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TECHNICAL MANUAL

OPERATION, MAINTNENACE AND
INSTALLATION

**HOBART LEGACY 80 & 140
QUART MIXERS;
MODELS HL800 & HL1400**

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FOREWORD

This technical manual provides a general description, operation, maintenance and installation information for the HOBART Legacy 80 & 140 Quart Mixers, models HL800 and HL1400. This technical manual is intended for the guidance of and use by personnel operating and maintaining the equipment described herein.

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SECTION 3

SERVICE MANUAL, HOBART LEGACY 80 & 140 QUART MIXERS,
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SECTION 4

CATALOG OF REPLACEMENT PARTS, HOBART LEGACY 80 & 140
QUART MIXERS, MODELS HL800 & HL1400

SAFETY SUMMARY

GENERAL SAFETY NOTICES

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. Should situations arise that are not covered in the general or specific safety precautions, the commanding officer or other authority will issue orders as deemed necessary to cover the situation. No work shall be undertaken on energized equipment or circuits until approval of the commanding officer is obtained, and then only in accordance with Naval Ships' Technical Manual (NSTM) S9086-KC-STM-010/Chapter 300.

DO NOT REPAIR OR ADJUST ALONE

Under no circumstances shall repair or adjustment of energized equipment be attempted alone. The immediate presence of someone capable of rendering first aid is required. Before making adjustments, be sure to protect against grounding. If possible, adjustments should be made with one hand, with the other hand free and clear of equipment. Even when power has been removed from equipment circuits, dangerous potentials may still exist due to retention of charges by capacitors. Circuits must be grounded and all capacitors discharged prior to attempting repairs. Equipment should be deenergized and properly tagged out according to the ship's Standard Operating Procedures.

TEST EQUIPMENT

Make certain test equipment is in good condition. If a metal-cased test meter must be held, ground the case of the meter before starting measurement. Do not touch live equipment or personnel working on live equipment while holding a test meter. Do not ground any measuring devices; these devices should not be held when taking measurements.

INTERLOCKS

Interlocks are provided for safety of personnel and equipment and should be used only for the purpose intended. They should not be battle shorted or otherwise modified except by authorized maintenance personnel. Do not depend solely upon interlocks for protection. Whenever possible, disconnect power at the power distribution source.

MOVING EQUIPMENT

Personnel shall remain clear of moving equipment. If equipment requires adjustment while in motion, a safety watch shall be posted. The safety watch shall be qualified to administer CPR, have a full view of the operations being performed, and have immediate access to controls capable of stopping equipment motion.

FIRST AID

An injury, no matter how slight, shall never go unattended. Always obtain first aid or medical attention immediately, and file an injury report in accordance with OPNAVINST 5102.1 series, subj: Mishap Investigation and Reporting.

RESUSCITATION

Personnel working with or near high voltage shall be familiar with approved methods of resuscitation. Should someone be injured and stop breathing, begin resuscitation immediately. A delay could cost the victim's life. Resuscitation procedures shall be posted in all electrically hazardous areas.

GENERAL PRECAUTIONS

The following general precautions are to be observed at all times.

1. Install and ground all electrical components associated with this system/ equipment in accordance with applicable Navy regulations and approved shipboard practices.
2. Ensure that all maintenance operations comply with Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100.19 series.
3. Observe precautions set forth in NSTM S9086-KC-STM-010/Chapter 300 with respect to electrical equipment and circuits.
4. Ensure that protective guards and shutdown devices are properly installed and maintained around rotating parts of machinery and high voltage sources.
5. Do not wear loose clothing while working around rotating parts of machinery.
6. Ensure that special precautionary measures are employed to prevent applying power to the system/equipment any time maintenance work is in progress.
7. Do not make any unauthorized alterations to equipment or components.
8. Before working on electrical system/equipment, use the correct tag out procedure and check with voltmeter to ensure that system is not energized.
9. Consider all circuits not known to be "dead," "live" and dangerous at all times.
10. When working near electricity, do not use metal rules, flashlights, metallic pencils, or any other objects having exposed conducting material.
11. Deenergize all equipment before connecting or disconnecting meters or test leads.
12. When connecting a meter to terminals for measurement, use range higher than expected voltage.
13. Before operating equipment or performing any tests or measurements, ensure area is dry of water or other liquid conductive material and that frames of all motors and starter panels are securely grounded.
14. Ensure that area is well-ventilated when using cleaning compound or solvent. Avoid prolonged breathing of fumes and compound or solvent contact with skin or eyes.

SECTION 1

INSTRUCTION MANUAL

HOBART LEGACY

80 & 140 QUART MIXERS

MODELS HL800 & HL1400

HOBART

LEGACY[®]

Models

HL800 ML-134306

HL1400 ML-134343

Prior MLs Covered
in this Manual:

ML-134334

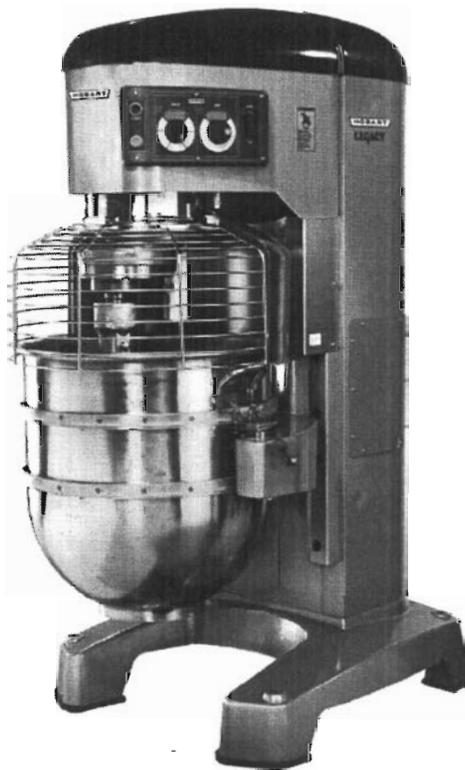
**INSTRUCTION
MANUAL**



701 S. RIDGE AVENUE TROY, OHIO 45374-0001

937-332-3000 · WWW.HOBARTCORP.COM

FORM 34928 Rev D (March 2007)



LEGACY 80-QUART AND 140-QUART MIXERS

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Installation, Operation and Care of Legacy[®] 80-Quart Mixers and Legacy[®] 140-Quart Mixers

SAVE THESE INSTRUCTIONS

GENERAL

The Legacy[®] 80-quart mixer is a heavy-duty mixer which features a 3-horsepower motor, digital Smart Timer™ and power bowl lift as standard equipment.

A programmable Recipe Timer is optional.

60 and 40-quart bowls and a variety of agitators are also available.

The Legacy[®] 140-quart mixer is a heavy-duty mixer which features a 5-horsepower motor, digital Smart Timer™ and power bowl lift as standard equipment.

A programmable Recipe Timer is optional.

80, 60 and 40-quart bowls and a variety of agitators are also available.

Both models have four mix speeds and stir speed.

A variety of agitators and accessories are available. These are described in a separate *Use and Applications Handbook*, which is furnished on the Legacy Mixer Operator Training CD provided with each mixer.

INSTALLATION

UNPACKING

Immediately after unpacking the mixer, check for possible shipping damage. If this machine is found to be damaged after unpacking, save the packaging material and contact the carrier within 15 days of delivery.

LOCATION

Prior to installation, test the electrical service to assure that it agrees with the specifications on the machine data plate.

Place the mixer in its operating location. There should be adequate space around the mixer for the user to operate the controls and to install and remove bowls. The area above and to the right side of the mixer should allow the top and side covers to be removed for routine maintenance and servicing.

Once in position, the mixer must be leveled:

- Remove the two top cover screws and the top cover.
- Place a level on the top rim of the large pulley (Fig. 1). Slide shims under the base contact surface of the mixer as required to level it front-to-back and side-to-side.
- Do not replace the top cover until installation is completed.

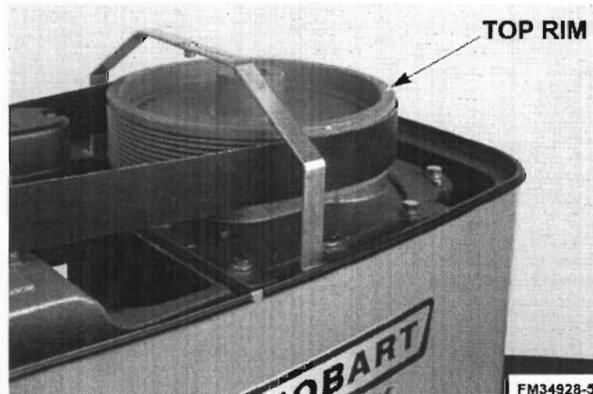


Fig. 1

ELECTRICAL CONNECTIONS

WARNING: ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTION OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES.

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT/TAGOUT PROCEDURES.

A hole for $\frac{3}{4}$ "-trade-size conduit is located at the top of the pedestal. Make electrical connections per the wiring diagram located on the inside of the top cover.

Three-Phase Mixer:

- Connect field supply lead wires to L1, L2 and L3.
- Connect ground wire to ground lug on the mixer.

INITIAL CHECKS

Check Lubrication Before Use

This mixer is shipped with oil in the transmission. Check oil level before starting mixer (Fig. 2). Refer to Lubrication on page 23 for applicable lubrication procedures.

Operation

1. Turn the SPEED dial pointer to STIR.
2. Apply power to the mixer. With the bowl locked into place, the bowl support all the way up and bowl guard closed, momentarily run the machine by pushing the START and then STOP buttons.
3. Verify that the motor is turning counterclockwise (Fig. 2). If not, reverse any two lead wires.
4. Verify that the bowl lift actuator raises and lowers per the switch direction arrows.

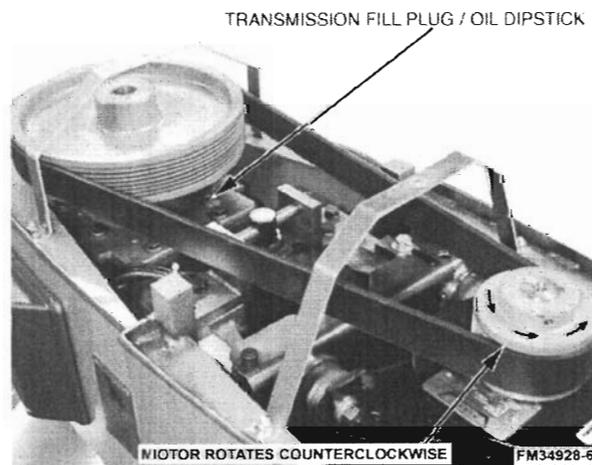
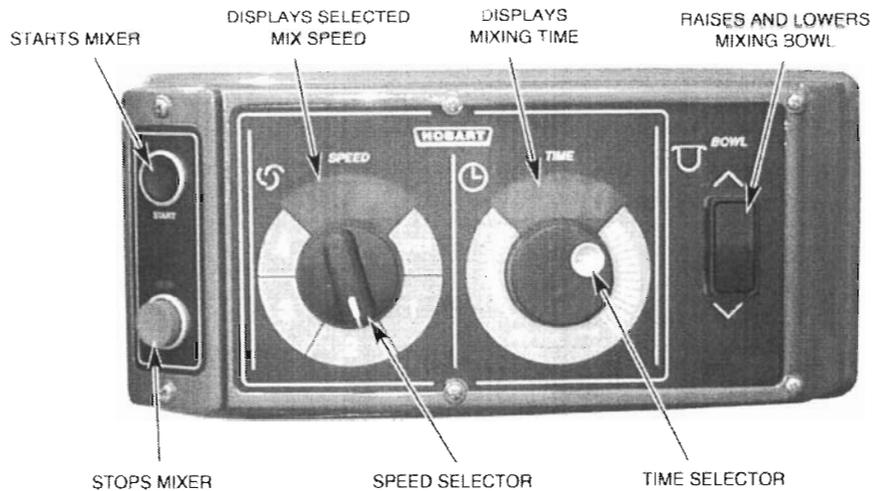


Fig. 2

STANDARD CONTROLS

Model HL800 and HL1400 (With Four Mix Speeds Plus Stir Speed)



FM34928-3

Fig. 4

Mixer Speeds (Model HL800 and HL1400)

STIR (Slow)	This speed is for incorporating ingredients at the start of each mixing process.
SPEED 1 (Low)	This speed is for heavy mixtures such as pizza dough, heavy batters and potatoes.
SPEED 2 (Medium-low)	This speed is for mixing cake batters, mashing potatoes and developing bread dough.
SPEED 3 (Medium-high)	This speed is for incorporating air into light batches, as well as finishing whipped items.
SPEED 4 (High)	This speed is for maximum and accelerated air incorporation into light batches.

PROGRAMMABLE RECIPE TIMER (OPTIONAL)

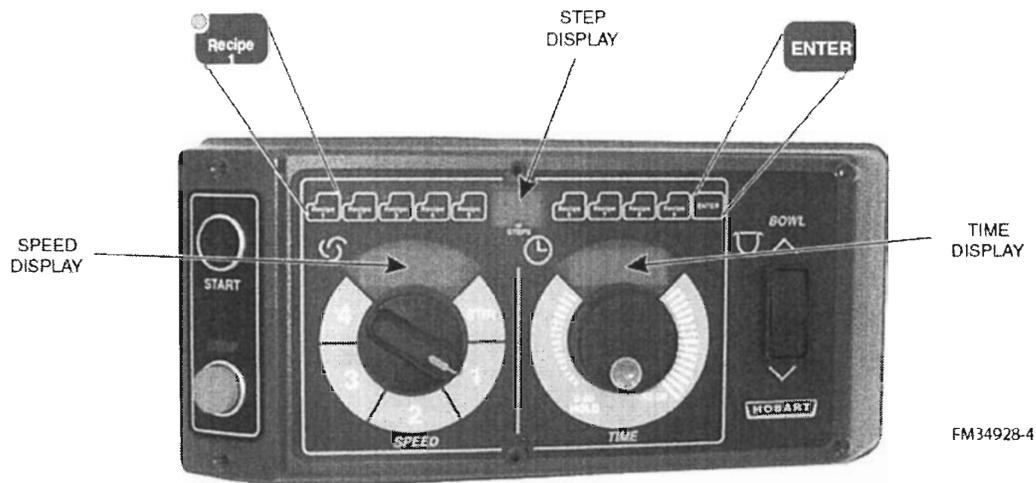


Fig. 5

Timer Specifications (Model HL800 and HL1400)

- Maximum number of programmable recipes: 9 recipes.
- Maximum number of steps allowed for each recipe: 6 steps.
- Maximum time allowed for each step in a recipe: 30 minutes.

For additional information on use of the programmable recipe timer, refer to pages 14 through 19.

BOWL PLACEMENT

NOTE: The bowl must be installed onto the bowl support before the agitator is installed.

To Install

1. Fully lower the bowl support.
2. Position bowl so the alignment pins on the left side of the bowl support fit in the holes in the bowl.
3. Swing the bowl into the locked position on bowl support (Fig. 6).

To Remove

1. Lower the bowl by pressing and holding the down arrow on the bowl switch.
2. Unlock bowl and swing out slightly from locked position
3. Open wire cage and remove agitator.

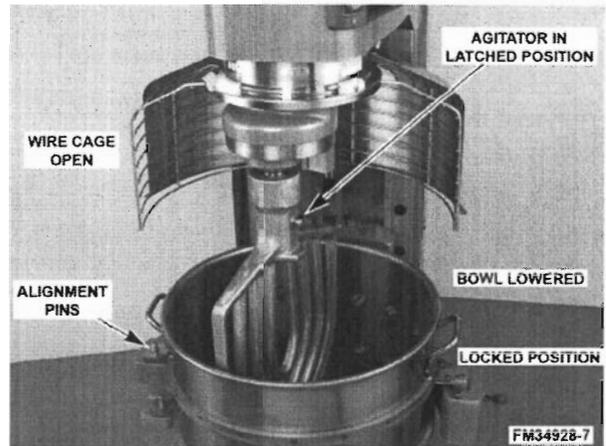


Fig. 6

AGITATOR

To install an agitator, the bowl must be on the bowl support and fully lowered.

To Install

1. Open the wire cage.
2. Place the agitator inside the bowl and line up the horizontal slot on the agitator with the agitator shaft pins.
3. Slide the agitator up the agitator shaft until it stops and latches (Fig. 6).

To Remove

1. Open the wire cage.
2. Lower the bowl by pressing and holding the down arrow on the bowl switch.
3. Hold the agitator and pull the plunger of the agitator out (Fig. 7). Slide agitator down off the agitator shaft.

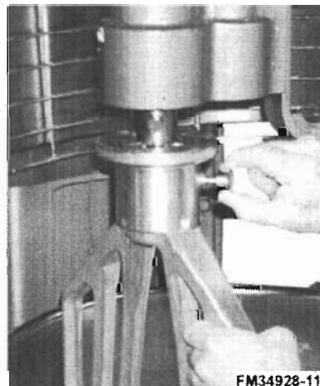


Fig. 7

POWER BOWL LIFT

CAUTION: Before lowering the bowl onto a bowl truck, always unlock bowl and swing bowl out slightly.

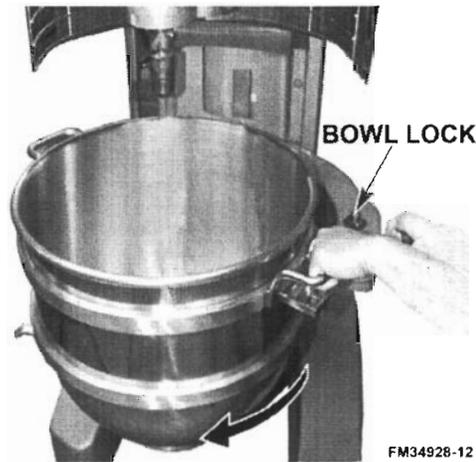


Fig. 8

To raise the bowl, the bowl must be in the locked position. Push and hold the up arrow on the bowl switch. To lower the bowl, push and hold the down arrow on the bowl switch.

To Raise the Bowl While Mixing

To raise the bowl while the agitator is mixing the product (when required by recipe or when using the Bowl Scraper Attachment):

1. Close the wire cage, then select a mixing speed on the SPEED dial.
2. Select a count-down time or HOLD for continuous count-up mixing.
3. While pressing and holding the up arrow on the bowl switch, press and hold the START button. The mixer runs only in stir speed while the bowl is rising.
4. When the bowl reaches the mix position, release the START button. The mixer automatically changes to the selected mixing speed.

NOTE: Mixing speed and time can be adjusted any time during the mixing operation without stopping the mixer.

PREPARE FOR MIXING

1. Open the wire cage.
2. Place the mixing bowl on the bowl support.
3. Pour ingredients into the bowl.
4. Swing the bowl back to the locked position.
5. Place the agitator inside the bowl, then attach it to the agitator shaft.
6. Return the wire cage to front-center position.
7. Push and hold the up arrow on the bowl switch until the bowl reaches the mix position and stops.
8. The mixer is now ready for mixing. (See Timer Operation.)

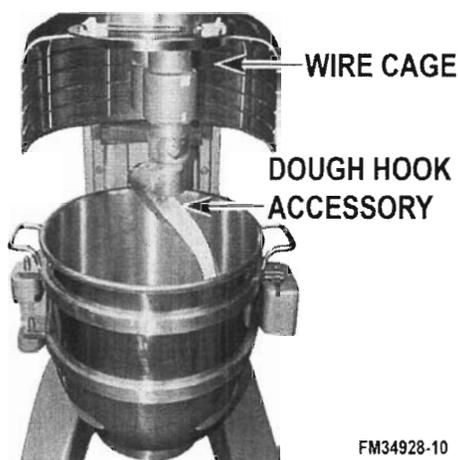


Fig. 14

FM34928-10

TIMER OPERATION

Using the Count-Up Mode (Continuous Mixing)

1. Turn the SPEED dial to select a mix speed (the SPEED setting can be changed at **any** time during the mixing operation).

NOTE: STIR is to be used for incorporating ingredients. Do not use to develop dough products.

2. Set the timer on hold by turning the TIME selector counterclockwise until "Hold" appears in the TIME window.
3. Press the START button to begin mixing. The timer starts counting forward from 00:00.

NOTE: If the wire cage is opened at any time, the mixing operation will stop. To resume the mixing operation, close the wire cage and press the START button.

4. Use the STOP button to stop the mixer; the mixing time is displayed in the TIME window.
5. Press the START button to resume mixing if needed.

NOTE: When the timer reaches 50:00 minutes, it will rollover to 00:01 and continue counting until the STOP button is pressed.

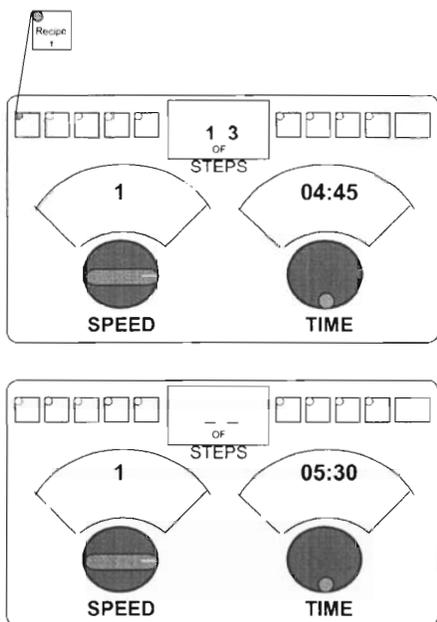
Using the Count-Down Mode (Timed Mixing)

1. Turn the SPEED dial to select a mix speed.
 - a. If the count-up mode was used for the previous batch, the desired time needs to be entered.
 - b. If the count-down mode was used for the previous batch, the previous time will be displayed. If a different time is needed, turn the TIME selector to the desired time.
 2. Press the START button to begin mixing; the timer starts counting down from the set time.
 - a. To stop the mixer at any time, press the STOP button. To resume mixing, press the START button. For example: The mixer is started at SPEED 1 for 30 seconds and is stopped after 10 seconds. Pressing the START button will resume the mixing operation.
 - b. If the mixer is stopped and a new time setting is entered, pressing the START button saves the new time setting on the current speed selection. For example: The mixer is started at SPEED 1 for 30 seconds and is stopped after 10 seconds. A new time is entered by turning the TIME selector. The new time will replace the initial 30 seconds for SPEED 1 after the START button is pressed.
 - c. If the time is changed while mixing, the mixer will operate until the new time expires. The adjustment to the time will not be stored.
 - d. If speed is changed while mixing, the time will change to the previous time for the selected speed and count down.
- NOTE:** If the wire cage is opened at any time, the mixing operation will stop. To resume the mixing operation, close the wire cage and press the START button.
3. When the timer reaches 00:00, the mixer stops; a beeper sounds for 3 seconds. The count-down timer displays the last-entered time.

OPERATING NOTES

- STIR is to be used for incorporating ingredients. Do not use it to develop dough products.
- If the mixer is stopped during a mixing operation, the timer also stops. The timer starts again where it left off when the START button is pressed.
- The SPEED window will display the current SPEED selection.
- Turn the TIME selector clockwise to take the mixer out of the hold mode.

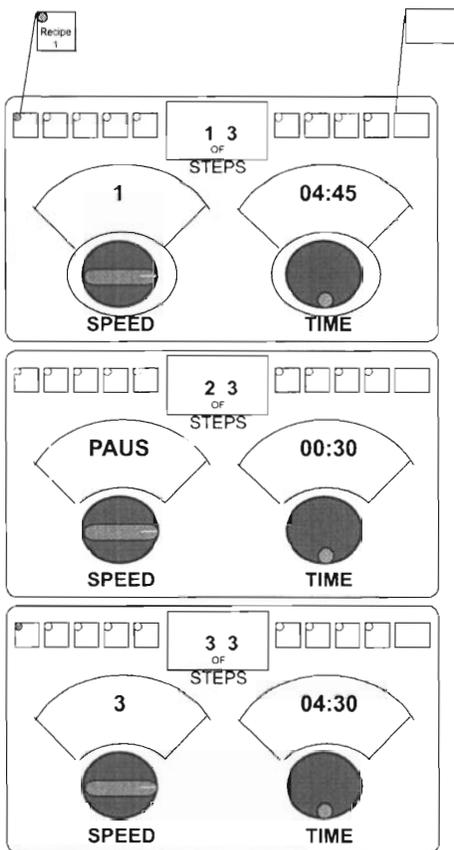
Recipe Mode — To Enter and Exit



- To enter recipe mode, press any recipe button. The recipe button lights to indicate you are in Recipe Mode, and the display shows the speed and time for the first step of the recipe.
- If the recipe button light blinks, the recipe is inactive. Refer to special functions to activate or de-activate recipe buttons.
- To exit Recipe Mode, press the lighted Recipe Button. The light on the recipe button goes off, indicating you are in Standard Timer Mode. The previous time setting for the shown speed will display.

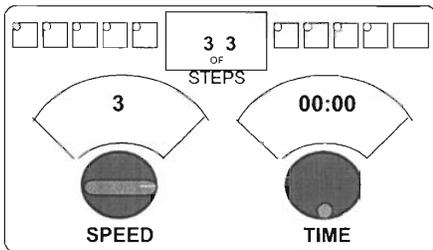
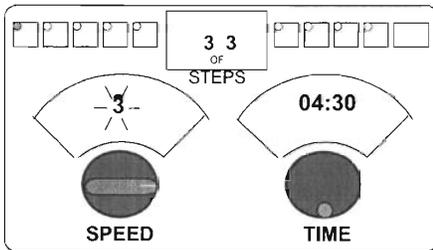
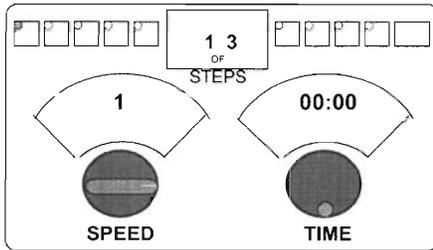
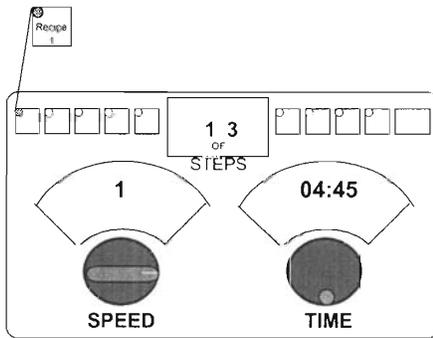
Reviewing Recipe Steps

This allows you to view a recipe without running the mixer. For example, a three step recipe is shown.

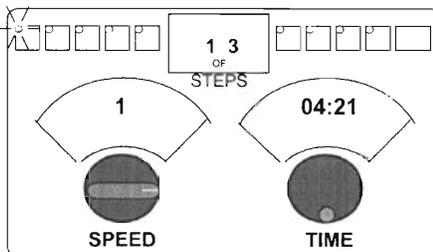


- Select the recipe. The speed and time for the first step of the recipe are displayed.
- Press ENTER to display the next recipe step. Repeatedly pressing ENTER cycles through all the recipe steps.
- Pressing START will begin mixing step 1 of the recipe, regardless of the step displayed.

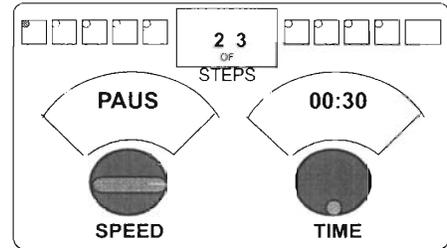
Running a Recipe



Interrupting a Recipe



- Select the desired recipe by pressing the recipe button. The button lights and step one of the recipe displays.
- Press START.
- The mixer begins to run step 1 of the programmed recipe. The timer display indicates the mixer speed and counts down the remaining time.
- When the time expires, the mixer automatically switches to the speed and time for the next recipe step and continues mixing. Mixing steps run in succession at the programmed speed and time.
- If a **Pause** step is programmed in the recipe, the mixer stops and the time display counts down the pause time to 00:00 and beeps.



- After a Pause step, the speed display for the next step flashes; press START when ready to resume mixing.
- The mixer stops after the last step.
- The timer displays revert back to step one for that recipe (as shown at the top of this page). Run the same recipe again by pressing START or select a different recipe.

- Mixing can be stopped at any time by pressing STOP.
- The speed display flashes to indicate the program is interrupted, and the timer displays the remaining time. Press START to resume mixing.
- If you do not wish to resume mixing, press the recipe button twice until it is not lit — this returns to Standard Timer Mode.

Timer will beep between steps and at end of step.

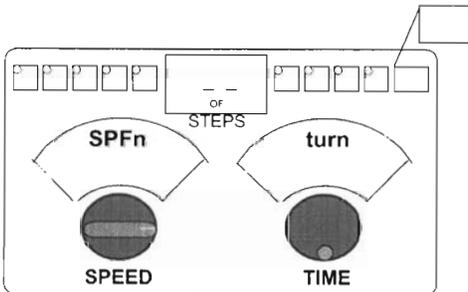
Entering a Special Function

Special Function Mode allows you to access three user resettable parameters:

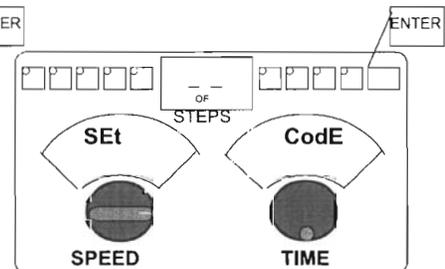
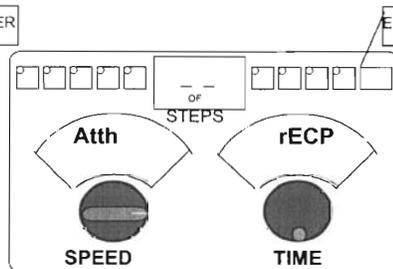
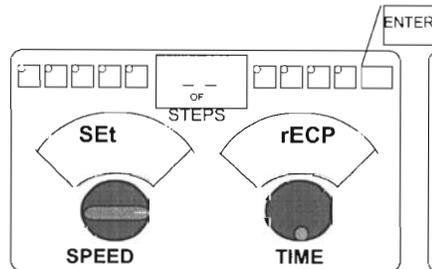
- Programming Recipes, (SEt . . . rECP),
- Making Recipes Active or Inactive, (Atth . . . rECP) and
- Setting the User Access Code (SEt . . . CodE).

[There are also other parameters for service use viewable in Special Functions.] Refer to the table, right.

FUNCTION		USED BY
SEL . . .	Unit	Service Technician
LAST . . .	Err	Service Technician
Err . . .	Log	Service Technician
totL . . .	HrS	Service Technician
LAST . . .	HrS	Service Technician
CAP . . .	HrS	Service Technician
RUN . . .	DiAg	Service Technician
SEt . . .	CodE	Authorized Operator
SEt . . .	rECP	Authorized Operator
Atth . . .	rECP	Authorized Operator

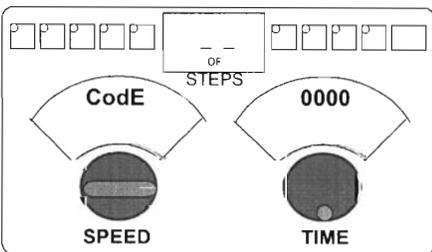


- Begin from Standard Timer Mode . . . (If you are in Recipe Mode, exit by pressing the lighted Recipe button to return to Standard Timer Mode.)
- With no Recipe buttons lighted, press Enter for 5 seconds. **SPFn . . . turn** displays indicating Special Functions.
- There is a one minute timeout in Special Functions Mode: After one minute of inactivity the control will automatically return to Standard Timer Mode.
 - Turn the Timer Dial to select one of the special functions: SEt . . . rECP, Atth . . . rECP or SEt . . . CodE, .

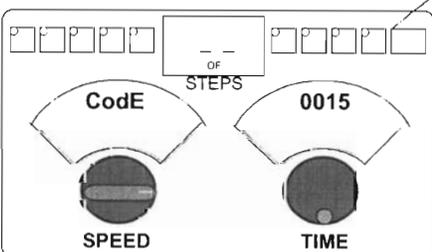


- Press ENTER.

Enter the Access Code



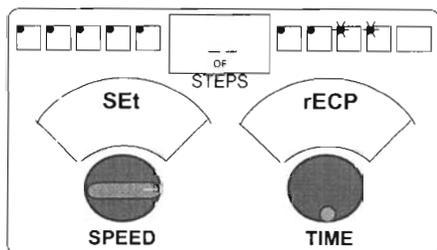
- You must enter the code to change any recipe parameters.
- **CodE . . . 0000** displays.
- Turn the timer dial to the applicable access code and press ENTER. The default access code is 0015. Refer to the next three pages for the applicable function.



- If the incorrect code has been entered, **no** is displayed in the Step Display.

Programming a Recipe [SEt . . . rECP]

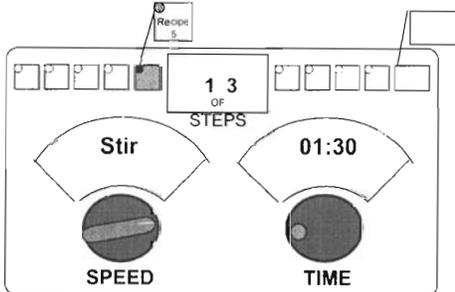
This function allows you to program any of 9 mixer recipes with up to 6 steps in each recipe.



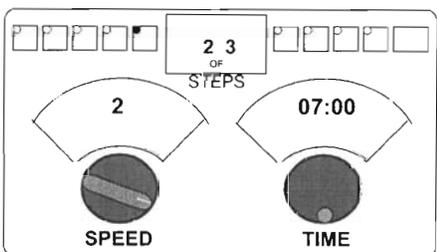
Follow instructions in Entering a Special Function on the previous page to enter SEt . . . rECP.

After entering the Access Code, the display of **SEt . . . rECP** indicates that you can now program a recipe.

All active recipe keys are lit continuously; inactive recipe keys blink.

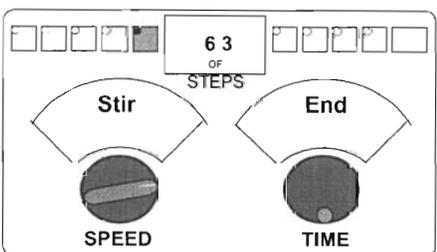
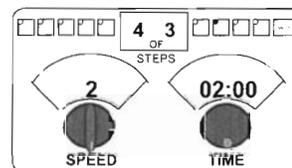


- Press the recipe key you want to program (1–9). It stays lit.
- Set the speed and mix time for step one by turning the speed and time dials; press ENTER to go to the next step. If the recipe was previously programmed, **step 1 of X** displays to indicate the first of up to 6 steps programmed for this recipe. The example shows that Stir speed was previously programmed for 1 minute and 30 seconds.



- Set the speed and time for each step of the recipe, then press ENTER to go to the next step. Repeat for each step.

- If you add more steps than were previously programmed, the step display does not update until the recipe has been saved. The step display can show step 4 of 3 during programming.

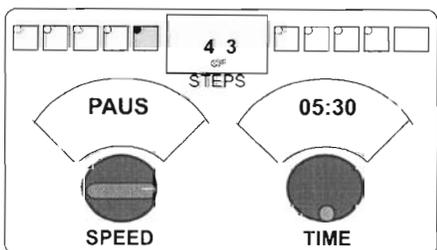


- Turn timer dial counterclockwise to **End** to terminate the recipe. This sets the previous step as the last step.

- To save the recipe, press the lit recipe button.

- Continue programming other recipes; or press ENTER for 5 seconds to exit SEt . . . rECP and return to Standard Timer Mode.

Programming a Pause



- If you need to stop mixing to add ingredients or to rest the dough, you can program a Pause step. Turn the Speed dial to the top (**PAUS** displays); set the timer dial for that amount of time; press ENTER.

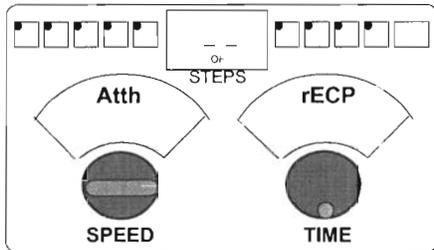
- The mixer cannot be restarted while the pause step is counting down. If programming a Pause to add ingredients, its best to set the Pause Time for a short amount of time.

- Pause cannot be entered in first or last step of a recipe.

NOTE: If a recipe step is programmed wrong, exit SEt . . . rECP and re-program the entire recipe.

Making a Recipe Active or Inactive [Atth . . . rECP]

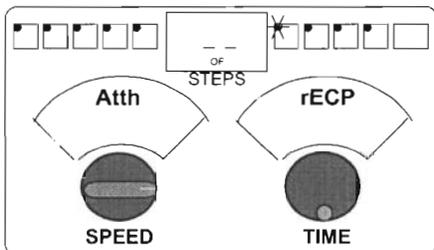
This function allows you to change the status of a recipe from Active to Inactive or vice versa. A recipe that has inactive status will not run.



Follow instructions in Entering a Special Function on page 17 to enter Atth . . . rECP.

After entering the Access Code, the display of **Atth . . . rECP** indicates that you can change the status of a recipe.

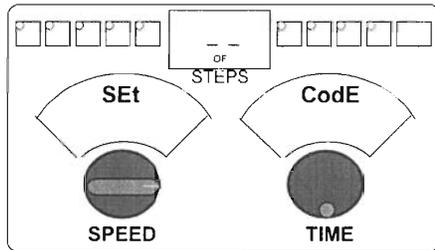
All active recipe buttons are lit continuously; inactive recipe keys blink.



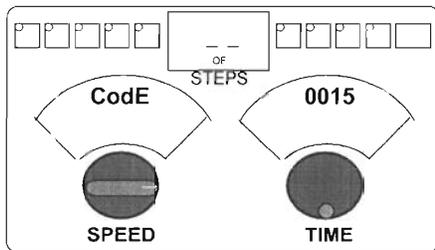
- Press any lighted recipe button to deactivate the recipe; the recipe button blinks.
- Press any blinking recipe button to activate the recipe; it becomes lit continuously.
- Press ENTER for 5 seconds to exit Atth . . . rECP and return to Standard Timer Mode.

Setting the Access Code [SEt . . . CodE]

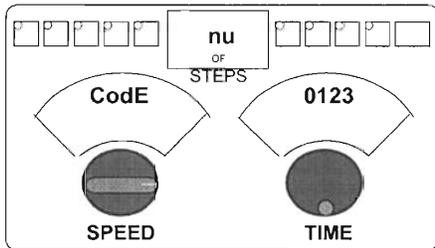
This function allows you to change the factory-set access code, 0015, to any number from 0000 to 9999. We recommend that you keep the 0015 access code.



Follow instructions in Entering a Special Function on page 17 to enter SEt . . .CodE.

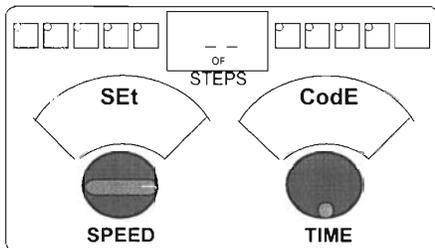


- Turn the timer dial to the current code number and press ENTER.



- The step display now reads **nu**.

- Turn the timer dial to the new code number and press ENTER.



- **SEt ... CodE** displays. Press ENTER for 5 seconds to exit SEt . . . CodE and return to Standard Timer Mode.

- Make a record of the new access code.

If you lose the code, it can be restored to the factory-set default code 0015. Disconnect power to the mixer. Press the enter key while powering up the mixer again. This resets all factory defaults. Programmed recipes will be lost.

UNLOADING

1. After the mixer has stopped, unlock the bowl and swing-out slightly. Press and hold the down arrow on the bowl switch to lower the bowl.
2. Open the wire cage assembly.
3. Remove the agitator from the agitator shaft.
4. Remove the bowl from the bowl support.

WIRE CAGE (Fig. 9)

The wire cage can be rotated out of the way to add ingredients or to access the bowl and agitator.

Note how the grooves on the nylon retainer shoes allow the Wire Cage to ride around the circular ridge of the planetary drip cup.

- To open the wire cage, rotate it to your left.
- To close the wire cage, rotate it to your right until it stops in the front-center, closed position.

NOTE: The wire cage must be returned to the closed position for the mixer to operate.

