

# 780C150

Ship To: BUNGE - ERGON VICKSBURG, LLC  
Customer: BUNGE - ERGON VICKSBURG, LLC  
PO Number: 61310-4500145584

Order: 0001013563 Line: 000030

READ AND UNDERSTAND THIS DOCUMENT PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



**Tagging:**  
AG-2101 / SLURRY MIX

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**IMPORTANT: READ THIS SECTION THOROUGHLY  
SAFETY INSTRUCTIONS / CHECKLIST**

IF YOU DO NOT UNDERSTAND ANY PORTION OF THESE INSTRUCTIONS **DO NOT** ATTEMPT TO INSTALL OR OPERATE THIS MIXER! CONTACT YOUR **LIGHTNIN®** REPRESENTATIVE FOR ANY QUESTIONS YOU MAY HAVE CONCERNING SAFETY OR THESE INSTRUCTIONS.

Your **LIGHTNIN®** mixer is equipped with safety labels which contain specific instructions pertaining to the safe handling and operation of the mixer. For your protection, you must understand that failure to follow the safety instructions imprinted on the safety labels or failure to follow the safety instructions printed in this instruction manual may result in serious personal injury or death. In addition, failure to adhere to safety instructions may cause damage to property or equipment.

In this publication, and on the mixer safety labels, the words DANGER, WARNING and CAUTION may be used to signify special instructions to be observed by the installer or user. These instructions warn of potential hazards concerning service, installation or operation if the instructions are performed incorrectly, carelessly or are ignored. Safety instructions alone cannot eliminate the hazards they signal. Strict compliance with these special instructions, along with safe work habits and simple "common sense" are major accident prevention measures.

**CAUTION** - Signals unsafe practices or hazards which **could** cause **minor** personal injury or property damage.

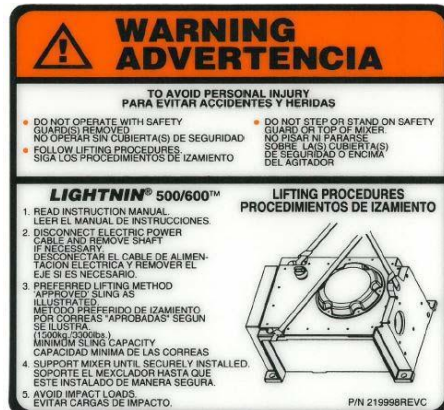
**WARNING** - Signals unsafe practices or hazards which **could** cause **severe** personal injury or death.

**DANGER** - Signals immediate hazards which **will** probably cause **severe** personal injury or death.

This mixer should be equipped with safety or instructional labels similar to those shown below. If any of the labels are missing, damaged or otherwise illegible, **DO NOT** install, service or operate the mixer. Contact your **LIGHTNIN®** representative immediately for instructions.



EXAMPLES:



## SAFETY CHECK LIST

### IMPORTANT WARNINGS

All **LIGHTNIN**® Mixers and Aerators are provided with properly designed lifting devices and safety covers to avoid potential injury and/or equipment damage. The following SAFETY CHECK LIST should be THOROUGHLY REVIEWED AND ADHERED TO before installing, operating or performing maintenance on the mixer. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY. Ensure the use of qualified, quality trained and safety conscious personnel.

1. **WARNING:** When moving, installing or lifting this mixer, always use equipment which is rated to carry the full load of the mixer. Use only the lifting device, if provided, on your unit to install the mixer. Failure to follow these instructions could cause severe injury, death or damage to property. Consult the appropriate section of this manual for lifting and installation instructions.
2. **WARNING:** DO NOT attempt to connect a power source to this mixer unless you are licensed or certified to do so. Failure to follow this instruction could cause severe injury, death or damage to property.
3. **WARNING:** DO NOT connect the motor to the power source until all components are assembled, the mixer is installed, and all hardware is tightened to the proper torque which is specified in the operation and maintenance manuals supplied by **LIGHTNIN**®.
4. DO NOT operate shaft sealing devices at temperatures higher than those specified in the manual or on the nameplates.
5. DO NOT service the mixer until you have followed your "Control of Hazardous Energy Sources" (lockout, tagout procedure) as required by OSHA.
6. **WARNING:** Never touch a mixer, which has an electric motor, or any part of an electrical service line cord or conduit, while your hands or feet are wet or if you are standing on a wet or damp surface. Failure to follow this instruction may result in severe electrical shock or death.
7. **WARNING:** DO NOT touch any part of mixer that has the potential of having a hot surface including the motor, gear drive housing, seal, shafting and flange. When a mixer is running, the motor temperature rises. This is a normal occurrence, but the motor temperature may be high enough to cause burns to the hands or any other part of the body. DO NOT touch a mixer motor until it cools for at least one hour. Failure to follow these instructions may result in severe personal injury.
8. **DANGER:** Never touch any rotating part of a mixer with bare hands, gloved hands or any other part of your body, or with any hand held object. Rotating parts include, but are not limited to, the mixer shaft, impeller(s), set screws, hardware, couplings, mechanical seals and motor fans.
9. **WARNING:** DO NOT operate mixer for service other than its intended use, that being fluid mixing with the mixer attached to a rigid structure and connected to a power source appropriate to operate the mixer drive motor.
10. **WARNING:** Never attempt to move or adjust a mixer while it is running.

## SAFETY CHECK LIST, cont'd.

### IMPORTANT WARNINGS, cont'd.

11. **DO NOT** make any field changes or modifications (horsepower, seal material components, output speed, shaft lengths, impellers, etc.) without reviewing the changes with your **LIGHTNIN®** Sales Representative or the **LIGHTNIN®** Customer Service Department.
12. **DO NOT** install an aftermarket Variable Frequency Drive without first consulting your **LIGHTNIN®** Sales Representative or the **LIGHTNIN®** Customer Service Department to determine the compatibility of the existing motor with the Variable Frequency Drive.
13. **DO NOT** operate mixer until you have checked the following items:
  - A. Make sure the mixer is properly grounded.
  - B. Ensure all protective guards and covers are installed.  
Guarding of the mixer shaft below the mixer mounting surface is the responsibility of the customer.
  - C. Ensure all detachable components are securely coupled to the mixer.
  - D. Thoroughly REVIEW and ADHERE TO the mixer operating instructions supplied by **LIGHTNIN®**.
  - E. Ensure the mixer output shaft rotates freely by hand.
  - F. Ensure all personnel and equipment are clear of rotating parts.
  - G. Ensure all external connections (electrical, hydraulic, pneumatic, etc.) have been completed in accordance with all applicable codes and regulations.
14. **DO NOT** enter the mixing vessel UNLESS:
  - A. The mixer power supply is locked out (follow item number 5).
  - B. The mixer shaft is firmly attached to the mixer drive or the shaft is supported securely from below.
  - C. You have followed applicable confined space regulations.
15. **WARNING:** Eye protection must be worn at all times while servicing this mixer. Failure to follow this instructions may result in severe injury or death.
16. **WARNING:** Never attempt to clean or service the mixer, or any part of it, while the mixer is running, or while it is connected to a power source. Always turn the mixer off and disconnect the power before cleaning or servicing.
17. **CAUTION:** When repairing the mixer, or replacing parts, use factory authorized parts and procedures. Failure to do so may result in damage to the mixer or injury to the user.

## CE COMPLIANCE

If the mixer nameplate has a CE marking on it, then the equipment furnished conforms to the following directives:

Machinery Directive: 2006/42/EC  
 Electro-Magnetic Compatibility: 2004/108/EC  
 Low Voltage Directive: 2006/95/EC  
 Noise: 2000/14/EC



**CAUTION:** When applicable specific markings required by Pressure Equipment Directive 97/23/EC (PED) and/or Equipment for Use in Potential Explosive Atmospheres Directive 94/9/EC (ATEX) will be indicated on supporting nameplates. If there is any doubt relating to the intended use of this equipment please contact **LIGHTNIN®** before installation and operation.

Any CE marking and/or associated documentation applies to the mixer only. This has been supplied on the basis that the mixer is a unique system. When the mixer is installed, it becomes an integral part of a larger system which is not within the scope of supply and CE marking is the responsibility of others.

## NOISE LEVELS

### SOUND PRESSURE LEVELS

Portable Series: ECL, EV - maximum 80 dBA @ 1 meter.  
 Heavy Series: S10, 70/80, 500/600 - maximum 85 dBA @ 1 meter.

## PATENTS

**THIS PRODUCT MAY BE COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS:**

5152606	5501523	6517233	6860474	7168848	7387431	7550120
5152934	5511881	6517246	6877750	7168849	7407322	7572112
5203630	5568975	6742923	6986507	7278799	7473025	7726946
5344235	5779359	6746147	7001063	7328809	7481573	7753215
5368390	5925293	6789314	7056095	7329065	7488137	7874719
5470152	5988604	6796707	7114844	7331704	7507028	
5480228	6158722	6796770	7168641	7384551	7547135	

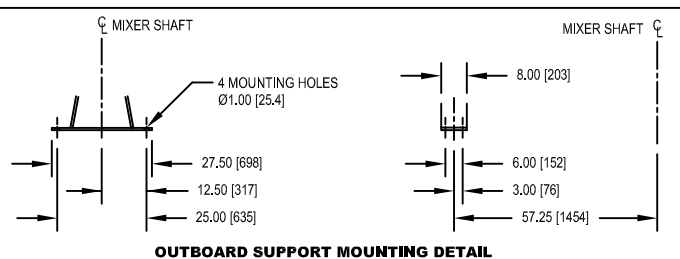
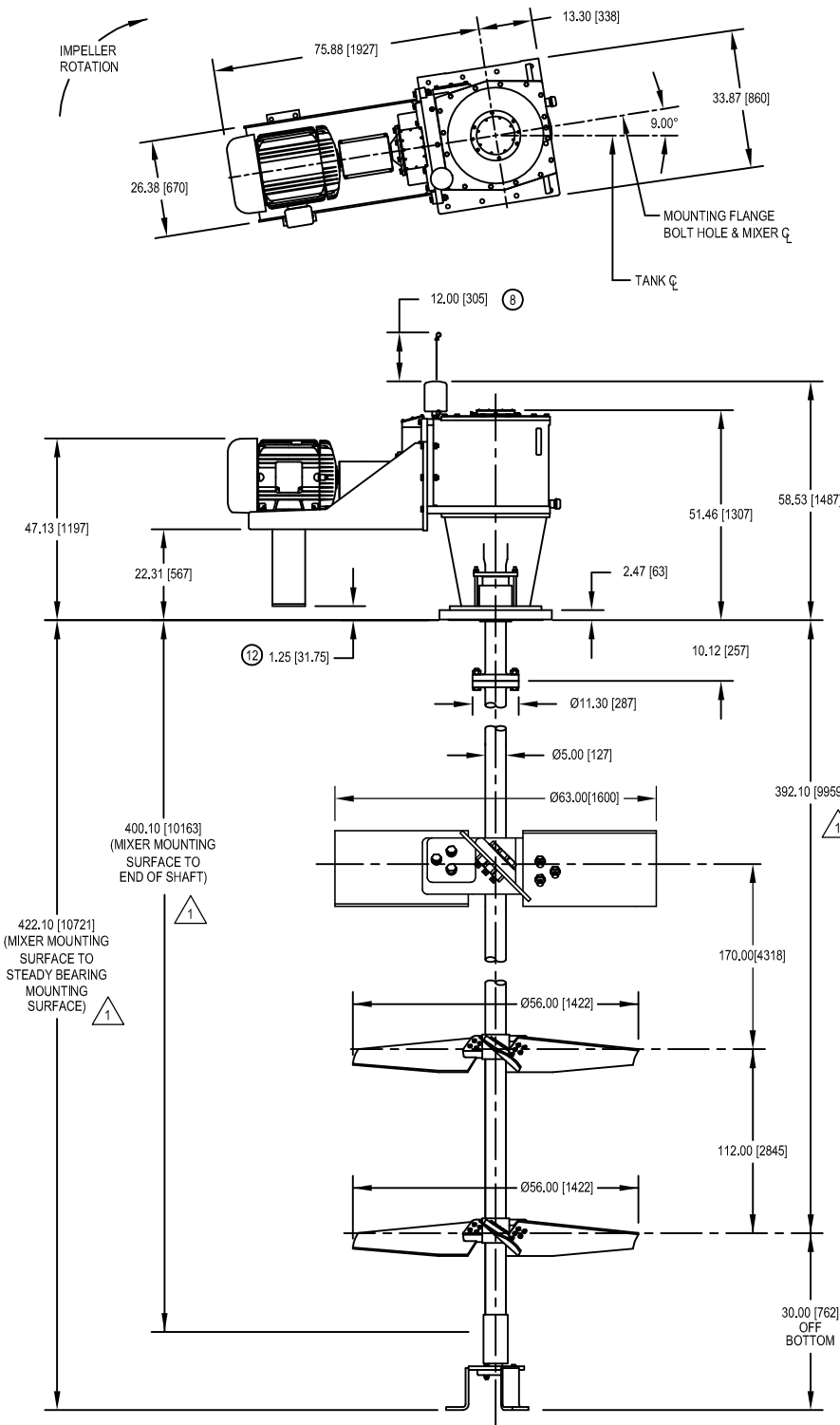
## ENVIRONMENTAL NOTICE



Dispose of equipment responsibly at the end of its service, in accordance with local laws and directives. Correct disposal is the responsibility of the end user. If in doubt, consult with local environmental agencies for advice on the best method of disposal.

NOTES:

- ① MATERIAL OF IN-TANK MIXER PARTS IS 316.
- ② ALL DIMENSIONS ARE IN INCHES [mm].
- ③ MOTOR DATA:  
H.P.: 150.0 R.P.M.: 1800 DUTY: SEVERE  
VOLTS: 460 PHASE: 3 HZ: 60  
ENCLOSURE: TEFC FRAME: 445T
- ④ IMPELLER DATA:  
TYPE: A200 / A510E / A510E QUANTITY OF BLADES: 4 / 3 / 3  
R.P.M.: 100.2  
IMPELLER HUBS ARE NOT ADJUSTABLE OR REMOVABLE FROM POSITIONS SHOWN. BLADES ARE REMOVABLE.
- ⑤ TOTAL MIXER WEIGHT IS 9686 lbs [4395 kg].
- ⑥ MIXER MOUNTING DESIGN DATA:  
VERTICAL DOWNWARD LOAD: 35,000 LBS. [155680 N]  
TORQUE: 213,000 IN.-LBS. [24069 N•m]  
BENDING MOMENT: 639,000 IN.-LBS. [72207 N•m]  
DESIGN LOADS ARE GREATER THAN ACTUAL LOADS BY A SUITABLE FACTOR, CONSISTENT WITH CONSTRUCTION CODES AND LIGHTNIN EXPERIENCE.  
**LIGHTNIN** WARRANTIES AND GUARANTEES EXTEND FOR THOSE ITEMS FURNISHED BY IT. ALL OTHER EQUIPMENT AND DESIGNS ARE THE RESPONSIBILITY OF OTHERS.
- ⑦ MINIMUM OPENING REQUIRED TO PASS DISASSEMBLED MIXER PARTS IS 24.00" [610 mm].
- ⑧ CLEARANCE REQUIRED FOR REMOVAL OF OIL LEVEL GAUGE.
- ⑨ UNIT IS FURNISHED WITH A STUFFING BOX PACKING MATERIAL: COMBINATION 50
- ⑩ MIXER MOUNTING FLANGE DATA:  
150 LB. ANSI SERIES DRILLING  
SIZE: 20" O.D.: 27.50 BOLT CIRCLE: 25.00  
NO. OF HOLES: 20 BOLT DIA: 1.13  
AS COMMON PRACTICE, FLANGE BOLT HOLES ARE SHOWN STRADDLING MIXER CENTERLINE
- ⑪ OUTBOARD SUPPORT DESIGN DATA:  
VERTICAL DOWNWARD LOAD: 8,315 LBS. [37001 N]  
HORIZONTAL LOAD: 1325 LBS. [5896 N]  
MAKE SURE SUPPORT IS SECURED TO MOTOR BRACKET BEFORE UNIT IS INSTALLED ON STRUCTURE.  
OUTBOARD SUPPORT MOUNTING STRUCTURE AND MOUNTING HARDWARE NOT FURNISHED BY **LIGHTNIN**.
- ⑫ ALLOW 1/2" [12.7 mm] FOR FINAL SHIM ADJUSTMENT. BOLT UNIT SECURELY TO THE MOUNTING STRUCTURE BEFORE SHIMMING. IMPROPER SHIMMING WILL INDUCE HIGH PRE-LOADS IN THE UNIT AND CAUSE MOTOR COUPLING MISALIGNMENT. DO NOT OVERSHIM OR ALLOW DRAWDOWN.
- ⑬ UNIT IS FURNISHED WITH A TRIPOD MOUNTED STEADY BEARING. BUSHING MATERIAL IS GLASS FILLED TEFLON. THE LATERAL DESIGN LOAD ACTING AT THE CENTERLINE OF THE BUSHING IS 2028 LBS. [9025 N]. MIXER MOUNTING SURFACE AND STEADY BEARING MOUNTING SURFACE MUST BE PARALLEL WITHIN ±.25° IF THEY ARE NOT A TAPERED GASKET, DUTCHMAN OR SHIMS SHOULD BE ADDED TO OBTAIN THE REQUIRED PARALLELISM. MOUNTING PAD TO BE AFFIXED TO TANK BOTTOM AT TIME OF STEADY BEARING INSTALLATION. RECOMMENDED MINIMUM PAD THICKNESS MEASURED AT TANK ⌀ IS 2.00" [51 mm]. IF TANK BOTTOM THICKNESS IS LESS THAN 3/8", **LIGHTNIN** RECOMMENDS THAT IT BE REINFORCED.



ALL EQUIPMENT DESIGN AND APPLICATION DATA SHOWN HEREIN AND RELATED KNOW-HOW IS CONFIDENTIAL AND THE PROPERTY OF THE LIGHTNIN GROUP OF COMPANIES. NO USE OR DISCLOSURE THEREOF MAY BE MADE WITHOUT OUR WRITTEN PERMISSION.

**LIGHTNIN**<sup>®</sup>  
MIXERS AND AERATORS

GENERAL ARRANGEMENT

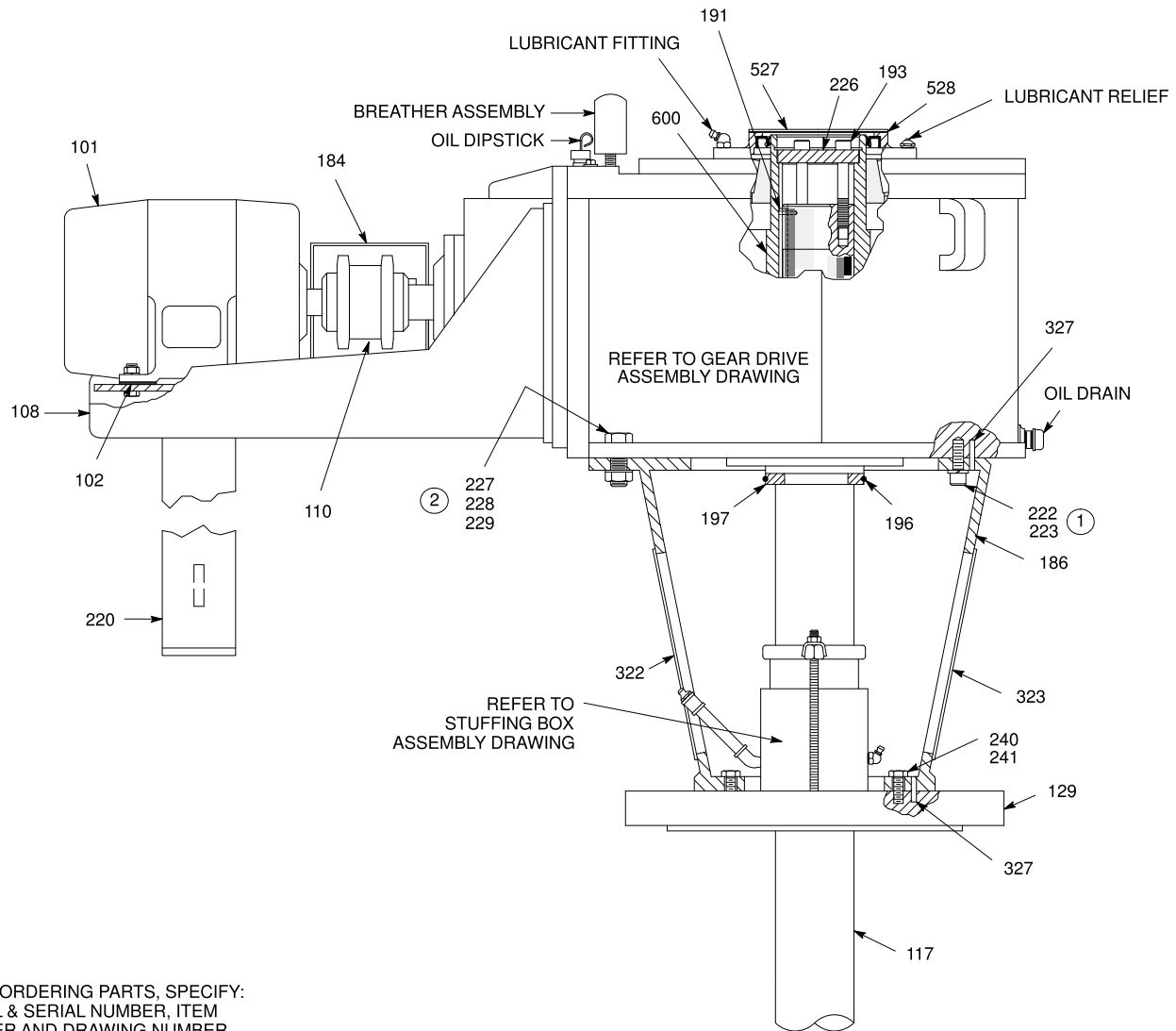
FOR: **BUNGE - ERGON VICKSBURG, LLC**  
S.O. NO.: 1013563 LINE: 30  
CUST. P.O. NO.: 61310-4500145584  
TAG NO.: AG-2101 / SLURRY MIX QUANTITY: 1  
MIXER MODEL: 780C150 RATIO: 17.4:1



CERTIFIED BY: *Jim Finch*

DATE: 09/24/07

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WHEN ORDERING PARTS, SPECIFY:  
MODEL & SERIAL NUMBER, ITEM  
NUMBER AND DRAWING NUMBER

600	GEAR DRIVE LOW SPEED SHAFT
528	GASKET
527	COVERPLATE
327	LOCATING PIN (2)
323	COVER PLATE - FRONT
322	COVER PLATE - REAR
241	LOCKWASHER
240	HEX HEAD CAP SCREW
229	HEX NUT
228	LOCKWASHER
227	HEX HEAD CAP SCREW
226	THRUST PLATE
223	WASHER
222	SOCKET HEAD CAP SCREW - NYLOK
220	OUTBOARD SUPPORT
197	THRUST RING - SPLIT
196	RETAINING RING
193	SOCKET HEAD CAP SCREW (3)
191	HOOK KEY
186	LOWER BEARING MEMBER
184	COUPLING GUARD
129	HUB & FLANGE ASSEMBLY
117	UNIT SHAFT
110	HIGH SPEED FLEXIBLE COUPLING
108	MOTOR BRACKET
102	SHIM SET - MOTOR
101	MOTOR

- ① MOUNTING HARDWARE FOR MODELS 780 & 781.
- ② MOUNTING HARDWARE FOR MODEL 782.

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**LIGHTNIN**

MIXERS AND AERATORS  
ASSEMBLY DRAWING

**MODELS  
780C THRU 782C**



CERTIFIED

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1979



# GENERAL INSTRUCTIONS FOR **LIGHTNIN® 780 & 880 SERIES**

## SECTION 1 - INITIAL INSPECTION, SHIPPING ARRANGEMENTS

- 1.1 Check shipping crates and your **LIGHTNIN** equipment for possible shipping damage. Report any damage immediately to the carrier and our factory.
- 1.2 All mixers are shipped fully assembled whenever possible. If shipping restrictions limit overall size, major subassemblies will be crated separately, ready for quick, easy assembly at the job site. Generally, motor brackets fitted with standard NEMA motor frames 364T and smaller are assembled to the mixer. Brackets fitted with large, special drives and standard NEMA motors 365T and larger may be shipped separately. Before shipping, the brackets and motors on all mixers are assembled, the flexible couplings factory aligned and the assembly removed for shipping. See Section 2 for reassembly. Refer to motor maintenance instructions in this manual and the nameplate before connecting to power source.
- 1.3 Long in-tank shafts are crated separately for shipping ease and handling at the job site.
- 1.4 All mixers are treated with corrosion inhibitors for protection during shipment and possible storage.
  - a. All steel surfaces not protected with permanent coatings are covered with a rust preventative that is easily removed with kerosene or a similar solvent.
  - b. All internal surfaces are protected against corrosion due to water or water vapor in case the mixer will not be put into service right away.
- 1.5 Factory applied inhibitors will protect mixers from internal corrosion for periods up to one (1) year if stored indoors in clean, temperature controlled, dry surroundings. **OUTDOOR STORAGE IS NOT RECOMMENDED.** Review the section on storage carefully if the mixer is to be stored or inactive for an extended period.

## SECTION 2 - INSTALLATION

- 2.1 Recommended lifting procedures are covered in Section 3 of these instructions. Important mounting and operating information is shown on the installation drawing.
  - a. Mixer weight and design loads imposed by mixer for mounting structure design.
  - b. Location and mounting dimensions.
  - c. Baffle information (when required).
  - d. The minimum size opening required to pass disassembled in-tank parts into the vessel.
  - e. Proper impeller off-bottom and relative spacing for multi-impeller applications.
- 2.2 Using a torque wrench, tighten all in-tank hardware to their specified torque values.
- 2.3 Do not hoist, handle or rest the mixer on any shaft extensions. Always support the mixer so that the shaft extensions are free floating.
- 2.4 Check specifications elsewhere in this document to be sure that sufficient quantities of the required lubricants are available before beginning installation procedures.
- 2.5 **When installing the impeller/s on a shaft, refer to the assembly drawing and/or instructions.** Make sure the impellers are installed for the shaft rotation indicated and that the bolts are properly tightened.
- 2.6 Tighten all in-tank hardware to the specific torques listed in either Section 8 or special torques that will be listed on individual instruction sheets if applicable.
- 2.7 If your mixer is equipped with a shaft seal, refer to the instructions in this booklet for lubrication procedures before operating the mixer.

- 2.8 The high speed flexible coupling is factory aligned, but alignment should always be rechecked in case misalignment occurs during shipping and handling. Coupling life and performance depends on accurate alignment. The coupling grids are not installed at the factory on models with special drives and motors over 50 H.P. Slide back or remove coupling covers. Check coupling gap, and parallel and angular alignment as described in the coupling instructions. If a motor bracket outboard support is provided, check coupling alignment only after the support is mounted, properly shimmed and secured.

NOTE: **Correct misalignment** by adding or removing slotted shims under the motor feet. Evenly distribute shims under each foot to achieve alignment and provide uniform support at each foot.

2.9 DISASSEMBLED MOTORS AND BRACKETS

- a. Remove the flexible coupling (110) covers and motor hub.
- b. Mount the bracket (with motor) securely to the gear drive. Tighten the cap screws (183) to the torques listed in Section 8.
- c. Check coupling alignment and gap. Readjust motor if necessary.

NOTE: Place U-shaped shims under each motor foot to achieve coupling alignment and provide uniform support at each foot.

- d. After the mixer is fully installed, recheck all shaft alignments before installing grids and guards.
- e. Install the coupling grids and covers and fill the coupling with grease per coupling instructions.
- f. Install the safety coupling guard (184).

- 2.10 It is the customer's responsibility to touch up any paint damage incurred during installation and/or storage.

### SECTION 3 - RECOMMENDED LIFTING PROCEDURES

- 3.1 780/880 thru 783/883 models are designed as follows for lifting in accordance with the procedure outlined in this section:

- a. When a motor bracket is furnished, refer to Figure 1A.
- b. When a channel base is furnished, refer to Figure 1B. Four (2" x 5") lifting slots are provided, (2) at each end of channel base.

- 3.2 LIFTING LOAD: Do not include the lower shaft and impeller(s) as part of the total mixer being lifted due to excessive lift heights and maneuvering required. Install the gear drive and motor assembly and attach the lower shaft and impeller assemblies after the gear drive has been installed and properly bolted in place.

Check the capacity of the lifting straps or cables and attachments against the total weight of the mixer being lifted to be sure these items are capable of safely lifting the total weight of the assembled motor and gear drive.

Visually check the condition of all lifting straps or cables and connectors to be sure they are not damaged in any way. When lifting the mixer, take slack out of the lifting straps or cables to avoid sudden impact loads that may damage the lifting devices.

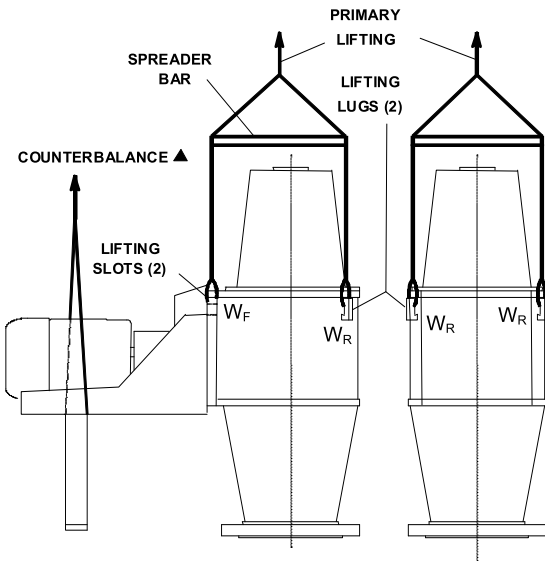


**CAUTION: THE ANGLE OF THE PRIMARY LIFTING CABLES (SEE FIGURES 1A & 1B) MUST BE AS CLOSE TO VERTICAL AS POSSIBLE, WITHIN A PLUS OR MINUS 5° VARIANCE. USE OF A CONVIENT SPREADER BAR IS RECOMMENDED.**

- 3.3 Under slinging can be used to lift the mixer when headroom is a problem. Sling directly under the gear drive only. DO NOT sling under the motor bracket or other members except to counterbalance the mixer when required.
- 3.4 Whenever a bolted lifting device is used, make sure the hardware is tightened securely to proper torques. Always use a torque wrench to check torque before lifting. Consult the lifting device manufacturer's instructions for proper instructions in their use and especially for the proper bolt torque.

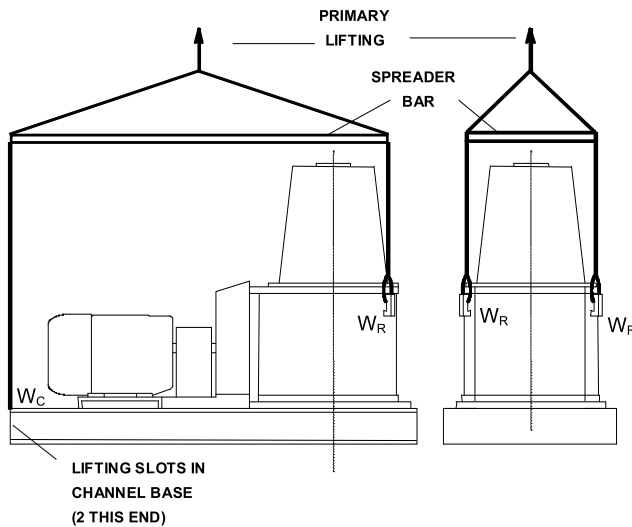
**FIGURE 1 - RECOMMENDED LIFTING PRACTICE**

CAUTION: When taking up slack on lifting cables, avoid sudden impact loading on the lifting devices



**FIGURE 1A**

CAUTION: When taking up slack on lifting cables, avoid sudden impact loading on the lifting devices



**FIGURE 1B**

▲ It may be necessary to sling under the motor bracket and through the outboard support in order to keep the unit vertical or to guide around obstructions.

ALLOWABLE VERTICAL LOAD [LBS] FOR EACH LUG LOAD MUST BE VERTICAL WITHIN ± 5 DEGREES				
MIXER CASE SIZE	W <sub>F</sub> FRONT LUG	W <sub>C</sub> CHANNEL BASE	W <sub>R</sub> REAR LUG	MAX CAPACITY 2W <sub>R</sub> + 2W <sub>F/C</sub>
780/880	7,500	7,500	8,000	31,000
781/881	11,000	11,000	8,000	38,000
782/882	11,000	11,000	9,000	40,000
783/883				
783ST	13,000	13,000	11,000	48,000

## SECTION 4 - START UP

- 4.1 The gear drive dipstick and breather assembly are removed prior to shipment, and replaced with solid plugs to provide an airtight gear drive housing. The dipstick and breather are packed separately with other installation hardware. Install the dipstick and breather assembly prior to start up.
- 4.2 **FILL THE GEAR DRIVE WITH OIL TO THE PROPER LEVEL.** The oil capacity is shown on Table 1, however, use the dipstick full mark as an accurate guide. For gear drives furnished with a lubricating pump, recheck oil level after the oil has had a chance to circulate through the oil lines and pump. Oil type and viscosity recommendations are given in Section 5. Only lubricants defined in Section 5 may be installed, unless otherwise approved by the factory. After the mixer has been operating for approximately 10 minutes, the oil level should be checked again and, if necessary, the oil should be added to the level up to the full mark on the dipstick or the full mark on the sight gauge, for models so equipped. Always stop the mixer to check the oil level.
- 4.3 Lubricate and adjust packing on stuffing box models. Packing should be "run-in" per instructions before pressurizing vessels.
- 4.4 Add lubricant and pressurize mechanical seal chambers per instructions before pressurizing vessel.

- 4.5 Review the motor maintenance instructions supplied with this manual for motor start up procedures.
  - a. Turn the motor shaft by hand to check for free rotation.
  - b. It is recommended that stator windings be checked for insulation resistance. If resistance is less than one megaohm, windings should be thoroughly dried before start up.
- 4.6 Connect the motor to a power source that matches the line voltage specified on the order and according to the wiring diagram on the motor nameplate.
- 4.7 **IMPORTANT:** Your 780RR/780RL/880 series gear drive is designed for clockwise output rotation of the low speed shaft when viewed from top. **DO NOT** operate **counterclockwise** unless the mixer nameplate so specifies. Before permanently connecting the motor leads, check impeller shaft rotation. Jog the motor until it is determined that rotation is correct, and make permanent connections. Motors should be properly grounded in accordance with applicable U.L. codes.
- 4.8 Before filling and/or pressurizing the vessel:
  - a. Run mixer in air and check for any unusual noises - observe mixer operation.
  - b. Take load reading and check output RPM.
  - c. Check all bolts and fasteners including locknuts (126) for tightness. After two weeks operation, recheck hardware for tightness.
- 4.9 After filling and/or pressurizing the vessel:
  - a. Jog the motor or rotate the input shaft by hand to ensure the shafts and impeller(s) are free of obstructions.
  - b. NEVER start up the mixer with the impeller imbedded in solids or set-up liquids.

