

# OPERATING AND MAINTENANCE INSTRUCTIONS FOR *LIGHTNIN*<sup>®</sup> X1P, X5P & X6P SERIES PORTABLE MIXERS

## SECTION 1 – INITIAL INSPECTION, SHIPPING ARRANGEMENTS AND STORAGE

- 1.1 Check the shipping crates and your *LIGHTNIN* equipment for possible shipping damage. Report any damage immediately to the carrier and our factory.
- 1.2 The mixer and impellers are packed together. The impeller shaft, if over 48 inches (1200mm) long, is packed in a separate container.
- 1.3 Do not remove any protective coatings or wrappings until the mixer is ready to be put into service. If the mixer is to be stored, store only in an indoor, clean, dry location with controlled temperatures of 59° F to 104° F (15° C to 40° C). When gear drive models have been stored for more than one year, the gear lubricant should be replaced (see lubrication instructions). Motor shafts are to be rotated manually every month, at least 10 to 15 revolutions.
- 1.4 For units with electronic tachometer, refer to tachometer instructions.

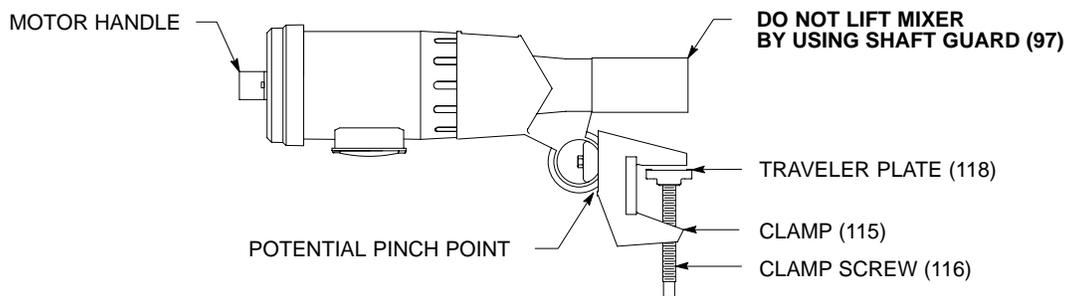
## SECTION 2 – MIXER INSTALLATION AND POSITIONING

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

- 2.1 Refer to Installation Drawing for:
  - a . Proper mixer mounting and location.
  - b . Proper minimum impeller off-bottom and relative spacing for dual impeller applications.
- 2.2 All mixers are furnished with shaft guard (97) safety covers to eliminate contact with mixer shaft.

**WARNING: DO NOT OPERATE THE MIXER UNLESS THE GUARD IS IN PLACE.**

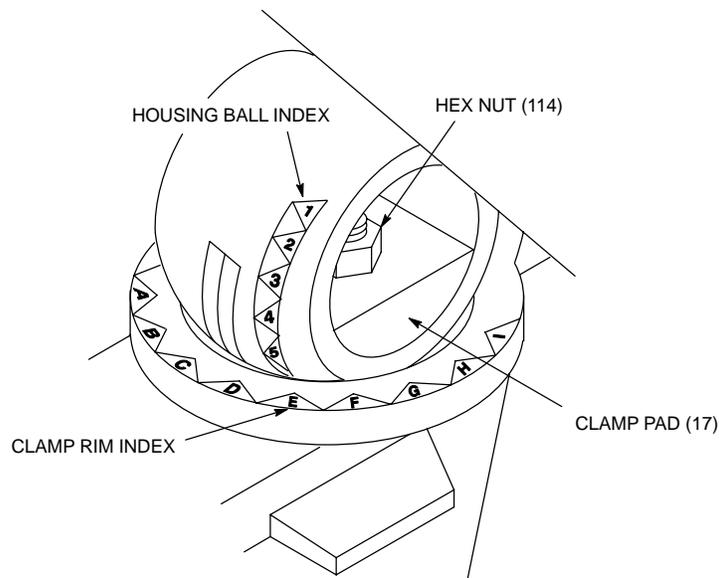
- 2.3 Lift the mixer from its crate using the motor handle provided (refer to Figure 1). **DO NOT LIFT THE UNIT BY THE SHAFT GUARD.** Loosen the clamp screw (116) sufficiently so that the clamp base will engage the tank lip or rim when the mixer is mounted. Set the clamp (115) squarely on the mounting surface so that the clamp rests on the lip of the tank if a lip is present. Tighten the clamp screw (116), making sure the traveller plate (118) is parallel to the tank lip when it contacts the tank wall. Using an M8 socket or box wrench, or a 5/16 hex wrench, tighten the clamp screw to 40–50 ft–lbs (54–61 N·m) so that the mixer is held securely to the tank. **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION.**



**FIGURE 1**

- 2.4 Impeller rotation must be according to the arrow on the mixer nameplate.
  - a . Single phase totally enclosed motors are wired at our factory for correct rotation.
  - b . All three phase and explosion proof motors must be field wired for proper rotation. If rotation does not agree with nameplate, reverse any two line leads.
  - c . Dual voltage motors can be wired for the desired voltage. Refer to the connection diagrams provided on the motor nameplate and inside the conduit box cover.

