

## REPLACING MAIN BEARINGS AND SEALS ON 30015, 30020, 30022Cxx, Kxx, Sxx, AND Mxx MODELS

### ⚠ DANGER ⚠



**ELECTROCUTION HAZARD**—High voltage is present inside electric boxes, motors, and many other components, even when Master switch is off and/or any emergency stop is off. You can be killed or seriously injured on contact with high voltage.

- ☞ **Lock OFF and tag out power at the wall disconnect before servicing.**
- ☞ **Maintenance must be performed by qualified, authorized service personnel.**

Oil or water dripping from the leak-off, or water in the bearing oil indicates leaking seals. Bearing oil containing metal particles indicates damaged bearings. Ordinarily, only the shell front and cylinder need to be removed to replace the seals and bearings. Replacing the entire bearing housing assembly or a major bearing housing component requires removal of the shell.

Maintenance procedures require:

- Cylinder puller kit P/N PK33-008 (or equivalent) available from Milnor<sup>®</sup> on a rental or purchase basis.
- Loctite 242, 271, and 504 adhesives, Dow Corning RTV 732, and Permatex 2 (or equivalents).
- Shell clamps.

## Removing the Shell Front and Cylinder

Refer to “CYLINDER + SHELL + BEARING + CONSOLE INSTALLATION . . .” (see Table of Contents) and proceed as follows:

1. Remove the door interlock housing cover. Mark the terminal position of the wires and remove the wires from the *interlock switch*. Loosen the two conduit connections and move the conduit so the shell front can be removed.
2. Remove all shell attachments including pipes, hoses, and optional equipment. Drain oil from the bearing housing and inspect.
3. Remove the shell mount ring clip guard located on the top of the shell clamp ring, then mark the position of the shell front with respect to the shell.
4. Support the shell front and remove the bolts, shell clamp ring, rubber extrusion, and shell front.
5. Remove the shaft retainer bolt, cover, spacer, and the two allen screws covering the puller mounting holes. Mount the puller and remove the cylinder.

## Replacing Seals with Bearing Housing In Place

**NOTE:** See the appropriate bearing assembly drawing.

If no water or metal particles are present in drained oil, replace seals and o-rings as follows. If bearing oil contains water or metal particles, see “Replacing Bearings with Bearing Housing in Place” below.

1. Remove front shaft seal holder (push-off holes are provided).
2. Inspect the shaft seal sleeve for nicks, gouges, or excessive wear. If a replacement is necessary, heat and tap the damaged sleeve off of the shaft. Before installing the new sleeve, ensure that the shaft and sleeve are clean and free from oil. Apply Loctite 271 to the inside of the sleeve, tap sleeve onto the shaft, then remove excess Loctite.
3. Replace the seals and o-rings. Apply Loctite 271 to the outside of the seals and install in shaft seal holder. Ensure that the new seals are parallel within the shaft seal holder. Use Loctite 242 when re-installing the front seal holder bolts.

## Replacing Bearings with Bearing Housing In Place

**NOTE:** Set bearing clearances only if major components of the original bearing housing (front shaft seal holder, rear seal/bearing holder, shaft, or shims) are replaced. See “Setting Clearances” in this section after replacing major components.

Often, the bearing housing does not need to be removed to change the bearings. Remove the shell and bearing housing only if insufficient space exists for the following procedures, or if the bearing housing (or housing major components) must be replaced:

1. Remove the front shaft seal holder and rear seal/bearing holder (containing the rear bearing). Note the position and number of shims under the rear seal/bearing holder. **The shims must be installed exactly as removed.**
2. Remove the main shaft, front bearing, and bearing cup through the front of the bearing housing. Remove and discard used bearings, cups, seals, and o-rings.
3. Install a new seal, bearing, and cup in the rear seal/bearing holder. Install the shims and rear seal/bearing holder.
4. Press a new front bearing on the shaft then guide the shaft into the rear seal/bearing holder. **Do not scrape the new bearings against the inside of the bearing housing.**
5. Center the shaft within the housing, then gently tap in the front bearing cup. Install the front shaft seal holder. The shaft should turn in the housing.

