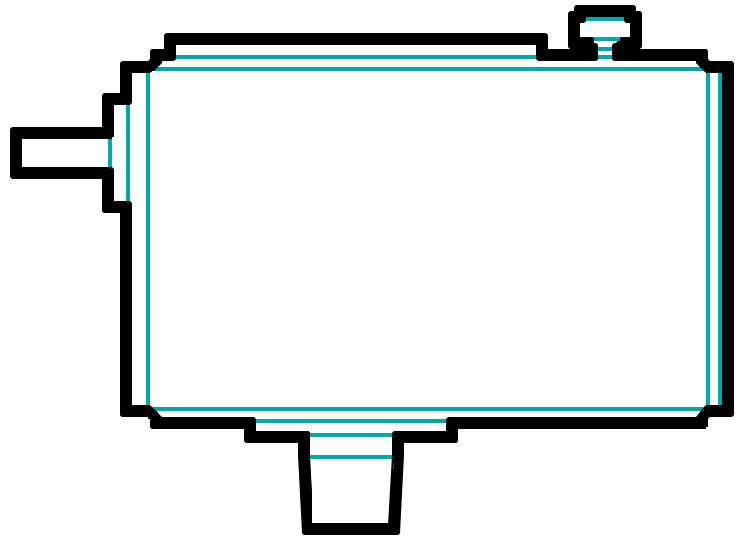


# HT Gear Drive Maintenance Manual Case Size 10



Equipment Reference:

For Service and  
Information Contact

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## MAINTENANCE

### GEAR DRIVE

Case Size 10

This manual contains instructions for HT gear drive disassembly and assembly. Refer to the agitator manual for all other information relative to the agitator.

Other than periodic lubrication as defined in the *Lubrication* section of the Agitator Manual, no routine operational gear drive maintenance is required.

To assure the longest life from your gear drive, annual shutdowns which can correspond with plant shutdowns should be planned. Gear tooth wear patterns, shaft/bearing end play, alignment, bolting and the condition of all seals should be checked. Worn parts should be replaced and any areas of general concern should be brought to the attention of your *local Chemineer office*.

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## GEAR DRIVE

Case Size 10

### Disassembly

#### Gear Drive (Figure 18, page 24)

1. Remove change gear cover [276] and gasket [277].
2. Remove pinion locknut [217] and change pinion washer [216].
3. Remove change pinion [215]. All change pinions are spline-mounted.
4. Loosen change gear bolt [218] two turns. Apply a gear puller to disengage the taper. Remove the gear puller and change gear bolt [218], lockwasher [219] and change gear washer [220]. All change gears are taper hub mounted with three 5/8-11 tapped holes, on 5.75" (146 mm) bolt circle diameter, provided for gear puller attachment.

*CAUTION! Release of taper fit can cause the change gear to jump off the shaft if not retained.*

5. Remove change gear and key [221, 222].
6. Remove spiral bevel pinion cartridge assembly [223] (Figure 1, page 4) and shim set [236]. Keep the shim set intact for reference at assembly.
7. Remove upper bearing cap assembly [239] and shim set [243]. Keep the shim set intact for reference at assembly.
8. Remove cap screws [268] securing taper pins [267] to housing cover [263]. Insert cap screws into the jacking holes in the head of the taper pin. Remove the taper pins.
9. Remove bolts [264] and housing cover [263].
10. Remove input shaft bearing cap assembly and gasket [201, 205].
11. Remove lube trough [270].
12. Retain bearing [213] cup by inserting a piece of 3/8" (10 mm) square stock x 1" (25 mm) long into the oil feed hole on the top of the bearing [213] boss. The square stock will fit down into the lubrication groove in the bearing cup preventing axial movement of the bearing cup. Retain the square stock with a large C-clamp.

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## GEAR DRIVE

Case Size 10

### Disassembly (Cont'd)

13. Remove input shaft **[212]** by pressing it out of bearing **[213]** cone through the motor end of the housing. Proceed slowly when removing the input shaft through the housing to avoid damage to the input shaft.
14. Remove bearing **[213]** cup and o-ring **[214]** from the housing.
15. Install a 5/8-11 eyebolt in the end of output shaft **[247]**. Lift the output shaft assembly (*Figure 2, page 5*) out of the housing.
16. Remove lower bearing cap assembly **[256]** and shim set **[259]**. Keep the shim set intact for reference at assembly.

Bearing **[226, 228, 241, and 255]** cups are mounted with interference fits and can be difficult to remove with a commercial bearing puller. Removal can be made easier by welding a 1/8" (3 mm) bead completely around the cup in the center of the roller race. Upon cooling, the cup will shrink allowing removal. Be sure to protect adjacent surfaces from weld spatter.

The gear drive is now disassembled into major subassemblies; input shaft, spiral bevel pinion cartridge, output shaft and bearing caps.

*NOTE: When the gear drive is fully disassembled, all bearings, lip seals, o-rings, shims and gaskets should be replaced with new parts. When replacing bearings, always replace both cup and cone. Replace gears in sets. Spiral bevel gears must always be replaced in matched sets.*

*CAUTION! Bearing assemblies **[210, 213]** are matched sets consisting of two cones, one cup and one spacer each. Do not interchange any of these bearing parts. Bearing parts are match marked.*

**GEAR DRIVE**

Case Size 10

**Disassembly (Cont'd)****Spiral Bevel Pinion Cartridge**

1. Remove locknut [224]. *NOTE: This locknut is split on one side and is retained with a tangential locking bolt. Loosen locking bolt prior to removing bearing locknut.*
2. Press spiral bevel pinion shaft [230] out of bearing [226] cone. Press bearing [228] cone and pinion washer [229] off the spiral bevel pinion shaft.
3. Remove bearing [226, 228] cups from the cartridge housing.

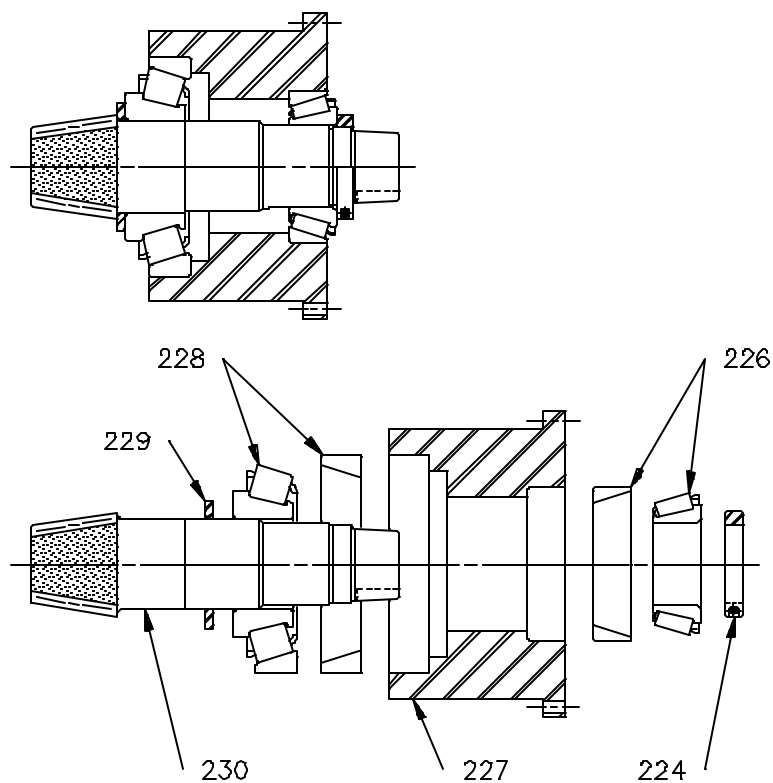


Figure 1: Spiral Bevel Pinion Cartridge Assembly [223]

**GEAR DRIVE**

Case Size 10

**Disassembly (Cont'd)****Output Shaft**

1. Remove gear mounting bolts [249] and spiral bevel gear [248].
2. Press bearing [255] cone off output shaft [247].
3. Press grease retainer [253] and bearing [241] cone off the output shaft.

