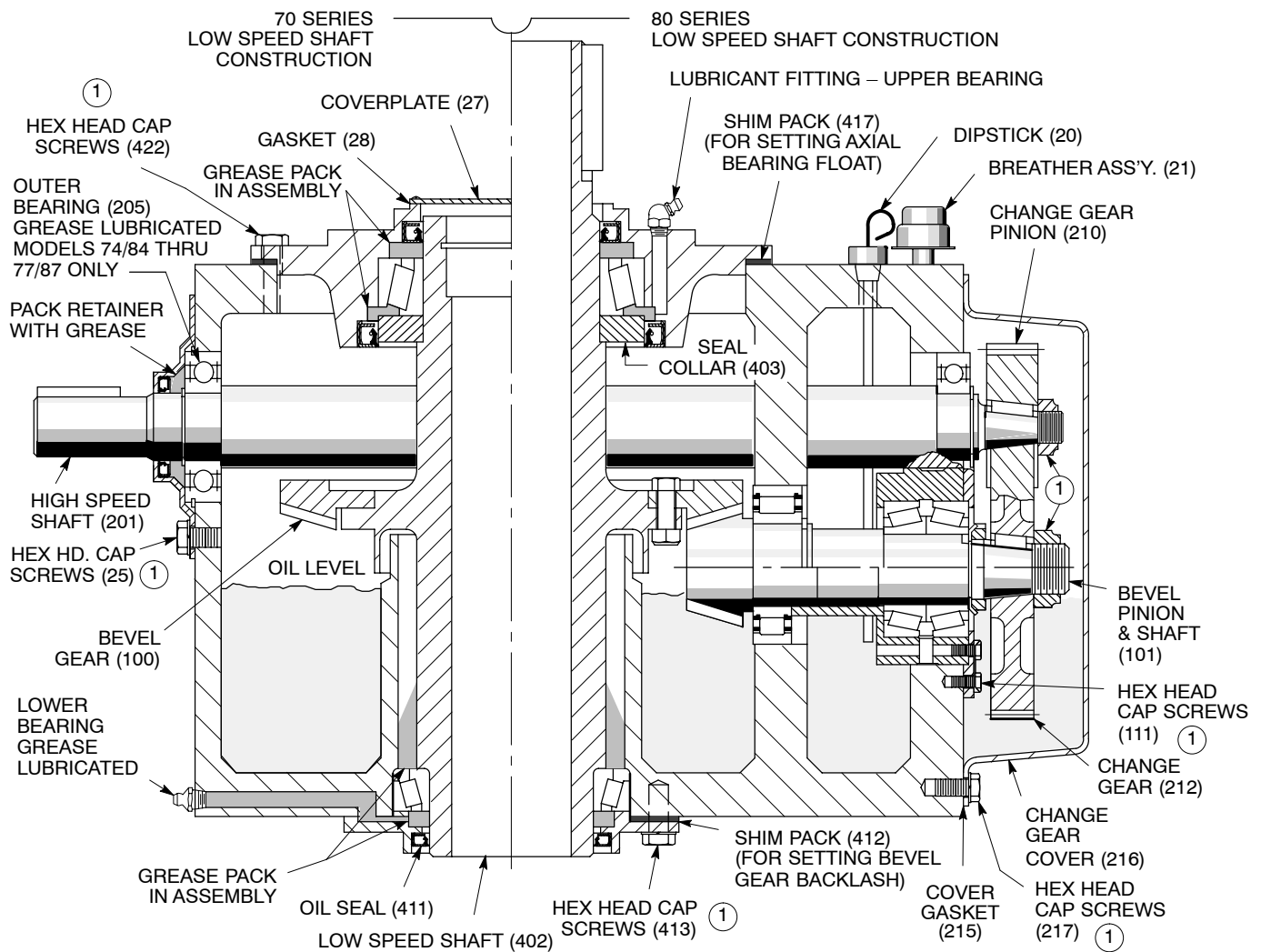


GEAR DRIVE MAINTENANCE INSTRUCTIONS 70 & 80 SERIES MODELS – UNIT SIZES 2 THRU 7



NOTE ① SEE TABLES 4 & 5 FOR TIGHTENING TORQUES

**FIGURE 1 – TYPICAL DOUBLE REDUCTION
UNIT SIZE 2 THRU 6 GEAR DRIVE ILLUSTRATED**

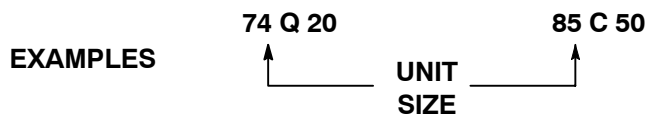
SECTION 1 – GENERAL

WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.

WARNING: DISCONNECT MOTOR LEADS OR OTHERWISE LOCK-OUT POWER SUPPLY BEFORE SERVICING THIS MIXER.

1.1 Model 70 & 80 Series Gear Drives are precision manufactured and assembled to provide long trouble-free service when properly maintained. If it becomes necessary to disassemble the unit, careful precise re-assembly is necessary.

1.2 These gear drives are available in 2 series, Models 72 thru 77 and 82 thru 87. The unit size referred to in the instructions that follow can be identified by the second digit in the model number.



- 1.3 Equipment that may be required to service a unit, in addition to standard mechanics tools, are hoists, slings, arbor press, wheel pullers, torque wrench, feeler gauges, dial indicator and micrometers.
- 1.4 Before dismantling the unit, drain the oil. To speed up drainage, remove the dipstick (20).
- 1.5 When disassembling a unit, clean external surfaces adjacent to covers to prevent dirt from entering the housing.
- 1.6 During disassembly, keep old shim pack sets with their respective cages and retainers for reference when reassembling.
- 1.7 It is recommended that oil seals, O-rings and non-metallic gaskets be replaced when units are reassembled.