## Setting Clearances

**NOTE:** This procedure is required only when a major bearing housing component is replaced. See “Removing and Re-installing the Shell and Bearing Housing” below.

1. Remove all shims from the rear seal/bearing holder. Install the rear seal/bearing holder. Leave a small gap between the bearing housing and the rear seal/bearing holder.
2. Insert a lead wire (e.g., soldering wire) in the gap between flanges. Tighten each bolt slowly while turning the shaft. Stop tightening when the shaft just begins to drag or bind. Remove the rear seal/bearing holder, **being careful not to mark or damage the lead wire.**
3. Using a micrometer, measure the thickness of the lead wire. Add .002" (.050 millimeters) to the thickness of the lead wire and install the rear seal/bearing holder using this amount of shims. The shaft should turn in the housing.

## Removing and Re-installing the Shell and Bearing Housing

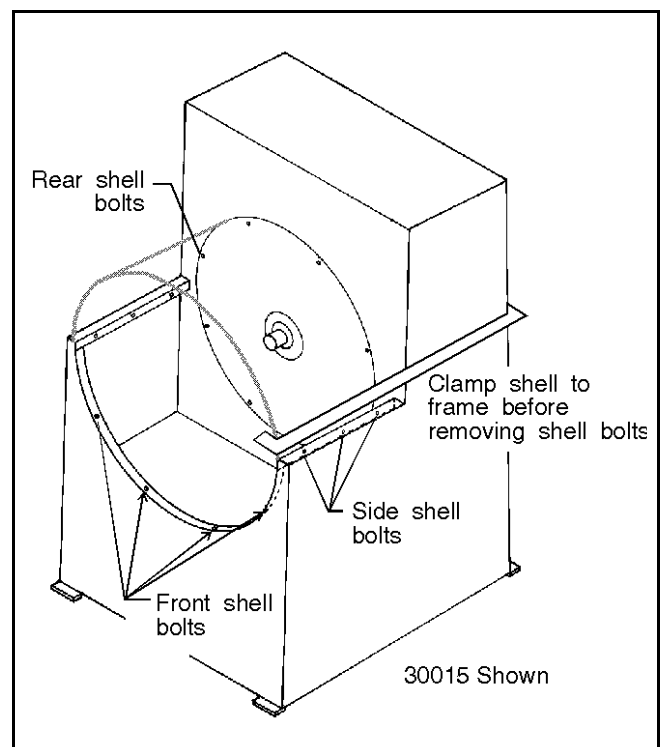
Replacing the entire bearing housing assembly or a major bearing housing component requires removal of the shell.