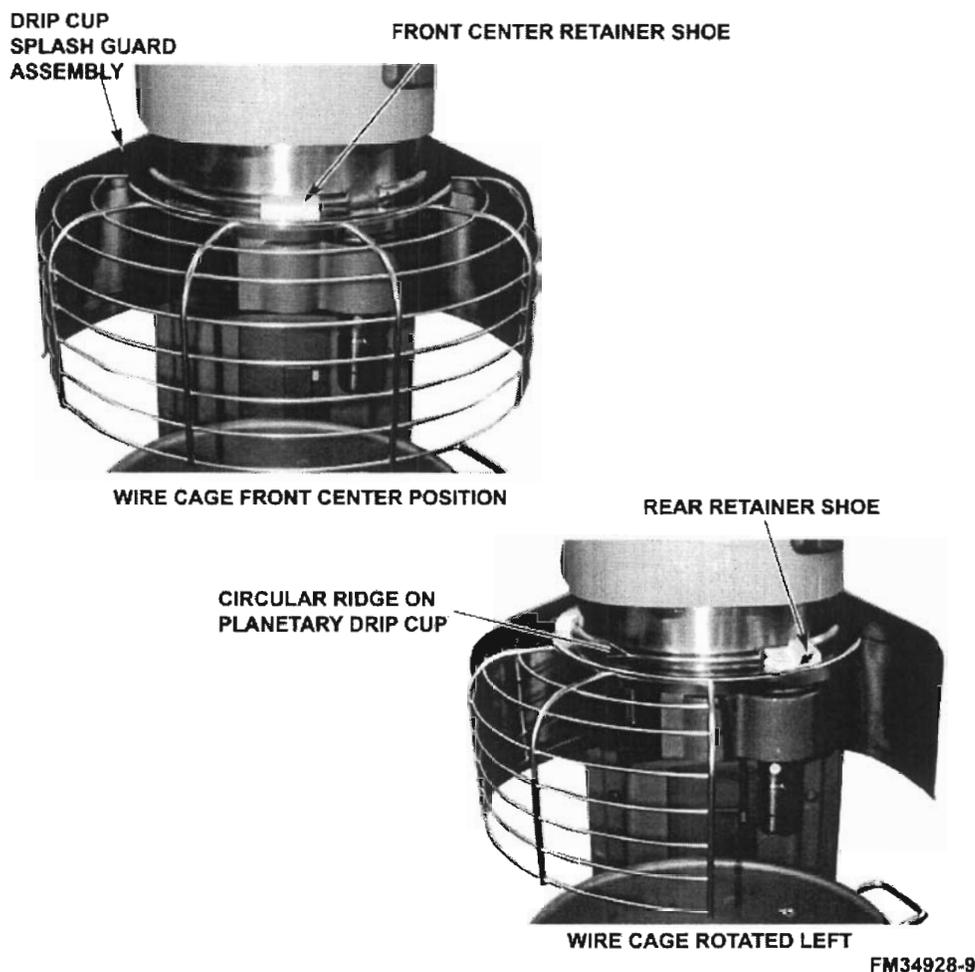


Fig. 9

Remove and Clean Wire Cage (Fig. 10)

1. Lower the bowl. Remove the agitator and bowl.
2. While holding the wire cage securely with both hands, rotate it to your left until the front-center retainer shoe reaches the gap in the circular ridge of the planetary drip cup.
3. Lower the front of the wire cage and move the wire cage slightly to the rear so the rear retainer shoes clear the ridge of the drip cup. The wire cage can now be removed.

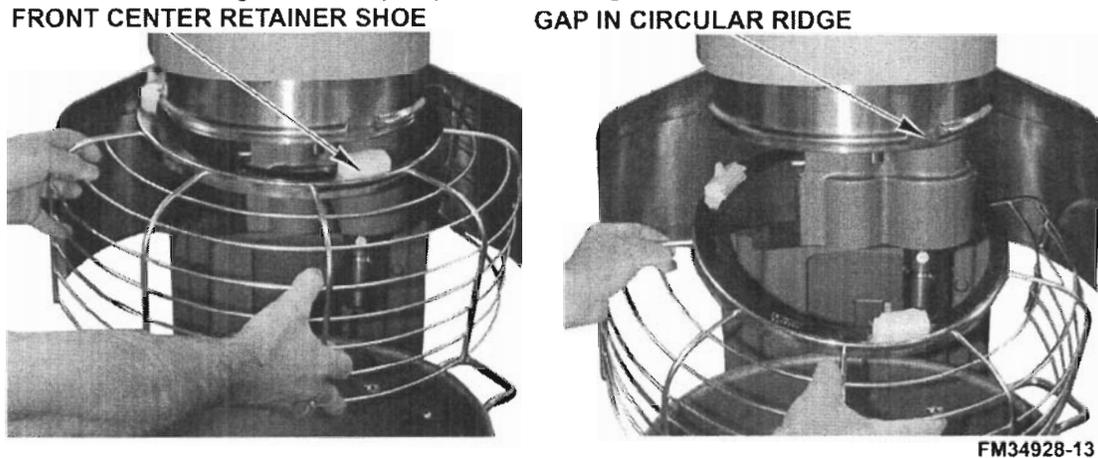


Fig. 10

4. Wash the wire cage in a sink, rinse with clear water, and dry with a clean cloth.
5. The stainless steel splash guard can be wiped off and/or washed with a cloth or sponge using warm, soapy water. Rinse with clear water and dry with a clean cloth.

Reinstall Wire Cage

1. Position the ring of the wire cage so the front-center retainer shoe is positioned below the gap in the circular ridge of the planetary drip cup.
2. Position the grooves so the rear retainer shoes straddle the circular ridge on the planetary drip cup.
3. Lift the front of the wire cage so the front-center retainer shoe passes up through the gap in the circular ridge on the planetary drip cup.
4. Rotate the wire cage to your right until all three retainer shoes straddle the ridge on the drip cup.
5. Continue rotating the wire cage so the opening is to the front of the mixer (to install the agitators) or until it stops at the front-center position.

AGITATORS

Agitators are covered in a separate Hobart Legacy Mixer Use and Application Handbook on the Mixer Operator Information CD. Follow the instructions accordingly.

CLEANING

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

New mixer bowls and accessories (beaters, whips and dough arms) should be thoroughly washed with hot water and a mild soap solution, rinsed with either a mild soda or vinegar solution and thoroughly rinsed with clear water before being used. This cleaning procedure should also be followed for bowls and agitators before whipping egg whites or whole eggs.

The mixer should be thoroughly cleaned daily. DO NOT use a hose to clean the mixer; it should be washed with a clean, damp cloth. The base allows ample room for cleaning under the mixer. The apron (Fig. 3) may be removed for cleaning by loosening the thumb screws.

The drip cup-splash guard assembly (Fig. 3) should be removed periodically and wiped clean.

For cleaning the Wire Cage refer to page 21.

MAINTENANCE

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

LUBRICATION

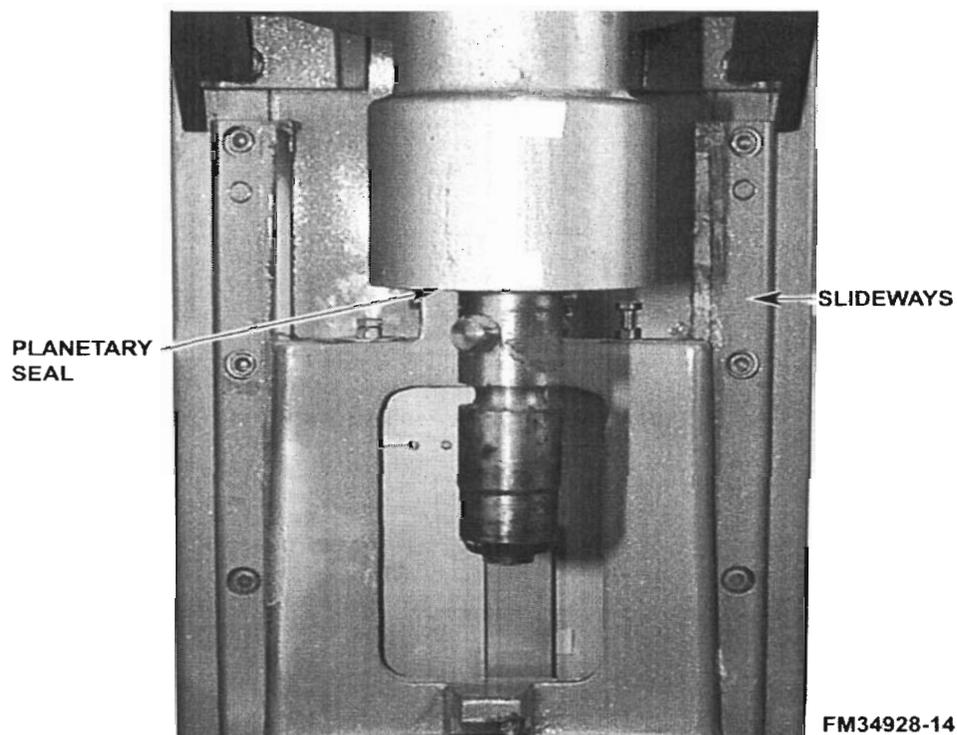


Fig. 11

Slideway

The slideways (Fig. 11) should be lubricated approximately twice a year. To reach these areas, fully lower the bowl support and remove the apron, which is secured by thumb screws. Wipe a thin coat of Lubriplate 630AA on the bowl pad area of the bowl supports and on each slideway. Install the apron.

Planetary Seal

Occasionally, the planetary seal (Fig. 11) may become dry and begin to squeak. To correct this, work a little lubrication (mineral oil) under the lip of the seal.

Transmission

To check the oil level, remove the top cover, which is secured by two screws. Remove the Transmission Fill Plug (Fig. 12) and check the oil level. If the oil level is below the line on the oil dipstick, add a small amount of the recommended transmission oil until it returns to the proper level. Do not overfill the transmission, as leakage may result. Contact your local Hobart Service Office for the recommended transmission oil.

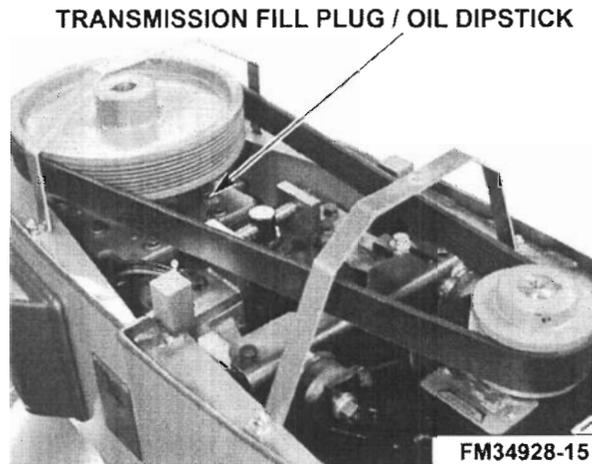


Fig. 12

ADJUSTMENTS

Agitator Clearance

The agitator clearance should be checked periodically. The agitator must not touch the bowl, and the maximum clearance between the bottom of the bowl and the B flat beater is $\frac{1}{8}$ " (3 mm); the maximum clearance between the bottom of the bowl and the ED dough arm is $\frac{5}{16}$ " (8 mm) for the HL800 Mixer and $\frac{11}{16}$ " (17 mm) for the HL1400 Mixer.

Install a bowl and agitator (e.g., beater). If the bowl and beater come into contact before the bowl support reaches its stop, adjust the stop screw. Refer to Adjust the Bowl/Agitator Clearance, page 25.

Measure Clearance

Pour enough flour in the bowl to cover the bottom of the bowl where the beater travels. With the bowl fully raised (beater should not touch the bottom of the bowl), briefly run the mixer at the lowest speed.

Turn off the mixer, disconnect the electrical power supply, and measure the depth of flour where the beater has traced a path. This measurement should be taken at several points around the bowl to assure accuracy.

Adjust the Bowl/Agitator Clearance

- Remove the apron (which is secured by thumbscrews).
- Adjust the stop screw on left side.
 - Loosen the bottom locking nut, (Fig. 13) and turn the stop screw counterclockwise to increase the clearance or clockwise to decrease the clearance.
 - Tighten the locking nut while holding the stop screw.
- After the adjustments are made, replace the apron and secure it with the thumbscrews.
- Reconnect the electrical power supply.
- Carefully operate the bowl lift several times to check the adjustment.

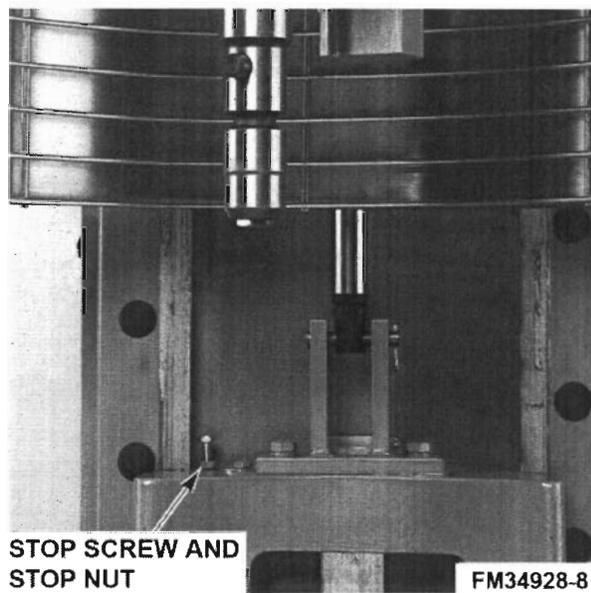


Fig. 13

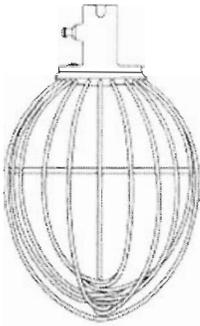
TROUBLESHOOTING

Symptoms	Possible Causes
Mixer will not start.	Circuit protector is in open position - check fuse or disconnect switch. Mixer is overloaded. Wire cage is not in the closed position. Bowl is not in closed (locked) position.
Agitator touches bowl.	Bowl is not in closed (locked) position. Improper agitator clearance - see Maintenance for adjustment procedure. Agitator is not installed properly.
Planetary seal squeaks.	Seal requires occasional lubrication - see Maintenance.
Timer displays error code (ErXX).	If the error code is flashing - wait for mixer to clear error condition. If mixer continues to stop and timer displays flashing error code, disconnect electrical power from mixer for 1 minute, then reconnect. If symptoms still exist, contact your local Hobart Service office.
Alternated message of "b_in" on SPEED display.	Bowl is not in all the way. If message of "b_in" appears again after a corrective action, disconnect electrical power from mixer for 1 minute, then reconnect. If symptoms still exist, contact your local Hobart Service office.
Alternated message of "b_up" on SPEED display.	Bowl is not up all the way. If message of "b_up" appears again after a corrective action, disconnect electrical power from mixer for 1 minute, then reconnect. If symptoms still exist, contact your local Hobart Service office.
Alternated message of "b_gd" on SPEED display.	Wire cage is not closed completely. If message of "b_gd" appears again after a corrective action, disconnect electrical power from mixer for 1 minute, then reconnect. If symptoms still exist, contact your local Hobart Service office.
Message of "HI" and "LOAD" on displays.	Make sure you are not using STIR to develop dough product.

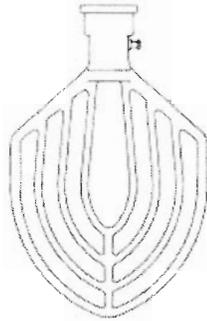
SERVICE

If service is needed on this equipment, contact your local Hobart Service office.

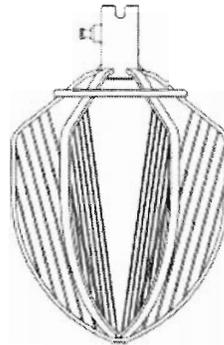
AGITATORS



I Wire Whip



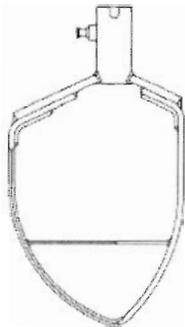
B Flat Beater



C Wing Whip



D Wire Whip



P Pastry Knife



Bowl Scraper



ED Dough Hook

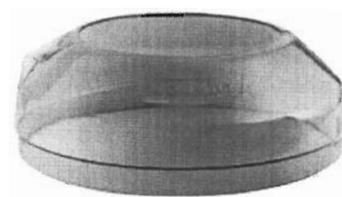
ACCESSORIES



Bowl



Bowl Truck



Splash Cover

FM34928-16

NOTES

SECTION 2

SPECIFICATIONS

HOBART LEGACY

80 & 140 QUART MIXERS

MODELS HL800 & HL1400

HOBART701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com**LEGACY®
HL800 MIXER****HOBART****STANDARD FEATURES**

- Heavy-Duty 3 H.P. Motor
- Gear Transmission
- Four Fixed Speeds Plus Stir Speed
- Shift-on-the-Fly™ Controls
- Patented soft start Agitation Technology
- 50-Minute SmartTimer™
- Automatic Time Recall
- Large, Easy-To-Reach Controls
- Single Point Bowl Installation
- Ergonomic Swing-Out Bowl
- Power Bowl Lift
- Open Base
- Stainless Steel Bowl Guard
- Metallic Gray Hybrid Powder Coat Finish

**ACCESSORY PACKAGES - featuring
Hobart Quick Release™ Agitators** **Deluxe Accessory Package Includes:**

- 80 Quart Stainless Steel Bowl
- 80 Quart "B" Beater
- 80 Quart "D" Wire Whip
- 80 Quart "ED" Dough Hook
- 80 Quart Bowl Scraper
- 80 Quart Bowl Truck
- 80 Quart Ingredient Chute

 Standard Accessory Package Includes:

- 80 Quart Stainless Steel Bowl
- 80 Quart "B" Beater
- 80 Quart "ED" Dough Hook
- 80 Quart Bowl Truck

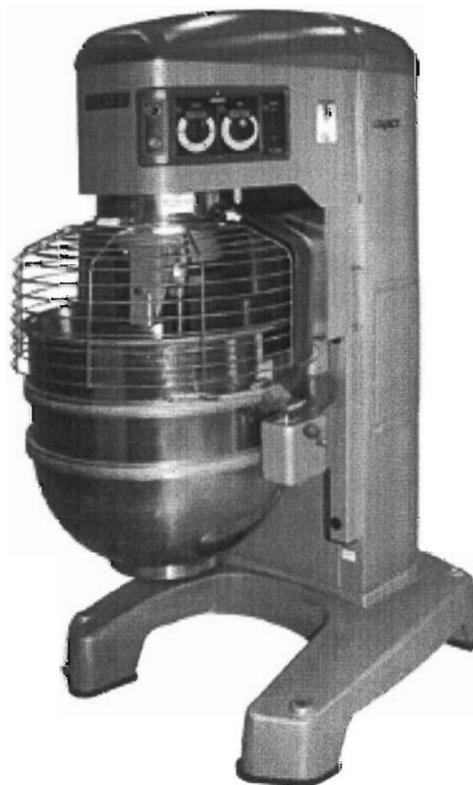
MODELS

- HL800 – 80-Quart All Purpose Mixer
- HL800C – 80-Quart All Purpose Mixer with
Maximum Security Correctional
Package

OPTIONS

- SmartPlus™ Programmable Recipe Timer

Specifications, Details and Dimensions on Inside and Back.

**LEGACY® HL800 MIXER**

SOLUTIONS/BENEFITS

3 H.P. Motor

Durability

- Heavy-duty to meet the most demanding operations

Gear Transmission

Durability, Reliability

- Ensures consistent performance and minimum downtime under heavy loads

Four Fixed Speeds plus Stir Speed

Flexibility, Reliability, Consistency

- For incorporating, blending, mixing ingredients
- Supports consistent results and thorough mixing

Shift-on-the-Fly™ Controls

Flexibility

- Allows operator to change speeds while mixer is running

Patented soft start Agitation Technology

Sanitation

- Each speed has a soft transition into a higher speed to reduce the chances of product splash-out

50-Minute SmartTimer™

Convenience, Ease of Use, Consistency

- Supports recipe mixing times
- Provides accurate results and eliminates overmixing

Automatic Time Recall

Productivity, Consistency

- Remembers the last time set for each speed
- Great for multiple batches

Ergonomic Swing-Out Bowl

Ease of Use, Convenience

- Easy loading and unloading of products
- Single Point Bowl Installation allows for simple mounting and removal of bowl
- Bowl Lock ensures mixer bowl is properly in place for mixer to operate

Stainless Steel Bowl Guard

Protection

- Interlock prevents operation when front portion of guard is out of position

Hobart Accessories

Durability, Flexibility, Simplicity

- Hobart Quick Release™ agitators allow for simple installation and removal from agitator shaft
- Hobart accessories are designed for long-term usage under heavy-duty conditions
- Large array of accessories provide multiple uses for recipe and product processing

HL800 MIXER CAPACITY CHART

Recommended Maximum Capacities - dough capacities based on 70°F. water and 12% flour moisture.

PRODUCT	AGITATORS SUITABLE FOR OPERATION	HL800
CAPACITY OF BOWL (QTS. LIQUID)		80
Egg Whites	D	2 qts.
Mashed Potatoes	B & C	60 lbs.
Mayonnaise (Qts. of Oil)	B or C or D	30 qts.
Meringue (Qts. of Water)	D	3 qts.
Waffle or Hot Cake Batter	B	32 qts.
Whipped Cream	D or C	16 qts.
Cake, Angel Food (8-10 oz. cake)	C or I	60
Cake, Box or Slab	B or C	100 lbs.
Cake, Cup	B or C	90 lbs.
Cake, Layer	B or C	90 lbs.
Cake, Pound	B	100 lbs.
Cake, Short (Sponge)	C or I	80 lbs.
Cake, Sponge	C or I	65 lbs.
Cookies, Sugar	B	60 lbs.
Dough, Bread or Roll (Lt.-Med.) 60% AR	§ ED	170 lbs.*
Dough, Heavy Bread 55% AR	§ ED	140 lbs.*
Dough Pie	B & P	75 lbs.
Dough, Thin Pizza 40% AR (max. mix time 5 min.)	§‡ ED	85 lbs.□
Dough, Med. Pizza 50% AR	§‡ ED	155 lbs.□
Dough, Thick Pizza 60% AR	§‡ ED	155 lbs.*
Dough, Raised Donut 65% AR	ED	60 lbs.†
Dough, Whole Wheat 70% AR	ED	150 lbs.*
Eggs & Sugar for Sponge Cake	B & C or I	40 lbs.
Icing, Fondant	B	65 lbs.
Icing, Marshmallow	C or I	10 lbs.
Shortening & Sugar, Creamed	B	65 lbs.
Pasta, Basic Egg Noodle (max. mix time 5 min.)	ED	65 lbs.*□

NOTE: % AR (% Absorption Ratio) - Water weight divided by flour weight. Capacity depends on moisture content of dough. Above capacities based on 12% flour moisture at 70°F water temperature.

□ 1st Speed

* 2nd Speed

† 3rd Speed

§ If high gluten flour is used, reduce above dough batch size by 10%.

‡ 2nd Speed should never be used on 50% AR or lower products.

USE OF ICE REQUIRES A 10% REDUCTION IN BATCH SIZE.

1 gallon of water weighs 8.33 lbs.



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL800 MIXER

SPECIFICATIONS

MOTOR:

3 H.P. high torque motor.

200-240/50/60/3	11.0 Amps
380-460/50/60/3	5.2 Amps

ELECTRICAL:

200-240/50/60/3 and 380-460/50/60/3 – UL Listed.

CONTROLS:

Magnetic contactor with thermal overload protection. Internally sealed “Start-Stop” and Power Bowl Lift push buttons. Reduced voltage pilot circuit transformer is supplied for 380-460/50/60/3 machines. A 50-minute SmartTimer™ is standard. SmartTimer™ includes **Automatic Time Recall**, which remembers the last time set for each speed. Optional SmartPlus™ Programmable Recipe Timer allows operators the ability to program up to 9 recipes with 6 steps per recipe. SmartPlus™ automatically changes speeds and starts timer count-down without operator intervention.

TRANSMISSION:

A rated 10 H.P. poly-V belt transfers power from motor to the input shaft then geared down to desired reduction with a constant gear mesh. Gears and shafts are heat-treated hardened alloy steel along with anti-friction ball bearings. Circulating oil and grease lubricants furnished to all gears and shafts.

SPEEDS:

	Agitator (RPM)
Stir	27
First	55
Second	96
Third	183
Fourth	322

BOWL GUARD:

Heavy-duty stainless steel wire front and solid stainless steel rear portion. Front portion of guard rotates easily to add ingredients and install or remove agitator. It detaches in seconds for cleaning in dishwasher or sink. Rear portion of guard can be quickly cleaned in position. Guard must be in closed position before mixer will operate. Bowl support interlock provides further protection.

POWER BOWL LIFT:

Powered by an electric motor, the bowl may be raised or lowered by fingertip control through the conveniently located switch. Bowl will remain in position until switch is activated. **Stir-on-Lift Feature:** Allows the agitator to run in Stir Speed while the mixer bowl is being raised. Once the bowl is in the raised position, the mixer automatically shifts into the preselected speed.

FINISH:

Metallic Gray Hybrid Powder Coat finish.

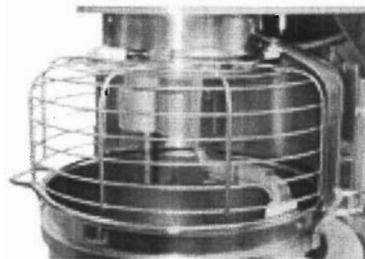
FOOTPADS:

Neoprene footpads are standard.

ATTACHMENTS AND ACCESSORIES:

The following are available at extra cost:

Stainless Steel Bowl	Bowl Extension Ring
“B” Flat Beater	Bowl Splash Cover
“C” Wing Whip	Bowl Scraper
“D” Wire Whip	Bowl Truck
“ED” Dough Hook	40 & 60 Quart
“P” Pastry Knife	Accessories
“I” Heavy Duty Wire Whip	Ingredient Chute



Hobart Bowl Scraper



Hobart Ingredient Chute

LISTED BY: Underwriters Laboratories Inc. and NSF International.

LEGACY® HL800 MIXER

HOBART

701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS: 200-240/50/60/3,
380-460/50/60/3 – UL Listed.

WEIGHT: 1,320 lbs. net; 1,352 lbs. domestic shipping.

WARRANTY: Unit has full one-year warranty on parts, labor and mileage against manufacturer's defects. Service contracts are available.

DETAILS AND DIMENSIONS

WARNING

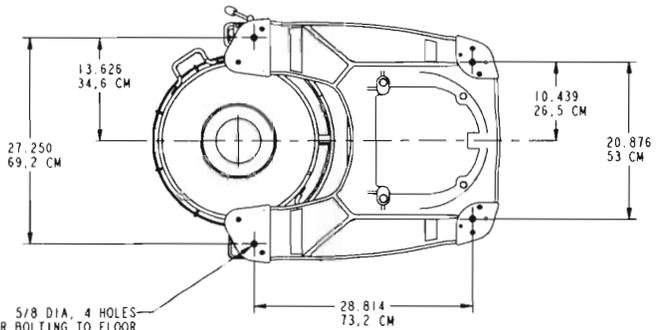
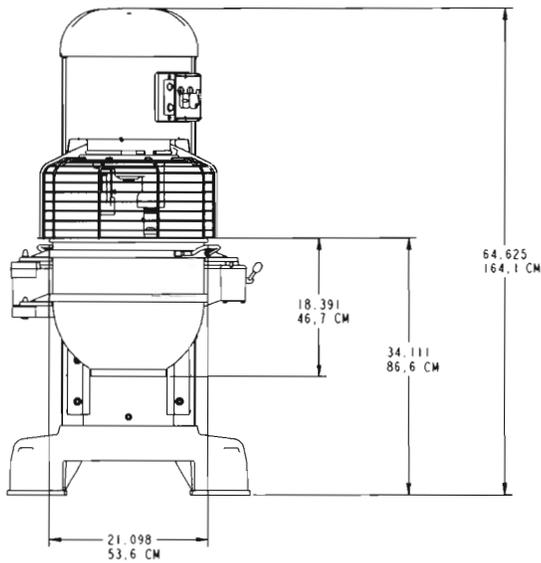
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER ELECTRICAL CODES.

STANDARD MODEL:
NET WEIGHT (BOWL INCLUDED) 1375 LBS (624 KG)
BOWL WT 55.4 LBS (25.1 KG) - REF

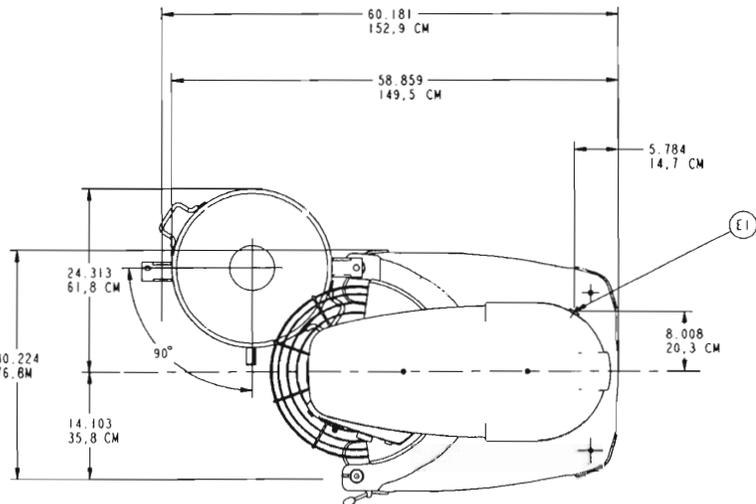
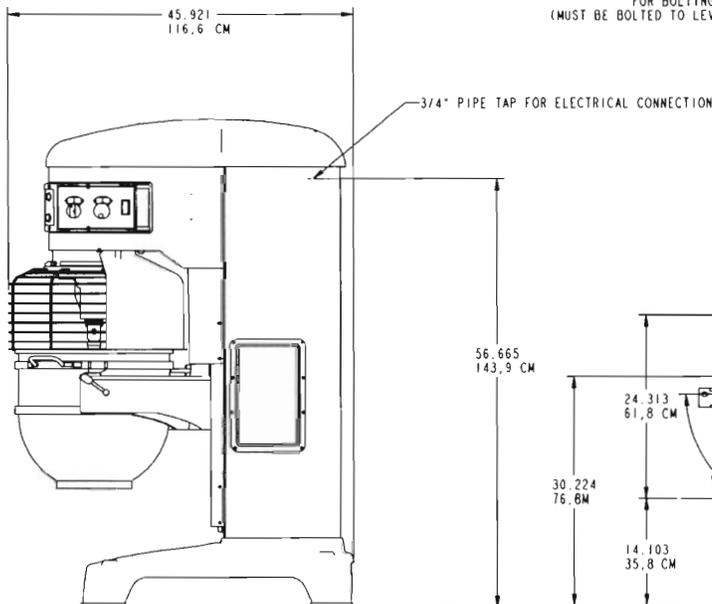
E1- ELECTRICAL CONNECTION.

NOTE: UNIT MUST BE BOLTED TO LEVEL FLOOR.

MACHINE ELECTRICAL SPECS:
400V., 50 HZ., 3 PH., 5.2 AMPS



5/8 DIA. 4 HOLES FOR BOLTING TO FLOOR (MUST BE BOLTED TO LEVEL FLOOR)



As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

HOBART701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com**LEGACY®
HL1400 MIXER****HOBART****STANDARD FEATURES**

- Heavy-Duty 5 H.P. Motor
- Gear Transmission
- Four Fixed Speeds Plus Stir Speed
- Shift-on-the-Fly™ Controls
- Patented soft start Agitation Technology
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- Automatic Time Recall
- Large, Easy-To-Reach Controls
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- Power Bowl Lift
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**ACCESSORY PACKAGES - featuring
Hobart Quick Release™ Agitators**

- Deluxe Accessory Package Includes:**
 - 140 Quart Stainless Steel Bowl
 - 140 Quart "B" Beater
 - 140 Quart "D" Wire Whip
 - 140 Quart "ED" Dough Hook
 - 140 Quart Bowl Scraper
 - 140 Quart Bowl Truck
 - 140 Quart Ingredient Chute
- Standard Accessory Package Includes:**
 - 140 Quart Stainless Steel Bowl
 - 140 Quart "B" Beater
 - 140 Quart "ED" Dough Hook
 - 140 Quart Bowl Truck

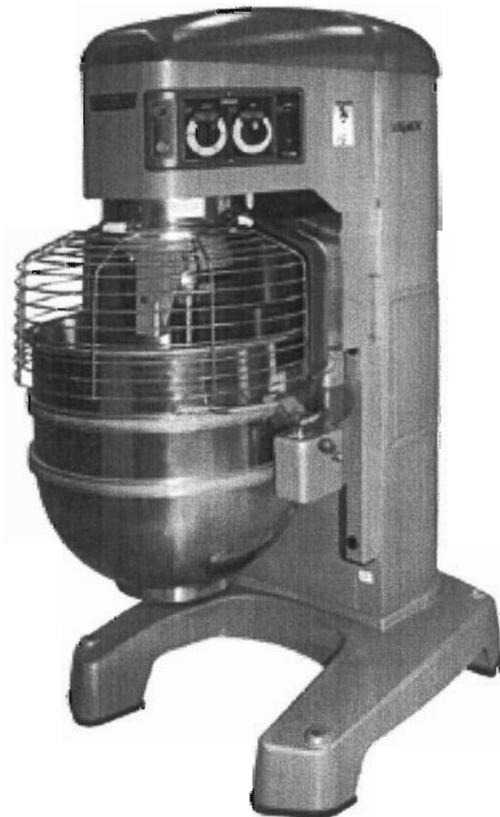
MODELS

- HL1400 – 140-Quart All Purpose Mixer
- HL1400C – 140-Quart All Purpose Mixer with
Maximum Security Correctional
Package

OPTIONS

- SmartPlus™ Programmable Recipe Timer

Specifications, Details and Dimensions on Inside and Back.

**LEGACY® HL1400 MIXER**

LEGACY® HL1400 MIXER



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

SOLUTIONS/BENEFITS

5 H.P. Motor

Durability

- Heavy-duty to meet the most demanding operations

Gear Transmission

Durability, Reliability

- Ensures consistent performance and minimum downtime under heavy loads

Four Fixed Speeds plus Stir Speed

Flexibility, Reliability, Consistency

- For incorporating, blending, mixing ingredients
- Supports consistent results and thorough mixing

Shift-on-the-Fly™ Controls

Flexibility

- Allows operator to change speeds while mixer is running

Patented soft start Agitation Technology

Sanitation

- Each speed has a soft transition into a higher speed to reduce the chances of product splash-out

50-Minute SmartTimer™

Convenience, Ease of Use, Consistency

- Supports recipe mixing times
- Provides accurate results and eliminates overmixing

Automatic Time Recall

Productivity, Consistency

- Remembers the last time set for each speed
- Great for multiple batches

Ergonomic Swing-Out Bowl

Ease of Use, Convenience

- Easy loading and unloading of products
- Single Point Bowl Installation allows for simple mounting and removal of bowl
- Bowl Lock ensures mixer bowl is properly in place for mixer to operate

Stainless Steel Bowl Guard

Protection

- Interlock prevents operation when front portion of guard is out of position

Hobart Accessories

Durability, Flexibility, Simplicity

- Hobart Quick Release™ agitators allow for simple installation and removal from agitator shaft
- Hobart accessories are designed for long-term usage under heavy-duty conditions
- Large array of accessories provide multiple uses for recipe and product processing

HL1400 MIXER CAPACITY CHART

Recommended Maximum Capacities - dough capacities based on 70°F. water and 12% flour moisture.

PRODUCT	AGITATORS SUITABLE FOR OPERATION	HL1400
CAPACITY OF BOWL (QTS. LIQUID)		140
Egg Whites	D	4 qts.
Mashed Potatoes	B & C	100 lbs.
Mayonnaise (Qts. of Oil)	B or C or D	50 qts.
Meringue (Qts. of Water)	D	5 qts.
Waffle or Hot Cake Batter	B	—
Whipped Cream	D or C	30 qts.
Cake, Angel Food (8-10 oz. cake)	C or I	120
Cake, Box or Slab	B or C	185 lbs.
Cake, Cup	B or C	165 lbs.
Cake, Layer	B or C	165 lbs.
Cake, Pound	B	185 lbs.
Cake, Short (Sponge)	C or I	150 lbs.
Cake, Sponge	C or I	140 lbs.
Cookies, Sugar	B	100 lbs.
Dough, Bread or Roll (Lt.-Med.) 60% AR	§ ED	210 lbs.*
Dough, Heavy Bread 55% AR	§ ED	175 lbs.*
Dough Pie	B & P	125 lbs.
Dough, Thin Pizza 40% AR (max. mix time 5 min.)	§‡ ED	135 lbs.□
Dough, Med. Pizza 50% AR	§‡ ED	190 lbs.□
Dough, Thick Pizza 60% AR	§‡ ED	190 lbs.*
Dough, Raised Donut 65% AR	ED	100 lbs.†
Dough, Whole Wheat 70% AR	ED	185 lbs.*
Eggs & Sugar for Sponge Cake	B & C or I	75 lbs.
Icing, Fondant	B	100 lbs.
Icing, Marshmallow	C or I	20 lbs.
Shortening & Sugar, Creamed	B	120 lbs.
Pasta, Basic Egg Noodle (max. mix time 5 min.)	ED	100 lbs.*

NOTE: % AR (% Absorption Ratio) - Water weight divided by flour weight. Capacity depends on moisture content of dough. Above capacities based on 12% flour moisture at 70°F water temperature.

□ 1st Speed

* 2nd Speed

† 3rd Speed

§ If high gluten flour is used, reduce above dough batch size by 10%.

‡ 2nd Speed should never be used on 50% AR or lower products.

USE OF ICE REQUIRES A 10% REDUCTION IN BATCH SIZE.

1 gallon of water weighs 8.33 lbs.



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LEGACY® HL1400 MIXER

SPECIFICATIONS

MOTOR:

5 H.P. high torque motor.

200-240/50/60/3	14.8 Amps
380-460/50/60/3	6.8 Amps

ELECTRICAL:

200-240/50/60/3 and 380-460/50/60/3 – UL Listed.

CONTROLS:

Magnetic contactor with thermal overload protection. Internally sealed “Start-Stop” and Power Bowl Lift push buttons. Reduced voltage pilot circuit transformer is supplied for 380-460/50/60/3 machines. A 50-minute SmartTimer™ is standard. SmartTimer™ includes **Automatic Time Recall**, which remembers the last time set for each speed. Optional SmartPlus™ Programmable Recipe Timer allows operators the ability to program up to 9 recipes with 6 steps per recipe. SmartPlus™ automatically changes speeds and starts timer count-down without operator intervention.

TRANSMISSION:

A rated 10 H.P. poly-V belt transfers power from motor to the input shaft then geared down to desired reduction with a constant gear mesh. Gears and shafts are heat-treated hardened alloy steel along with anti-friction ball bearings. Circulating oil and grease lubricants furnished to all gears and shafts.

SPEEDS:

	Agitator (RPM)
Stir	23
First	46
Second	80
Third	150
Fourth	265

BOWL GUARD:

Heavy-duty stainless steel wire front and solid stainless steel rear portion. Front portion of guard rotates easily to add ingredients and install or remove agitator. It detaches in seconds for cleaning in dishwasher or sink. Rear portion of guard can be quickly cleaned in position. Guard must be in closed position before mixer will operate. Bowl support interlock provides further protection.

POWER BOWL LIFT:

Powered by an electric motor, the bowl may be raised or lowered by fingertip control through the conveniently located switch. Bowl will remain in position until switch is activated. **Stir-on-Lift Feature:** Allows the agitator to run in Stir Speed while the mixer bowl is being raised. Once the bowl is in the raised position, the mixer automatically shifts into the preselected speed.

FINISH:

Metallic Gray Hybrid Powder Coat finish.

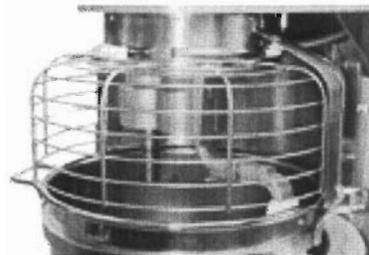
FOOTPADS:

Neoprene footpads are standard.

ATTACHMENTS AND ACCESSORIES:

The following are available at extra cost:

- | | |
|--------------------------|---------------------|
| Stainless Steel Bowl | Bowl Extension Ring |
| “B” Flat Beater | Bowl Splash Cover |
| “C” Wing Whip | Bowl Scraper |
| “D” Wire Whip | Bowl Truck |
| “ED” Dough Hook | 40, 60 & 80 Quart |
| “P” Pastry Knife | Accessories |
| “I” Heavy Duty Wire Whip | Ingredient Chute |



Hobart Bowl Scraper



Hobart Ingredient Chute

LISTED BY: Underwriters Laboratories Inc. and NSF International.