2.5 The positioning device of the mixer combines a vertical index on the ball of the housing, and a horizontal index on the rim of the clamp socket. Mixing positions are established by referencing one index against the other. Figure 2 shows the indexes in D-5 position, a typical setting. To change the mixing position, loosen the hex nut (114), adjust the mixer by its motor handle, and tighten the hex nut.



**FIGURE 2 – POSITIONING INDEXES**

2.6 The correct position for the mixer will vary in individual cases. Use Table 1 to position the mixer in relation to the tank diameter and height for normal applications. In operation, some adjustment of position may be desirable for best results.

MIXING PATTERN	BATCH HEIGHT (Z) / TANK DIAMETER (T)	CLAMP RIM INDEX (HORIZONTAL ANGLE)	HOUSING BALL INDEX (VERTICAL ANGLE)
NORMAL MIXING Off-center position Top to bottom turnover No swirling	Z/T less than 1 Z/T greater than 1	D D	5 6
VORTEXING On-center position	Z/T less than 1 Z/T greater than 1	E E	5 6
SWIRLING Off-center position Usually vortexing	Z/T less than 1 Z/T greater than 1	F F	6 7

Swirling and vortexing positions may be useful for surface introduction of solids, liquids or gases.

**TABLE 1 – MIXER POSITIONING**

### SECTION 3 – MOTOR CONNECTIONS

3.1 **LIGHTNIN** Portables are equipped with ball bearing chemical plant motors specifically designed for mixer service in totally enclosed or explosion proof construction.

- a . Constant speed mixers are furnished with **LIGHTNIN** mixer motors unless otherwise specified.
- b . For variable speed mixers with electronic or air driven motors, refer to supplementary instructions for motor control data and connection requirements.

**3.2 Single Phase Motors or motors nameplated 1/4 thru 3/4 horsepower:**

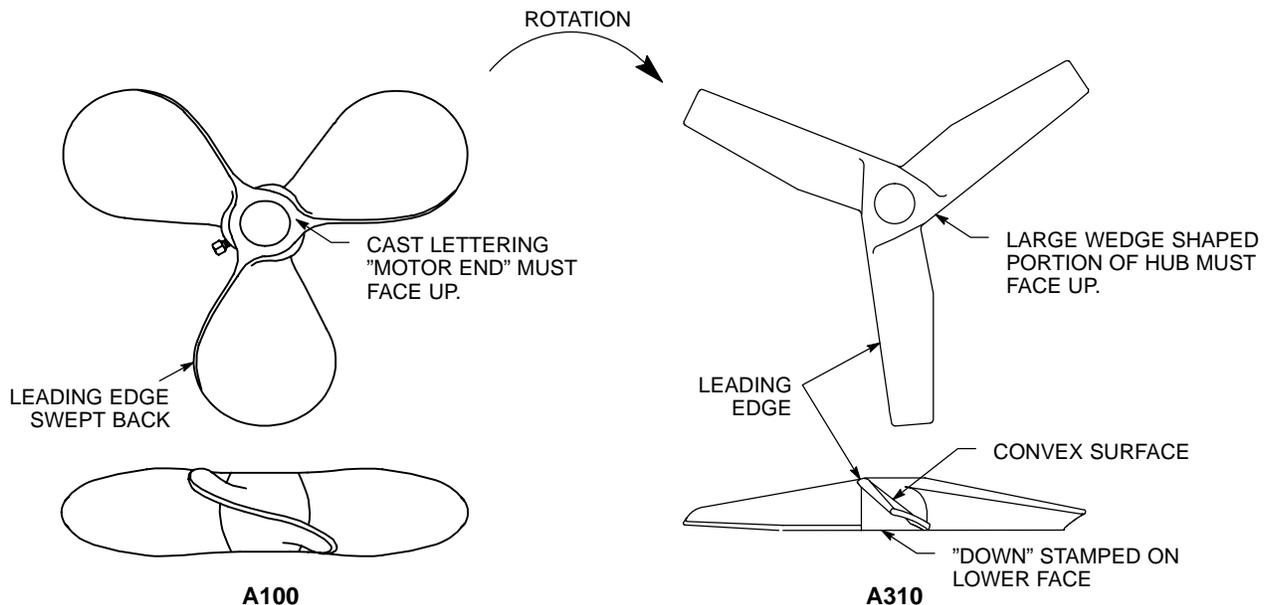
- a . Totally enclosed motors may be furnished with power cords fitted with UL approved three prong grounded plugs suitable for the correct voltage.
- b . Explosion proof motors are furnished with a pipe tap connection and suitable leads. A conduit box with internal switch is available for explosion proof service.
- c . All **LIGHTNIN** single phase motors are equipped with an internal over-temperature device with manual reset. If the thermal trips, wait fifteen (15) minutes and depress the reset button on the motor body. A click indicates reset.

**3.3 Three Phase Motors:**

- a . All totally enclosed motors are equipped with a conduit box and suitable leads.
- b . All explosion proof motors are furnished with a pipe tap connection and suitable leads.