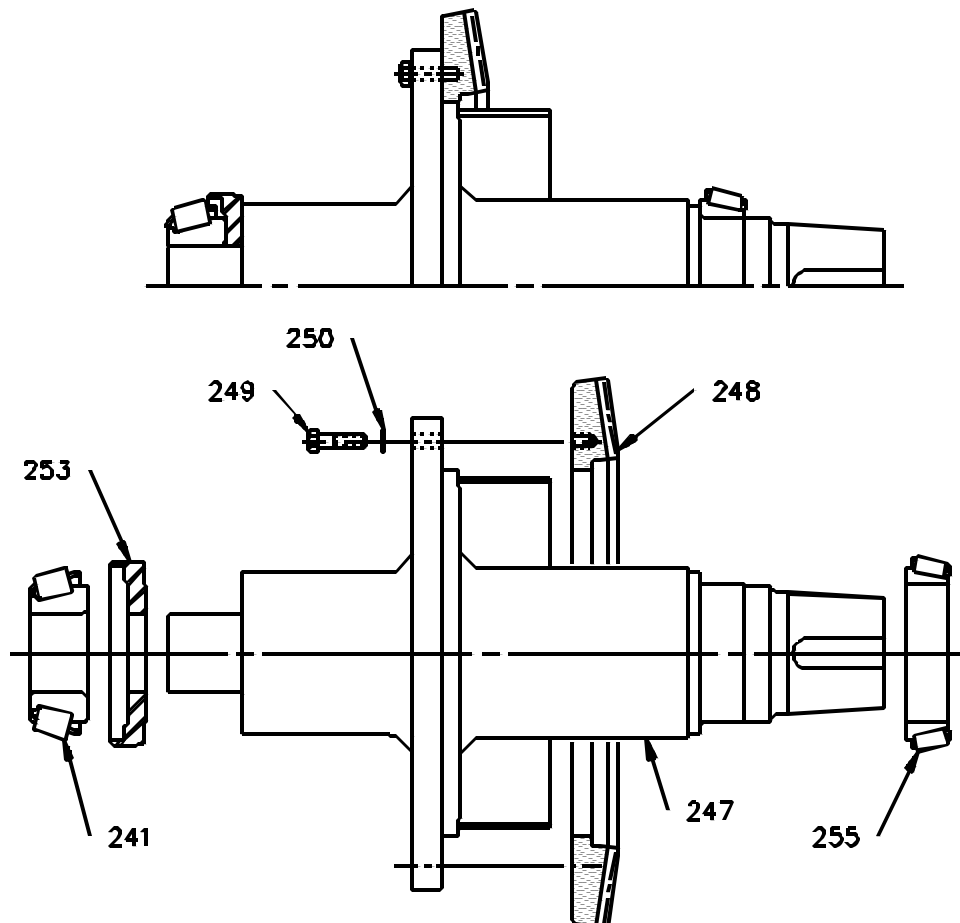


Figure 2: Output Shaft Assembly [246]



## GEAR DRIVE

### Case Size 10

#### Disassembly (Cont'd)

#### Upper and Lower Bearing Caps

1. Press lip seals [242, 258] out of bearing caps [240, 257].
2. Remove bearing [241, 255] cups from the bearing caps.

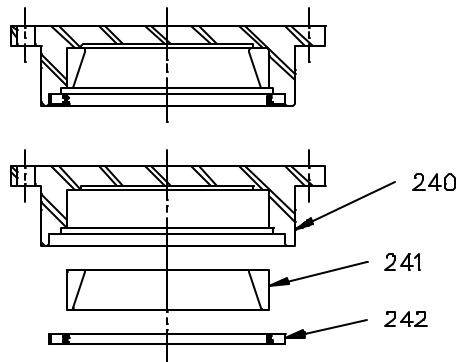


Figure 3: Upper Bearing Cap Assembly [239]

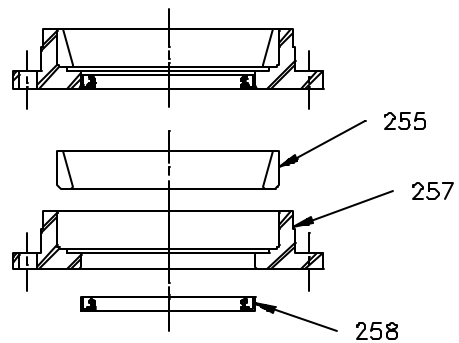


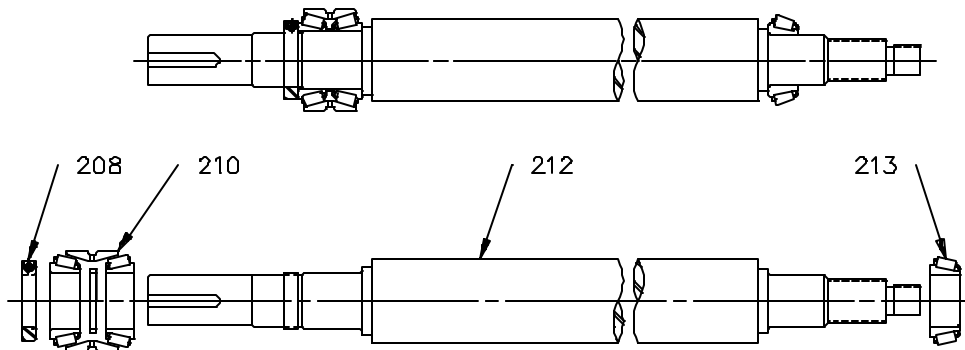
Figure 4: Lower Bearing Cap Assembly [256]

**GEAR DRIVE**

Case Size 10

**Disassembly (Cont'd)****Input Shaft**

1. Press bearing [213] cone off input shaft [212].
2. Remove bearing locknut [208]. *NOTE: This locknut is split on one side and is retained with a tangential locking bolt. Loosen locking bolt prior to removing bearing locknut.*
3. Press bearing assembly [210] off the input shaft.