LEGACY® HL1400 MIXER

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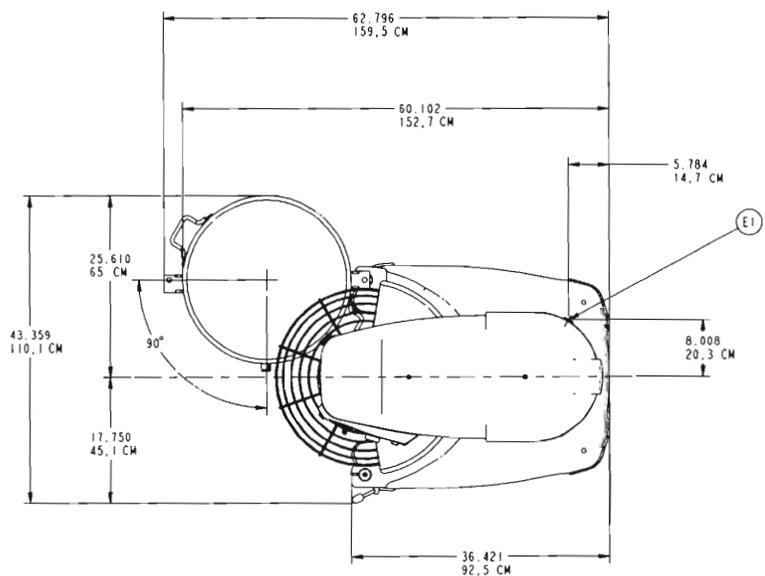
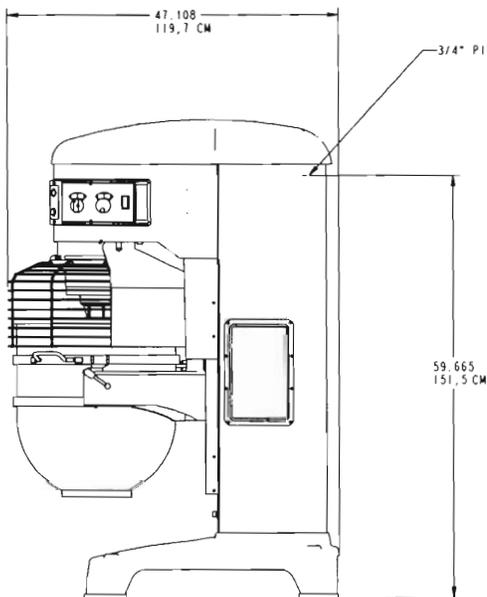
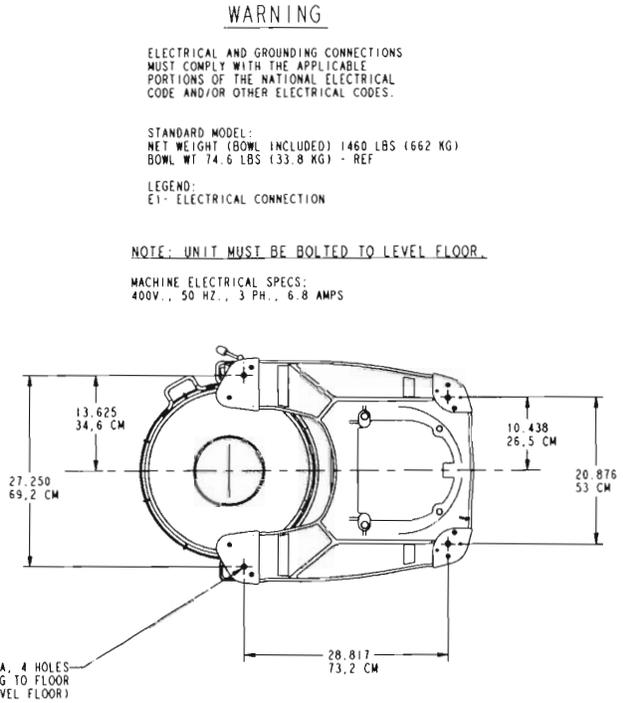
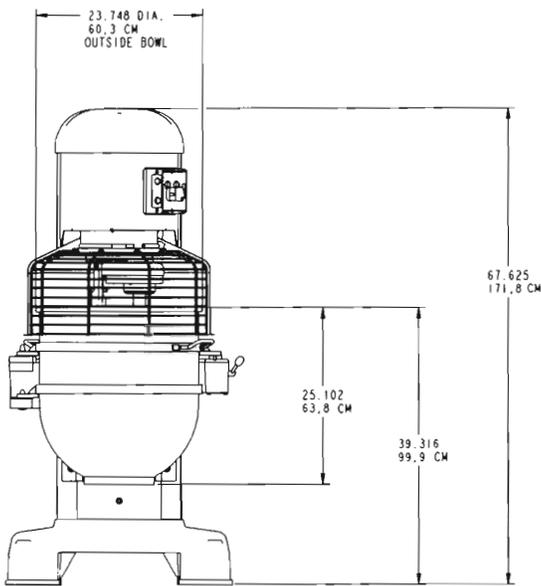
SPECIFICATIONS

ELECTRICAL SPECIFICATIONS: 200-240/50/60/3,
380-460/50/60/3 – UL Listed.

WEIGHT: 1,385 lbs. net; 1,417 lbs. domestic shipping.

WARRANTY: Unit has full one-year warranty on parts, labor and mileage against manufacturer's defects. Service contracts are available.

DETAILS AND DIMENSIONS



As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

SECTION 3

SERVICE MANUAL

HOBART LEGACY

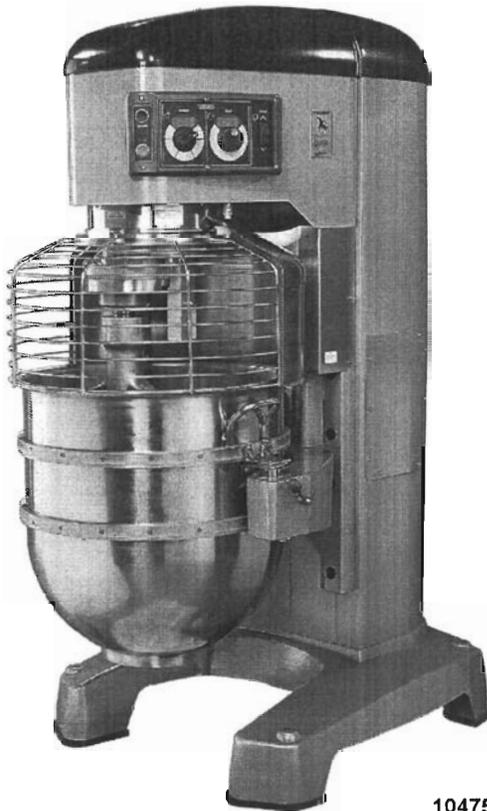
80 & 140 QUART MIXERS

MODELS HL800 & HL1400



SERVICE MANUAL

SERVICE



HL1400 SHOWN

10475

Legacy™

Models:

HL800

ML-134306

HL1400

ML-134300

HL1400

ML-134334

- NOTICE -

This Manual is prepared for the use of trained Hobart Service Technicians and should not be used by those not properly qualified. If you have attended a Hobart Service School for this product, you may be qualified to perform all the procedures described in this manual.

This manual is not intended to be all encompassing. If you have not attended a Hobart Service School for this product, you should read, in its entirety, the repair procedure you wish to perform to determine if you have the necessary tools, instruments and skills required to perform the procedure. Procedures for which you do not have the necessary tools, instruments and skills should be performed by a trained Hobart Service Technician.

Reproduction or other use of this Manual, without the express written consent of Hobart, is prohibited.

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GENERAL

USING THIS MANUAL

Throughout the manual, a number of steps will re-direct the reader to other locations within the manual to perform a specific procedure. These re-directs can be identified by the component or procedure of interest appearing in uppercase type. For example, Place drive in SERVICE POSITION as outlined in DRIVE, is a step that occurs several times throughout the manual. Referring to the index, this procedure can be located by finding the heading DRIVE, followed by the sub-heading, SERVICE POSITION PROCEDURE.

Drive	5, 11, 70
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INTRODUCTION

OVERVIEW

The HL1400 and HL800 mixers utilize an electronic timer control assembly for operator interface and an electronic drive to control mixer speed. The timer control board allows the operator to enter the mixing speed and mix time with either count UP (hold) or count DOWN (timed) operation.

The HL1400 and HL800 mixers use an AC variable frequency drive to control the speed of the mixer motor. Power is delivered to a fixed ratio transmission through a re-enforced poly-V drive belt. Agitator speed is controlled electronically which permits changing mixing speeds without stopping the mixing process.

THEORY OF OPERATION

Timer Control Board

Mixing time and speed are set using the timer control. Should a drive system error occur, the timer control will display the error code.

The timer control also has a hidden special function mode that allows the technician to change or view data stored in memory.

With the timer control, the technician can select model type, reset parameters, view data, and perform in-line diagnostic tests.

Service Replacement Timer Control Boards

- The timer control board is common to the larger Legacy mixers utilizing variable frequency drives. The model type programmed into the timer control board must match the model designation found on the mixer data plate.

Resettable

- Last hours.

View Data Only

- Total hours since installation (up to 61,000 hrs.).
- Software revision.

Timer Encoder (Timer Control Board)

The encoder¹ consists of two digital switching circuits with ground. When the encoder is resting in a detent, both switching circuits are open. As the time knob is turned, one of the switches will close followed by the other. Before the encoder gets to the next detent, the first switch to close will open followed by the opening of the second switch.

The timer control board can determine what direction the encoder is being turned by the switch operating sequence.

¹ **encoder** - An electronic device that converts mechanical movement into a coded digital signal.

MOTOR

The motor used in the Legacy HL800 and HL1400 mixers is a heavy duty three phase induction motor.

Variable Frequency Drive (Drive)

The variable frequency drive (drive) control board communicates with the timer control board. It also provides the necessary signals to create the required AC frequency to power the AC 3phase motor at the set speeds. The drive does not require a feedback circuit from the motor to output frequencies and voltage. The drive is pre-programmed to function with the type of motor used to operate the mixer.

The drive monitors several parameters such as drive temperature, current flow and DC bus voltage conditions among other parameters. If any of the monitored parameters begin to operate outside of the tolerance range, an error code will be produced. Some of the error codes will cause the drive system to completely shut down. When this happens, an error code on the timer control will flash. Cycle power to mixer to reset.

SPECIFICATIONS

The timer control board can be programmed to function as an HL800 or HL1400. Refer to the table below for planetary speeds.

It is important that the model type of the timer control software match the data plate.

OPERATING SPEEDS AND RPMS				
Speed	Planetary RPM		Agitator RPM	
	HL800	HL1400	HL800	HL1400
STIR	15	12	33	28
1	24	20	55	46
2	42	35	96	80
3	79	66	183	150
4	139	116	322	265

NOTE: When the speed selector knob is pointed to the speed window, the mixer will operate at STIR.

No matter what speed is selected, the mixer will only run in STIR when the bowl is not up and the start switch is held in, provided the bowl guard is closed and the bowl is locked into mix position.

ELECTRICAL DATA	
Model	Voltage
All Models	200-240/50/60/3
	380-460/50/60/3

TORQUE VALUES	
Component	Torque
Transmission cover bolts	35 ft*lb
Planetary Internal (Ring) Gear	35 ft*lb
Top planetary shaft spanner nut (transmission cover)	35 ft*lb
Bottom planetary shaft spanner nut (planetary)	35 ft*lb
Slideways to pedestal	35 ft*lb
Drive pulley set screws	110 in*lb
Driven pulley set screws	
Bowl Pins to Bowl Support	81 in*lb
Motor to Motor Mount Plate	37 ft*lb
Drive main circuit screws, (L1-L3, GND, U, V and W), 240VAC (M3.5 screw)	20.8 in*lb
Drive main circuit screws, (L1-L3, GND, U, V and W), 460VAC (M3.5 screw)	31.0 in*lb
Drive control circuit screws, (FWD, CM, SD, DX+, DX-)	6.2 in*lb

LUBRICATION

Location	Lubrication Type	Qty.
Transmission	Mobil Gear 634	61 FL OZ
Transmission Seal	Mobil Gear 634	Light Coating
Planetary	Exxon Spartan EP-150	6 FL OZ
Transmission cover	Permatex #2	A/R
Bowl Lock Pin	Lubriplate 630-AA	Coat Pin
Bowl-in Plunger	Never Seize	Coat Threads
Slideways	Lubriplate FMO-200-AW	Light Coating
Top Cover Gasket	Mineral Oil or equivalent	A/R
Drain Plug	Permatex #2	A/R
Dip stick threads	Never Seize	A/R
Agitator Shaft Seal	Mineral Oil	A/R
Sun Gear I.D.	Never Seize	A/R
Planetary Service Bolts	Loctite 242	Coat Threads
Bowl Scraper Screw	Loctite 271	
Bowl Support Ramp	Loctite 641	Sides
Drive and Driven Pulley	Loctite 222	Coat Threads
Motor Bearings	Pre-Lubricated	
Linear Actuator	Pre-Lubricated	

A/R = As Required.

REFERENCE MATERIAL

NOTE: Refer to the latest revisions of the forms listed below for the most current HL800 and HL1400 information.

- Catalog of Replacement Parts F-43119
- Instruction Manual for installation, operation and care F-34928
- Lubrication Manual F-20067
- Use and Applications Handbook F-34901
- Mixer Capacity Chart, All Models F-7701

BASIC OPERATION

Power-Up

When power is applied to the mixer, a self-test between the timer control board and drive will be performed. After the self-test, the display will alternate between the timer control software version and the mixer model. This display will continue for one minute or until either the speed or timer dials are moved at which time the timer control will enter the operator mode displaying the selected speed and time.

NOTE: Power must be removed from mixer more than 35 seconds for timer and control drive to synchronize on start up. Power interruptions of less than 35 seconds between power cycles may induce a communications or low bus voltage fault.

Starting Conditions

Before the mixer will operate, the following conditions must be met.

1. Bowl must be in the locked position (bowl IN).
2. Bowl guard must be closed.

NOTE: At this point, any speed can be selected, but will only operate in STIR, as long as the START button is held in. When the START button is held in, the speed display will alternate between [b_UP] and the chosen speed.

3. Bowl must be raised into the UP position.

NOTE: Once the bowl is up, if START button was held in while lifting the bowl into position, the selected speed will automatically be engaged and the START button can be released.

Count-Up Timer Feature (Hold)

1. Verify that Starting Conditions are met.
2. Turn speed dial to desired mixing speed.
3. Turn timer knob counterclockwise until [HOLd] is displayed.

NOTE: An encoder is used on the timer control to set time. The encoder will increment or decrement quickly by using smooth and steady knob movement.

NOTE: The speed setting can be changed at any time during count-up operation, however, the time setting can not be changed.

4. Push START button to start mixer.
 - A. The mixer will stop anytime during operation if:
 - 1) STOP button is pushed.
 - 2) Wire cage of bowl guard is opened.
 - 3) Bowl support is lowered.
 - 4) Bowl lock is disengaged (not recommended).
 - 5) Power is removed.

NOTE: The elapsed mix time will be displayed when mixer stops unless power was removed.

- B. To restart mixer in count-up (hold) mode, reverse condition that caused mixer to stop and push START button to resume count-up.

NOTE: When the timer reaches 50:00 minutes, the displayed time will roll-over to 00:00, a short beep will sound, and the timer will continue counting up until the mixer is stopped.

- 1) If the power was removed from mixer, refer to POWER-UP. Once mixer is in normal operating mode, press the START button to continue count-up mix.

Count-Down Timer Feature (Timed)

NOTE: The previous count down time is shown in the time display for the selected speed provided the time dial has not moved and the last operation was not the count-up feature.

If the mixer was last operated using the count-up feature, a new time will have to be set into any speed, and the mixer will have to be started in order for the count-down feature to function. The times for the remaining speeds will be restored once the mixer is started.

If a new time is entered by turning the time dial, the new time will be displayed for all speeds until the mixer is started. The new time will be stored for the selected speed once the mixer is started.

1. Verify that the starting conditions are met.
2. Turn speed dial to desired mixing speed.
3. If adjustment of mix time is required, set in a new time (other than [HOLd]).
4. Press START button to start mixer. Time will count down from the time set to 00:00.

NOTE: Starting mixer will save the new time setting as the default mix time for the selected speed.

- A. The mixer can be stopped anytime during count-down operation by:
 - 1) Pushing the STOP button.
 - 2) Wire cage of bowl guard is opened.
 - 3) Lowering the bowl support.
 - 4) Disengaging the bowl lock (not recommended).
 - 5) Removing power.
- B. To resume mixing, reset starting conditions and press the START button. On restart, the timer will count down from where it was interrupted.

NOTE: During operation, the mix time can be changed (increased or decreased) during mix cycle without affecting the stored time. If the speed is changed during operation, the time will change to the stored time for the selected speed and count down will continue.

- C. Mixer will continue to count-down until 00:00 is reached at which time a beep sounds for three seconds.
- D. After three seconds, time display will return to the default time for selected speed.

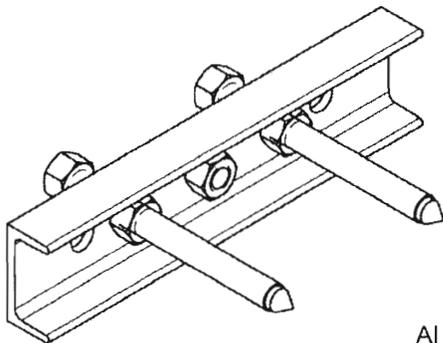
TOOLS

- Standard set of tools.
- Digital Multi-Meter (with sensitivity of at least 20K ohms per volt).
- Clamp-on ammeter.

Special Tools

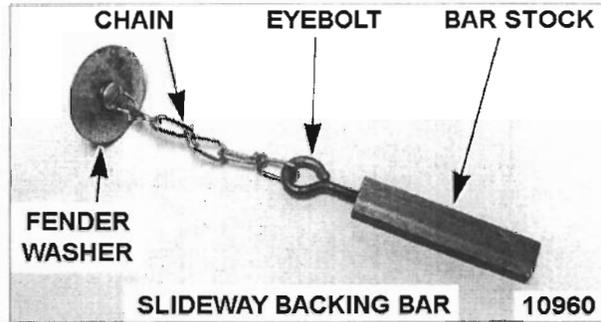
- Three foot straight edge.
- Pressing Sleeves - constructed from schedule 40 black pipe or similar material.
 - 10" x 2" I.D. - capped on one end, cut square on the other.
 - 5" x 1-1/4" I.D. - capped on one end, cut square on the other.
 - 8" x 1-1/2" I.D. - capped on one end, cut square on the other.
- Belt Tension tool, Part No. 874560. Used to tension belt. Note - Keep threads of tension tool bolts lubricated with mineral oil to help prevent galling.

BELT TENSION TOOL - 874560



- Motor Pulling Tool, Part No. 916553.
- V-belt drive tension tester, Part No. 874356.
- Torque wrenches
 - Capable of measuring up to 40 ft*lb.
 - Capable of measuring up to 115 in*lb.
- Spanner socket, Hobart Part No. 875916 - Top transmission, input shaft bearing.
- Spanner socket for, Hobart Part No. 875917 - Top transmission, planetary shaft bearing.
- 4 each - 1/4-20 x 2" bolt - full thread. Transmission cover jack out screws.
- Drive Bleeder Tool, Hobart Part No. 874553 - Wire wound resistor to bleed down drive bus voltage.

- Slideway Backing Bar
 - Bar stock, 1/2" x 3/4" x 3-1/2" - tapped to 1/4-20
 - 1/4-20 eyebolt 2" long
 - 1/4-20 round head screw
 - 1/4-20 nut



- 1/4" fender washer
- 1/4" lock washer
- 4.5" light chain or similar material

PREVENTIVE MAINTENANCE OUTLINE

1. Verify that mixer is properly installed and that voltage supplied matches voltage required on data plate of machine.
 2. Check interlocks and actuator.
 - A. Bowl up - Try to operate mixer in 1ST speed with bowl not all the way up. Mixer must operate with planetary speed of STIR.
 - 1) With mixer set to 1ST speed, raise bowl to full up position while start button is held in. Display should read, [b_UP]. Verify that speed increases from STIR to 1ST speed when bowl reaches up position.
 - B. Bowl in - Try to operate mixer with bowl not locked in place. Display should read, [b_in] and agitator must not move.
 - C. Bowl guard - Try to operate mixer when bowl guard is open. Display should read, [b_gd] and agitator must not move.
 3. Check BASIC OPERATION of mixer as outlined in GENERAL section.
 - A. Run mixer in Count-Up Timer Feature (Hold).
 - 1) Interrupt and resume operation by pressing the stop and start buttons respectively.
 - 2) Verify mixer operates in all speeds.
 - B. Run mixer in Count-Down Timer Feature (Timed).
 - 1) Verify mixer times out at 00:00, beeps and agitator stops.
 4. Enter Timer Control Board Special Functions - *Advanced Menu* as outlined in TIMER CONTROL BOARD.
 - A. Verify that mixer model programmed on timer matches model type on data plate of machine.
 - B. Record capacitor hours.
 - C. Record any errors that may be present (four errors maximum).
 - D. Enter In-line Diagnostic Parameter and perform all tests.
 5. Make electrical checks.
 - A. Run mixer in Count-Up Timer Feature (Hold) on 1ST speed.
 - 1) Measure Incoming Line Service Current as outlined in MOTOR.
 - 2) Measure and record Drive Output Current as outlined in VARIABLE FREQUENCY DRIVE.
- NOTE:** When measuring Drive Output Current, value will not be the same as incoming line current. However, all three phase amperes values should be approximately equal.
6. Inspect electrical cord / connections.
 7. Inspect belt for cracks, excessive wear or nicks.
 - A. Check Pulley Alignment and Drive Belt Tension as outlined in DRIVE BELT AND PULLEYS.
 8. Check oil level of planetary and transmission as found under Transmission Assembly of TRANSMISSION.
 9. Inspect bowl, Bowl Pins and Bowl Lock Assembly.
 10. Remove Bowl Guard Assembly.
 - A. Inspect agitator shaft pin.
 - B. Apply side pressure to agitator shaft while looking for lateral movement of shaft and up/down movement of planetary casting.
 - C. Clean drip cup of bowl guard.
 11. Inspect all agitator attachments including plunger assembly.
 12. Check and set BOWL-TO-BEATER CLEARANCE ADJUSTMENT.
 13. Inspect machine hardware, covers, shields and guards.
 - A. Inspect gasket and seals of top cover and side panel for compression damage, tears and nicks.
 14. Lubricate machine.
 15. Clean complete mixer and check for leaks.
 16. Reassemble parts removed and check mixer for proper operation.

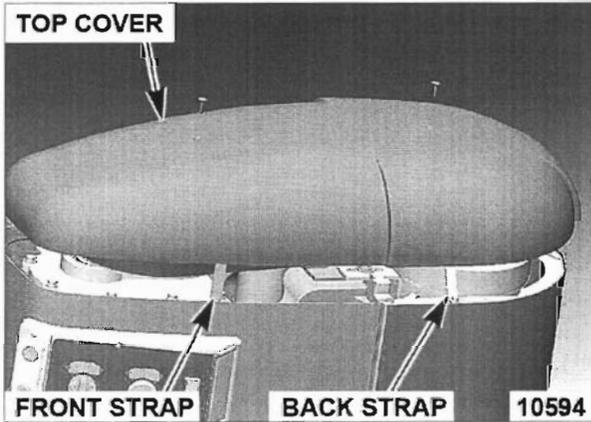
COVERS AND WRAP

TOP COVER



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove the screws in top cover.
2. Remove top cover.



3. Inspect condition of top cover seal. Replace if damaged.
4. Apply a light coat of mineral oil to seal before installing top cover.



5. Install top cover securing with screws.

SIDE COVER

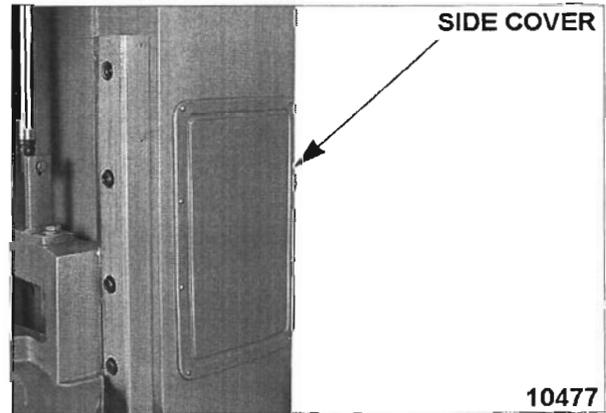


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

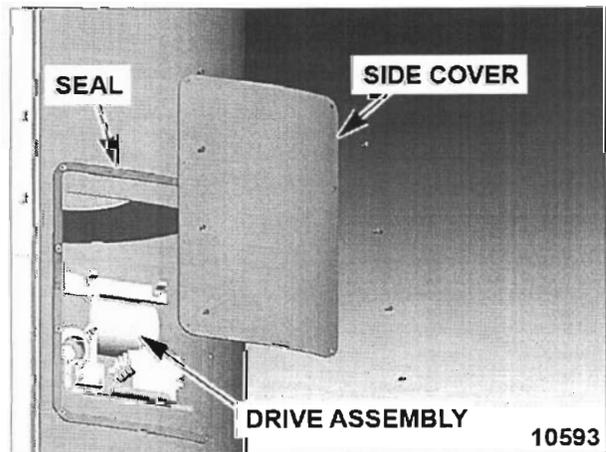
WARNING: WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

1. Remove the screws securing side cover to pedestal.



2. Inspect seal. Replaced if damaged or deformed.



3. Reinstall parts removed in reverse order.

BACK APRON

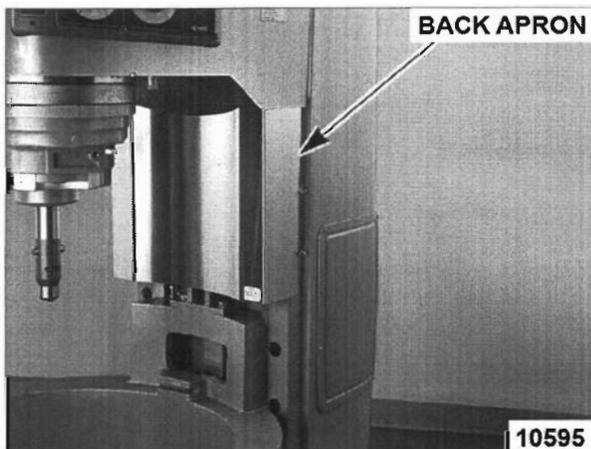


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Lower bowl support.
2. Remove the thumb screws securing back apron to slideways.

NOTE: It is not necessary to remove the splash guard or bowl guard assembly to service the back apron.

3. Pull down on back apron in order to clear top apron and splash guard.



BOWL GUARD REMOVED FOR CLARITY

4. Remove back apron.
5. Reinstall parts removed in reverse order.

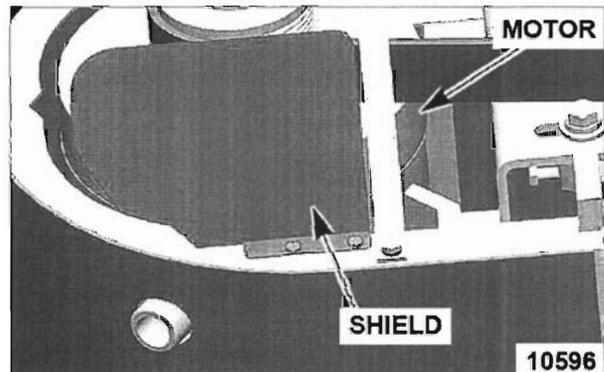
WRAP



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Removal and Replacement

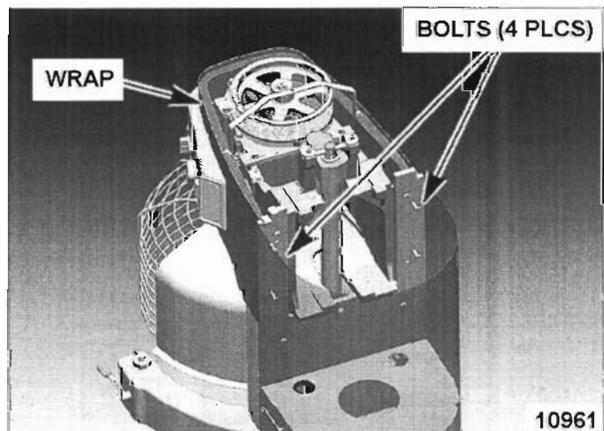
1. Remove TOP COVER.
2. Remove CONTROL PANEL.
3. Disconnect incoming line service and remove shield.



4. Cut through sealant with a sharp knife near pedestal to prevent paint damage.

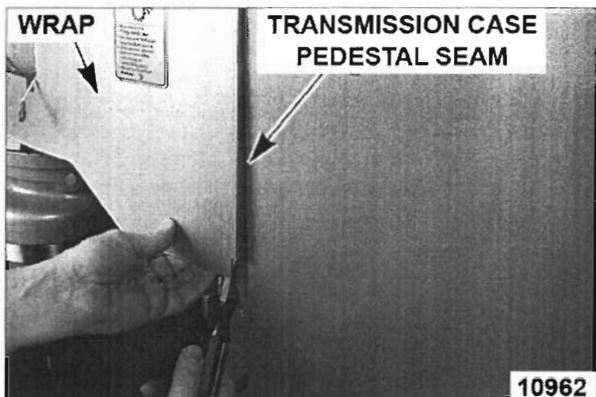
NOTE: Thru bolts located in motor compartment area of pedestal are used to apply direct pressure to the ends of wrap holding it in position between the pedestal and transmission case. The bolts can be accessed without removing the motor assembly.

5. Loosen the small bolts securing wrap between pedestal and transmission case.



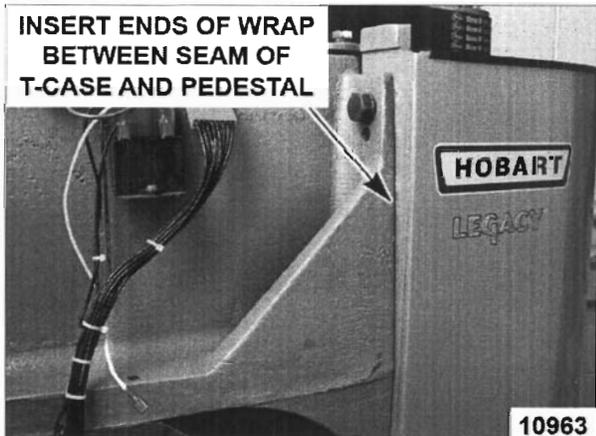
MOTOR ASSEMBLY REMOVED FOR CLARITY

6. Gently pry the ends of wrap out of pedestal and transmission case seam.

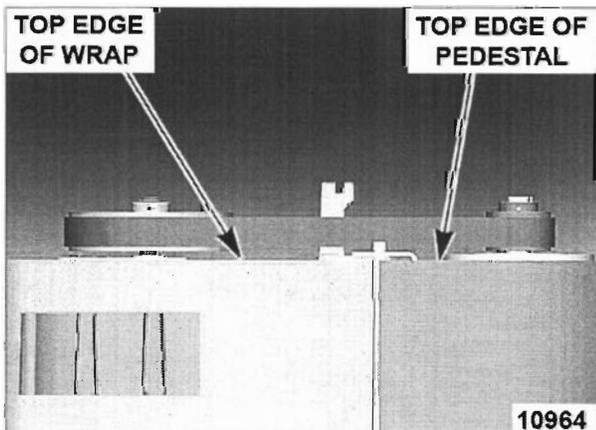


12. Install a new seal around top edge of wrap.
13. Reinstall remaining components that were removed to access wrap.
14. Check for proper operation.
15. Apply a light coat of mineral oil to seal before reinstalling top cover.

7. Remove wrap.
 - A. If wrap is being replaced, remove speed nut fasteners used to secure control panel to wrap.
8. Clean old sealant from pedestal.
 - A. Clean wrap if it is to be reused.
9. Install wrap by inserting ends of wrap between pedestal and transmission case.



- A. Position wrap such that top edge of wrap is even with top edge of pedestal.



10. Tighten bolts to apply direct pressure to ends of wrap.
11. Fill seam between wrap and pedestal with aluminum colored RTV-732.

BOWL GUARD

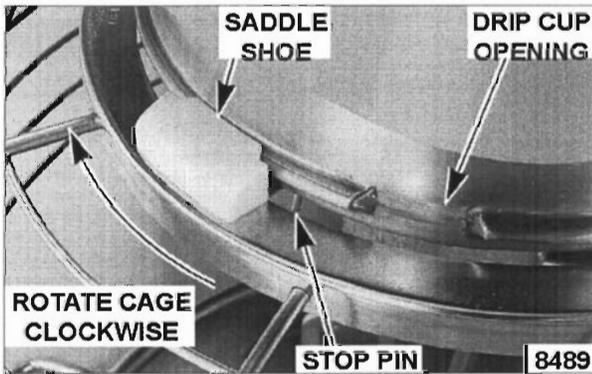
WIRE CAGE ASSEMBLY



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Wire Cage - Removal

1. Lower bowl support.
2. Remove agitator.
3. Rotate cage clockwise (as looking down on cage) until saddle shoe aligns with opening of drip cup.



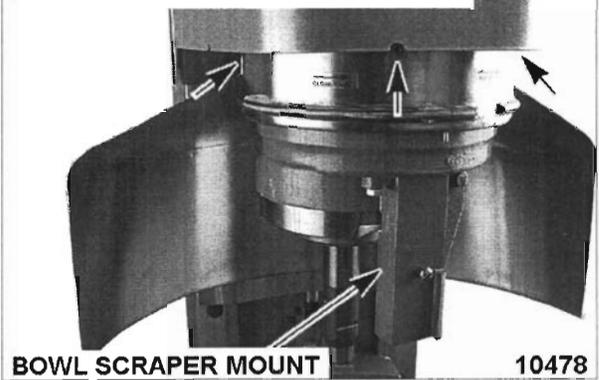
4. Lower cage until saddle shoe clears opening of splash guard assembly.
 - A. Remove cage.
5. Reassemble in reverse order.

Bowl Guard Assembly - Removal

NOTE: Bowl guard assembly can be removed with or without wire cage installed.

1. Lower bowl support.
2. Remove or fully open wire cage assembly.
3. Remove agitator.
4. Remove bowl or swing bowl out of the way.
5. If HL1400, remove bowl scraper mount.
6. Support bowl guard assembly and remove screws securing splash guard assembly to transmission case (three places).

REMOVE SCREWS - THREE PLACES



7. Remove bowl guard assembly.
8. Reassemble parts removed in reverse order.
9. Verify bowl guard switch operation.
10. Check mixer for proper operation.

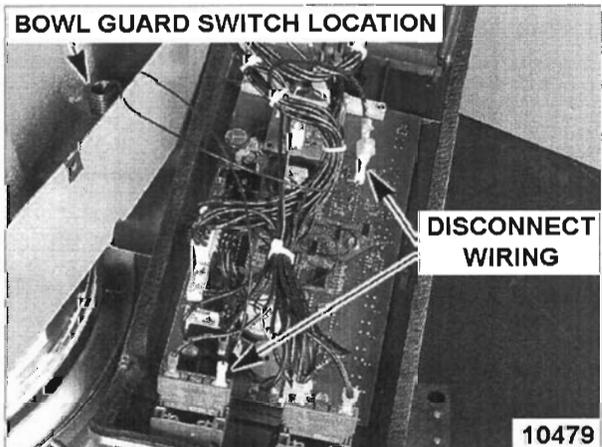
BOWL GUARD SWITCH



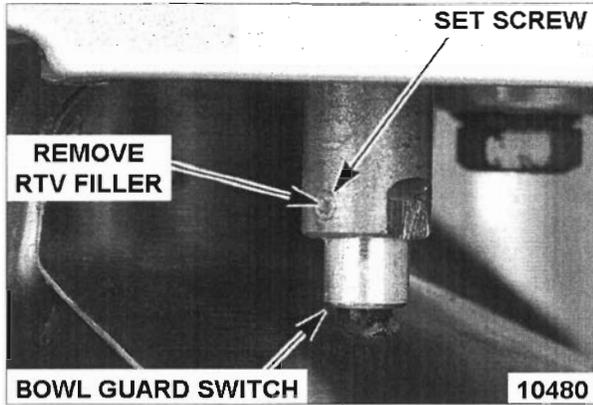
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Switch Removal

1. Remove screws securing timer control assembly to wrap, but do not disconnect wiring.
 - A. Pull timer control assembly away from wrap.
 - B. Support timer control assembly to relieve stress on wiring.
2. Note connection points of bowl guard switch leads and disconnect bowl guard switch.



3. Remove RTV in bowl guard set screw then loosen set screw in collar.

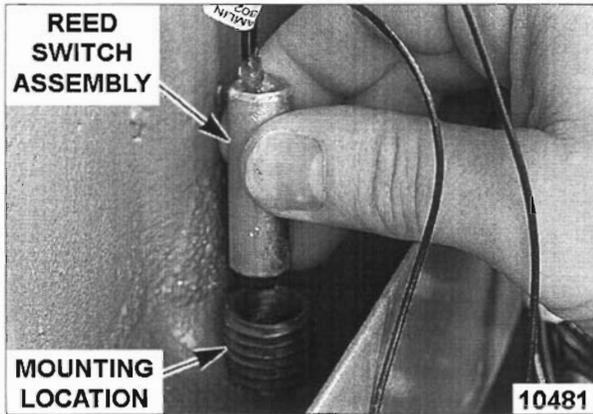


4. Remove reed switch assembly out through the top (behind timer control board mounting location).

Switch Installation

NOTE: Make sure bowl guard assembly is installed prior to installing bowl guard switch.

1. Install reed switch assembly from top (behind timer control assembly mounting location).



2. Perform Bowl Guard Switch Adjustment.
3. Connect bowl guard switch to wiring harness.
4. Reinstall timer control assembly.
5. Reinstall bowl.
 - A. Raise bowl into mix position.
6. Check mixer for proper operation.

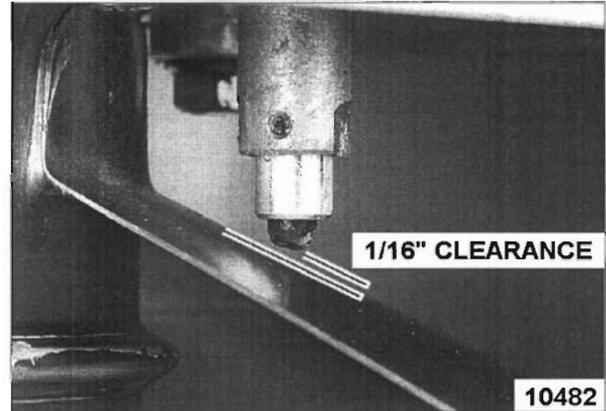
Bowl Guard Switch Adjustment

NOTE: The bowl guard must be installed in order to adjust the bowl guard switch.

1. Remove screws securing timer control assembly to wrap, but do not disconnect wiring.
 - A. Pull timer control assembly away from wrap.

- B. Support timer control assembly to relieve stress on wiring.

2. Note connection points of bowl guard switch leads and disconnect bowl guard switch.
3. Loosen set screw in collar.
4. Position reed switch assembly 1/16" above surface of splash guard.



5. Tighten set screw.
 6. Open bowl guard.
 7. Set meter to measure resistance (Ω) or check continuity.
 8. Place meter leads across bowl guard switch leads. Meter should indicate an open circuit.
- NOTE:** Bowl guard switch should operate as wire cage is moved to operating (closed) position.
9. Close wire cage and observe meter for change in resistance or continuity.
 - A. Meter should indicate a closed circuit.
 10. Open bowl guard and observe meter for change in resistance or continuity.
 - A. Meter should indicate an open circuit.
 11. If switch is not closed when bowl guard is in the operating (closed) position, verify presence of magnet in wire cage. If present, adjust height of reed switch assembly.

12. Connect bowl guard leads to control circuit.
13. Fill set screw hole with RTV109 (aluminum color).
14. Reinstall timer control assembly.
15. Check mixer for proper operation.

DRIVE

SERVICE POSITION

WARNING: ENSURE CAPACITIVE BUS CIRCUIT IS BELOW 50VDC BEFORE HANDLING DRIVE. WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

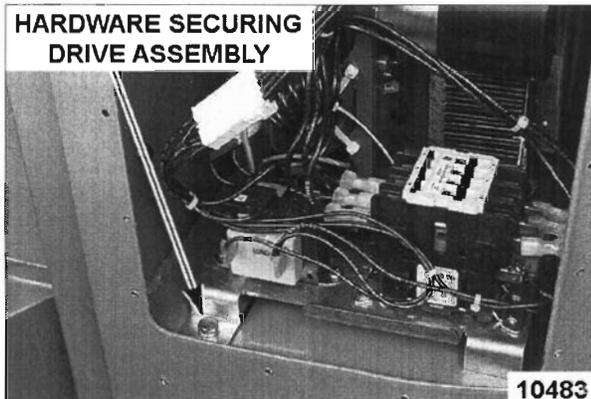
NOTE: The drive pictures shown are from an HL1400 mixer unless otherwise noted.