**SECTION 4 – MIXER IMPELLER AND SHAFT INSTALLATION****WARNING: EYE PROTECTION MUST BE WORN AT ALL TIMES WHILE SERVICING THIS MIXER.****4.1 Position the impeller(s) on the impeller shaft. Refer to the specification sheet for recommended dual impeller spacing.**

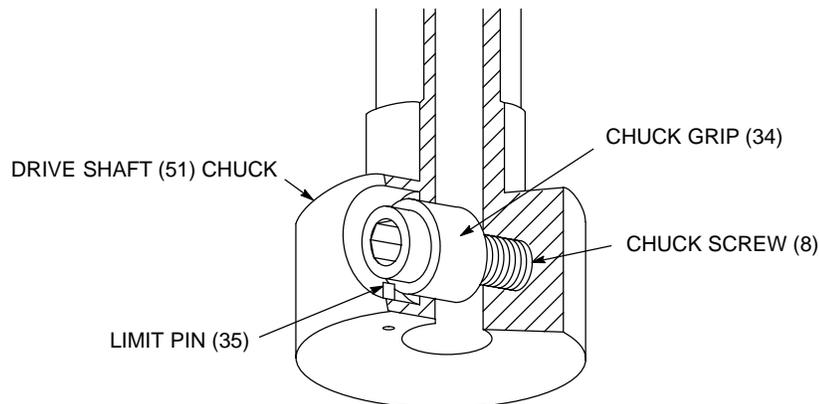
- a . A100 impeller – “Motor End” is cast on the upper side of the impeller. Figure 3 shows how to determine the upper face of the impeller in the event the printing becomes illegible. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.
- b . A310 impeller – The larger wedge shaped portion of the hub body must face up towards the mixer. The bottom of the hub is stamped “Down”. Refer to Figure 3 for general orientation reference. Tighten impeller set screws securely. For unusually severe conditions, the shaft should be spotted for the set screws.

**FIGURE 3 – IMPELLER ORIENTATION****4.2 To install the mixer shaft, back off the chuck screw (8) (refer to Figure 4) as far as the limit pin (35) will allow. DO NOT FORCE. Loosely place the shaft guard (97) and worm gear clamp (98) on the impeller shaft (42).**

**NOTE:** The shaft guard hinge must face the impeller end of the shaft. Make sure the shaft is clean, with no burrs.

Insert the impeller shaft into the chuck bore as far as it will go. Draw up the chuck screw, rotating the shaft slightly back and forth to make sure the chuck grip (34) seats against the flat of the shaft. Tighten the chuck screw. **DO NOT IMPACT THE WRENCH OR USE AN EXTENSION**

NOTE: A safety feature is provided by a slight taper in the flat on the impeller shaft. The shaft cannot drop out unless the grip is intentionally released.



**FIGURE 4 – CHUCK DETAILS**

#### 4.3 ALTERNATE PROCEDURE FOR UNITS EQUIPPED WITH COUPLING:

Connect the impeller shaft to the drive shaft by bolting the coupling halves together. Use care to prevent damage to the rabbets. Make sure the mating faces are flush and free of debris before torquing the hardware.

#### 4.4 Slide the worm gear clamp and shaft guard onto the housing and tighten the clamp securely.

**DO NOT OPERATE THE MIXER UNLESS THE GUARD IS IN PLACE.**

### SECTION 5 – MIXER OPERATION

5.1 This **LIGHTNIN** mixer is designed for continuous operation, and normally needs no additional maintenance.

5.2 Variable speed units have specified critical speed ranges where the unit should not be operated during draw off condition or operated in air.

**CAUTION: THESE CONDITIONS MUST BE AVOIDED WHEN THE UNIT IS BEING OPERATED WITH A VARIABLE SPEED DRIVE. IT IS ALSO NOT RECOMMENDED TO OPERATE THE MIXER WITH EXTREME VORTEXING OR SURGING OF THE LIQUID BEING MIXED.**

5.3 All bolts should be retightened 12 hours after assembly, and at each scheduled shut down thereafter.

5.4 Turn on the mixer. Allow time for the mixing pattern to be established, then make any required adjustments of position as outlined in Section 2 of these instructions.

### SECTION 6 – LUBRICATION

6.1 Your **LIGHTNIN** mixer has been lubricated at the factory with the correct type and amount of high quality lubricants. Lubricant cleanliness is protected by properly designed closures.

6.2 All mixer bearings are sealed type and are pre-packed with lubricant. Relubrication of these bearings is not necessary.

6.3 The gear chamber in **LIGHTNIN** X5P & X6P Series mixers has been factory filled with a grease suitable for ambient temperature ranges of  $-4^{\circ}\text{F}$  to  $+122^{\circ}\text{F}$  ( $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ ). Under normal operating conditions, this lubricant need not be changed until the unit has been dismantled for some reason. Refer to Table 2 for lubricant specifications.

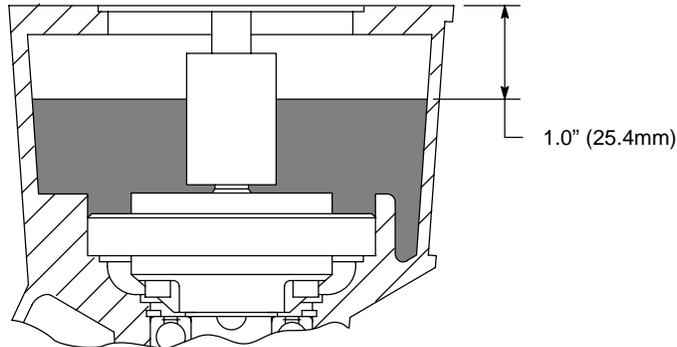
6.4 Under adverse operating conditions, periodic changes of lubricant may be necessary. Adverse conditions are defined as operating in very humid, dust laden, chemical atmospheres, or where wide variations in ambient temperatures occurs. Such adverse conditions can lead to deterioration of lubricant compounds and additives, and it is recommended that the condition of the grease be checked within six months of start-up.