*Figure 5: Input Shaft Assembly [211]*

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## GEAR DRIVE

Case Size 10

### Disassembly (Cont'd)

#### Input Shaft Bearing Cap

1. Press lip seal [204] out of bearing cap [203].
2. Remove gasket [205].

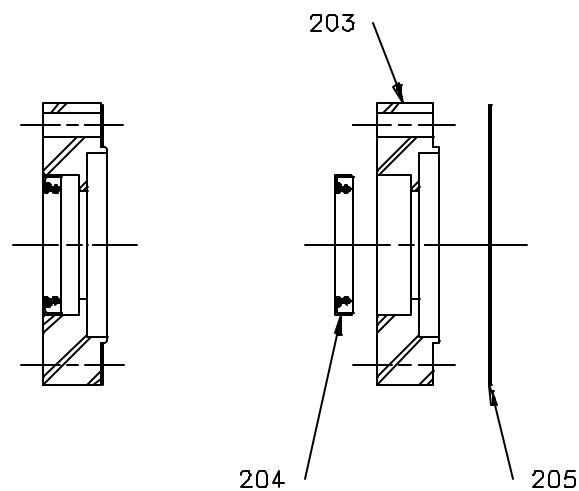


Figure 6: Input Shaft Bearing Cap Assembly [201]

The gear drive is now fully disassembled. Clean all parts and inspect for wear. Replace worn parts as required.

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## GEAR DRIVE

Case Size 10

### Assembly

Inspect all bolts and setscrews for damage after cleaning (threads, shank and head). If replacement is required, replace with the equivalent type and strength grade.

Inspect and clean all tapped holes. If threads are damaged, chase with an appropriate tap.

*NOTE: The following assembly procedures require the use of a torque wrench. The values listed in Table 1, page 10 are proper tightening torques as a function of thread size.*

All bearing cones are mounted with interference fits. Heat the cones and press onto the shaft. Heat the bearings in oven or oil bath.

*NOTE: Do not heat parts in excess of 275°F (135°C). Do not apply direct flame. Do not allow parts to touch the bottom or sides of the oven or oil bath.*

Bearing **[226, 228, 241 and 255]** cups are mounted with interference fits. Press bearing cups into their housings cold. *Placing the cups in dry ice will cause them to shrink and ease installation.*

Before installing lip seals, clean the cap bore and apply Permatex #2 or equal to the outside of the lip seal. Install the lip seal with the seal lip toward the bearing. Before installation on a shaft, coat the shaft and seal lip with bearing grease.

**GEAR DRIVE**

Case Size 10

TABLE 1: BOLT TIGHTENING TORQUE<sup>(1),(2)</sup>

| Bolt Size | CARBON STEEL <sup>(3)</sup> |     |         |      |
|-----------|-----------------------------|-----|---------|------|
|           | Grade 2                     |     | Grade 5 |      |
|           | ft lb                       | Nm  | ft lb   | Nm   |
| 8-32      | 1.2                         | 1.6 | 1.9     | 2.5  |
| 10-24     | 1.7                         | 2.3 | 2.7     | 3.6  |
| 10-32     | 1.9                         | 2.6 | 3.1     | 4.1  |
| 1/4-20    | 4.1                         | 5.6 | 6       | 8.1  |
| 5/16-18   | 8.3                         | 11  | 13      | 17   |
| 5/16-24   | -                           | -   | 14      | 19   |
| 3/8-16    | 15                          | 20  | 23      | 31   |
| 3/8-24    | -                           | -   | 26      | 36   |
| 1/2-13    | 38                          | 51  | 56      | 76   |
| 1/2-20    | -                           | -   | 68      | 92   |
| 5/8-11    | 68                          | 92  | 113     | 153  |
| 5/8-18    | -                           | -   | 135     | 161  |
| 3/4-10    | 120                         | 163 | 200     | 271  |
| 3/4-16    | -                           | -   | 225     | 305  |
| 7/8-9     | 105                         | 143 | 296     | 401  |
| 1-8       | 165                         | 224 | 443     | 601  |
| 1! 1/8-7  | 225                         | 305 | 596     | 808  |
| 1! 1/4-7  | 315                         | 428 | 840     | 1139 |
| 1! 3/8-6  | 417                         | 566 | 1103    | 1495 |
| 1! 1/2-6  | 555                         | 752 | 1463    | 1983 |

<sup>(1)</sup> Tighten all fasteners to values shown in the table unless specifically instructed to do otherwise.

<sup>(2)</sup> Lubricate all fasteners at assembly with grease, oil or an anti-seize material. Bolt threads and contact surfaces of bolt heads and nuts should be lubricated.

<sup>(3)</sup> If fasteners cannot be lubricated, multiply table values by 1.33.

## GEAR DRIVE Case Size 10

### Assembly (Cont'd)

Most gear drive bolt patterns are circular with six, eight, twelve, twenty or twenty-four hole spacings. Install all bolts finger tight, then tighten in sequential order (see below) to 50% of the prescribed torque values. Repeat the sequence, tightening the bolts to full torque values.