## SECTION 5 - GEAR DRIVE LUBRICATION

### 5.1 GEAR DRIVE OIL LUBRICATION

Fill the gear drive to the proper level with an industrial gear oil with a viscosity as defined in Table 3. Fill the gear drive by removing the bushing below the breather assembly (518). It is imperative that the oil viscosity grade specified in Table 3 be used and that the specific lubricant be selected only from the listings provided in these instructions. See Section 5.7 for a more detailed description of approved oils.

<b>TABLE 1</b>			
<b>780 – 880 SERIES GEAR DRIVE OIL CAPACITIES</b>			
MODEL SIZE	SPEED REDUCTION	APPROXIMATE OIL CAPACITY *	
		QUARTS	GALLONS
780 - 880	DOUBLE	50	12.5
	TRIPLE	58	14.5
781 – 881	DOUBLE	80	20.0
	TRIPLE	88	22.0
782 – 882	DOUBLE	112	28.0
	TRIPLE	128	32.0
783 - 883	DOUBLE	198	49.5
	TRIPLE	222	55.5

\* Capacities listed are approximate and for reference only. **Always fill the gear drive to the full mark on the dipstick.**

5.2 OIL DISTRIBUTION

Oil within the gear drive feeds from a distribution reservoir through channels in the housing to lubricate all gears and bearings (except the low speed shaft bearings). Oil is delivered to the distributor either by an internal oil slinger or an external lubrication pump.

Gear drives that are equipped with an oil pump must be interwired, so that the mixer may not be started unless the oil pump has already been started. Pump equipped gear drives must also be wired such that they automatically shut down if the pump fails to deliver oil to the gear drive.

The majority of gear drives utilize the slinger type lubrication method. Lubrication pumps, when furnished, are mounted on the main housing and feed oil to the distributor.

GEAR DRIVES WITH SLINGER LUBRICATION REQUIRE PRIMING PRIOR TO START UP.

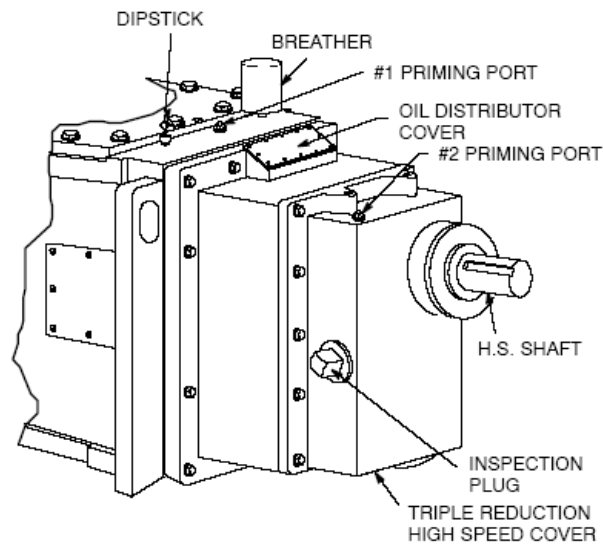


FIGURE 2

5.3 Priming requirements of slinger lubricated gear drives depend on ambient and oil temperature conditions

- a. When oil temperatures are less than the minimum temperatures in Table 2, follow the COLD START UP priming procedure outlined in paragraph 5.4.

TABLE 2 COLD START UP - TEMPERATURE GUIDELINES				
OIL TYPE	MINIMUM OIL COLD START UP TEMPERATURE		MAXIMUM OIL SUMP TEMPERATURE	
	( °C )	( °F )	( °C )	( °F )
AGMA 6, 7, 8	23.9	75	93.3	200
AGMA 5	18.3	65		
AGMA 4	12.8	55		
AGMA 3	7.2	45	82.2	180
AGMA 2	-1.1	30	62.8	145

- b. When oil temperatures are above the table minimums:
  - 1. Remove the pipe plug at the #1 port on Double Reduction gear drives and add 1 quart of oil BEFORE start up. Replace the pipe plug.
  - 2. Remove pipe plugs at #1 and #2 ports on triple reduction gear drives and add 1 quart of oil through EACH priming port BEFORE start up. Replace pipe plugs.

#### 5.4 COLD START UP PRIMING

- a. NOTE: Only mixers without lubricating pumps require priming.
- b. PRIOR to start up, add 1 quart of room temperature oil to the #1 priming port on double reduction or both #1 and #2 ports on triple reduction gear drives.
- c. DURING the first 1 to 1 ½ hours of operation, add 1 quart of room temperature oil through the #1 priming port every 15 minutes.
- d. Terminate priming after 5 quarts for double or 6 quarts for triple reduction. Replace priming port plugs.
- e. Check oil level and drain off excess oil after priming to maintain oil level at the full mark on the dipstick.

#### 5.5 PROLONGED SHUT DOWN PRIMING (mixer off for longer than a day)

- a. If oil temperature is less than the minimum cold start up oil temperature, use cold start up procedure per paragraph 5.4.
- b. If oil temperature is greater than the minimum cold start oil temperature, prime per paragraph 5.3, step b.

- 5.6 DO NOT operate the mixer if the oil sump temperature exceeds the maximum oil operating temperature in Table 2. Gear drives exposed to direct sunlight for extended periods where ambient temperatures reach 100° F (38° C) or greater, should be protected from this solar energy. A canopy over the drive or reflective paint can be used. If not possible, a heat exchanger or other cooling device may be required.

When the oil temperatures are less than those listed in Table 2, heat the oil.

#### 5.7 APPROVED GEAR OILS

- a. **LIGHTNIN** provides a list of recommended oils based on successful field experience with mixer gear drive applications and specific lubricant performance data. **All lubricants do not perform equally**, even though they may be the same AGMA viscosity grade. Each lubricant has different performance levels based on the specific additives and formulations.
- b. The specific viscosity grade required is shown in Table 3. The viscosity is dependant on the ambient conditions expected. It is imperative that the appropriate viscosity be selected for each mixer and that the viscosity of the oil be changed to meet any anticipated change in ambient temperature conditions. Certain regions will experience significant seasonal variations in temperature range. **This requires a seasonal oil viscosity change.** Ambient Temperature Range is the average temperature during daylight hours.
- c. Tables 4 and 5 show approved oils for **LIGHTNIN** 780 / 880 Series gear drives. **ONLY the specific lubricants shown in these tables are approved for use in LIGHTNIN gear drives.** These are lubricants with which **LIGHTNIN** has had successful field experience.
- d. Petroleum based oils provide excellent performance at moderate cost. Synthetic lubricants also provide excellent performance, however, for a small additional cost, they are capable of wider temperature ranges and longer drain intervals. The use of synthetic oils is recommended wherever a longer oil change interval is required. Synthetic oils are especially recommended where wider than normal changes in ambient temperature may occur between normal oil change intervals or where the mixers are subjected to particularly high ambient temperatures for long periods of time.

#### 5.8 LUBRICATION INSTRUCTION REVISIONS

- a. Both AGMA Standards and Lubricant Manufacturer's offerings change, over time. The lubricant information in this general instruction may be different than in older versions. In most cases **LIGHTNIN** urges the customer to be consistent with AGMA lubrication standards, but we recognize that they may have had successful field experience based on the older instructions. Immediate conversion is not required, however a gradual transition to the current lubrication standards is recommended.

TABLE 3 – REQUIRED OIL VISCOSITY GRADES (1)			
AMBIENT TEMPERATURE RANGE (°C)	AMBIENT TEMPERATURE RANGE (°F)	AGMA GRADE (2)	
		OUTPUT RPM < 130	OUTPUT RPM = or > 130
- 40 to - 10	- 40 to + 14	3	3
- 10 to + 10	+ 14 to + 50	4	3
+ 10 to + 35	+ 50 to + 95	6	5
+ 35 to + 55	+ 95 to + 131	8	7

- (1) Mixers equipped with any type of oil heating device: Consult Factory for proper oil viscosity grade.  
 (2) Per AGMA Standard 9005-D94. Applies to both “EP” and synthetic oils.

TABLE 4 – APPROVED PETROLEUM BASED EP GEAR OILS								
MANUFACTURER	BRAND	PRODUCT	PRODUCT BY AGMA GRADE					
			3 EP	4 EP	5 EP	6 EP	7 EP	8 EP
EXXONMOBIL	MOBIL	MobilGear 600 XP	100	150	220	320	460	680
EXXONMOBIL	EXXON	Spartan EP	100	150	220	320	460	680
CHEVRON	CHEVRON	Gear Compound EP	100	150	220	320	460	680
CHEVRON	TEXACO	Meropa	100	150	220	320	460	680
SHELL	SHELL	Omala	100	150	220	320	460	680

TABLE 5 – APPROVED SYNTHETIC EP GEAR OILS								
MANUFACTURER	BRAND	PRODUCT	PRODUCT BY AGMA GRADE					
			3 S	4 S	5 S	6 S	7 S	8 S
SPX/LIGHTNIN	N/A	N/A	100	150	220	320		
EXXONMOBIL	MOBIL	Mobil SHC 600 / 600* (1)	100	150	220	320	460	680
EXXONMOBIL	EXXON	MobilGear SHC		150	220	320	460	680
CHEVRON	CHEVRON	Tegra		150	220	320	460	680
CHEVRON	TEXACO	Pinnacle EP		150	220	320	460	680
SHELL	SHELL	Omala S4 GX	100	150	220	320	460	680
BEL-RAY	BEL-RAY	Synthetic Gear Oil		150	220	320	460	680

- (1) Mobil does not rate this product as “EP” due to the lack of “EP” additives. The load carrying capability of these oils is equal to or greater than the limits of “EP” oils.

For reference purposes, Table 6 shows a viscosity/grade comparison for the required oil viscosities defined in Table 3.

TABLE 6 – LUBRICANT VISCOSITY GRADES ( Kinematic Viscosity Range )		
AGMA GRADE EP / Synthetic	ISO GRADE	cSt ( mm <sup>2</sup> /s ) @ 40 °C
2 EP / 2 S	68	61.2 – 74.8
3 EP / 3 S	100	90 – 110
4 EP / 4 S	150	135– 165
5 EP / 5 S	220	198 – 242
6 EP / 6 S	320	288 – 352
7 EP / 7 S	460	414 – 506
8 EP / 8 S	680	612 – 748

### 5.9 ALTERNATE OILS

- a. Mixer gear drives operate continuously under very high loads. Care must be taken to choose an appropriate lubricant that can perform under these high loads and high temperatures. Great care must be exercised in the selection of alternate oils for use in mixer gear drives.
- b. The selection of an alternate oil should be done only after thorough evaluation by a qualified individual. Lubrication is a complex subject with numerous variables.

NOTE: The gear drive contains elastomers, gear case sealer and other materials that may not be suitable for use with an alternate oil. It is the customer's responsibility to ensure that the oil is compatible.

- c. All lubricants DO NOT perform equally, even though they may be the same AGMA viscosity grade. Each lubricant has different performance levels based on the specific additives and formulations. Additives can be depleted under high shear loads and temperatures, over time. **It is the Customer's responsibility to understand the performance capability of the alternate lubricant they will be using.**
- d. **LIGHTNIN** provides a list of recommended oils based on, successful field experience with mixer gear drives, and specific lubricant performance data.
- e. **LIGHTNIN DOES NOT APPROVE OR INVESTIGATE ALTERNATE OILS.** We recognize, however, that alternate oils may perform adequately and provide other benefits to the customer. Customers may want an alternate oil due to cost, availability or commonality of use with other equipment. In light of this, **LIGHTNIN provides general guidance for the customer or a third party to evaluate alternate oils.**
- f. **LIGHTNIN** offers general guidelines for evaluating alternate oils, however, successful field experience is critical to the selection. The customer benefits from understanding the performance of the specific product and additive package (anti-wear, anti-foaming, anti-oxidation, water solubility etc.).
- g. Most lubricant manufacturers can provide, upon request, product specification data sheets for each of their products. These data sheets generally provide all or most of the data required.
- h. Proper evaluation requires:
  1. An understanding of the additives and oil performance as indicated in Table 7.
  2. Adequate field experience in similar equipment with similar operating parameters, to confirm the lubricant's long-term performance.
- i. If a lubrication related failure occurs, the Customer's lubricant evaluation and field experience would be considered in the failure analysis.



- j. **The Warranty may be voided if the customer has not conducted a proper lubricant evaluation, before using the alternate lubricant.**
- k. For suggestions of a third party to perform an oil evaluation, the Society of Tribologists and Lubrication Engineers may be contacted at [www.stle.org](http://www.stle.org).

**TABLE 7**  
**MINIMUM PHYSICAL AND PERFORMANCE REQUIREMENTS FOR**  
**EXTREME PRESSURE AND SYNTHETIC GEAR LUBRICANTS**

PROPERTY	TEST PROCEDURE	ACCEPTANCE CRITERIA
Flash Point ( °F )	ASTM D 92	400 (Minimum)
Viscosity	ASTM D 445	Per AGMA 9005-E02 Table 4
Viscosity Index	ASTM D 2270	EP: 90 (Minimum), SYN: 120 (Minimum)
Oxidation Stability	ASTM D 2893 (Increase in Kinematic Visc. of a sample at 250°F )	6% Maximum
Rust Protection	ASTM D 665 B (24 hrs in synthetic sea water)	No Rust
Corrosion Protection	ASTM D 130 (Copper strip corrosion after 3 hrs. @ 212°F)	1b strip
Foam Suppression	ASTM D 892 (Must be within the limits shown)	Maximum Volume of Foam (ml) after: Sequence:            I    II    III Temp. °F:            75  200  75 After 5 Min. Blow:    75    75    75 After 10 Min. Rest:  10    10    10
Demulsibility	ASTM D 2711 MOD (Must be within the limits shown)	AGMA Grades <u>EP</u> <u>Syn.</u> 2-7                    8-13 Max. % H <sub>2</sub> O in oil after 5 hr. test            2.0            2.0            1.0 Max. Cuff after centrifuging (ml)            1.0            4.0            2.0 Min. Total free water collected during entire test (start w/ 90 ml of water) (ml)            80.0            50.0            60.0
Cleanliness	None	Must be free from grit and abrasives.
Pour Point	ASTM D 97	
Timken OK Load ( lbs. )	ASTM D 2782	60 (Minimum)
FZG Test (No. of stages passed)	DIN 51 354 ( A/8.3/90°C parameters)	12 (Minimum)
Filterability	None	Must be filterable to 25 microns without the loss of additives.

5.10 OIL MAINTENANCE

Proper operation of the gear drive is dependant on the careful maintenance of its oil lubrication system. The oil level must be checked (with the mixer shut down and after all rotation has ceased) at regular intervals and the entire fill must be drained and replaced when it has begun to lose its load carrying capacity or when it becomes contaminated.

- a. Oil Capacity - The gear case oil capacity is shown for reference in Table 1. Due to the physical size variations of gears and other internal components, the actual capacity of individual drives may vary from the volumes listed in Table 1. For this reason, the dipstick full mark should be used as the most accurate guide to the actual oil level in a specific mixer.
- b. Initial Oil Change – The lubricant in a new gear drive should be drained and the gear case flushed after two (2) weeks of operation. This is necessary to ensure that all initial wear products and contamination that may have occurred during shipping and installation are removed from the gear drive. Drain the gear drive while the oil is still at operating temperature. Flush the housing thoroughly with a flushing oil that has a viscosity of 215 SSU or less, provided the mixer can be run at no load. The original oil should be conditioned and reused OR discarded and new oil installed.

If the mixer is run under load during the flushing operation, it must be filled with an approved oil that meets the requirements of paragraph 5.1 of this document. Low viscosity flushing oils must not be used unless the mixer can be run under no load conditions.

- c. Normal Oil Change Interval - The oil change frequency required for the gear drive is dependant upon the type of oil being used and the overall operating conditions. Table 8 provides specific guidance regarding the oil change interval for these gear drives. These oil change intervals must be adhered to.
- d. Oil Change Interval for Adverse Conditions - In general, higher operating or local ambient temperatures or adverse operating conditions will require more frequent oil changes. When adverse operating conditions, such as rapidly changing temperatures, chemical fumes or vapors, dusty or humid atmospheres, high solar gain, etc. are present, the oil change interval must be reduced. Under such conditions, oil change intervals should be determined based on an oil analysis program.

More frequent oil changes at intervals of one to three months will be necessary for unfavorable operating conditions that tend to deteriorate oil and/or cause condensation.

Rapid changes in oil temperatures caused by intermittent operation or wide fluctuations in ambient temperatures or operation in humid atmospheres, all promote condensation that can result in the formation of harmful sludge.

Harmful vapors or chemical fumes and dusty atmospheres also tend to deteriorate oil and the beneficial additives.

- e. Oil Analysis - In order to determine the optimum change interval for the lubricating oil in the gear drive, an oil analysis program may be utilized. It is very important, however, that the type of analyses performed and the individuals evaluating the results be selected to ensure that inappropriate conclusions are not reached. In general, a successful oil analysis program must consider a wide range of parameters including both wear particle and spectral analysis of the basic lubricant.

Reputable lubricant suppliers can test oil and recommend economical oil change schedules when adverse operating conditions are present. Severe duty applications should be referred to our factory for specific recommendations.

TABLE 8 RECOMMENDED NORMAL OIL CHANGE INTERVALS			
DUTY CLASSIFICATION	OIL SELECTED FROM TABLE	OIL CHANGE INTERVAL (WHICHEVER OCCURS FIRST)	
		OPERATING HOURS	CALENDAR MONTHS
OCCASIONAL (IDLE PERIODS > 50 HRS.)	4	1500	4
	5	4500	8
INTERMITTANT (> 5 HRS PER DAY)	4	2500	6
	5	7500	12
CONTINUOUS (24 HRS PER DAY)	4	4380	6
	5	13140	18

- f. Oil Level Check - The oil level should be checked at regular intervals, preferably not longer than biweekly. DO NOT overfill the gear drive with oil as leakage and severe overheating can occur.
- g. Oil Compatibility - While most quality oils are mutually compatible, different brands of the same or different grades should not be mixed. If a change in lubricant brand or type is required, the gear drive must be drained as fully as possible and flushed with the new lubricant prior to placing the mixer back in service.

Flushing may be accomplished simply by first draining the current lubricant from the gear drive, refilling it with the new oil and running for at least 12 hours but not longer than 24 hours. After this period of time, the gear drive should be drained fully and then refilled with fresh oil of the new type. The used oil must be discarded.

5.11 GEAR DRIVE BEARING LUBRICATION

- a. All gear drive bearings are oil splash lubricated, except the low speed shaft upper and lower bearings. These bearings are initially lubricated at the factory and should be relubricated at regular intervals with a premium quality lithium soap NLGI #2 consistency grease having rust and oxidation inhibitors and a base oil viscosity of at least 500 SSU at 100° F. To ensure that the upper and lower bearings receive an adequate supply of fresh grease, add the minimum quantity shown in Table 9.
- b. LOWER BEARING (ITEM 601) – This regreasable bearing is initially lubricated at the factory with a Lithium base grease, but requires relubrication at regular intervals. **Be sure to clean all grease fittings and greasing equipment thoroughly before attempting to lubricate bearings. Also, make sure that the recommended grease used is clean and free of contamination.** Refer to the assembly drawings for location of the grease fittings.

TABLE 9 LOWER BEARING (ITEM 601) MINIMUM QUANTITY OF GREASE	
MODEL SIZE	QUANTITY (LBS.)
780 - 880 & 781 - 881	0.5
782 - 882	0.75
783 - 883	1.0

- c. Section 6 of this document provides listings defining the greases approved for use in **LIGHTNIN** drives.

5.12 LUBRICATION INTERVALS

- a. Open type bearings require fresh lubricant at regular intervals. The frequency of relubrication depends on the extent of atmospheric contamination, humidity, variations in ambient temperature and actual bearing operating temperatures. Bearings operating at high temperatures require fresh grease at more frequent intervals. Under most circumstances, the bearings in these gear drives should be regreased at the intervals defined in Table 10.

TABLE 10 BEARING LUBRICANT INTERVALS (Months)			
TYPE OF GREASE	BEARING OPERATING TEMPERATURE ( °F )		
	UNDER 160	160 - 185	186 - 200
STANDARD NLGI # 2	6	4	3
NLGI # 2 (EP) EXTREME PRESSURE	4	3	1

\* NLGI – NATIONAL GREASE LUBRICATING INSTITUTE

- 5.13 Bearing operating temperatures can be determined with a surface pyrometer or thermometer. For inaccessible bearings, grease or oil temperatures can be measured. Add 10° F to lubricant temperatures to compensate for heat transfer loss. Periodic temperature checks should be made to establish lubrication intervals and also to detect potential problems that can result from overheating.
- 5.14 It is normal for a bearing to show a slight temperature increase (as much as 20° F) for a short period of time (up to 10 hours) after regreasing. This is due to the heat generated within the bearing as the fresh grease is redistributed inside the bearing by the motion of the rolling elements. For this reason, bearings should not, except under special circumstances as defined by the factory for a particular gear drive, be regreased on a daily basis.

## **SECTION 6 – BALL AND ROLLER BEARING LUBRICATION (880 SERIES UPPER SHAFT BEARINGS)**

### **6.1 APPROVED GREASES**

**LIGHTNIN** Mixers and Aerators are equipped with high quality ball and roller bearings that are housed in sealed enclosures for maximum protection. These bearings should be treated with care and only the highest quality lubricants should be used. Only the greases specified in Tables 11 and 12 are to be used to lubricate bearings in **LIGHTNIN** drives.

- 6.2 All mixers are furnished with open type bearings, which are initially lubricated at our factory. Housings are provided with grease fittings and automatic relief fittings or relief plugs when required. Lithium based NLGI #2 consistency grease is used to lubricate these bearings at our factory.
- 6.3 Lithium base grease is a multipurpose grease most ideally suited to covering the broad range of operating conditions to which bearings are subjected. It offers good resistance to water and remains stable through a wide range of varying mechanical, oxidation and temperature conditions.
- 6.4 With the exception of “polyurea” greases, as noted below, only lithium greases must be used. Without taking a bearing apart and thoroughly cleaning it, it is virtually impossible to remove all of the lithium grease that was installed at our factory and thus undesirable cross contamination is unavoidable. Many types of grease are not compatible with one another and cross contamination can, therefore, create serious problems. Since it is not practical to present a complete compatibility chart in these instructions, it is best not to mix greases.

Greases made with “polyurea complex” thickeners are compatible with most grease, including lithium thickened greases. Polyurea greases are generally higher in load capacity and may be used where an EP grease is required.

### **6.5 LUBRICATION INTERVALS (refer to Table 10)**

Open type bearings require fresh lubricant at regular intervals. The frequency of relubrication depends on:

- a. Presence of excessive moisture
- b. Extent of atmospheric contamination
- c. Variations in ambient temperature
- d. Bearing operating temperatures

Bearings operating at high temperatures and/or bearings lubricated with extreme pressure (EP) grease require fresh grease at more frequent intervals.

### **6.6 BEARING LUBRICATION PROCEDURE**

- a. The following procedure will ensure that the grease is properly distributed with the bearing and effectively displaces the old, worn out grease pack.
- b. Stop the mixer and disconnect or otherwise lock out the power supply.
- c. Remove safety cover(s) (Items 320 & 322).
- d. For bearings that are equipped with grease fittings, fresh grease should be added to the lubricant fitting until fresh, clean grease is observed to flow from the grease relief. **DO NOT** stop pumping in fresh grease at the first sign of grease at the relief fitting. It is important that the new grease displace as much of the old, worn grease pack as possible. This will ensure that maximum bearing life is obtained.

- e. Install safety covers and reconnect the mixer to its power supply.
  - f. Run the mixer for (10) minutes.
  - g. Again, stop the mixer and disconnect or otherwise lock out the power supply.
  - h. Remove the safety covers.
  - i. Add lubricant per 6.6d.
  - j. Install the safety covers.
- 6.7 For bearings that are not equipped with grease relief fittings (e.g. output shaft bearings in a dry well), care should be exercised to ensure the appropriate quantity of grease as defined in Table 13 is introduced into the bearing when the bearings are regreased.
- a. Regreasing Procedures - Before attempting to relubricate any bearing, be sure to clean all grease fittings and greasing equipment thoroughly. Make sure that the recommended type of grease has been loaded into the regreasing device and it is also clean and free of contamination. Refer to the assembly drawings for the location of the grease fittings. Use only one of the approved greases listed in these instructions when relubricating bearings on these gear drives.
- 6.8 Approved greases for use in all bearings in **LIGHTNIN** gear drives are shown in Tables 11 and 12.
- a. EP Greases - The products shown in Table 11 are EP greases. They may be used in all applications and are REQUIRED for all spherical roller bearings on **LIGHTNIN** drives.

TABLE 11 APPROVED LITHIUM EP BEARING GREASES			
MANUFACTURER	BRAND	PRODUCT	TIMKEN OK LOAD LBS (N)
AMOCO	AMOCO	AMOLITH EP 2	40 (180)
EXXONMOBIL	MOBIL	MOBILUX EP 2	
CHEVRON	TEXACO	MULTIFAK EP 2	
	CHEVRON	DURA-LITH EP 2	
GULF	GULF	GULFCROWN GREASE EP 2	
PENWALT	PENWALT	KEYSTONE 81 EP LT	75 (330)
SHELL	SHELL	ALVANIA EP 2	60 (270)

- b. Alternate High Temperature Greases - The products shown in Table 12 may be used for gear drive bearings **and 800 Series upper shaft bearings**, which may experience higher than normal operating temperatures, in mixers with high output speeds.

Note: These greases are not to be used in lieu of correcting any special high temperature ambient operating conditions (including high temperature process equipment, presence of solar radiation, very dusty atmosphere or enclosed space).

TABLE 12 HIGH TEMPERATURE LITHIUM COMPLEX BEARING GREASES	
MANUFACTURER	PRODUCT
MOBIL	MOBILITH SHC 220
CASTROL	TRIBOL 4020 / 220-2

6.9 MIXER SHAFT BEARING LUBRICATION  
(880 Series Upper Shaft Bearings)

- a. Unit size 880 models with 4.5" diameter shafts through the bearings are equipped with ball bearings. Unit sizes 880 – 883 with larger than 4.5" diameter shafts through the bearings are equipped with spherical roller bearings.
- b. Open Type Ball Bearings - These bearings are designed to use a premium quality lithium soap NLGI #2 consistency grease having rust and oxidation inhibitors and a base oil viscosity of at least 500 SSU at 100° F. A List of suitable greases is provided in Table 11.
- c. Spherical Roller Bearings - These bearings should use only an NLGI #2 consistency lithium based EXTREME PRESSURE (EP) grease which contains an oil whose viscosity is 800-1000 SSU at 100° F. A listing of suitable greases conforming to this specification is given in Table 11.

6.10 GREASE QUANTITIES

The minimum quantity of grease needed to adequately lubricate each of the mixer shaft bearings is given in Table 13.

TABLE 13 MINIMUM GREASE QUANTITY		
UPPER SHAFT DIAMETER (IN.)	TYPE OF BEARING	MIN. QTY. OF GREASE (OZ.)
4.5	Ball	3
5.0	Spherical Roller	5
5.5		6
6.0, 6.5		7
7.0		8
7.5		9
8.0		11
8.5		13

6.11 REGREASING PROCEDURES

Mixer shaft bearings may be relubricated either while they are installed in a unit or after disassembly and cleaning.

- a. Installed Bearings - **Before attempting to relubricate any bearing, thoroughly clean all grease fittings on greasing equipment. Make sure that the recommended type of grease has been loaded into the regreasing device and it is also clean and free of contamination.** Refer to the assembly drawings for location of the grease fittings. Use only one of the approved greases listed in these instructions when relubricating the mixer shaft bearings.

Without compromising safety, whenever possible, bearings should be regreased while the mixer is operating. This will ensure that the grease is properly distributed within the bearing and effectively displaces the old, worn out grease pack. If it is not possible to regrease the bearings while the mixer is in operation, **LOCKOUT THE POWER SUPPLY** and rotate either the input or output shaft slowly by hand while the bearings are being regreased.

- b. Uninstalled Bearings - If a bearing is removed, clean thoroughly with kerosene or a similar solvent until all old grease and foreign matter is removed. Allow to air dry. **DO NOT SPIN DRY BEARINGS.** Dip bearing in a light lubricating oil for protection if it is not to be regreased immediately.

Regrease the bearing by forcing grease between the rolling elements and the inner and outer races. Thoroughly work the grease in from both sides of the bearing to ensure that it is fully packed.

Before reinstalling the bearing, thoroughly clean the housing and coat it with fresh bearing grease. In addition, pack the cavity below the bearing with fresh bearing grease of the same type. Replace all covers and add lubricant through the fitting to purge the housing of air pockets and ensure that the channels are full.

## 6.12 MOTOR BEARINGS

Prior to shipment, motor bearings are greased with the proper amount and grade of lubricant by the motor vendor. Motors equipped with sealed bearings require no additional lubrication. Motors equipped with open ball bearings require lubrication periodically. Refer to motor manufacturer's maintenance instructions for further details.

## SECTION 7 - STORAGE PROCEDURES

**LIGHTNIN** Mixers and Aerators, like all precision equipment, must be protected against corrosion during prolonged periods of inactivity. The primary cause of corrosion is condensation due to fluctuating temperatures, high humidity, or both. Properly treated and located in clean, dry surroundings, inactive equipment can be successfully stored for up to one year without damage from corrosive attack.

**REVIEW AND FOLLOW THE PROCEDURES IN THE INSTRUCTIONS THAT FOLLOW. FAILURE TO PROPERLY STORE AND PROTECT THE EQUIPMENT AS OUTLINED MAY VOID ANY WARRANTY, EXPRESSED OR IMPLIED.**

Electric motors or other prime movers are not prepared for indoor storage beyond the periods shown below by **LIGHTNIN**. **OUTDOOR STORAGE OF ELECTRIC MOTORS IS NOT RECOMMENDED BY ANY MOTOR MANUFACTURER.** For storage periods beyond those shown below, refer to motor maintenance instructions furnished with this manual for further details.

The seal cartridge of mechanical seal models is not filled with lubricant. Fill the seal cartridge with lubricant as outlined in the seal maintenance instructions of this manual.

7.1 STORAGE OF NEW MIXERS - **LIGHTNIN** Mixers are factory treated with high quality corrosion inhibitors and rust preventatives. With reasonable care at the site, the products will effectively protect new, uninstalled mixers from corrosion due to water and water vapor, for up to one year, depending on how the mixer is stored. Outdoor, unprotected storage is not permitted under any circumstances unless the mixer has been specifically prepared for such storage at the factory prior to shipment.

### a. LENGTH OF CORROSION PROTECTION

1. 12 months, when stored indoors in a dry ambient atmosphere with controlled temperatures. Corrosion protection to be reapplied at 12 month intervals.
2. 6 months, when installed indoors in a dry ambient atmosphere without temperature control. Corrosion protection to be reapplied at 6 month intervals.
3. 6 months, when stored outdoors as crated with suitable protection from the elements. Coverings must be waterproof, but have provisions for free circulation of air to avoid buildups of condensation. Equipment must be elevated at least 12" above ground level to reduce moisture pickup. **CORROSION PROTECTION TO BE REAPPLIED AT 4 MONTH INTERVALS AFTER INITIAL STORAGE.**

### b. STORAGE OF INSTALLED MIXERS

1. Mixers that have been installed, but not filled with oil and will be inactive for an extended period should be prepared for storage per paragraph 7.2.
2. Mixers that have been installed, filled with oil and run but will be inactive for an extended period should be prepared for storage per paragraph 7.3.

### c. STORAGE OF CRATED MIXERS

1. For mixers that will be stored for periods longer than one month as crated, indoors without temperature control or outdoors, remove the breather plug per paragraph 4.1. Add "NOX RUST" per paragraph 7.2.b.5. Replace the plug.

### d. INSPECTION

1. Inspect factory installed wrappings and coatings. If factory wrappings or coatings are accidentally removed or damaged, reapply them over the exposed areas. Corrosion inhibitors deteriorate rapidly when exposed to air and water vapors.

- 7.2 CORROSION PROTECTION RENEWAL - Careful adherence to the protection renewal procedures defined herein will afford adequate protection for the same period covered by a factory prepared model when stored under conditions defined in paragraph 7.1.a. These procedures should be repeated at the same intervals as noted in paragraph 7.1.a.
- a. The interior of the gear drive must be treated with a vapor phase inhibitor.  
"NOX RUST" VCI - 10 preservative oil, a product of Daubert Chemical Co., Chicago, Ill. (This is the factory applied product).
  - b. Prepare the mixer as follows:
    1. For 880 Series models where the upper shaft is not installed, check the condition of the anti-seize compound in the low speed flexible coupling bores. Reapply if necessary.
    2. On 780 thru 782 (RL) C & S models with a tubular low speed shaft in the gear drive, the lower or impeller shaft is not installed at the factory. The upper portion of this shaft is coated with a "NEVER-SEEZ" anti seize compound and then wrapped. DO NOT remove these wrappings. Also, the bore of the gear drive tubular shaft is coated with "NEVER-SEEZ". Check the condition of the bore and reapply NEVER-SEEZ if necessary.
    3. Remove all covers and protective wrappings. Add fresh lubricant to all regreasable bearings. Rotate shafts to distribute fresh oil and grease.
    4. Remove oil filler plug or inspection cover, dipstick and breather plug(s) in the gear drive.
    5. Spray a mist of rust inhibitor oil, preferably "NOX RUST", through one or more of the openings, directing the spray to all corners for maximum coverage.
    6. Add the minimum quantity (in ounces) of "NOX RUST" listed in Table 14 to the gear drive.
    7. Seal off the bottom of hollow gear drive shafts with VPI paper and waterproof tape, then pour a tablespoon of "NOX RUST" into the shaft cavity. Seal off the top of the shaft or flexible coupling hub with VPI paper and waterproof tape.
    8. The black coating on exposed steel surfaces is Rust-Gard or equivalent rust preventative. It can be applied with a brush or sprayed on, and is easily removed with kerosene or a similar solvent.
    9. Electric Motors - Refer to motor maintenance instructions furnished with this manual for further details.
    10. Check the seal cartridge lubricant and add more lubricant if necessary to top off the seal chamber – see seal maintenance instructions.
- 7.3 STORAGE OF INACTIVE MIXERS - Mixers that have been in service, but will be idle less than 3 months, must be run for at least 15 minutes every week, to redistribute oil and grease, and receive regular maintenance. Mixers inactive for more than 3 months should be prepared as follows:
- a. Check the condition of the oil. (Lubricant suppliers can furnish oil checking service.)
  - b. If the oil condition is good, add a mist of "NOX RUST" oil to the regular oil.
  - c. If the oil condition has deteriorated, or is due to be changed under normal schedules, drain the gear drive completely.
    1. Spray a mist of "NOX RUST" in the gear drive, directing the spray to all corners for maximum coverage.
    2. Add the minimum quantity (in ounces) of "NOX RUST" listed in Table 14 to the gear drive.
  - d. Remove the breather. Seal the opening with a solid plug. Store the breather in a safe place. Tape the dipstick tight against the housing with waterproof tape.
  - e. Cover mixers stored outdoors with waterproof covering, allowing for free air circulation.
  - f. Inspect the drive every 4 months and:
    1. Regrease all bearings. Rotate bearing shafts.
    2. Add additional "NOX RUST" as outlined above.
    3. Rotate shafts to distribute fresh oil and grease.
  - g. Electric motors - Refer to motor maintenance instructions furnished with this manual for further details.