Refer to Section 9 for instructions on disassembling the gear drive.

**NOTE: THE GEAR CHAMBER SHOULD BE FILLED TO 1.0 INCHES (25.4mm) FROM THE TOP OF THE GEAR CHAMBER. ALL O-RINGS SHOULD BE CHECKED FOR INTEGRITY AND REPLACED IF THEY ARE DEFORMED, CUT OR DETERIORATED.**

MODEL	RECOMMENDED GREASE		GEAR HOUSING CAPACITY	
	STANDARD	FOOD GRADE	LBS.	kg
X5P & X6P33-50	<b>LIGHTNIN</b> SHC 0	BEL-RAY NO-TOX HD 0	2.2	1
X5P & X6P75-300			3.75	1.7

**LIGHTNIN** STANDARD GREASE (PART NUMBER 293101PSP – 2 LB. CONTAINER) AND FOOD GRADE GREASE (PART NUMBER 275255PSP – 14 OZ. TUBE) ARE AVAILABLE.



**TABLE 2 – LUBRICANT RECOMMENDATION & CAPACITY**

**6.5 CHANGING GEAR LUBRICANT**

Standard Grease: Gear sets are initially lubricated at the factory with **LIGHTNIN** SHC 0 grease. This is the optimum lubricant. It will give the best performance, and is available from **LIGHTNIN**. An alternate grease, Mobilith SHC 007 can be used, but assembly and disassembly will be more difficult due to the fluid nature of this grease. Greater care must be taken during assembly and disassembly to ensure the grease remains in the gear chamber.

Food Grade Grease: Gear sets are initially lubricated at the factory with Bell-Ray No-Tox HD 0 grease. This is the optimum lubricant. **NO OTHER FOOD GRADE GREASE IS ALLOWED.** It will give the best performance, with no derate necessary, and is available from **LIGHTNIN**.

- a . Make sure the gear housing is vertical to prevent spillage.
- b . Remove all old grease from the gear chamber and wipe the gear chamber clean.
- c . Pack the gear chamber with fresh grease (see Table 2). Paddle the grease to fill voids and remove air pockets, rotating the shaft and shaking the housing while paddling.
- d . Check for free movement of all components by rotating the drive shaft. If satisfactory, refer to Section 9 and complete assembly.

**SECTION 7 – PREPARATION FOR DISASSEMBLY AND ASSEMBLY**

**WARNING: DISCONNECT MOTOR LEADS OR OTHERWISE LOCK-OUT POWER SUPPLY BEFORE SERVICING THIS MIXER. EYE PROTECTION MUST BE WORN.**

**NOTE: FOR UNITS WITH ELECTRONIC TACHOMETER, REFER TO TACHOMETER INSTRUCTIONS FOR REMOVAL INFORMATION.**

7.1 GENERAL – **LIGHTNIN** mixers are precision manufactured and assembled to provide long, trouble free service when properly maintained. If it becomes necessary to disassemble the unit, careful, precise reassembly is necessary.

Refer to the assembly drawing for location of parts.

Equipment that will be required to service the mixer, in addition to standard mechanics tools, is a rubber mallet, retaining ring pliers, arbor press and torque wrench.

When disassembling the mixer, clean adjacent external surfaces to prevent dirt from entering the housings.

It is recommended that oil seals, O-rings and non-metallic gaskets be replaced when the mixer is disassembled.

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## 7.2 SEAL REPLACEMENT

New oil seals, O-rings and gaskets should always be used. Drive out all old oil seals and remove accumulations of sealing compound. When replacing seals:

- a . Coat the lips of seals with bearing grease.
- b . Install oil seals with the lip facing in the direction indicated on the assembly drawing.
- c . Coat the section of the shaft sealing surface with oil. If the oil seal must pass over a keyway, wrap the shaft with thin paper or tape, coat with grease, and pass the seal over.

## 7.3 BEARING REPLACEMENT

Inspect the bearings carefully and replace if necessary.

- a . Old bearings can be removed with a puller or an arbor press.
- b . New bearings can be pressed onto the shafts. Be careful to apply load only to the inner race.
- c . Make sure the bearings are tightly seated against the shaft or housing shoulder with no clearance.