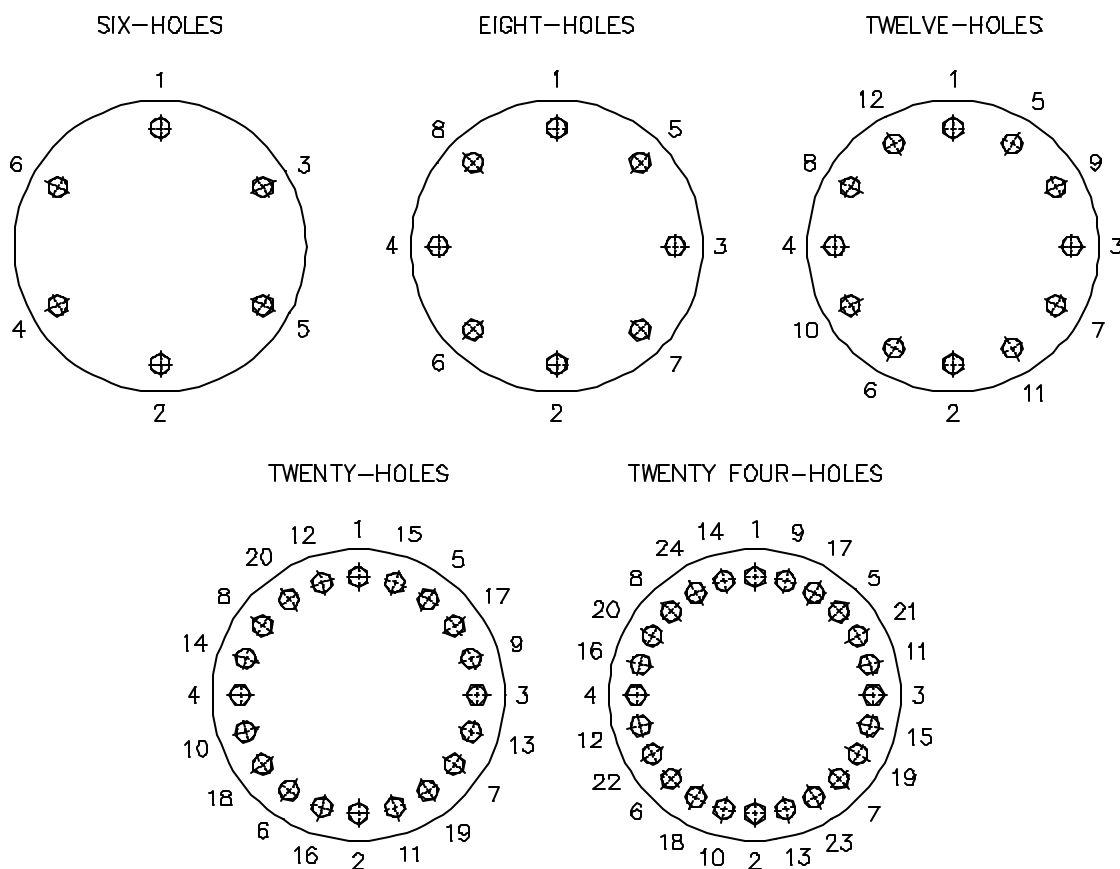


Figure 7: Sequential Tightening

When tightening two or more setscrews which retain a collar, flange, or sleeve to a shaft, tighten alternately, working back and forth or around the shaft. Tighten in several steps to full torque values.

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## GEAR DRIVE

Case Size 10

### Assembly (Cont'd)

#### Input Shaft Bearing Cap

1. Press lip seal [204] into input shaft bearing cap [203].

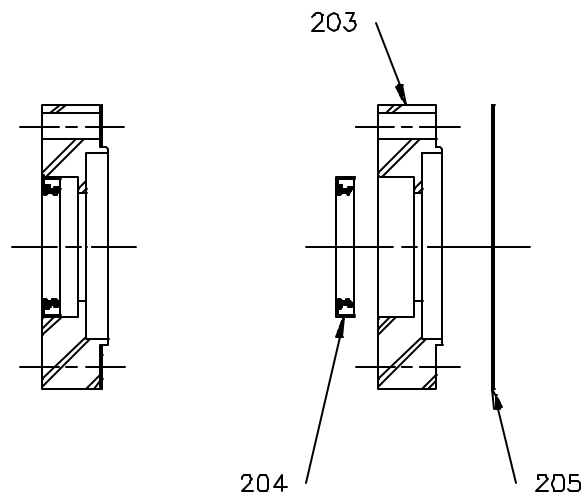


Figure 8: Input Shaft Bearing Cap Assembly [201]

## GEAR DRIVE

Case Size 10

### Assembly (Cont'd)

#### Input Shaft

**CAUTION!** Each bearing assembly [210, 213] is a matched set consisting of two cones, one cup and one spacer. Each set of bearing assembly parts is marked with a unique set number. In addition, one cone and one end of the cup will be marked with the suffix letter "A". The cone marked "A" must be assembled into the cup end marked "A". Do not mis-match parts from one assembly to another.

1. Heat bearing [210] cone and press onto input shaft [212]. The bearing cone must be firmly seated against the shaft shoulder. Check with a feeler gage. Allow the bearing to cool.
2. Install bearing [210] cup and spacer, observing matchmarks.
3. Heat bearing [210] cone and press onto the input shaft.
4. Spray locknut [208] threads and face, and bearing [210] with light machine oil. Install and tighten the locknut against the bearing cone face.

**NOTE:** This locknut is split on one side and is retained with a tangential locking bolt. With the locking bolt loosened, the locknut will be "free running" on the shaft threads. Prior to tightening the locknut against the bearing cone face, tighten the locking bolt until the locknut shows slight restraint to turning by hand.

5. Torque the locknut locking bolt to 53 in lb (6 Nm) lubricated.
6. Heat bearing [213] cone and press onto the spline end of the input shaft. The bearing cone must be firmly seated against the shaft shoulder. Check with a feeler gage.

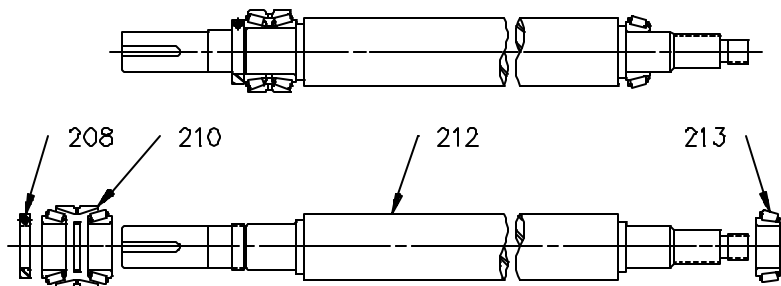


Figure 9: Input Shaft Assembly [211]



**GEAR DRIVE**  
Case Size 10

**Assembly (Cont'd)**

**Upper and Lower Bearing Caps**

1. Press bearing [241, 255] cups into bearing caps [240, 257].
2. The bearing cups must be firmly seated against the cap shoulders. Check with a feeler gage.
3. Press lip seals [242, 258] into the bearing caps.

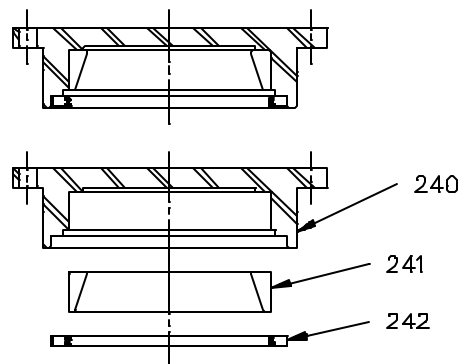


Figure 10: Upper Bearing Cap Assembly [239]

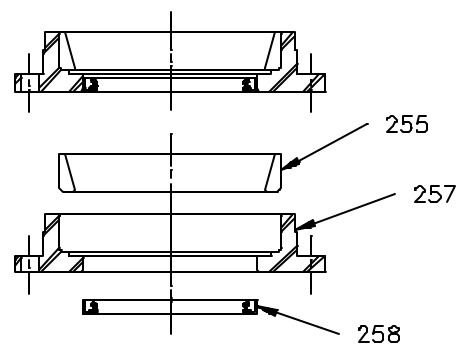


Figure 11: Lower Bearing Cap Assembly [256]

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)****Output Shaft**

1. Heat grease retainer [253] and bearing [241] cone and press onto output shaft [247].
2. Heat bearing [255] cone and press onto the output shaft. The grease retainer and bearing cones must be firmly seated against the shaft shoulders. Check with a feeler gage.
3. Install spiral bevel gear [248].
4. Install bolts and lockwashers [249, 250] and torque to the value shown in *Table 1, page 10*.