TABLE 14 REQUIRED CORROSION INHIBITORS FOR GEAR DRIVE OIL SUMP	
MIXER SIZE	NOX RUST VCI – 10 (IN OUNCES)
780-880 or 781-881	40
782-882	48
783-883	

#### 7.4 START-UP PREPARATION

- a. Remove all wrappings and coverings.
- b. Rotate shafts to check for free movement.
- c. Install breather if removed.
- d. Check oil level, with mixer stopped, and fill if necessary.
- e. Install all safety covers.

## SECTION 8 - BOLT TIGHTENING TORQUE RECOMMENDATIONS

Inadequately or improperly tightened hardware can loosen due to vibration or the load reactions imposed by fluid forces. This can result in reduced equipment service life or damage and failure.

- 8.1 Recommended torques for tightening metric bolts and screws on **LIGHTNIN** Mixers and Aerators and their mounting structures are listed in table below for your general reference. These average torque values should be considered only as guides and not as absolute values.

The amount of torque required to maintain a tight connection can vary considerably for bolts of the same size under different operating conditions. Variations such as basic joint design, compression factors, type and strength of base and hardware material, surface finish of mating parts and lubrication are only some of the factors that influence the tightness of bolted connections for given bolt torques.

**UNLESS SPECIFICALLY LISTED ELSEWHERE IN THE DETAILED INSTRUCTIONS, TIGHTEN THE MIXER AND MOUNTING HARDWARE TO THE RECOMMENDED VALUES SHOWN IN TABLE.** A torque wrench must be used to ensure compliance with these torque requirements.

Certain assembly connections may require special torques that are not listed in table below. These torques can be found in the detailed assembly and disassembly sections of your manual. **REVIEW YOUR MANUAL CAREFULLY TO DETERMINE WHERE SPECIAL TORQUES ARE REQUIRED.**

For severe duty service, torques higher than listed, to tighten a bolt to maximum capacity, can often be used. However, due to the many variables previously mentioned, the only absolute method to determine optimum torque is to deliberately yield a bolt under actual conditions. If a bolt does yield or shear, 75% of the torque applied in yielding the bolt can be used to obtain a tight connection that is satisfactory.

**ALL BOLTS SHOULD BE RETIGHTENED 12 HOURS AFTER ASSEMBLY, AND AT EACH SCHEDULED SHUT DOWN THEREAFTER.**

RECOMMENDED TIGHTENING TORQUES FOR LIGHTNIN GRADE 5.6 & 8.8 STEEL, 304 & 316 STAINLESS STEEL HARDWARE (1) (2) (4)					
BOLT THREAD SIZE	Tightening Torque (ft-lbs) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (ft-lbs) Grade 8.8 Lubricated (4)	Tightening Torque (N-m) Grade 5.6 or 304/316 SS (5) Lubricated (4)	Tightening Torque (N-m) Grade 8.8 Lubricated (4)	ISO MARKING REFERENCE GUIDE (2)
M5	1.9	3.9	2.5	5.3	<b>HEX HEAD CAP SCREWS</b> 
M6	3.2	6.6	4.3	8.9	
M7	5	11	7	15	
M8	8	16	10	22	
M10	15	32	21	43	
M12	27	55	36	75	
M14	42	88	57	119	<b>HEX NUTS</b> 
M16	66	137	89	186	
M18	91	195 (3)	123	265 (3)	
M20	129	277	174	375	
M22	175	377	237	511	
M24	222	479	301	649	
M27	245 (3)	700	382 (3)	950	<b>SOCKET HEAD CAP SCREWS</b> 
M30	332	951	450	1 290	
M33	452	1 294	618	1 755	
M36	581	1 662	787	2 254	
M39	752	2 151	1 019	2 917	
M42	930	2 661	1 261	3 608	

(1) ALL BOLTS SHOULD BE COATED WITH OIL, GREASE OR AN ANTI-SEIZE COMPOUND WHENEVER POSSIBLE. THE THREADS AND BEARING FACE OF BOLT HEADS AND/OR NUTS SHOULD BE LUBRICATED.

(2) TORQUE VALUES SHOWN SUPERSEDE PREVIOUS TABLES THAT MAY HAVE ALLOWED LOWER VALUES. IT IS RECOMMENDED THAT ONLY FASTENERS BE USED THAT ARE PROPERLY MARKED, INCLUDING MANUFACTURER'S TRADE MARKING. ONLY FASTENERS MARKED AS SHOWN ARE GUARANTEED TO MEET SPECIFICATION AND PERFORMANCE REQUIREMENTS.

(3) ALLOWABLE BOLT STRESS VALUES CHANGE AT THESE LOCATIONS AND IS REFLECTED IN THE SUGGESTED TORQUE VALUES.

(4) **CONVERSION FACTORS:**

DRY VALUES MULTIPLY LUBRICATED VALUE BY 1.33.

METRIC VALUES IN N-m                      1FT-LB = 1.3558 N-m

(5) TORQUE VALUES ARE BASED ON THE LOWER OF GRADE 5.6 STEEL OR STAINLESS STEEL:

A2/A4 CLASS 70 FOR BOLTS LESS THAN OR EQUAL TO M24

A2/A4 CLASS 50 FOR BOLTS LARGER THAN M24

8.2 Recommended torques for tightening ANSI standard bolts and screws are listed in table below for your general reference. These average torque values should be considered only as guides and not as absolute values.






The amount of torque required to maintain a tight connection can vary considerably for bolts of the same size under different operating conditions. Variations such as basic joint design, compression factors, type and strength of base and hardware material, surface finish of mating parts and lubrication are only some of the factors that influence the tightness of bolted connections for given bolt torques.

**UNLESS SPECIFICALLY LISTED ELSEWHERE IN THE DETAILED INSTRUCTIONS, TIGHTEN THE MIXER AND MOUNTING HARDWARE TO THE RECOMMENDED VALUES SHOWN IN TABLE.** A torque wrench must be used to ensure compliance with these torque requirements.

Certain assembly connections may require special torques that are not listed in table below. These torques can be found in the detailed assembly and disassembly sections of your manual. REVIEW YOUR MANUAL CAREFULLY TO DETERMINE WHERE SPECIAL TORQUES ARE REQUIRED.

For severe duty service, torques higher than listed, to tighten a bolt to maximum capacity, can often be used. However, due to the many variables previously mentioned, the only absolute method to determine optimum torque is to deliberately yield a bolt under actual conditions. If a bolt does yield or shear, 75% of the torque applied in yielding the bolt can be used to obtain a tight connection that is satisfactory.

**ALL BOLTS SHOULD BE RETIGHTENED 12 HOURS AFTER ASSEMBLY, AND AT EACH SCHEDULED SHUT DOWN THEREAFTER.**

RECOMMENDED TIGHTENING TORQUES FOR LIGHTNIN STEEL AND STAINLESS STEEL HARDWARE (1) (2) (4)					
BOLT THREAD SIZE	Tightening Torque (ft-lbs) Grade 5 STEEL (5) Lubricated (4)	Tightening Torque (ft-lbs) 304SS & 316SS (5) Lubricated (4)	Tightening Torque (N-m) Grade 5 STEEL (5) Lubricated (4)	Tightening Torque (N-m) 304SS & 316SS (5) Lubricated (4)	MARKING REFERENCE GUIDE (2)
1/4 - 20	7.2	5.1	10.0	6.9	
5/16 - 18	15	10	20	14	
3/8 - 16	26	19	35	25	
7/16 - 14	42	30	57	40	
1/2 - 13	64	45	87	61	 SAE Grade 5 Steel ASTM A449 Type 1
9/16-12	92	65	125	88	
5/8-11	128	90	173	122	 SAE Grade 8 Steel
3/4-10	226	112 (3)	307	152 (3)	
7/8 - 9	365	180	495	244	
1 - 8	547	270	742	366	 All Socket Head Cap Screws SAE Grade 8
1-1/8 - 7	675 (3)	383	915 (3)	520	
1-1/4 - 7	952	541	1 291	733	
1-3/8 - 6	1249	709	1 693	961	 F593C F593D 304SS ASTM F593 Cold Worked
1-1/2 - 6	1657	941	2 247	1 275	
1-3/4 - 5	1600 (3)	640 (3)	2 169 (3)	868 (3)	 F593G F593H 316SS ASTM F593 Cold Worked
2 - 4-1/2	2406	962	3 262	1 304	
2-1/4 - 4-1/2	3519	1407	4 771	1 907	
2-1/2 - 4	4813	1924	6 525	2 609	

(1) ALL BOLTS SHOULD BE COATED WITH OIL, GREASE OR AN ANTI-SEIZE COMPOUND WHENEVER POSSIBLE. THE THREADS AND BEARING FACE OF BOLT HEADS AND/OR NUTS SHOULD BE LUBRICATED.

(2) TORQUE VALUES SHOWN SUPERSEDE PREVIOUS TABLES THAT MAY HAVE ALLOWED LOWER VALUES. IT IS RECOMMENDED THAT ONLY FASTENERS BE USED THAT ARE PROPERLY MARKED, INCLUDING MANUFACTURER'S TRADE MARKING. ONLY FASTENERS MARKED AS SHOWN ARE GUARANTEED TO MEET SPECIFICATION AND PERFORMANCE REQUIREMENTS.

(3) ALLOWABLE BOLT STRESS VALUES CHANGE AT THESE LOCATIONS AND IS REFLECTED IN THE SUGGESTED TORQUE VALUES.

(4) **CONVERSION FACTORS:**

DRY VALUES MULTIPLY LUBRICATED VALUE BY 1.33.  
METRIC VALUES IN N-M                      1FT-LB = 1.3558 N-M

(5) APPLICABLE MATERIAL GRADES FOR SPECIFIED TORQUE VALUES:

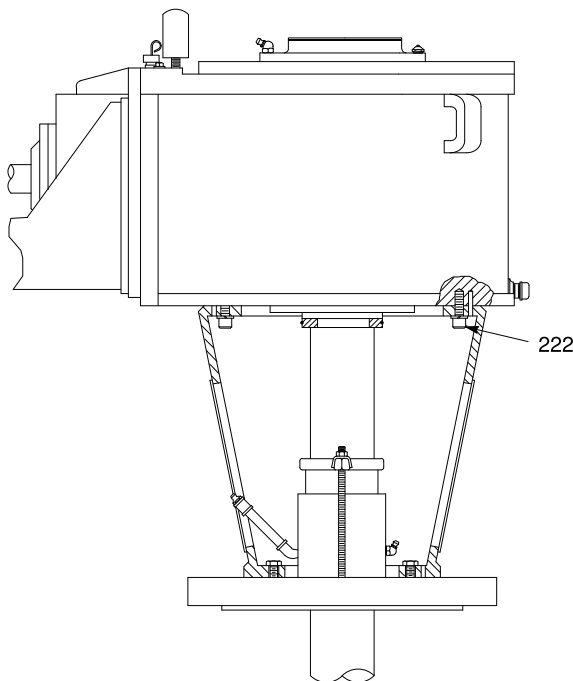
STEEL - SAE J429/J995 Grade 5 or higher, ASTM A449 Type 1  
304SS - ASTM F593/F594C, F593/F594D - cold worked condition. Includes 1/4" through 1.5" hardware sizes.  
316SS - ASTM F593/F594G, F593/F594H - cold worked condition. Includes 1/4" through 1.5" hardware sizes.  
304SS & 316SS FOR SIZES GREATER THAN 1.5" DIAMETER ARE BASED ON ASTM A276.

## CRITICAL HARDWARE TORQUE VALUES FOR 780C SERIES MIXERS

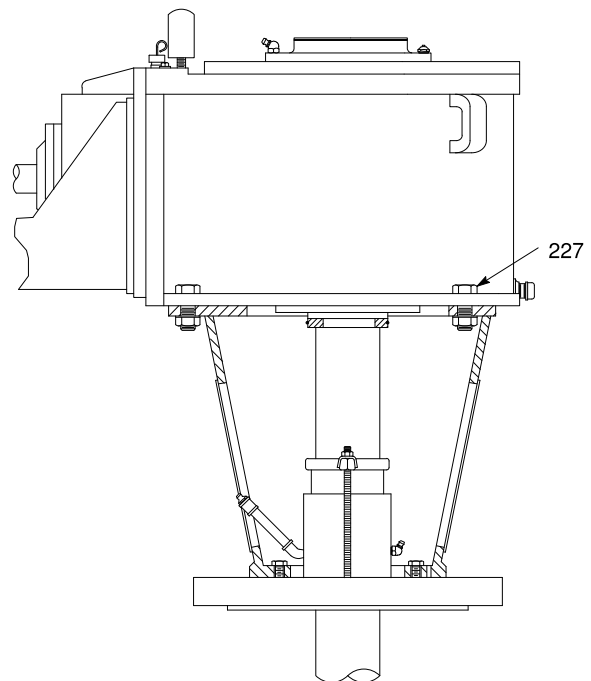
Inadequate or improperly tightened hardware can loosen due to vibration, or the load reactions imposed by fluid forces. This can result in reduced service life, or damage and failure. Certain assembly connections may require either special torque values, or are critical to performance so that the torque values must be closely monitored.

Refer to the following itemized sketches and Table 1 for critical hardware location/size, and tighten the hardware to the torque values listed.

**ALL BOLTS SHOULD BE RETIGHTENED 12 HOURS AFTER ASSEMBLY, AND AT EACH SCHEDULED SHUT DOWN THEREAFTER.**



**TYPICAL  
MODEL 780 & 781C**



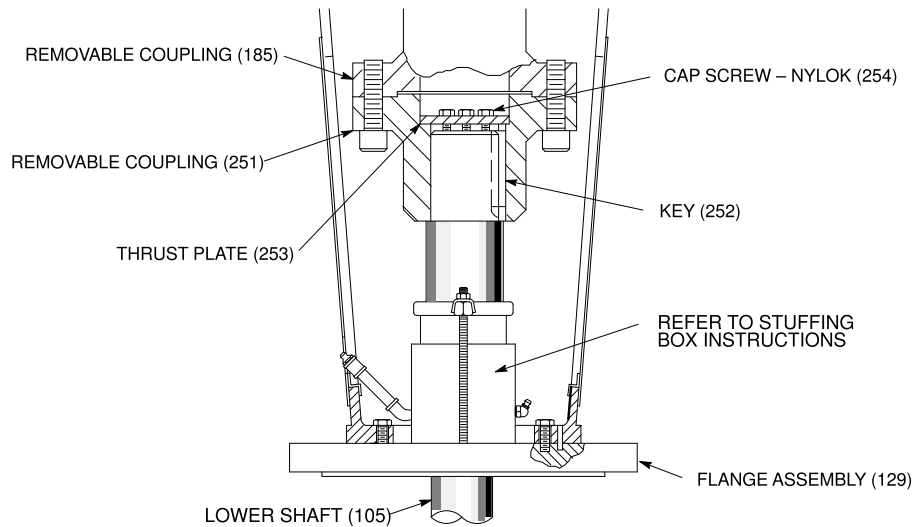
**TYPICAL  
MODEL 782C**

MIXER MODEL	ITEM NUMBER	BOLT THREAD SIZE	TIGHTENING TORQUE IN FT-LBS
780 & 781C	222	3/4-10	168
782C	227	1-3/4-5	754

# SHAFT MAINTENANCE INSTRUCTIONS FOR 780C THRU 782C MODELS

## SECTION 1 – INSTALLATION OF SHAFT

- 1.1 780C Models with REMOVABLE COUPLING ABOVE STUFFING BOX are shipped with the lower shaft (105) disassembled.
- 1.2 To install 780C lower shaft (105) with removable coupling (251), raise the shaft up through the stuffing box until the key (252), coupling (251), thrust plate (253) and cap screws (254) can be installed on the shouldered portion of the shaft. Tighten the cap screws (254) securely to the torque listed in Table 1. **CAUTION: This is a critical connection. It is essential that the cap screws (254) are tightened to the specific torque values listed in Table 1.** Couple the lower shaft (105) to the removable coupling (251) using care so as not to damage the coupling rabbets.



**MODEL 780C  
REMOVABLE COUPLING ABOVE STUFFING BOX**

<b>TABLE 1 Item 254 Cap Screw Tightening Torque</b>		
<b>Thread Size</b>	<b>Torque (FT-LBS.) – Grade 5 Hardware</b>	
	<b>Standard Cap Screw</b>	<b>With Friction Locking Device</b>
5/8 – 11	128	147
3/4 – 10	226	260
1" – 8	547	629

TORQUE VALUES ARE FOR CAP SCREWS COATED WITH OIL, GREASE OR ANTI-SEIZE COMPOUND. COAT THREADS AND HEAD BEARING FACE WITH LUBRICANT.

- 1.3 780C models with one piece shaft are shipped with the shaft (117) disassembled from the unit.
- 1.4 The upper end of the shaft (117), split thrust ring (197), and inside of the tubular drive shaft (600) are covered with a high quality anti-seize lubricating compound.
- 1.5 Remove the coverplate (527), gasket (528), thrust plate (226) and the three (3) nylok cap screws (193).

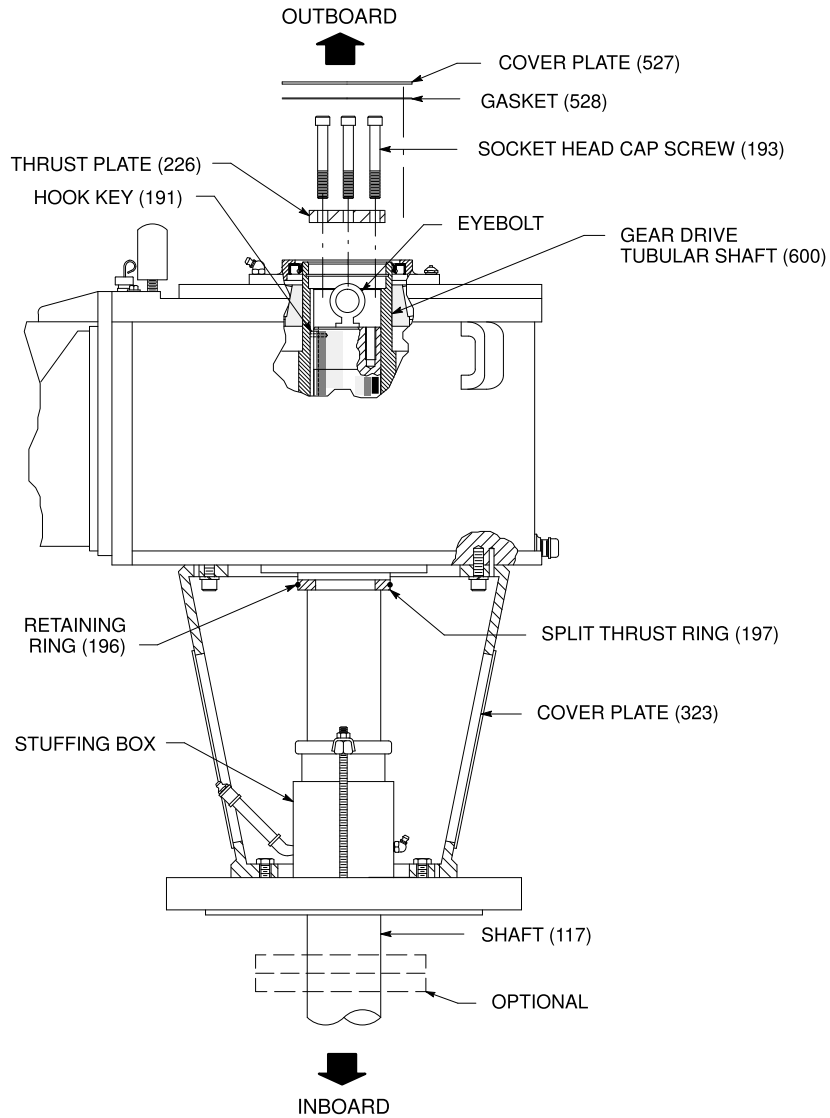
- 1.6 Insert the key and pin assembly (191) in the shaft (117) keyway with the pin extending into the hole in the shaft. Place the retaining ring (196) on the packing gland and slide it over the end of the shaft as the shaft clears the stuffing box.
- 1.7 Install an eyebolt (see Table) in the center tapped hole of the shaft (117) and position the shaft under the gear drive. Use only a heavy-duty shouldered eyebolt. If the eyebolt shoulder will not seat against the shaft, use a spacer or jam nut to insure a tight connection.

**We strongly recommend that either the eyebolt or hoist ring be of the safety swivel type with a 360° rotational capability.**

**EYEBOLT TABLE**

Unit Size	One Piece Impeller Shaft		Coupling Connected Impeller Shaft	
	Eyebolt Size	Working Load Capacity in Pounds	Eyebolt Size	Working Load Capacity in Pounds
780 & 781	1 <sup>1</sup> / <sub>4</sub> -7	15000	3/4-10	6000
782			1"-8	8000

- 1.8 Position the shaft so that it is in the vertical position and ready to be inserted upward into the unit assembly.
- 1.9 Install split thrust ring (197) and retaining ring (196). (Not furnished on 780C models with optional coupling or removable coupling). Slide the retaining ring over the end of the shaft and install the thrust ring after the shaft clears the stuffing box.
- 1.10 Raise the shaft until the thrust ring (197) or shaft shoulder contacts the bottom of the low speed shaft (600).
- 1.11 Support the shaft in this position. A **brace** can be wedged between the bearing member and the thrust ring (197) or coupling half to support the shaft. This will allow for removal of the eyebolt and installation of the thrust plate (226) and socket head cap screws (193).
- 1.12 Lubricate the (193) cap screw threads and head bearing surfaces with a light oil or anti-seize lubricating compound.
- 1.13 Carefully take tension off the lifting device. CHECK RIGIDITY AND STABILITY OF THE "BRACING" before disconnecting the lifting device or removing the eyebolt from the shaft.



**MODEL 780C  
ONE PIECE SHAFT AND OPTIONAL COUPLING**

- 1.14 Install the thrust plate (226) in the low speed shaft (600).
- 1.15 Insert socket head cap screws (193) and tighten them evenly, drawing the shaft up into position; then **TIGHTEN THE CAP SCREWS TO THE TORQUE LISTED IN THE TABLE BELOW.**

<b>ITEM 193 CAP SCREW TIGHTENING TORQUE</b>			
<b>Unit Size</b>	<b>Quan. of Capscrews</b>	<b>Thread Size</b>	<b>Torque Ft. Lbs.</b>
780 & 781	3	3/4-10	225
782	3	1"-8	370

Torque values are based on using cap screws with nylon pellet inserts and lubricated threads and head shoulder.

- 1.16 Install the packing – refer to Stuffing Box Instructions.
- 1.17 Replace the gasket (528) and coverplate (527).
- 1.18 Retighten the upper cap screws to the proper torque 12 hours after assembly, and at each scheduled shut down thereafter.

## SECTION 2 – SHAFT REMOVAL

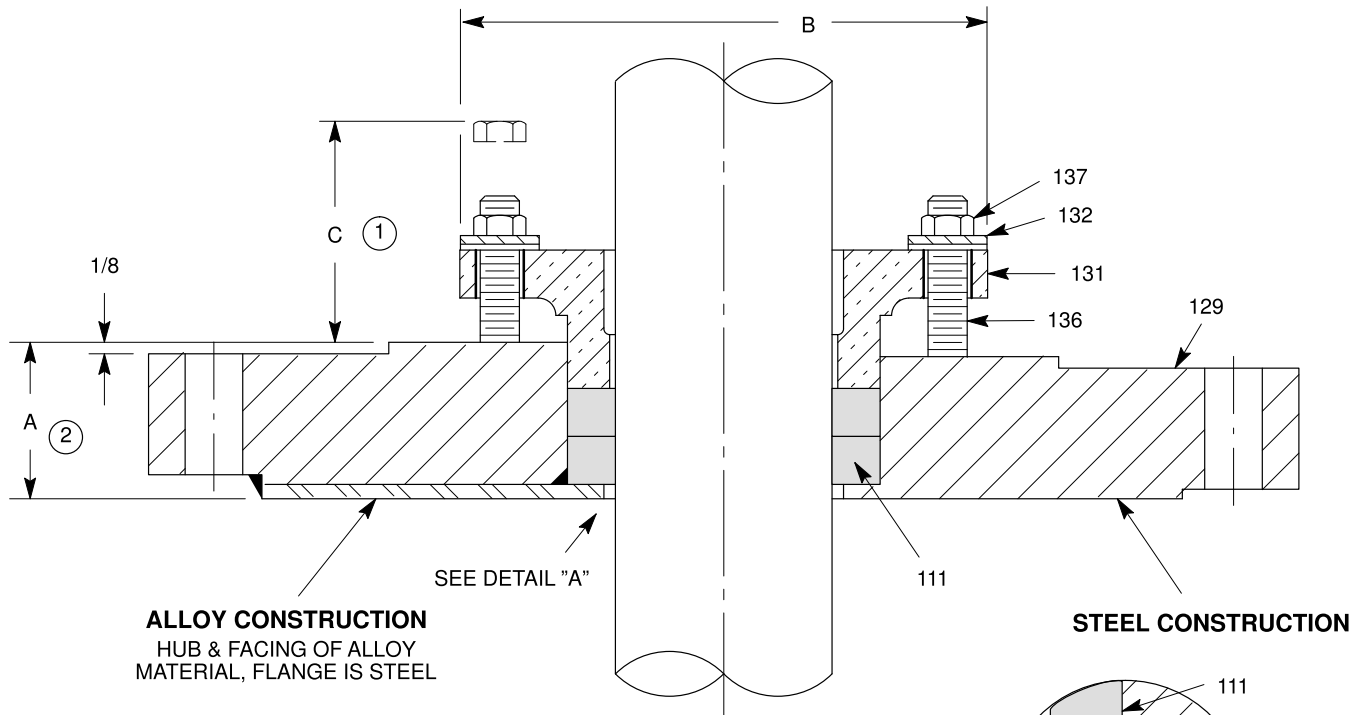
- 2.1 Remove the coverplates (527 and 322) and gasket (528).
- 2.2 For 780C models with REMOVABLE COUPLING ABOVE STUFFING BOX:
  - a. Loosen gland adjusting nuts (137).
  - b. Block the lower shaft in position.
  - c. Remove the coupling hardware and carefully move the lower shaft down until the removable coupling half rests on the packing gland (131).
  - d. Remove the lubricant relief line from the stuffing box hub.
  - e. Disconnect the lower bearing member (122) from the flange (129) and move the entire drive assembly away from the mounting flange.
- 2.3 For 780C models without removable coupling, unpack the stuffing box. Refer to Stuffing Box Instructions.
- 2.4 Support the unit shaft (117) so that it will not drop after it is disengaged from the 3 socket head cap screws (193). A brace can be wedged between the bottom of the bearing member and the thrust ring (197) or coupling half to support the shaft.
- 2.5 Remove the three (3) socket head cap screws (193).
- 2.6 Remove thrust plate (226).
- 2.7 Insert an eyebolt with the correct threads, per the eyebolt table, into the upper end of the shaft for use in supporting the shaft when it is being lowered out of the unit assembly.
- 2.8 Remove split thrust ring (197) and retaining ring (196). (Not furnished on 780C models with removable coupling).
- 2.9 Lower the shaft until it is free of the unit assembly and remove.

A small amount of high quality anti-seize lubricating compound has been applied to the entire length of the inside diameter of the gear drive low speed shaft (600). It is recommended that this be repeated whenever the shaft (117) is replaced.
- 2.10 On 780C models with removable coupling (251), if the stuffing box is to be serviced, raise the removable coupling off the packing gland (131) to a point where the split packing gland (131) and split rings of packing (111) and separators (112) can be removed. Refer to the Stuffing Box Instructions for repacking the stuffing box.

## SECTION 3 – REPLACING THE SHAFT

- 3.1 For 780C models without REMOVABLE COUPLING, install the shaft as outlined in Section 1, steps 1.5 thru 1.18.
- 3.2 For 780C models with REMOVABLE COUPLING ABOVE STUFFING BOX:
  - a. Check the cap screws (254) and tighten securely to the torque listed in Table 1. **CAUTION: This is a critical connection. It is essential that the cap screws (254) are tightened to the specific torque values listed in Table 1.**
  - b. Replace the entire drive assembly and connect the lower bearing member (122) to the mounting flange (129).
  - c. Replace the lubricant relief line in the stuffing box.
  - d. Raise the lower shaft (105) and install the coupling hardware. Use care so as not to damage the coupling rabbets.
  - e. Readjust the packing gland (131) in accordance with the Stuffing Box Instructions in this booklet.



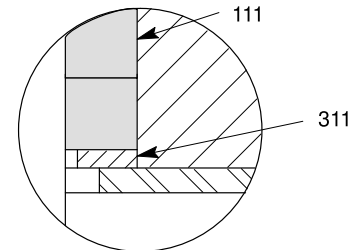


**ALLOY CONSTRUCTION**  
HUB & FACING OF ALLOY  
MATERIAL, FLANGE IS STEEL

**STEEL CONSTRUCTION**

**MOUNTING FLANGE DATA**  
150 LB. ANSI SERIES DRILLING

70/80 UNIT SIZE	ANSI SIZE	O.D.	BOLT CIRCLE	NO. OF HOLES	BOLT DIA.	A (2)
1	8	13-1/2	11-3/4	8	3/4	1-5/8
2						1-3/4
3	10	16	14-1/4	12	7/8	1-3/4
4	12	19	17	12	7/8	1-7/8
5	14	21	18-3/4	12	1"	2-1/8
6	16	23-1/2	21-1/4	16	1"	2-3/8
7	18	25	22-3/4	16	1-1/8	
8 & 9	20	27-1/2	25	20	1-1/8	2-5/8



**DETAIL "A"**

(ALTERNATE CONSTRUCTION)  
ITEM 311 NOT FURNISHED ON ALL MODELS.  
REFER TO STUFFING BOX INSTRUCTIONS.

SHAFT DIA.	B	C (1)
2	6-1/4	4
2-1/2	7-1/4	5
3	7-3/4	
3-1/2	9	
4	9-1/2	5-1/2
4-1/2	10-3/4	
5		
5-1/2	13-1/2	
6		

WHEN ORDERING PARTS, SPECIFY:  
MACHINE SERIAL NO., ITEM NO.  
AND DRAWING NO.

311	SPLIT RING
137	GLAND ADJUSTING NUT
136	GLAND STUD (2)
132	GLAND CLAMP (2)
131	PACKING GLAND
129	FLANGE ASSEMBLY
111	PACKING

ITEM	PART NAME
------	-----------

ALL EQUIPMENT DESIGN AND APPLICATION DATA SHOWN  
HEREIN AND RELATED KNOW-HOW IS **CONFIDENTIAL** AND  
THE PROPERTY OF THE LIGHTNIN GROUP OF COMPANIES.  
NO USE OR DISCLOSURE THEREOF MAY BE MADE WITHOUT  
OUR WRITTEN PERMISSION.

**LIGHTNIN**

MIXERS AND AERATORS  
ASSEMBLY DRAWING

**LOW PRESSURE  
STUFFING BOX**

- (1) CLEARANCE REQUIRED FOR PACKING REMOVAL.
- (2) DIMENSION LISTED IS FOR ALLOY FACED CONSTRUCTION.  
FOR STEEL CONSTRUCTION, SUBTRACT 3/16".



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1969

# STUFFING BOX INSTRUCTIONS

## SECTION 1 – PACKING SPECIFICATIONS

- 1.1 A **LIGHTNIN**<sup>®</sup> standard packing and separator combination is furnished unless otherwise specified. The combination number (or special packing) is listed on the specification sheet. See Table 1 for **LIGHTNIN** combinations.

TABLE 1  
STANDARD **LIGHTNIN**<sup>®</sup> PACKING COMBINATIONS

COMBINATION NUMBER	PACKING TYPE	SEPARATOR TYPE	MAX. TEMP. ° F
40	INTERLACE BRAID BLEACHED MULTI-FILAMENT TEFLON YARN IMPREGNATED WITH TEFLON DISPERSION PH RANGE 0-14	NON-STICK HIGH STRENGTH VIRGIN TEFLON	500
50	INTERLACE BRAID SPECIAL HIGH TENSILE STRENGTH ARAMID FIBER IMPREGNATED WITH TEFLON DISPERSION AND A SPECIAL HIGH TEMPERATURE LUBRICANT PH RANGE 3-12	NON-STICK HIGH STRENGTH VIRGIN TEFLON	500
60	SPECIAL INTERLACE BRAID PTFE YARN IMPREGNATED WITH A SPECIAL FDA APPROVED LUBRICANT FOR FOOD SERVICE, EDIBLE OILS AND FATS PH RANGE 3-10	NON-STICK HIGH STRENGTH VIRGIN TEFLON	500

- 1.2 Most units are shipped with the stuffing box components installed. If the packing and separators are not installed at our factory, a separate package containing the stuffing box components will be attached to the unit.
- 1.3 If the packing is not suitable for the service conditions, it should be replaced.