## **SECTION 8 – DISASSEMBLY AND ASSEMBLY OF DIRECT DRIVE UNITS**

**NOTE: FOR UNITS WITH ELECTRONIC TACHOMETER, REFER TO TACHOMETER INSTRUCTIONS FOR REMOVAL INFORMATION.**

### **DISASSEMBLY – X1P SERIES:**

#### 8.1 MOTOR REMOVAL

- a . Remove the mixer from the tank.
- b . Loosen the worm gear clamp (98) and slide the shaft guard (97) down the impeller shaft (42).
- c . Remove the impeller shaft (42) from the drive shaft (51), back off the chuck screw (8) as far as the limit pin (35) will allow. The impeller shaft is now free from the chuck and can be withdrawn.  
FOR MODELS EQUIPPED WITH COUPLING: Remove the coupling bolts (67), then remove the impeller shaft.
- d . Remove the mixer hardware (3, 114 & 121), clamp assembly (50), vibration pad (40) and clamp pad from the housing (36).
- e . Set the mixer upright on a workbench.
- f . X1P33 – 50 electric motor:  
Remove the four cap screws (60) holding the motor (101) to the housing (36).  
X1P 75 – 300 electric motor:  
Remove the four cap screws (155) and washers (62) holding the adapter (103) and electric motor (101) to the housing (36).
- g . X1P75 – 300 electric motor:  
Remove the four flat head screws (60) holding the adapter (103) to the electric motor. Remove the O-ring (109).
- h . Lift the motor (101), motor coupling half and motor gasket (108) off the housing.
- i . Loosen the set screw, and remove the motor coupling half and key (106).
- j . Loosen the set screw, and remove the drive shaft coupling half, coupling insert and key (Item 117 – Models X1P75 thru 300 only).

## 8.2 DRIVE SHAFT & HOUSING DISASSEMBLY

- a . Place the housing (36) upright on a workbench and remove the retaining rings (52 & 56).
- b . Place the housing upright in a press, and press out the drive shaft (51), bearing (41) and oil seal (38).
- c . Remove the upper retaining ring (59) and press or pull the lower bearing (41) off the shaft. Remove the lower retaining ring (59) and oil seal (38).
- d . Turn the housing over and press out the upper bearing (37).  
Models X1P33 – 50: Remove the lower retaining ring (52) from the housing (36).
- e . Inspect the bearings (37 & 41). Replace if there is excessive wear.

## 8.3 CHUCK DISASSEMBLY

- a . Place a flat blade screwdriver between the limit pin (35) and chuck screw (8), and drive the pin down sufficiently to allow removal with pliers.
- b . Remove the chuck screw (8) and chuck grip (34).

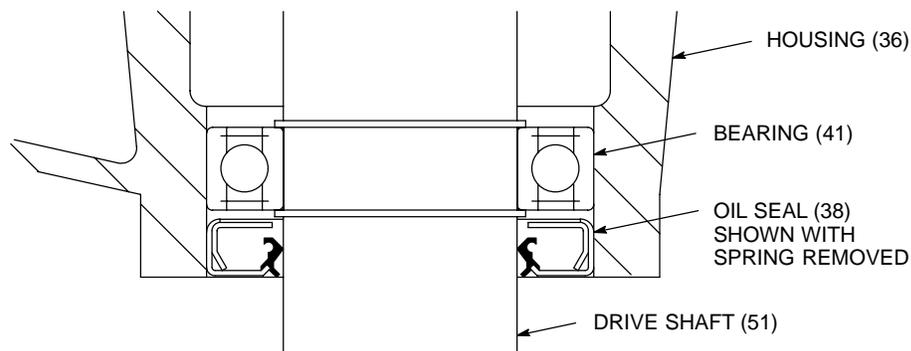
## ASSEMBLY – X1P SERIES:

### 8.4 PREPARING FOR ASSEMBLY

- a . Clean all parts thoroughly.
- b . Inspect for the following defects:
  - 1 . Cracks or damage of the housing.
  - 2 . Dents, gouges or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.
- c . Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.
- d . Replace the bearings if they show indications of wear.

### 8.5 DRIVE SHAFT ASSEMBLY

- a . Press the lower oil seal (38) down the drive shaft (51) as far as possible, with the seal cavity facing the retaining ring grooves as shown in Figure 5. Make sure the oil seal has the internal spring removed. This is a non-lubricated seal, and will run hot and have a shortened life if the spring is not removed.



**FIGURE 5 – OIL SEAL INSTALLATION**

- b . Install the lower retaining ring (59).
- c . Press the lower bearing (41) onto the drive shaft (51). The bearing must seat against the retaining ring with no visible gap.
- d . Install the upper retaining ring (59).
- e . For mixers with chuck type drive shaft:
  - 1 . Assemble the chuck grip (34) on the chuck screw (8).

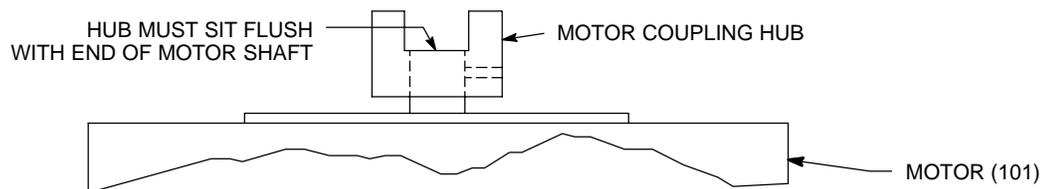
- 2 . Thread the chuck screw into the chuck (51).
- 3 . Insert the limit pin (35) so that it is flush with the drive shaft (51) face.

#### 8.6 DRIVE SHAFT AND HOUSING ASSEMBLY

- a . Models X1P33 – 50: Install the lower retaining ring (52) in the housing (36).
- b . Mount the housing (36) in an arbor press, large end up.
- c . Press the bearing (37) on its outer race to the retaining ring (Models X1P33 – 50) or the shoulder of the housing bore (Models X1P75 – 300).
- d . Install the upper retaining ring (52).
- e . Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.
- f . Press the drive shaft (38) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.
- g . Install the upper retaining ring (56) in the shaft groove.
- h . Turn the housing large end down, and adjust the lower oil seal until it is flush with the end of the housing.