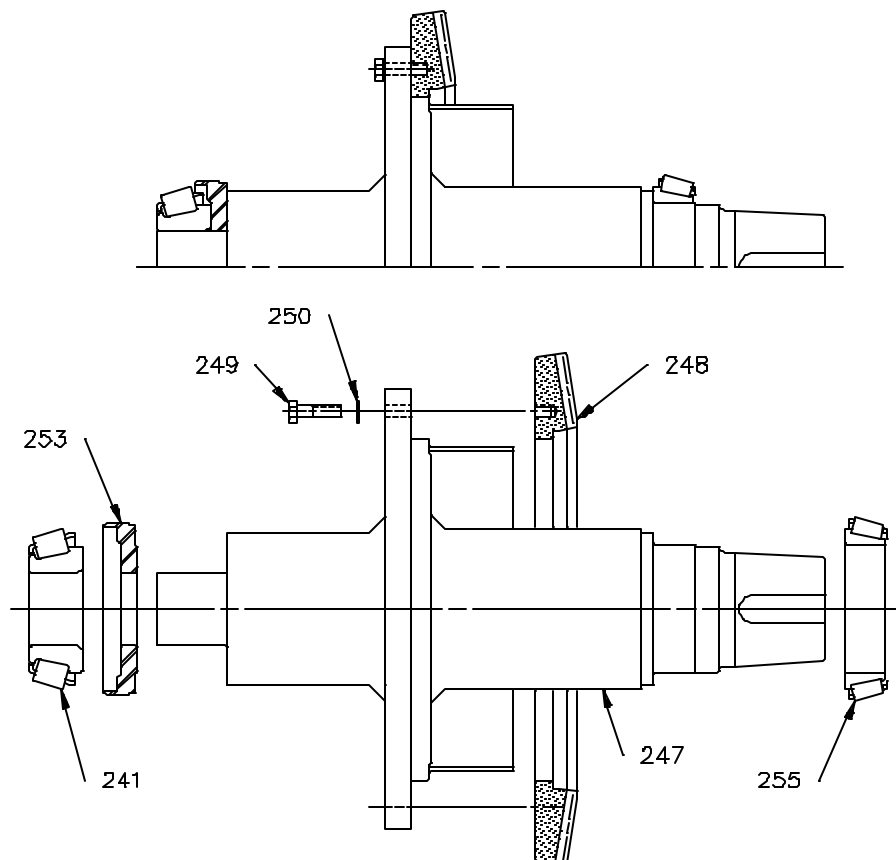


Figure 12: Output Shaft Assembly [246]

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)****Spiral Bevel Pinion Cartridge**

1. Press bearing [226, 228] cups into cartridge housing [227]. The bearing cups must be firmly seated against the housing shoulders. Check with a feeler gage.
2. Install pinion spacer [229] on spiral bevel pinion shaft [230]. Heat and press bearing [228] cone onto the spiral bevel pinion shaft. Allow the bearing to cool. The bearing cone must be firmly seated against the spacer. Check with a feeler gage.
3. Insert the spiral bevel pinion shaft into cartridge housing.
4. Heat bearing [226] cone and press it onto the spiral bevel pinion shaft while turning the cartridge housing by hand. The cartridge housing should show slight resistance to turning. Maintain this pressure while the bearing cone cools.

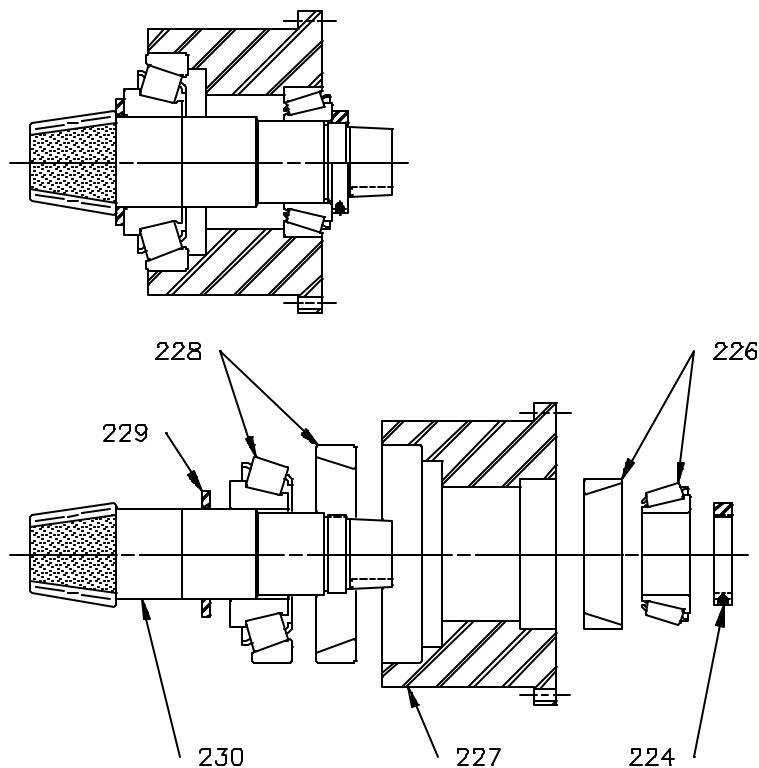


Figure 13: Spiral Bevel Pinion Cartridge Assembly [223]

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)**

5. Clamp the housing flange of the cartridge assembly in a soft jawed bench vise.
6. Spray locknut [224] threads and face, and bearings [226, 228] with light machine oil. Install and tighten the locknut against the bearing cone face.

*NOTE: This locknut is split on one side and is retained with a tangential locking bolt. With the locking bolt loosened, the locknut will be "free running" on the shaft threads. Prior to tightening the locknut against the bearing cone face, tighten the locking bolt until the locknut shows slight restraint to turning by hand.*

7. Install bolt [218] and tighten securely.

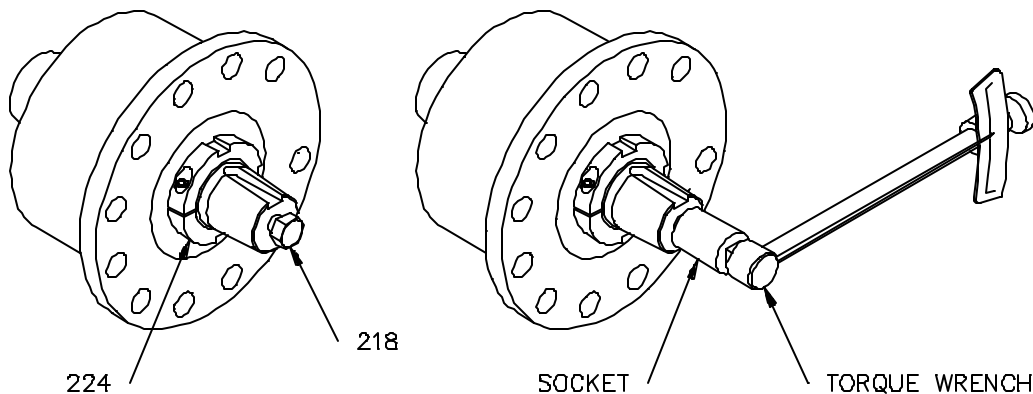


Figure 14: Torque Reading

8. Apply a torque wrench and measure the shaft turning torque. The torque reading is to be taken while rotating the pinion shaft at about 3 rpm. Increase turning torque by tightening locknut [224]. Turn shaft one complete revolution between adjustments. Adjust to 70 in lb (7.91 Nm).