### Removing the Shell

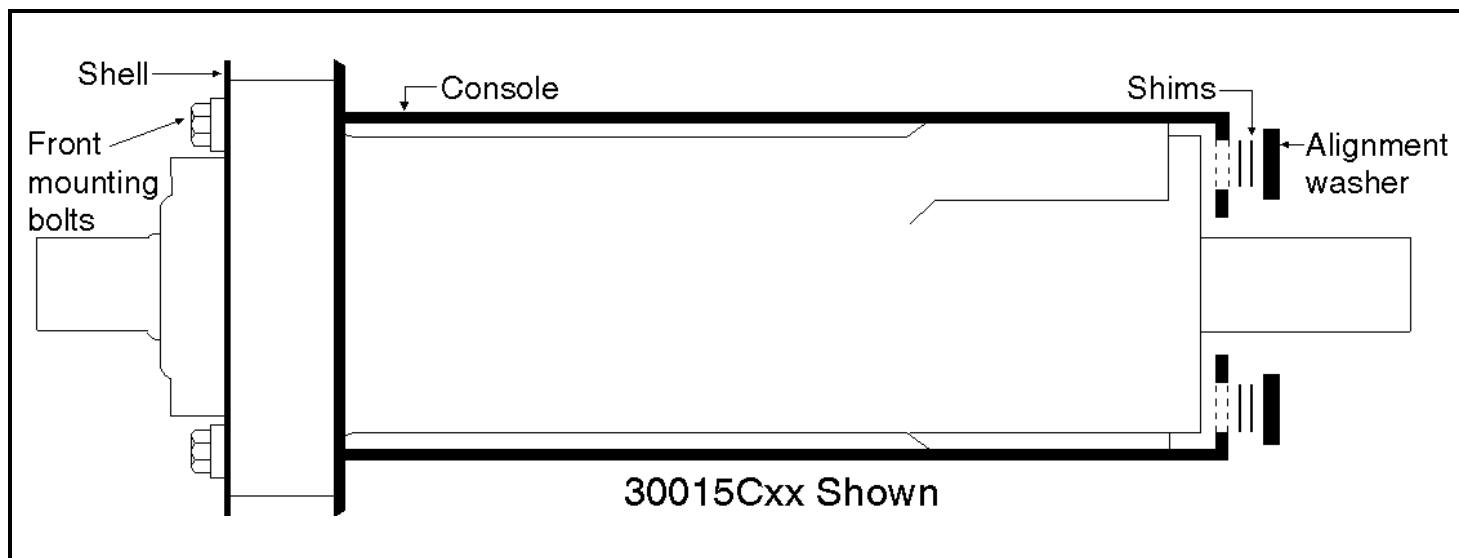
**NOTE 1:** 30015 front bearing housing bolts are provided with self-locking nuts.

**NOTE 2:** 30020 and 30022 shell back clamp rings have three push-off holes to aid in removal. Replace the three plastic set screws with three bolts then tighten evenly to separate the ring from the shell.

1. Clamp the shell to the frame before removing the shell bolts (as shown in FIGURE 1).
2. Remove the self-locking nut and clamp used to secure the level switch sensor hose to the shell mounting screw. Remove all shell bolts, front bearing housing bolts (do not remove the rear bearing housing bolts), and shell back clamp ring, then remove the shell (and bearing housing reinforcing plate if so equipped) from the frame.
3. Remove the belt guard and the top console cover by prying out the four plugs and removing the bolts. Loosen and remove the main drive belts (and *centrifugal switch* if so equipped), and the main drive pulley. For further information see “DRIVE TRAIN SERVICE” (see Table of Contents).



**FIGURE 1** (MSSM0708BE)  
**Clamping the Shell**



**FIGURE 2** (MSSM0708BE)  
**Typical Main Bearing Mounting**

## Removing the Bearing Housing

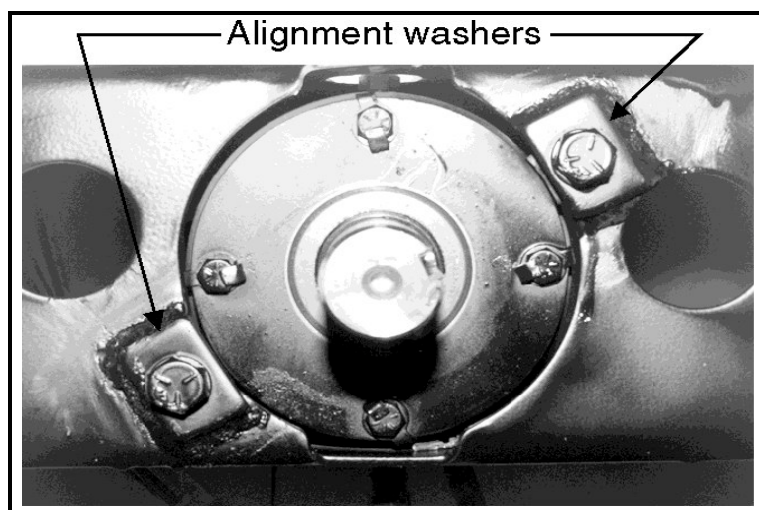
**NOTE 1:** Shims (shown in FIGURE 2) are factory installed between the bearing housing and the alignment washers. **These shims must be removed and replaced in their exact original positions.**

**NOTE 2:** 30015M6 models are equipped with a rear reinforcing plate (see FIGURES 4 and 6). Use 30020 and 30022 instructions when removing and installing the bearing housings on these models.