#### 8.7 MOTOR COUPLING ASSEMBLY

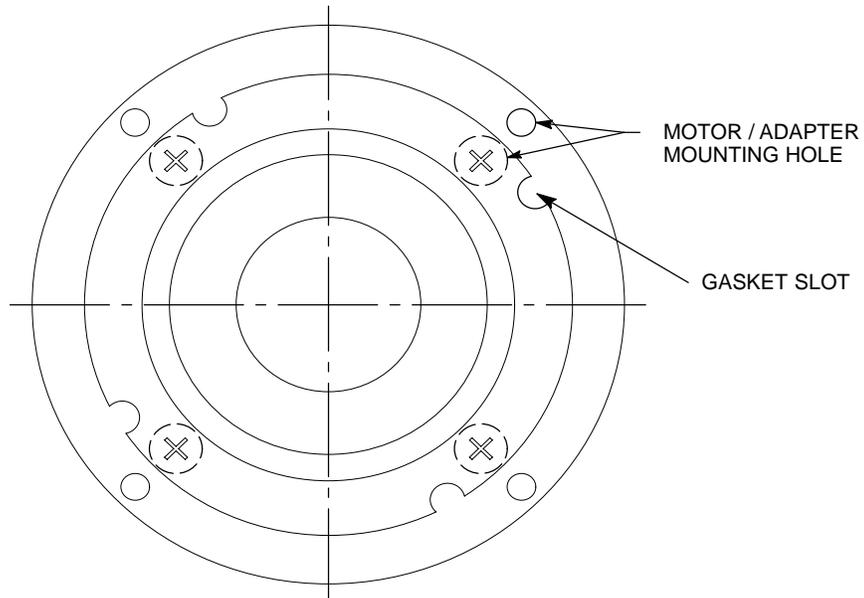
- a . Position the motor coupling hub as shown in Figure 6.
- b . Tighten the set screws.
- c . Place the drive coupling half and key (Item 117, Models X1P75 – 300 only) onto the drive shaft until it bottoms on the shaft shoulder. Tighten the set screw.
- d . Install the coupling insert into the drive shaft coupling half.



**FIGURE 6 – MOTOR COUPLING PLACEMENT**

#### 8.8 MOTOR ASSEMBLY

- a . X1P75 – 300 electric motor:  
Install the O-ring (109) in the adapter plate (103) and place them on the motor (101). Secure with the flat head screws (60).
- b . Install the motor gasket (108) on the motor (101) (Models X1P33 – 50) or the adapter plate (103) (Models X1P75 – 300). A small amount of grease on the motor/adapter mounting face, to hold the gasket in place, and oil on the gasket rabbet will ease motor/adapter to housing assembly.  
**NOTE:** X1P33 – 50 Align the slots in the motor gasket with the motor mounting holes to ensure a leak tight seal.  
X1P75 – 300 Align the slots in the motor gasket as shown in Figure 6A to ensure a leak tight seal.
- c . Align the motor and the housing so that the switch conduit box (or junction box) of the motor, and the ball of the housing are on the same side.
- d . X1P33 – 50: Align the screw holes, install the housing cap screws (60) and tighten evenly.
- e . X1P75 – 300: Align the screw holes, install the housing cap screws (155) and washers (62) and tighten evenly.



**FIGURE 6A – MOTOR / ADAPTER & GASKET**

#### 8.9 CLAMP ASSEMBLY

- a . Thread the clamp screw (116) through the outer arm of the clamp (115). Slide the plain washer (125) over the end of the clamp screw. Install the traveler plate (118) so that the four raised surfaces are facing away from the clamp screw. Slide the retaining ring (119) onto the clamp screw. Position the retaining ring to allow free movement of the traveler plate (118).
- b . Set the clamp pad (17) in place in the ball of the housing.
- c . Install the hex head cap screw (3) in the clamp (115). To keep the cap screw in position, slide the retaining washer (4) in place on the cap screw.
- d . Install the vibration pad (40) in the clamp (115).
- e . Pass the hex head cap screw through the slot in the ball of the housing, install the plain washer (121), and loosely thread the hex nut (114) onto the clamp pad.
- f . Tighten the hex head cap screw until the clamp can just be moved in the housing ball.

#### 8.10 SAFETY GUARD AND IMPELLER SHAFT ASSEMBLY

- a . Loosely place the safety guard (97) and worm gear clamp (98) on the impeller shaft (42).
- b . Install the impeller shaft as outlined in Section 4 of these instructions.