SECTION 2 – PARTS REPLACEMENT

2.1 SEAL REPLACEMENT

Inspect oil seals and O-rings for nicks, gouges and deformities. Drive out all old oil seals and remove accumulations of sealing compound. When replacing seals:

- a . Pack the interior and coat the lips of seals with a lithium base NLGI #2 bearing grease. Refer to General Instructions.
- b . Install oil seals with the lips facing the direction indicated on the assembly drawing.
- c . Coat the section of shaft sealing surface with oil. If the oil seal must pass over a keyway, wrap the shaft with thin paper or tape, coat with grease and pass the oil seal over. Do not expand seal lips over 1/32".

2.2 BEARING REPLACEMENT

Inspect bearings carefully and replace if necessary.

- a . Remove worn bearings with a puller or at an arbor press.
- b . New bearings can be pressed on the shafts and can be preheated to make installation easier.
- c . Maximum oil bath or oven temperature for heating bearings are:
 - Roller bearings (taper and roller) 275° F
 - Ball bearings 200° F

When preheating bearings, do not apply direct flame or rest bearings on the bottom or side walls of oven.
- d . Thoroughly coat bearing surfaces and shaft seats with oil.
- e . Make sure bearings are tightly seated against shaft shoulders with no clearance. Check with feeler gauges.

2.3 CHANGE GEAR REPLACEMENT

The majority of change gears are taper bored. The pinion (210) and change gear (212) can be removed with wheel pullers, wedges or a pry bar and brass hammer.

- a . Remove the change gear cover (216) and gasket (215).
- b . Wedge a cloth or leather strap between the mesh of the pinion and gear and loosen the locknuts (204 & 214).
- c . When wedges or pry bars are used, be sure to use soft brass or copper shims between the wedge or bar to protect the gear teeth. Apply pressure behind the gear in line with the keyway and sharply tap the gear 90° from the keyway between the outside diameter and the hub. A brass hammer or mallet should be used.
- d . The change gears on unit size 76–86 and 77–87 are provided with jack screw holes to facilitate removal. Two high strength bolts (Grade 5 or equivalent) may be threaded into these holes and tightened securely against the retainer. Then sharply tap the gear 90° from the bolts, between the outside diameter and the hub. A brass hammer or mallet should be used.

- e . If removal is stubborn, apply heat evenly around the circumference of the gear hub with a torch or other device, but do not allow the hub temperature to exceed 275° F. The heat should be applied quickly to the hub to prevent the shaft from heating.
 - f . Remove straight bore pinions from shafts at an arbor press.
 - g . To replace straight bore pinions, preheat to 275° F and press on shaft with large chamfered side tight against shaft shoulder. Check with feelers for zero clearance between shaft shoulder and pinion before tightening locknut.
 - h . Some units are furnished with an integral shaft and pinion (209) (pinion teeth machined directly on shaft) for the higher ratios. Remove shaft and pinion (209) as outlined in Section 3 to change speeds.
- 2.4 Unit size 77–87 models require an oil pan as shown in Figure 2 for the total ratio and input speed combinations designated by an "X" in Table 1. If the unit is dismantled, make sure the oil pan is re-installed.
- a . If converting to a speed and ratio which no longer requires an oil pan, remove the front half of the pan. The adapter can remain assembled to the retainer (110).
 - b . If the unit was not equipped with an oil pan, and the unit is converted to a speed and ratio that requires one, an oil pan must be added.
 - c . For variable speed applications, an oil pan is required if either extremity of the speed range falls within the input speeds (and ratio) shown in Table 1.

| TABLE 1 – OIL PAN USAGE | | | | | |
|-------------------------|-----------|---------------------|-----|-----|------|
| UNIT SIZE | INPUT RPM | NOMINAL TOTAL RATIO | | | |
| | | 6.2 | 7.6 | 9.3 | 11.4 |
| 77–87 | 1750 | X | X | X | X |
| | 1450 | X | X | | |

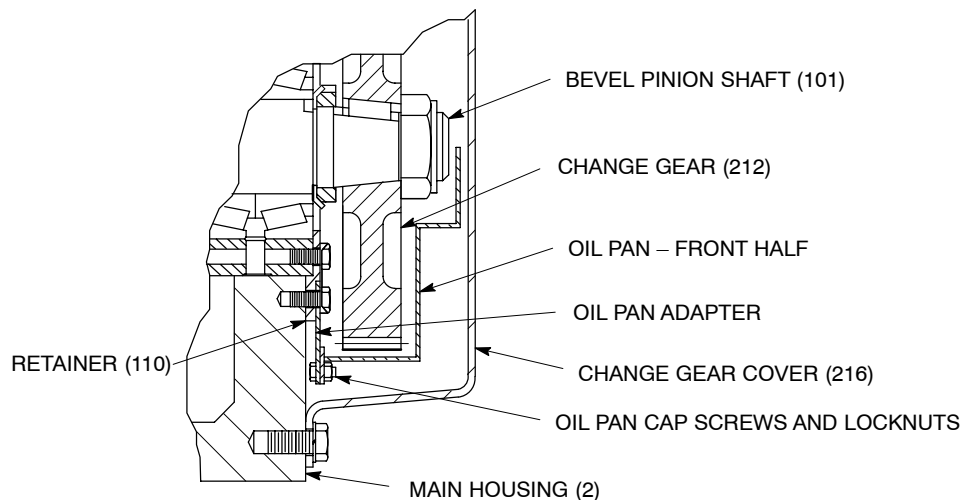


FIGURE 2 – OIL PAN DETAIL

SECTION 3 – HIGH SPEED OR (TRIPLE REDUCTION) INTERMEDIATE SHAFT REMOVAL

- 3.1 These shafts must be removed from the motor end of the gear drive.
- 3.2 DOUBLE REDUCTION – HIGH SPEED SHAFT (201 or 209) REMOVAL
 - a . Remove the pinion (210) to prevent damage to the gear teeth. For integral shaft and pinion (209), or pinions that are not removed, wrap the teeth with a strong tape prior to removal.
 - b . Remove the high speed seal cage (22), oil seal (23) and gasket (24). Use care so as not to damage the oil seal.