---

## GEAR DRIVE

Case Size 10

### Assembly (Cont'd)

9. Torque the locknut locking bolt to 53 in lb (6 Nm) lubricated. Precision measure and record the assembled height "A" of the spiral bevel pinion cartridge assembly. This measurement will be required to set the mounting distance of the spiral bevel pinion. Delete the original dimension stamped on the cartridge housing.

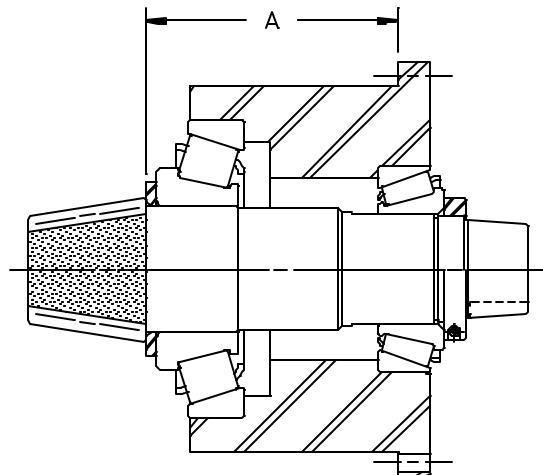


Figure 15: Cartridge Measurement

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)****Gear Drive**

1. Calculate required pinion cartridge shim set [236] thickness as follows:

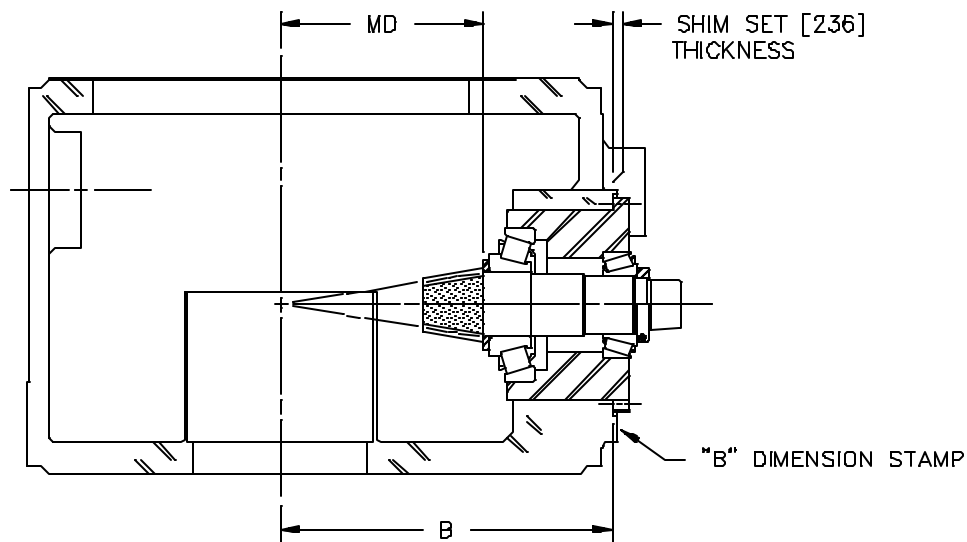


Figure 16: Shim Calculation

$$A + MD - B = \text{Shim set [236] thickness}$$

MD = Pinion mounting distance (MD X.XXX) etched on the small end of the pinion.

B = Dimensional value marked on the housing.

A = Assembled cartridge height measurement (*Figure 15, page 18.*)

2. Using a paint stick, highlight the top edge of the tooth marked with an "X" on the spiral bevel pinion.
3. Install spiral bevel pinion cartridge assembly [223] and shim set [236] into the housing.
4. Install bolts and lockwashers [237, 238] and torque to the value shown in *Table 1, page 10.*

---

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)**

5. Measure with a micrometer the thickness of original shim set **[259]** for the lower bearing cap and duplicate the thickness with new shims.

## Example:

If the thickness of the old shim set was .062", use (12) blue shims and (1) red shim to equal .062" when compressed.

Red = .002" (.051 mm) thick

Blue = .005" (.127 mm) thick

6. Install lower bearing cap assembly **[256]** and new shim set **[259]** into housing **[262]**. Install bolts and lockwashers **[260, 261]**. Torque to the value shown in *Table 1, page 10*.
7. Position the housing so that the lower bearing cap is down. Rotate the spiral bevel pinion shaft until the tooth marked "X" is on top center.
8. Using a paint stick, highlight the "X" match marks on the outside of spiral bevel gear **[248]**.
9. Spray bearings **[241, 255]** with light machine oil and lower output shaft assembly **[246]** into the housing. **CAUTION!** Make sure the spiral bevel gear teeth marked "X" straddle the pinion shaft tooth marked "X".
10. Coat the housing/housing cover mating surfaces with Permatex #2 or equal. Install housing cover **[263]**. Align taper pin holes and install taper pins **[267]**. Install cap screws and lockwashers **[268, 269]**. Torque to the value shown in *Table 1*.
11. Install the cover bolts and lockwashers **[264, 265]**. Torque to the value shown in *Table 1*.
12. Install upper bearing cap assembly **[239]**. Bolt in place using four equally spaced bolts **[244]**. Alternately tighten bolts until the upper bearing cap is seated on the bearing. *Do not torque the bolts; snug-up only.*

