 and 3 Drives—Install O-rings (17, Figures 3 and 4) into O-ring

grooves in caps and pinion housings. Apply grease liberally on surface of all O-rings before assembly into housings. Install Open Cap (9, Figures 3 and 4) on the gear side of Case (2, Figures 3 and 4) with 3 shims. Fasten caps and shims to gear case by torquing down cap screws securely. Insert Output Sleeve Assembly (8, Figure 3) or Cross Shaft Assembly (7, Figure 4) carefully through opening in case and into open caps. Install 3 shims and Open Cap (6, Figures 3 and 4) on the case side which is opposite the gear with cap screws and torque down all screws evenly.

Bearings are then adjusted by removing or adding gaskets until the bearings bind and then add one gasket at a time until shaft or sleeve rotates freely, with no end play. Note—Position of gear will be closer to center if the number of shims on each end cap does not vary by more than one.

Insert Pinion Shaft Assembly (4, Figures 3 and 4) carefully into Case (2) using 3 shims and cap screws. Gear backlash is adjusted by moving shims from the cross shaft or output sleeve open cap on the gear side to the side opposite the gear until gears rotate freely, with no noticeable backlash. At this point, move 2 shims back to the gear side end cap and the gears will then be properly adjusted. Note—if there are not enough shims left in open cap opposite gears to move 2 shims back—further gear adjustment must be made by removing 2 shims from between the pinion housing and case and repeat the entire procedure listed in this and two preceding paragraphs.

When bearings and gear backlash have been properly adjusted, remove cap screws a final time, clean threads on screws and in holes with degreaser. Coat threads with Loctite®. If Loctite® or equivalent is not available, use lock washers (not supplied) behind screw heads. Torque down all screws evenly.

OIL SEAL INSTALLATION

Group 1, 2 and 3 Drives—Oil seals (30 and 31, Figures 3 and 4) and (16, Figure 4) can now be installed in open caps and pinion housings. Slip Seal (1, Figure 10) over tapered end of Pilot Sleeve (2, Figure 10), making sure that the spring loaded lip of the seal is facing toward the Bevel Gear Drive. Slip pilot sleeve over shaft and down until end of sleeve is against bearing. Install Seal Driver (1, Figure 11) over pilot sleeve and tap seal down sleeve until it is seated in housing or cap. Remove seal driver and pilot sleeve. These installation tools are available from Hub City.



FIGURE 11 – Oil Seal

If a pilot sleeve and seal driver (or their equivalent) are not readily available, seal must be installed with a rubber hammer or block of wood to prevent seal damage.



Damage to seals can be avoided by covering the shaft keyways with cellophane tape, plastic shim stock or paper before sliding seals onto shaft.

REFILLING GEAR CASE WITH LUBRICANT

Group 1, 2 and 3 Drives—Clean and recoat Drain Plug (1, Figures 3 and 4) with pipe sealant and replace in bottom of gear case. Remove Fill and Breather Plug (32, Figures 3 and 4) and Oil Level Plug (33, Figures 3 and 4). Fill gear case with recommended lubricant and follow all recommended procedures as detailed in Lubrication and Installation Instructions which are included with each Drive.



Do not operate the unit without making sure it contains the correct amount of lubricant. Do not overfill or underfill, or injury to personnel, unit, or other equipment may result.



Do not mix nonsynthetic and synthetic oil in the unit.



Make certain that all tools and other items are clear from rotating parts before starting machine. Stand clear, and start machine slowly to be sure all components are secure, and operating properly.

Maintenance Instructions

DISASSEMBLY PROCEDURE GROUP 4 DRIVES



Make certain that the power supply is disconnected before attempting to service or install the unit, or remove any components. Lock out the power supply, and tag it to prevent unexpected application of power.

Group 4 Drives (Refer to Figure 12 unless otherwise noted).

Field replacement of bevel gears, shafts, bearings, oil seals and O-rings may be made on AD Series Bevel Gear Drives. If gear case, open or closed caps or spacers need replacing it is recommended that the entire unit be returned to the Hub City Factory for service. If this is inconvenient, the worn or damaged spacer or cap may be sent to the factory so that it can be precision duplicated. Each AD Series Drive contains caps and spacers which are precision matched to the gear case.

Disassembly of Bevel Gear Drive is accomplished by removing Pinion Assembly (4) from Gear Case (3) and draining (preferably while warm) all lubricant from gear case.



Wear protective clothing and eye shields when installing or maintaining unit and machine.

Pinion Shaft Assembly (4) is removed from case by taking out Snap Ring (5) and carefully sliding entire assembly out so that gear teeth are not damaged and bearings are kept clean. Remove Snap Ring (6) on the opposite gear side of case and carefully slide Output Shaft Assembly (7) out of case. Remove Snap Ring (8) from the gear side of case and slide out Closed Cap (9) and remaining Ball Bearing (10). Note — all parts are precision fit so no shims are necessary. Bearings should be removed easily with only light pressure on the outer race.

IMPORTANT

All parts which are intended for reuse must be marked when they are disassembled so that they are reassembled in their exact original position in the case. If seals are to be reused, cover all shaft keyways with cellophane tape, plastic shim stock or paper to avoid seal damage.

PINION SHAFT DISASSEMBLY

Slide Open Cap (11, Figure 12) and Outer Bearing (12) off Pinion Shaft (13). Drive Spring Pin (14) out of Bevel Gear (15) and pinion shaft. Place pinion shaft in a press with shoulder of gear resting on the press anvil. Remove gear by pushing shaft through gear. Remove Inner Ball Bearing (16) from shaft. If pinion shaft is to be replaced and Spacer (17) salvaged, press off spacer carefully from shaft so that seal may be broken on Loctite® used to affix spacer to shaft. Remove Seal (18) from open cap with a driver tool or gently tap opposite sides of inner seal surface with a flat punch so that they are removed evenly and no damage occurs to open cap counterbore. Remove O-ring (19) from open cap.