- c . Remove high speed shaft (201) assembly from unit to provide clearance for bevel gear removal. Inspect bearings (202 & 205) and replace if necessary.

CAUTION: Proceed slowly and maneuver the shaft until the bearings clear the bevel gear (100), low speed shaft (402) and bearing cage (420).

3.3 TRIPLE REDUCTION – INTERMEDIATE SHAFT (315) REMOVAL

- a . Remove the high speed head (30).

When removing and replacing the high speed head (30), rotate the high speed shaft (310) so that the key is in the relative position shown in Figure 3. This position allows the oil slinger (306) to clear the high speed gear (312) without damage.

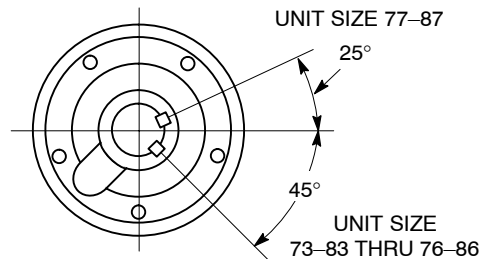


FIGURE 3 – UNIT SIZES 3 THRU 7

- b . Remove the high speed head (30) assembly and place it in a clean, protected area.
c . Remove locknut (314), high speed gear (312) and key (313).
d . Remove retainer (316).
e . Remove the intermediate shaft assembly. Inspect bearings (202 and 205) and replace if necessary.

CAUTION: Proceed slowly and maneuver the shaft until the bearings clear the bevel gear (100), low speed shaft (402) and bearing cage (420).

3.4 HIGH SPEED HEAD (30) DISASSEMBLY – TRIPLE REDUCTION ONLY

- a . Oil slinger (306) removal:
1 . Unit Size 73–83 thru 76–86 – Remove hex head cap screws (307) and slinger (306).
2 . Unit Size 77–87 – Remove locknut (320), slinger (306) and pinion (310).
b . Remove the high speed cage (32) and oil seal (33). Use care so as not to damage the oil seal.
c . High speed shaft removal:
1 . Unit Size 73–83 thru 76–86 – Remove the high speed shaft and pinion (310) assembly.
2 . Unit Size 77–87 – Remove the high speed shaft (311) assembly.
d . Inspect the bearings (303 and 305) and replace if necessary.

3.5 HIGH SPEED HEAD (30) ASSEMBLY – TRIPLE REDUCTION ONLY

- a . Press the inner bearing (303) on the high speed pinion (310).
b . Install the retaining ring (304) in the two grooves just above the bearing (303).
c . Carefully press the outer bearing (305), with its external retaining ring facing up, onto the pinion shaft until it registers against the retaining ring. Do not impact or distort the ring.
d . Install the third retaining ring (304) in the outer most groove.
e . Install the high speed shaft and bearing assembly in the high speed head (30).
f . Install the oil seal (33) with the appropriate driver in the high speed cage (32). Oil seal lip must face in.
g . Pack the cage interior and oil seal lip with a lithium based NLGI #2 grease.
h . Install the high speed cage with hex head cap screws (35) and lockwashers (36). Tighten cap screws to 27 ft–lbs.

- i . Install the slinger (306):
 - 1 . Unit size 73–83 thru 76–86 – Install the slinger (306) with hex head cap screws (307).
 - 2 . Unit size 77–87 – Install the high speed pinion (310), slinger (306) and locknut (320). Tighten the locknut to the value shown in Table 5.

SECTION 4 – BEVEL SET REMOVAL AND ASSEMBLY

4.1 BEVEL GEAR REMOVAL

- a . The high speed shaft (201) assembly / intermediate shaft (209) assembly must be removed from unit to provide clearance for bevel gear removal.
- b . Remove the cap screws (422) from the low speed bearing cage (420). Install 2 eyebolts and lift cage straight up. Use caution so as not to damage the oil seal (415 and 416) lips. Inspect the oil seals and bearing (404) cup. Remove if necessary.
- c . Wrap and interlock two web straps around the low speed shaft (402) directly below the seal collar (403) and carefully lift the shaft out.
- d . Remove the low speed retainer (410) and shims (412). Inspect oil seal (411) and replace if necessary.
- e . Remove the bevel gear (100) from the low speed shaft (402).
 - 1 . For units 72–82 and 73–83 – Press the bevel gear off the shaft.
 - 2 . For units 74–84 thru 77–87 – Remove the cap screws (405) by restraining the locknuts and remove the gear.
- f . Inspect bearings (404 and 408) and replace if necessary.

4.2 BEVEL PINION REMOVAL

CAUTION: DO NOT USE POWER WRENCHES ON NYLOK CAP SCREWS OR JACKING SCREWS.

- a . Remove the outer set of cap screws (111) in the retainer (110).
- b . Insert jacking screws in the retainer (110) and remove the bevel pinion assembly.
- c . Remove the inner set of cap screws (111) and the retainer (110).
- d . Remove the outer bearing cup (105) by pushing the bearing cage (107) inward.
- e . Models 76–86 only: Remove O–ring (29).
- f . Remove the locknut and washer (106).
- g . Press the bearings (102 and 105) off the shaft.