**GEAR DRIVE**

Case Size 10

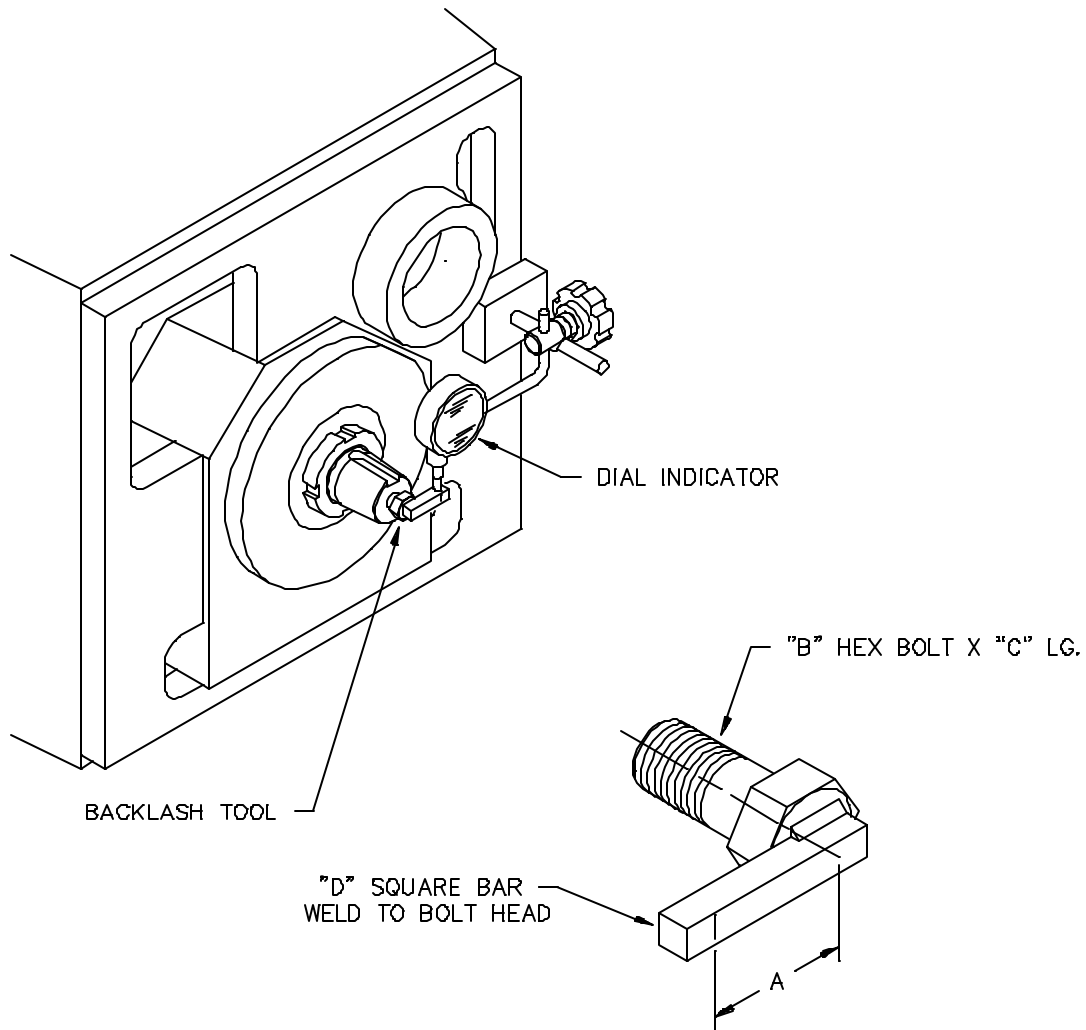


Figure 17: Backlash Setting

TABLE 2: BACKLASH SETTING

| Case Size | A                   | B   | C                   | D                 |
|-----------|---------------------|-----|---------------------|-------------------|
| 10        | 2 1/8"<br>(54.0 mm) | 1-8 | 1 1/2"<br>(38.1 mm) | 1/2"<br>(12.7 mm) |



---

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)**

13. Install a backlash tool (supplied by others) (*Figure 17, page 21*) in the spiral bevel pinion shaft and measure the backlash by placing a dial indicator against the backlash tool at a right angle to the rotation. Restrain the output shaft from turning and rotate the spiral bevel pinion shaft back and forth to measure the free movement.

The Backlash Setting (Full Indicator Movement) is etched on the spiral bevel gear.

14. Take six consecutive backlash readings. Rotate the spiral bevel pinion shaft one revolution counterclockwise after each reading. Turn the pinion shaft back to the position on the lowest backlash reading.
15. Add shims **[259]** to lower bearing cap assembly **[256]** to decrease backlash; remove shims to increase backlash.

*NOTE: Before each shim adjustment, the bolts on the upper bearing cap should be loosened. After changing the shims, the bolts on the lower bearing cap should be torqued to the value shown in Table 1, page 10 and then the bolts on the upper bearing cap should be snugged-up.*

16. Measure the gap between upper bearing cap **[240]** and the housing cover. Count out new shims equal to the gap plus .003" to .004" to provide a bearing setting of .003" to .004" (.076 mm to .102 mm) endplay.
17. Install upper bearing cap assembly **[239]** with a new shim set **[243]**. Install bolts and lockwashers **[244, 245]** and torque to the value shown in *Table 1*.
18. Check the output shaft endplay. If adjustment is required, add or subtract from shim set **[243]** to obtain .003" to .004" (.076 mm to .102 mm) endplay.
19. Install o-ring **[214]** into the housing. Install bearing **[213]** cup into the housing bore. *CAUTION! Cup end marked "A" must be assembled with cone marked "A".*
20. Install input shaft assembly **[211]** into the housing from the motor end.
21. Assemble lube trough **[270]** to the housing with bolts and lockwashers **[271, 272]**. Torque the bolts to the value shown in *Table 1*.
22. Place input shaft bearing cap assembly **[201]** and gasket **[205]** over the end of the input shaft. Align the six cap and gasket bolt holes with the six housing bolt holes. The seventh cap and gasket hole orients at the 6 o'clock position.

---

**GEAR DRIVE**

Case Size 10

**Assembly (Cont'd)**

23. Assemble the input shaft bearing cap assembly to the housing with bolts and lockwashers **[206, 207]**. Torque the bolts to the value shown in *Table 1*.
24. Install bearing **[213]** spacer onto the input shaft. Heat bearing **[213]** cone and press onto the input shaft.
25. Before the bearing is cool, install change pinion **[215]**, change pinion washer **[216]** and pinion locknut **[217]**. *NOTE: Counter-bored side of the change pinion goes against the bearing face.* Torque the locknut to 400 ft lb (542 Nm). Allow bearing **[213]** cone to cool. Remove pinion locknut and change pinion washer.
26. Slide change gear **[221]** (taper bore) into place on spiral bevel pinion shaft **[230]**. The change gear bore and the spiral bevel pinion shaft taper must be clean and dry prior to assembly.
27. Install key, bolt, lockwasher and change gear washer **[222, 218, 219, and 220]**. Torque the bolt to the value shown in *Table 1, page 10*.
28. Reinstall the change pinion washer and pinion locknut. Torque the locknut to 600 ft lb (813 Nm).
29. Install change gear cover and gasket **[276, 277]** with bolts and lockwashers **[278, 279]**. Torque the bolts to 144 in lb (16 Nm).  
  
*CAUTION! Do not tighten the change gear cover bolts beyond 144 in lb (16 Nm).*
30. Rotate the input shaft by hand until the output shaft makes at least one turn. Check for any binding.
31. Add grease to bearings **[241, 255]** and fill the gear housing with oil. See *Agitator IOM Manual, Lubrication, Gear Drive*.
32. Reinstall gear drive coupling half **[351]**. See *Agitator IOM Manual, Installation, Rigid Shaft Coupling*.
33. Reinstall motor bracket **[131]** and motor **[100]**. See *Agitator IOM Manual, Installation*.