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

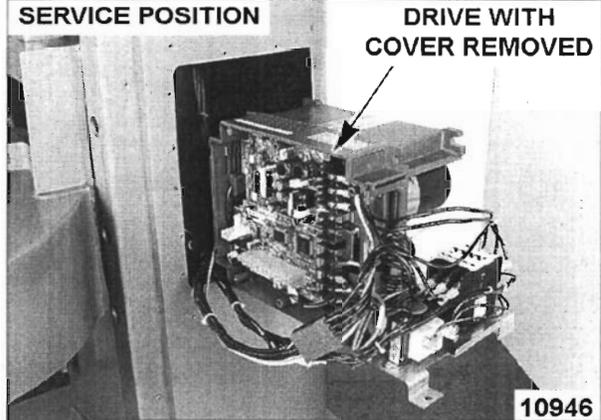
Service Position

1. Remove SIDE COVER.
2. Remove screw, lock washer and washer securing drive assembly to pedestal.



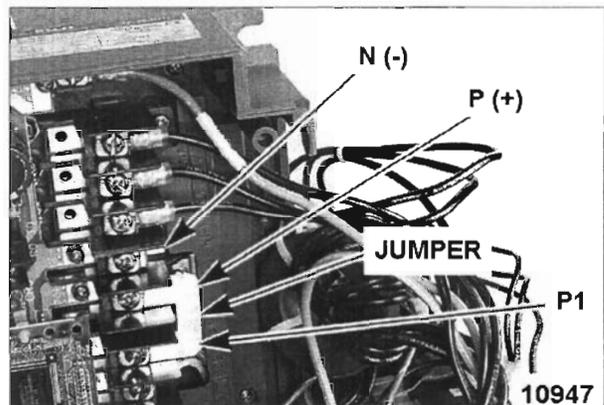
NOTE: The drive mount assembly plate slides in and out of the pedestal within two slots cut into the pedestal of the control area. Pins mounted to the back of the drive mount assembly plate drop into openings in the rear of the inside pedestal allowing the drive assembly to be pulled out for servicing while remaining secure in the pedestal.

3. Lift up slightly on front of drive mount assembly plate and carefully pull assembly plate out to access components.
4. Remove cover from drive assembly.



5. Set meter to DC voltage.

- A. Measure bus voltage across P (+) & N (-) terminals on drive to ensure the voltage is below 50VDC.

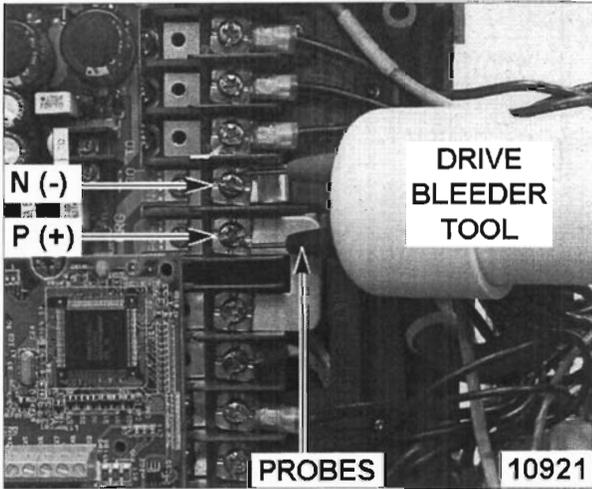


- B. If bus voltage is higher than 50VDC:
 - 1) Verify jumper is in place between terminals P (+) and P1 on drive.

NOTE: Terminal spacing on drive for the HL800 does not permit the drive bleeder tool to connect with terminals P (+) & N (-) for bleed down. However, with the jumper connecting P (+) and P1 the same voltage potential exists at both terminals.

NOTE: If desired, meter leads can be attached in parallel with drive bleeder tool for monitoring voltage when discharging bus circuit.

- 2) Place drive bleeder tool across the jumper at P (+) & N (-) terminal for at least one minute to discharge the bus circuit.



6. Remove drive bleeder tool.
7. Recheck bus voltage with meter. If necessary, repeat until voltage is below 50 VDC.

DRIVE MOUNT ASSEMBLY PLATE

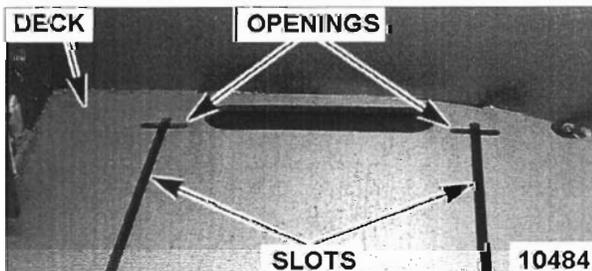


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

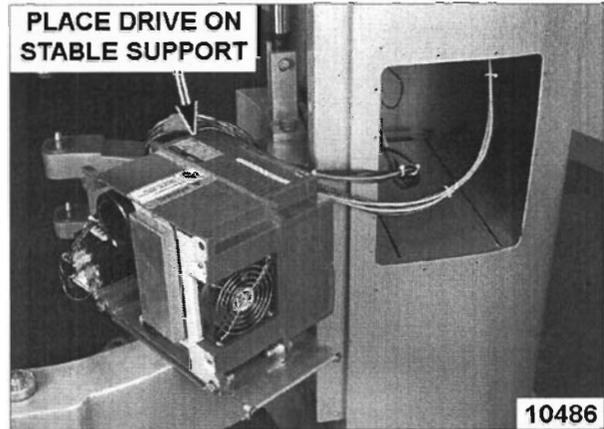
Removal

1. Place drive in SERVICE POSITION.
 - A. Ensure bus voltage is below 50VDC.
 - B. Push drive assembly back into pedestal.

NOTE: The entire drive assembly can be removed from the pedestal without disconnecting any of the wiring harness. The drive mount assembly plate slides in and out of the pedestal within two slots cut into the inside pedestal plate of the control area. Openings in the back of the inside pedestal allow pins mounted to the back of the drive mount assembly plate to drop below the inside pedestal into two slots. The openings are cut perpendicular to the slots near the back of the pedestal.



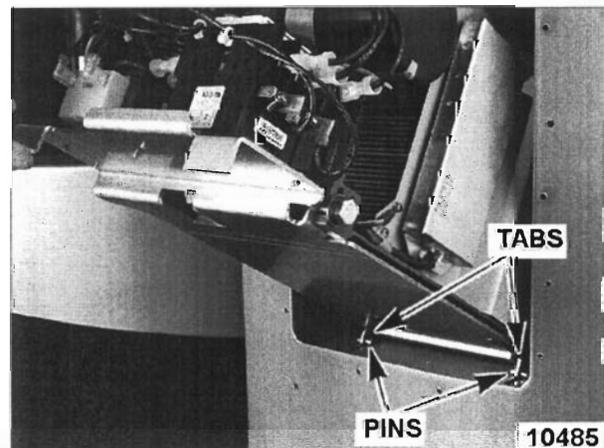
2. Lift up on back of drive while at the same time moving the drive mount assembly plate in and out slightly to locate the small openings for the pins to exit.
 - A. Once pins in drive mount assembly plate clear the inside pedestal plate of control area, navigate drive mount assembly plate out of pedestal.
 - B. Place drive assembly on stable support.



3. Disconnect wiring from drive.
4. Remove drive mounting plate.

Installation

1. Reassemble components removed from drive mounting plate.
2. Connect wiring as necessary to serviced components.
3. Reinstall drive assembly cover.
4. Place drive into opening on pedestal.
5. Align drop down tabs of plate with slots cut into inside pedestal plate of control area.
6. Slide drive into pedestal until pins in plate tabs drop under inside pedestal plate through openings in back of plate.



7. Secure drive mount assembly plate into position with washer, lock washer and screw.
8. Check mixer for proper operation.
9. Reinstall SIDE COVER.

ELECTRICAL TEST



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

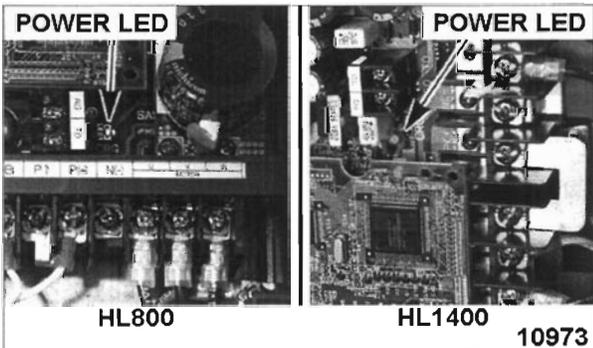
WARNING: WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

NOTE: If possible, test with load in mixer; otherwise, test line voltage for each speed.

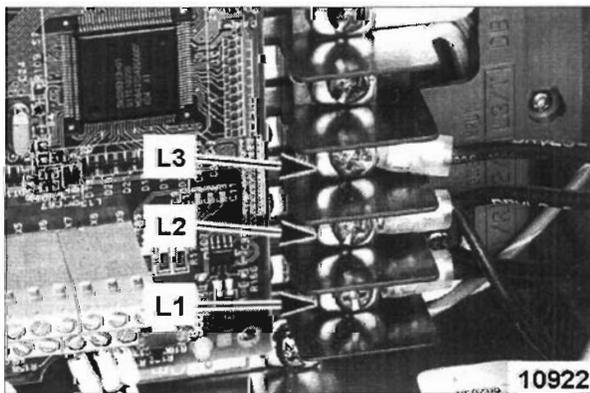
1. Place drive in SERVICE POSITION as outlined in DRIVE and ensure capacitive bus circuit is below 50VDC.

Line Input Voltage (Mixer Under Load) - Test

1. Connect power.
 - A. Verify power LED on drive is lit.



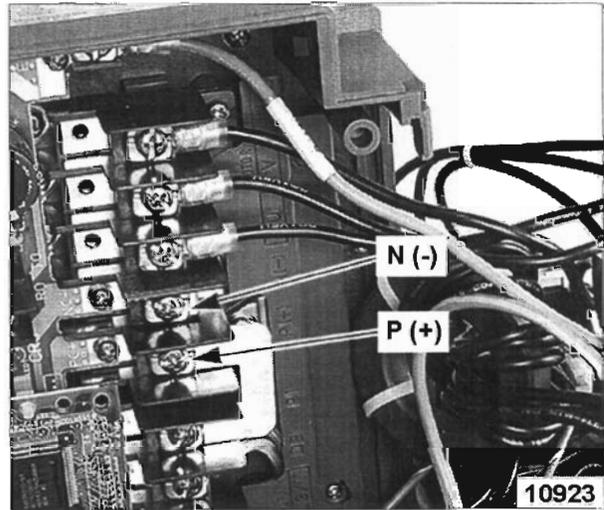
2. Start mixer in stir speed.
3. With meter set to AC voltage, measure incoming line voltage across L1-L2, L2-L3, and L1-L3 on the drive. Check data plate for correct voltage.



4. Repeat procedure for all mixer speeds.
 - A. If not correct for all speeds, see TROUBLESHOOTING.

Bus Voltage - Test

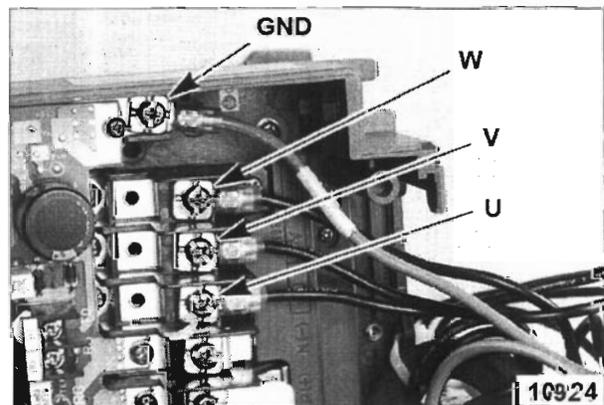
1. Connect power and check DC bus voltage.
 - A. The acceptable DC bus voltage range is:
 - 1) 240V machines - 240VDC to 358VDC.
 - 2) 460V machines - 457VDC to 747VDC.



2. Start mixer in stir speed.
 - A. Repeat procedure for all mixer speeds.

Drive Internal Resistance Test

1. Disconnect power. Ensure capacitive bus circuit is below 50VDC before handling drive.
2. Disconnect lead wires from drive terminals U, V & W.
3. Measure resistance (ohms) between chassis ground and drive terminals U, V, W.
 - A. An open circuit should exist.



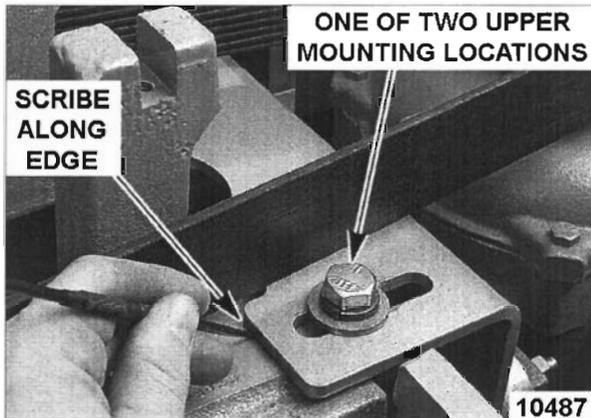
DRIVE BELT

Removal

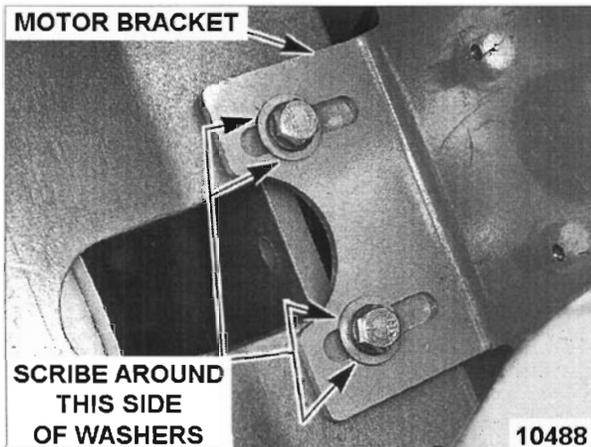


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove TOP COVER and mounting straps.
2. Remove ACTUATOR.
3. Scribe a mark at the four motor bracket mounting locations.

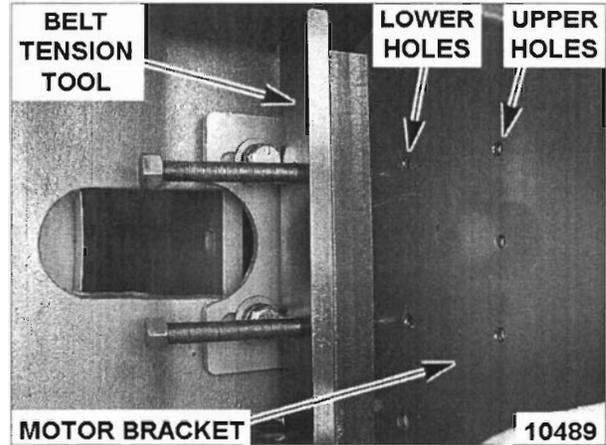


UPPER BRACKET MOUNTING LOCATIONS

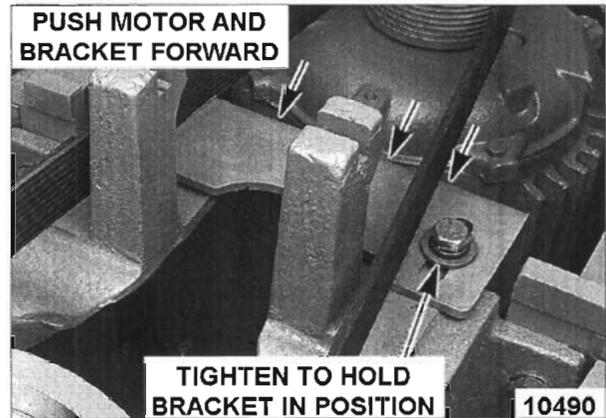


LOWER BRACKET MOUNTING LOCATIONS

4. Install belt tension tool in position between the motor bracket and the transmission with the adjustment bolts retracted.
5. Loosen the mounting bolts until the motor can be slid forward.



6. Push motor toward transmission case to relieve belt tension. Secure motor in position by tightening one of the upper motor bracket mounting bolts.



NOTE: If reusing belt, note the way the belt is installed (writing up/down). Reinstall belt in the same orientation so not to disturb wear pattern.

7. Rotate driven pulley while lifting up on belt to walk belt off driven pulley.

Installation

1. Install belt onto pulleys. Make certain that when belt is seated into grooves of both pulleys.
2. Perform drive belt tension - adjustment as outlined under DRIVE BELT TENSION - Adjustment.
3. Reinstall ACTUATOR.
4. Check for proper operation.
5. Reinstall top cover.

DRIVE BELT TENSION

NOTE: A chirping, rumbling or squeaking sound when mixer is started or when running can be an indication of a slipping belt.

Drive Belt Tension - Check



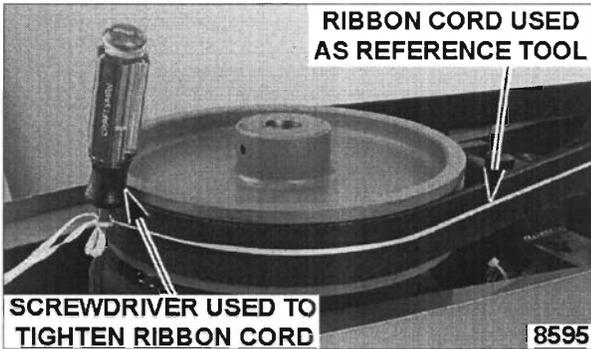
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: Verify pulley position prior to checking belt tension.

1. Remove TOP COVER.

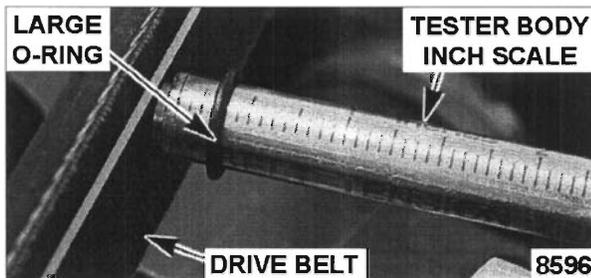
NOTE: Use a straight edge or cording material tied tightly around upper third of drive belt as a reference tool to measure belt deflection.

- A. Span both pulleys with reference tool slightly above center line of drive belt.

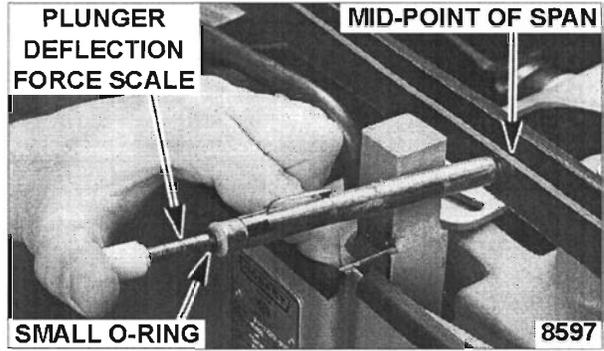


2. Set belt tension tester large O-ring to 11/32" (belt deflection).
 - A. If using a span scale, set belt tension tester according to the table.

SPAN SCALE		
Model	New Belt	Used Belt
HL800	21"	22"
HL1400	22"	23"

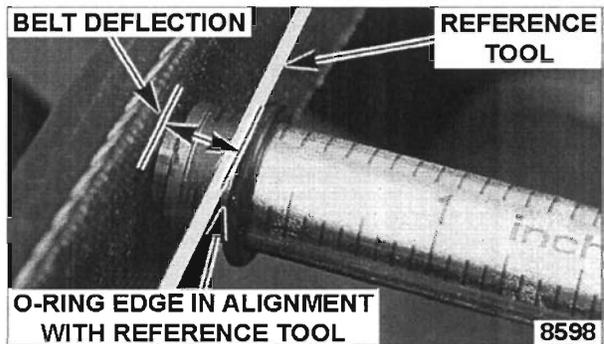


3. Place the small O-ring next to body of tester.
4. Position tester at mid-point of span and in the middle of the belt.

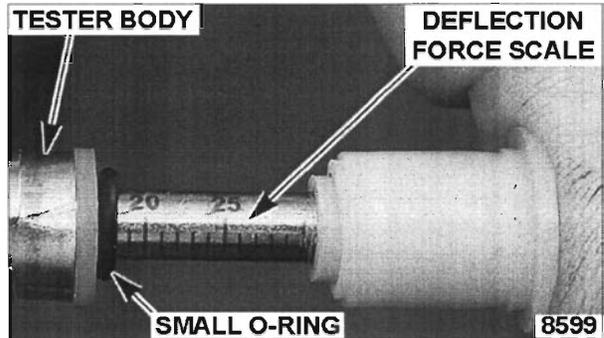


NOTE: Keep deflection force scale tester perpendicular to the reference tool when making measurement.

- A. Push in with tester until leading edge of large O-ring closest to belt is in alignment with reference tool.



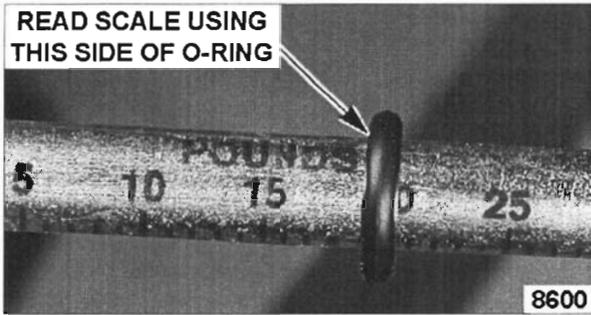
- B. Remove tester and observe measurement recorded on plunger deflection force scale.



NOTE: Use edge of small O-ring closest to tester body to determine deflection force when reading scale.

- C. Measure tension three times and calculate average to obtain deflection force.

DEFLECTION FORCE	
New or Used Belt	18.5 - 20 lbs.



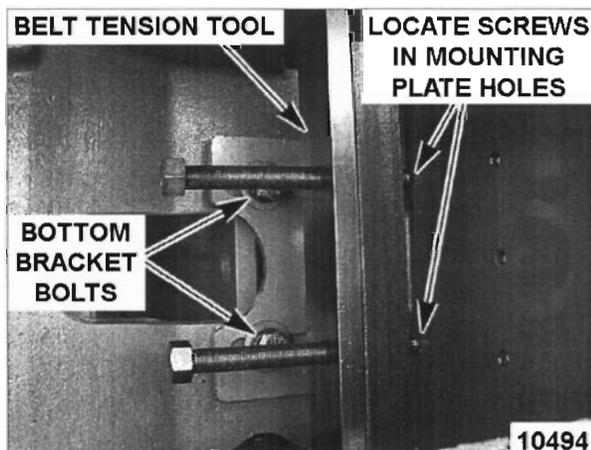
Drive Belt Tension - Adjustment

NOTES:

- Apply mineral oil to threads of belt tension tool to prevent galling.
- It is important to move both adjusting screws equally to ensure proper tension against motor mounting bracket.
- Reduce to 1/4 to 1/2 turns of adjusting screws when belt approaches correct tension to avoid galling threads of belt tension tool.

Depending on the reason you are adjusting the drive belt, you may not have to perform all steps of this procedure. They may have been performed in determining that the belt needs tensioned.

1. Remove top cover mounting straps.
2. Remove ACTUATOR.
3. Scribe a mark at the four motor bracket mounting locations.
4. Check pulley alignment as outlined under PULLEY ALIGNMENT.
5. Position belt tension tool in the lower locating holes in the motor mounting bracket and tighten adjusting screws until tool is held in position.



6. Loosen all mounting bolts.

7. Using the belt tension tool, move the motor away from the transmission. When the bottom of the mounting bracket is in the location scribed earlier, tighten bottom mounting bolts.

NOTE: If position was not recorded, start with the bottom mounting bolts centered in the slots and then tighten bottom mounting bolts.

8. Move belt tension tool to the upper locating holes in motor mounting bracket and tighten adjustment screws until tool is held in position.
9. Continue moving motor until the top mounting bracket is in the location scribed earlier.

NOTE: If position was not recorded, move motor until the feel of the belt indicates the belt is tensioned.

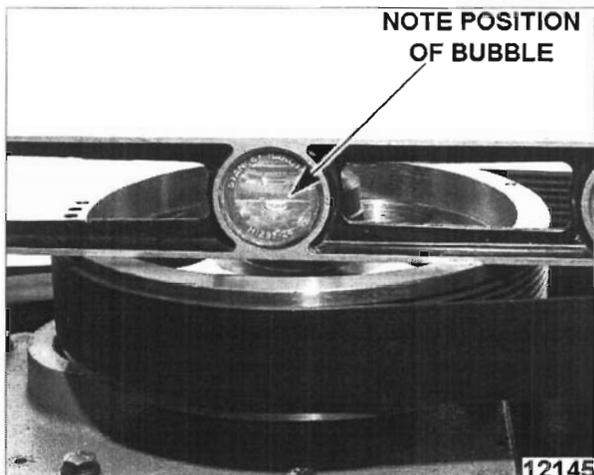
10. Check drive belt tension as outlined under DRIVE BELT TENSION.
 - A. If belt tension is correct, continue with procedure.
 - B. If belt tension is not correct, move top and bottom of motor evenly in the direction necessary to achieve correct tension.
11. Verify PULLEY ALIGNMENT.
12. Tighten motor mounting bolts.
13. Remove belt tension tool.
14. Reinstall ACTUATOR.
15. Check mixer for proper operation.
16. Reinstall TOP COVER.

PULLEY ALIGNMENT

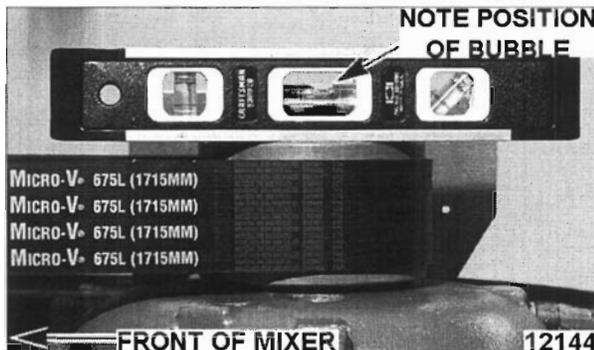


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

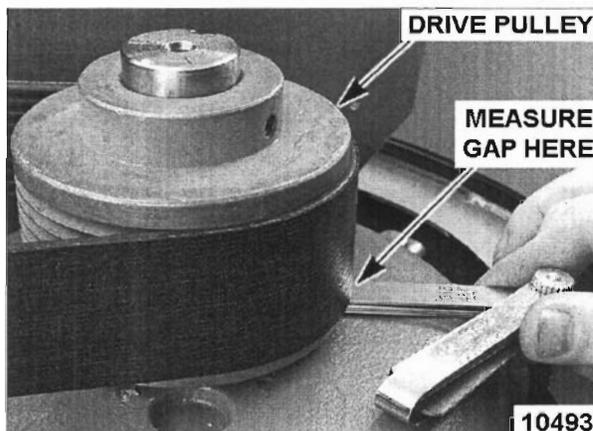
1. Remove TOP COVER and top cover straps.
2. Verify correct belt tension as outlined under DRIVE BELT TENSION.
3. Place a level on the driven pulley in line with the motor shaft and note position of bubble for reference.



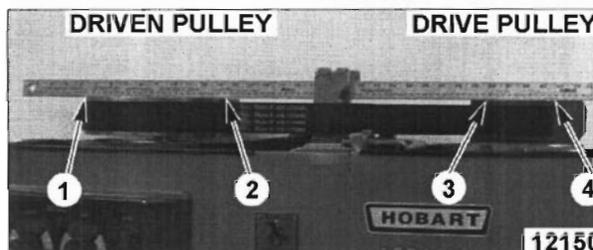
4. Place a level on the drive pulley in line with the transmission shaft and note position of bubble. The bubble position should be the same as the reference from drive pulley. If not, reposition motor to match reference and adjust belt tension before proceeding.



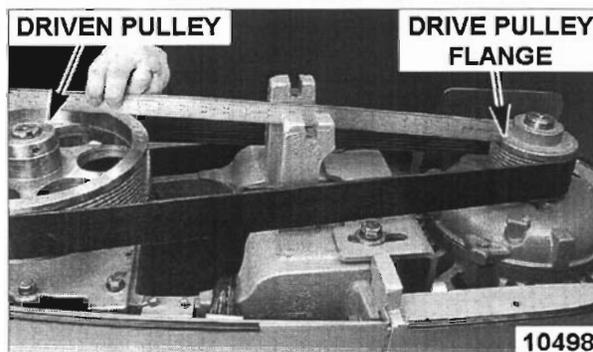
5. Measure pulley height between drive pulley and motor. Range is 0.125" (1/8") to 0.156" (5/32") . Adjust if necessary.



6. Check angularity.
 - A. Remove actuator.
 - B. Place a straight edge across the top of the pulleys.
 - C. The straight edge should touch at both front and rear edges of both pulleys.
 - 1) If the straight edge is not touching all 4 locations continue this procedure.
 - 2) If the straight edge is touching all 4 locations, the pulleys are in the correct position.



7. Place a straight edge over the span of driven pulley flange extending straight edge to the drive pulley. Bottom edge of straight edge should be aligned to $\pm 3/32$ " with top edge of drive pulley flange.



8. Adjust driven pulley up or down.
9. Perform DRIVE BELT TENSION - ADJUSTMENT.
10. Continue performing procedure until pulley height, pulley angularity and belt tension is adjusted properly.
11. Reinstall ACTUATOR.
12. Check mixer for proper operation.
13. Reinstall TOP COVER.

TRANSMISSION

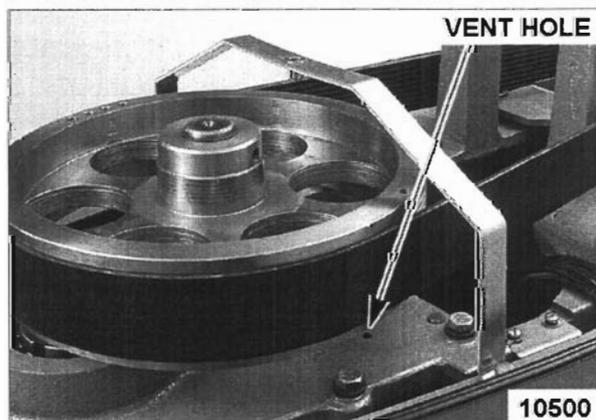
TRANSMISSION DISASSEMBLY



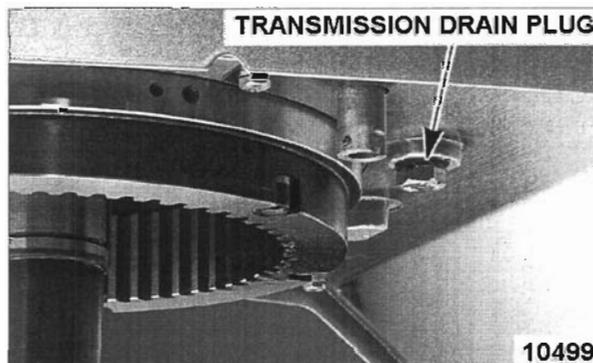
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: The transmission can be serviced with the planetary assembly installed with the exception of the planetary shaft and lower bearing. This procedure describes full disassembly of the transmission.

1. Perform PLANETARY REMOVAL as outlined in PLANETARY.
2. Place container under transmission drain hole to collect oil.
 - A. Ensure vent hole in transmission cover is clear. Vent is located to the rear of the transmission case cover.

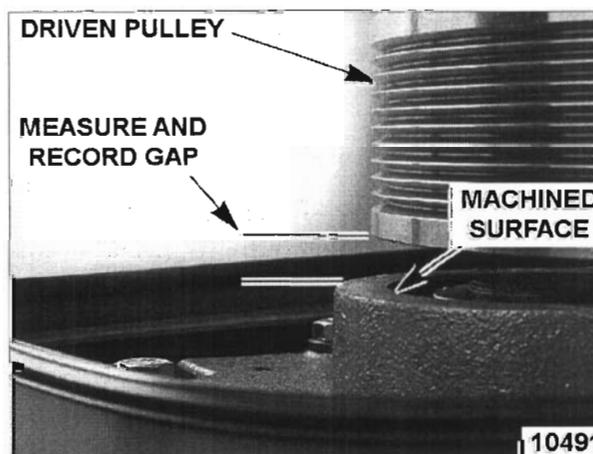


- B. Remove transmission drain plug and drain transmission oil.

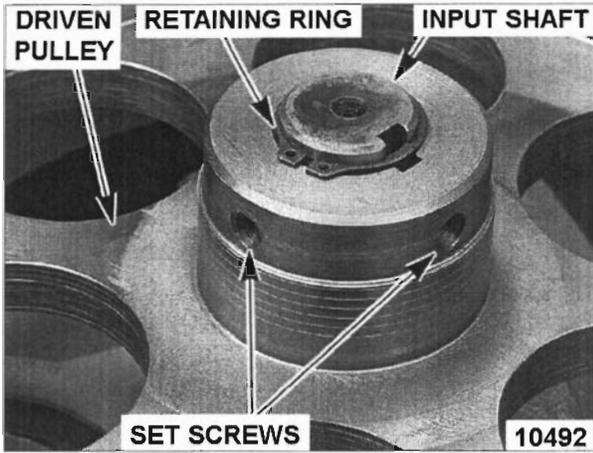


- 1) Clean drain plug.
 - a. Apply Permatex #2 around head of drain plug.
 - b. Reinstall drain plug.

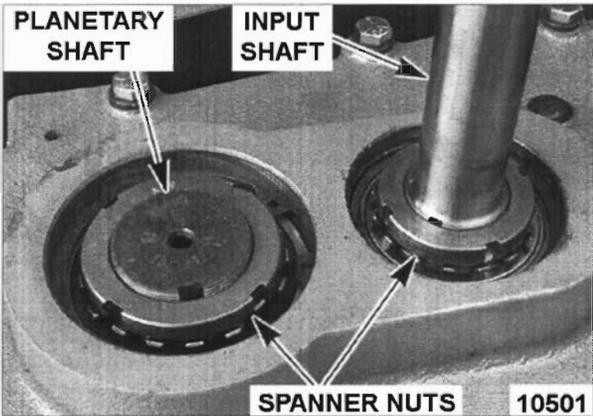
3. Remove the ACTUATOR.
4. Remove the Drive Belt as outlined in DRIVE BELT AND PULLEYS.
5. Measure and record gap between top of transmission cover and bottom of driven pulley.



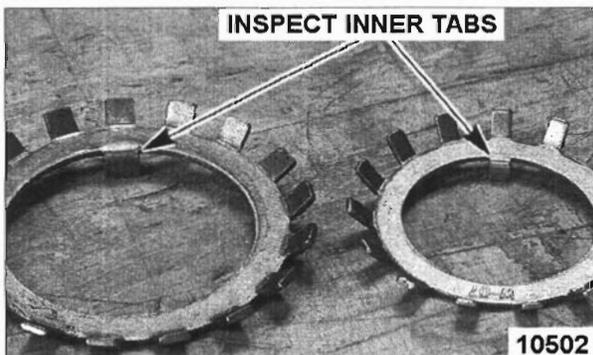
6. Remove input shaft retaining ring and loosen set screws in driven pulley.



7. Pull driven pulley off input shaft and remove key.
8. Remove spanner nuts and locking washers from input and planetary shafts.



9. Inspect condition of locking washers to ensure inner tab is present and in good condition. Replace locking washers if inner tab is damaged or missing.



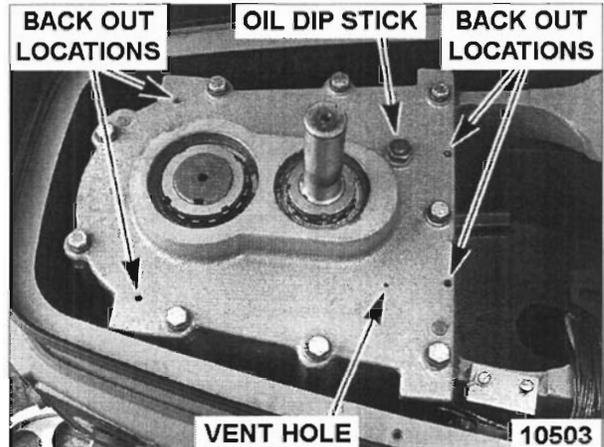
10. Remove oil dip stick.

CAUTION: Do not pry the transmission cover off the transmission. The sheet metal of the wrap could be damaged in the process.

NOTE: Four 1/4-20 tapped holes are provided in the transmission case cover to aid in transmission cover removal. Use 1/4-20 x 2" all-thread bolts as back out bolts. Tighten all four back out bolts in an even pattern to avoid damage to the bolts.

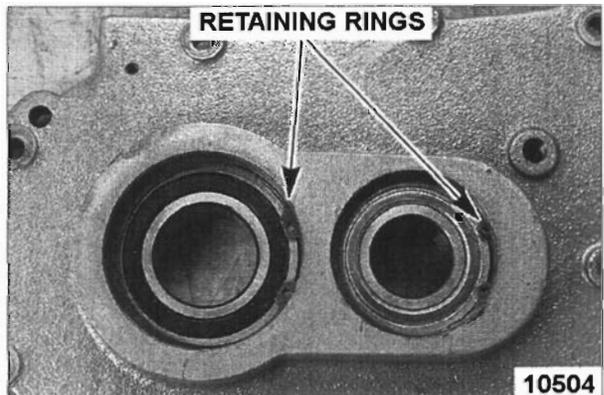
NOTE: Both top transmission bearings are a press fit onto the input and planetary shafts and a close tolerance slip fit into the transmission cover. The input shaft assembly will most likely come out of the transmission along with the transmission cover when it is removed. Carefully navigate the input shaft out of the transmission.

11. Remove transmission cover.



12. Press input shaft assembly from inner race of upper input shaft bearing.
 - A. If input shaft assembly does not come out of transmission when transmission cover is removed, remove input shaft at this time.

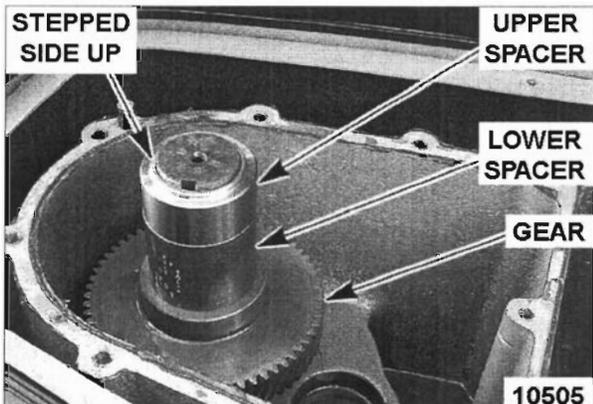
13. Remove retaining rings securing input and planetary bearings into transmission cover.



14. Tap both bearings out through the top of transmission cover.

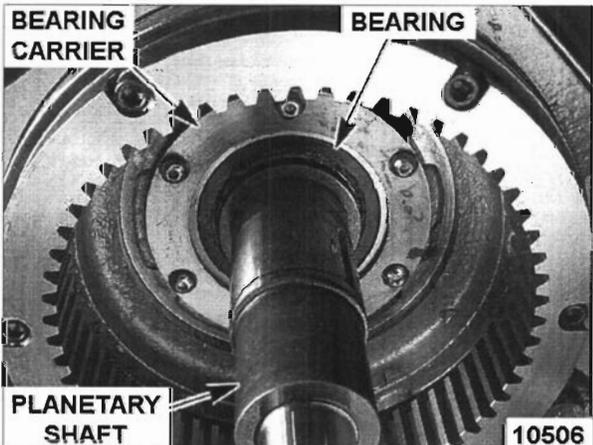
Planetary Shaft Removal

1. Remove the upper spacer (stepped) and lower spacer (longer) from planetary shaft.
2. Remove gear and key.



NOTE: Planetary shaft assembly is held into position by the lower planetary shaft bearing carrier. Planetary shaft assembly is removed out of the transmission case from the bottom.

3. Remove five of the six screws and lock washers securing bearing carrier to transmission case.



- A. Support planetary shaft and remove the sixth screw.

4. Remove the planetary shaft assembly from the transmission case.

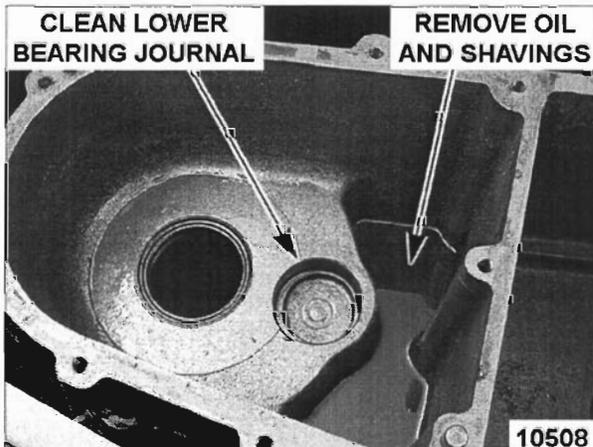
NOTE: Planetary oil shaft seal comes out thru top of transmission case. Slots are located in the bottom of transmission case to aid in tapping out seal.

5. Remove the planetary shaft oil seal located in bottom of transmission case.



CAUTION: Transmission oil trapped inside input shaft lower bearing journal during installation can cause a hydraulic effect and not allow the input shaft to seat correctly. Damage to transmission cover could occur if input shaft is not seated into position.