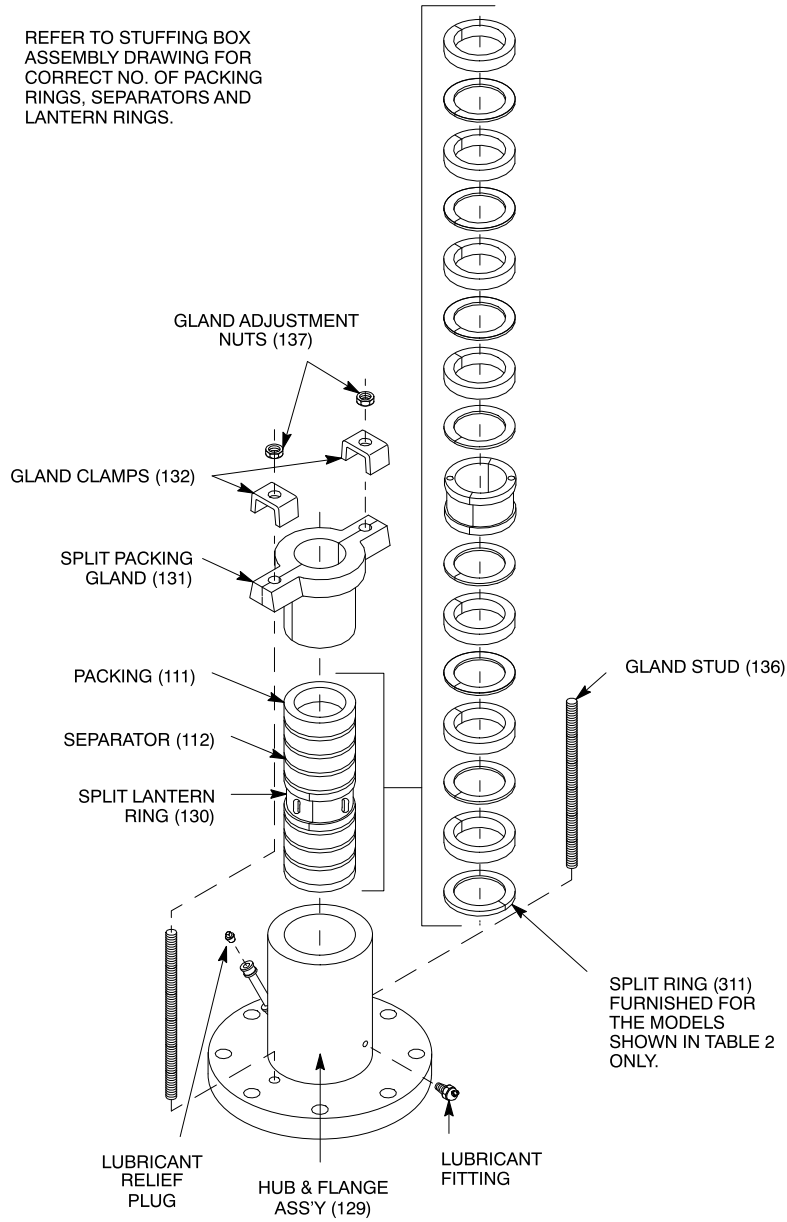
## SECTION 2 – INSTALLATION OF PACKING

- 2.1 Remove bearing member coverplates.
- 2.2 Remove gland adjustment nuts (137), gland clamps (132) and packing gland halves (131).
- 2.3 Standard Stuffing Box (see Figure 1)

The packing is not lubricated because of the danger of using a lubricant that could contaminate the product. Thoroughly coat all surfaces of the packing rings (111), separators (112) and lantern ring (130) with a product compatible lubricant. Teflon lantern rings are standard for applications up to 300° F. Over 300° F, lantern ring is metal.

- 2.4 Insert packing, separators, split lantern ring and split ring (if furnished) in the EXACT order shown on the Stuffing Box assembly drawing.
- 2.5 Install each packing ring and separator with their joints staggered 90 degrees and carefully seat each packing ring by firm even tamping on the separator above each packing ring with a piece of split pipe. Make sure a separator is placed on either side of the lantern ring.
- 2.6 Install packing gland (131), clamps (132) and adjustment nuts (137). Lubricate and seal the packing as outlined in Sections 3 and 4.

REFER TO STUFFING BOX ASSEMBLY DRAWING FOR CORRECT NO. OF PACKING RINGS, SEPARATORS AND LANTERN RINGS.

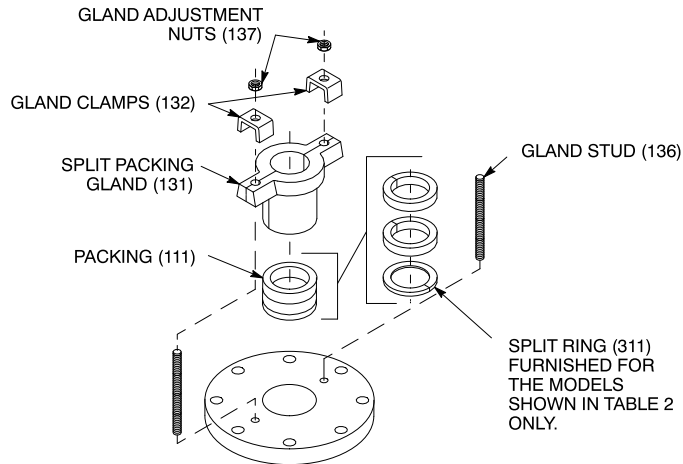


**FIGURE 1 – STANDARD STUFFING BOX CONSTRUCTION**

### 2.7 Low Pressure Stuffing Box (see Figure 2)

This stuffing box (10 PSIG MAX.) consists of 2 rings of packing and gland components only. No separators or lantern rings are furnished. The low pressure packing rings have been impregnated with lubricant. No additional lubricant is necessary.

### 2.8 Seat the packing rings as outlined in Section 4.



**FIGURE 2 – ALTERNATE LOW PRESSURE CONSTRUCTION**

## SECTION 3 – LUBRICATION

- 3.1 The unit is shipped without lubricant in the Stuffing Box because of the danger of using a lubricant that may contaminate the product. **LUBRICATE THE STUFFING BOX BEFORE SEATING THE PACKING.** Use only a high quality lubricant physically and chemically suitable for the service conditions and compatible with the product.
- 3.2 For good stuffing box performance and proper lubrication of the packing, it is desirable to supply the lubricant continuously at a constant pressure of approximately 5 lbs. per square inch higher than that in the vessel. For continuous constant pressure lubrication, the "**LIGHTNIN** Weight Loaded Lubricator" is recommended. In the event this is not possible, careful lubrication at proper intervals will give satisfactory results.
- 3.3 For intermittent lubrication, remove lubricant relief plug, and when the lubricant begins to show at the relief hole, replace the plug. Apply an additional amount of lubricant to insure spreading throughout the stuffing box.
- 3.4 If the stuffing box has a water jacket, circulate water throughout the jacket continuously while in operation.

---

## SECTION 4 – SEATING THE PACKING

- 4.1 Tighten the gland adjusting nuts firmly and evenly to initially seat the packing.
- 4.2 Back off the adjusting nuts and re-seat fingertight. DO NOT adjust further until the unit is started up.
- 4.3 Adjust the packing by "running in".
  - a . Tighten each gland nut 1/4 to 1/2 turn every 10 minutes or so until the box is hot to the touch. Stop the unit.
  - b . While the packing is still soft and hot, compress the packing into the box by even tightening of the gland nuts.
  - c . Let stand at least 10 – 15 minutes to allow the packing to adjust and conform under heat and pressure.
  - d . Loosen the gland nuts and then tighten finger tight only. Check for even gland force by measuring the distance from the stuffing box hub to the underside of the gland shoulder.
- 4.4 Ideally, the packing takes up all the room between the inside diameter of the stuffing box hub and the outside diameter of the shaft. It should be packed in good and tight, but still allow the shaft to turn easily. If the packing is packed too loose, it will not seal well. On the other hand, if it is packed too tight, excess friction will be detrimental to the packing and the shaft.
- 4.5 As the shaft turns, there is a tendency for the shaft to deflect or run out. The shaft pushes against the inside diameter of the packing, tending to increase the clearance between the shaft and the packing. On the other hand, tightening the gland nuts pushes the gland against the end of the packing and this tends to decrease the clearance between the shaft and packing inside diameter.
- 4.6 Adjust the packing as required during operating cycles to minimize shaft runout and/or leakage. DO NOT OVERTIGHTEN. We suggest that the gland nuts be tightened no more than 1/4 to 1/2 turn at each adjustment. However, experience with each individual application must dictate the amount and frequency of adjustment and/or replacement of packing rings.

## SECTION 5 – REPACKING STUFFING BOX

- 5.1 Remove packing rings and separators using corkscrew packing pullers.
- 5.2 Remove the split lantern ring (130);
  - a . Teflon lantern ring halves can be removed by inserting packing hooks in the notches on the O.D. of each ring half.
  - b . Metal lantern rings (when furnished) are removed by inserting lantern ring puller screws into piloted and tapped (#8–32) holes in the split lantern ring (130) and removing the ring halves.
- 5.3 Remove the lower rings of packing and separators.
- 5.4 Remove the split ring (311) if necessary. (Furnished only with models shown in Table 2.)
  - a . Remove glass filled Teflon rings with a corkscrew packing puller.
  - b . Alloy rings can be removed with a wire hook.
- 5.5 Thoroughly clean the shaft and stuffing box. Flush out any old lubricant. Check the shaft surface for damage. If the shaft is damaged, do not repack the stuffing box until the shaft surface is repaired. Be sure the shaft and stuffing box are in alignment.
- 5.6 Die-molded rings of packing are recommended for the stuffing box. If die-molded packing is not used, cut coil packing to exact length so that the ends meet with no gap or overlap.
- 5.7 Repack the stuffing box, lubricate and seat the packing in accordance with the procedures outlined in Sections 2 and 4.

**TABLE 2 – MODELS WITH SPLIT RING (311) ▲**

<b>UNIT SIZE ●</b>	<b>72 &amp; 82</b>	<b>73 &amp; 83</b>	<b>74 &amp; 84</b>	<b>75 &amp; 85</b>	<b>76 &amp; 86</b>	<b>77 &amp; 87</b>	<b>780 &amp; 880</b>	<b>781 &amp; 881</b>	<b>782 &amp; 882</b>
<b>Shaft Dia. thru Stuffing Box</b>	2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2

- ▲ THE SPLIT RING (ITEM 311) STANDARD MATERIAL IS GLASS FILLED TEFLON. IF OPERATING TEMPERATURE IS OVER 450° F, THE MATERIAL WILL BE THE SAME AS THE IN-TANK WETTED PARTS.
- SPLIT RING (311) NOT FURNISHED WHEN UNIT IS CONSTRUCTED WITH REMOVABLE COUPLING ABOVE BOX. REFER TO MIXER ASSEMBLY DRAWING.

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<b>STUFFING BOX PERFORMANCE</b> (Knowledgeable attention, at regular intervals, makes the difference)
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**SECTION 1 – LUBRICATION**

- 1.1 A stuffing box should always be well lubricated. If you are using a continuous lubrication method, such as the weight loaded lubricator or the spring loaded lubricator, be sure to keep a regular check on the lubricant. If you are using the intermittent grease gun method, be sure to remove the relief plug before greasing. For most applications, the stuffing box should be regreased once every 24 hours. Some specific applications will require more, or less frequent schedules.
- 1.2 On side entering units, or on bottom entering units, the stuffing box is below the liquid level in the tank. It is, therefore, important that the lubricant be as insoluble as possible in the liquid being mixed, to reduce the chances of the lubricant being washed out or thinned out. The more soluble the lubricant is, the more frequently the lubricant will be used up and the more frequently lubricant will have to be added.

**SECTION 2 – SEATING THE PACKING**

- 2.1 Ideally, the packing takes up all the room between the inside diameter of the stuffing box hub and the outside diameter of the shaft. It should be packed in good and tight, but still allow the shaft to turn easily. If the packing is packed too loose, it will not seal well. On the other hand, if packed too tight, excess friction will be detrimental to the packing, the lubricant, and the shaft.
- 2.2 There are two ways of seating the packing. One way obviously consists of merely pushing each ring of packing in as tight and firm as you can by hand, as you pack the box. This method is common on top entering mixers, where leakage is not critical. (Homemade tamping tools are common. They are made out of a piece of a half round of pipe or tubing that will fit in between the box and the shaft. You can push down on each ring of packing by hitting or tamping from outside the box.)
- 2.3 After the packing is installed, the packing can be seated further by "running in". This procedure is simply a way of heating up the packing and compressing it uniformly in place. It takes time, but will result in vastly improved performance. This procedure is used most often where liquid is being sealed or when leakage is critical. It is considered good, common practice.

**SECTION 3 – PROCEDURE FOR SEATING THE PACKING BY "RUNNING IN"**

- 3.1 Make sure gland nuts are only finger tight, then turn on the mixer.
- 3.2 Tighten the gland nuts about 1/4 to 1/2 turn every 10 minutes or so, until the box is hot to the touch. (NOTE: Never really bear down on the gland nuts while the unit is running, because this can cause damage to the shaft, the packing and the lubricant.)
- 3.3 Stop the unit. Immediately, while the packing is still hot and soft, seat the packing by jamming the packing down in the box by tightening on the gland nuts.
- 3.4 Let it all just sit there for at least 10 to 15 minutes. This gives the packing a chance to adjust and conform under heat and pressure.
- 3.5 Loosen up the gland nuts until they are only finger tight. The packing has now been "run in", and seated, once. "Once" is enough for most applications of 150 PSI or less. For higher pressures or for very critical applications, repeated "run in and seating" operations can be worthwhile.

**SECTION 4 – KEEPING THE PACKING SEATED**

- 4.1 The shaft turns, and when it does, there is a tendency for the shaft to deflect or wiggle or run out. The shaft pushes against the inside diameter of the packing, tending to increase the clearance between the shaft and the packing. On the other hand, tightening the gland nuts pushes the gland against the end of the packing and this tends to decrease the clearance between the shaft and the packing inside diameter.
- 4.2 Tightening the gland nuts, by the right amount, every other minute, would completely nullify the run out action of the shafts and keep the stuffing box in tip-top shape. However, "every other minute" is not practical or necessary. The problem, of course, is to know just how much to tighten the nuts, and how often. The answer varies from job to job because of the many variable, such as shaft diameter, shaft speed, pressure, temperature, type of lubricant, type of packing, etc.

- 4.3 If you have no experience to go by, we would suggest a 1/4 to 1/2 turn on the gland nuts every 24 hours. For the first week, stop by at more frequent intervals to see how the box is doing, and revise the amount of turns and/or the scheduled frequency, if and as required.

### **SECTION 5 – WHAT IF IT LEAKS?**

- 5.1 If sometime you find the box leaking unacceptably and it must be corrected in a short amount of time, the natural impulse is to quickly overtighten the gland nuts. While this might temporarily seal off the leak, IT CAN CAUSE PERMANENT DAMAGE to the shaft and packing and it is not recommended. Instead, we recommend stopping the mixer and reseating the packing by tightening down hard on the gland nuts. BE SURE TO LOOSEN THE NUTS TO FINGER TIGHT BEFORE TURNING THE MIXER ON AGAIN.
- 5.2 However, if the mixer cannot be stopped, or if the packing is not hot enough to seat, we recommend taking a 1/4 to 1/2 turn every 10 minutes or so, until the leak is eliminated or reduced to an acceptable level. If the packing has now become hot enough and if the machine can be turned off, consider reseating the packing.



# INSTALLATION OF A510 AND A510E AXIAL FLOW IMPELLER ONE PIECE HUB WELDED TO IMPELLER SHAFT BOLTED ON BLADES

## SECTION 1 – GENERAL

- 1.1 Refer to the appropriate table for the minimum diameter opening that the impeller will pass through. Opening shown is based on disassembled impellers with the hub on the shaft.
- 1.2 A510 type impellers are shipped disassembled for ease of shipment and handling at the job site. Refer to Section 2 for impeller assembly guides.

## SECTION 2 – IMPELLER ASSEMBLY

- 2.1 Mate the three blades (convex side up) on the hub ears. If fins (168) are furnished, mount them before installing hex nuts (167).  
  
 WARNING: Before securing the hardware, apply pressure to the blade so that its edge is firmly seated against the raised shoulder on each hub ear. After tightening hardware, check to make sure that the blade has not shifted away from the hub ear shoulder. PROPER BLADE POSITIONING IS IMPORTANT TO IMPELLER FUNCTION.
- 2.2 **IT IS ESSENTIAL** that the hardware securing the blades to the hub is tightened to the specific torques in Table 1. It is important that tight connections are maintained as impellers are usually subjected to a wide range of adverse loading conditions imposed by fluid force reactions.
- 2.3 It is good practice to RETIGHTEN all bolted connections after the equipment has been in operation. It is recommended that all hardware be checked for tightness 12 hours after assembly, and at each scheduled shut down thereafter.

**TABLE 1 – IMPELLER TIGHTENING TORQUES**

BOLT THREAD SIZE	TORQUE (FT-LBS)	
	GRADE 2, 3 OR 304 / 316 SS BOLTS	GRADE 5 BOLTS
3/8-16	17	26
1/2-13	41	64
5/8-11	83	128
3/4-10	120	226
7/8-9 (1)	142	365
1-8	212	547
1-1/8-7	301	675
1-1/4-7	425	952

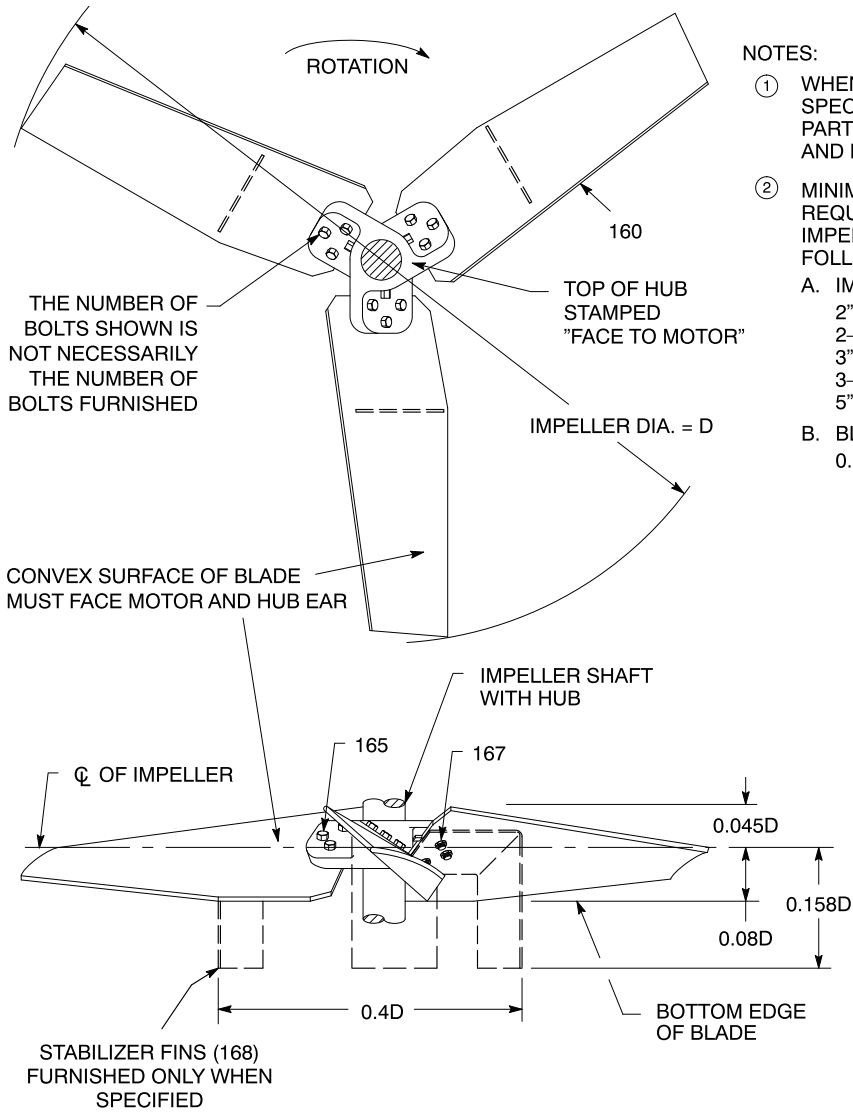
Torque must be applied to the hex nuts. Restrain the bolt heads and tighten the hex nuts.

Torque values are based on hardware, threads and bearing surfaces lubricated with a light oil.

LIGHTNIN standard steel material is SAE Grade 5.

(1) Allowable bolt stress values change at these locations and this is reflected in the torque values.

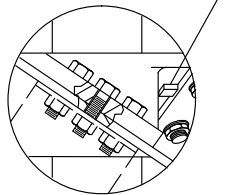
**FIGURE 1 – A510 AND A510E AXIAL FLOW IMPELLER  
ONE PIECE HUB WELDED TO IMPELLER SHAFT  
BOLTED ON BLADES**



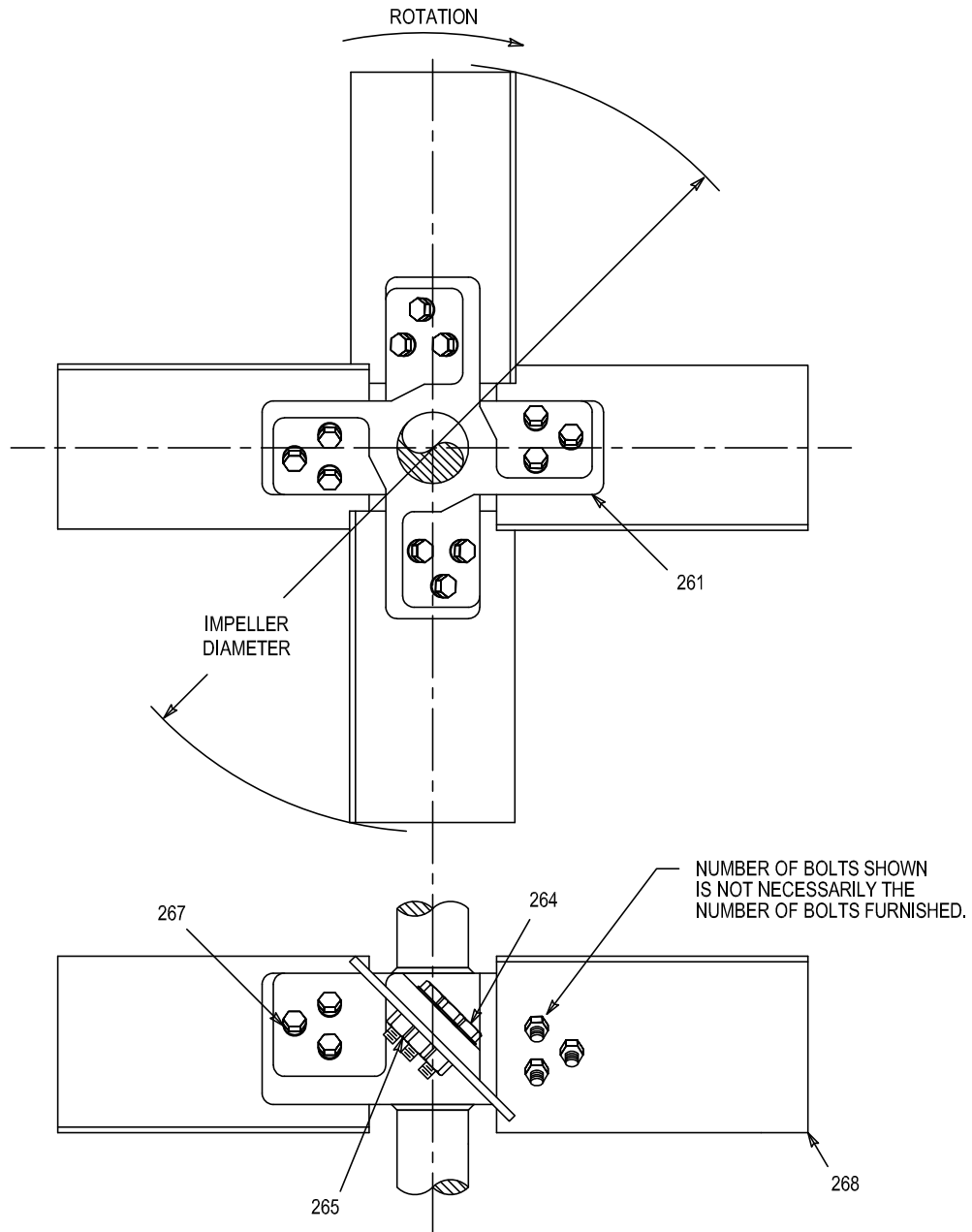
**NOTES:**

- ① WHEN ORDERING PARTS, SPECIFY DRAWING NUMBER, PART NAME, ITEM NUMBER, AND MACHINE SERIAL NUMBER
- ② MINIMUM DIAMETER OPENING REQUIRED TO PASS DISASSEMBLED IMPELLER IS THE LARGER OF THE FOLLOWING:
  - A. IMPELLER SHAFT WITH HUB:  
 2" SHAFT – 9" DIA.  
 2-1/2" SHAFT – 13" DIA.  
 3" SHAFT – 15" DIA.  
 3-1/2" THRU 4-1/2" SHAFT – 17" DIA.  
 5" & 5-1/2" SHAFT – 20" DIA.
  - B. BLADE (160) OFF HUB:  
 0.165D

CAST LOCATING LUGS FOR BLADE SEATING. (2) PER EAR



168	STABILIZER FIN
167	HEX NUT
165	HEX HD. CAP SCREW
160	BLADE
ITEM	PART NAME



WHEN ORDERING PARTS, SPECIFY:  
MACHINE SERIAL NO., ITEM NO.  
AND DRAWING NO.

268	BLADE
267	PLAIN WASHER
265	HEX NUT
264	HEX HEAD CAP SCREW
261	TURBINE HUB
ITEM	PART NAME



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**LIGHTNIN**<sup>®</sup>  
MIXERS AND AERATORS

ASSEMBLY DRAWING

**A200**  
**AXIAL FLOW IMPELLER**  
**ONE PIECE HUB**  
**WITH BOLTED BLADES**

**INSTRUCTIONS FOR A200 IMPELLERS W/WELDED HUBS**

A200 impellers are shipped from our factory disassembled. The blades are not assembled to the hub for reasons of safety and ease of handling at the job site, in addition to providing more compact packaging for shipment and storage.

Larger A200 impeller designs utilize blade / hub alignment pins to position the blades on the same plane. If the A200 impeller you are installing includes alignment pins, the pin holes in the blades must be aligned with the alignment pins when installing the blades to the hub. Smaller A200 impellers do not required pins. To maximize the performance of these impellers, ensure that the installed blades are all located on the same plane. The bottoms of all the blades should be level within 1/2".

IT IS ESSENTIAL that the hardware securing the blades to the hub is tightened to the specific torque listed in Table 1. It is important that tight connections are maintained as impellers are usually subjected to a wide range of adverse loading conditions imposed by fluid force reactions.

It is good practice to RETIGHTEN all bolted connections after the equipment is installed and running. It is recommended that these blade bolts be checked for tightness 12 hours after assembly, and at each scheduled shut down thereafter.

**A200 AXIAL FLOW IMPELLER**

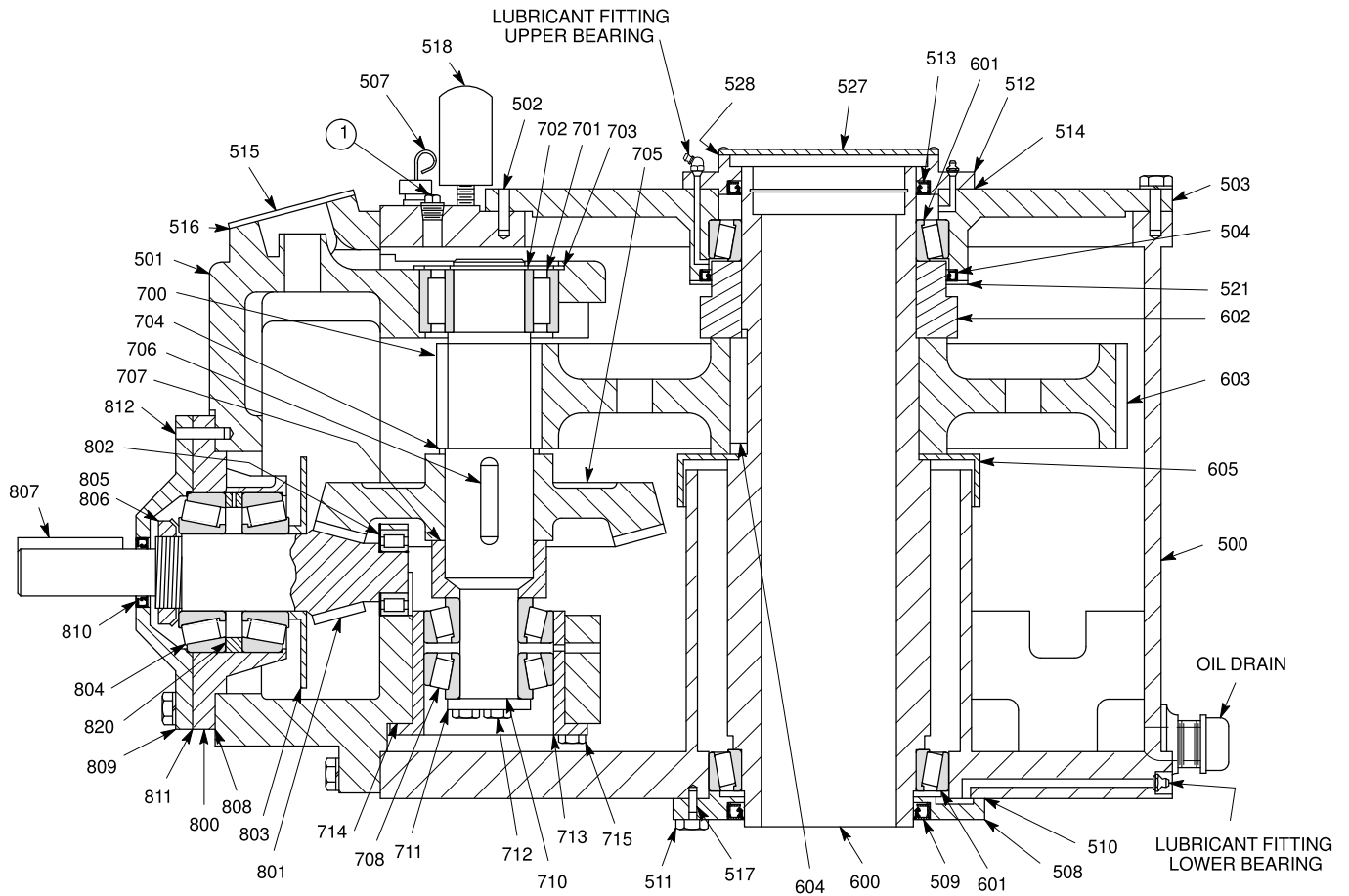
STABILIZING FINS  
FURNISHED ONLY  
WHEN REQUIRED

TORQUE TO  
VALUE IN  
TABLE 1

- ① Restrain the nut and apply torque to the bolts.
- ② The number of bolts (264) shown is not necessarily the number of bolts furnished.
- ③ Alignment pins (269) are furnished on "larger" impeller designs only. Check impeller to see if they are furnished.
- ④ Plainwashers (267) furnished on impellers with cast hubs only.

269	ALIGNMENT PIN	③
268	BLADE	
267	PLAINWASHER	④
265	HEX NUT	
264	HEX HEAD BOLTS	②
261	IMPELLER HUB	

ITEM	PART NAME	
TABLE 1 IMPELLER BLADE BOLT TORQUES (ITEM 264)		
IMPELLER HUB BORE (IN.)	BOLT DIAMETER	TORQUE (FT.-LBS.)
1-1/2, 2 and 2-1/2	1/2-13	41
3 and 3-1/2	3/4-10	146
4 and 4-1/2	7/8-9	142
5 and 5-1/2	1"-8	212



- ① PRIOR TO INITIAL START, REMOVE PIPE PLUG AND ADD 1 QUART OF OIL.
- ② TO FILL THE UNIT, REMOVE THE BUSHING BELOW THE BREATHER ASSEMBLY (518) AND ADD OIL TO THE FULL MARK ON THE DIPSTICK (507).
- ③ BEVEL PINION (801) AND GEAR (705) ARE AVAILABLE IN MATCHED SETS ONLY. NOT SOLD SEPARATELY.
- ④ IT IS RECOMMENDED THAT HELICAL GEARS BE REPLACED AS SETS. HOWEVER, THEY ARE AVAILABLE AS INDIVIDUAL ITEMS.
- ⑤ L.S. PINION SHAFT (700) IS ONE PIECE CONSTRUCTION.
- ⑥ WHEN ORDERING PARTS, SPECIFY MODEL, TOTAL RATIO, SERIAL NO., ITEM NO. AND DRAWING NO.