Drain the oil from the bearing housing and remove all fittings and connections from the top and bottom of the bearing housing; then follow the procedure for your machine.

**On 30015 Machines**—Considerably loosen, **but do not fully remove** the two rear bearing housing mounting bolts.

1. Pry the bearing housing out of the console until the rear mounting bolts bottom out.
2. Remove the rear mounting bolts one at a time and catch the shims with your fingers through the holes in the rear console member (next to the bearing housing). **Note the position of the shims; they must be replaced in the same position.**
3. Remove the bearing housing from the frame. Grind off the alignment washers as shown in FIGURE 3 and discard old alignment washers.
4. Grind the rear console smooth in preparation for main bearing re-installation.



**FIGURE 3** (MSSM0708BE)  
**Alignment Washers**  
**30015 Models (see Note 2 above)**

**On 30020 and 30022 Machines**—Remove the rear bearing housing and rear reinforcing plate mounting bolts.

1. Remove the rear reinforcing plate very carefully, noting the position of bearing support tap strips and shims. **Note the position of the shims; they must be replaced in the same position.**
2. Remove the bearing housing from the frame. Remove plate and grind off the alignment washers (as shown in FIGURE 4). and discard old alignment washers.
3. Grind rear reinforcing plate smooth in preparation for main bearing re-installation.

## Installing the Bearing Housing and Shell

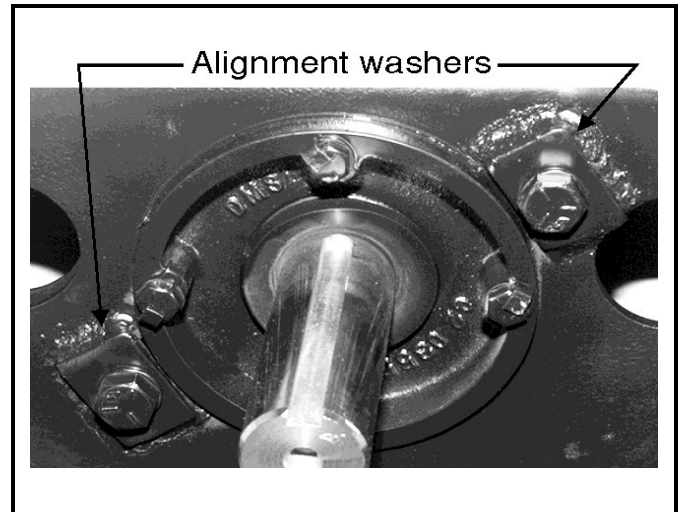
**NOTE 1:** Use new bolts when reassembling the machine.

**NOTE 2:** Apply Permatex 2C adhesive (or equivalent) to both sides of the new bearing housing gaskets.

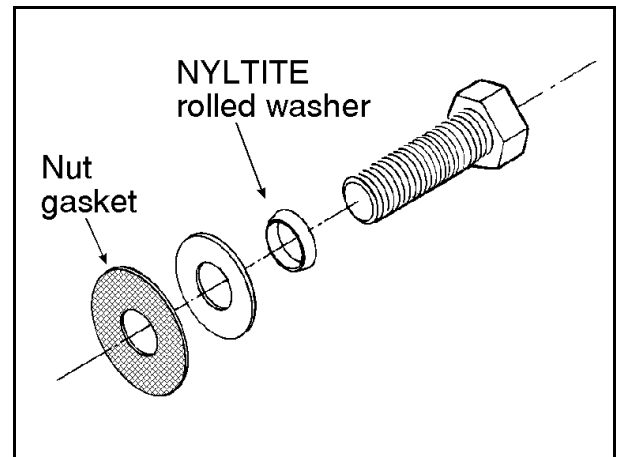
**NOTE 3:** Install a new NYLTITE washer and nut gasket on each new shell bolt (see FIGURE 5).