6. Clean remaining oil and all metal shavings out of transmission. Make certain to remove all oil from the input shaft lower bearing journal.

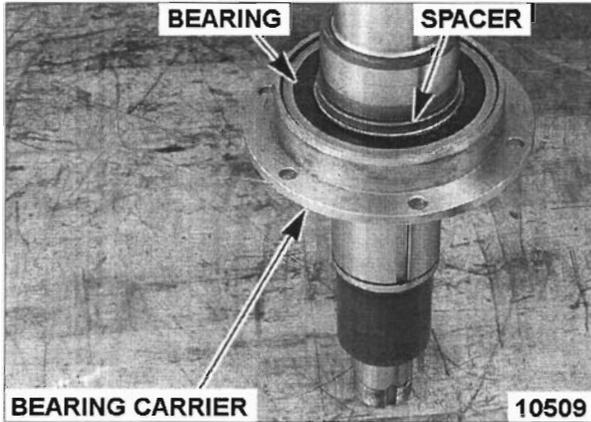


7. Remove old sealant from top of transmission case and transmission cover.

Planetary Shaft Disassembly

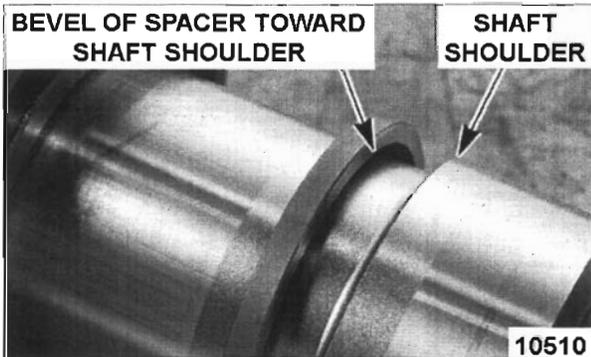
NOTE: The planetary shaft bearing carrier is a close tolerance slip fit onto the outer race of lower planetary shaft bearing.

1. Tap planetary shaft bearing carrier off bearing.
2. Press bearing from planetary shaft.



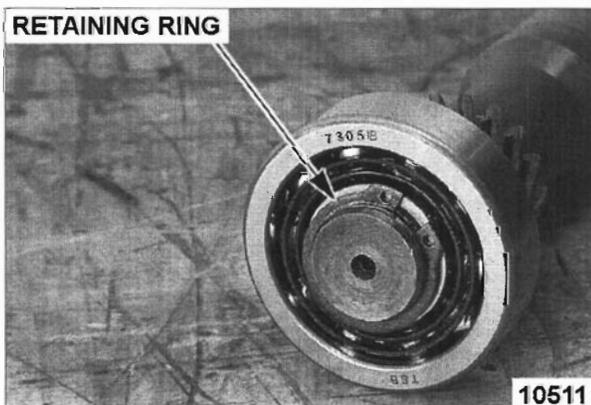
NOTE: The beveled inside diameter of spacer faces toward shoulder of planetary shaft (away from bearing).

- A. Remove the beveled spacer.



Input Shaft Disassembly

1. Remove retaining ring.



NOTE: The inner race of the lower input shaft bearing has narrow and wide surfaces. The narrow inner race is to be installed toward the bottom of transmission case.

2. Press lower bearing off input shaft.
3. Inspect shaft pinion for wear or damage. Replace if necessary.

TRANSMISSION ASSEMBLY



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

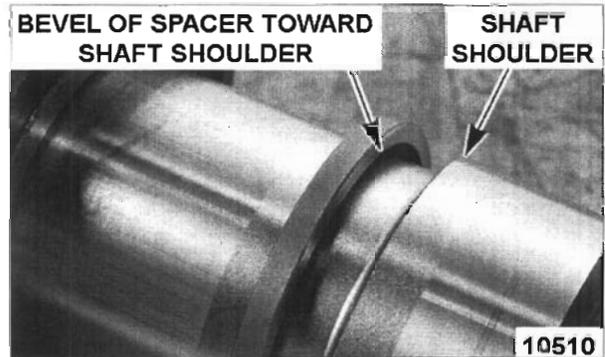
NOTE: Before assembling transmission, make certain that the inside of transmission is clean and free of oil and metal shavings.

NOTE: Coat threads of drain plug near head of bolt with Permatex #2 before assembling.

1. Reinstall drain plug and tighten.

Planetary Shaft Assembly and Installation

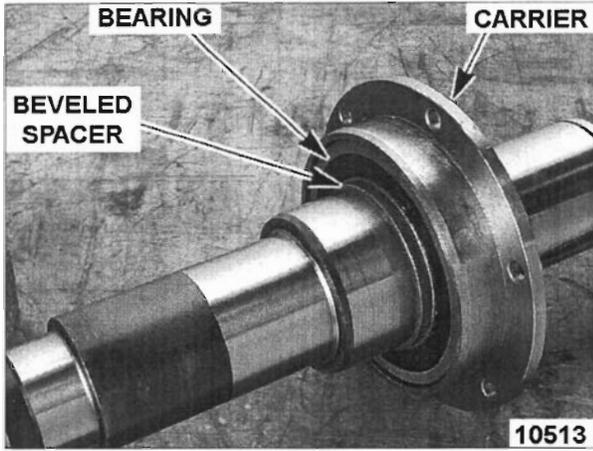
1. Install beveled spacer onto larger diameter side of planetary shaft with bevel facing shaft shoulder.



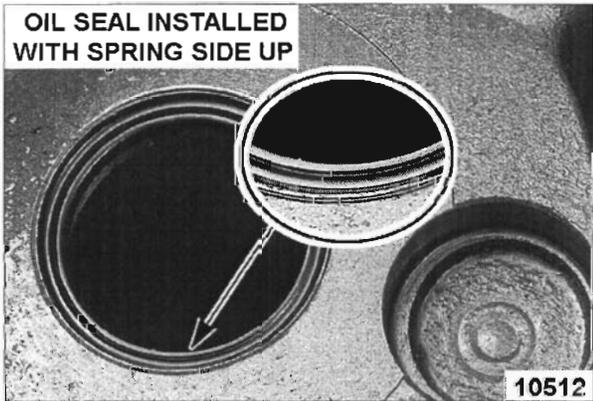
2. Press lower transmission planetary shaft bearing onto planetary shaft tight against beveled spacer.

NOTE: The planetary shaft bearing carrier is a close tolerance slip fit onto the outer race of lower planetary shaft bearing.

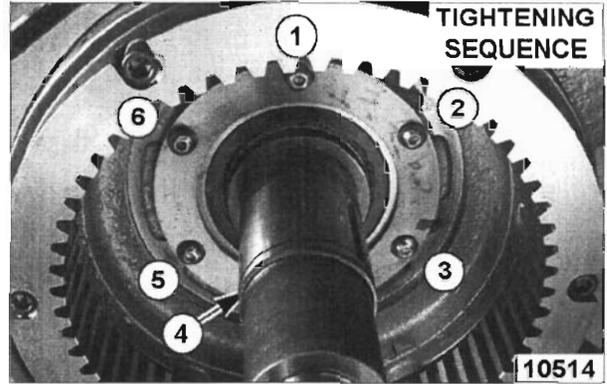
3. Install lower bearing carrier onto lower transmission planetary shaft bearing.



4. Install a new planetary shaft oil seal into transmission case with face of seal facing down toward planetary.
 - A. Start oil seal into hole by hand, then install using a small piece of 4"x4" hardwood or equivalent, install seal until flush with bottom of transmission case.

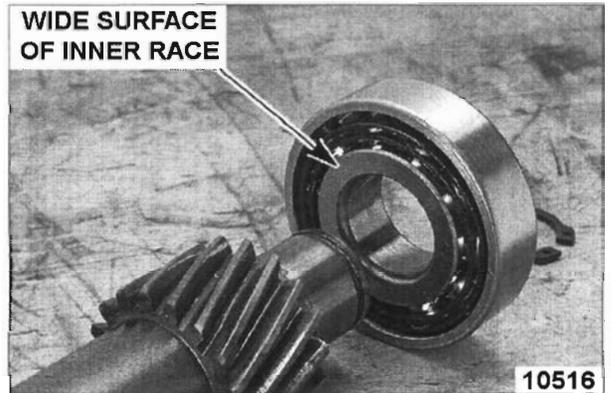


- B. Apply light coat of Mobil Gear 634 to inside radius of oil seal.
5. Install planetary shaft assembly into transmission case from bottom (planetary side). Support planetary shaft in position until bearing carrier screws can be started.
 - A. Secure lower bearing carrier into position using cap screws and lock washers. Evenly tighten in a star pattern (1-3-5, 2-4-6).



Input Shaft Assembly and Installation

1. Press bearing onto shaft with wide surface of inner race toward pinion of input shaft until retaining ring can be installed.



2. Install retaining ring.

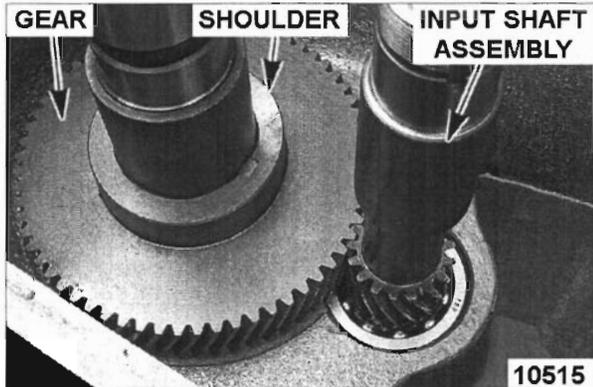
CAUTION: Transmission oil trapped inside input shaft lower bearing journal during installation can cause a hydraulic effect and not allow the input shaft to seat correctly. Damage to transmission cover could occur if input shaft is not seated into position.

NOTE: Outer race of lower input shaft bearing is a slip fit into the bearing journal.

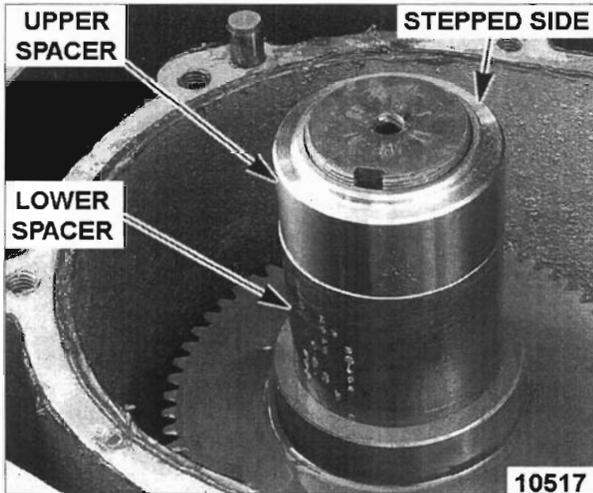
3. Install input shaft assembly into transmission case.

Transmission and Transmission Cover Assembly

1. Install key and gear (shoulder side up) onto planetary shaft. Turn planetary shaft as necessary to mesh the planetary shaft gear with the input shaft pinion.



2. Install the lower (longer) spacer then install the upper (stepped side up) spacer onto planetary shaft.

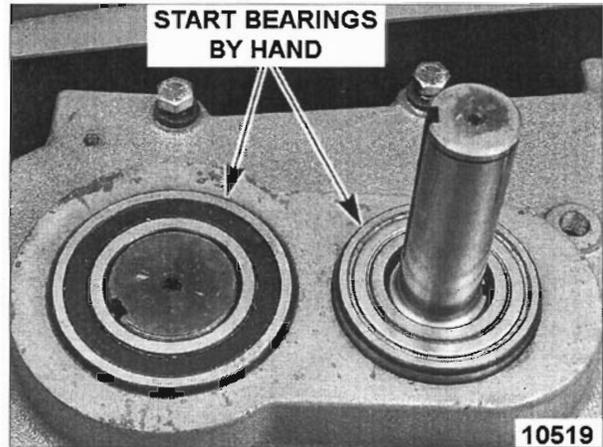


3. Reinstall PLANETARY.
4. Fill transmission with amount and type of lubricant called out in Lubrication Manual F-20067.
5. Verify both dowel pins are in position in the transmission case.
6. Apply Permatex #2 sealant to top edge of transmission case.

CAUTION: Do not use transmission cover as a pressing tool to press bearings onto shafts.

7. Reinstall transmission cover and tap into position (flush with transmission case) with a mallet.
8. Reinstall transmission cover bolts and lock washers.

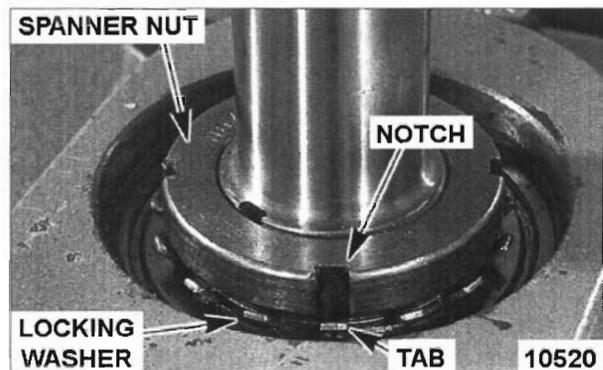
9. Install new bearings onto planetary and input shafts. Start bearings into transmission cover by hand.



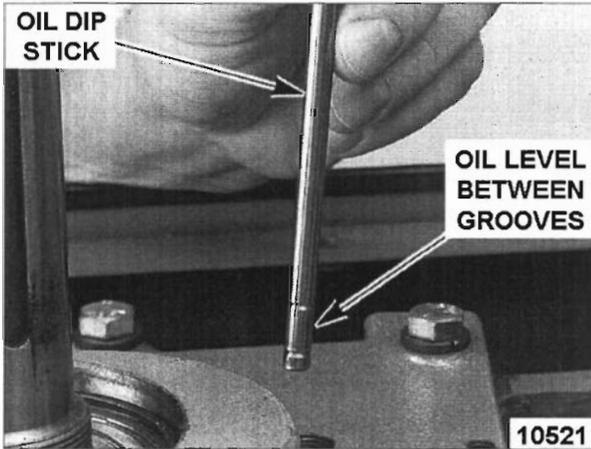
10. Use a sleeve against inner race of each bearing as a pressing tool.
 - A. Press the planetary and input shaft bearings onto shafts until bearings seat firmly and retaining rings can be installed above each bearing.
 - B. Reinstall retaining rings.
11. Tighten transmission cover bolts evenly in an alternating pattern to 35 ft*lb of torque.
12. Inspect condition of locking washers for both the planetary and input shafts. Verify that the inside tab is present and in good shape. Replace locking washer if inside tab is damaged or missing.

NOTE: Install an attachment onto agitator shaft to hold planetary and input shafts in position when spanner nuts are being installed and tightened.

13. Install locking washers and spanner nuts onto planetary and input shafts.
 - A. Tighten both spanner nuts to 35 ft*lb torque.
 - B. Bend tab(s) of locking washer into notch(es) of each spanner nut.

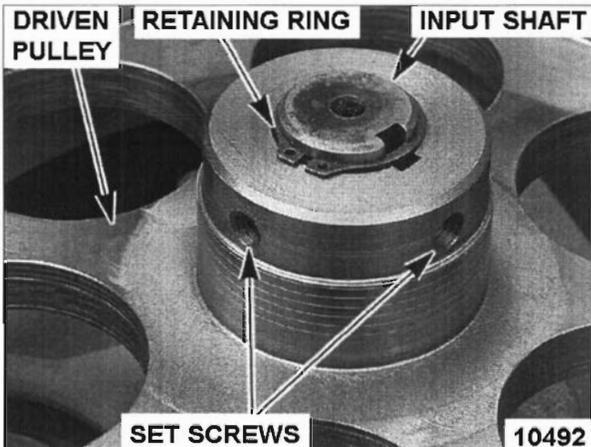


14. Check oil level by inserting dip stick into hole, but not starting threads. Oil level should be between the two grooves. Fill, if necessary, to the correct level.



20. Reinstall front top cover strap.
21. Lubricate top cover gasket with mineral oil and reinstall top cover.
22. Check mixer for proper operation.

15. Coat threads of dip stick with Never Seize then reinstall dip stick and tighten.
16. Reinstall driven pulley and key.
 - A. Reinstall retaining ring.
 - B. Position bottom of driven pulley to top of transmission cover gap distance recorded earlier.
 - C. If gap was not measured, lift driven pulley up such that top collar is touching retaining ring.
 - D. Apply Loctite 222 to threads of set screws.
 - E. Snug driven pulley set screws.



17. Reinstall DRIVE BELT.
18. Perform DRIVE BELT TENSION ADJUSTMENT as outlined under DRIVE BELT.
 - A. Tighten set screws on driven pulley to 110 in*lb torque against input shaft.
19. Reinstall ACTUATOR.

PLANETARY

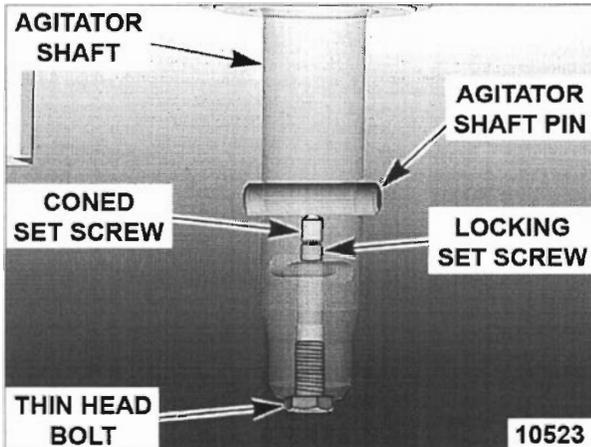
AGITATOR SHAFT PIN



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Removal

1. Remove the thin-headed screw located at bottom of agitator shaft.
2. Remove the locking set screw and cone-pointed set screw.



AGITATOR SHAFT PIN COMPONENTS

NOTE: Agitator shaft pin is a straight pin and a loose slip fit into agitator shaft.

3. Remove the agitator shaft pin.

Installation

1. Install agitator shaft pin such that the counter sunk hole will align with the set screw.
2. Install coned set screw seating it into the countersunk hole of agitator shaft pin. Tighten set screw.
3. Install locking set screw and tighten.
4. Install the thin-headed bolt and tighten.

PLANETARY REMOVAL



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

CAUTION: The planetaries of the HL800 & HL1400 utilize an oil pump to disperse lubricant onto the moving gears inside the planetary. Use care when removing/installing the planetary to avoid damaging the fiber gear of the oil pump.

1. Remove BOWL GUARD.
2. Place a container under the planetary to capture the oil (6 ounces) from the planetary.
 - A. Remove the drain plug and drain oil from planetary.

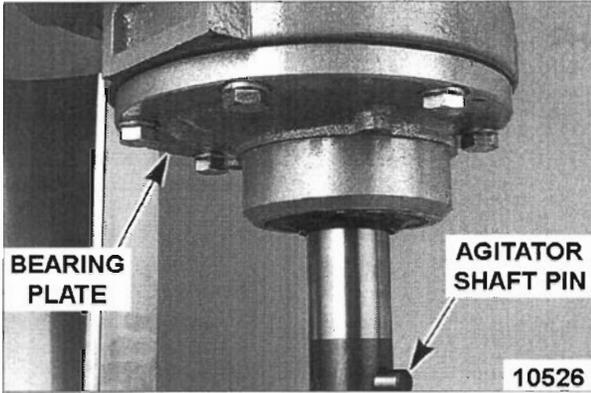


3. If HL1400, remove bearing plate cover.



HL1400 ONLY

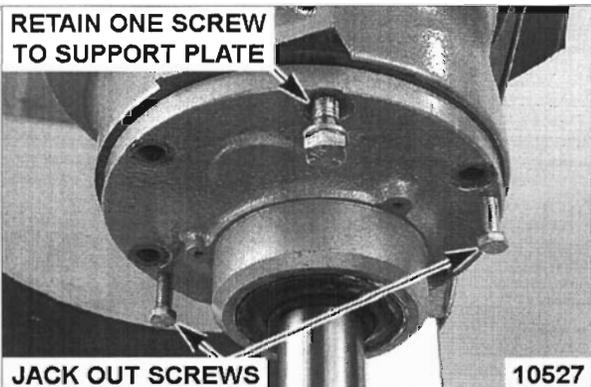
4. If HL1400, remove agitator shaft pin then remove five of the six bolts and lock washers securing bearing plate to planetary.



- A. Loosen the sixth bolt such that approximately 1/2" of threads are exposed.

NOTE: Retaining one screw in the bearing plate will prevent bearing plate from falling unexpectedly during removal process.

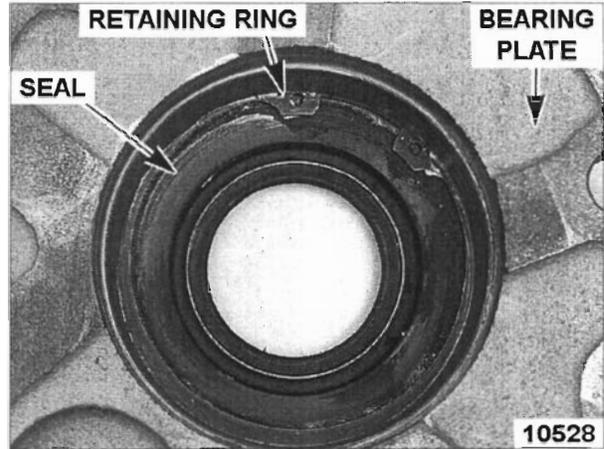
- B. Rap on sides of bearing plate with a mallet to release bearing plate from planetary. If necessary, use the provided 5/16-18 threaded jack out holes and two all-thread screws (5/16-18 x 1-1/2") to separate the bearing plate from the planetary.



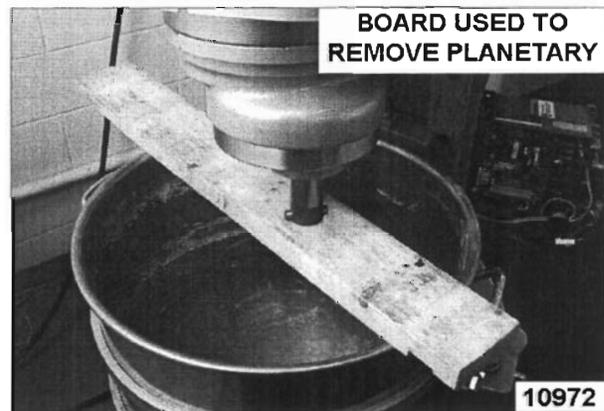
- C. Remove bearing plate.

NOTE: A retaining ring is installed in the bearing plate to act as a positive stop for the bearing plate seal. This ring must be in place for the seal to be positioned correctly.

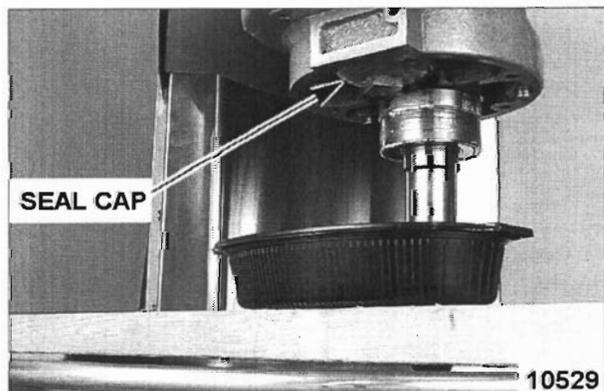
- D. Remove and discard bearing plate seal.



- 5. Install bowl and place a board (2"x6"x42" or wider with a 1.77" hole drilled in center of board 13" from one end) across bowl.



- A. If HL1400, reinstall agitator shaft pin and secure with coned set screw only.
- B. Apply electrical power.
- C. Raise bowl allowing agitator shaft to pass thru hole in board. Position board so that it is under the seal cap. Continue to raise bowl until agitator shaft pin is resting on board. DO NOT continue to drive actuator upward once board contacts bottom of agitator shaft pin.

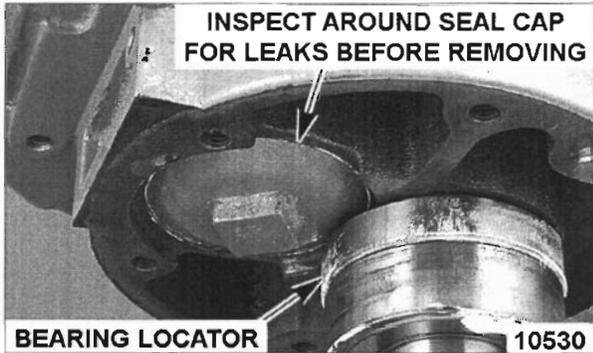


- 6. Disconnect electrical power.

7. Place a container under the seal cap.
 - A. Check for oil leaks around perimeter of seal cap before removal. Replace O-ring if leaking is evident.

NOTE: Use care when removing seal cap as it will be full of oil.

8. Remove seal cap. Bearing locator is a loose fit above bearing. Position bearing spacer as necessary to remove seal cap.

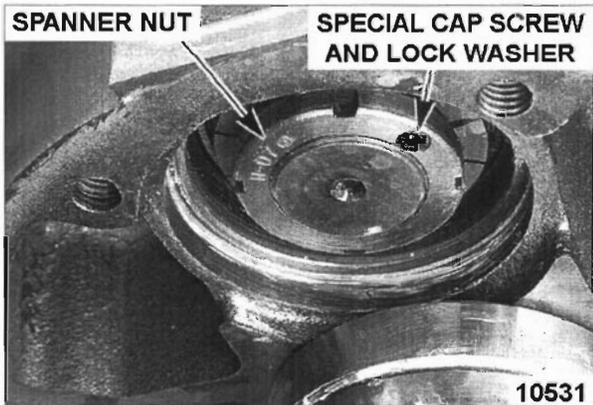


HL1400 SHOWN

- A. Allow oil to drain from planetary.
 - 1) Clean seal cap and inspect O-ring for wear or damage. Replace O-ring if necessary.

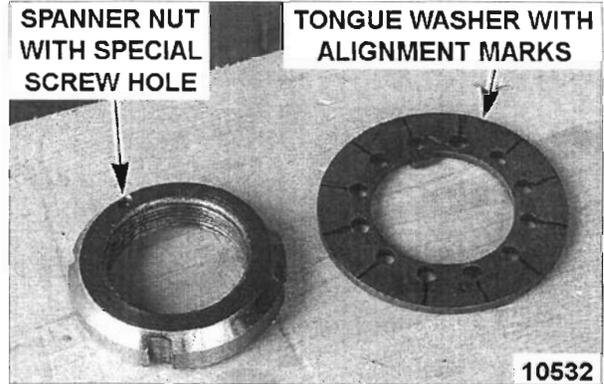
NOTE: A small lock washer secures the special screw into position.

9. Remove the special cap screw and lock washer from spanner nut.



10. Remove spanner nut and tongue washer.

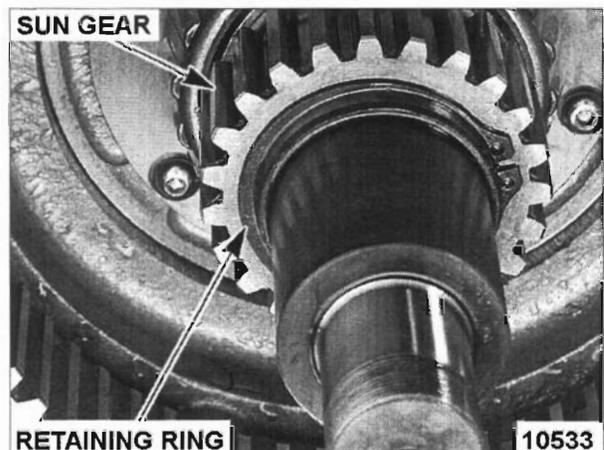
NOTE: Black marks may be present on one side of the tongue washer. The black alignment marks aid in positioning the spanner nut during assembly so that the special screw can be installed correctly. If tongue washer does not have marks as seen in the photo, place marks with fine felt-tipped marker from center of hole to outside of tongue washer.



CAUTION: Use care when lowering bowl support when it is supporting planetary assembly. When lowering bowl support, the actuator will over-travel approximately 1-1/4" after bowl lift switch is released. Be prepared to balance full weight of planetary when planetary assembly clears planetary shaft.

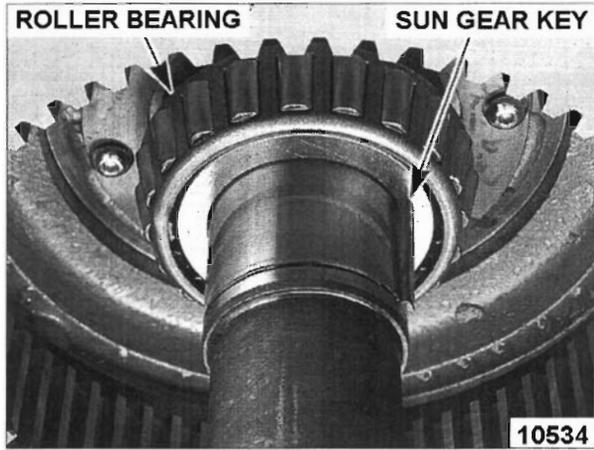
NOTE: The lower planetary shaft roller bearing is a slip fit into position and may release at any time when the tongue washer is removed. However, it is most likely that the lower roller bearing will stay in position until the planetary assembly is lowered.

11. Apply power to mixer and lower planetary assembly away from mixer by lowering bowl with actuator. Support planetary as required to maintain balance during removal process.
12. Move planetary assembly to a firm work surface. Support planetary assembly in vertical position by using two 4"x4" boards under bottom of planetary. Remove remaining oil from inside planetary. Refer to PLANETARY DISASSEMBLY for breakdown of planetary assembly.
13. Disconnect electrical power.
14. Remove retaining ring securing sun gear into position.

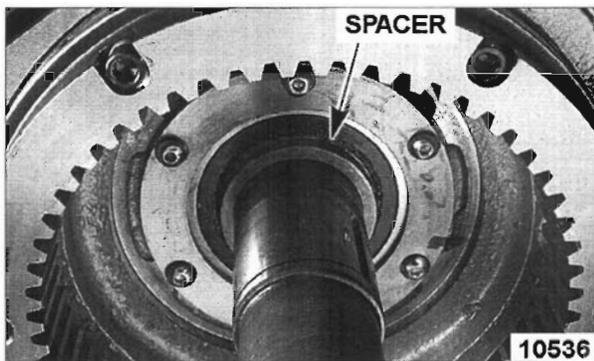


NOTE: Sun gear is manufactured with a shoulder on one end. Install the sun gear onto the planetary shaft with the shoulder end up toward transmission case.

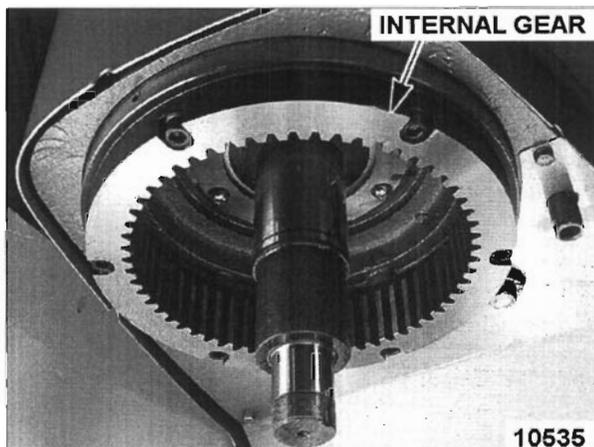
15. Remove sun gear, key and tapered roller bearing from planetary shaft.



16. Remove spacer located above tapered roller bearing.



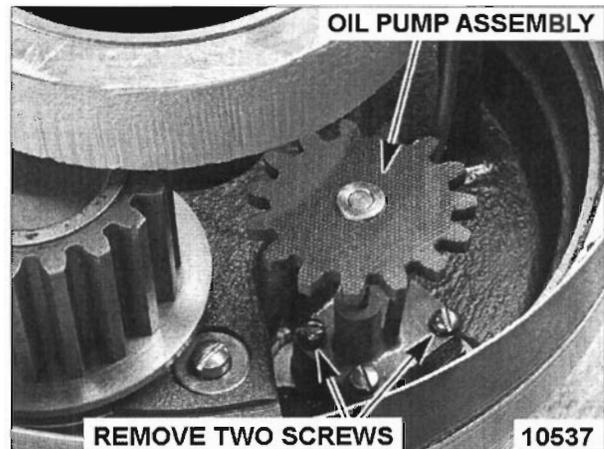
17. Remove the internal gear.



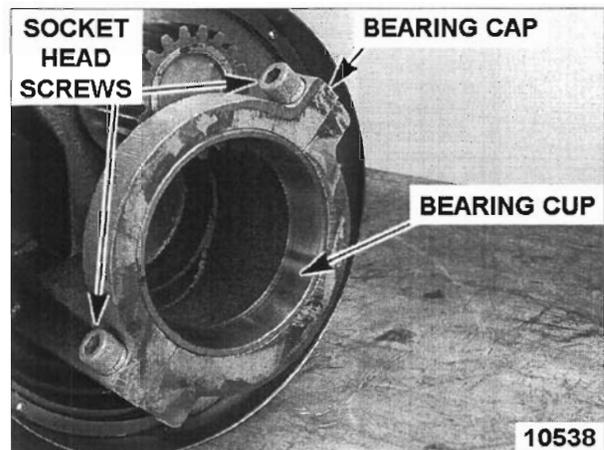
PLANETARY DISASSEMBLY

Agitator Shaft Removal

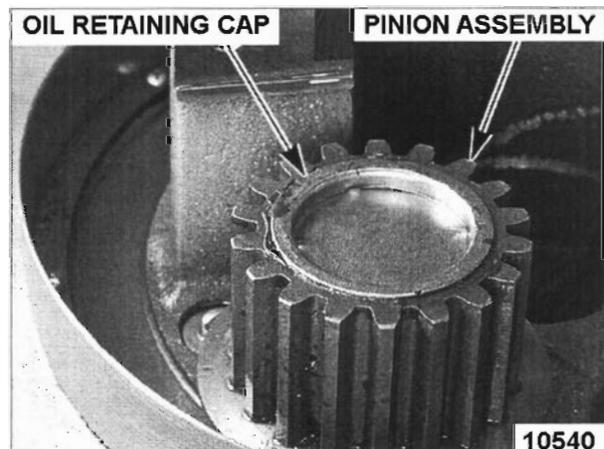
1. Remove AGITATOR SHAFT PIN.
2. Remove the oil pump assembly.



3. Remove the two socket head screws, bearing cap and bearing cup.

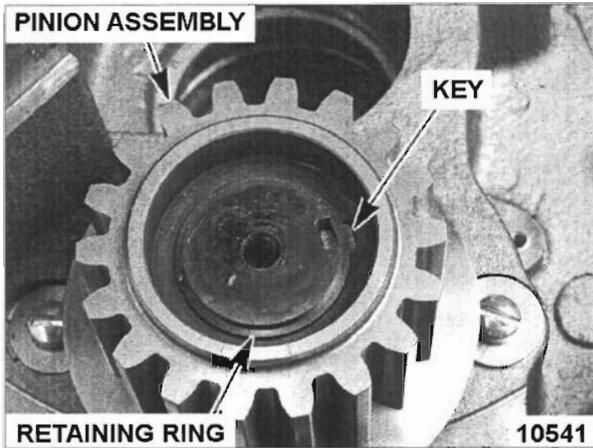


4. Pry out oil retaining cap.



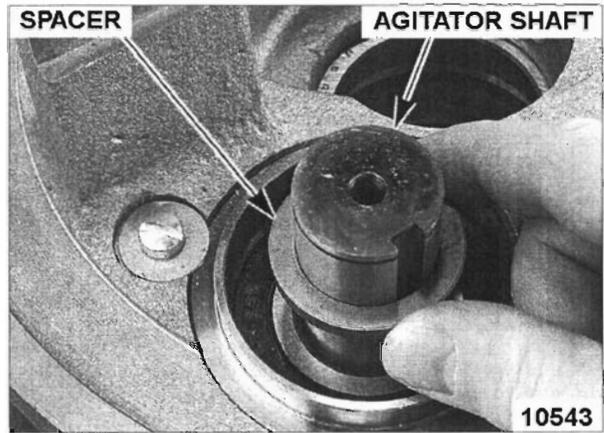
5. Remove the retaining ring, pinion assembly.

NOTE: There is a key present on HL800 only.

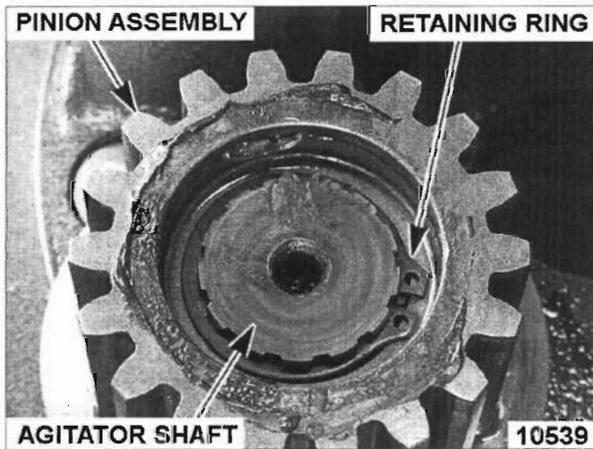


HL800 SHOWN

6. If HL800, remove the spacer located under pinion assembly.

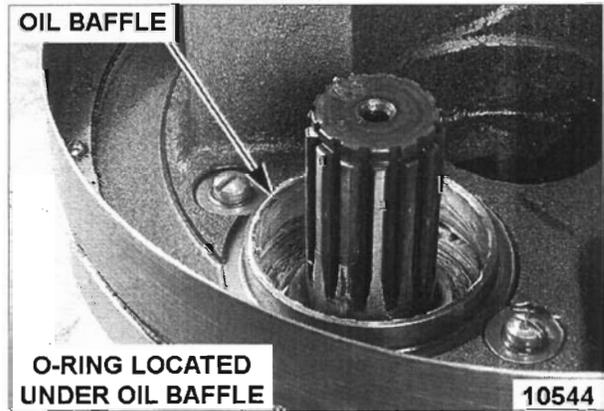


HL800 SHOWN



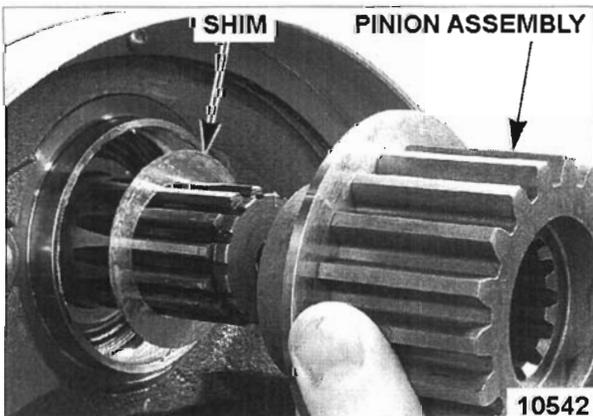
HL1400 SHOWN

7. Remove the two machine screws and lift out the planetary oil baffle and O-ring.



HL1400 SHOWN

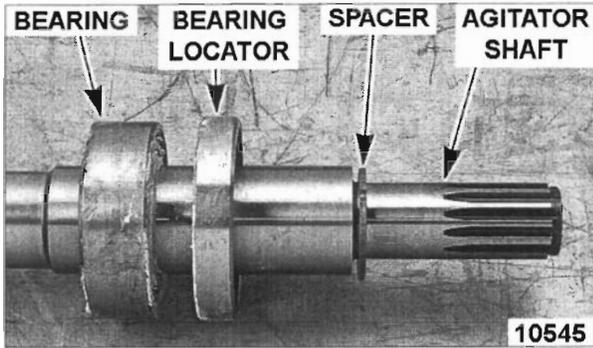
NOTE: For HL1400, if a pinion shim has been used it will be located under the pinion assembly. For HL800, if a pinion shim has been used it will be located between the pinion assembly and retaining ring. If used, the shim must be reassembled exactly as found.



HL1400 SHOWN

NOTE: For HL800, the lower agitator shaft seal and bearing should drive out of the planetary along with the agitator shaft when it is removed.

8. Support lower part of agitator shaft.
 - A. Using a hard rubber or dead blow mallet, drive the agitator shaft out through upper bearing.
9. If HL1400, remove the spacer and bearing locator from agitator shaft.

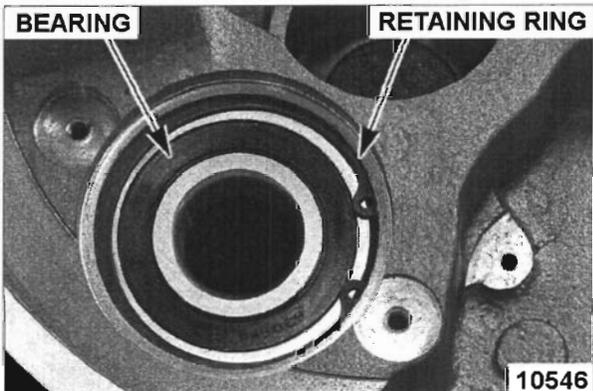


HL1400 SHOWN

10. Press lower bearing off agitator shaft.

NOTE: The upper agitator shaft bearing used on HL1400 mixers is a shielded bearing that must be packed with grease before assembling into planetary.