CAUTION: Unit sizes 6 and 7 are furnished with a double row taper roller bearing (Item 102) that is fitted with a custom spacer, ground to provide a specific end play clearance for each individual bearing. DO NOT substitute spacers or interchange any components of the bearing set.

4.3 BEVEL PINION ASSEMBLY (SEE FIGURE 4)

- a . Insert the inner cup of the inside tapered roller bearing (105) in the bearing cage (107).
- b . Mount the inner bearing (102) on the shaft.
 - 1 . Unit size 72–82 thru 75–85: Mount the cylindrical roller bearing (102) with the large radius against the pinion shoulder.
 - 2 . Unit size 76–86 and 77–87: Mount the 2 roller bearing cones with ground spacer between the 2 cones.
- c . Press one of the outer bearing (105) cups into the bearing cage (107), thicker section down, using the appropriate bearing driver to seat firmly against the cage shoulder.
- d . Slide the bearing cage (107) over the shaft.
- e . Install the 2 bearing (105) cones, oriented back to back, until the lower cone registers against the shaft shoulder or the spacer (103).
- f . Seat the bearing cones at an arbor press and check for spacer rotation or a zero clearance shoulder fit.
- g . Install the lockwasher and locknut (106) and tighten securely.

NOTE: On unit size 2, be sure to add the spacer (116) provided between the outer bearing (105) and the lockwasher (106). Check for any rotation of the spacer.

- 2 . Preheat the bearing (404 and 408) cones to 225° F maximum and install them on the low speed shaft (402).
- b . For unit sizes 72–82 and 73–83:
 - 1 . Insert the key (120) in the low speed shaft (402).

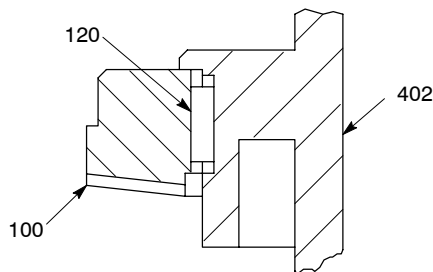


FIGURE 6

- 2 . Preheat the bevel gear to 225° F maximum and press the gear tight against the shaft shoulder.
- NOTE: DO NOT USE LUBRICANTS OF ANY KIND ON THE SHAFT (402) OR GEAR (100) BORE.
- c . For unit sizes 74–84 thru 77–87:
 - 1 . Coat bevel gear cap screw (405) and locknut (406) threads and heads with oil. Place the bevel gear (100) on shaft flange and install the cap screws (405) and locknuts (406).
 - 2 . Always use an open end wrench to restrain the locknuts (406) and tighten the cap screws (405) to the torques listed in Table 2.

| TABLE 2 ITEM 405 BEVEL GEAR CAPSCREW TORQUES | | | | |
|---|-------|-------|-------|-------|
| UNIT SIZE | 74–84 | 75–85 | 76–86 | 77–87 |
| TORQUE FT–LBS | 50 | 98 | 165 | 273 |

4.5 PREPARATION FOR SETTING BEVEL GEAR MOUNTING DISTANCE AND BACKLASH

Prior to setting the bevel gears as outlined in Section 5, follow these preliminary steps:

- a . Record the mounting distance (MD) and backlash (BL) values etched on the periphery of the bevel gear.
- b . Measure the outside diameter of the machined portion of the oil dam, divide by 2, and record for reference.
- c . Place the lower roller bearing (408) cup in the housing so that the face of the cup is recessed 1/16 inch into the housing.
- d . Check alignment of the grease channel in the low speed retainer (410) with the grease holes in the housing (2) and shims (412).
- e . Add the following tentative shim pack (412):

| 72–82 thru 74–84 | 75–85 thru 77–87 |
|------------------|------------------|
| (1) .015 thick | (1) .015 thick |
| (1) .010 thick | (1) .009 thick |
| (1) .0075 thick | (1) .007 thick |

- f . Mount the shims (412) and retainer (410) to the housing, making sure the face of the bearing cup is in full contact with the raised face of the retainer. Do not install the oil seal (411) at this time.

SECTION 5 – SETTING BEVEL GEARS

Bevel gears are precision generated and custom matched. They are precision lapped for optimum tooth contact and should always be replaced as **MATCHED SETS**. They require precise assembly with accurate setting of the bevel pinion mounting distance (MD) and backlash (BL).

5.1 SETTING THE MOUNTING DISTANCE

- a . Unit size 76–86 only: Install O–ring (29).
- b . Insert the bevel pinion sub–assembly into the housing without shims (109) and tap lightly until tight against face of the housing.
- c . Apply pressure to the end of the bevel pinion shaft (101), and measure the gap between the oil dam and the toe of the bevel pinion (Dimension "C"). Record the measured gap.
- d . Determine the shims (109) required by referring to the mounting distance (MD) and oil dam diameter (B/2) recorded previously and referring to the method shown below (see Figure 7).

$$A(\text{MD}) \text{ minus } (B/2 + C) = \text{SHIM PACK REQUIRED } \pm .001$$
- e . Back off the bevel pinion sub–assembly approximately 1 inch from the housing. (Use jacking screws in the holes provided.)
- f . Split the calculated amount of shims (109) and insert under the face of the retainer (110).
- g . Push the assembly back into the housing and tighten all the outer cap screws (111).
- h . Recheck the mounting distance after tightening and re–adjust if necessary.