**On 30015 Machines**—Replace the four J-type nuts along the rim of the front console with new clips.

1. Determine that all threaded holes are clean and in good condition by screwing a new bolt into each hole (if necessary, tap out any damaged threads).
2. Position the bearing housing in the console.
3. Mount the gasket on the front of the bearing housing.
4. Determine that the shell is clean and free from any old gasket material, then mount the shell onto the console using new shell bolts (FIGURE 5).
5. Using drift pins, install the rear shell bolts first (FIGURE 1), then tighten to draw the shell into place.
6. Install all other shell bolts and tighten evenly. Liberally apply Dow Corning RTV 732 sealant over the inside shell bolts and washers.
7. Mount the gasket and the new ring to the inside of the shell.
8. Install the front bearing mounting bolts through the ring and bearing housing, and tighten front bolts. Install new alignment washers and original shims on rear mounting bolts (FIGURE 2). **Replace the shims on rear mounting bolts exactly as removed.**

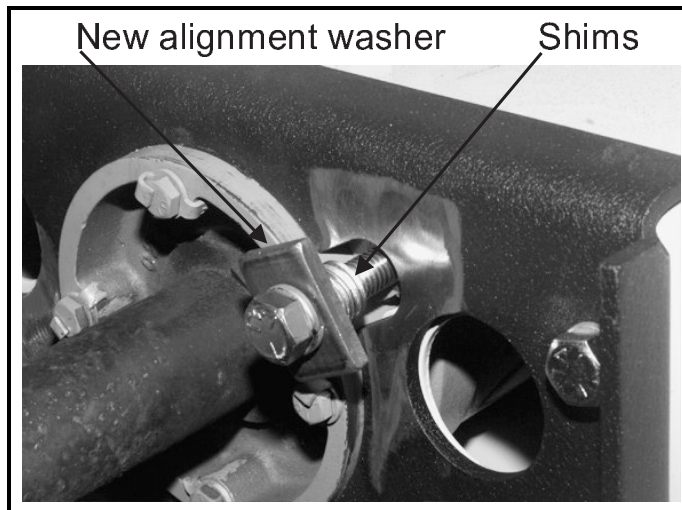


**FIGURE 4** (MSSM0708BE)  
**Alignment Washers**  
**30020 and 30022 Models**

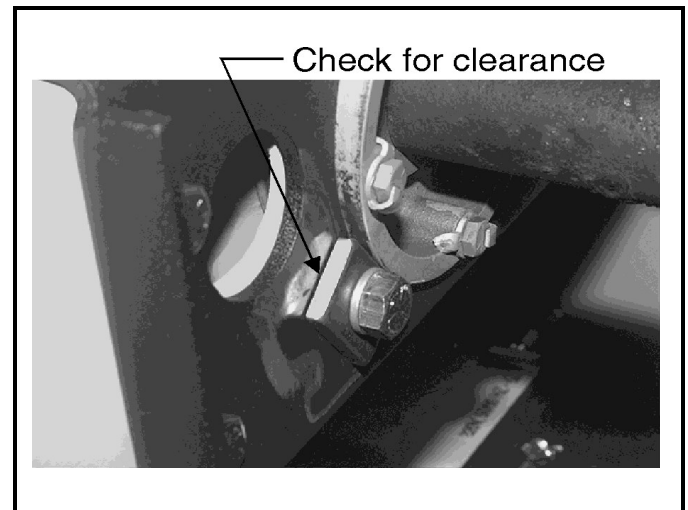


**FIGURE 5** (MSSM0708BE)  
**Shell Bolt**

9. Tighten bolts. Insure there is approximately .0625 inch (1.6 mm) clearance between the alignment washers and the console as shown in FIGURE 7. Add or subtract shims as required to obtain the specified clearance. Weld the new alignment washers to the console.
10. Install all of the original lubrication fittings and connections to the new bearing housing.
11. Secure the level switch sensor hose using a new clip and self-locking nut.