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## SECTION 9 – DISASSEMBLY AND ASSEMBLY OF GEAR DRIVE UNITS

**NOTE: FOR UNITS WITH ELECTRONIC TACHOMETER, REFER TO TACHOMETER INSTRUCTIONS FOR REMOVAL INFORMATION.**

### DISASSEMBLY – X5P & X6P SERIES:

#### 9.1 MOTOR REMOVAL

- a . Remove the mixer from the tank.
- b . Loosen the worm gear clamp (98) and slide the shaft guard (97) down the impeller shaft (42).
- c . Remove the impeller shaft (42) from the drive shaft (51), back off the chuck screw (8) as far as the limit pin (35) will allow. The impeller shaft is now free from the chuck and can be withdrawn.  
FOR MODELS EQUIPPED WITH COUPLING: Remove the coupling bolts (67), then remove the impeller shaft.
- d . Remove the mixer hardware (3, 114 & 121), clamp assembly (50), vibration pad (40) and clamp pad from the housing (36).
- e . Set the mixer upright on a workbench.
- f . X5P, X6P33 – 50 electric motor:  
Remove the four cap screws (60) holding the electric or air motor (101) to the housing (36).  
X5P, X6P75 – 300 electric motor:  
Remove the four cap screws (155) holding the adapter (103) and electric motor (101) to the housing (36).
- g . X5P, X6P75 – 300 electric motor:  
Remove the four flat head screws (60) holding the adapter (103) to the electric motor. Remove the O-ring (109).
- h . Lift the motor (101), motor coupling assembly (102), sun gear (9) and motor gasket (108) off the housing.
- i . Remove the sun gear (9) and motor coupling assembly (102).
- j . Remove the retaining ring (7), gear carrier assembly (1), ring gear (2), key (Item 27 – Models X5P & X6P200 thru 300 only), and any remaining old lubricant.

#### 9.2 DRIVE SHAFT & HOUSING DISASSEMBLY

- a . Place the housing (36) upright on a workbench and remove the retaining rings (52 & 56).
- b . Place the housing upright in a press, and press out the drive shaft (51), bearing (41) and oil seal (38).
- c . Remove the upper retaining ring (59) and press or pull the lower bearing (41) off the shaft. Remove the lower retaining ring (59) and oil seal (38).
- d . Turn the housing over and press out the upper bearing (37).
- e . Remove the oil seal (38) from the housing (36).
- f . Inspect the bearings (37 & 41). Replace if there is excessive wear.

#### 9.3 CHUCK DISASSEMBLY

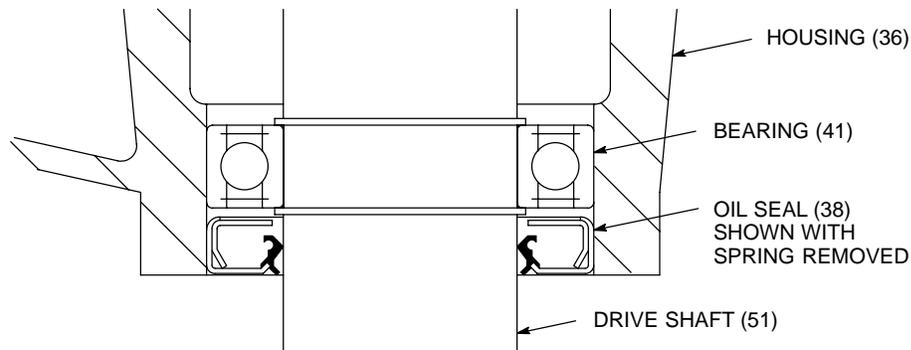
- a . Place a flat blade screwdriver between the limit pin (35) and chuck screw (8), and drive the pin down sufficiently to allow removal with pliers.
- b . Remove the chuck screw (8) and chuck grip (34).

**ASSEMBLY – X5P & X6P SERIES:****9.4 PREPARING FOR ASSEMBLY**

- a . Clean all parts thoroughly.
- b . Inspect for the following defects:
  - 1 . Cracks or damage of the housing.
  - 2 . Dents, gouges or scoring of the drive shaft, housing bore, and particularly the mating faces of the motor and housing.
- c . Repair or replace defective parts. It is good practice to replace an oil seal which has been removed from the housing. Apply a small quantity of bearing grease to the housing bore, and around the oil seal lip to provide lubrication and make the seal more effective.
- d . Replace the bearings if they show indications of wear.

**9.5 DRIVE SHAFT ASSEMBLY**

- a . Press the lower oil seal (38) down the drive shaft (51) as far as possible, with the seal cavity facing the retaining ring grooves as shown in Figure 7. Make sure the oil seal has the internal spring removed. This is a non-lubricated seal, and will run hot and have a shortened life if the spring is not removed.

**FIGURE 7 – OIL SEAL INSTALLATION**

- b . Install the lower retaining ring (59).
- c . Press the lower bearing (41) onto the drive shaft (51). The bearing must seat against the retaining ring with no visible gap.
- d . Install the upper retaining ring (59).
- e . For mixers with chuck type drive shaft:
  - 1 . Assemble the chuck grip (34) on the chuck screw (8).
  - 2 . Thread the chuck screw into the chuck (51).
  - 3 . Insert the limit pin (35) so that it is flush with the drive shaft (51) face.