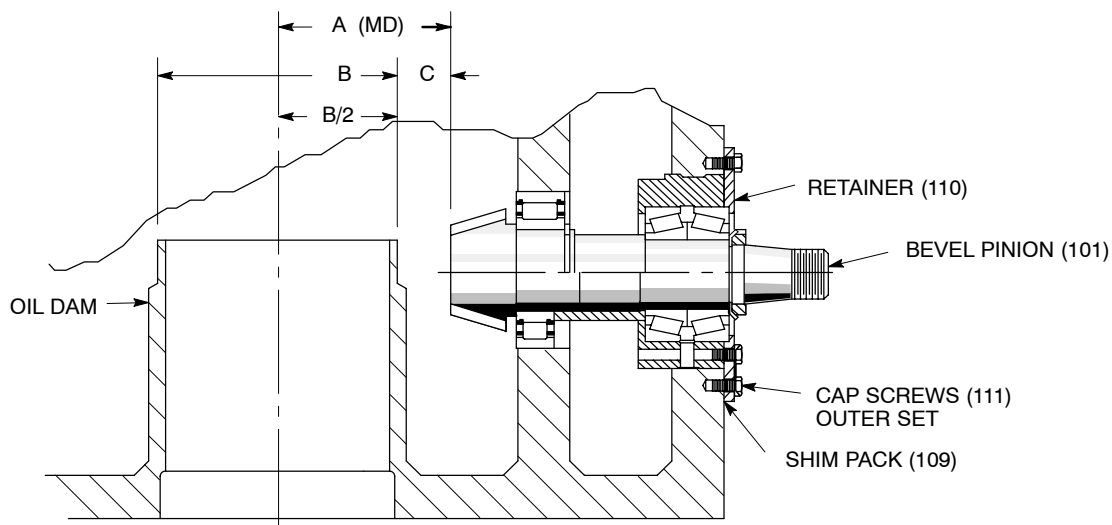
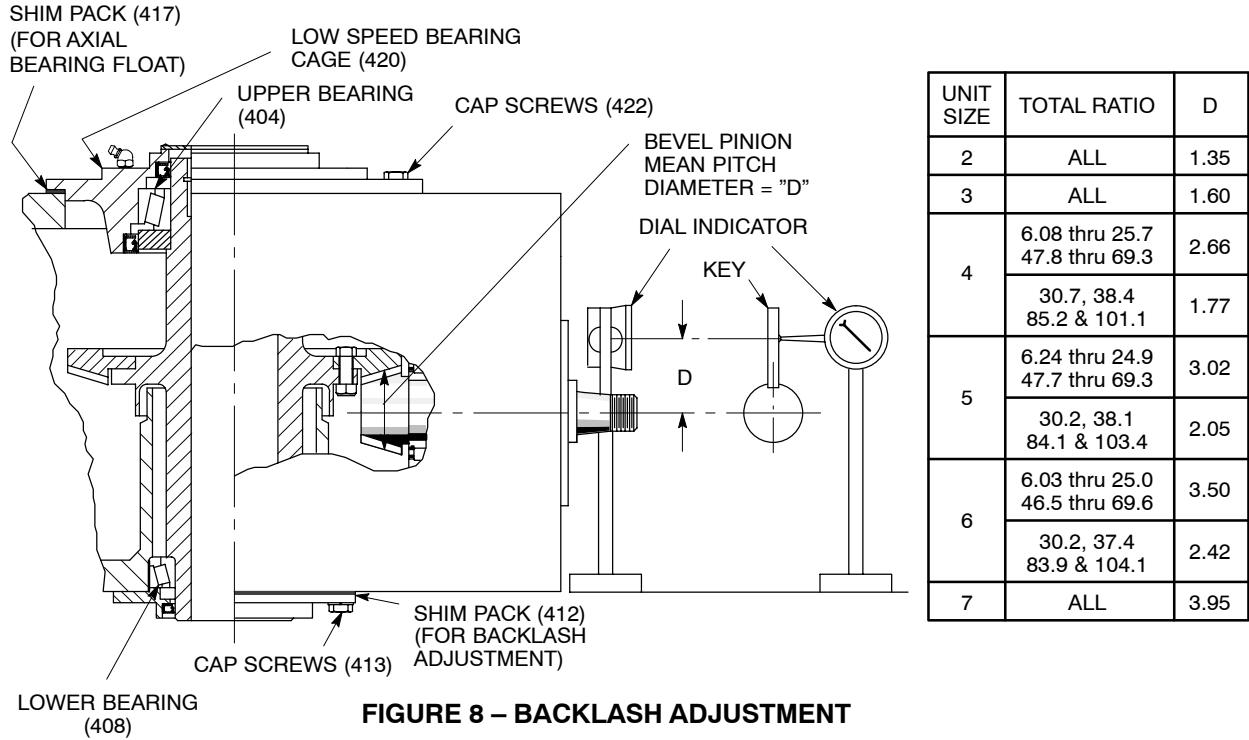


FIGURE 7 – SETTING MOUNTING DISTANCE

5.2 SETTING THE BACKLASH (SEE FIGURE 8)

- a . Carefully lower the low speed shaft (402) assembly into the housing (2).
- b . Install low speed bearing cage (420) with the full shim pack (417) and tighten the 4 cap screws (422).
- c . Check the actual backlash against the value previously recorded from the bevel gear.
- d . To measure the backlash (see Figure 8):
 - 1 . Wedge a key into the key seat and set up a dial indicator with the indicator tip located at dimension "D".
 - 2 . Rotate the bevel pinion shaft (101) back and forth while holding the low speed shaft immobile and read the backlash on the indicator. The indicator reading should be two times the backlash etched on the bevel gear.