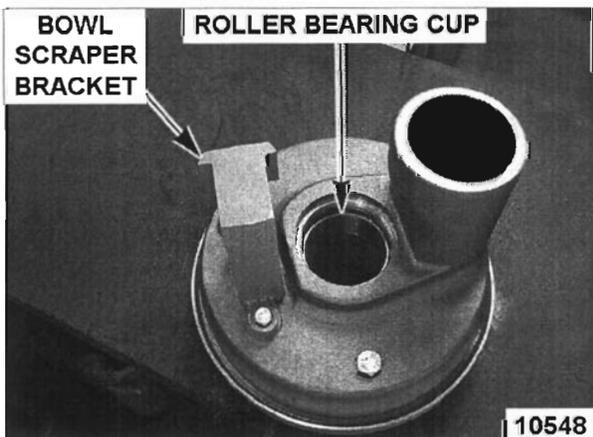
11. Remove the retaining ring and lift out the upper agitator shaft bearing.



HL800 SHOWN

12. Remove the roller bearing cup.

A. If HL800, remove bowl scraper bracket.



HL800 SHOWN

13. For HL1400, remove the lower agitator shaft seal from the bearing plate cover.

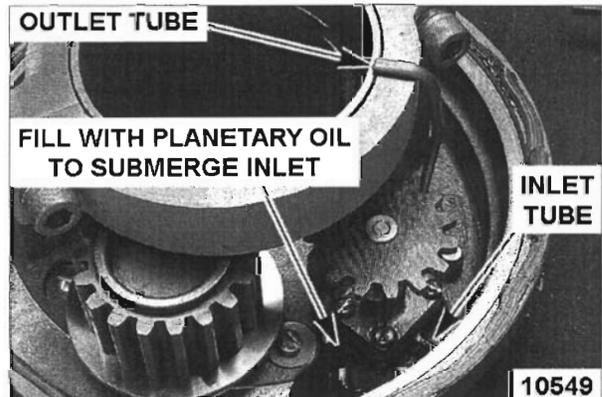
PLANETARY OIL PUMP

NOTE: Parts are not available to service the internal mechanism of the oil pump. Replace oil pump as an assembly.

NOTE: The oil pump provides lubrication to the internal gear, pinion and upper planetary bearing.

Oil Pump Check

1. Visually inspect oil pump inlet and outlet holes verifying openings are not clogged.
2. Fill planetary cavity near oil pump with enough oil such that inlet tubing is submerged.



3. Check oil flow.

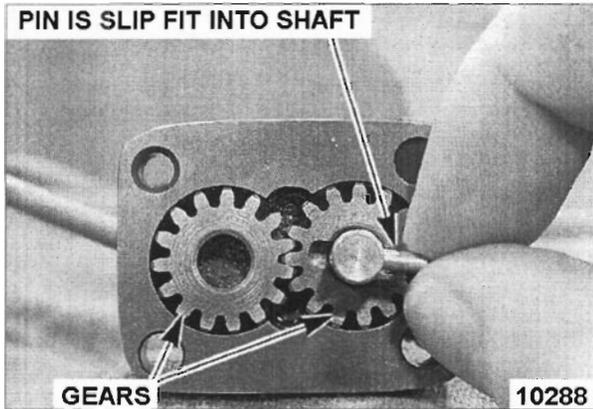
- A. Turn fiber drive gear of oil pump counterclockwise by hand.
- B. While turning drive gear verify that oil flows out of outlet hole.

Removal

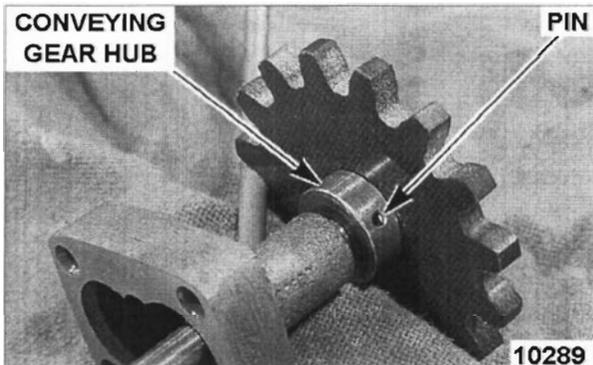
1. Remove the two screws and lock washers securing oil pump to planetary.
2. Remove oil pump.
3. Reinstall oil pump with inlet tube of pump toward outside radius of planetary.
4. Secure with lock washers and screws.
5. Perform Oil Pump Check.

Disassembly

1. Remove the two screws that hold the pump body and bottom plates together to gain access to pump gears.
2. Remove pin from shaft and remove gears.



3. Drive pin from conveying gear hub.



Assembly

1. Install conveying gear (hub side down) onto oil pump shaft. Secure by driving pin into position.
2. Reinstall slotted and non-slotted oil pump gears into housing and tube assembly. Slotted gear is to be positioned over thru hole in housing and tube assembly with slotted surface visible.
3. Reinstall conveying gear shaft into housing and tube assembly. Allow shaft to pass through slotted gear.
4. Reinstall pin into oil shaft. Pull conveying gear away from housing and tube assembly to seat pin into slotted gear.

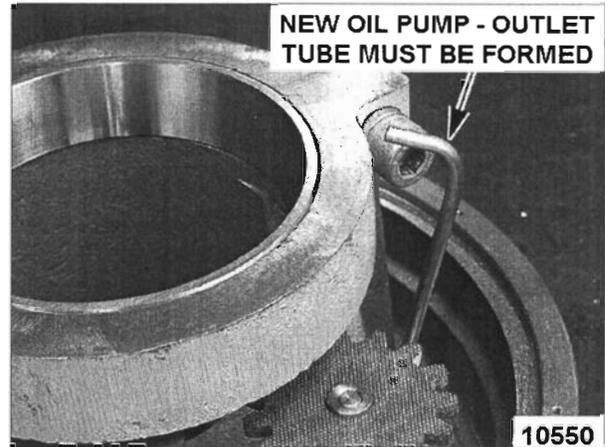
NOTE: Different size screws are used on the oil pump to assure correct installation of bottom plate onto housing and tube assembly.

5. Reinstall oil pump bottom plate and secure with one 8-32 and one 10-32 screws.
6. Reinstall oil pump into planetary and secure with screws.

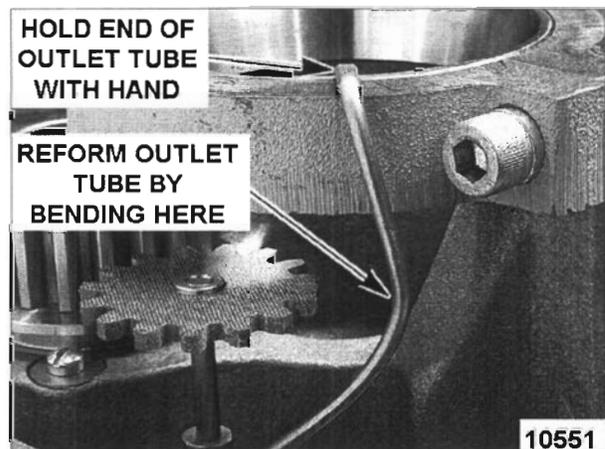
New Oil Pump Installation

NOTE: The outlet tubing of a new oil pump must be reformed once the pump is installed into the planetary.

1. Install oil pump with inlet tube of pump toward outside radius of planetary. Outlet tubing will be away from bearing cap.

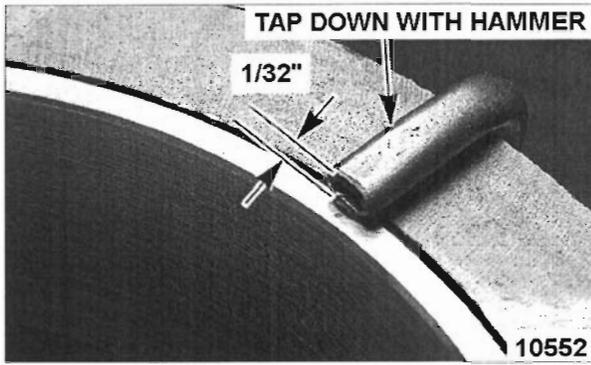


2. Hold end of outlet tube in fingers while bending outlet tube at the mid-point of tube length. Do not kink tubing as it is being bent. Refer to follow photo for tube positioning.
 - A. While bending tube, move end of tube such that when in its final position, the end of outlet tubing will be resting on top of bearing cap.

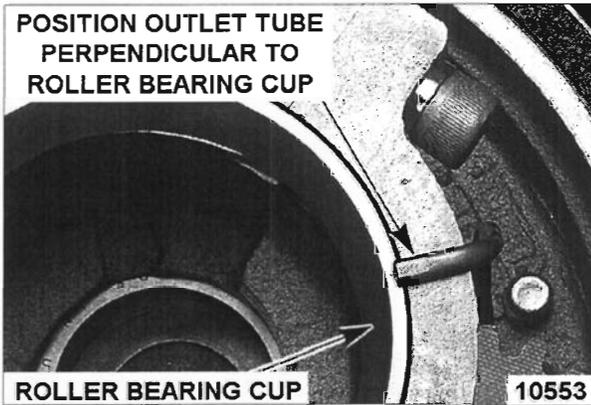


NOTE: The end of the outlet tubing is crimped (1/32" inside diameter) to provide back pressure for correct oil pump operation.

- B. Measure the narrow inside diameter of the outlet tubing.
 - 1) If inside diameter of narrow portion is greater than 1/32", reform tubing to 1/32".



- C. Adjust formed end of outlet tube such that this section of tubing is perpendicular to bearing cap with end of outlet tubing flush with inside of bearing cap.

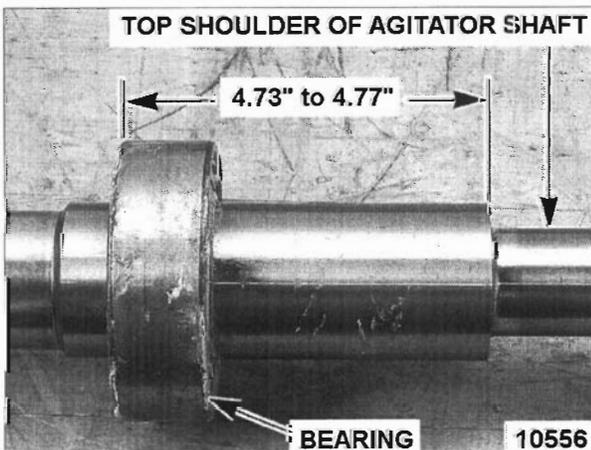


- 3. Perform Oil Pump Check.

PLANETARY ASSEMBLY

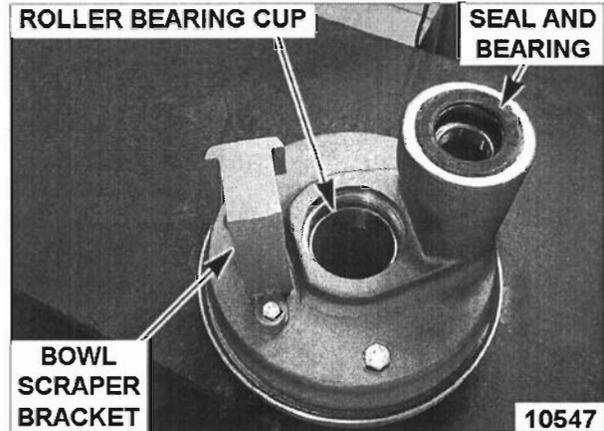
NOTE: Make certain that all parts of planetary are clean and dry before reassembling. Remove old grease and sealant from parts being reused.

- 1. For HL1400, use an arbor press to press lower agitator shaft bearing onto agitator shaft.
 - A. Press bearing 4.75" (range 4.73" to 4.77") from top shoulder of agitator shaft.



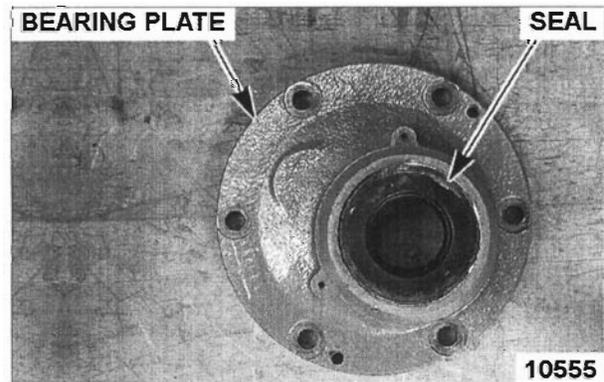
NOTE: Apply a small amount of Permatex #2 to outside surface of roller bearing cup to hold cup in position until planetary is assembled.

- 2. Install roller bearing cup into planetary.
 - A. If HL800, also install lower agitator shaft bearing, seal and bowl scraper bracket.



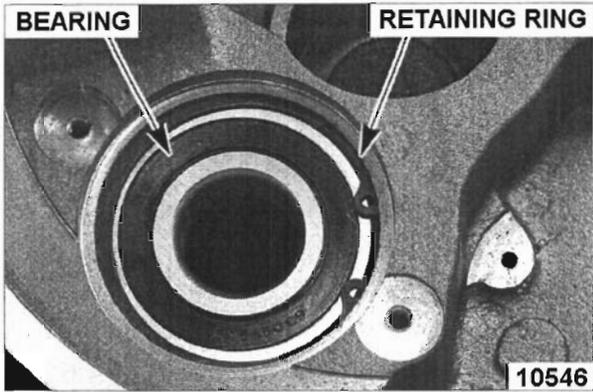
HL800 SHOWN

- B. If HL1400, also install the retaining ring and lower agitator shaft seal into bearing plate. Install seal until flush with surface of bearing plate.

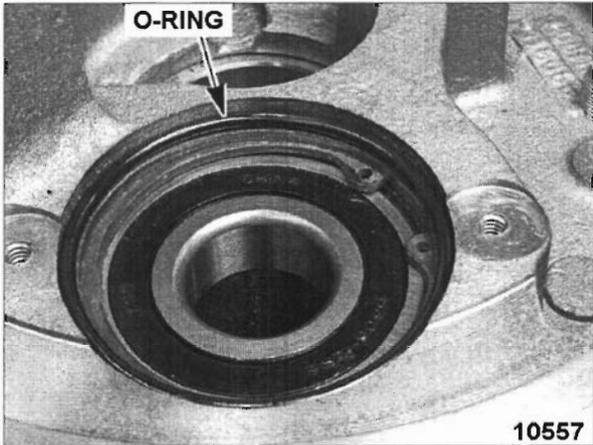


NOTE: The HL800 uses a sealed bearing for the upper agitator shaft bearing. HL1400s use a shielded bearing that must be packed with grease before its assembly into the planetary. If servicing an HL1400 planetary that uses a shielded bearing, install bearing with shielded side down toward bottom of planetary.

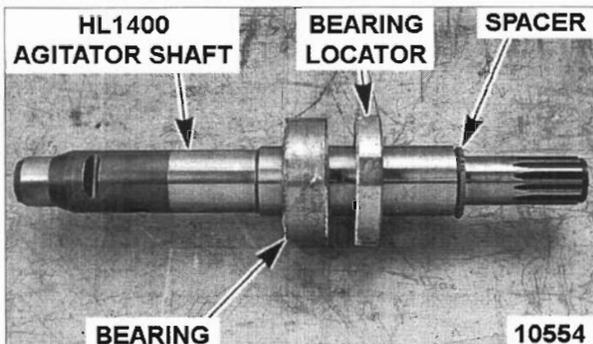
- 3. Install upper agitator shaft bearing.
 - A. Secure bearing with retaining ring.



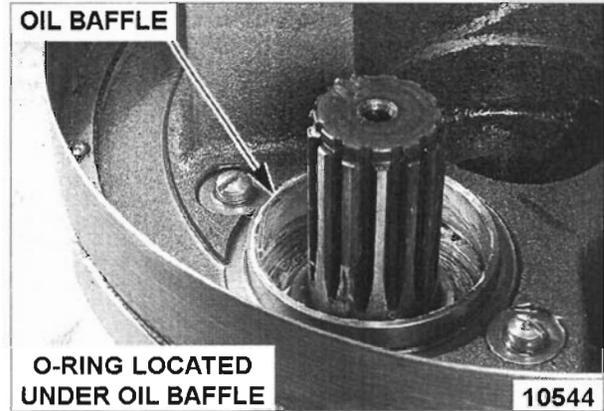
4. Lubricate and install O-ring.



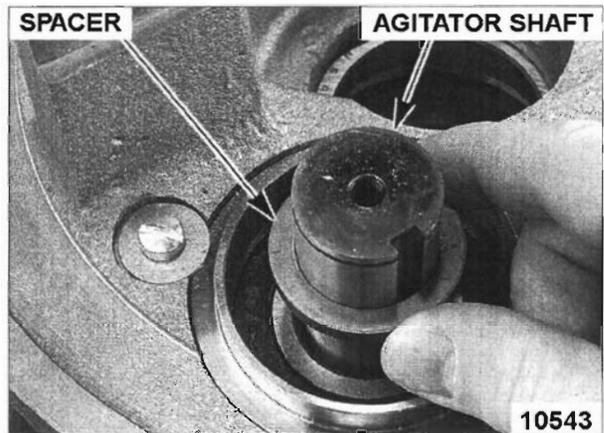
5. Insert agitator shaft from bottom of planetary into inner race of upper agitator shaft bearing.
- A. For HL800, coat inside diameter of seal with mineral oil before installing agitator shaft.
 - B. For HL1400, install the bearing locator and spacer onto agitator shaft before inserting agitator shaft into planetary.



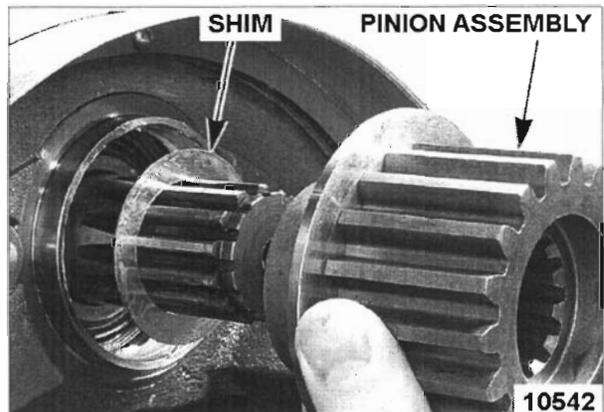
6. Drive agitator shaft into position using a mallet or dead blow hammer.
7. Install oil baffle and secure with flat washers and machine screws.



8. If HL800, install spacer.

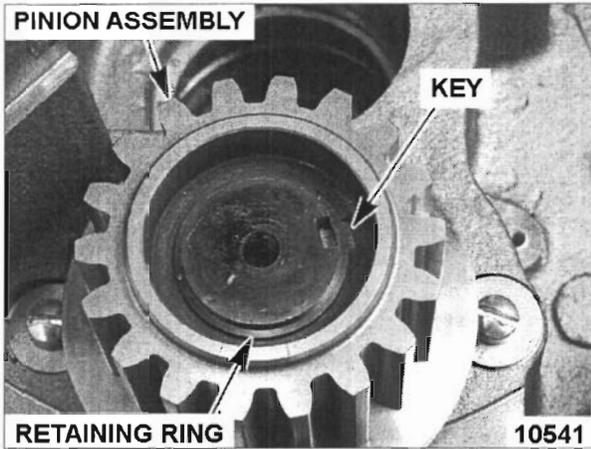


9. If HL1400, install shim, if present.



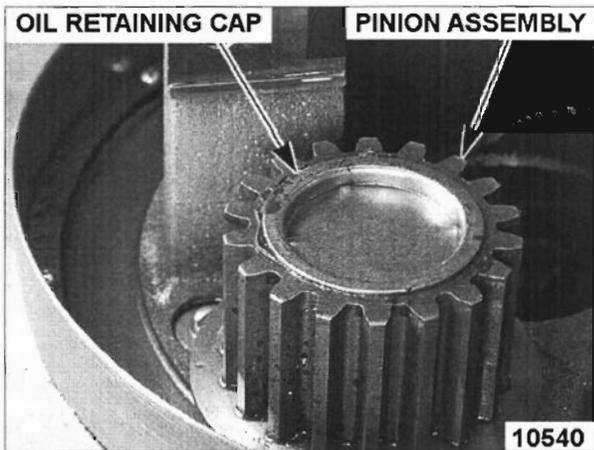
10. Reinstall pinion.
- A. If HL800, install key and secure with retaining ring.

- B. If HL1400, secure pinion with retaining ring.



HL800 SHOWN

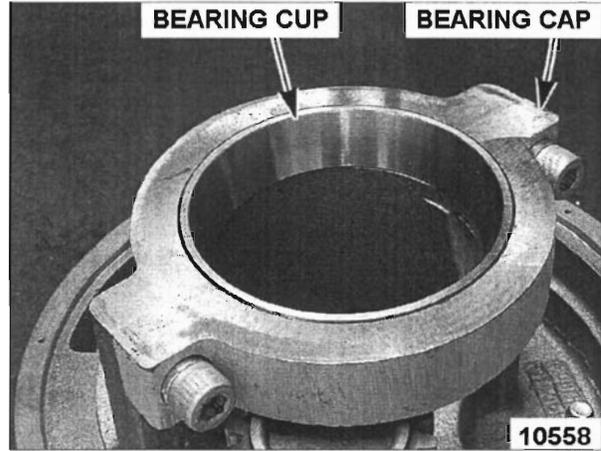
11. Apply Permatex #2 around top of thoroughly cleaned pinion.
- A. Install oil retaining cap.



12. Apply a thin coat of Permatex #2 around outside surface of bearing cup.

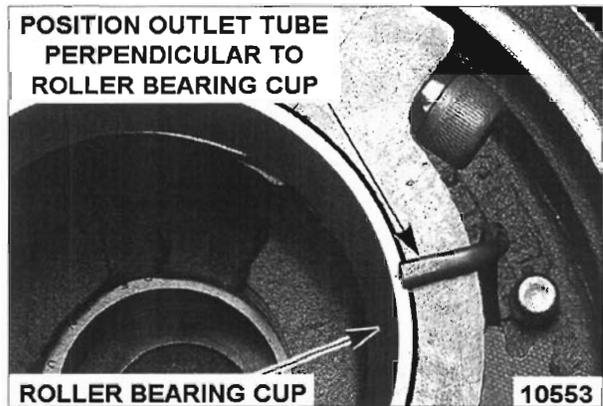
NOTE: The wider side of bearing cup is installed down toward bottom of planetary.

13. Install bearing cup and bearing cap into planetary.
- A. Secure with socket head screws making certain that cup remains fully seated in position. Tap down on bearing cup with mallet if necessary. Tighten socket head screws.



14. Reinstall planetary oil pump. If oil pump assembly is new, refer to New Oil Pump Installation as outlined in PLANETARY OIL PUMP.

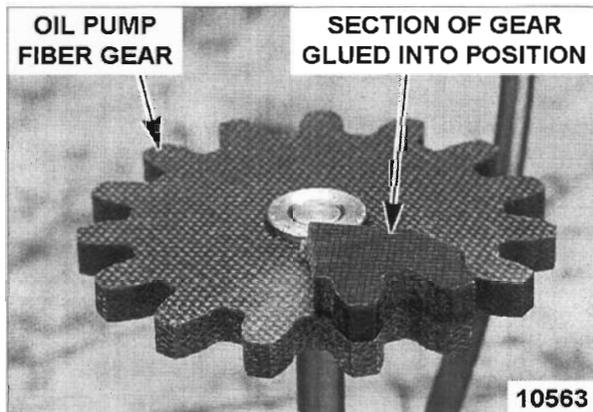
- A. Position formed end of outlet tube such that this section of tubing is perpendicular to bearing cap with end of outlet tubing flush with inside of bearing cap.



15. Coat threads of drain plug near bolt head with Permatex #2 then install drain plug.
16. Perform Oil Pump Check.
17. Install AGITATOR SHAFT PIN.

PLANETARY INSTALLATION

NOTE: As an aid to installing the planetary assembly with a reduced risk of breaking the fiber gear of the oil pump, a small section of an old fiber gear can be glued onto the top of the oil pump fiber gear. The section of fiber gear should contain at least two teeth. Clean both the good fiber gear of the oil pump and the old section then glue the section of fiber gear onto the top of the good gear aligning the teeth together. Position the fiber gear such that the old section will be closest to the internal ring gear when the planetary is being installed. As the planetary is raised into position, the partial fiber gear section can be viewed until it meshes with the internal ring gear. Apply Lubriplate to teeth of fiber gear to aid in installation.



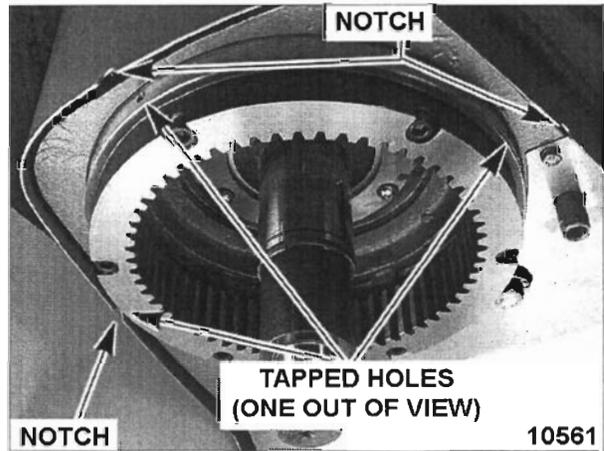
Installation

NOTE: Removing the mixer top cover allows access to driven pulley which can be rotated by hand to align sun gear with planet gear during assembly.

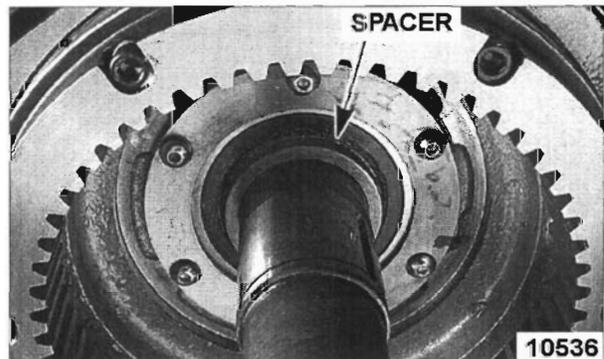
1. Remove mixer TOP COVER.

NOTE: If ring gear is not installed properly, bowl guard assembly cannot be installed.

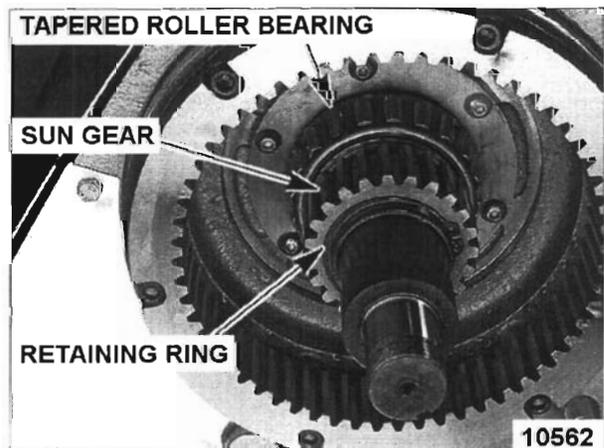
2. Reinstall ring gear making certain to align tapped holes in ring guard with notched areas of wrap.
 - A. Tighten screws in an alternating pattern, torque screws to 35 ft*lb.



3. Reinstall spacer.

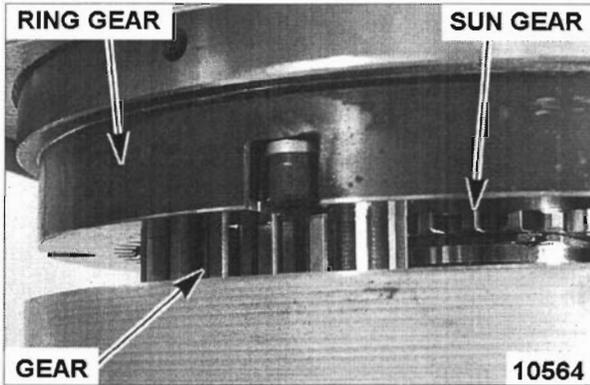


4. Reinstall tapered roller bearing (narrow side down), key and sun gear securing into position with retaining ring.



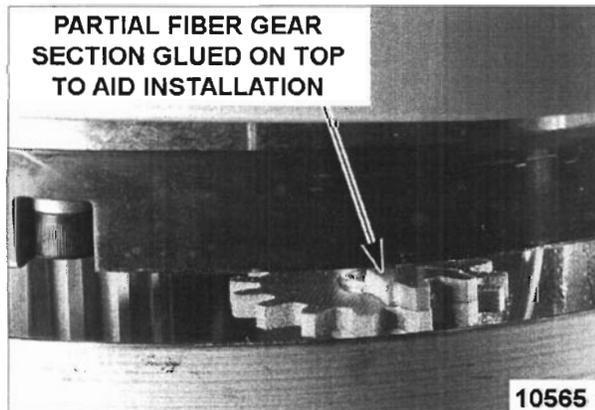
5. Install bowl. Place board used for planetary assembly removal across bowl.
6. Place agitator shaft of planetary assembly into hole drilled into board. Planetary assembly should be resting with agitator pin against board.
7. Apply electrical power to mixer.
8. Lift planetary assembly using actuator until gear comes into contact with ring gear.

- A. Turn agitator shaft and adjust angle of planetary assembly as necessary until gear meshes with ring gear.
9. Lift planetary assembly using actuator until gear contacts sun gear.
- A. Turn driven pulley and agitator shaft while also adjusting angle of planetary assembly as necessary until gear meshes with sun gear.



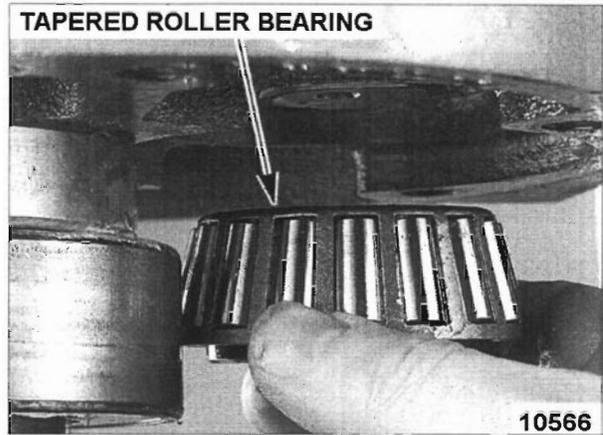
NOTE: If fiber gear of oil pump is flush with top edge of planetary extension, a small (two teeth) section of an old fiber gear can be glued onto the top of the intact oil pump fiber gear to increase visibility of the fiber gear during installation as it meshes with the ring gear. Apply a small amount of Lubriplate to teeth of fiber gear before installation.

10. Carefully lift planetary assembly by small amounts using actuator until fiber gear of oil pump can be aligned with ring gear.



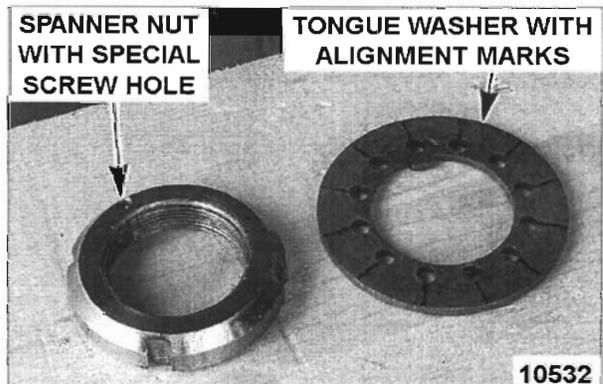
- A. Once fiber gear of oil pump has meshed with ring gear, raise planetary assembly into final position.

11. Install tapered roller bearing with taper faced upward.



HL1400 SHOWN

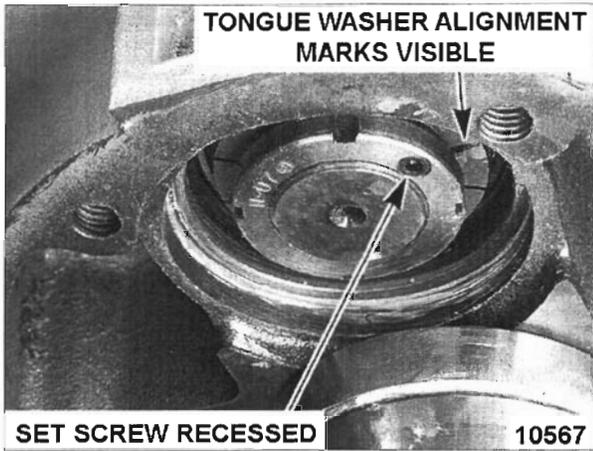
NOTE: Black marks may be present on one side of the tongue washer. The black alignment marks aid in positioning the spanner nut during assembly so that the special screw can be installed correctly. If tongue washer does not have marks as seen in the photo, place marks with fine felt-tipped marker from center of hole to outside of tongue washer as shown.



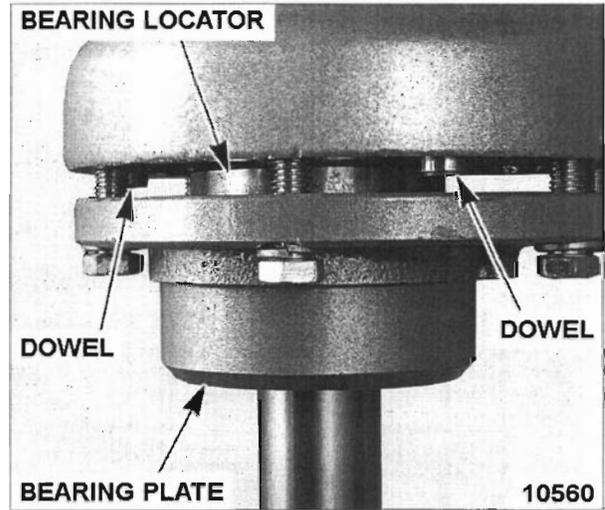
12. Reinstall tongue washer with marked side facing down.
13. Reinstall spanner nut and tighten.
14. Align tapped hole with one of the marks made on tongue washer. If marks are not present, use a small probe as an alignment tool, turn spanner nut until tapped hole in spanner nut aligns with one of the holes in tongue washer.

CAUTION: If special set screw is not flush with or below spanner nut, spanner nut is not aligned properly with tongue washer. Planetary assembly may fall off mixer during operation.

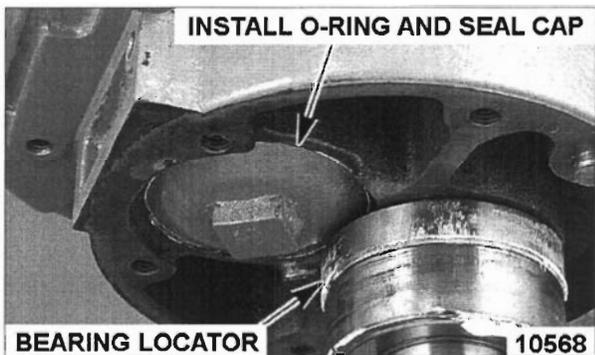
15. Reinstall special set screw and lock washer. Tighten set screw until head of set screw is flush or slightly recessed with face of spanner nut.



HL1400 SHOWN



16. Lubricate O-ring with planetary oil.
17. Reinstall seal cap and O-ring. For HL1400, position bearing locator as necessary to install seal cap.



HL1400 SHOWN

18. If HL1400, coat inside diameter of seal with mineral oil then install bearing plate onto planetary assembly.
 - A. Partially install bearing plate by hand until plate contacts bearing locator.
 - B. Align bearing locator with bearing plate. Push bearing plate onto locator.
 - C. Align planetary assembly dowel pins with bearing plate.

- D. Install bearing plate screws and lock washers. Tighten screws evenly in an alternating pattern until bearing plate is seated against planetary assembly.
 - E. Reinstall AGITATOR SHAFT PIN
19. Lower bowl support and remove wooden support.
20. Remove planetary oil fill plug. Service planetary with amount and type of lubricant specified in Lubrication Manual F-20067.
21. Reinstall bearing plate cover.
22. Reinstall BOWL GUARD.
23. Check mixer for proper operation.
24. Reinstall TOP COVER as outlined in COVERS AND WRAP.

MOTOR

REMOVAL

1. Lower bowl support.



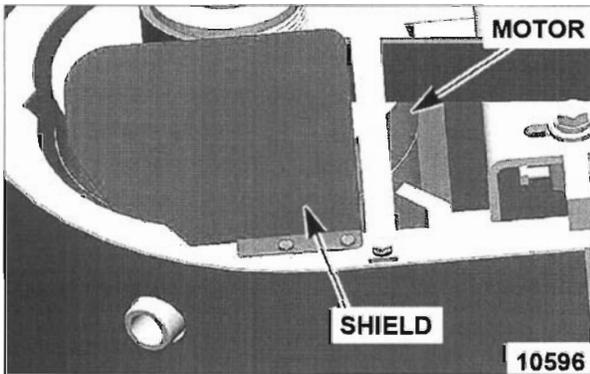
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

WARNING: WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

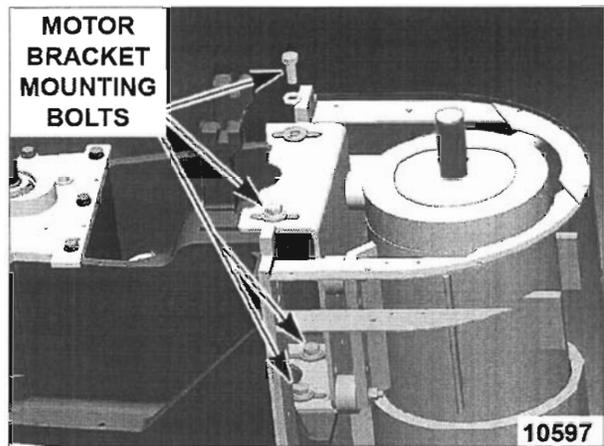
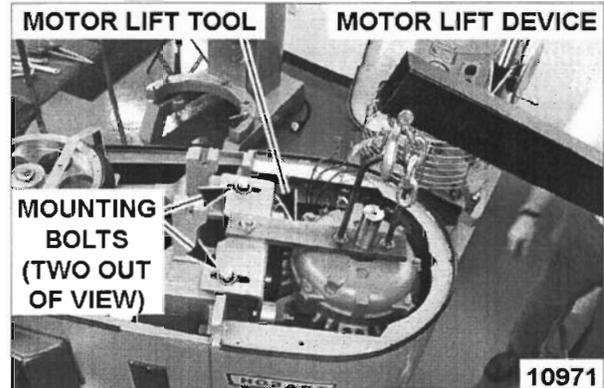
NOTE: The combined weight of the motor and mounting bracket assembly of an HL1400 is approximately 165 lbs. The two components are to be removed from the mixer as an assembly.

2. Remove the TOP COVER and rear top cover strap.
3. Disconnect incoming line service at mixer.
4. Remove the shield and ground block.

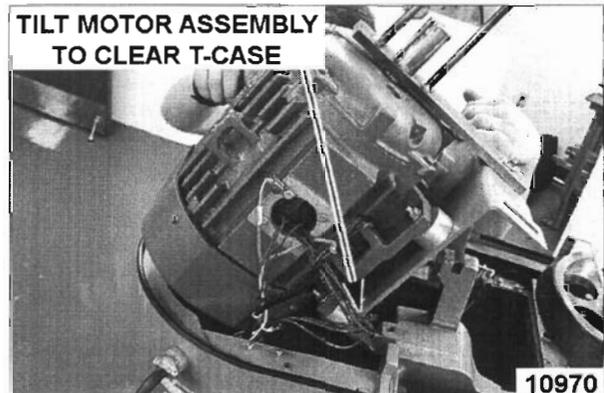


5. Remove ACTUATOR.
6. Remove Drive Belt by following REMOVAL AND REPLACEMENT as outlined in DRIVE BELT AND PULLEYS. Do not install belt tension tool.
7. Record clearance between bottom of drive pulley and motor endbell.
8. Remove drive pulley and key from motor shaft.
9. Attach motor lift tool to motor and motor bracket.
10. Connect motor lifting device to motor lift tool.

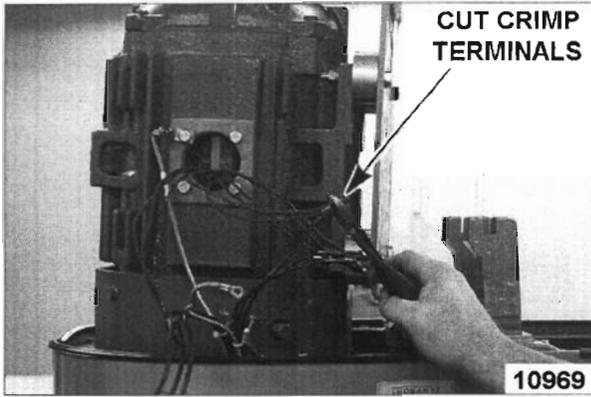
11. Remove top and bottom motor bracket mounting bolts securing motor bracket to transmission case.