**9.6 DRIVE SHAFT AND HOUSING ASSEMBLY**

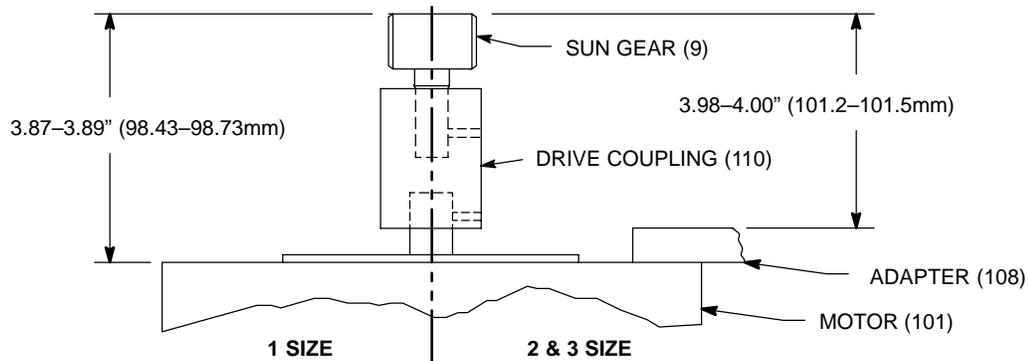
- a . Models X5P, X6P33 – 50: Install the lower retaining ring (52) in the housing (36).
- b . Mount the housing (36) in an arbor press, large end up.
- c . Press the oil upper seal (38) into the housing (36) with the seal cavity facing the large end of the housing.
- d . Press the bearing (37) on its outer race to the shoulder of the housing bore.
- e . Install the upper retaining ring (52).
- f . Support the housing, large end down, by resting the inner race of the bearing on a suitable sleeve.
- g . Press the drive shaft (38) into the bearing until the shoulder of the shaft registers against the inner race of the bearing.
- h . Install the upper retaining ring (56) in the shaft groove.
- i . Turn the housing large end down, and adjust the lower oil seal until it is flush with the end of the housing.

**9.7 GEAR ASSEMBLY**

- a . If removed, install the ring gear retaining pins (5).
- b . Install the ring gear (2) in the gear housing (21).
- c . Install the retaining ring (7) in the groove above the ring gear.
- d . **PACK THE GEAR CARRIER (1) WITH GREASE** and rotate the gears several times to distribute the grease to the needle bearings (13). Refer to Section 6 of these instructions for lubricant recommendations.
- e . X5P & X6P75 thru 150: Align the flats on the inside of the gear carrier (1) with the flats on the drive shaft (51).
- f . X5P & X6P200 thru 300: Install the key (27) in the drive shaft (51). Align the keyway in the gear carrier (1) with the keyway on the drive shaft (51).
- g . Place the gear carrier assembly onto the drive shaft.

**9.8 MOTOR COUPLING ASSEMBLY**

- a . Assemble the sun gear (9), the drive coupling (110) and key (Item 107 – Models X5P100 thru 300 and X6P100 thru 300 only) until the sun gear shoulders against the drive coupling. Tighten the set screws.
- b . Set the elevation of the sun gear to the dimension shown in Figure 8, and tighten the remaining set screws.



**FIGURE 8 – SUN GEAR PLACEMENT**

- c . Fill the gear housing with lubricant to approximately 1 inch (25mm) from the top. Refer to Section 6 of these instructions for lubricant recommendations.

**9.9 MOTOR ASSEMBLY**

- a . X5P, X6P75 – 300 electric motor:  
Install the O-ring (109) in the adapter plate (103) and place them on the motor (101). Secure with the flat head screws (60).
- b . Install the motor gasket (108) on the motor (101) (Models X5, X6P33 – 50) or the adapter plate (103) (Models X5, X6P75 – 300). A small amount of grease on the motor/adaptor mounting face, to hold the gasket in place, and oil on the gasket rabbet will ease motor/adaptor to housing assembly.  
NOTE: X5, X6P33 – 50 Align the slots in the motor gasket with the motor mounting holes to ensure a leak tight seal.  
X5, X6P75 – 300 Align the slots in the motor gasket as shown in Figure 6A to ensure a leak tight seal.
- c . Align the motor and the housing so that the switch conduit box (or junction box) of the motor, and the ball of the housing are on the same side.
- d . X5P, X6P33 – 50: Align the screw holes, install the housing cap screws (60) and tighten evenly.
- e . X5P, X6P75 – 300: Align the screw holes, install the housing cap screws (155) and washers (62) and tighten evenly.

**9.10 CLAMP ASSEMBLY**

- a . Thread the clamp screw (116) through the outer arm of the clamp (115). Slide the plain washer (125) over the end of the clamp screw. Install the traveler plate (118) so that the four raised surfaces are facing away from the clamp screw. Slide the retaining ring (119) onto the clamp screw. Position the retaining ring to allow free movement of the traveler plate (118).
- b . Set the clamp pad (17) in place in the ball of the housing.
- c . Install the hex head cap screw (3) in the clamp (115). To keep the cap screw in position, slide the retaining washer (4) in place on the cap screw.
- d . Assemble the clamp, vibration pad (40) and hex head cap screw (3).
- e . Pass the hex head cap screw through the slot in the ball of the housing, install the plain washer (121), and loosely thread the hex nut (114) onto the clamp pad.
- f . Tighten the hex head cap screw until the clamp can just be moved in the housing ball.

**9.11 SAFETY GUARD AND IMPELLER SHAFT ASSEMBLY**

- a . Loosely place the safety guard (97) and worm gear clamp (98) on the impeller shaft (42).
- b . Install the impeller shaft as outlined in Section 4 of these instructions.