- e . To obtain the required backlash, add or remove shims from the lower shim pack (412) equal to 1/2 the indicator reading. Loosen and retighten the 4 upper bearing cage cap screws (422) and tap down the low speed shaft (402) each time the shim pack (412) is adjusted. When the proper backlash is obtained, measure the total shim pack.
- f . The final indicator reading should be 2 times (BL) etched on the bevel gear within a tolerance of plus .004, minus .000.
- g . If backlash is satisfactory, tighten the cap screws (413). Recheck the backlash.



5.3 SETTING THE AXIAL FLOAT IN THE LOW SPEED SHAFT ROLLER BEARINGS

- a . To set axial float:
 - 1 . Tap the low speed shaft (402) downward.
 - 2 . Lower a sling through the shaft and insert a bar through the sling across the bottom end of the shaft.
 - 3 . Place a dial indicator on the top face of the shaft and carefully raise the shaft with a hoist.
 - 4 . Read the axial bearing float on the indicator and adjust shim pack if necessary.

| TABLE 3 AXIAL BEARING FLOAT | | |
|--|--------------|--------------|
| UNIT SIZE | 70 SERIES | 80 SERIES |
| 2, 3 & 4 | .001 TO .004 | .003 TO .005 |
| 5 THRU 7 | .003 TO .005 | |

SECTION 6 – FINAL ASSEMBLY

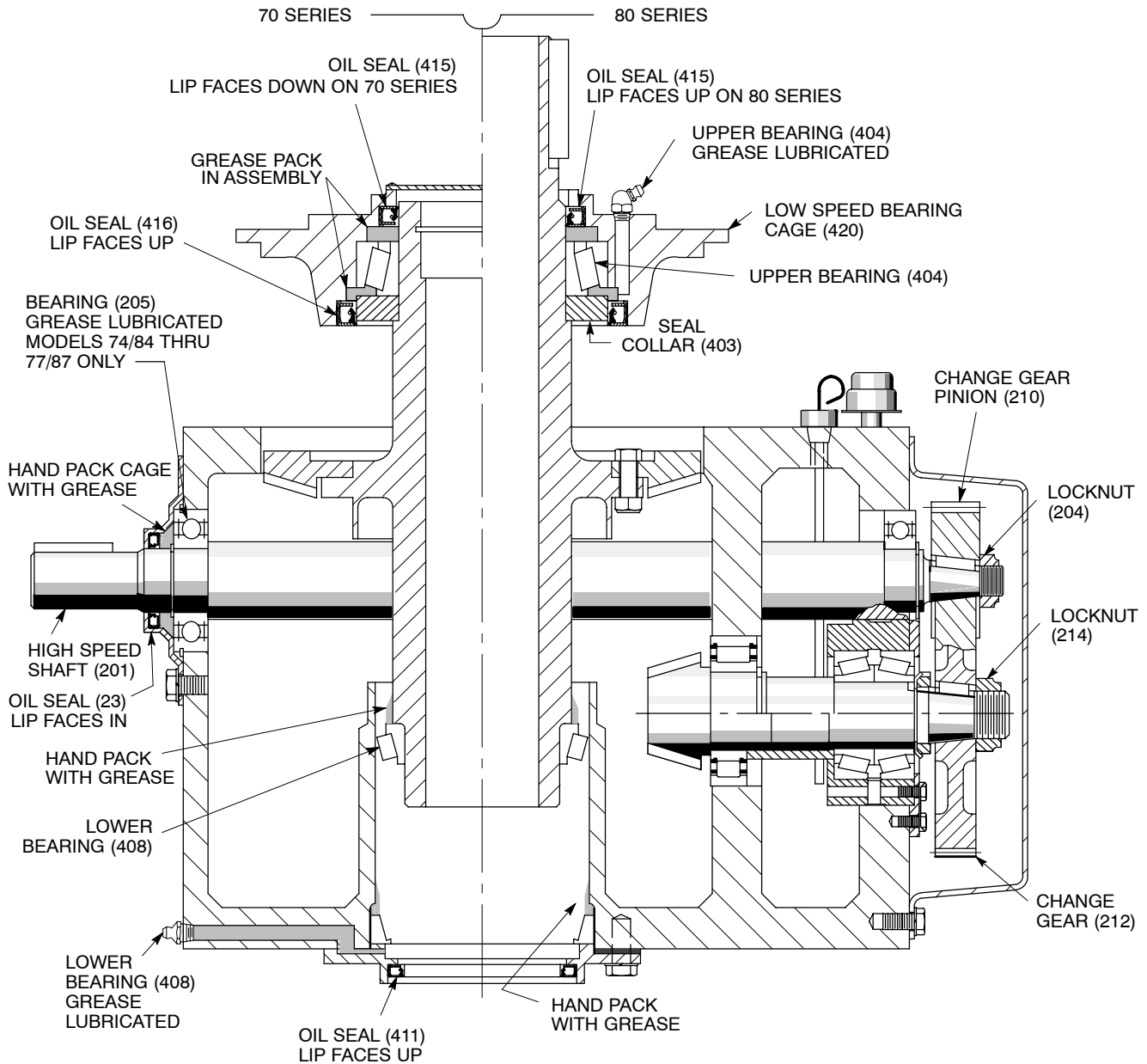


FIGURE 9 – FINAL ASSEMBLY

- 6.1 Remove the low speed shaft (402) and cage assembly (420).
- 6.2 Use a lithium based NLGI #2 ball and roller bearing grease throughout the following steps.
- 6.3 Pack the interior and coat the lips of all oil seals with grease.
- 6.4 Make sure oil seal lips are facing the direction shown on the assembly drawings in this manual.
- 6.5 Carefully clean and pack the bearing rollers of the upper (404) and lower (408) bearings. Pack the interior of the oil dam up to 2" above the lower bearing.
- 6.6 Install the oil seals (415 and 416).
 - a . Install the outer oil seal (415) and the inner oil seal (416) with the appropriate seal driver.
 - b . Reinstall the low speed shaft (402) and bearing cage (420) assembly using cap screws (422).

c . 70 Series units only: Install gasket (28) and coverplate (27).