12. Lift motor from pedestal high enough to access motor wiring. Carefully navigate motor past transmission case and pedestal supports.



13. Note motor wiring connections then cut crimp terminals from wiring harness.

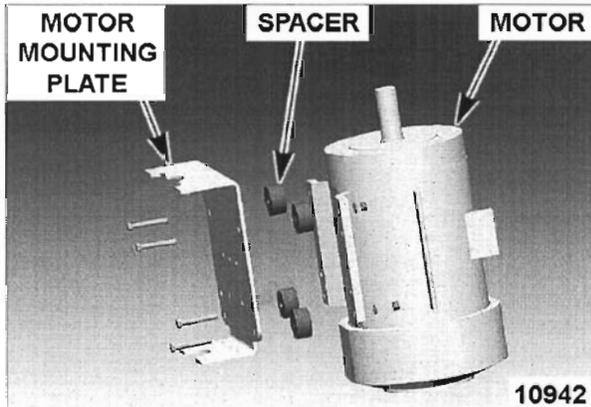


MOTOR MOUNTING PLATE REMOVAL

1. Remove MOTOR.
2. Place motor assembly on work surface.
3. Note mounting relationship of motor mounting plate with motor.
 - A. Note position of spacers and shims (if present) with relationship to the motor during hardware removal.

NOTE: Spacers and shims are not required for use on all motor configurations. However, they must be used when the mounting flanges of the motor being installed are of equal thickness. When spacers are used, the two thicker spacers, one on each mounting flange, are to be installed at the pulley end of motor.

- B. Remove motor mounting hardware.



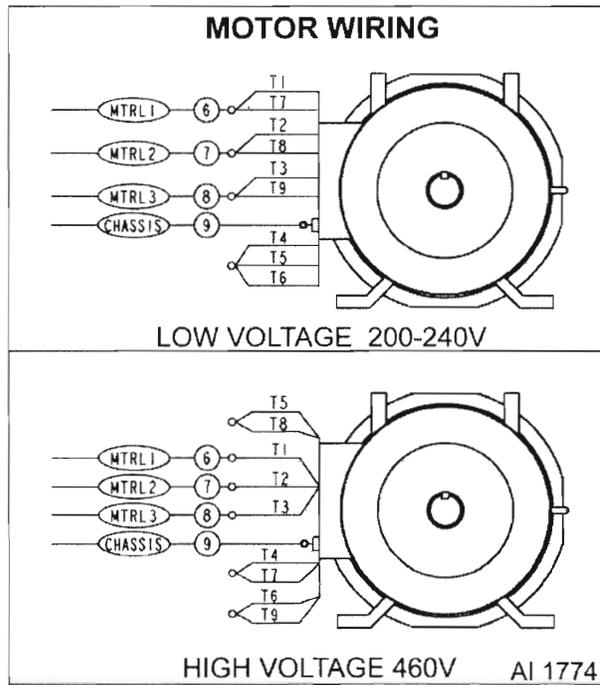
4. Reassemble motor and motor plate assembly in reverse order. Torque motor to motor mount bolts to 37 ft*lb.

INSTALLATION

1. Install motor onto motor mounting plate.
2. Install motor lift tool onto motor and bracket assembly.
3. Lift motor into position over opening in column.

CAUTION: Make certain that wiring harness connecting timer control assembly and actuator to drive plate components is clear of motor mounting bracket during installation of motor.

4. Carefully lower motor and bracket mounting assembly into pedestal until motor wiring harness can be connected. Navigate assembly into position by tilting motor toward front of mixer until lower part of mounting bracket clears rear of transmission case.
 - A. Refer to the motor connection diagram for the mixer voltage configuration being serviced then connect motor wiring using wire nuts. Insulate wire nuts, motor lead wires and harness with electrical tape.



- B. Connect chassis ground to motor.
 - C. Lower motor and mounting bracket assembly into position.
5. Align holes of motor bracket with mounting holes in transmission case.
 - A. Loosely reinstall the top and bottom motor bracket mounting bolts.
6. Push motor assembly as far forward as possible. Snug one of the top bolts to secure motor in position.

7. Reinstall pulley, key and set screws. Position pulley to clearance recorded during removal.
8. Install and tension Drive Belt by following REMOVAL AND REPLACEMENT as outlined in DRIVE BELT AND PULLEYS.
9. Check for proper operation.
10. Reinstall rear top cover strap.
11. Reinstall TOP COVER.

MOTOR - TESTS

1. Disconnect power before performing a motor test.

WARNING: WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

2. Place drive in SERVICE POSITION as outlined in DRIVE and ensure capacitive bus circuit is below 50VDC.

Motor Current - Test

NOTE: Because of the nature of variable frequency technology, accurate output voltage measurements from the drive to the motor cannot be made with a standard DMM or analog VOM. Use a clamp-on ammeter to measure current for each phase of the motor.

NOTE: The motor current will not be the same as line service input current. The motor currents measured should be equal for all 3 phases.

1. Reconnect power.
2. Start mixer in stir speed (no-load condition).
3. Measure current and record the value for each phase of the motor. Use the mixer wiring diagram found in the top cover to identify phase wires and outputs from the drive on contactor (1CON).
4. Repeat procedure for all mixer speeds.
 - A. Current may vary between phases but should be balanced. If current draw on any phase is 5% higher or lower than the other phases, verify that the drive, motor and contactor are wired properly.
 - 1) If wiring is correct, check MOTOR WINDING RESISTANCE.
 - 2) If motor checks ok, replace drive.

Motor Winding Resistance - Test

1. Disconnect power.
2. Disconnect motor lead wire extensions at T1, T2, T3 on contactor (1CON).
3. Set meter to ohms and measure resistance between all three motor lead wire extensions. Use the motor wiring table to identify motor lead extension wires.
 - A. Verify wiring harness lead wire connections are secure (J10-5, J10-6, J10-7).
 - B. If resistance is out of tolerance for the room ambient temperature, or reading indicates open condition (OL), replace motor.

3 PHASE MOTOR STATOR WINDING RESISTANCE						
Model	HP	Low Voltage	Hz	Measured Ohm Values***		
				L1	L2	L3
				T1 - T2	T1 - T3	T2 - T3
HL800 - Initial production motor*	3	200V	50-60	1.0	1.0	1.0
HL800 - Later production motor**	3	200V	50-60	1.0	1.0	0.8
HL1400 - Initial production motor*	5	200V	50-60	1.1	1.0	1.0
HL1400 - Later production motor**	5	200V	50-60	1.8	1.9	1.8
Model	HP	High Voltage	Hz	Measured Ohm Values***		
				L1	L2	L3
				T1 - T2	T1 - T3	T2 - T3
HL800 - Initial production motor*	3	400V	50-60	3.5	3.2	3.2
HL800 - Later production motor**	3	400V	50-60	2.8	2.8	2.9
HL1400 - Initial production motor*	5	400V	50-60	2.1	2.0	2.0
HL1400 - Later production motor**	5	400V	50-60	1.8	1.9	1.8

* Motor used for initial production (1st 50 mixers).
 ** Motor used after initial production offering.
 *** Resistance values at 72°F room ambient. Tolerance is ±5%.

ACTUATOR

REMOVAL

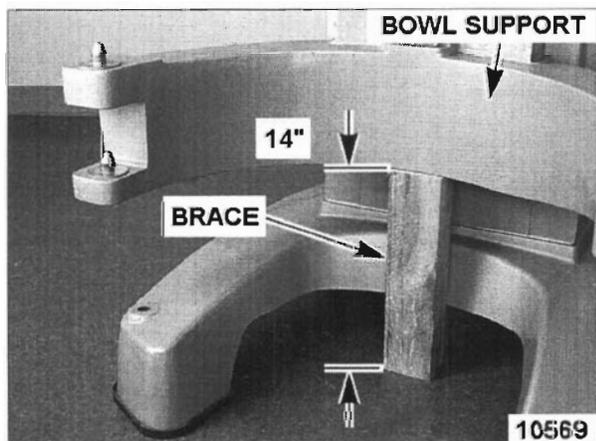


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

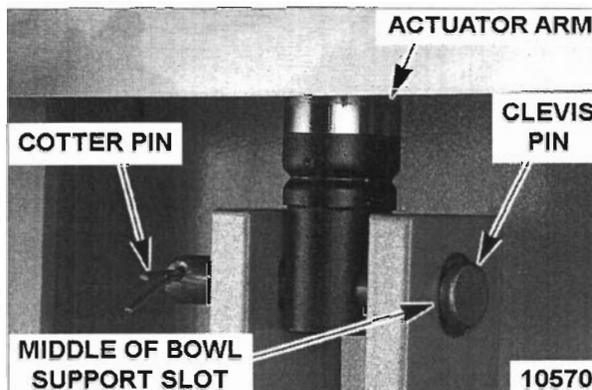
NOTE: The actuator utilizes a solenoid controlled mechanical brake to prevent the actuator arm from drifting when the actuator is not powered. The brake solenoid is energized whenever the actuator motor is energized. When the brake solenoid is energized, the brake is released.

Removal - Actuator Functioning

1. Remove top cover.
2. Remove bowl.
3. Place a brace (4"x4"x14" board or equivalent) under bowl support.

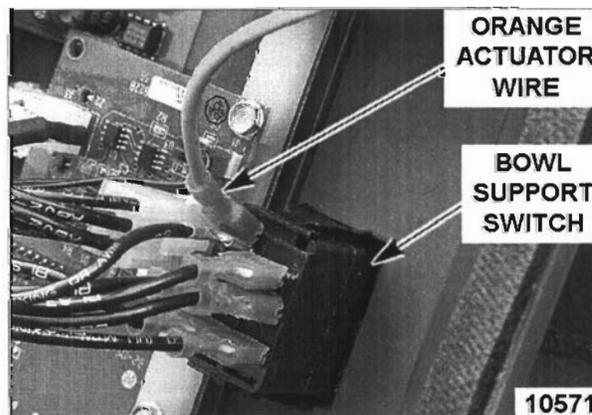


4. Apply electrical power to machine.
5. Lower bowl support until weight of bowl support is transferred from actuator arm pin to brace. Lower actuator such that actuator clevis pin is within the middle of bowl support slot when weight is relieved from pin.
6. Disconnect electrical power from mixer.
7. Remove cotter and clevis pins from actuator arm.



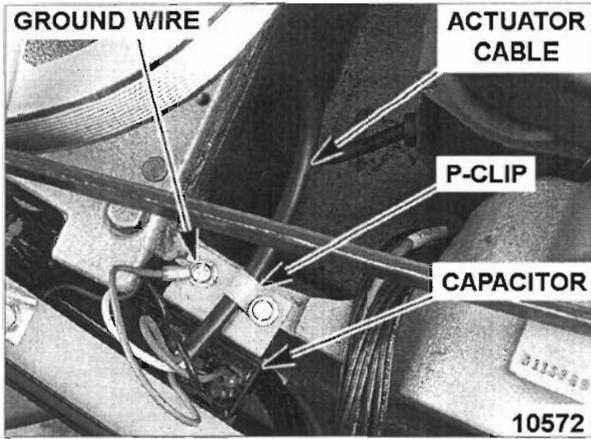
NOTE: If actuator is being removed to service another component, protect timer control assembly by reinstalling timer control board assembly. Secure into position with one screw.

8. Remove the screws securing timer control assembly to wrap. Support assembly to remove stress on wiring.
 - A. Disconnect the orange actuator wire connected to the bowl lift switch.

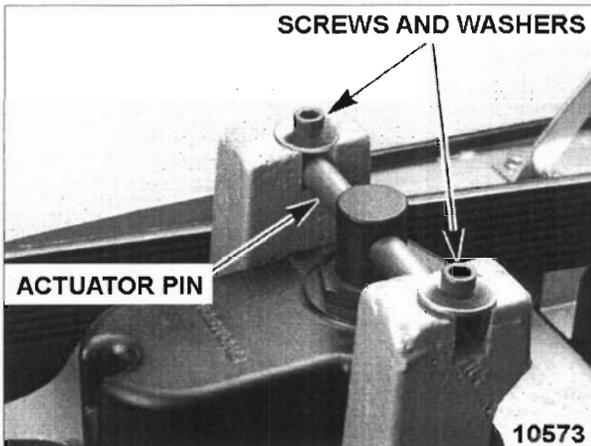


EARLY PRODUCTION MIXERS

9. Disconnect the white (common) wire.
10. Remove the P-clip and actuator cable from the actuator capacitor mounting bracket.
11. Disconnect actuator wiring.
 - A. Note actuator wiring locations at the capacitor located inside the wrap above the right side of timer control board assembly and disconnect the two actuator wires.
 - B. Loosen the screw securing the actuator ground wire to the capacitor mounting bracket and remove the ground wire.



12. Remove the cap screws and washers securing upper actuator pin.



13. Pull actuator and pin out of mixer.
14. Reinstall parts removed in reverse order of removal.

Removal - Actuator Not Functioning

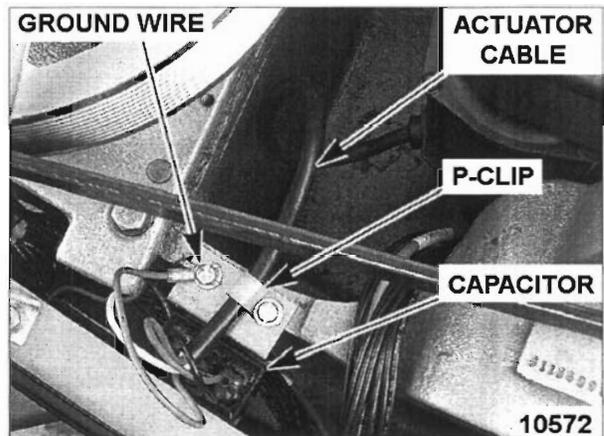
NOTE: Use this procedure if the actuator quits working where the bowl support is in a position that prevents removal of bowl from bowl support.

1. Remove top cover.
2. Disconnect actuator wiring harness.
3. Open bowl guard cage completely.
4. Remove the bowl guard screws that secure drip cup to internal ring gear.
 - A. Rotate bowl guard assembly 180° so splash guard is away from column.
 - B. Lower bowl guard as low as possible.
5. Remove back apron.
6. Brace bowl support to relieve weight on actuator arm clevis pin.
7. Remove cotter and clevis pins from actuator arm.

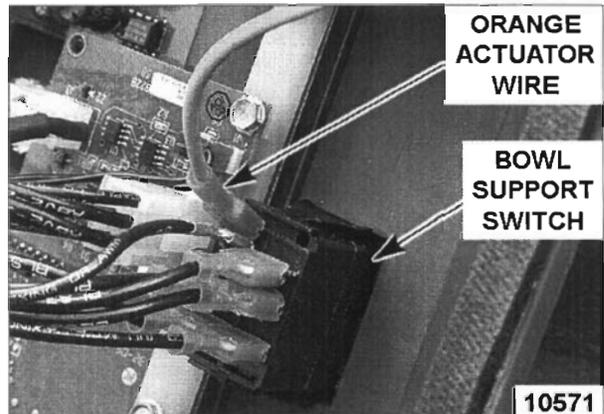
8. Remove screws and washers securing actuator pin at motor end of actuator.
9. Disconnect electrical wiring from actuator.
10. Remove actuator.
 - A. Remove pin from actuator.

INSTALLATION

1. Reinstall pin into motor end of actuator.
2. Install actuator into mixer with actuator motor toward transmission.
 - A. Secure with hardware.
3. Connect actuator wiring.
 - A. Secure cable and P-clip to rear capacitor mounting bracket screw.



- B. Red wire to rear capacitor connection.
- C. Black wire to front capacitor connection.
- D. Orange wire to double connector on bowl lift switch (Early production mixers).
- E. White wire to ACT-WHT.



- F. Green ground wire to capacitor mounting bracket screw.
4. Insert a screwdriver or other device into hole of actuator arm to prevent arm from rotating.

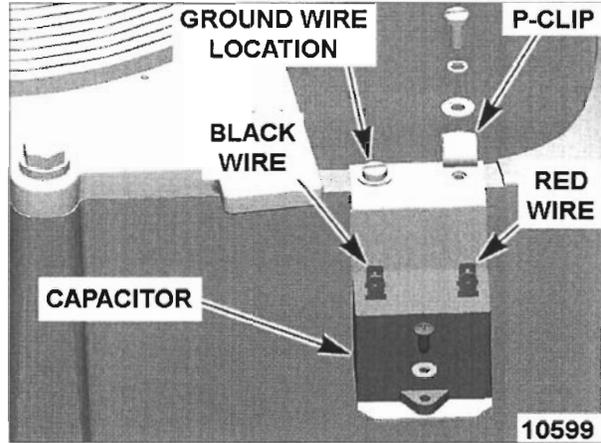
5. Apply power to mixer.
6. Press down on bowl lift switch to lower actuator. Lower actuator until hole in end of actuator aligns with slot in bowl support.
7. Reinstall clevis pin and secure with cotter pin.
8. Apply power to mixer.
 - A. Raise bowl support and remove brace, if present.
9. Check bowl lift operation.
10. Reinstall back apron, if removed.
11. Reinstall BOWL GUARD, if removed.
12. Lubricate top cover seal with mineral oil and reinstall top cover.
13. Check mixer for proper operation.

ACTUATOR CAPACITOR AND TERMINAL BLOCK



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove TOP COVER.
2. Note electrical connection points then disconnect wiring to capacitor.



3. Remove capacitor from mounting bracket.
4. Reassemble parts removed in reverse order.
5. Check for proper bowl lift and mixer operation.

BOWL SUPPORT

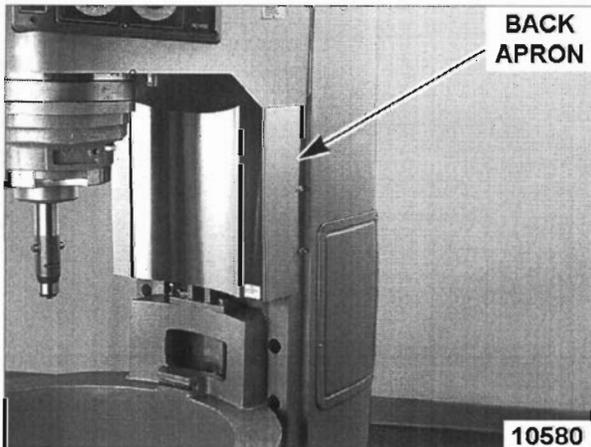
REMOVAL AND REPLACEMENT



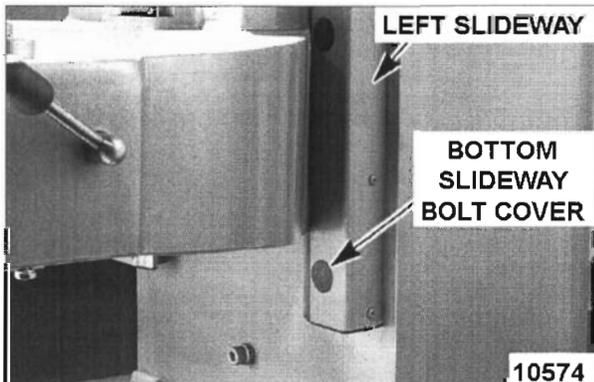
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: Only the left slideway (timer control board side) is adjustable.

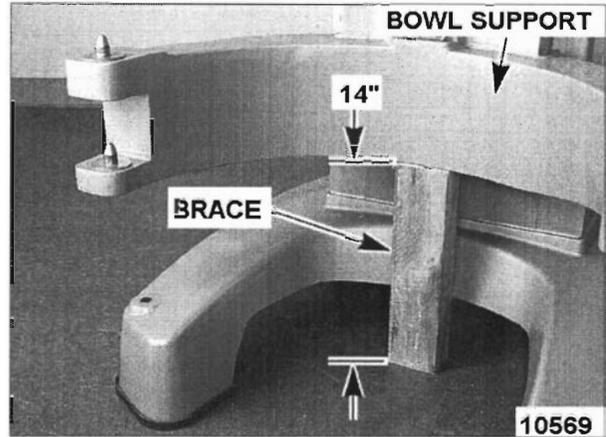
1. Remove bowl.
2. Remove BOWL GUARD.
3. Remove back apron.



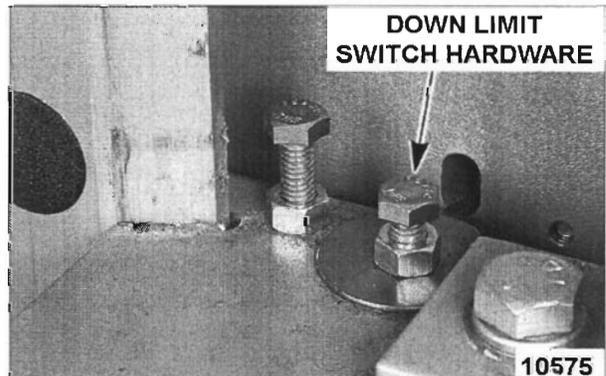
4. Remove covers from left slideway cap bolts.
5. Apply electrical power.
6. Lift bowl support high enough to allow access to bottom slideway bolt. Remove bottom slideway bolt.



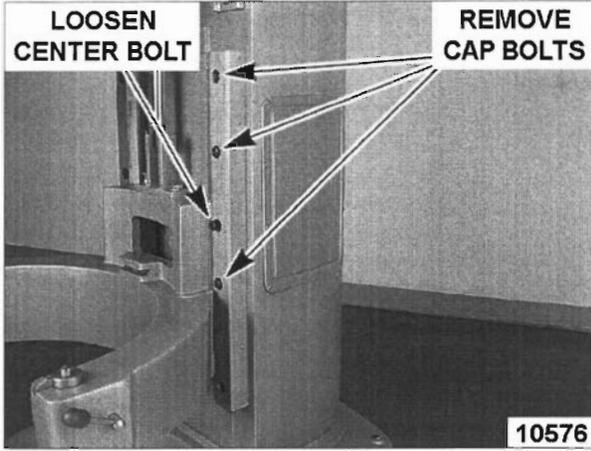
7. Place a brace, 4"x4"x14" hardwood board or equivalent, under center of bowl support.



8. Lower bowl support until weight of bowl support is transferred to the brace and actuator arm pin is free to turn by hand. Do not remove actuator pin.
9. Disconnect electrical power following lockout/tagout procedures.
10. Observe stack-up of down limit switch hardware and remove bolt, nut and washer(s) covering switch arm.

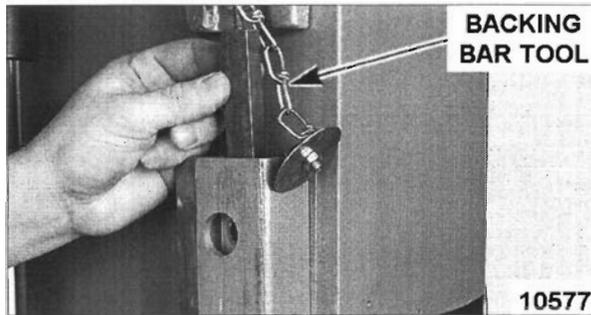


11. Loosen the center (third from top) slideway bolt until head of cap screw is 3/4 outside slideway.
12. Remove remaining bolts from left slideway.

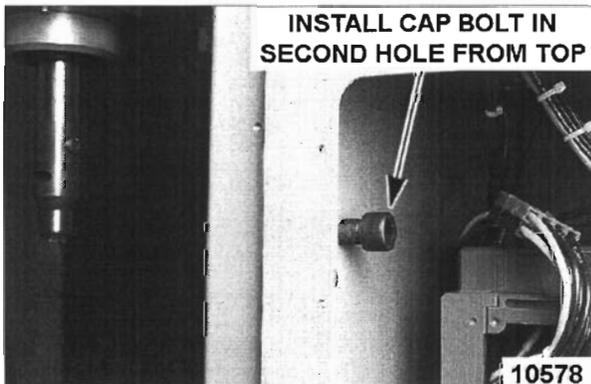


NOTE: The powder coat finish used is very durable when cured. Parts that have been assembled and then powder coated can be difficult to separate.

13. Test to see if slideway will easily separate from pedestal by tapping slideway with mallet.
 - A. If slideway does not separate from pedestal, insert slideway backing bar tool into top of slideway. Refer to SPECIAL TOOLS as outlined under GENERAL for construction plans.



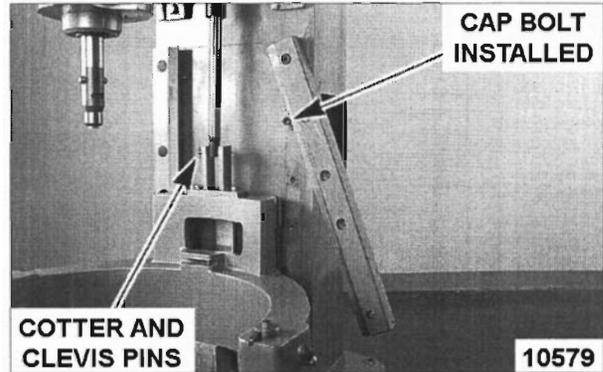
14. Remove SIDE COVER.
15. From inside pedestal, install a slideway cap bolt (washer and lock washer removed) in the second hole (from top).



NOTE: Be prepared! A very loud and sharp report will be produced when the slideway breaks free of pedestal.

- 1) Tighten cap bolt against backing bar until slideway breaks free of pedestal.

16. When slideway separates from pedestal, remove cap bolt and backing bar tool from inside pedestal (if used).
 - A. Loosely install a cap bolt in the top slideway hole location.
 - B. Remove the center slideway bolt.
 - C. Swing slideway away from bowl support and secure in position by installing a cap bolt in second hole in pedestal so that slideway rests against head of cap bolt.



17. Brace bowl support and remove cotter and clevis pins from actuator arm.

CAUTION: Avoid hitting the bowl down limit switch with the bowl support assembly during removal.

18. Remove bowl support assembly from mixer.
19. If bowl support is being replaced, remove hardware from bowl support.
 - A. Install hardware onto new bowl support.
20. Remove old grease from slideways and bowl support.

NOTE: Apply light coat of Lubriplate 630-AA to slideways before reinstalling bowl support.

21. Assemble parts removed in reverse order.
22. Perform SLIDEWAY ADJUSTMENT.
23. Check mixer for proper operation.

SLIDEWAY ADJUSTMENT

NOTE: There should be little play between bowl support and slideways. Too much play and a banging or clunking sound will be heard when mixing product as the bowl support hits one slideway and then the other.

Too little play and the actuator may stall or overheat when bowl is lifted. Bowl support may also stick in slideways as bowl support is being lowered. If bowl support sticks in slideways, a repetitive knocking sound will be heard as the bowl support is lowered. The sound is caused by the clevis pin of the actuator arm contacting the bottom of the travel slot knocking the bowl support loose momentarily and then sticking again. This cycle repeats itself until the actuator is stopped or proper clearance is achieved between slideways and bowl support.

Check

1. Remove back apron.
2. Raise bowl support to highest position.
3. Lift up on one of the bowl support arms.
 - A. Slight movement should be felt as the bowl support contacts the slideway.
4. Observe bowl support travel.
 - A. The bowl support should always hang from the clevis pin of the actuator arm throughout bowl support travel.
 - 1) If actuator arm clevis pin travels within the bowl support slot as bowl support is lowered, bowl support is sticking between slideways and adjustment is necessary.
 - 2) If bowl support is properly adjusted, reinstall lower cover.

Adjustment

1. Raise bowl support to its uppermost position.
2. Remove plugs covering bolts of adjustable slideway.
 - A. Loosen all bolts of adjustable slideway.
 - B. Snug bolts.
3. Tap side of slideway toward bowl support to reduce bowl support side-to-side play.
4. Tighten top and bottom bolts of adjustable slideway and perform Check.
 - A. If adjusted properly, tighten all bolts of adjustable slideway to 35 ft*lb.
 - 1) Reinstall plugs to cover bolt heads. Replace damaged or deformed plugs.
 - B. If bowl support is out of adjustment, repeat until correctly adjusted.

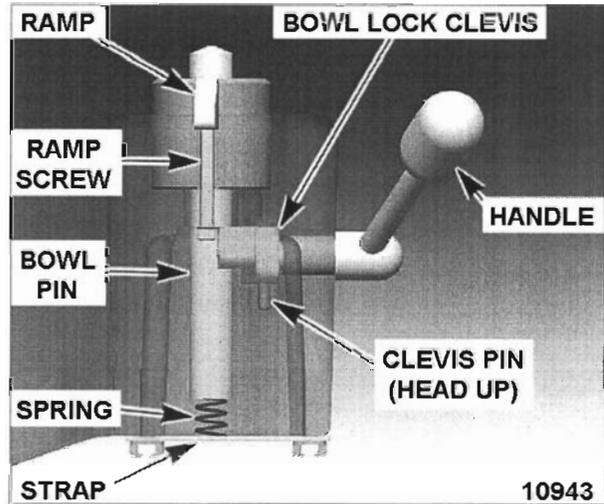
5. Check bowl lift operation throughout full range of bowl support travel.
6. Fill seam between slideway and pedestal with aluminum color RTV-109.
7. Reinstall lower cover.
8. Check mixer for proper operation.

BOWL LOCK ASSEMBLY



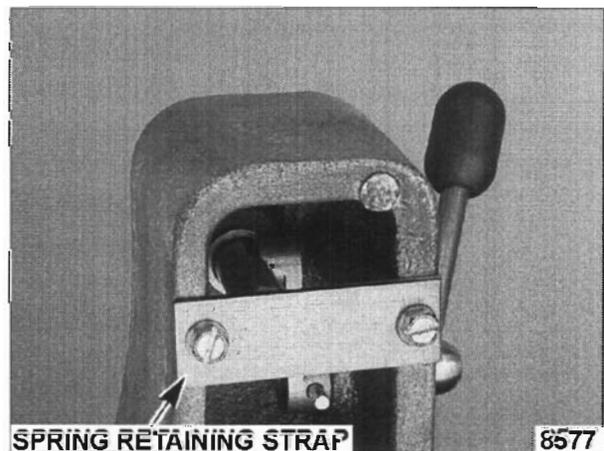
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Bowl Lock Assembly

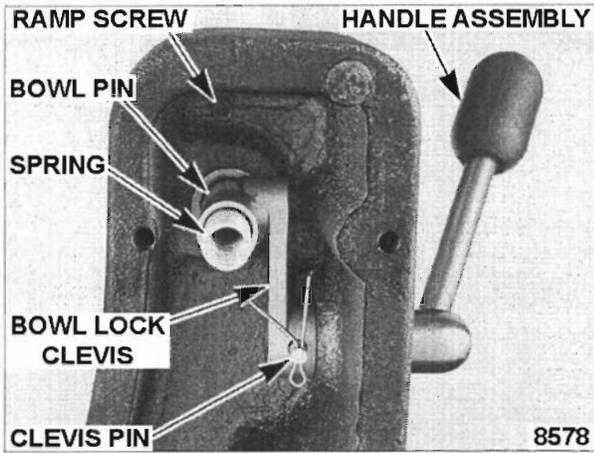


NOTE: The bowl lock assembly can be serviced with the bowl support installed on the mixer.

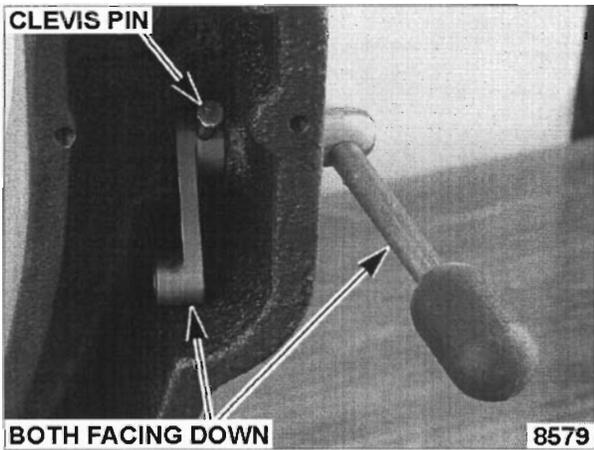
1. Remove spring retaining strap.



2. Remove spring.
3. Remove cotter pin from clevis pin.



4. Rotate handle down.
5. Remove bowl pin.
6. Note orientation of handle assembly with respect to the bowl lock clevis.

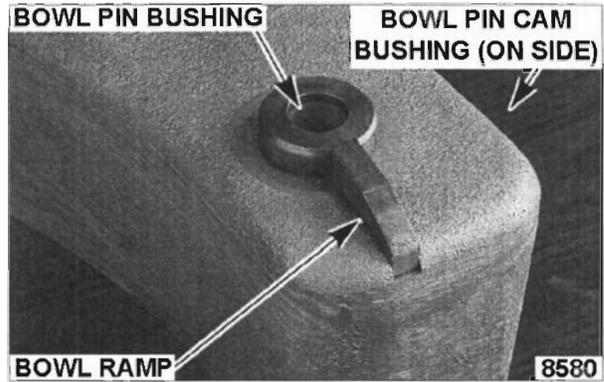


NOTE: Clevis pin must be installed with head of pin toward top of bowl support when handle and bowl lock clevis are in normal position.

- A. Remove clevis pin.
- B. Pull handle assembly out of bowl support.
7. Remove bowl lock clevis.
8. Clean bowl lock parts.
9. Inspect bowl pin and bowl pin cam bushings for wear or damage. Replace if necessary.

NOTE: Coat bowl lock pin with Lubriplate 630-AA before reassembly.

- B. Bowl pin cam bushing is installed from the outside of bowl support.



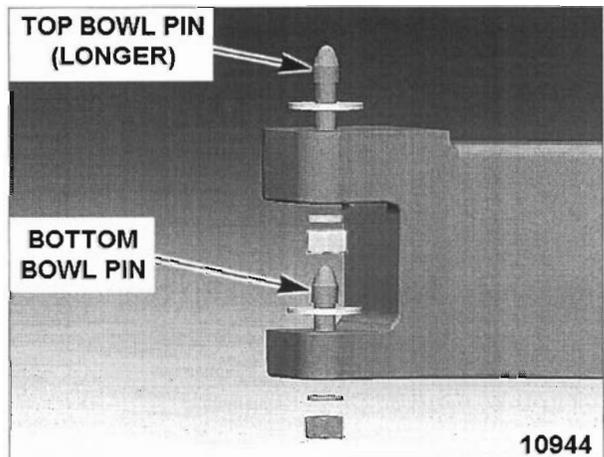
10. Remove ramp screw inside bowl support that secures bowl ramp (photo 8578).
 - A. Remove bowl ramp.
 - B. Apply Loctite 641 to sides of bowl ramp before assembly.
11. Reassemble in reverse order.

BOWL PINS

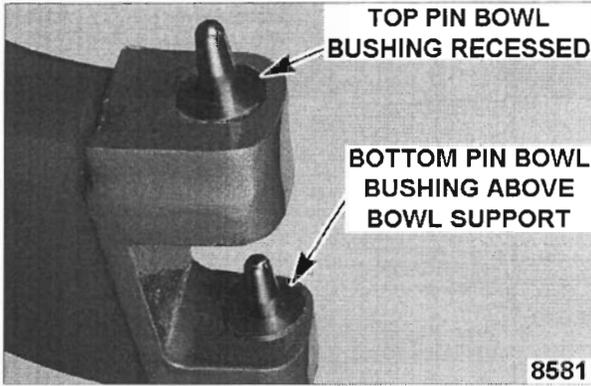


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: Top pin threads are longer than bottom pin.



1. Remove bottom pin.
 - A. Remove bowl support bushing from pin.
2. Remove top pin.
 - A. Remove bowl support bushing from pin.



NOTE: Support bushing is a close fit with bowl pin.

3. Reassemble by reinstalling and tightening top pin before bottom pin. Torque bowl pin nuts to 81 in*lb (± 9 in*lb).
4. Remove burrs from bowl pins.

BOWL PUSHPLATE ASSEMBLY

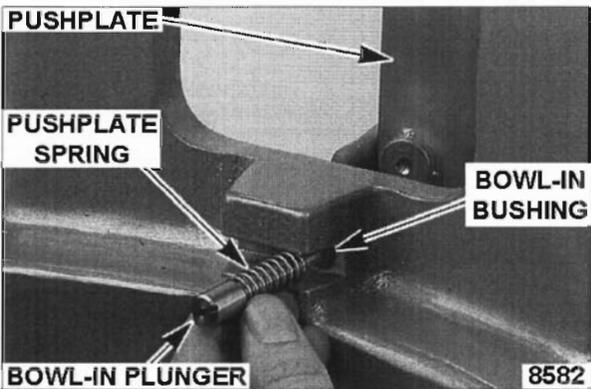


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: The bowl pushplate can be serviced with the bowl support installed on the mixer.

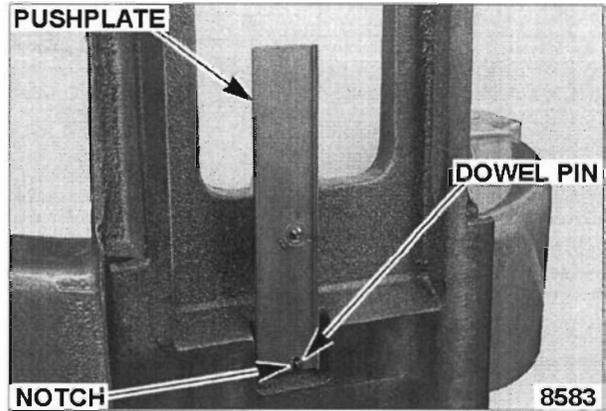
NOTE: The bowl-in bushing is serviceable and is a press fit into the bowl support. If the bushing is loose, apply a light coat of Loctite 641 to outside diameter of bushing.

1. Unscrew bowl-in plunger.
 - A. Remove plunger and pushplate spring.



NOTE: When reinstalling pushplate, make certain that notch of pushplate captures dowel pin located on back of bowl support.

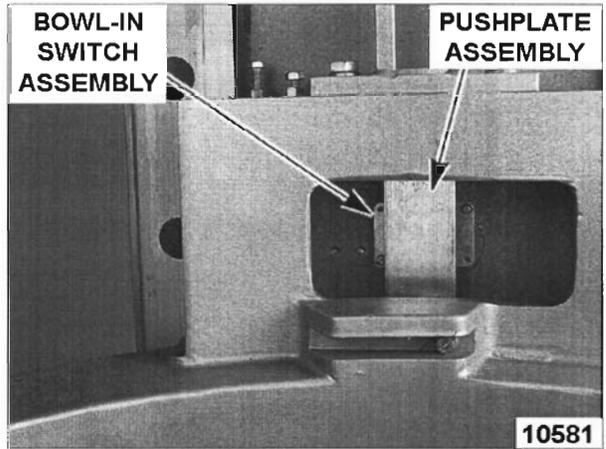
2. Remove pushplate.



3. Coat threads of bowl-in plunger with Never-Seez before reassembly.
4. Coat pushplate spring with Lubriplate 630-AA before reassembly.
5. Reassemble parts removed in reverse order.
6. Check for proper operation.

BOWL-IN SWITCH

1. Lower bowl support and remove back apron.
2. Position bowl support such that bowl-in switch assembly can be accessed through opening in bowl support.

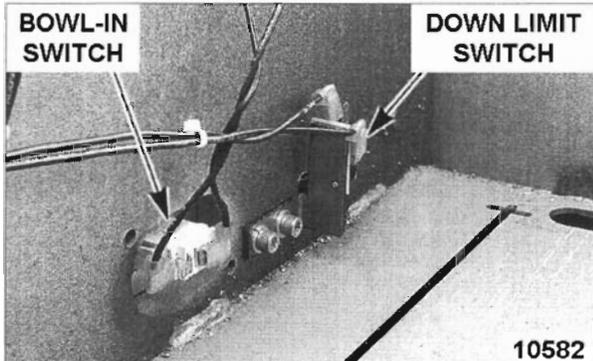


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

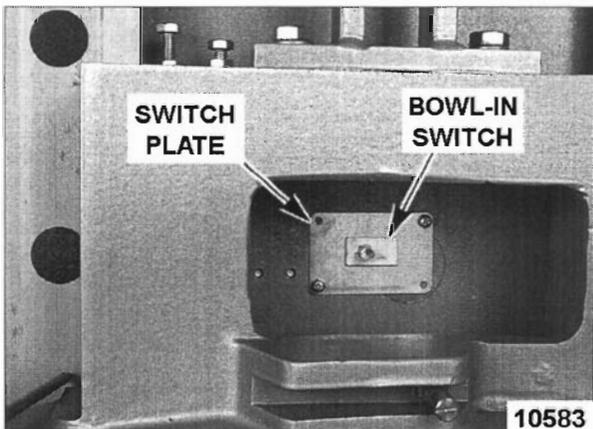
WARNING: ENSURE CAPACITIVE BUS CIRCUIT IS BELOW 50VDC BEFORE HANDLING DRIVE. WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

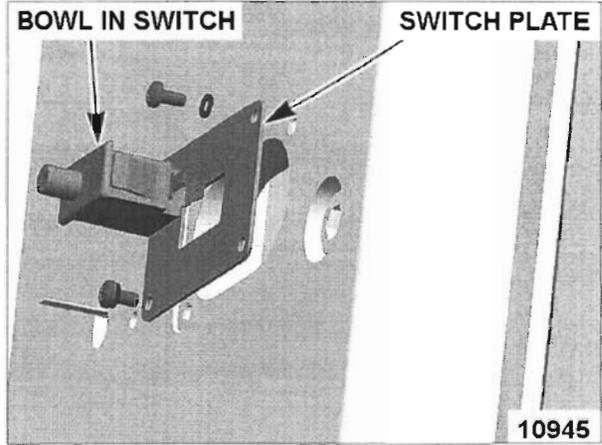
3. Remove pushplate as outlined in BOWL PUSHPLATE ASSEMBLY.
4. Remove DRIVE MOUNT ASSEMBLY PLATE as outlined in DRIVE.
 - A. Place drive assembly on stable support.
5. Note bowl-in switch wire connection points and disconnect wiring from switch.