702	RETAINING RING	820	SPACER
701	UPPER BEARING	*819	DOWEL
700	L.S. PINION SHAFT	812	ROLL PIN
605	UMBRELLA	811	GASKET
604	KEY - L.S. GEAR	810	OIL SEAL
603	L.S. GEAR	809	H.S. BEARING RETAINER
602	SPACER	808	SHIM SET
601	UPPER & LOWER BEARING	807	KEY - H.S. EXTENSION
600	L.S. SHAFT	806	LOCKNUT
528	GASKET	805	WASHER
527	COVERPLATE	804	BEARING (SET OF 2)
521	OIL SEAL RETAINER	803	OIL SLINGER
518	BREATHER ASSEMBLY	802	NOSE BEARING
517	ROLL PIN	801	BEVEL PINION
516	GASKET	800	BEVEL PINION BEARING HOUSING
515	OIL DISTRIBUTOR COVER	715	HEX HD CAP SCREW (NYLOK)
514	GASKET	714	SHIM SET
513	OIL SEAL	713	PINION BEARING HOUSING
512	L.S. SEAL CAGE	712	HEX HD CAP SCREW (NYLOK)
511	HEX HD CAP SCREW (NYLOK)	711	WASHER
510	SHIM SET	710	SHIM SET
509	OIL SEAL	708	LOWER BEARING (SET OF 2)
508	L.S. BEARING CAGE	707	SHAFT SLEEVE
507	DIPSTICK	706	KEY - BEVEL GEAR
504	OIL SEAL	705	BEVEL GEAR
503	MAIN COVER	704	SPACER
502	ROLL PIN	703	RETAINING RING
501	HIGH SPEED HEAD		
500	LOW SPEED HOUSING		

\* NOT SHOWN

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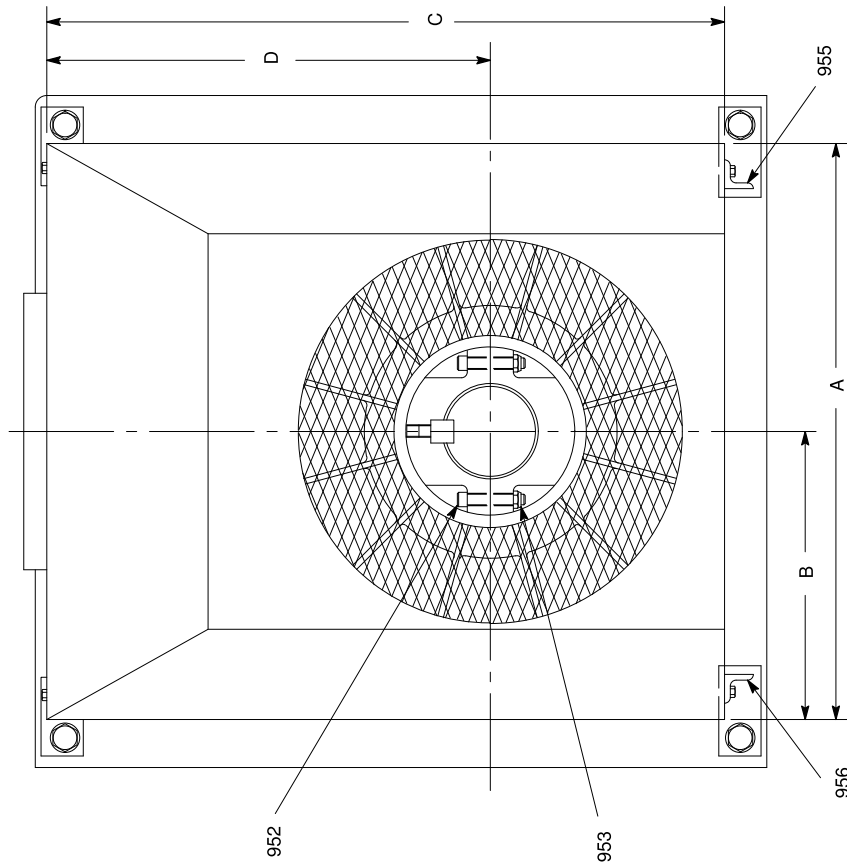
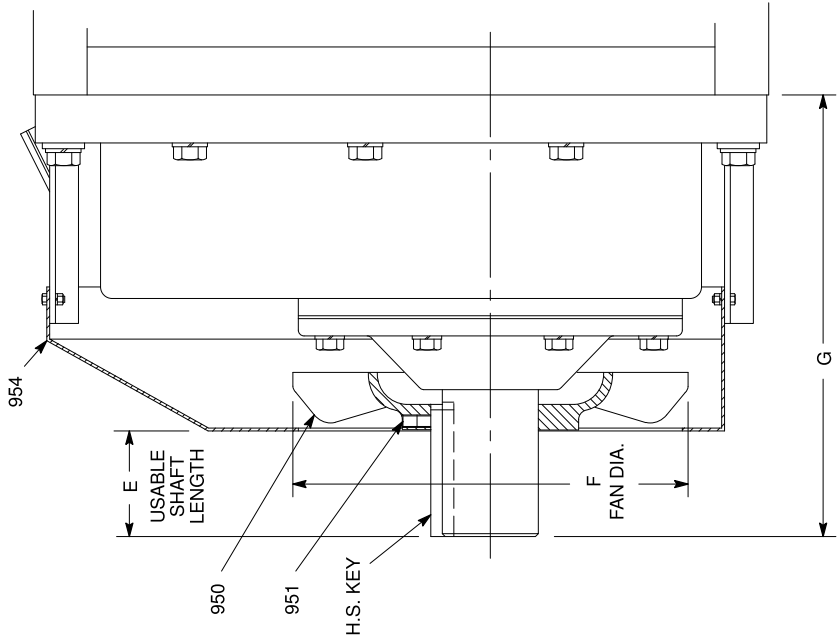
ASSEMBLY DRAWING

**SIZE 780RL GEAR DRIVE**

**DOUBLE REDUCTION**



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MIXERS AND AERATORS  
ASSEMBLY DRAWING

**780/880 THRU 783/883**  
**COOLING FAN ASSEMBLY**  
DOUBLE REDUCTION



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MODEL	A	B	C	D	E	F	G
780/880	19-1/4	9-5/8	21-7/8	14-1/4	2-11/16	12-3/8	13-1/8
781/881	20-1/2	10-1/4	23-7/8	15-11/16	3-1/2	14	15-7/16
782/882	25-1/4	12-5/8	26-5/8	16-7/8	3-7/8	16	16-1/8
783/883	29-3/4	14-7/8	30-3/8	18-3/4	5-9/16	18-1/2	19-1/8

WHEN ORDERING PARTS, SPECIFY:  
MODEL, TOTAL RATIO, SERIAL NO.,  
ITEM NO. AND DRAWING NO.

ITEM	PART NAME
956	BRACKET - L.H. (2)
955	BRACKET - R.H. (2)
954	SHROUD
953	LOCKNUT
952	SOCKET HEAD CAP SCREW
951	SOCKET HEAD SET SCREW (2)
950	FAN

## MAINTENANCE INSTRUCTIONS FOR MODEL 780/880 THRU 782/882 GEAR DRIVES

780 & 880 gear drives are precision manufactured and carefully factory assembled to assure reliable performance and extended service life. Carefully follow the procedures outlined in these instructions if it becomes necessary to dismantle and re-assemble the unit for any reason. Only careful adherence to the correct gear settings, bearing adjustments, and precautionary procedures will insure continued reliability and long service life.

The illustrations and procedures in these instructions are representative of the 780 & 880 right angle gear drives and may not agree in exact detail with all units.

Before attempting to service the gear drive, **DISCONNECT OR LOCKOUT POWER SUPPLY**. Refer to the cross-section assembly drawing in this manual for exact construction details and complete parts listings. The assembly drawing also shows the unit style (780 or 880), number of gear reductions and lubrication points.

When ordering parts or requesting information, specify the model number, serial number, total ratio and input and output RPM stamped on the nameplate located on the gear drive. Also specify the part name, item number and drawing number listed on the assembly drawing.

Optional or auxiliary non-standard accessories not covered in these instructions are shown in separate drawings and/or instruction sheets in this booklet.

**EQUIPMENT REQUIRED TO SERVICE** – In addition to standard mechanic’s tools, includes hoists, slings, bearing pullers, torque wrenches, feeler gauges, micrometers, a dial indicator, an oven or oil bath, a 50 ton press and a 1 lb. tube of Loctite #515 gasket eliminator or equivalent.

**LIFTING INSTRUCTIONS** – Always lift the unit using the four (4) lifting lugs on the sides of the main housing. Table 1 lists the approximate gear drive weights for handling purposes.

TABLE 1 – GEAR DRIVE WEIGHTS (LBS.)												
Unit Size & Reduction	780		880		781		881		782		882	
	Dbl.	Trip.	Dbl.	Trip.	Dbl.	Trip.	Dbl.	Trip.	Dbl.	Trip.	Dbl.	Trip.
Weight (Lbs.)	2140	2360	2390	2610	2755	3070	3000	3300	4590	4915	5000	5500

**LUBRICATION** – All gears and bearings are lubricated with oil splash except the low speed shaft bearings which are grease lubricated. Refer to the General Instructions in this manual for lubrication intervals. Oil capacity and viscosity is listed on the unit nameplate and in the General Instructions.

**PREPARATION FOR DIS-ASSEMBLY**

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

The following operations should be done before any work is started on the gear drive.

- a. Drain the oil. To speed up drainage, remove the dipstick and breather assembly. For triple reduction units, remove the auxiliary drain plug located on the bottom of the high speed head.
- b. Remove the motor, motor bracket and any mixer components that are attached to the gear drive. On 880 Series units, remove the low speed flexible coupling.
- c. Move the gear drive to a suitable work area, preferably on an elevated stand that allows free access to the top, bottom, and high speed end of the gear drive.

### PARTS REPLACEMENT

**SEAL REPLACEMENT** – Before removing seal cages, wrap shaft extensions with tape and coat tape with grease so seals will slide easily without damage from keyways or slot edges.

Inspect all oil seals and gaskets for nicks, gouges and deformities. If oil seals are to be replaced, drive them out of the bores and remove accumulations of sealing compound from the bores. When the unit is being dismantled, DO NOT replace seals in their cages until instructed in the assembly procedures.

**BEARING REPLACEMENT**

- a. Wash bearings in solvent and allow to dry. Carefully check all the rolling elements and raceways for wear. To avoid scoring, DO NOT SPIN BEARINGS WHILE DRYING.

- b. Bearings can be removed from shafts with wheel pullers or at an arbor press. Apply force on the inner cone only, do not press or pull on the inner cage and roller assemblies. To ease removal, apply heat to the bearing cone. If the bearing is to be reused, DO NOT exceed 275° F.
- c. To facilitate assembly of the outer cups in housing bores with interference fits, the cups can be cooled in dry ice to a temperature of -20° F or at a temperature differential of approximately 90° F between the housing and bearing cup.
- d. Thoroughly coat bearings and mating surfaces with a light oil (SAE #10) before assembling.
- e. When pressing bearings on a shaft, make sure the bearings are tightly seated against shoulders, spacers or mating bearings. Check with feeler gauges for zero clearance. To insure tight assemblies, clearance between bearings and mating shoulders should be rechecked after heated bearings have had a chance to cool. Spacers should NOT BE free to rotate after assemblies have been tightened.

#### HELICAL GEAR REPLACEMENT

- a. Wash gears and pinion with solvent and carefully check for damaged, worn or cracked teeth.
- b. Helical gears should be replaced in sets, but are available as individual items.
- c. Pre-heat the gears in an oil bath or oven to 275° F and slide or press them tight against shaft shoulders or spacers. Tighten the locknuts on high speed helical gears to the torques listed in Section 2, paragraphs 2.10 and 2.12. When assembling the large low speed gear, place substantial weights in the gear web to prevent creep while cooling. After the gear has cooled, check for zero clearance at shoulder and spacer fits. Spacers should not rotate. Cold press assembly tight if necessary.

#### BEVEL PINION AND GEAR REPLACEMENT

Spiral bevel gear sets are precision made and custom matched and are available as MATCHED SETS ONLY. Each set is individually precision lapped on a machine to a specific mounting distance (MD) and backlash (BL) for optimum tooth contact. Etched on the periphery of each bevel gear is the set number (#) and the correct backlash (BL). Etched on the end of each bevel pinion is the set number (#) and the correct mounting distance (MD). Record the correct mounting distance (MD) and backlash (BL) values for later use in adjusting the bevel gear sets as outlined in Section 2. If a replacement set is being installed, make sure the set numbers agree.

Note: Mounting distance (MD), etched on the bevel pinion shaft (Item 801), is normally in the 3–4 inch (75–100 mm) range depending on the gear drive size and ratio.

Conversion factor: 1" = 25.4 mm. See Section 2.0.

## SECTION 1 – DISMANTLING THE GEAR DRIVE

### 1.1 GENERAL

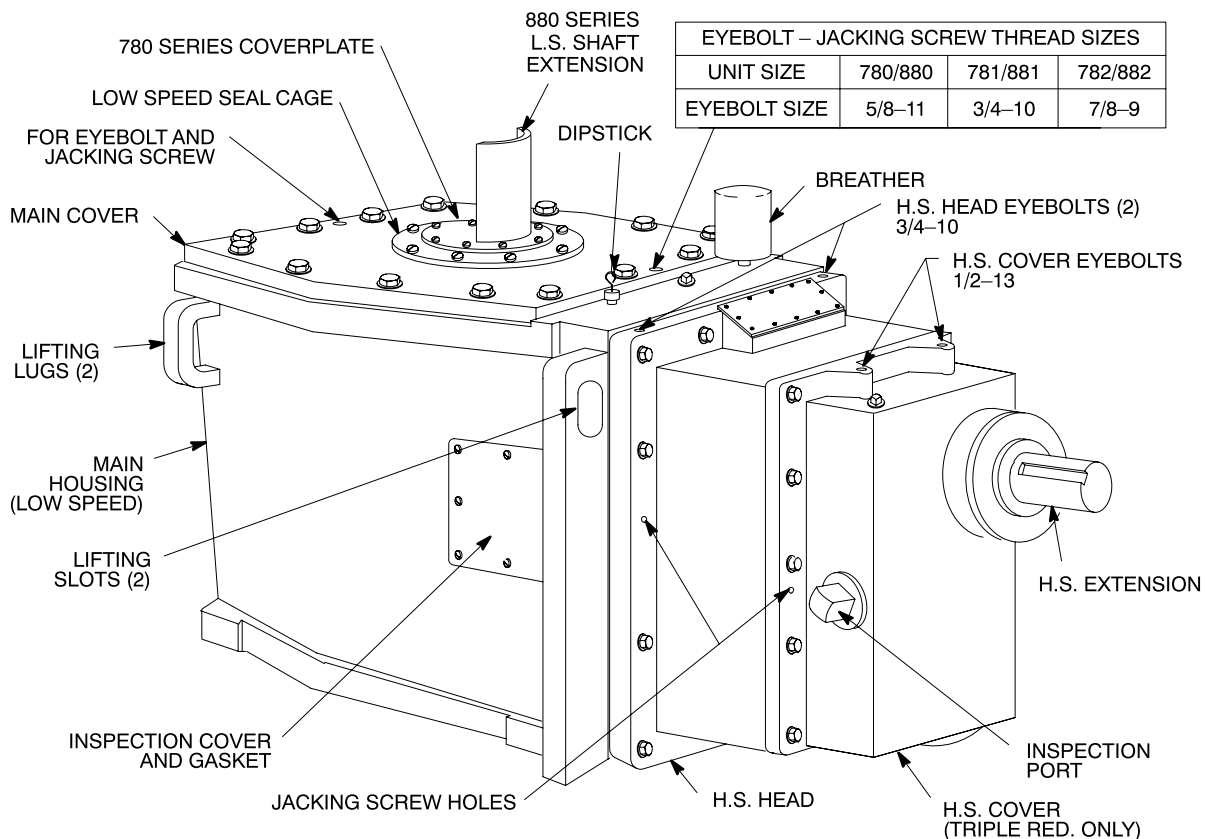
- a. Clean all surfaces adjacent to the main cover, high speed head and high speed cover. This will prevent any foreign matter from entering the interior if the housings.
- b. Wrap the high speed and 880 series low speed shaft extensions with thin tape, and coat the tape with grease to avoid cutting the oil seal lips when the seal cages are removed.
- c. During disassembly, keep the old shim packs and gaskets, spacers, retaining rings, oil seals, etc., with their respective sub-assemblies for later reference during assembly.

### 1.2 COVER AND HEAD REMOVAL (See Figure 1)

Each cover and housing has tapped holes for jacking screws and eyebolts plus locating pins for accurate alignment. To remove covers and heads;

- a. Remove the low speed seal cage from the main cover.
- b. Remove 2 cap screws from each member and install in the jacking screw holes.
- c. On the high speed head and/or high speed cover, install eyebolts and support by slinging and taking up slack in hoist cables. Remove all remaining cap screws.
- d. Cross-tighten jacking screws until locating pins release from housings.
- e. On the main cover, install eyebolts in the jacking screw holes once locating pins are free of the housing.





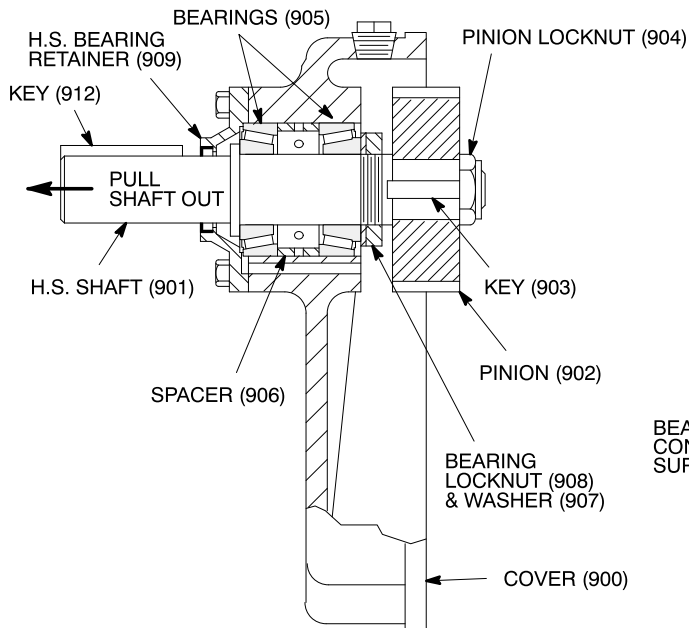
**FIGURE 1 – TRIPLE REDUCTION ILLUSTRATED**

**1.3 DIS-ASSEMBLY OF LOW SPEED COMPONENTS (See Figure 4)**

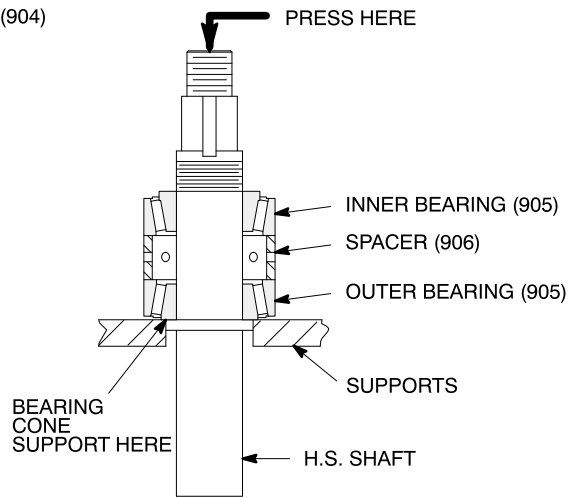
- a . Clean up and carefully examine the low speed gear teeth and all low speed bearing cones and rollers on the shaft, and bearing cups in the main cover and housing.
- b . If the gear is to be removed, use a gear puller to remove the spacer (602) and upper bearing cone and rollers.
- c . Place the shaft and gear in a hydraulic press with uniform supports under the rim of the gear and press on the end of the low speed shaft. DO NOT damage the umbrella (605) or let the shaft drop suddenly.
- d . Examine the lower bearing cone and rollers. If removal is necessary, invert the shaft and press off the cone.
- e . Invert the main housing (500) and remove the low speed bearing cage (508).
- f . Remove the lower bearing cup from housing if necessary.
- g . Remove the oil seal (504) and bearing cup in the main cover (503) if necessary.
- h . Clean out grease passages in the housing and cover and remove accumulations of Permatex from the oil seal cavities and sealing compounds from the housing and cover mating faces.

**1.4 HIGH SPEED COVER DIS-ASSEMBLY (TRIPLE REDUCTION ONLY)**

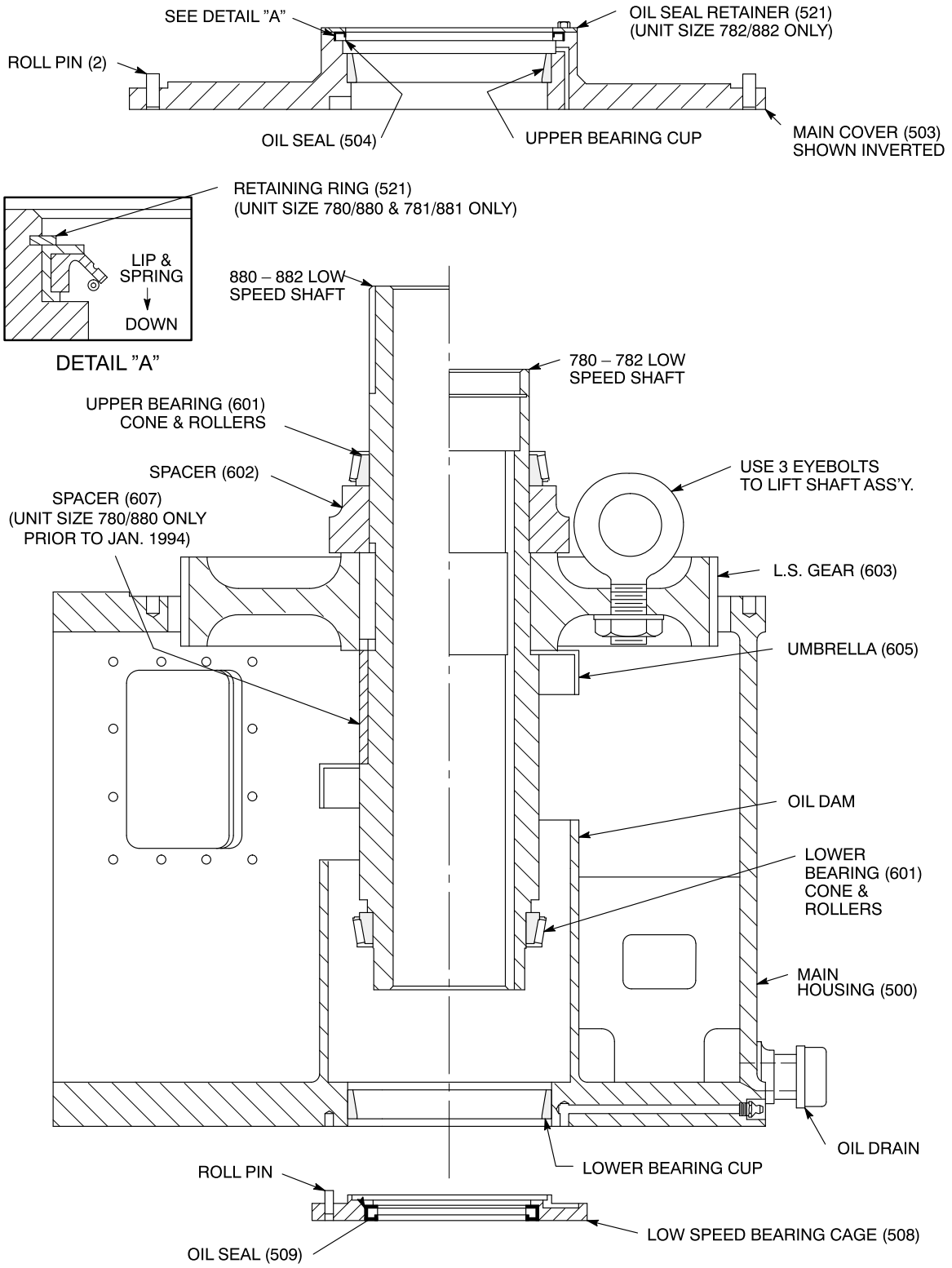
- a . Restrain the high speed shaft (901) with a spanner or strap wrench and remove the pinion locknut (904) and washer.
- b . Remove the high speed pinion (902) with a gear puller.
- c . Remove the high speed bearing retainer (909) and pull shaft assembly (901) thru housing in direction indicated in Figure 2.
- d . Bend the locknut tang free of the slot so that the locknut can be turned. Remove the locknut (908) and keyed washer (907).
- e . Place the shaft in an arbor press and support as shown in Figure 3.
- f . Press on pinion end of shaft and remove the bearing cups and cones and spacer.



**FIGURE 2 – HIGH SPEED COVER**



**FIGURE 3 – BEARING REMOVAL**



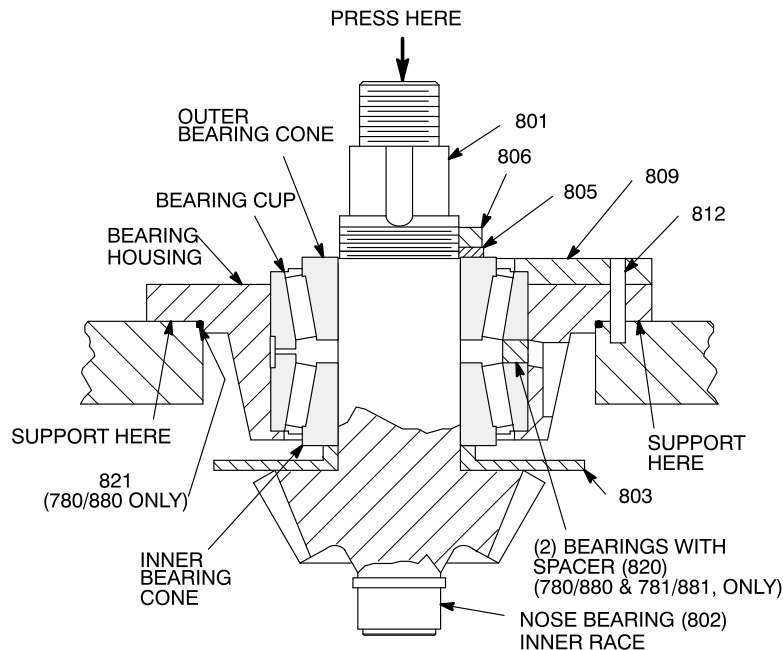
**FIGURE 4 - LOW SPEED ASSEMBLY**

**1.5 DISMANTLING THE HIGH SPEED HEAD (SEE FIGURE 6)**

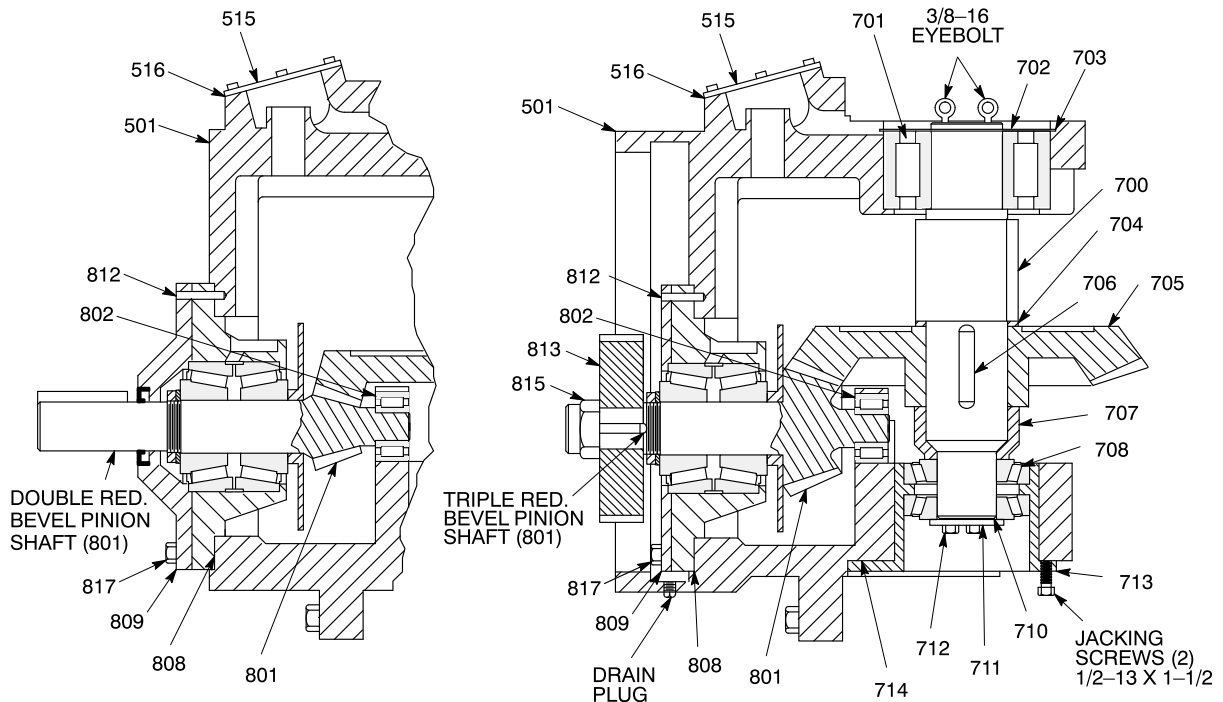
- a . On triple reduction units, remove the change gear (813). Restrain the bevel pinion by wedging a leather strap in the bevel gear mesh and remove the locknut (815). Use a gear puller to remove the gear.
- b . Remove the washer (711) and shims (710) from the bottom of the L.S. pinion shaft (700).
- c . Install (2) jacking screws in the bearing housing (713).
- d . Loosen and remove the cap screws. Cross-tighten the jacking screws until the lower bearing (708) clears the end of the L.S. pinion shaft (700). Slide out the bearing housing (713) and remove the bearing cups.
- e . Remove the outer retaining ring (703) securing the upper bearing (701) outer race.
- f . Install (2) 3/8–16 eyebolts in the top of the L.S. pinion shaft, sling and raise the shaft until the upper bearing (701) outer race and rollers are pushed out of the bore.
- g . Tilt and guide the L.S. pinion out of the head as shown in Figure 6.
- h . To remove the bevel gear (705), invert the L.S. pinion, support under the bevel gear, and press OFF the bearing cone and rollers (708), sleeve (707) and gear.
- i . Remove the retaining ring (702) and bearing (701) inner race from the shaft.
- j . Remove all cap screws (817) and remove the bevel pinion sub-assembly from the head.
- k . Remove nose bearing (802) outer race and rollers from bore if necessary.

**1.6 DISMANTLING BEVEL PINION SUB-ASSEMBLY**

- a . Drive out the roll pin (812) and remove the bearing retainer (809).
- b . Set the assembly in an arbor press as shown in Figure 5 and support under the housing flange.
- c . Bend the locknut tang free of the slot so that the locknut can be turned. Remove locknut (806) and washer (805).
- d . Press the bevel pinion shaft (801) down through the bearings until the outer bearing cone is free of the shaft seat.
- e . Press bearing cup/s out of the housing. Remove the inner bearing cone and rollers with a bearing puller.
- f . It is not necessary to remove the slinger (803). If a new bevel set is to be installed, it is recommended that a new slinger be used.
- g . Use a bearing puller to remove the nose bearing (802) inner face if necessary.

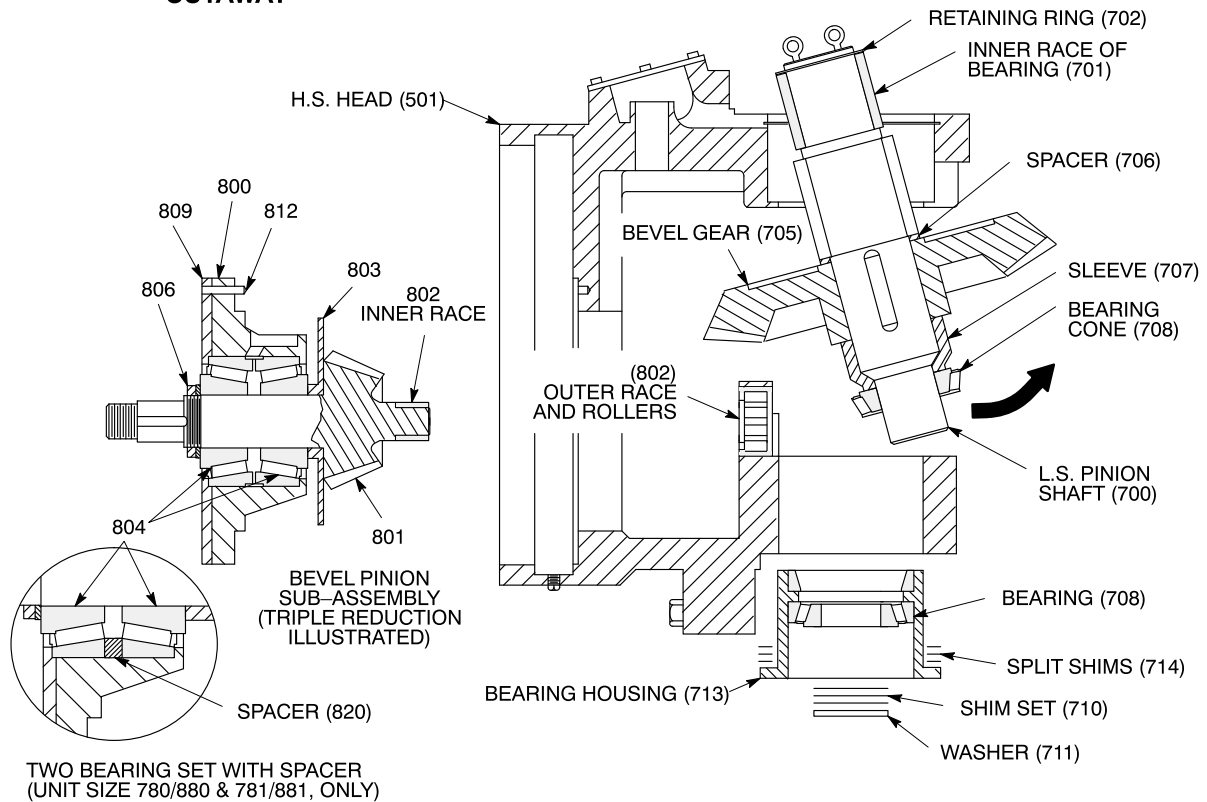


**FIGURE 5**  
**BEVEL PINION SUB-ASSEMBLY**



**DOUBLE REDUCTION CUTAWAY**

**HIGH SPEED HEAD (TRIPLE REDUCTION)**



**FIGURE 6 – DOUBLE AND TRIPLE REDUCTION HIGH SPEED HEAD**

**SECTION 2 – GEAR DRIVE ASSEMBLY**

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

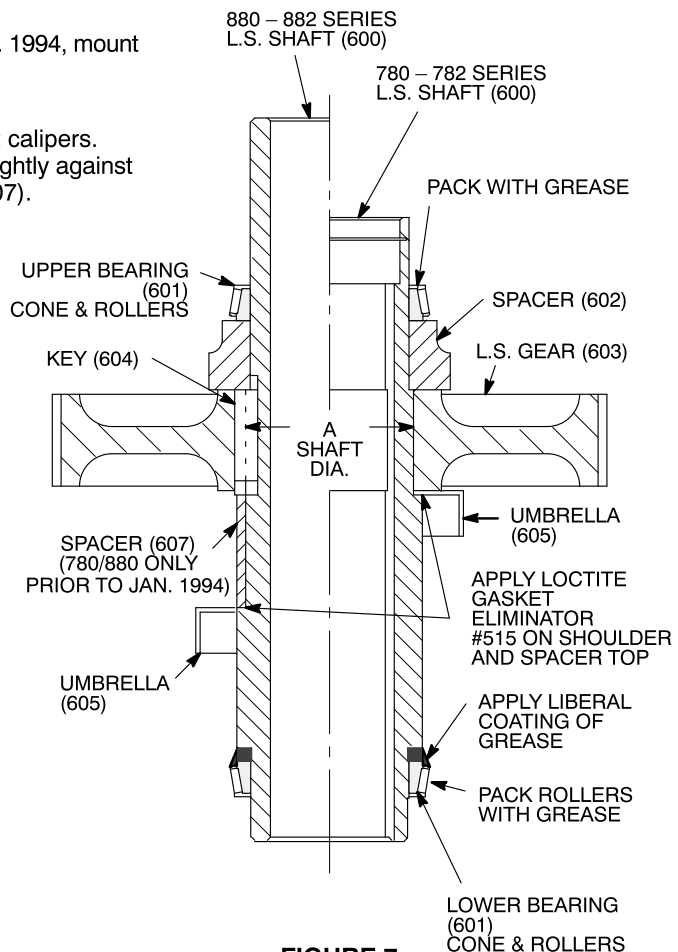
We recommend that the interference fit gears and bearing components be heated, mounted on their respective shafts, and allowed to cool, well in advance of the major assembly procedures. This will reduce delays between assembly sequences and lessen the chance of injury due to handling hot parts. Always check bores for nicks and gouges and fit of keys in gear and shaft keyways. Review procedures 2.2 through 2.12 to determine which parts require heating and plan heating cycles to coincide with the progression of assembly sequences. Do not allow parts to cool before mounting. Note: Low speed shaft bearings – cups and cones must be from the same vendor.