6.7 Change Gear Installation:

a . Double Reduction Units:

- 1 . Install the high speed shaft (201) and bearings (202 and 205) in the reducer housing (2).
- 2 . If removed, install a new oil seal (23) in the high speed seal cage (22) with the lips facing the direction indicated on the assembly drawing.
- 3 . Install the high speed seal cage (22) and gasket (24) using hex head cap screws (25) and lockwashers (26).
- 4 . Install the key (213), change gear (212) and locknut (214) on the bevel pinion shaft (101).
- 5 . Install the key (211), change gear pinion (210) and locknut (204) on the high speed shaft (201).
- 6 . Wedge a cloth or leather strap between the mesh of the pinion and gear and tighten the locknuts (204 & 214) to the values shown in Table 5.

b . Triple Reduction Units:

- 1 . Install the intermediate shaft (315) and change gear pinion (210).
- 2 . Install the retainer (316).
- 3 . Install the key (313), high speed gear (312) and locknut (314).
- 4 . Install the key (213), change gear (212) and locknut (214) on the bevel pinion shaft (101).
- 5 . Wedge a cloth or leather strap between the mesh of the pinion and gear and tighten the locknuts (204, 214 & 314) to the values shown in Table 5.
- 6 . If removed, install the 1/2 inch diameter dowel pin in the bottom surface of the housing (2).
- 7 . Model 74–84 & 75–85 only: Install the Loctred studs.
- 8 . Install the gasket (31).
- 9 . Install the high speed head (30) assembly. Align the high speed shaft as shown in Figure 3 to allow the oil slinger (306) to clear the high speed gear (312) without damage. Use care to align and not damage the high speed pinion (310) or high speed gear (312).
- 10 . Install hex head cap screws (38), hex nuts (74–84 & 75–85 only) and lockwashers (39). Rotate the high speed pinion (310) shaft several times before tightening the hardware to the values shown in Table 4.

6.8 Install lower oil seal (411).

6.9 To insure grease channels are full, and purged of air, add grease through the fittings to the upper and lower bearings (404 & 408) and (205, 74–84 thru 77–87). Rotate the shafts while adding grease.

a . On 70 Series units, remove the pipe plug at the top.

b . On 80 Series units, add until grease flows into the cavity above the upper oil seal (415).

6.10 Unit size 77–87: Refer to Table 1 and install oil pan if necessary.

6.11 Install change gear cover (216) and gasket (215) using hex head cap screws (217) and washers (218).

6.12 Tighten all external hardware to the recommended torques in Table 4.





6.13 Fill the unit with oil through the large opening with the socket head plug in the side of the housing to the dipstick full mark. The approximate oil capacity is shown in the General Instructions.

6.14 Rotate the high speed shaft a few revolutions by hand to check for free running.

6.15 Re-assemble gear drive to the mixer. Install all safety guards.

6.16 Reconnect power to motor. Jog the motor and check for proper impeller shaft rotation.

**TABLE 4
RECOMMENDED TIGHTENING TORQUES FOR COMMERCIAL GRADE STEEL, ①
GR5, 304 AND 316 STAINLESS**

| BOLT THREAD SIZE | TIGHTENING TORQUES ② IN FT-LBS | | | STEEL SAE GRADE MARKING REFERENCE GUIDE | |
|------------------------|-----------------------------------|---------------------------------|--------------------------------------|---|--|
| | STANDARD BOLTS DRY | STANDARD BOLTS LUBRICATED | WITH FRICTION LOCKING DEVICE ④ | GRADE MARKING | STANDARD BOLTS COMMERCIAL GRADES |
| 1/4 - 20 | 6.1 | 4.6 | 5.3 |  No Mark | SAE Grades ② 0, 1 and 2 |
| 5/16 - 18 | 12.8 | 9.6 | 11 | | |
| 3/8 - 16 | 23 | 17 | 20 | | |
| 7/16 - 14 | 36 | 27 | 31 |  | SAE Grade 3 |
| 1/2 - 13 | 54 | 41 | 48 | | |
| 9/16 - 12 | 80 | 60 | 69 |  | SAE Grade 5 |
| 5/8 - 11 | 110 | 83 | 95 | | |
| 3/4 - 10 | 194 | 146 | 168 | | |
| 7/8 - 9 ③ | 189 | 142 | 163 |  | All Socket Head Cap Screws SAE Grade 8 |
| 1 - 8 | 282 | 212 | 244 | | |
| 1 1/8 - 7 | 400 | 301 | 346 | | |
| 1 1/4 - 7 | 565 | 425 | 488 | | |
| 1 3/8 - 6 | 741 | 557 | 640 | | |
| 1 1/2 - 6 | 983 | 739 | 850 | | |
| 1 3/4 - 5 ③ | 1003 | 754 | 868 | | |
| 2 - 4 1/2 | 1508 | 1134 | 1305 | | |
| 2 1/4 - 4 1/2 | 2206 | 1659 | 1908 | | |
| 2 1/2 - 4 | 3018 | 2269 | 2609 | | |