**FIGURE 6** (MSSM0708BE)  
**Installing New Alignment Washers**



**FIGURE 7** (MSSM0708BE)  
**Alignment Washer to Console**

**On 30020 and 30022 Machines**—Replace the four J-type nuts and determine that all threaded holes are clean and in good condition.

1. Position the bearing housing in the console.
2. Mount the gasket, housing reinforcing plate, and second gasket.
3. Determine that the shell is clean and free from any old gasket material, then using new shell bolts (FIGURE 5), mount the shell onto the console.
4. Mount the gasket and ring to the inside of the shell.
5. Using Loctite 504, install the front bearing housing bolts and lockstraps through the ring and the bearing housing. Tighten the bolts and bend the lockstraps as applicable.
6. Pre-position the two bearing support tap strips, then install the rear reinforcing plate. Install new alignment washers and original shims on rear mounting bolts (FIGURE 6). **Replace the shims on rear mounting bolts exactly as removed.**
7. Tighten bolts. Insure there is approximately .0625 inch (1.6 mm) clearance between the alignment washer and the reinforcing plate as shown in FIGURE 7. Add or subtract shims as required to obtain specified clearance. Weld the new alignment washers to the reinforcing plate.
8. Install all of the original lubrication fittings and connections to the new bearing housing.
9. Secure the level switch sensor hose.

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## Installing the Cylinder and Shell Front

1. Screw two new allen screws into the cylinder puller mounting holes; **do not obstruct the shaft retainer spacer seat.**
2. Determine that the main shaft is clean and free from any foreign material and that the key is properly seated.

### ⚠ CAUTION ⚠



**Failure to properly install cylinder may cause it to loosen during machine operation. This will cause damage to the cylinder, shell, and main bearing shaft surfaces.**

☞ **Carefully follow cylinder installation step below.**

3. Slide the cylinder onto the shaft, and install a new 3/4" inch long 3/4-10 grade 8 zinc plated bolt and washer. Carefully tighten this bolt, using it to pull the cylinder up the tapered main bearing shaft. After cylinder is in place, torque the bolt to 282 foot pounds (382 Newton meters).

Remove the grade 8 bolt and replace with a new 3/4" inch 18-8 stainless steel retainer bolt and washer with the original cover and spacer. Torque the retainer bolt to 150 foot pounds.

4. Determine that the shell front and front lip of the shell is clean and free from burrs, sharp edges, or sealants.

### ⚠ CAUTION ⚠

**A metal hammer can crack stainless steel components.**

☞ **Do not use a metal hammer to seat the shell front or install the ring.**

5. Using clamps, mount and support the shell front in place (align it with the mark made before it was removed). If necessary, use a rubber or rawhide maul to strike the shell front so it seats within the shell. After the shell front is seated properly on the shell, check the gap between the shell front and the lip on the shell. If necessary, use a rubber or rawhide maul on the shell lip to close the gap.
6. Pack a small amount of Permatex 2 adhesive (or similar) into the top center gap of the shell front and shell, two inches on both sides of the shell weld.
7. Install the new rubber extrusion starting at the 10 o'clock position. Trim off any excess.
8. Install the shell clamp ring on the shell front with the ring gap at the top center of the shell. Tap around the ring (bottom to top) with a rubber maul until a clamp can be installed on the ends of the shell clamp ring. Repeat this procedure and tighten the clamp until the bolt can be installed. Tap around the ring again, and tighten the bolt. Install the shell mount ring clip guard.
9. Reconnect door interlock conduit and wires.
10. See "DRIVE TRAIN SERVICE" (see Table of Contents) to replace pulleys, belts, and to set belt tension.