**2.1 HEATING GEARS AND BEARING CONES**

- a . OVEN HEATING – Set oven thermostat at 275° F and allow 1 hour for each inch of wall thickness. Do not allow parts to touch oven walls. Put gears in oven first and follow later with thinner wall bearing cones and rollers so maximum 275° F heat in parts will not be exceeded.
- b . OIL BATH – Use oil with a flashpoint of 350° F or higher. Allow 15 minutes per inch of wall thickness. Do not rest parts on bottom of containers.
- c . Ideally, gears and bearings should be mounted the day before final assembly and allowed to cool overnight to room temperatures, so tightness between components can be checked prior to assembly.

**2.2 ASSEMBLE LOW SPEED SHAFT COMPONENTS (See Figure 7)**

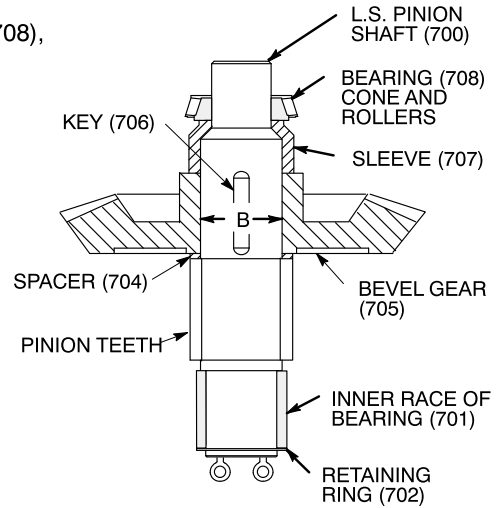
- a . While gear (603) is heating, measure shaft diameter 'A' and preset internal calipers .004" larger than measured diameter.
- b . Apply a continuous bead of "Loctite" brand #515 gasket eliminator on the shaft shoulder and mount the umbrella (605).
- c . On unit size 780/880 only, built prior to Jan. 1994, mount the spacer (607).
- d . Insert the gear key (604) in the keyway.
- e . Check the L.S. gear bore with the preset calipers. If satisfactory, mount the gear and seat tightly against the umbrella (605) and/or the spacer (607).
- f . Apply a coating of Loctite sealing compound #609 to the inside diameter of spacer (602) and install against the gear, wider section facing down.
- g . Mount the upper and lower bearing cones and rollers. The lower bearing cone must be tight against the shoulder, and the upper bearing cone tight against the spacer (602). Check both fits with feelers.
- h . Allow the heated parts to cool. It is recommended that substantial weights be applied to the low speed gear to prevent creep during cooling.
- i . After cooling, check the entire assembly for tightness. If the spacer/s rotate, or bearings are not tight against shoulders, press the assembly tight in an arbor press.
- j . Smear a coating of NLGI #2 lithium based grease to both bearings, working grease between rollers. Add a liberal quantity above the lower bearing.



**FIGURE 7**

**2.3 LOW SPEED PINION AND BEVEL GEAR COMPONENTS**

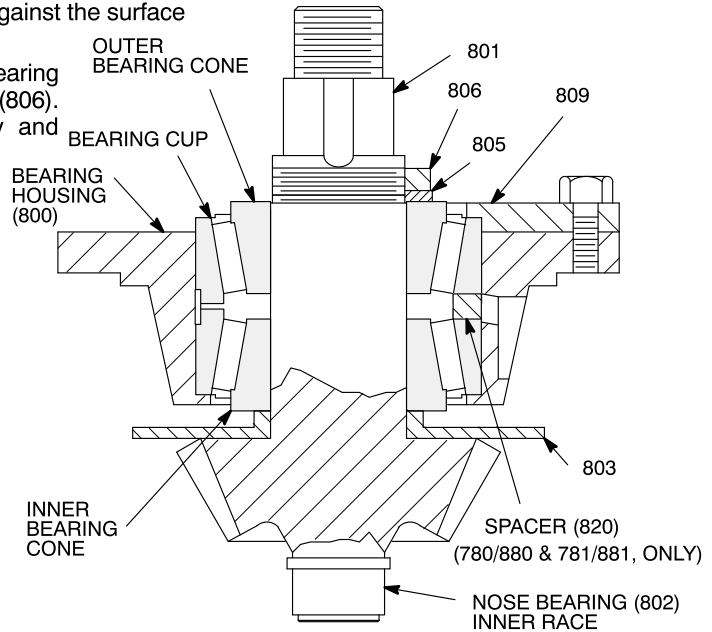
- a . Heat bevel gear (705), shaft sleeve (707), lower bearing (708), cone and upper bearing (701) inner race.
- b . Mount the (701) bearing inner race with the large inner radius against the shaft shoulder and install the retaining ring (702).
- c . Invert the L.S. pinion as shown in Figure 8 and slide the spacer (704) on the shaft, large chamfered end toward the pinion teeth and insert the bevel gear key (706).
- d . Measure diameter 'B' and preset internal calipers .003" larger than the measured diameter.
- e . Check the bevel gear bore with the calipers. When to size, mount the gear, shaft sleeve (707) and the bearing (708). Check each component for tightness. Weights can be added in the bevel gear web to prevent creep during cooling.
- f . After the parts have cooled, check for zero clearance between each part with feeler gauges. If spacer (704) or shaft sleeve (707) rotates, the assembly should be cold pressed tight at an arbor press.



**FIGURE 8  
LOW SPEED PINION  
SHAFT & BEVEL GEAR**

**2.4 BEVEL PINION SUB-ASSEMBLY (See Figure 9)**

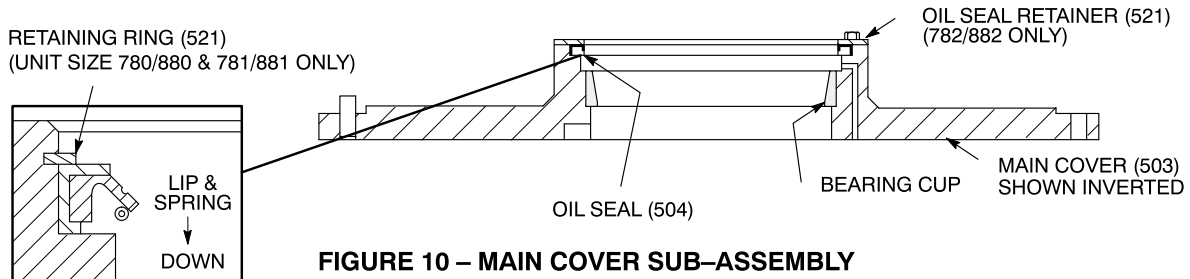
- a . Heat the nose bearing (802) inner race, slinger (803) and the (804) inner and outer bearing cones and rollers. Cool the bearing cup/s.
- b . Install the bearing cup/s in the housing (800). On unit size 780/880 & 781/881, only, install in order the inner cup, spacer (820) and outer cup.
- c . Install slinger (803) tight against the pinion. Mount the inner bearing cone on the shaft tight against the slinger (803) and then slide the shaft through the bearing housing until the bearing rollers seat against the surface of the bearing cup.
- d . Mount in order on the shaft, the outer bearing cone, keyed washer (805) and locknut (806). Tap the outer bearing cone radially and rotate the shaft to seat the bearing rollers, then snug up the locknut (806) one turn beyond hand tight.
- e . Temporarily install the bearing retainer (809) without gasket (811) or roll pins (812). Final bearing adjustments will be made after the sub-assembly is installed in the head.



**FIGURE 9  
BEVEL PINION  
SUB-ASSEMBLY**

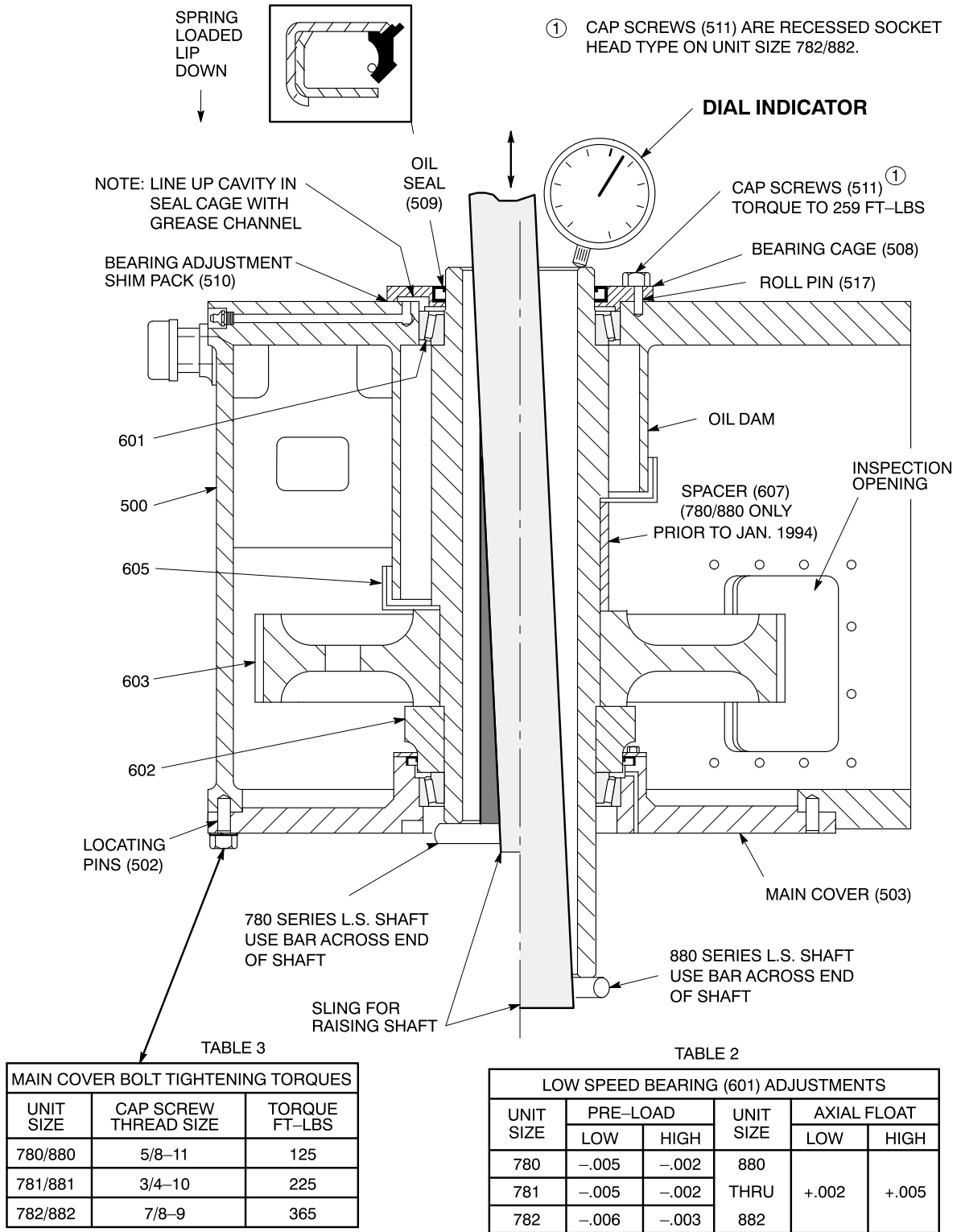
**2.5 MAIN COVER ASSEMBLY**

- a . Invert the cover (503) as shown in Figure 10 and insert the bearing cup in the bore, narrow end of taper toward shoulder. Check with feeler gauge for zero clearance between housing shoulder and bearing cup.
- b . Install the oil seal (504) with seal lip and spring facing down. On unit size 780/880 and 781/881, install the retaining ring (521). On 782/882, install the retaining plate (521).
- c . Pack the oil seal interior and coat the seal lip and bearing cup with NLGI #2 lithium base grease.

**2.6 LOW SPEED ASSEMBLY COMPLETION**

- a . With the housing (500) placed on its side, insert the (601) lower bearing cup in the housing, thin wall section inward, approximately 1/16" underflush.
- b . Mount the full axial float shim pack (510) and cage (508). Do not install the roll pin (517) or oil seal (509) at this time.
- c . Insert the cap screws (511) and torque to 259 ft-lbs.
- d . Set the main housing (500) in an upright position and install the low speed shaft assembly. Using the 3 eyebolts in the gears web holes as described in Section 1.4, guide the shaft slowly into the oil dam and stabilize when it comes to rest on the lower bearing cup.
- e . Apply a continuous bead of Loctite #515 gasket eliminator to the top of the main housing adjacent to the bolt hole pattern.
- f . Install the 2 locating pins (502) into the housing holes.
- g . Mount the main cover (503) on the housing, engaging the locating pins. Install all lockwashers and cap screws. Draw the cover down evenly by alternate crisscross tightening of the cap screws to insure even distribution of the gasket material. Tighten each cap screw to the torques listed in Table 3.
- h . Invert the housing as shown in Figure 11 and block up to allow access to the end of the shaft.
- i . Rotate the shaft to seat the bearing rollers.
- j . Lower a sling through the shaft I.D., inset bar stock through the sling and across the bottom of the shaft as shown in the detail.
- k . Set up a dial indicator, raise the shaft and record the total axial movement.
- l . Adjust the low speed bearings (601) as follows:
  - 1 . On 880 series, add or remove shims from the shim pack (510) to obtain an axial float condition within the tolerance in Table 2.
  - 2 . On 780 series, remove shims (510) equal in thickness to the indicator reading plus the required pre-load within the tolerance in Table 2.
- m . Replace the adjusted shim pack (510) and install the locating pin (517) in the housing.
- n . Coat the lower oil seal (509) O.D. with Permatex #3 and install in the bearing cage (508) with the spring loaded lip facing inward. Coat the seal lip and pack the cage interior with NLGI #2 lithium base grease.
- o . Install the bearing cage (508) and torque the cap screws (511) to 259 ft-lbs.





**FIGURE 11 – LOW SPEED ASSEMBLY  
(HOUSING INVERTED)**

2.7 ASSEMBLING THE HIGH SPEED HEAD (SEE FIGURE 12)

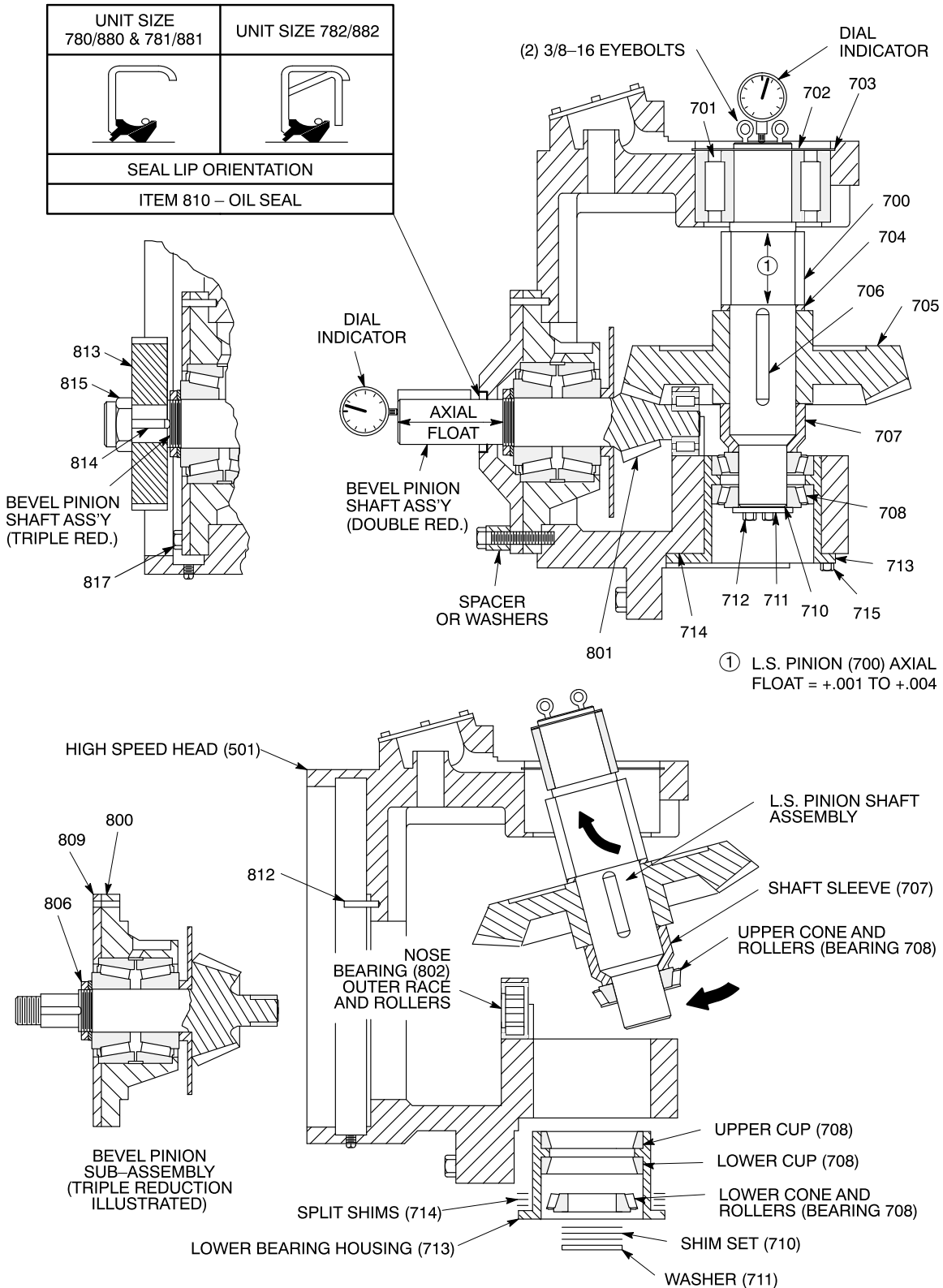
- a . Mount the nose bearing (802) outer race and rollers in the bevel pinion bore tight against the shoulder.
- b . Install the (708) upper and lower bearing cups oriented as shown in the detail.
- c . Install the full shim pack (714) and lower bearing housing (713) into the head bore. Make sure the split shim halves are positioned to straddle the jacking screw holes. Evenly tighten the cap screws to the torques in Table 4.
- d . Guide the low speed pinion shaft assembly up through the upper bearing bore as shown in Figure 12 and carefully lower against the upper (708) bearing cup.
- e . Insert the (708) upper bearing race and rollers into the housing and install the outer retaining ring (703).
- f . Install the (708) bearing cone and rollers into the housing on the bottom end of the pinion shaft (700) and add the full shim pack and washer (711). Draw up the 3 cap screws (712) evenly and torque to the values in Table 4. At this point, check that spacer (704) and sleeve (707) do not rotate and that parts register tightly against each other with zero clearance all around.
- g . SET THE L.S. PINION SHAFT AXIAL FLOAT – Rotate the shaft to seat the bearings, set up a dial indicator and raise the shaft. Record the total axial float. Remove the shaft washer (711) and subtract from the (710) shim pack to obtain an axial float of .001” to .004”. Retorque the cap screws (712) (See Table 4) each time the shim pack is adjusted and after the axial float is obtained.

TABLE 4 – CAP SCREW TORQUE (FT-LBS)		
UNIT SIZE	ITEM 712	ITEM 715
780/880 THRU 782/882	75	75

- h . Mount the bevel pinion sub–assembly in the head.
  - 1 . On double reduction units, remove the bearing retainer (809), and secure the the bearing housing (800) to head with 4 shorter than standard (817) cap screws or use washers or spacers under the standard cap screws. Tighten the bolts securely.
  - 2 . On triple reduction units, install the sub–assembly complete with retainer (809) and tighten all cap screws securely.
- i . SET THE BEVEL PINION SHAFT AXIAL FLOAT
  - 1 . Rotate the shaft to set the bearing rollers and insert .002 shim stock between the bearing cup and rollers.
  - 2 . Tighten the locknut (806) until the shim stock begins to bind. Remove shim stock.
  - 3 . Set up a dial indicator and measure the total axial shaft movement.
  - 4 . Continue to tighten the locknut until the axial float listed in the table is achieved. Inspect the lock washer carefully. Bend one (only) tang into one of the eight locknut slots.

BEVEL PINION SHAFT AXIAL FLOAT	
DOUBLE REDUCTION	.003 to .004
TRIPLE REDUCTION	.002 to .003

- 5 . On double reduction units, install gasket (811) with retainer (809) and tighten all cap screws (817). Recheck axial float with retainer (809) securely in place.



**FIGURE 12 – HIGH SPEED HEAD ASSEMBLY**

**2.8 SETTING THE MOUNTING DISTANCE**

a . To set mounting distance:

1 . Record the mounting distance (MD) etched on the bevel pinion shaft.

Note: Mounting distance (MD), etched on the bevel pinion shaft (Item 801), is normally in the 3–4 inch (75–100 mm) range depending on the gear drive size and ratio.

Conversion factor: 1" = 25.4 mm.

2 . Measure the shaft sleeve (707) O.D. and divide by 2. Record as dimension "C".

3 . Measure the distance between the bevel pinion toe and sleeve (707). Record as dimension "B".  
NOTE: For some unit sizes the bevel pinion nose bearing will extend beyond the end of the pinion shaft. It may be necessary to use a tool such as an inside caliper, or a magnetic disk approximately .250" thick that will allow the the remaining distance to be measured with a conventional feeler gage, to measure dimension "B".

4 . Add dimensions B and C and subtract from etched (MD). The difference between the etched value and the actual measurement is the thickness of the shim pack (808) required. Select individual shims equal to the difference, and measure in a compressed state to obtain etched (MD) +.000" to +.004".

b . Remove bevel pinion sub-assembly and tap locating pin (812) into head (501).

c . Install the selected shim pack (808). Replace the bevel sub-assembly.

d . Mount the gasket (811) and retainer (809). On double reduction units, coat the O.D. of the oil seal (810) with Permatex #3 and install in the retainer, spring loaded lip facing inward. Tape the sharp edges of the keyway and coat with grease before sliding the retainer over the shaft.

e . Torque the cap screws (817) to values in table below.

ITEM 817 CAP SCREW TORQUES		
780/880	5/8–11	144 FT–LBS
781/881 and 782/882	3/4–10	259 FT–LBS

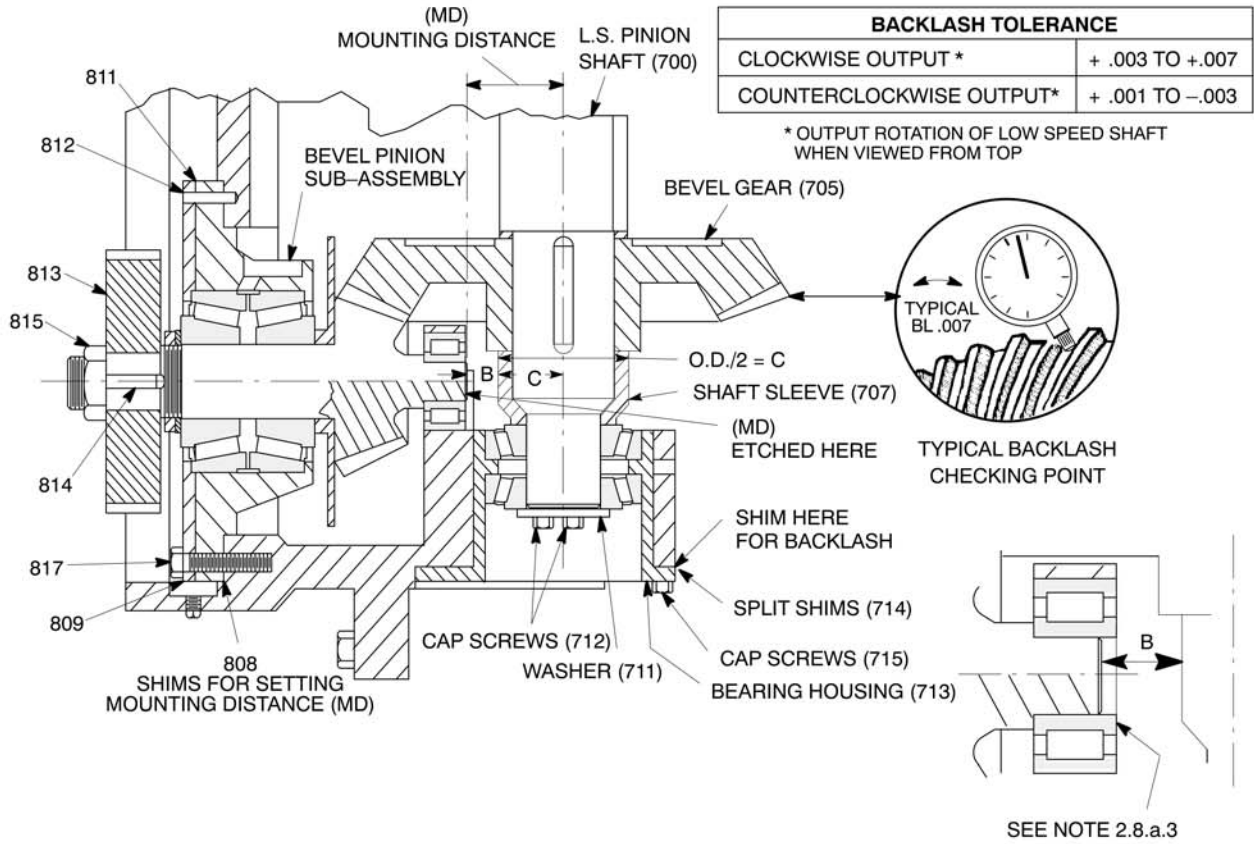
**2.9 SETTING THE BACKLASH**

a . Set up a dial indicator at the outer edge of a bevel gear (705) tooth.

b . Hold the bevel pinion shaft immobile and move the bevel gear (705) back and forth lightly. Check the backlash at 4 points to establish the minimum reading.

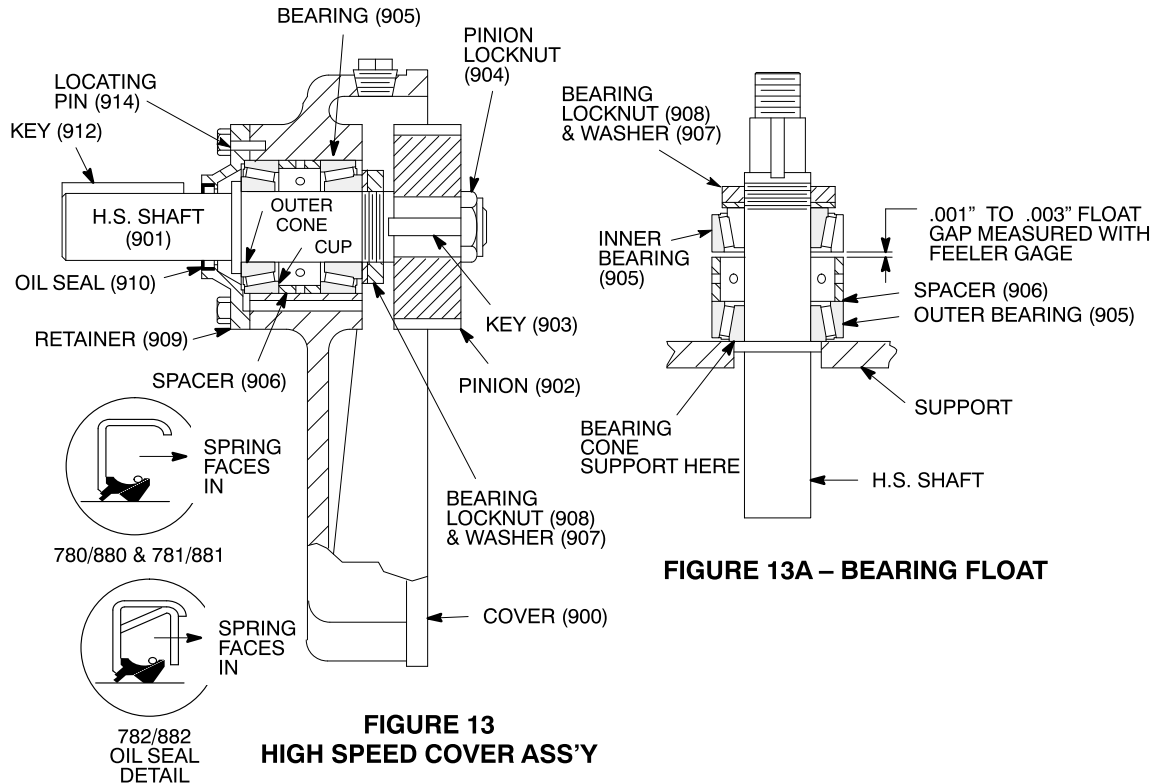
c . Back off both the cap screws (712) in the shaft and the bearing housing cap screws (715) approximately 1/8". Lower the bearing housing with jacking screws and adjust the backlash shim pack to the etched backlash within the tolerances in the table. The shims are split for ease of removal and insertion.

d . Draw up the cap screws (712 and 715) evenly and torque to the values in Table 4.



2.10 HIGH SPEED COVER ASSEMBLY (TRIPLE REDUCTION ONLY)

- a . Heat the bearing (905) cones and helical pinion (902) in an oven or oil bath.
- b . Coat the O.D. of the oil seal (910) with Permatex #3 or equivalent and install in the high speed retainer (909), spring lip facing inward as shown in Figure 13.

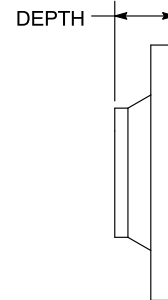


- c . Mount the following parts on the shaft in order:
  - 1 . Outer cone and rollers
  - 2 . Outer cup
  - 3 . Spacer (906)
  - 4 . Inner cup
  - 5 . Outer cone and rollers
  - 6 . Keyed washer (907) and locknut (908)
- d . Place the assembly on a bench as shown in Figure 13A.
- e . Tighten the locknut (908) to achieve .001" to .003" float measuring the gap as shown with a feeler gage.
- f . Inspect the lockwasher carefully. Bend one (only) tang into one of the eight locknut slots.
- g . Tap the locating pin (914) into the retainer flange and pack the interior of the retainer and oil seal lip with NLGI #2 lithium base grease.
- h . Slide the high speed shaft assembly into the cover (900) bore.

- i . Tape the shaft keyway, smear tape with grease and install the gasket (911), if furnished, and retainer (909) on the cover.

NOTE: On 7/1/2000, a change was made to the retainer (909) to eliminate the gasket (911). Loctite 515 Gasket Eliminator is now used with the bearing retainer (909). To check which sealing arrangement is used, measure the bearing retainer (909) depth.

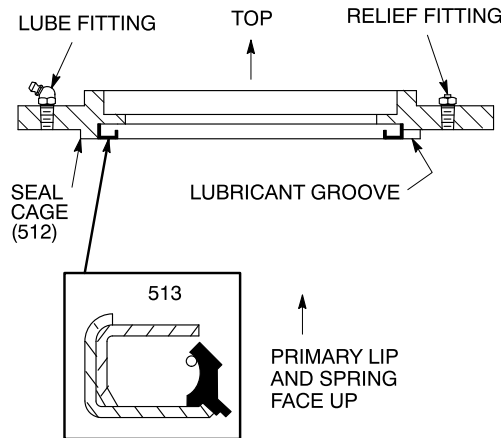
UNIT SIZE (TRIPLE REDUCTION)	RETAINER DEPTH (OVERALL)	
	FOR USE WITH GASKET	NO GASKET (USE GASKET ELIMINATOR)
780/880	1.680 in.	1.730 in.
781/881		
782/882	1.580 in.	1.640 in.



- j . Tighten the cap screws to 65 ft–lbs.
- k . Coat the shaft threads with light oil and install the key (903), pinion (902) and locknut (904).
- l . Restrain the shaft with a spanner or strap wrench and tighten the locknut (904) to:  
Unit sizes 780/880 and 781/881 – 400 ft–lbs, Unit size 782/882 – 450 ft–lbs
- m . Insert and tape the extension key (912) on the shaft.

**2.11 UPPER LOW SPEED SEAL CAGE (512)**

- a . Install the oil seal (513) in the seal cage (512) with the primary lip facing up.
- b . Pack the seal and cage cavity and coat the seal lip with NLGI #2 lithium base grease.
- c . Install the cage on the main housing (500). Tape the keyway edges and smear with grease before sliding seal over the shaft extension.
- d . Tighten the cap screws to the torques listed in Table 5.