- ① ALL BOLTS SHOULD BE COATED WITH OIL, GREASE OR AN ANTI-SEIZE COMPOUND WHENEVER POSSIBLE. THE THREADS AND BEARING FACE OF BOLTS AND / OR NUTS SHOULD BE LUBRICATED.
- ② **LIGHTNIN** SUGGESTED TORQUE VALUES FOR COMMERCIAL GRADE BOLTS IN STEEL (GRADES 2 & 3), GR5, 304 AND 316 STAINLESS MATERIALS BASED ON CLAMPING STEEL, 304 OR 316 STAINLESS MATERIALS. (**LIGHTNIN** STANDARD STEEL HEX HEAD CAP SCREWS FURNISHED IN SAE GRADE 2 OR 3 PRIOR TO JULY, 1993, AND SAE GRADE 5 AFTER JULY, 1993).
- ③ ALLOWABLE BOLT STRESS VALUES CHANGE AT THESE LOCATIONS AND IS REFLECTED IN THE SUGGESTED TORQUE VALUES.
- ④ THESE TORQUES PERTAIN TO BOLTS OR NUTS WITH FRICTION LOCKING DEVICES SUCH AS NYLON PELLETS OR PATCHES, FIBRE INSERTS OR UPSET THREADS.

**TABLE 5
HELICAL GEARING LOCKNUT TIGHTENING TORQUES**

| UNIT SIZE | REDUC-TION | TOTAL RATIO | CHANGE GEAR PINION (210) | | CHANGE GEAR (212) | | HIGH SPEED GEAR (312) | | | | | |
|-----------|------------|-----------------------|--------------------------|--------------------|----------------------|--------------------|------------------------------|--------------------|------------------|--------------------|--|--|
| | | | (204) LOCKNUT THREAD | TORQUE FT-LBS ① | (214) LOCKNUT THREAD | TORQUE FT-LBS ① | (314) LOCKNUT THREAD | TORQUE FT-LBS ① | (320) NUT THREAD | TORQUE FT-LBS ① | | |
| 72-82 | DOUBLE | 5.17 thru 17.0 | 7/8-14 | 105 | 1-14 | 160 | NONE | NONE | | | | |
| | | 21.1 and 25.6 | 1/2-20 | 20 | | | | | | | | |
| | | ② 32.1 | NO LOCKNUT | | | | | | | | | |
| 73-83 | DOUBLE | 5.17 thru 16.7 | 7/8-14 | 105 | 1-1/8-12 | 210 | NONE | NONE | | | | |
| | TRIPLE | 37.8 thru 55.9 | | | | | | | 1-14 | 160 | | |
| | DOUBLE | 20.9 thru 31.4 | 1/2-20 | 20 | | | NONE | NONE | | | | |
| | TRIPLE | 69.9 thru 105 | | | | | | | 1-14 | 160 | | |
| 74-84 | DOUBLE | 6.07 thru 13.6 | 1-14 | 160 | 1-1/4-12 | 250 | NONE | NONE | | | | |
| | TRIPLE | 45.4 | | | | | | | 1-14 | 160 | | |
| | DOUBLE | 16.7 thru 38.2 | 5/8-18 | 50 | | | NONE | NONE | | | | |
| | TRIPLE | 55.1 thru 105 | | | | | | | 1-14 | 160 | | |
| 75-85 | DOUBLE | 6.03 thru 14.1 | 1-14 | 160 | 1-1/2-12 | 460 | NONE | NONE | | | | |
| | | 17.4, 21.5 and 32.1 | 3/4-16 | 60 | | | | | 1-1/8-12 | 210 | | |
| | TRIPLE | 47.7, 58.9 and 87.9 | | | | | 1-1/8-12 | 210 | | | | |
| | DOUBLE | ② 25.5 and 38.1 | | | | | SOLID ON SHAFT NO LOCKNUT | | NONE | NONE | | |
| | TRIPLE | 69.6 and 105 | | | | | 1-1/8-12 | 210 | | | | |
| 76-86 | DOUBLE | 6.03 thru 9.50 | 1-1/2-12 | 460 | 1-3/4-12 | 750 | NONE | NONE | | | | |
| | | 11.5 and 14.2 | 1-1/2-12 | 300 | | | | | | | | |
| | | 17.1 thru 21.1 & 31.7 | 7/8-14 | 105 | | | | | | | | |
| | | ③ 25.3 and 37.9 | 7/8-14 | 120 | | | | | | | | |
| | TRIPLE | 47.4, 58.6 and 87.6 | 7/8-14 | 105 | | | 1-1/4-12 | 250 | | | | |
| | | ③ 70.3 and 105 | 7/8-14 | 120 | | | | | | | | |
| 77-87 | DOUBLE | 6.14 thru 14.0 | 1-1/2-12 | 460 | 1-3/4-12 | 750 | NONE | NONE | NONE | NONE | | |
| | | 16.8 and 20.5 | 1-14 | 160 | | | | | | | | |
| | | ② 25.4 thru 38.1 | NO LOCKNUT | | | | | | | | | |
| | TRIPLE | 48.0 and 58.0 | 1-14 | 160 | | | 1-1/2-12 | 460 | 1-14 | 160 | | |
| | | 71.6 thru 108 | | | | | | | 3/4-16 | 100 | | |

- ① TORQUE VALUES ARE BASED ON LOCKNUT BEARING FACES AND SHAFT THREADS THAT ARE LUBRICATED.
- ② THE PINION IS AN INTEGRAL PART OF THE HIGH SPEED SHAFT (SOLID ON SHAFT).
- ③ TORQUE VALUES BASED ON STRAIGHT BORE PINIONS. HEAT PINION PER PARAGRAPH 2.3g BEFORE INSTALLING LOCKNUT.