OUTPUT SHAFT DISASSEMBLY

The disassembly of the Output Shaft Assembly (7, Figure 12) is essentially the same as the procedure outlined above for the pinion shaft.

ASSEMBLY PROCEDURE

Group 4 Drives—Clean and inspect all parts as detailed in Step 1 of Assembly Procedure, Group 1, 2 and 3 Drives.

Align gears on shafts and secure with spring pins. Slide inner Ball Bearing (16) tightly against bevel gear. Apply #602 Loctite® (or equivalent) to spacer area of shaft and slide Spacer (17) on Pinion Shaft (13) and against inner bearing. On Output Shaft Assembly (7), Spacer (20) is affixed on Output Shaft (21) so that it is tight against Bevel Gear (22).



DO NOT GET LOCTITE® ON SEALS OR BEARINGS.

Install O-rings into Caps (9, 11 and 25) and Seals (18 and 23) into open caps with pilot sleeve and seal driver tools (see OIL SEAL INSTALLATION, on previous page). Install Ball Bearing (24) on output shaft and Ball Bearing (12) on pinion shaft. Slip pilot sleeve over keyway end of output shaft and slide Open cap (25) down pilot sleeve until it is tightly against Bearing (24). Slip pilot sleeve over keyway end of Pinion Shaft (13) and slide Open Cap (11) down pilot sleeve until it is tightly against Ball Bearing (12). **Important**—If the pilot sleeve tool is not available, keyways must be covered with cellophane tape, plastic shim stock, etc., so that keyways do not damage seals.

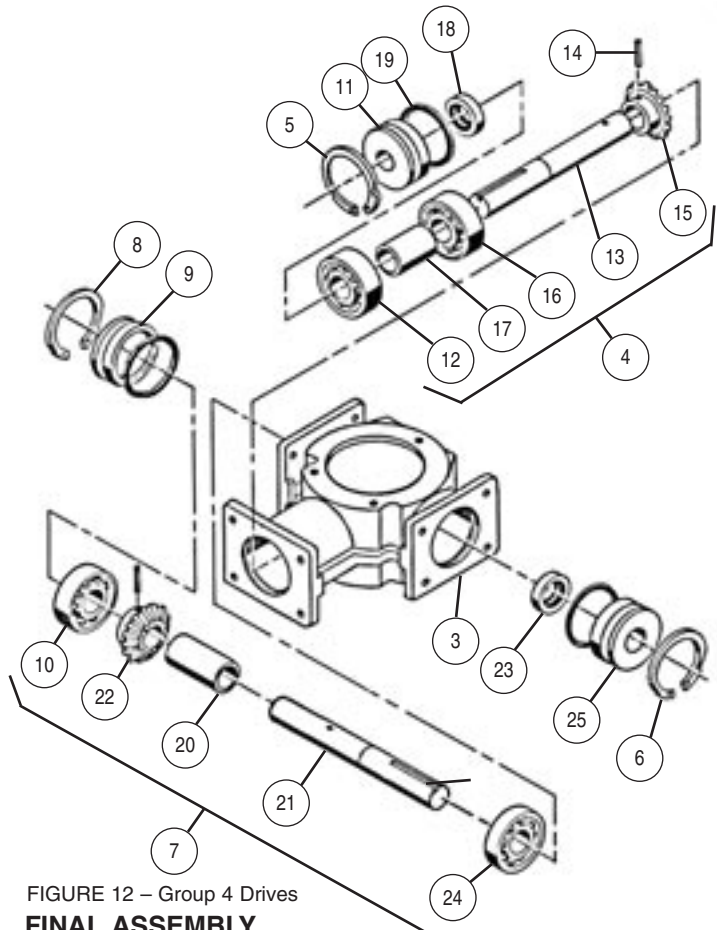


FIGURE 12 – Group 4 Drives

FINAL ASSEMBLY

Group 4 Drives—Insert entire Output Shaft Assembly (7) into gear case and secure Open Cap (25) with Snap Ring (6). Slide Remaining Ball Bearing (10) over gear end of output shaft and tightly against Bevel Gear (22). Install Closed Cap (9) in gear case and secure with Snap Ring (8).

Fill gear case with the amount of Lubriplate 5555 recommended in chart shown below.

Insert entire Pinion Shaft Assembly (4) into gear case, being careful to see that bevel gears mesh. Secure with Snap ring (5).

No adjustment of bearings or gear backlash is necessary as all parts have been precision fit. However, care should be taken that no foreign material is present between components during assembly that could alter the precision spacing.

LUBRICANT QUANTITIES

MODEL	QTY. REQ.	MODEL	QTY. REQ.
AD-1 & AD-4	1/2 oz.	AD-2 & AD-5	1-1/2 oz.
		AD-3	8 oz.



Do not overfill or underfill, or injury to personnel, unit, or other equipment may result.



Make certain that all tools and other items are clear from rotating parts before starting machine. Stand clear, and start machine slowly to be sure all components are secure and operating properly.

For further information that may be helpful, see the Lubrication, Installation and illustrated Replacement Parts sheets for your Bevel Gear Drive. Should a particular problem arise or additional information be required, contact the nearest Hub City Sales Office, or Industrial Power Transmission Distributor which are listed in the Yellow Pages or contact Hub City — Aberdeen, SD.