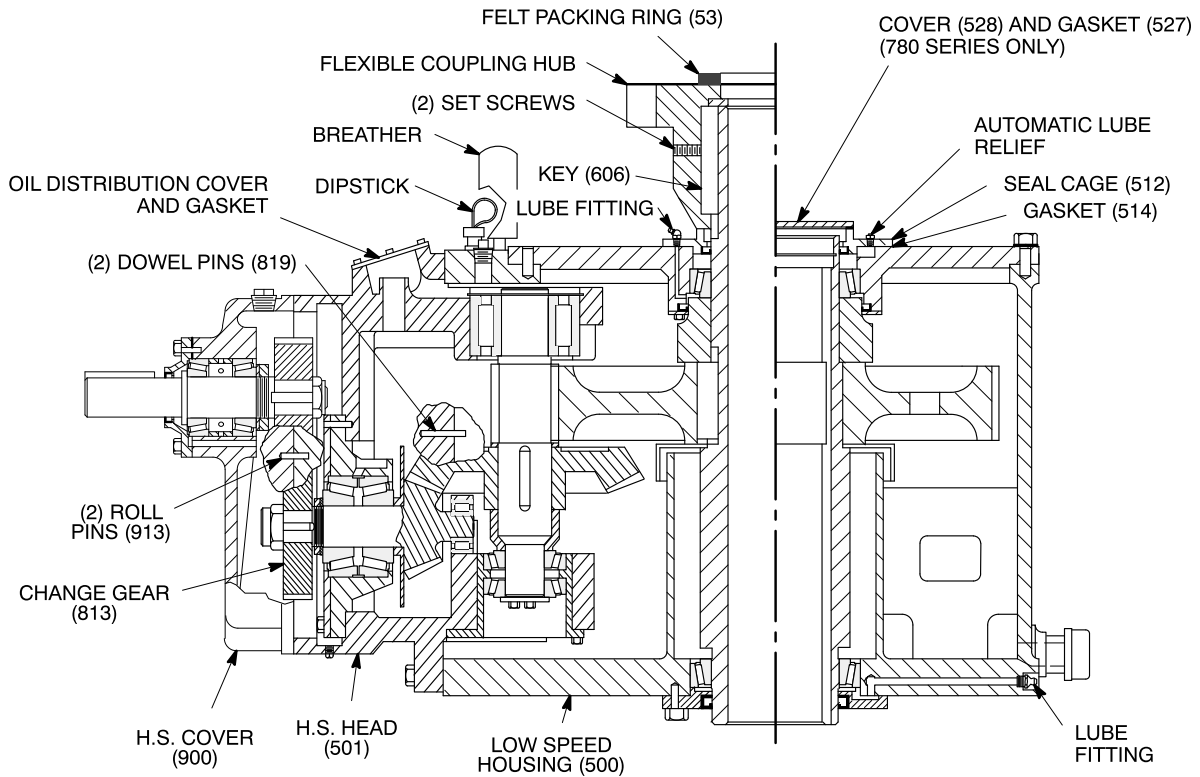


- 2.12 On triple reduction units only, install the change gear (813) on the bevel pinion shaft. Pre-heat the gear to 275° F max. Insert the key (814) in the shaft keyway and coat the locknut threads on shaft with a light oil. Wedge a leather strap into the bevel mesh and tighten the locknut (815) to: 780/880 & 781/881 – 400 ft–lbs, 782/882 – 450 ft–lbs.
- 2.13 Apply a continuous bead of Loctite #515 gasket eliminator on the mounting face of the low speed housing (500) and install the 2 dowel pins (819) in the head flange.
- 2.14 Mount the high speed head (501) on the low speed housing (500). Install and evenly snug up all the cap screws in a cross tightening pattern to insure even distribution of the gasket material. Tighten the cap screws to the torques in Table 5.
- 2.15 On triple reduction units, apply Loctite #515 gasket eliminator, insert the 2 roll pins (913) and install the high speed cover (900). Snug down the cap screws in a cross tightening pattern and torque to the values in Table 5.

- 2.16 Install the oil distributor and inspection covers and gaskets. Clean both the housing and the cover gasket mounting surfaces. Place the gasket on the housing, aligning the clearance holes in the gasket with the mounting holes in the housing. Place a generous amount of thread sealant on all the bolt threads and under each bolt head to create a good tight seal. Replace the dipstick, breather and all drain plugs and fittings.
- 2.17 Lubricate the upper and lower low speed shaft bearings with an NLGI #2 lithium base grease. At the upper bearing, add lubricant until air is purged and clean grease appears at the relief fitting. On the lower bearing, add at least 2 lbs. of grease.
- 2.18 On 880 series, heat the shouldered flexible coupling hub to 275° F. Insert the key (606) and coat the shaft extension with "NEVER-SEEZ" or equivalent. Install the hub and tighten the set screw. Cement the felt packing ring (53) on the hub and assemble the balance of the coupling components per the coupling instructions.
- 2.19 Re-install the gear drive on the mounting structure or base and refill with oil to the dipstick full mark.

**TABLE 5**

CAP SCREW TORQUES		
THREAD SIZE	STANDARD THREAD	NYLOK INSERT
3/8-16	27 FT-LBS	31 FT-LBS
1/2-13	65 FT-LBS	75 FT-LBS
9/16-12	90 FT-LBS	104 FT-LBS
5/8-11	125 FT-LBS	144 FT-LBS
3/4-10	225 FT-LBS	259 FT-LBS
7/8-9	365 FT-LBS	420 FT-LBS
1"-8	545 FT-LBS	620 FT-LBS

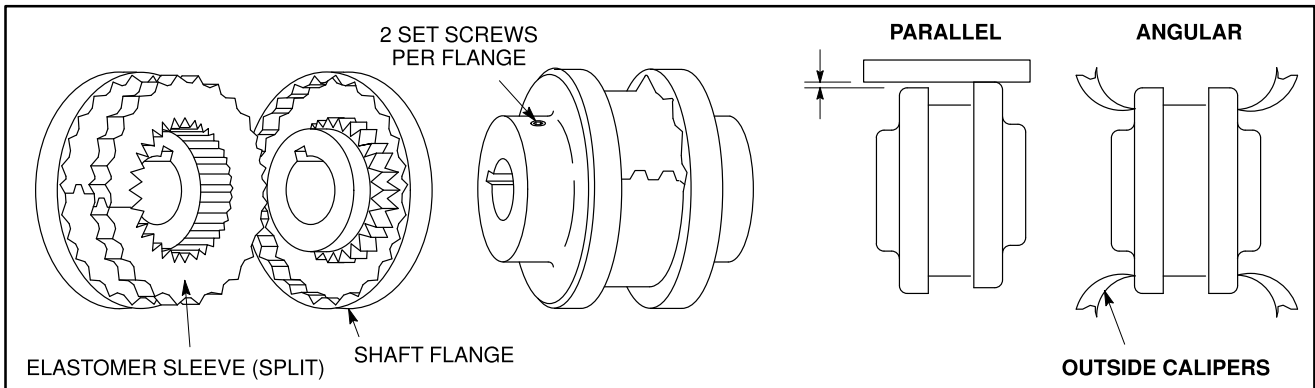




# INSTALLATION INSTRUCTIONS FOR ELASTOMER SLEEVE COUPLINGS

**NOTE:** The mixer is furnished with either an Elastomeric or T10/H high speed, and/or a T20/V low speed tapered grid coupling. Determine the coupling size and manufacturer so that correct coupling alignment procedure can be employed. Coupling identifiers are located on the coupling components.

**IMPORTANT: ALWAYS RECHECK HIGH SPEED COUPLING ALIGNMENT PRIOR TO INITIAL START IN CASE MISALIGNMENT OCCURS DUE TO SHIPPING, HANDLING AND INSTALLATION.**



**INTRODUCTION:**

Elastomeric couplings consist of three basic elements - two shaft flanges and one elastomer split sleeve. Each shaft flange is identified with basic size and shaft bore. Elastomer sleeves are identified with basic size and a material code letter stamped on or molded in.

Rubber sleeves are black and are coded with size/style designations 4JES thru 8JES and 9E. Polyester sleeves are peach color and designated as 6HS thru 11HS.

**INSTALLATION AND MAINTENANCE:**

Only simple tools are required; an allen wrench, straightedge and outside calipers. To install or replace elastomer sleeves, loosen both set screws in one of the shaft flanges and slide the flange back. Remove the two piece sleeve or spread apart one-piece split sleeves and replace with the same type new sleeve. Install the new sleeve over the shafts and slide the sleeve into the stationary shaft flange until it seats firmly against the flange inner wall. For couplings equipped with a type E sleeve (two piece with a retaining ring), the retaining ring has to be pried out of the sleeve groove for sleeve removal and back into position after installing new sleeve and checking alignments. Slide the loose shaft flange into position, engaging the sleeve teeth until the sleeve fits snugly against the flange inner wall. The teeth on the elastomer sleeve should be fully engaged and slightly underflush within each shaft flange. **DO NOT** force the flanges together so as to compress the sleeve in any way.

**NOTE:** Shaft gap is determined by the width of the elastomer element when engaged in both hub halves.

**PARALLEL ALIGNMENT:**

Place a straightedge across the 2 coupling flange rims and measure the maximum offset at 90° intervals around the coupling. If the maximum offset exceeds the allowable values in the table, add or subtract equal thicknesses of motor foot shims until parallel alignment is as close as possible.

**ANGULAR ALIGNMENT:**

Check angular alignment with outside calipers (or micrometers) as shown above. Check at 90° intervals around the coupling. **DO NOT ROTATE** the coupling during this measurement. The difference between the maximum and minimum measurement should not exceed the allowable value in the table. Re-check parallel alignment once angular alignment has been achieved.

**NOTE:** To insure maximum sleeve life, keep misalignment values as near zero as possible.

**TABLE 1 - ELASTOMERIC INSTALLATION DATA**

<b>MAXIMUM ALLOWABLE MISALIGNMENT</b> (DIMENSIONS IN INCHES)					
BASIC SLEEVE SIZE	FLANGE SET SCREW TORQUE (FT-LBS)	RUBBER SLEEVES (TYPE JES & E)		POLYESTER SLEEVES (TYPE H.S.)	
		PARALLEL	ANGULAR	PARALLEL	ANGULAR
4	3	.005	.014	--	--
5	7	.008	.018	--	--
6	13	.008	.023	.005	.005
7	23	.010	.026	.006	.007
8		.010	.031	.008	.008
9		.013*	.036*	.008	.009
10		--	--	.010	.011
11		--	--	.011	.012

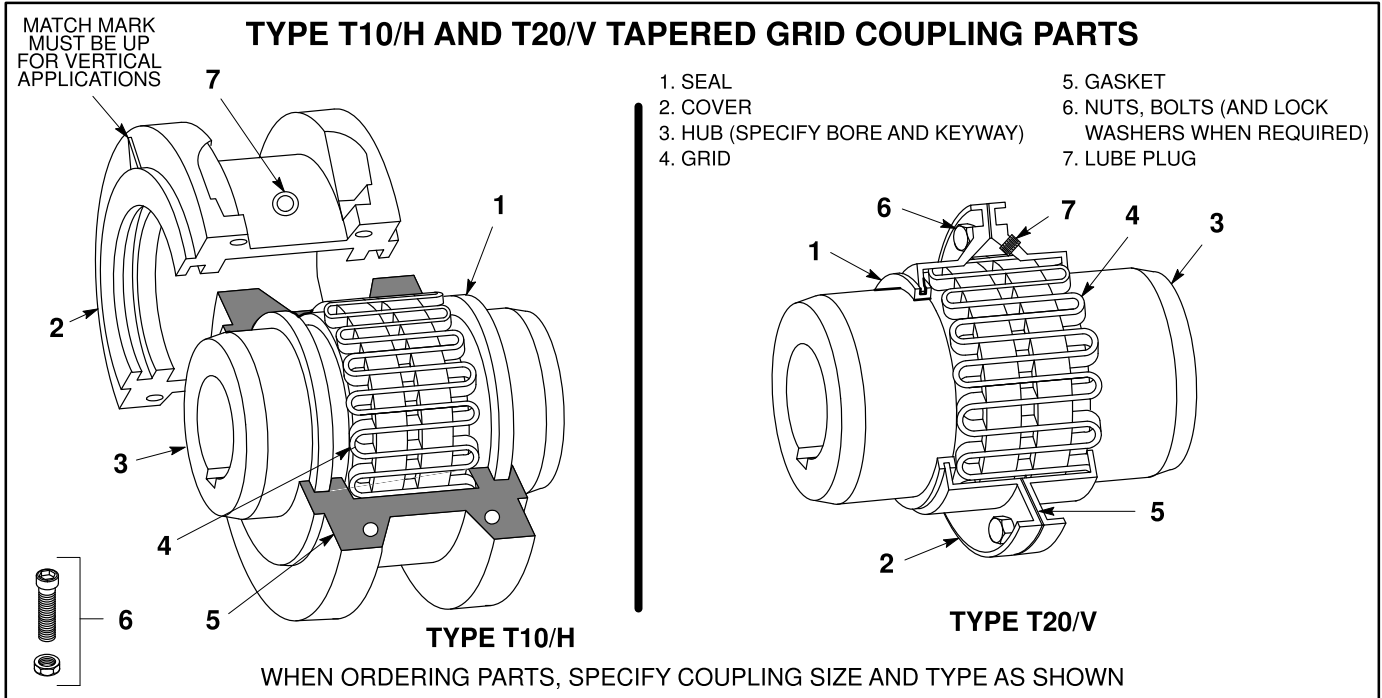
\* THESE ARE TYPE E SLEEVES (TWO-PIECE WITH RING)

**IMPORTANT:** Before starting up, be sure the coupling guard is replaced and properly secured. Elastomer sleeves can be thrown from the assembly when subjected to a severe shock load.

Due to vastly different torque ratings, NEVER substitute a polyester (peach) sleeve with a rubber (black) sleeve or vice versa. Do not use polyester sleeves on variable speed applications until the application has been reviewed by **LIGHTNIN** Engineering personnel.

# INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR GRID TYPE FLEXIBLE COUPLINGS

**IMPORTANT: ALWAYS RECHECK HIGH SPEED COUPLING ALIGNMENT PRIOR TO INITIAL START IN CASE MISALIGNMENT OCCURS DUE TO SHIPPING, HANDLING AND INSTALLATION.**



**INTRODUCTION:**

These instructions apply to Type T10/H and Type T20/V Tapered Grid Couplings. These couplings are designed to operate in either the horizontal or vertical position without modification. However, for vertical applications, the match mark shown above must be up. The performance and life of the couplings depend largely upon how you install and service them. Carefully follow the instructions that follow for optimum performance and trouble free service.

**PARTS IDENTIFICATION:**

All coupling parts have identifying part numbers as shown above. Parts 3 and 4 (Hubs and Grids) are the same for both T10/H and T20/V couplings; all other coupling parts are NOT INTERCHANGEABLE. Therefore, when ordering parts, always SPECIFY SIZE and TYPE.

**INSTALLATION:**

Only standard mechanic's tools, wrenches, a straight edge and feeler gauges, are required to install Taper Grid couplings. Couplings are furnished for PUSH or LIGHT TAP FIT with set screws. For best results, clean all parts thoroughly and align coupling for minimum angular and parallel misalignment. Set the coupling gap as recommended; permanently fasten unit foundation bolts and then recheck alignment. Refer to Page 5 for detailed instructions.

**LIMITED END FLOAT:**

When electric motors are fitted with sleeve bearings, limited axial and float couplings should normally be employed to protect motor bearings. Tapered Grid couplings are easily modified to limit end float. Consult the factory if this feature is required.

**LUBRICATION:**

Flexible couplings are shipped from the factory lubricated as follows:

High Speed Couplings - Type T10 or H - Shell EP2

Low Speed Couplings - Type T20 - Falk Long Term Grease

Type H - Texaco Marfax 2 or Mobilux EP2 Grease

Adequate lubrication is essential for proper operation of the coupling. It is recommended that the coupling be checked once a year and lubricant added if required. Unusual conditions may have an effect on the lubricant. For applications involving exposure to excessive moisture, extreme heat or cold, severe and rapid reversing or heavy shock loads, it is recommended the coupling be checked at more frequent intervals. The following specifications apply to lubricants for Grid couplings which are lubricated annually and operate within ambient temperatures of 0° to 150° F. For temperatures beyond this range, consult the factory.

Dropping Point - 300° F or higher

Consistency - NLGI No. 2 with worked penetration value in the range of 250 to 300.

Separation and Resistance - Low oil separation rate and high resistance to separation from centrifuging.

Liquid Constituent - To possess good lubrication properties...equivalent to a high quality, well refined petroleum oil.

Inactive - Should not corrode steel or cause swelling or deterioration of neoprene.

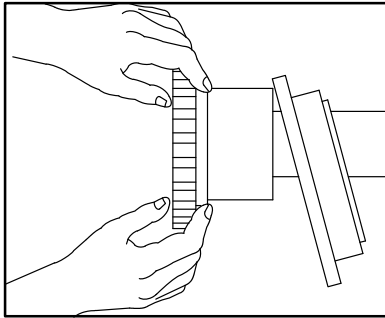
Clean - Free from foreign inclusions.

A list of lubricants meeting the above specifications is available from the factory.

**LUBE FITTINGS:**

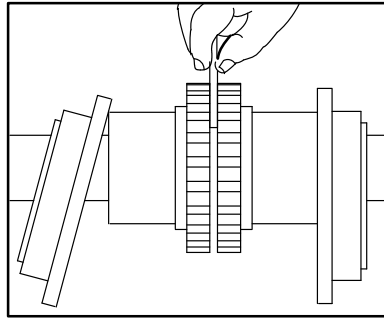
A standard grease gun with a 1/8 NPT fitting, or any standard lube fitting including the Alemite No. 1610B, Lincoln No. 5000 or Universal No. 800, may be used on the 1/8 NPT fitting in the cover.

**INSTALLATION OF TYPE T10/H AND T20/V TAPERED GRID COUPLINGS**



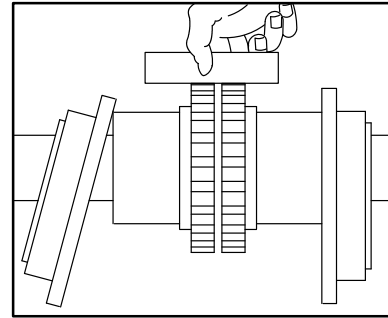
**1 MOUNT COVERS, SEALS AND HUBS**

Place Type T20/V cover and seal, or Type T10/H seal only on shaft BEFORE mounting hub (the Type T10/H cover is mounted later). Mount hubs on their respective shafts so the hub face is flush with the end of its shaft.  
NOTE: Recommended minimum engagement is one shaft diameter.



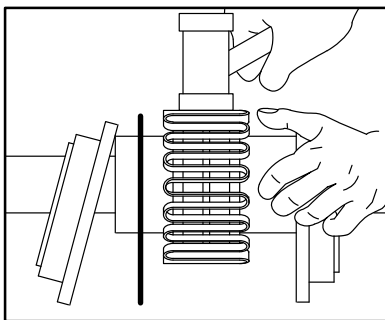
**2 CHECK GAP AND ANGULAR ALIGNMENT**

For best results, use a spacer bar equal in thickness to the gap specified in Table 2. Check alignment by placing the spacer between the hubs as shown, and at 90° intervals around the hub.



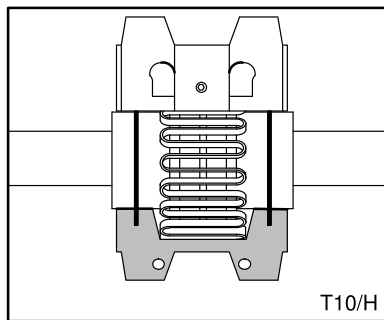
**3 CHECK OFFSET MISALIGNMENT**

Align shafts so that a straight edge will rest squarely on both hubs as shown, and at a position 90° away. Fasten foundation bolts and recheck both angular and offset alignment before doweling connected machinery in place.



**4 INSERT GRID**

After coupling hubs are aligned, insert the Type T20/V gasket through the gap and hang it on either hub. Pack gap and grooves with lubricant before inserting grid. When grids are furnished in two segments, install them so that all cut ends extend in the same direction. This will assure correct grid contact with lug in the T10/H cover and permit cover installation. Since grid runs are truly radial, it is necessary to spread the grid slightly to pass it over the coupling teeth. To minimize spreading, start grid at either end and then tap it into place. DO NOT attempt to force grid to the bottom of the groove, it will seat easily after all runs are positioned.

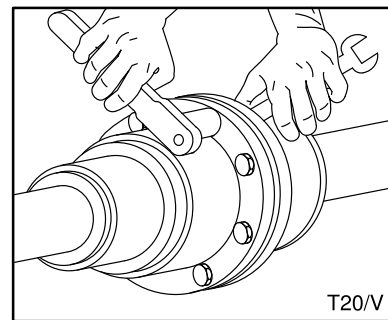
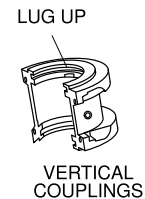


**5 POSITION COVERS**

Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Covers will be easier to install if lube plugs are not in place during this operation to allow trapped air to escape.

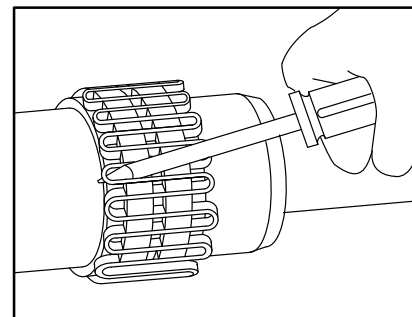
**Type T10/H Cover:** Assemble cover halves with the lug and match mark UP, or on the high side of the coupling so that the cover will be correctly positioned. The adjacent cover outer rib is match marked to indicate location of the lug. Slide seals into position on the hubs. Cover halves assemble in only one position. The correct position is with the lube holes (one in each cover half) at 180°. If bolt holes do not line up, reverse one cover half. Insert gaskets at cover splits and secure with cap screws and elastic stop nuts furnished. Lubricate per Step 6.

**Type T20/V Cover:** Place seals on cover halves and slide into hubs. Position cover halves with lube holes (one in each half cover) at 180°. Draw gasket and cover halves together, and secure with cap screws, nuts and lockwashers furnished. Lubricate per Step 6.

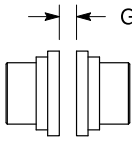
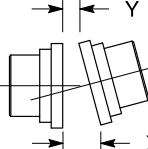
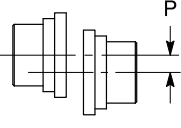


**6 LUBRICATE** - With the lube relief plug removed, fill the coupling through fitting with recommended grease until an excess appears at the relief. INSTALL LUBE PLUG when lubrication is completed.

**7 COUPLING DISASSEMBLY AND GRID REMOVAL** - Whenever it is necessary to disconnect the coupling, draw back the cover halves and remove the grid. A round rod or screwdriver that will conveniently fit into the open loop ends of the grid is required. Begin at the open end of the grid section and insert the rod or screwdriver into the loop ends. Use the teeth adjacent to each loop as a fulcrum and pry the grid out radially in even, gradual stages. Proceed alternately from side to side, lifting the grid about halfway out until the end of the grid is reached. By following the same procedure once again, the grid will clear the teeth.



**TABLE 2 - TAPER GRID INSTALLATION DATA**

<p>GAP AT CENTERLINE</p> 	<p>ANGULAR MISALIGNMENT</p> 	<p>OFFSET MISALIGNMENT</p> 
G NOMINAL	X MINUS Y**	P MAXIMUM

SERVICE LIFE OF COUPLING DEPENDS ON GOOD ALIGNMENT

ALL DIMENSIONS ARE IN INCHES

SIZE	MAXIMUM SPEED (RPM)		GAP AT CENTERLINE			X - Y** MAX.	P MAX.	COVER BOLT TORQUE (IN-LBS)	LUBE WGT. (LBS.)
	T10/H	T20/V	MIN.	NOMINAL	MAX.				
1020T	4500	6000	.062	.125	.188	.005	.005	100	.06
1030T	4500	6000	.062	.125	.188	.005	.005	100	.06
1040T	4500	6000	.062	.125	.188	.005	.005	100	.12
1050T	4500	6000	.062	.125	.188	.005	.005	200	.12
1060T	4350	6000	.062	.125	.188	.010	.010	200	.19
1070T	4125	5500	.062	.125	.188	.010	.010	200	.19
1080T	3600	4750	.062	.125	.250	.010	.010	200	.38
1090T	3600	4000	.062	.125	.250	.012	.012	200	.56
1100T	2440	3250	.062	.188	.375	.012	.012	260	.94
1110T	2250	3000	.062	.188	.375	.012	.012	260	1.1
1120T	2025	2700	.062	.250	.500	.012	.012	650	1.6
1130T	1800	2400	.062	.250	.500	.012	.012	650	2.0
1140T	1650	2200	.062	.250	.500	.015	.015	650	2.5
1150T	1500	2000	.062	.250	.500	.015	.015	650	4.2
1160T	1350	1750	.062	.250	.500	.015	.015	650*	6.2
1170T	1225	1600	.062	.250	.500	.015	.015	1300	7.7

\* 160T20/V TORQUE = 1300 IN-LBS

\*\* X MINUS Y IS THE DIFFERENCE IN MINIMUM AND MAXIMUM CLEARANCE BETWEEN THE HUBS AT 180° AT THE OUTER EXTREMITY OF THE HUBS.

## MOTOR MAINTENANCE INSTRUCTIONS FOR C-FACE AND FOOT MOUNTED MOTORS FURNISHED BY LIGHTNIN

### SECTION 1 – INITIAL INSPECTION, SHIPPING ARRANGEMENTS

1.1 Care is taken at the factory to assure that the motor arrives at its destination in first class condition. If there is evidence of rough handling or damage in shipment, file a claim at once with the carrier and notify our factory.

Examine the outside of the motor carefully for damage, with particular attention to the conduit box, fans and covers. Check nameplate for correct speed, horsepower/kilowatt, voltage, hertz and phase for conformance with power supply. See warning below for explosion proof motors.

#### 1.2 WARNING

**EXPLOSION PROOF MOTORS** – These motors are constructed to comply with the U.L. Label Service Procedure manual. When repairing and reassembling a motor that has an Underwriter's Label, it is imperative that the unit be reinspected and:

- All original fits and tolerances must be maintained.
- All plugs and hardware to be securely fastened.
- Any part replacements, including hardware, be accurate duplicates of the original.

**REPAIR WORK ON EXPLOSION PROOF MOTORS CAN ONLY BE DONE BY THE ORIGINAL MANUFACTURER OR U.L. CERTIFIED SERVICE SHOPS. VIOLATIONS OF ANY OF THE ABOVE ITEMS WILL INVALIDATE THE SIGNIFICANCE OF THE U.L. LABEL.**

### SECTION 2 – START-UP

2.1 After unpacking and inspection to see that all parts are in good condition, turn the shaft by hand to be sure there are no obstructions to free rotation. Equipment which has been in storage should be tested prior to putting into service.

- It is best to check the insulation resistance of the stator winding with a megohmmeter. If resistance is lower than one megaohm, the windings should be dried thoroughly before operating. Do not exceed a temperature of 80 degrees C (185 degrees F) in drying.
- Motors are shipped from the factory properly packed with grease and ready to operate. Where the motor has been subjected to extended storage (6 months or more), the bearings should be relubricated prior to starting. Refer to motor manufacturer's instruction manual for bearing lubrication details.

2.2 WIRING – Examine the nameplate data to see that it agrees with the power circuit to which the motor is to be connected. The motor is guaranteed to operate successfully with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below the nameplate data. Efficiency, power factor and current may vary from nameplate data.

2.3 Temporarily connect the motor leads to a power source that matches the line voltage and wiring diagram specified on the motor nameplate, inside the conduit box, or the motor manufacturer's instruction manual.

2.4 Check impeller shaft rotation by jogging the motor until it is determined that rotation is correct

#### 2.5 CAUTION

Repeated trial starts can overheat the motor (particularly for across-the-line starting). If repeated trial starts are made, allow sufficient time between trials to permit heat to dissipate from the windings or rotor to prevent overheating. Starting currents are several times running currents, and heating varies as the square of the current.

When checks are satisfactory, make permanent connections.

#### 2.6 WARNING

The frames and other metal exteriors of motors should be grounded to limit their potential to ground in the event of accidental connection or contact between live electrical parts and the metal exteriors. All motors should be grounded through the conduit box. Explosion proof motors have an integral ground lead for grounding.

## 2.7 WARNING

Before starting motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off.

2.8 Start motor and operate at minimum load prior to filling the tank or basin. Look for any unusual condition. The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that the motor has been connected improperly. Shut down the motor immediately and investigate for trouble.

It is recommended that condensation drain plugs be removed, if motor is so equipped. These are located in the lower portion of the end shields or frame.

## SECTION 3 – MOTOR MAINTENANCE AND STORAGE

3.1 To ensure continued, reliable operation of electric motors, the following basic rule applies: **KEEP THE MOTOR CLEAN, DRY AND PROPERLY LUBRICATED.** Motors should be inspected at regular intervals, with frequency depending upon the type of motor and service.

Windings should be cleaned by blowing or vacuuming dust from them. Ventilation openings must be kept clear. If dust or dirt is to be removed with a vacuum cleaner, nozzle should be of the non-metallic type. Deposits of dirt and grease may be removed using a commercially available low volatile solvent. **DO NOT USE GASOLINE OR OTHER FLAMMABLE SOLVENTS.**

3.2 Terminal connections and assembly hardware may loosen from vibration during service and should be tightened.

3.3 Insulation resistance should be checked at operative temperature and humidity conditions to determine possible deterioration of insulation due to excessive moisture or extremes in operating environment. If wide variations are detected, motor should be reconditioned.

3.4 LUBRICATION – Prior to shipment, motor bearings are greased with the proper amount and grade of lubricant by the motor manufacturer. It is recommended that the bearing lubricant be inspected at the end of two or three months to determine the necessity to add grease. Frequency of re-lubrication will vary with particular applications. Refer to the motor manufacturer's instruction manual for complete details.

**NOTE:** The greatest cause of bearing failure is over-greasing rather than under-greasing.

### 3.5 TYPE OF LUBRICANT

- Check the motor nameplate or manufacturer's instruction manual to determine whether a specific grease has been recommended by the motor manufacturer, and use that grease if possible.
- Lacking a specific grease recommendation, refer to the following:  
For best results, grease should be compounded from a lithium soap base and a good grade of petroleum oil. It should be No. 2 consistency and stabilized against oxidation. Most leading oil companies have a special bearing grease that is satisfactory. Your local lubricant supplier may be able to assist.

### 3.6 LUBRICATION PROCEDURE

- Each motor manufacturer has a specific method for regreasing the bearings. Refer to the motor manufacturer's instruction manual for complete details.

**NOTE:** Bearings and grease **MUST** be kept free of dirt.

### 3.7 OIL LUBRICATED MOTORS (Sleeve Bearing equipped)

- Electric motor or SAE 20 oil should be added after 3 years of normal service or 1 year of heavy duty service. For more specific instructions, consult the motor manufacturer's instruction manual or contact motor manufacturer's local representative.

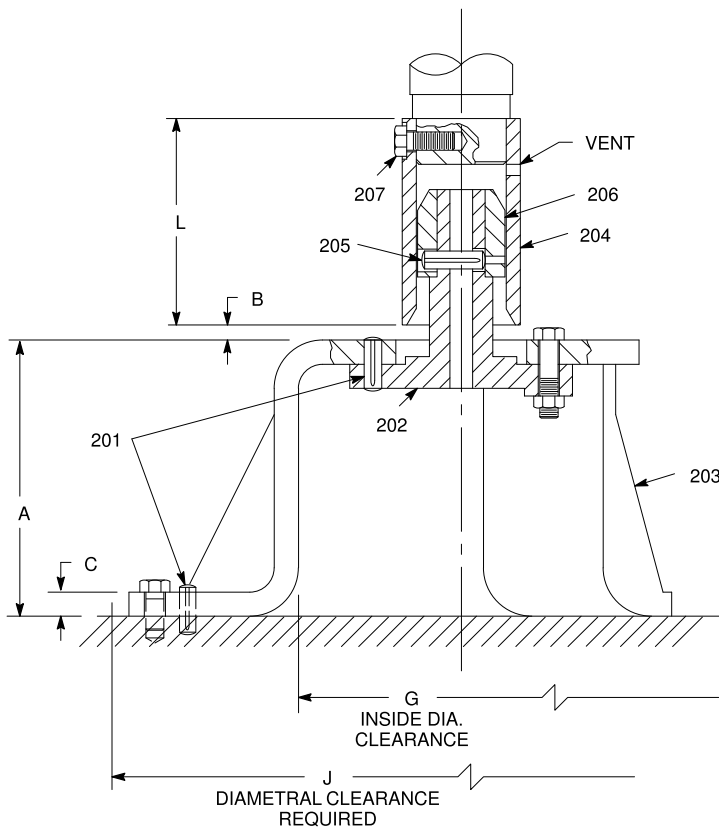
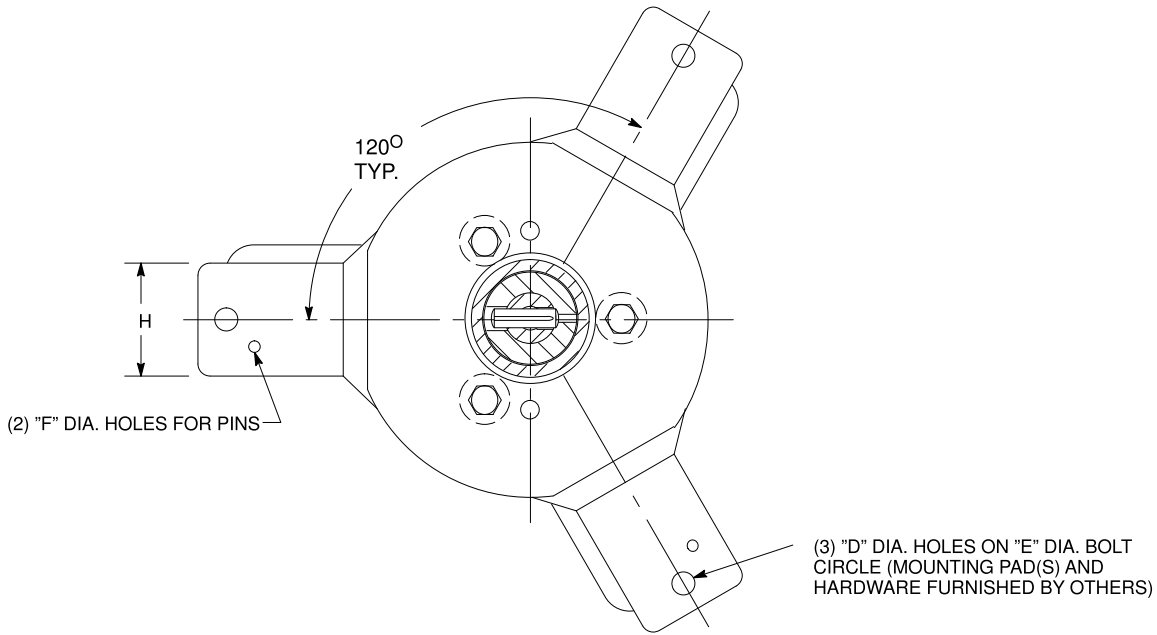
## SECTION 4 – STORAGE

Electric motors or other prime movers are not prepared by **LIGHTNIN** for indoor storage beyond 12 months in a dry ambient atmosphere with controlled temperatures, or 6 months in a dry ambient atmosphere with no temperature control. **OUTDOOR STORAGE OF ELECTRIC MOTORS IS NOT RECOMMENDED BY ANY MOTOR MANUFACTURER.** For information on storage periods beyond those shown, consult **LIGHTNIN**.