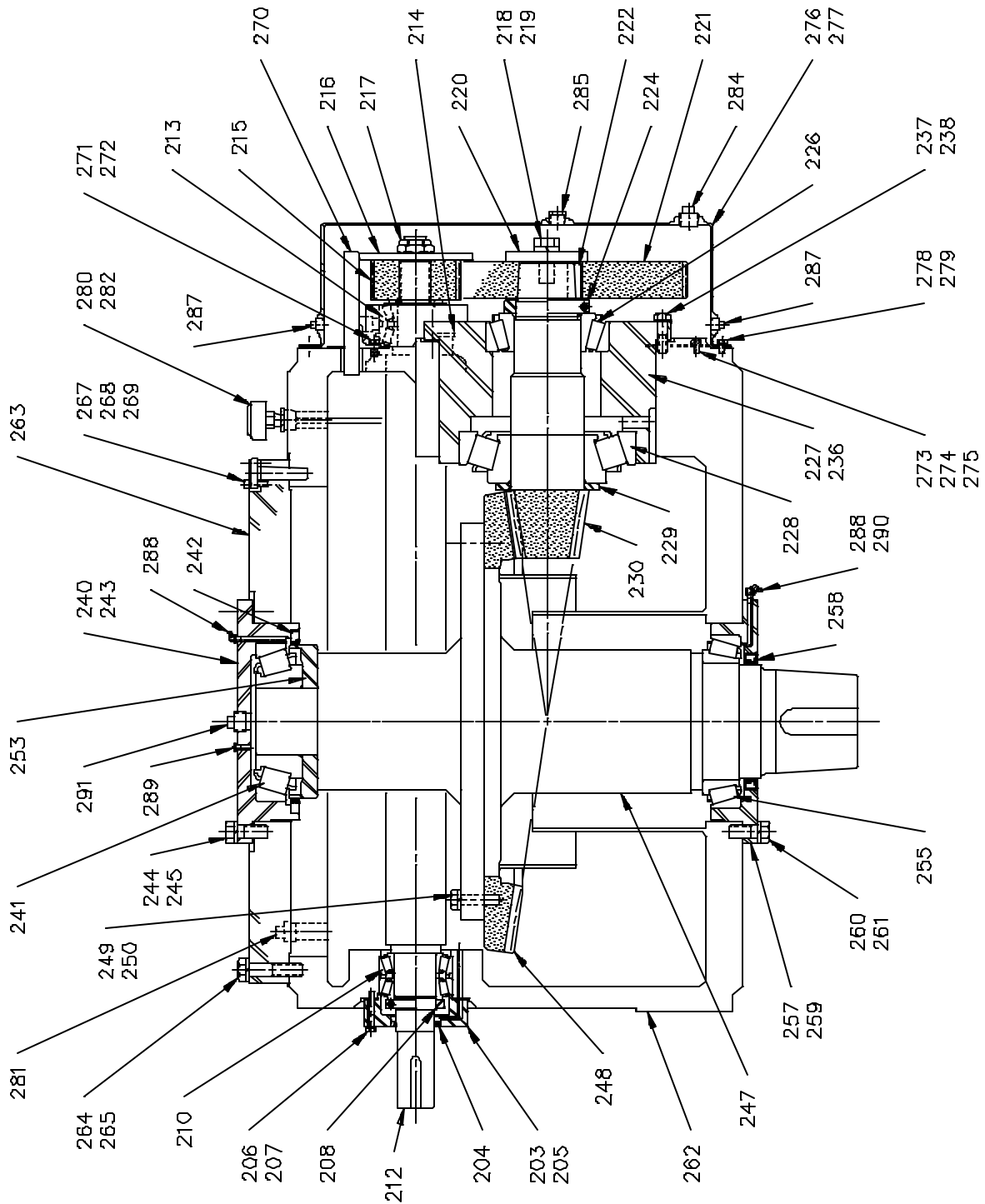


Figure 18: HT Gear Drive: Size 10

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## GEAR DRIVE ITEM LIST

Case Size 10

| Item #     | Description                                   | Qty.     | Item #     | Description                       | Qty.     | Item #  | Description              | Qty. |
|------------|---|----------|------------|-----------------------------------|----------|---------|--------------------------|------|
| <b>200</b> | <b>gear drive assembly</b>                    | <b>1</b> | 229        | pinion spacer                     | 1        | 265     | lockwasher               | 20   |
| <b>201</b> | <b>input shaft bearing cap assembly</b>       | <b>1</b> | 230        | spiral bevel pinion shaft         | 1        | 267     | taper pin                | 2    |
| 203        | bearing cap                                   | 1        | 236        | shim set                          | 1        | 268     | cap screw                | 4    |
| 204-002    | lip seal                                      | 1        | 237        | bolt                              | 11       | 269     | lockwasher               | 4    |
| 205        | gasket  | 1        | 238        | lockwasher                        | 11       | 270     | lube trough              | 1    |
| 206        | bolt  | 6        | <b>239</b> | <b>upper bearing cap assembly</b> | <b>1</b> | 271     | bolt                     | 2    |
| 207        | lockwasher                                    | 6        | 240        | upper bearing cap                 | 1        | 272     | lockwasher               | 2    |
| <b>211</b> | <b>input shaft assembly</b>                   | <b>1</b> | 241        | bearing                           | 1        | 273     | throttle plate           | 2    |
| 208-003    | clamp locknut with bolt                       | 1        | 242        | lip seal                          | 1        | 274     | bolt                     | 6    |
| 210-002    | bearing assembly                              | 1        | 243        | shim set                          | 1        | 275     | lockwasher               | 6    |
| 212        | input shaft                                   | 1        | 244        | bolt                              | 8        | 276     | change gear cover        | 1    |
| 213-002    | bearing assembly                              | 1        | 245        | lockwasher                        | 8        | 277     | gasket                   | 1    |
| 214        | o-ring  | 1        | <b>246</b> | <b>output shaft assembly</b>      | <b>1</b> | 278     | bolt                     | 35   |
| 215        | change pinion                                 | 1        | 247        | output shaft                      | 1        | 279     | lockwasher               | 35   |
| 216        | change pinion washer                          | 1        | 248-001    | spiral bevel gear                 | 1        | 280-002 | breather/dipstick        | 1    |
| 217-001    | pinion locknut                                | 1        | 249        | bolt                              | 24       | 281     | pipe plug, NPT           | 1    |
| 218        | bolt  | 1        | 250        | lockwasher                        | 24       | 282     | hex bushing              | 1    |
| 219        | lockwasher                                    | 1        | 253        | grease retainer                   | 1        | 284     | magnetic drain plug, NPT | 1    |
| 220        | change gear washer                            | 1        | 255        | bearing                           | 1        | 285     | oil level sight glass    | 1    |
| 221        | change gear                                   | 1        | <b>256</b> | <b>lower bearing cap assembly</b> | <b>1</b> | 287     | pipe plug, NPT           | 2    |
| 222        | key   | 1        | 257        | lower bearing cap                 | 1        | 288     | grease fitting           | 2    |
| <b>223</b> | <b>spiral bevel pinion cartridge assembly</b> | <b>1</b> | 258-002    | lip seal                          | 1        | 289     | relief fitting           | 1    |
| 224-002    | clamp locknut with bolt                       | 1        | 259        | shim set                          | 1        | 290     | elbow fitting            | 1    |
| 226        | bearing                                       | 1        | 260        | bolt                              | 8        | 291     | pipe plug, NPT           | 1    |
| 227        | cartridge housing                             | 1        | 261        | lockwasher                        | 8        |         |                          |      |
| 228        | bearing                                       | 1        | 262        | housing                           | 1        |         |                          |      |
|            |   |          | 263        | housing cover                     | 1        |         |                          |      |
|            |   |          | 264        | bolt                              | 20       |         |                          |      |



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