**4.1 STORAGE REQUIREMENTS FOR MOTORS** – These extended storage requirements must be followed to allow the submission of a valid warranty claim:

- The motor, if not mounted, is to be stored in the original container in a clean, dry, protected warehouse.
- The storage area is to be free from any vibration and from extremes in temperature.
- Bearings:
  - Ball & Roller (anti-friction) – The bearings are to be fully greased at the time the motor goes into extended storage. Motor shaft is to be rotated manually every month at least 10 to 15 revolutions. Every six months, and at time of removal from storage, the bearings are to be purged, making sure an ample supply of fresh grease is in the bearing. Refer to the motor manufacturer's instruction manual for details.
  - Sleeve (oil lube) – The bearings are tested using oil containing a rust inhibitor. If motor is stored for more than one month, the oil reservoir must be filled in accordance with the motor manufacturer's instruction manual. The shaft should be rotated by hand every month at least 10 to 15 revolutions to assure that an oil film is on the shaft and bearing surfaces.
- All drains are to be operable while motor is in storage, and/or the drain plugs removed. The motor must be stored so that the drain is at the lowest point. Any breathers or automatic "T" drains must be operable to allow breathing at points other than through the bearing fits.
- Motor equipped with a heater is to have the heater connected if storage conditions in any way simulate or approach atmospheric conditions experienced in operation.
- Windings are to be megged at the time the motor is put into storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point necessitates electrical or mechanical drying. Where a large quantity of motors is stored, an inspection or sampling should be made by removing the end brackets and visually inspecting for the presence of water in the grease or rust on the bearings. If present, replace the bearing and relubricate.
- All external parts and motors subjected to corrosion should be protected by a corrosion resistant coating.
- Where motor is not stored in the original container, the mounting must be such that the drains and breathers are fully operable. In this respect, the drains must be kept at the lowest point in the motor and/or drain plugs removed so that all condensation can automatically drain out.
- All other storage conditions apply, including rotation of the motor shafts. Where such conditions cannot be met, then the motor must be treated the same as if it were mounted in its normal position, and all protective devices such as heaters, breathers and drains fully operational.



WHEN ORDERING PARTS, SPECIFY:  
MACHINE SERIAL NO., ITEM NO. AND  
DRAWING NO.

207	RETAINING SCREW
206	BUSHING
205	BUSHING PIN
204	SLEEVE
203	TRIPOD
202	BUSHING HOLDER
201	LOCATING PIN
ITEM	PART NAME



CERTIFIED

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HEREIN AND RELATED KNOW-HOW IS CONFIDENTIAL AND  
THE PROPERTY OF THE LIGHTNIN GROUP OF COMPANIES.  
NO USE OR DISCLOSURE THEREOF MAY BE MADE WITHOUT  
OUR WRITTEN PERMISSION.

SHAFT DIA.	A	B		C	D	E	F	G	H	J	L
		MIN.	MAX.								
1-1/2 & 2	5-1/2	1/8	1	1/2	3/4	12	3/8	7	2-1/2	14	4-3/8
2-1/2 & 3	7-5/16	1/8	5/8	5/8	7/8	14-1/4	1/2	8-1/2	3	16-1/2	5-7/8
3-1/2 & 4	9	-1/8	5/8	5/8	1"	17	1/2	10-1/4	3	19-1/2	7-5/8
4-1/2	11	-1/8	1-1/4	3/4	1-1/4	18-3/4	1/2	11-1/4	4	22	9-1/2
5, 5-1/2 & 6	13-5/16	0	1-3/8	3/4	1-3/8	21-1/4	1/2	13-1/4	4-1/2	25	12

**LIGHTNIN**®  
MIXERS AND AERATORS

ASSEMBLY DRAWING  
**TRIPOD MOUNTED  
STEADY BEARING  
ASSEMBLY**

**INSTRUCTIONS FOR *LIGHTNIN*<sup>®</sup> STEADY BEARING  
(TRIPOD MOUNTED TYPE)**

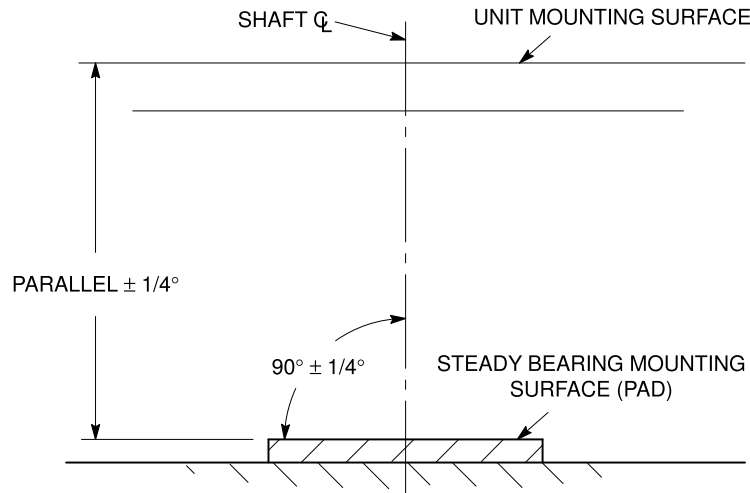
**SECTION 1 – GENERAL**

- 1.1 *LIGHTNIN*<sup>®</sup> steady bearings are designed to provide excellent service under all normal conditions. The rate of wear on the steady bearing bushing (206) can vary considerably depending on the severity of the operating conditions. It is important that periodic examinations of the bushing be made to establish, in advance, some indication of the rate of wear. If the bushing becomes too badly worn, serious damage to other steady bearing components and the mixer shaft and impellers can result. Therefore, it is recommended that the bushing be examined after 500 hours of operation. On the basis of this examination, determine the intervals of time between subsequent inspection and/or replacements.
- 1.2 The mixer mounting surface and the steady bearing mounting surface should be parallel within 1/4°. If they are not, a tapered gasket, a dutchman or shims should be added to obtain the required parallelism.

**IMPORTANT: THE MIXER SHOULD NOT BE OPERATED WHILE THE STEADY BEARING IS DRY. THE STEADY BEARING MUST BE LUBRICATED BY THE TANK CONTENTS OR BY SOME OTHER TYPE OF LUBRICANT.**

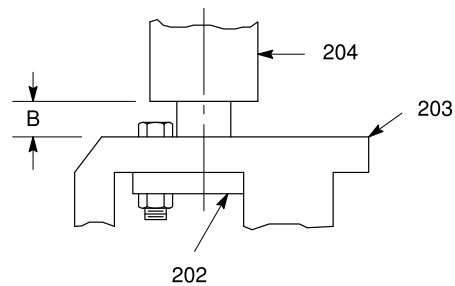
**SECTION 2 – INSTALLATION**

- 2.1 After the impeller/s are installed on the shaft, and the lower shaft is coupled to the upper shaft, slide the shaft sleeve (204) on the lower shaft, and install the retaining screw (207).
- 2.2 With the unit in position, plumb the lower shaft and check its perpendicularity with the steady bearing mounting surface. If not within ± 1/4°, correct with a tapered gasket, dutchman or shims (see Figure 1).



**FIGURE 1**

- 2.3 Disassemble the bushing holder (202) from the tripod (203).
- 2.4 Bolt the mounting pad(s) securely to the tripod (203) and place the tripod under the shaft in its approximate position. Do not secure at this time.
- 2.5 Raise the bushing holder (202), including the bushing (206), up through the tripod (203) and slide into the shaft sleeve (204).
- 2.6 Attach the bushing holder (202) to the tripod (203) by means of the three bolts. Be sure the bushing holder holes are as nearly centered with the tripod holes as possible.
- 2.7 Check the clearance between the shaft sleeve (204) and the tripod (203) as designated by the "B" dimension in Figure 2.



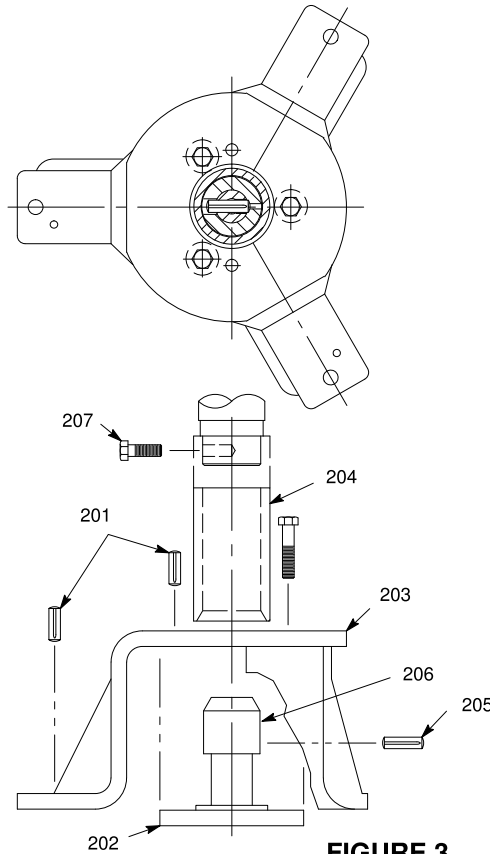
SHAFT DIA.		1-1/2 & 2	2-1/2 & 3	3-1/2 & 4	4-1/2	5 - 6
B	MIN.	1/8	1/8	-1/8	-1/8	0
	MAX.	1	5/8	5/8	1-1/4	1-3/8

**FIGURE 2**

- 2.8 Turn the reducer input shaft by hand and align the steady bearing tripod as closely as possible.
- 2.9 Secure the mounting pad(s) to the tank bottom after aligning the tripod.
- 2.10 Loosen the bolts holding the bushing holder (202) to the tripod (203). Rotate the reducer input shaft by hand again and obtain final alignment by adjusting the bushing holder position.
- 2.11 After final alignment has been obtained, pin the assembly using the four holes in the tripod as a guide. Drill four holes for a light drive fit of the Type 3 groove pins (furnished by **LIGHTNIN**).
- 2.12 The steady bearing is now ready for use.

**SECTION 3 – REPLACING BUSHING AND/OR SHAFT SLEEVE**

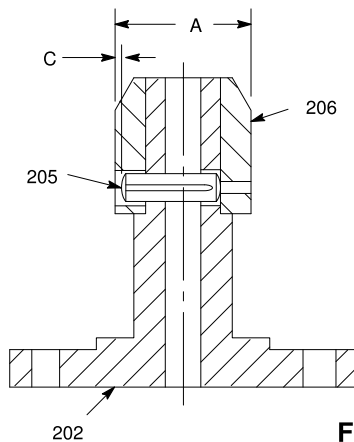
- 3.1 Remove the two groov-pins (201) from the tripod (203) by driving them down through the bushing holder (202).
- 3.2 Remove the bushing holder to tripod bolts, allowing the bushing holder and bushing to be removed.
- 3.3 Drive out the bushing pin (205) and remove the bushing (206) from the bushing holder (202).
- 3.4 Press a new bushing (206) on the bushing holder (202). Make sure that the hole in the bushing lines up with the hole in the bushing holder.
- 3.5 Drive the bushing pin (205) into the bushing holder (202) until it bottoms. This pin must be underflush to the "C" dimension shown in Figure 4.



207	RETAINING SCREW
206	BUSHING
205	BUSHING PIN
204	SLEEVE
203	TRIPOD
202	BUSHING HOLDER
201	LOCATING PIN
ITEM	PART NAME

**FIGURE 3**

- 3.6 Remove the retaining screws (207) and tap the shaft sleeve (204) free of the shaft.
- 3.7 Slide a new shaft sleeve (204) on the shaft and insert the retaining screw (207).
- 3.8 Bolt the bushing holder (202) with bushing (206) loosely to the tripod (203).
- 3.9 Line up the two groov-pin holes and drive in the groov-pins (201).
- 3.10 Tighten the bolts holding the bushing holder to the tripod.
- 3.11 The steady bearing is again ready for use.



SHAFT DIA.	A	C <sup>+0</sup> / <sub>-1/32</sub>
1-1/2 & 2	1-3/4	3/16
2-1/2 & 3	2-1/4	
3-1/2 & 4	3-1/4	5/16
4-1/2	3-1/2	3/8
5 & 5-1/2	5	

**FIGURE 4**

**REDUCER PARTS**

**UNIT SIZE: 780RL**

**DOUBLE/TRIPLE**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
	D	DRAWING L-17301				
	T	DRAWING L-17302				
500		LOW SPEED HSG. (CASTING USED AFTER NOV. 1998)	1	220798PSP		
		LOW SPEED HOUSING (FABRICATION)		218629PSP		
501	D	HIGH SPEED HOUSING (SEE NOTE 2)	1	278254PSP		
	T			278255PSP		
502		ROLL PIN	2	108515PSP		
503		COVER PLATE	1	208171PSP		
504*		OIL SEAL	1	115444PSP		
507		DIPSTICK	1	121236PSP		
508		L.S. BEARING CAGE	1	206984PSP		
509*		OIL SEAL	1	115442PSP		
511		HEX HEAD CAP SCREW - NYLOK	8	100304GR5		
512		L.S. SEAL CAGE	1	207846PSP		
513*		OIL SEAL	1	115463PSP		
514		GASKET	1	125758PSP		
515		OIL DISTRIBUTOR COVER	1	207107PSP		
516*		GASKET	1	125761PSP		
517		ROLL PIN	1	108501PSP		
518*		BREATHER FILTER	1	121504PSP		
521		RETAINING RING	1	114363PSP		
527		COVER PLATE	1	207847PSP		
528*		GASKET	1	207848PSP		
600		LOW SPEED SHAFT	1	218658PSP		
601*		BEARING	2	117068PSP		
602		SPACER	1	206979PSP		
605		UMBRELLA	1	218635PSP		
701*		BEARING	1	117102PSP		
702		RETAINING RING	1	114359PSP		
703*		RETAINING RING	1	114360PSP		
704		SPACER	1	208190PSP		
707		SHAFT SLEEVE	1	208192PSP		
708*		BEARING	2	117101PSP		

**◆ IDENTITY CODE:**

D = Double Reduction Units  
T = Triple Reduction Units

Blank code denotes common parts

\* Recommended spare parts

**NOTES:**

1. Not Furnished After 7/1/2000.
2. These components were part of a non-interchangeable change. refer to factory for units furnished prior to 11/2005. If the old bearing (117103PSP) is not available, use the H. S. Head upgrade kit along with the new bearing (802).
3. Not Furnished after 7/1/2001

**REDUCER PARTS**

**UNIT SIZE: 780RL**

**DOUBLE/TRIPLE**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
711		THRUST PLATE	1	112917PSP		
712		HEX HEAD CAP SCREW – NYLOK	3	100301GR5		
713		PINION BEARING HOUSING	1	208187PSP		
715		HEX HEAD CAP SCREW – NYLOK	4	100292GR5		
800		BEVEL PINION BEARING HOUSING	1	208188PSP		
802		NOSE BEARING – (SEE NOTE 2)	1	278256PSP		
803		OIL SLINGER	1	139294PSP		
804*		BEARING	2	117069PSP		
805		WASHER	1	205515PSP		
806		LOCKNUT	1	205522PSP		
807	D	KEY – H.S. EXTENSION	1	190889PSP		
809	D	H.S. BEARING RETAINER	1	208186PSP		
	T	BEARING RETAINER		208184PSP		
810*	D	OIL SEAL	1	115443PSP		
811*		GASKET	1	125880PSP		
812		ROLL PIN	1	108512PSP		
815	T	LOCKNUT	1	192611PSP		
817	T	HEX HEAD CAP SCREW – NYLOK	8	100321GR5		
819		DOWEL PIN	2	108529PSP		
820		SPACER	1	208191PSP		
821*		O-RING (3)	1	221062PSP		
900	T	HIGH SPEED COVER	1	208183PSP		
901	T	HIGH SPEED PINION SHAFT	1	208180PSP		
904	T	LOCKNUT	1	192611PSP		
905*	T	BEARING	2	117070PSP		
906	T	SPACER	1	206982PSP		
907	T	WASHER	1	205515PSP		
908	T	LOCKNUT	1	205522PSP		
909	T	H.S. BEARING RETAINER	1	206988PSP		
910*	T	OIL SEAL	1	115443PSP		
911*	T	GASKET (SEE NOTE 1)	1	125762PSP		
912	T	KEY – H.S. EXTENSION	1	190889PSP		
913	T	ROLL PIN	2	108505PSP		
914	T	ROLL PIN	1	108501PSP		

◆ **IDENTITY CODE:**

D = Double Reduction Units  
T = Triple Reduction Units

Blank code denotes common parts

\* Recommended spare parts

**NOTES:**

1. Not Furnished After 7/1/2000.
2. These components were part of a non-interchangeable change. refer to factory for units furnished prior to 11/2005.  
If the old bearing (117103PSP) is not available, use the H. S. Head upgrade kit along with the new bearing (802).
3. Not Furnished after 7/1/2001





**GEAR KITS**

**UNIT SIZE: 780 / 880**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENTITY CODE #	DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.						
*		<b>Low Speed Gear Kit - All Ratios - Consisting of:</b>				
510		Shim Set	1	125763PSP		
604		Key - Low Speed Gear	1	190857PSP		
603 / 700		<b>Low Speed Gear &amp; Pinion Set</b>				
		For Ratios 7.679 & 9.064	1	180760PSP		
		For All Other Ratios	1	180757PSP		
*		<b>Bevel Pinion Kit - Consisting of:</b>				
706		Key - Bevel Gear	1	190888PSP		
710		Shim Set	1	125936PSP		
714		Shim Set	1	125870PSP		
803		Oil Slinger	1	139294PSP		
808		Shim Set	1	125875PSP		
705 / 801		<b>Bevel Gear &amp; Pinion Set</b>				
	D	For Ratios 7.68 & 11.70	1	207992PSP		
	D	For Ratios 9.06 & 13.81	1	208000PSP		
	D	For Ratios 17.36	1	208006PSP		
	D	For Ratios 21.08	1	208016PSP		
	D	For Ratios 25.63	1	208026PSP		
	D	For Ratios 31.96	1	208036PSP		
	T	For Ratios 21.43 Thru 71.02	1	208022PSP		
*		<b>High Speed Pinion Kit - Triple Reduction Only - Consisting of:</b>				
814	T	Key - High Speed Gear	1	190887PSP		
903	T	Key - High Speed Pinion	1	190887PSP		
813 / 902		<b>High Speed Gear &amp; Pinion Set</b>				
	T	For Ratio 21.43	1	208042PSP		
	T	For Ratio 25.84	1	208048PSP		
	T	For Ratio 31.38	1	208211PSP		
	T	For Ratio 39.07	1	208054PSP		
	T	For Ratio 47.42	1	208217PSP		
	T	For Ratio 58.46	1	208060PSP		
	T	For Ratio 71.02	1	208223PSP		

**# IDENTITY CODE:**

D = Double Reduction Unit

T = Triple Reduction Unit

Blank Code denotes common parts.

\* Recommended spare parts

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**GEAR KITS**

**UNIT SIZE: 780 / 880**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENTITY CODE #	DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
Note: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier.						
805		Washer		Refer to Reducer Parts: IT-3295, 3296 or 3297		
815	T	Locknut				
904	T	Locknut				
		<b>Double Reduction High Speed Head Kit</b>				
		Consisting of items 501, 502, 515, 516, 700 Thru 708, 710 Thru 715, 800 Thru 812, 819 & 820:				
	D	For Ratios 7.68	1	602069PSP		
	D	For Ratios 9.06	1	602070PSP		
	D	For Ratios 11.70	1	602071PSP		
	D	For Ratios 13.81	1	602072PSP		
	D	For Ratios 17.36	1	602073PSP		
	D	For Ratios 21.08	1	602074PSP		
	D	For Ratios 25.63	1	602075PSP		
	D	For Ratios 31.96	1	602076PSP		
		<b>Triple Reduction High Speed Head Kit</b>				
		Consisting of items 501, 502, 515, 516, 700 Thru 708, 710 Thru 715, 800 Thru 806, 808 Thru 815, 817, 819, 820, & 900 Thru 914:				
	T	For Ratio 21.43	1	602077PSP		
	T	For Ratio 25.84	1	602078PSP		
	T	For Ratio 31.38	1	602079PSP		
	T	For Ratio 39.07	1	602080PSP		
	T	For Ratio 47.42	1	602081PSP		
	T	For Ratio 58.46	1	602082PSP		
	T	For Ratio 71.02	1	602083PSP		

# **IDENTITY CODE:**

D = Double Reduction Unit

T = Triple Reduction Unit

Blank Code denotes common parts.

\* Recommended spare parts

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**MIXER PARTS**

**UNIT SIZE: 780C**

**5" DIA. SHAFT**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
		DRAWING - L-16617				
		DRAWING - L-16312				
101		MOTOR				
102		MOTOR SHIM PACK				Refer to Prime Mover Parts
105		LOWER SHAFT				Contact <b>LIGHTNIN</b> Representative
108		MOTOR BRACKET				
110		MOTOR FLEXIBLE COUPLING				Refer to Prime Mover Parts
111*		PACKING				
112*		SEPARATORS				Refer to Stuffing Box Parts
117		UPPER SHAFT	1	208524STL		
				208524316		
		ONE PIECE SHAFT				Contact <b>LIGHTNIN</b> Representative
129		HUB & FLANGE ASSEMBLY				Refer to Stuffing Box Parts
130		LANTERN RING	1	137583BRZ		
131		PACKING GLAND	1	137275BRZ		
132		GLAND CLAMP	2	150094CPS		
136		GLAND STUD	2	109224CPS		
137		HEX NUT	2	107010CPS		
183		HEX HEAD CAP SCREW				
184		COUPLING GUARD				Refer to Prime Mover Parts
186		LOWER BEARING MEMBER	1	208521STL		
191		HOOK KEY	1	190715STL		
193		SOCKET HEAD CAP SCREW	3	102608GR5		
196*		RETAINING RING - JC #437 O-RING	1	115801BUN		
197		SPLIT THRUST RING	1	114361414		
220		OUTBOARD SUPPORT				Refer to Prime Mover Parts
226		THRUST PLATE	1	112866414		
322		COVER PLATE	1	205463STL		
323		COVER PLATE	1	205461STL		
327		LOCATING PIN	4	108511PSP		

◆ **IDENTITY CODE:**

Blank code denotes common parts

\* Recommended spare parts

**MIXER PARTS**

**UNIT SIZE: 780C**

**5" DIA. SHAFT**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
527		COVER PLATE				
528*		GASKET				
600		GEAR DRIVE LOW SPEED SHAFT				
		REDUCER ASSEMBLY COMPLETE				
		REDUCER ASSEMBLY PARTS				

◆ **IDENTITY CODE:**

Blank code denotes common parts

\* Recommended spare parts

**FLANGE ASSEMBLY      UNIT SIZE: 780/880, 781/881 & 782/882S**  
**STYLE A, B & C**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
MODEL 780/880S						
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	4.5		1	198323GRC		
	4.5		1	198320316		
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	5		1	198326GRC		
	5		1	198324316		
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	5.5		1	198329GRC		
	5.5		1	198327316		
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	6		1	198439GRC		
	6		1	198437316		
MODEL 781/881S						
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	5		1	198326GRC		
	5		1	198324316		
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	5.5		1	198329GRC		
	5.5		1	198327316		
129		FLANGE ASSEMBLY – 20" ANSI 150#				
	6		1	198439GRC		
	6		1	198437316		
MODEL 782/882S						
129		FLANGE ASSEMBLY – 24" ANSI 150#				
	5.5		1	198659GRC		
	5.5		1	198660316		
129		FLANGE ASSEMBLY – 24" ANSI 150#				
	6		1	198662GRC		
	6		1	198663316		
129		FLANGE ASSEMBLY – 24" ANSI 150#				
	6.5		1	198667GRC		
	6.5		1	198665316		

**◆ IDENTITY CODE:**

- |                         |                         |
|-------------------------|-------------------------|
| 4.5 = 4-1/2" Dia. Shaft | 6 = 6" Dia. Shaft       |
| 5 = 5" Dia. Shaft       | 6.5 = 6-1/2" Dia. Shaft |
| 5.5 = 5-1/2" Dia. Shaft |                         |

\* Recommended spare parts

**PRIME MOVER PARTS**

**UNIT SIZE: 780/880**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	LIST PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
101		MOTOR – FRAME 444T, 445T & 447T		Contact <b>LIGHTNIN</b> Representative		
		DOUBLE REDUCTION				
102		MOTOR SHIM PACK	1	119991PSP		
108		MOTOR BRACKET – 780/880Q	1	208343PSP		
		MOTOR BRACKET – 780/880C		208339PSP		
		MOTOR BRACKET – 780/880S		208339PSP		
	R	MOTOR BRACKET – 880C		208339PSP		
110		MOTOR FLEXIBLE COUPLING COMPLETE	1	804045PSP		
		PARTS FOR MOTOR FLEXIBLE COUPLING:				
		MOTOR HUB	1	131494PSP		
		REDUCER HUB	1	131492PSP		
*		COVER KIT (INCLUDES GASKETS, SEAL RINGS, COVERS & FASTENERS)	1	215104PSP		
*		GRID MEMBER	1	202296PSP		
183		HEX HEAD CAP SCREW	6	100180GR5		
184		COUPLING GUARD	1	208331PSP		
220		OUTBOARD SUPPORT – 780/880C	1	208584STL		
		OUTBOARD SUPPORT – 780/880S		208592STL		
	R	OUTBOARD SUPPORT – 880C		208575STL		

◆ **IDENTITY CODE:**  
R = Removable Coupling Above Stuffing Box

Blank code denotes common parts

\* Recommended spare parts

**PACKING & SEPARATORS**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier

**PACKING SIZE:**

Packing used is "Square" Cross Section  
Type based on Shaft Diameter.

**PACKING NOTES:**

1. See Stuffing Box Assembly Drawing for quantity of Packing and Separators furnished.
2. Units with Low Pressure Stuffing Box have two Packing Rings and no Separators.

SHAFT DIA.	PACKING SIZES
2" Models 73C or 83C	5/8 sq.
2"	3/8 sq.
2-1/2 thru 4	5/8 sq.
4-1/2 thru 6-1/2	3/4 sq.

LIGHTNIN COMBINATION NUMBERS	INTERCHANGEABILITY
	Order the new style packing listed in the left hand column as replacement packing for LIGHTNIN old style combinations.
40	Teflon (C-1045) & Comb's 2, 2M & 20
50	Comb's 1, 1M, 3, 3M, 4, 4M, 5, 6, 10, 30, and Paperstock (7)
60	Food Service

PKG. SIZE	SHAFT DIA.	PART NO. COMB. 40		PART NO. COMB. 50		PART NO. COMB. 60		SEPARATOR (ITEM 112)
		KIT	RING (ITEM 111)	KIT	RING (ITEM 111)	KIT	RING (ITEM 111)	
3/8	3/4	804223PSP	124559PSP	804240PSP	124565PSP	829399PSP	124827PSP	125299TEF
	7/8	804224PSP	124560PSP	804241PSP	124566PSP	829400PSP	124828PSP	125300TEF
	1	804225PSP	124561PSP	804242PSP	124567PSP	829401PSP	124829PSP	125301TEF
	1-1/4	804226PSP	124562PSP	804243PSP	124568PSP	829402PSP	124830PSP	125298TEF
	1-1/2	804227PSP	124563PSP	804244PSP	124569PSP	829403PSP	124831PSP	125302TEF
	1-1/2	*804228PSP	124563PSP	*804245PSP	124569PSP	829415PSP	124831PSP	125302TEF
	2	804229PSP	124564PSP	804246PSP	124570PSP	829404PSP	124832PSP	125303TEF
5/8	2	804230PSP	124571PSP	804247PSP	124576PSP	829405PSP	124833PSP	125548TEF
	2-1/2	804231PSP	124572PSP	804248PSP	124577PSP	829406PSP	124834PSP	125304TEF
	3	804232PSP	124573PSP	804249PSP	124578PSP	829407PSP	124835PSP	125309TEF
	3-1/2	804233PSP	124574PSP	804250PSP	124579PSP	829408PSP	124836PSP	125310TEF
	4	804234PSP	124575PSP	804251PSP	124580PSP	829409PSP	124837PSP	125311TEF
3/4	4-1/2	804235PSP	124581PSP	804252PSP	124586PSP	829410PSP	124838PSP	125312TEF
	5	804236PSP	124582PSP	804253PSP	124587PSP	829411PSP	124839PSP	125481TEF
	5-1/2	804237PSP	124583PSP	804254PSP	124588PSP	829412PSP	124840PSP	125482TEF
	6	804238PSP	124584PSP	804255PSP	124589PSP	829413PSP	124841PSP	125499TEF
	6-1/2	804239PSP	124585PSP	804256PSP	124590PSP	829414PSP	124842PSP	125533TEF

\* Kits for SG Units, which consist of 6 packing rings and 6 separators. All other kits consist of 7 packing rings and 7 separators.

**STEADY BEARING ASSEMBLY**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
<b>2" DIA. SHAFT:</b>						
204		SLEEVE	1	138702STL		
				138702304		
				138702316		
204		SLEEVE - SPLIT	1	138739STL		
				138739304		
				138739316		
206		BUSHING	1	118252CIR		
				118252BRZ		
				118252NIR		
				118252STL		
				118252304		
				118252316		
				118253GFT		
				118253MIC		
	118253NYL					
		118253RYT				
<b>2-1/2" &amp; 3" DIA. SHAFT:</b>						
204		SLEEVE	1	138703STL		
				138703304		
				138703316		
204		SLEEVE - SPLIT	1	138740STL		
				138740304		
				138740316		
206		BUSHING	1	118254CIR		
				118254BRZ		
				118254NIR		
				118254STL		
				118254304		
				118254316		
				118255GFT		
				118255MIC		
	118255NYL					
		118255RYT				

◆ **IDENTITY CODE:**  
Blank code denotes common parts

\* Recommended spare parts



**STEADY BEARING ASSEMBLY**

**For service and repair, call 1-888-MIX BEST (1-888-649-2378)**

ITEM NO.	IDENT. CODE ◆	DESCRIPTION	QTY.	PART NO.	PRICE (EACH)	SHIPMENT (WEEKS)
NOTE: See mixer nameplate or spec. sheet for unit size & ratio. See Assembly Drawing for item no. identifier						
<b>3-1/2" &amp; 4" DIA. SHAFT:</b>						
204		SLEEVE	1	138704STL		
				138704304		
				138704316		
204		SLEEVE - SPLIT	1	138741STL		
				138741304		
				138741316		
206		BUSHING	1	118256GFT		
				118256RYT		
				118256MIC		
				118256CIR		
				118256BRZ		
				118256NIR		
				118256NYL		
				118256STL		
	118256304					
	118256316					
<b>4-1/2" DIA. SHAFT:</b>						
204		SLEEVE	1	138705STL		
				138705304		
				138705316		
204		SLEEVE - SPLIT	1	138742STL		
				138742304		
				138742316		
206		BUSHING	1	118257GFT		
				118257RYT		
				118257MIC		
				118257CIR		
				118257BRZ		
				118257NIR		
				118257NYL		
				118257STL		
	118257304					
	118257316					

◆ **IDENTITY CODE:**  
Blank code denotes common parts

\* Recommended spare parts



**FOR AN UP TO DATE REPRESENTATIVE LIST  
PLEASE GO TO: [www.lightnin-mixers.com](http://www.lightnin-mixers.com)**

**-OR-**

**CALL: 1-888-649-2378  
1-888-MIX-BEST**



# Notes

## LIMITED WARRANTY

Unless otherwise noted on the face hereof, SPX goods, auxiliaries and parts thereof are warranted to the original purchaser against defective workmanship and material for a period of twelve (12) months from date of installation or (18) months from date of shipment from factory, whichever expires first. If the goods or services do not conform to the warranty stated above, then as Buyer's sole remedy, SPX shall, at SPX's option, either repair or replace the defective goods or re-perform defective services. Third party goods furnished by SPX will be repaired or replaced as Buyer's sole remedy, but only to the extent provided in and honored by the original manufacturer's warranty. Unless otherwise agreed to in writing, SPX shall not be liable for breach of warranty or otherwise in any manner whatsoever for: (i) normal wear and tear; (ii) corrosion, abrasion or erosion; (iii) any good or services which, following delivery or performance by SPX, has been subjected to accident, abuse, misapplication, improper repair, alteration, improper installation or maintenance, neglect, or excessive operating conditions; (iv) defects resulting from Buyer's specifications or designs or those of Buyer's contractors or subcontractors other than SPX; or (v) defects resulting from the manufacture, distribution, promotion or sale of Buyer's products.

THE WARRANTIES CONTAINED HEREIN ARE THE SOLE AND EXCLUSIVE WARRANTIES AVAILABLE TO BUYER AND SPX HEREBY DISCLAIMS ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING REPAIR, REPLACEMENT AND REPERFORMANCE OBLIGATIONS STATE SPX'S ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS.



## TECHNICAL SERVICES

The Lightnin brand dedicated after sales support teams are on hand to offer advice and support. With more than 85 years' experience in the manufacture and supply of agitation equipment, we know what parts need to be on hand to support our customer base so that your downtime is minimized. Our team of highly experienced field service technicians is on call to support the on-site servicing of equipment, or supervise and train your maintenance staff in best practice care of equipment.

## INSTALLATION AND COMMISSIONING

Proper installation of your Lightnin mixer is critical to its long term performance and reliability. To ensure that installation

procedures are followed, a certified technician will:

- Audit the equipment
- Supervise job-site contractors
- Perform a final inspection

## SERVICE SUPPORT & REFURBISHMENT

The equipment audit is specifically designed to identify potential mechanical problems before they occur. Using many forms of modern technology and drawing on our mixer manufacturing experience, our technicians can identify the onset of bearing and gear failures, misalignment and system problems without the need to interrupt production. Factory gearbox exchange and refurbishment programs offer a fast and cost-effective route to extending equipment life.

### SPX FLOW TECHNOLOGY

135 Mt. Read Blvd.

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F: (585) 436-5589

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SPX reserves the right to incorporate our latest design and material changes without notice or obligation.

Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing.

Please contact your local sales representative for product availability in your region. For more information visit [www.spx.com](http://www.spx.com).

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