6. Remove switch plate and switch as an assembly.



7. Press in on tabs of bowl-in switch and push switch out of switch plate.



8. Reassemble parts removed in reverse order.
9. Check mixer for proper operation.

BOWL HEIGHT SWITCH



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

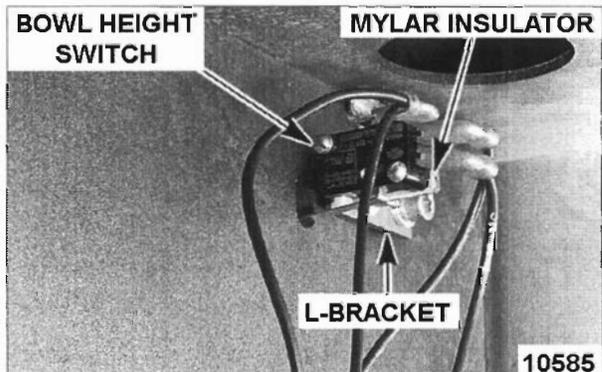
WARNING: ENSURE CAPACITIVE BUS CIRCUIT IS BELOW 50VDC BEFORE HANDLING DRIVE. WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

1. Remove DRIVE MOUNT ASSEMBLY PLATE as outlined in DRIVE.
 - A. Place drive assembly on stable support.

NOTE: Bowl height switch is located in the upper left of the drive area inside the pedestal.

2. Note bowl height switch wiring connections and remove wires.



3. Remove switch and mylar insulator from L-bracket.
4. Install switch and insulator onto L-bracket and connect wiring.
5. Perform BOWL TO BEATER CLEARANCE ADJUSTMENT.
6. Reinstall DRIVE MOUNT ASSEMBLY PLATE.
7. Check mixer for proper operation.

BOWL TO BEATER CLEARANCE ADJUSTMENT

Check

BOWL-TO-BEATER CLEARANCE	
Agitator Style	Clearance
B-Flat Beater	1/16" to 1/8"
ED Dough Hook	1/4"

NOTE: If the customer has both a B-flat beater and an ED dough hook, set bowl-to-beater clearance using the B-flat beater.

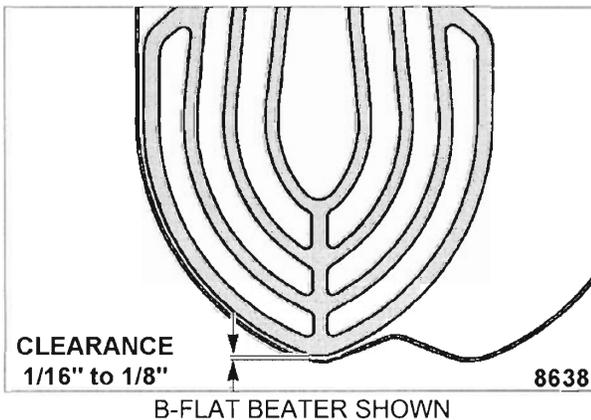
1. Remove back apron.

NOTE: The bowl height switch sets the bowl to beater clearance. When operated, the bowl height switch opens the actuator power supply circuit stopping the actuator.

2. Check to make sure bowl height switch arm is not bent. Replace switch if arm is damaged.
3. Place bowl in the "in" position and install agitator on agitator shaft.

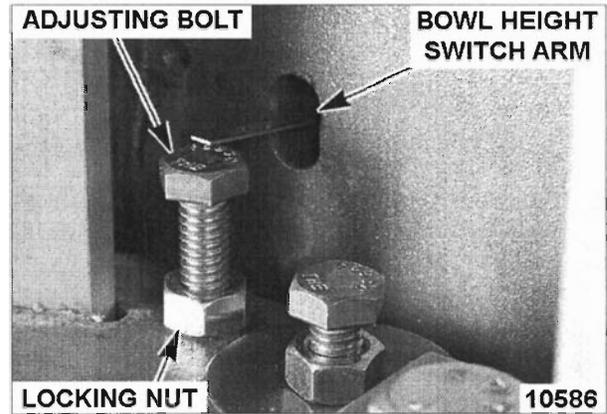
NOTE: Apply downward pressure to rim of bowl while raising bowl into position to simulate a loaded bowl.

4. Raise bowl to mix position (full up).
5. Measure clearance between bottom of agitator and bowl surface.
 - A. If clearance is outside the range of 1/16" to 1/8" for B-flat beater (1/4" for ED dough hook), adjustment is necessary.



Adjustment

1. Lower bowl support approximately two inches.
2. Loosen locking nut on adjusting bolt.



- A. If bowl to beater clearance was greater than allowed tolerance, screw adjusting bolt in (CW).
 - B. If agitator to bowl clearance was less than allowed tolerance, screw adjusting bolt out (CCW).
3. Raise bowl into mix position and check bowl to beater clearance.
 4. Adjust bowl to beater clearance as necessary to achieve approximately 1/16" to 1/8" clearance for B flat beater (1/4" for ED dough hook).
 5. When proper clearance is achieved, tighten locking nut. Prevent adjusting bolt movement while tightening locking nut.
 6. Recheck clearance after locking nut is tightened.
 7. Reinstall back apron.
 8. Check mixer for proper operation and that attachments do not contact bowl during operation.

DOWN LIMIT SWITCH



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

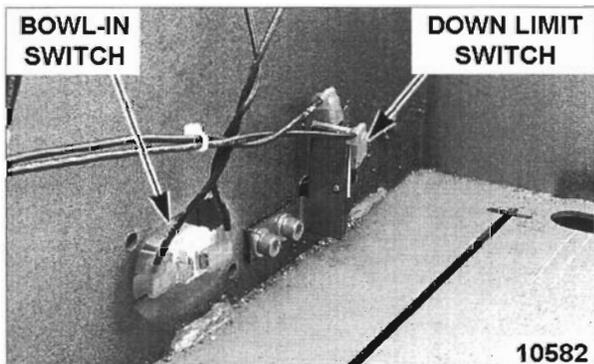
WARNING: ENSURE CAPACITIVE BUS CIRCUIT IS BELOW 50VDC BEFORE HANDLING DRIVE. WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

1. Remove DRIVE MOUNT ASSEMBLY PLATE as outlined in DRIVE.
 - A. Place drive assembly on stable support.

NOTE: Down limit switch is located near the base of the drive area inside the pedestal next to the bowl-in switch.

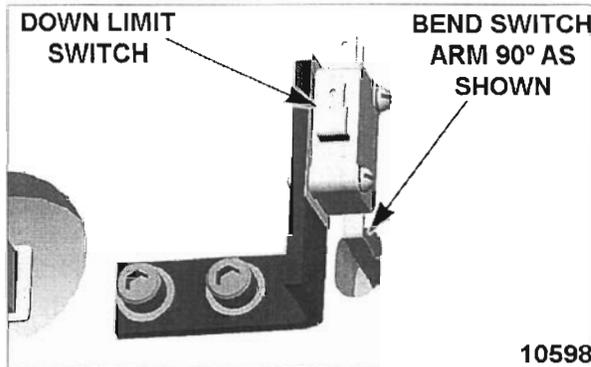
2. Note down limit switch wiring connections and disconnect wires from switch.



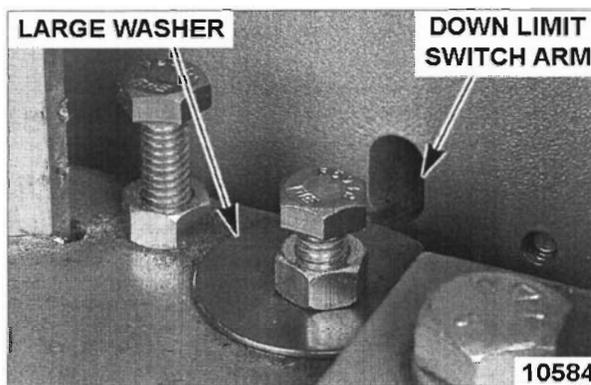
3. Remove switch and L-bracket as an assembly.
 - A. Note mounting orientation of switch on bracket then separate switch and mylar insulator from L-bracket.

CAUTION: Damage to down limit switch can occur if down limit switch arm is above large washer of bowl support.

4. Install replacement switch on L-bracket.
5. Bend down limit switch arm 90° as shown in the illustration.



6. Install down limit switch assembly into column while making sure that down limit switch arm is below large washer.



7. Reconnect wiring to switch.
8. Reinstall DRIVE MOUNT ASSEMBLY PLATE.
9. Check bowl switch operation and mixer for proper operation.

CONTROL PANEL ASSEMBLY



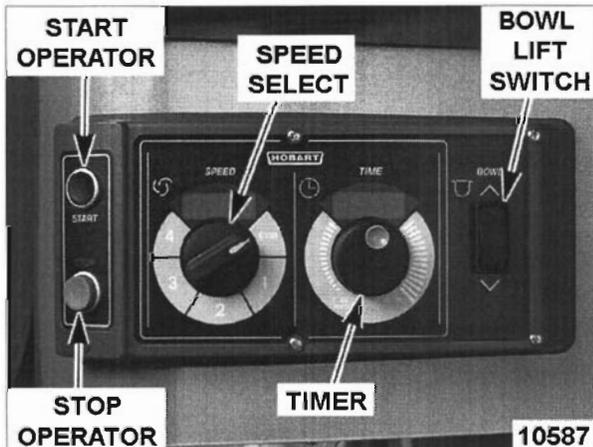
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

WARNING: CERTAIN PROCEDURES IN THIS SECTION REQUIRE ELECTRICAL TEST OR MEASUREMENTS WHILE POWER IS APPLIED TO THE MACHINE. EXERCISE EXTREME CAUTION AT ALL TIMES. IF TEST POINTS ARE NOT EASILY ACCESSIBLE, DISCONNECT POWER AND FOLLOW LOCKOUT / TAGOUT PROCEDURES, ATTACH TEST EQUIPMENT AND REAPPLY POWER TO TEST.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

NOTE: The components of the control panel include the timer control board, start, stop, speed select and bowl lift switches and the timer encoder.

1. Remove screws securing control panel to mixer.



2. Support control panel to relieve strain on wiring harness.
3. Note connection points of wiring harness and disconnect wiring from timer control board.

NOTE: When reinstalling speed select switch, torque retaining nut to 3 in*lb.

4. Reassemble parts removed in reverse order and check for proper operation.

TIMER CONTROL BOARD

Operator Diagnostics

When the mixer does not operate due to starting conditions not being met, the timer control board will display the missing condition in the speed window. The timer control board indicates to the operator when the bowl is not in position, bowl guard is open or bowl is not in the mix position. The information is shown in the speed display window whenever the start button is pushed and one or more of the starting conditions is not satisfied.

OPERATOR DIAGNOSTICS	
Display	Condition
b_in	Bowl is not in position on bowl support
b_UP	Bowl is not raised into mix position
b_gd	Bowl guard is not closed or stop switch is open

Removal

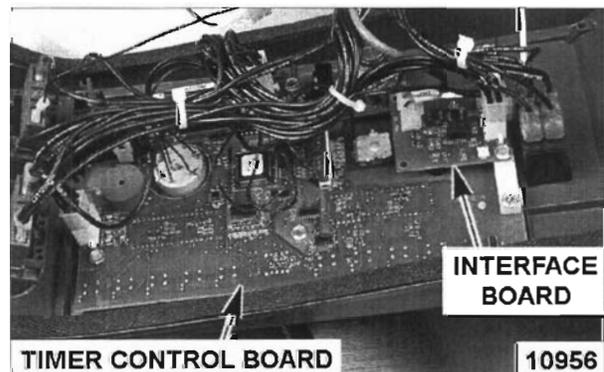


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

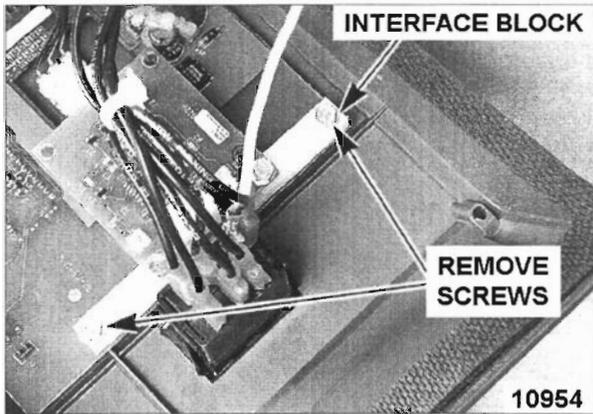
1. Remove screws securing control panel to mixer.
2. Support control panel to relieve pressure on wiring harness.
3. Note connection points of wiring harness to timer board and disconnect wiring from timer and interface board.

NOTE: When reinstalling the timer encoder or speed select switch, torque retaining nut to 3 in*lb.

4. Disconnect speed select switch and timer encoder wiring from timer board.
5. Disconnect ground wire.
6. Remove timer control board mounting screws.



- A. Remove screws securing interface block to timer board.

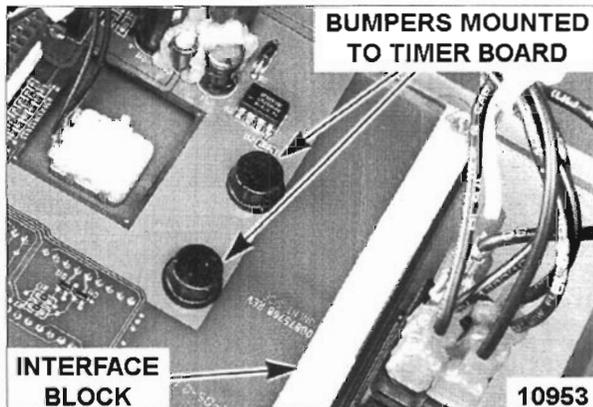


7. Inspect control panel gasket for damage. Replace if necessary.

NOTE: Replacement timer control board comes programmed as an HL800. Timer control programming is required to set the timer board to operate as an HL1400.

8. Install replacement timer control board.
A. Reinstall interface block.

9. Install interface board bumpers.

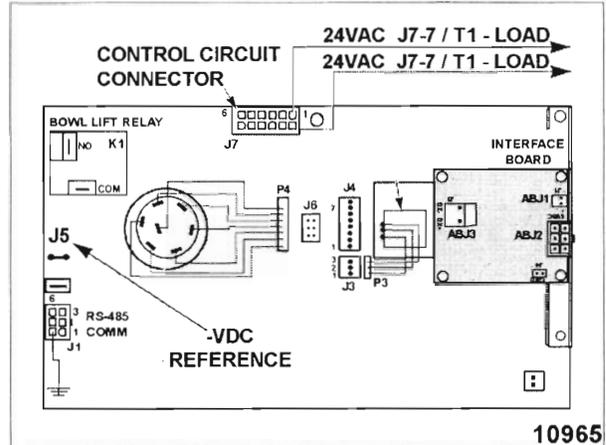


10. Reinstall interface board assembly.
11. Connect speed switch, timer encoder and wiring to board.
12. Refer to **TIMER CONTROL BOARD SPECIAL FUNCTIONS** to program timer control board to function as model designation on data plate.
13. Reassemble parts removed in reverse order.
14. Check for proper operation.

ELECTRICAL TESTS

Incoming 24VAC Supply Voltage - Check

1. Remove CONTROL PANEL from wrap. Do not disconnect wiring from control panel components.
2. Connect power.
3. Set meter to AC voltage and measure input voltage to timer control board across pins J7-1/7. Voltage should be 24VAC.

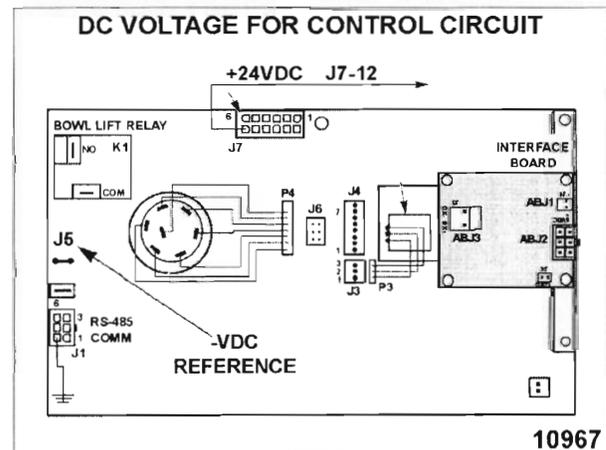


DC Voltage Negative Reference for Timer Control Board

NOTE: Use pin J5 connection as a VDC negative reference when troubleshooting the DC control circuit of mixer. Refer to **WIRING AND ELECTRICAL DIAGRAMS - Timer Control Wiring** for pin location. This negative reference is only valid for components that serve as inputs for the timer control board.

24VDC Output Voltage - Check

1. Remove CONTROL PANEL.
2. Connect power.
3. Set meter to DC voltage and measure output voltage from timer control board across J5 (negative) and J7-12. Voltage should be 24VDC.



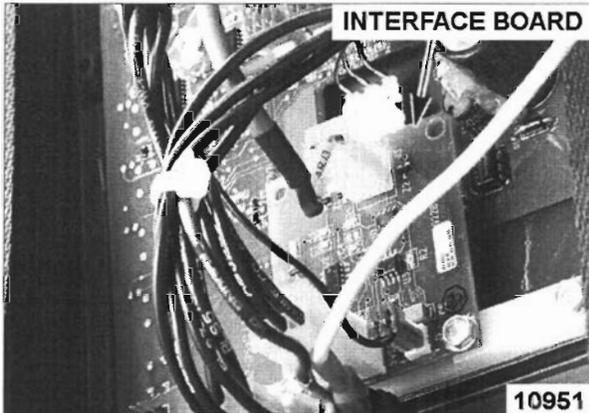
INTERFACE BOARD ASSEMBLY



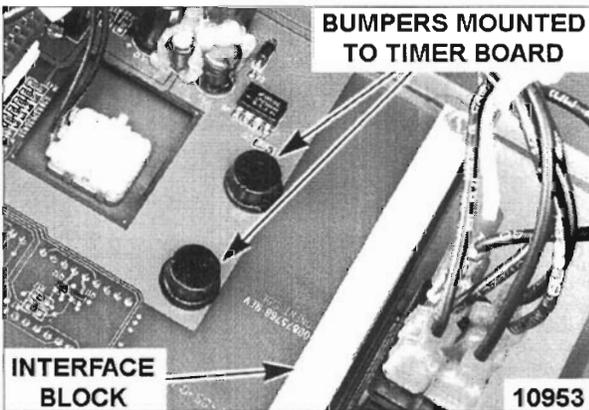
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Removal

1. Remove screws securing control panel to mixer.
2. Support control panel to relieve pressure on wiring harness.
3. Note connection points of wiring harness to interface board then disconnect wiring.



4. Remove the screws securing interface board to interface block then remove interface board.
5. Verify the existence of two bumpers mounted to timer control board under interface board.



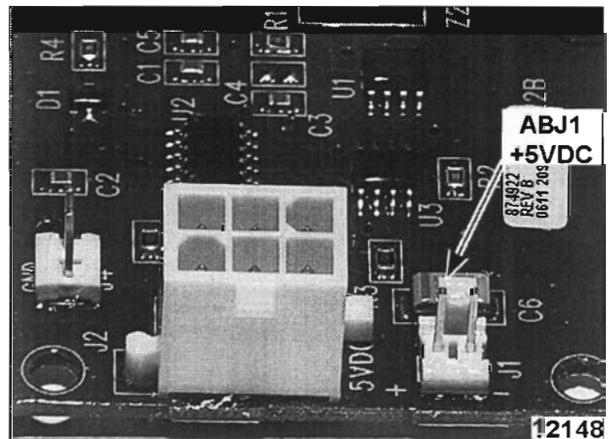
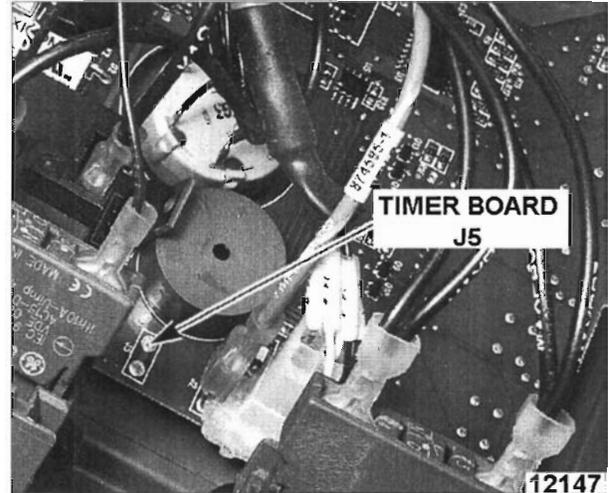
6. Reassemble parts removed in reverse order.
7. Check mixer for proper operation.

Interface Board Test

CAUTION: Do not measure voltage across the two pins of ABJ1 on the interface board. If meter leads are shorted together, a direct short will exist and the timer board or interface board could be damaged.

NOTE: Perform voltage measurement when mixer has entered normal operating mode (after start-up).

1. Access interface board assembly by removing timer control panel assembly from mixer.
2. Measure incoming voltage (+5VDC) to interface board across +5VDC pin of ABJ1 and J5 of timer control board.



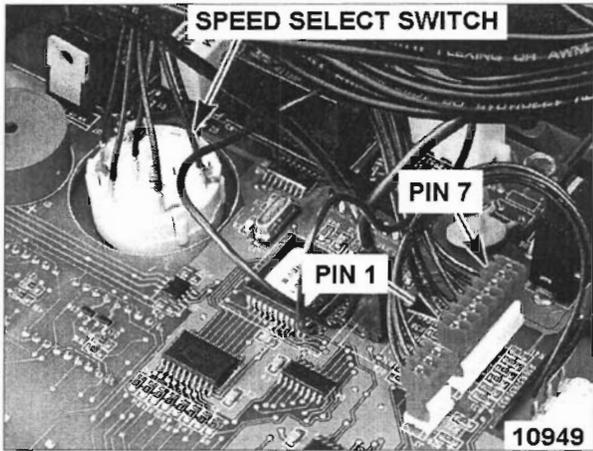
SPEED SELECT SWITCH



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

Removal

1. Pull knob from speed select switch shaft.
2. Remove CONTROL PANEL.
3. Disconnect speed select switch plug from timer board.

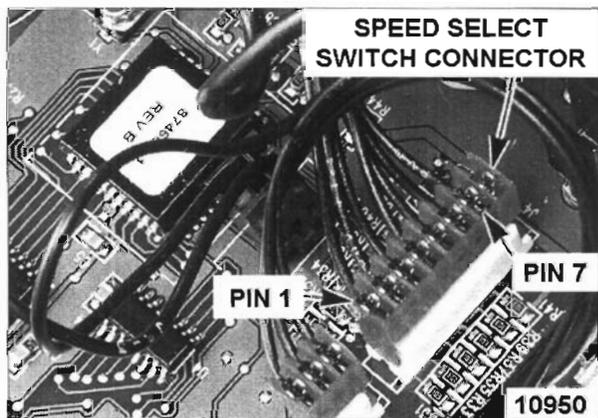


4. Remove mounting nut and lock washer then pull switch from control panel.
5. Reassemble parts removed in reverse order.
6. Check mixer for proper operation.

Speed Select Switch - Test

NOTE: The speed select switch is a six position rotary switch.

1. Remove CONTROL PANEL.
2. Disconnect speed select switch electrical wiring from timer board.
3. Set meter to measure continuity or resistance (Ω).
 - A. Check continuity between pin 7 (wiper) and pins 1 thru 6.



SPEED SELECT SWITCH	
Pin No.	Switch Position
1	Speed Display
2	STIR
3	1
4	2
5	3
6	4
7	Wiper (common)

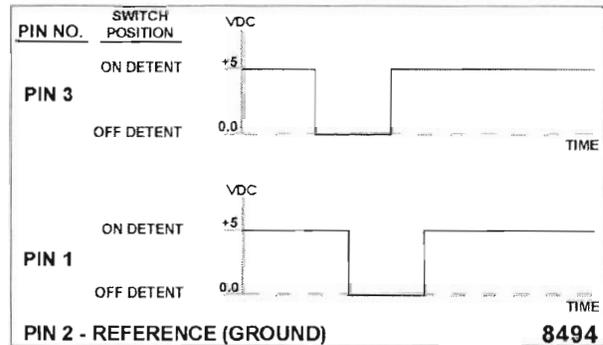
- B. When speed select switch is set to position being measured, continuity should exist and resistance should be approximately 0.0 ohms.
- C. When speed select switch is not on position being tested, the circuit should be open.

TIMER ENCODER



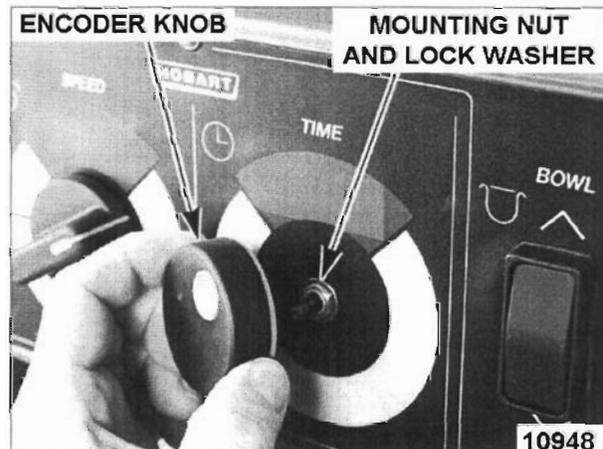
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: The encoder consists of two digital switching circuits with ground. When the encoder is resting in a detent, both switching circuits are open. As the time knob is turned, one of the switches will close followed by the other. Before the encoder gets to the next detent, the first switch to close will open followed by the opening of the second switch. This method of switch closures allows the timer control board to determine what direction (CW or CCW) the time dial is being turned.



Removal

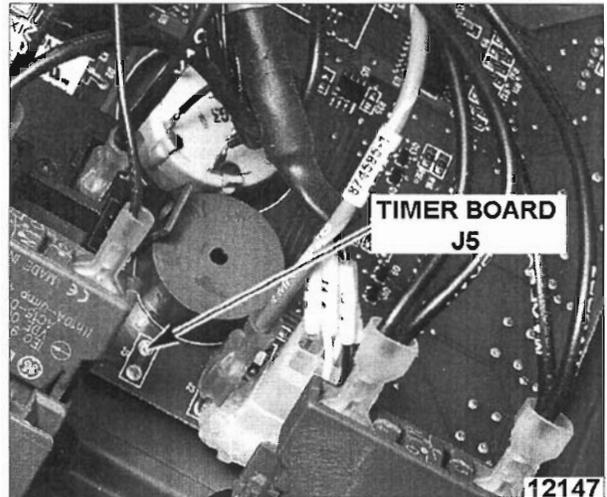
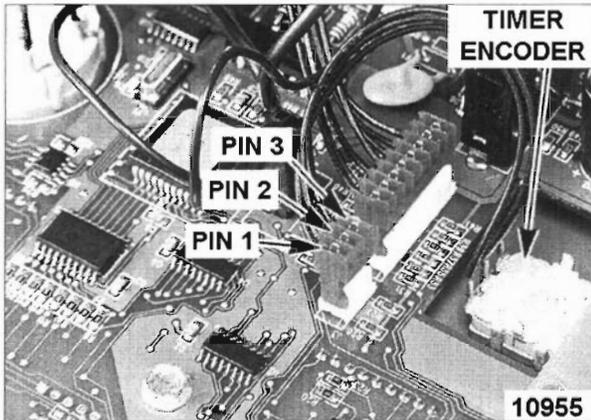
1. Pull knob from timer encoder shaft.



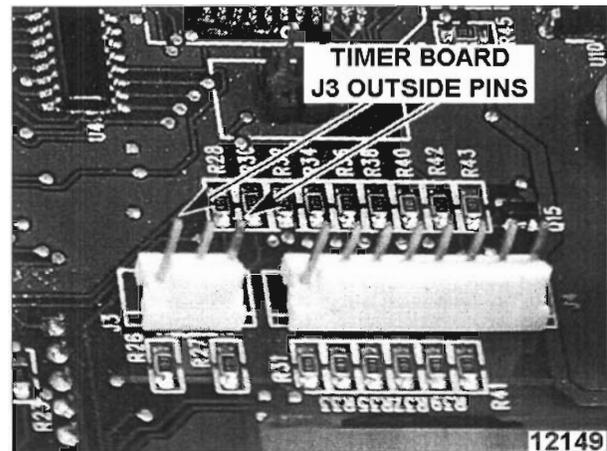
2. Remove CONTROL PANEL.
3. Disconnect timer encoder electrical wiring from timer board.
4. Remove mounting nut and lock washer.
5. Reassemble parts removed in reverse order.
6. Check mixer for proper operation.

Timer Encoder - Test

1. Remove CONTROL PANEL.
2. Apply power to mixer.
3. Set meter to measure DC voltage. Use pin 2 wire from encoder as reference.



- A. Measure voltage across pin 2 and pin 3 at the plug when timer dial is resting in a detent. Voltage should be +5VDC.
 - 1) With meter leads in place across pin 2 and pin 3, slowly turn the time dial on timer control. Voltage should drop to 0.0VDC.
- B. Measure voltage across pin 2 and pin 1 at the plug when timer dial is resting in a detent. Voltage should be +5VDC.
 - 1) With meter leads in place across pin 2 and pin 1, slowly turn the time dial on timer control. Voltage should drop to 0.0VDC.
4. If voltage readings are not as described, disconnect timer encoder from timer board and check +5VDC supply voltage.
 - A. Use J5 as VDC negative reference.
 - B. Measure voltage across the negative reference and the two outside pins of J3. Voltage should be +5VDC.
 - C. If +5VDC is not present, replace timer control.
 - D. If +5VDC is present, replace timer encoder.



TIMER CONTROL BOARD SPECIAL FUNCTIONS

ENTERING SPECIAL FUNCTIONS

NOTE: If testing the communications link between the timer control board and drive, the drive must first be put into the service position before applying power to the mixer and entering special functions. Follow DRIVE SERVICE POSITION PROCEDURE to place drive into the service position and ensure capacitive bus circuit is below 50VDC.

View Only Mode

NOTE: View only mode is entered by pressing and holding a hidden button located under the timer control overlay for three seconds. When special functions are entered this way, information can be viewed, but not reset or changed. To reset or change parameters, enter special functions by the advanced mode.

1. Mixer must be in normal operating mode (speed and time displayed).
2. Press and hold the hidden button located under the timer control overlay. A beep will be heard when the hidden button is pressed. Continue holding the hidden button in for three seconds until a second beep is heard. Release the hidden button.
 - A. The timer display will change to [SPFn turn].

Advanced Mode

NOTE: To enter the advanced mode, a jumper must be installed across pins of E1 of the timer control board when the mixer is in the normal operating mode. If jumper is installed before power is applied, on power-up the display will show the unit model number. If jumper is installed when display is alternating between the timer control firmware and model number, no change will occur.

NOTE: The mixer will remain in the advanced mode as long as the jumper is in place across pins of E1.

1. Remove power from mixer.
2. Remove screws securing timer control board to wrap and support timer control assembly to relieve stress on wiring harness.
3. Apply power to mixer.
 - A. Allow mixer to run self-diagnostic test which ends with display showing timer control firmware version alternating with the mixer model number.
 - B. Turn either the speed or time dials to enter normal operation mode (speed and time or hold will be displayed).
4. Carefully install jumper across pins of E1 on timer control board.
 - A. Timer will sound a short beep and [SPFn turn] will be displayed in the speed and time windows.
5. Place timer control board back into position on wrap and secure with one screw at top center of timer control assembly.

SPECIAL FUNCTIONS

<u>View Only Mode</u>	<u>Advanced Mode</u>
<ol style="list-style-type: none"> 1. Turn the time dial to enter main parameter selections. <ol style="list-style-type: none"> A. Turn time dial until desired parameter is displayed. 2. Press and release hidden button to enter parameter. <ol style="list-style-type: none"> A. For select model and any of the hour parameters, the data will be displayed when the hidden button is pressed to enter the parameter. To return to the main parameter selections, press and release the hidden button. B. For viewing the 4 most recent errors turn time dial to advance through stored data. To return to the main parameter selections, press and release the hidden button. C. For In-line diagnostics, turn time dial to select any of the diagnostic parameters listed below. Turn time dial to start. To return to the parameter selections, press and release the hidden button. 3. To exit special functions and return to normal operation, press and hold hidden button for at least three seconds. 	<ol style="list-style-type: none"> 1. Turn time dial to enter main parameter selections. <ol style="list-style-type: none"> A. Turn time dial until desired parameter is displayed. 2. Press and release hidden button to enter parameter. <ol style="list-style-type: none"> A. <u>To select model parameter.</u> <ol style="list-style-type: none"> 1) Turn time dial to display desired model (800 or 1400). 2) Press and release hidden button. Selection is stored and display goes back to main parameter selections. B. View capacitor hours. Hours will be displayed when parameter is selected. These parameters cannot be reset. C. For In-line diagnostics, turn time dial to select any diagnostic parameter listed below. Press and release the hidden button to enter diagnostic mode. To return to parameter selections, press and release the hidden button.

MAIN SPECIAL FUNCTION PARAMETERS		
Actual Display	Editable in Advanced Mode	Parameter
[SEL Unit]	Enabled	Select model number. Displays 800, 801 ¹ or 1400
[LAsT Err]	No	4 Most recent errors. Displays L-01 up to L-04 in speed window and Er# ² or [no] in the time window. No in time window represents no error.
[Log ----]	N/A	N/A = Not applicable to the HL800 and HL1400 mixers; however, parameters are present because of common software shared with HL600 switched reluctance mixers.
[totL HrS]	No	Displays total hours of mixer operation. Not resettable.
[LAsT HrS]	Enabled	Allows technician to reset hours to zero after mixer has been serviced.
[CAP HrS]	No	Displays total hours power is applied to mixer. Maximum hours = 61,000 hrs. NOTE: It is not an indication of capacitor hours.
[run diAg]	--	In-Line diagnostics. Parameter allows technician to check control switches, timer board, and drive firmware revision. Refer to IN-LINE DIAGNOSTIC PARAMETERS table.

¹ The selection 801 in the Select model parameter is a place holder in the software. If 801 is selected, it will have the same settings as model 800. To avoid confusion, do not use model 801.

² Where # is the number of the recorded error.

In-Line Diagnostics

NOTE: In-line diagnostics can be performed from either the view only or advanced mode.

<u>View Only Mode</u>	<u>Advanced Mode</u>
1. For In-line diagnostics, turn time dial to select any of the diagnostic parameters listed below. Initial timer display is [drlD A000]. To return to the parameter selections, press and release the hidden button.	1. For In-line diagnostics, turn time dial to select any of the diagnostic parameters listed below. Initial timer display is [drlD A000]. To return to the parameter selections, press and release the hidden button.

NOTE: In-line diagnostics are the same for both view only and advanced modes.

IN-LINE DIAGNOSTIC PARAMETERS			
Actual Display	Parameter	Timer Control Board Action	
[drId XXXX]	drive firmware revision	Displays drive revision where XXXX = actual numbers.	
[0000 - 9999]	Seven segment LED test	Advances from 0000 to 9999 with beep. Continues repeating cycle until another parameter is selected.	
b_in	Bowl-In switch	yES no	Bowl-IN switch sensed closed and bowl is in mix position. Bowl-IN switch sensed open and bowl is not in mix position.
		Bowl-Up switch	yES no
Strt	Start switch		yES no
		[Atth LOOP]	N/A
[SEnd PASS]			
[Send Fail]			

<u>View Only Mode</u>	<u>Advanced Mode</u>
A. For drive firmware revision and seven segment LED test, turning time dial to that parameter will automatically display firmware version or perform LED test. B. For bowl and start switches, moving bowl in or out, lowering or raising bowl support, or pressing start switch will cause the display to change indicating that the timer control board has sensed a change in the circuit condition. If no change is sensed, closer inspection of that specific control circuit is required. C. To return to parameter selections, press and release the hidden button.	A. For drive firmware revision and seven segment LED test, turning time dial to that parameter will automatically display firmware version or perform LED test. B. For bowl and start switches, moving bowl in or out, lowering or raising bowl support, or pressing start switch will cause the display to change indicating that the timer control board has sensed a change in the circuit condition. If no change is sensed, closer inspection of that specific control circuit is required. C. To return to parameter selections, press and release the hidden button.

Exiting Special Functions

<u>View Only Mode</u>	<u>Advanced Mode</u>
<p>NOTE: There are two methods used to exit special functions - view only mode.</p> 1. Press and hold the hidden button for at least three seconds. 2. The mixer will automatically exit special functions after one minute of inactivity from speed or time select dial. <p>NOTE: Upon exiting special functions, the display will show the speed selected and the time that was displayed when special functions was entered.</p>	1. Remove jumper from E1 of timer control board. <p>NOTE: If special functions advanced mode was entered from normal operation, mixer will return to normal operation. If special functions advanced mode was entered while already in special function - view only mode, mixer will return to special function - view only mode and remain in this mode until it is exited by methods described in Exiting Special Functions - <u>View Only Mode</u>.</p>

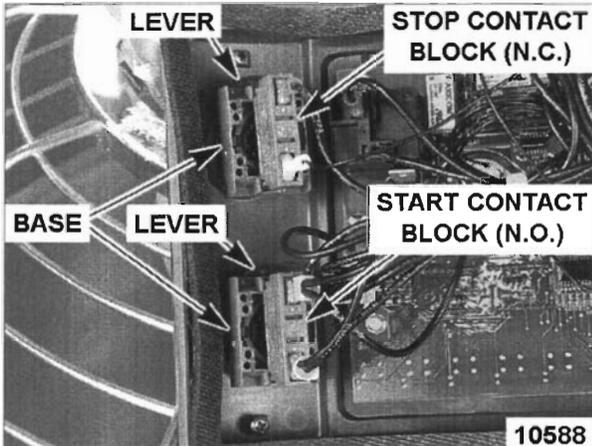
START / STOP SWITCHES



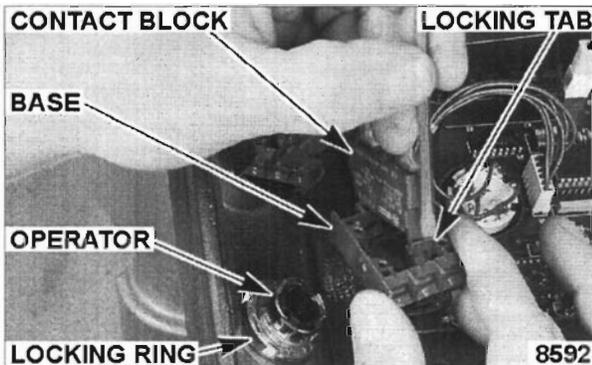
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: The start and stop switches are mounted in the control panel.

1. Remove CONTROL PANEL.
2. Note wiring connections and disconnect wires from switch being serviced.

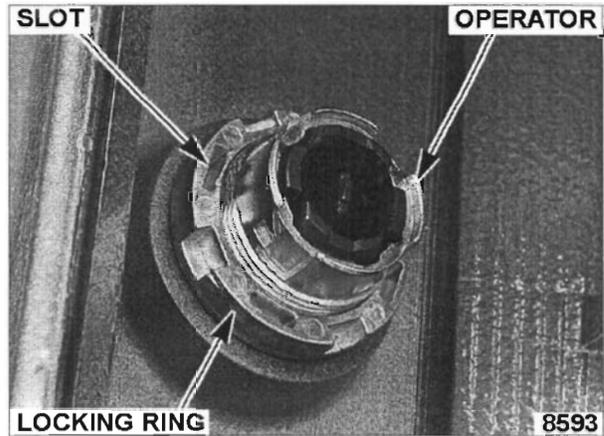


3. Push lever in direction of arrow on lever to release base and contact block from operator.
4. Pry out on locking tab to release contact block from base. The contact block snaps into place during installation and does not require prying out on locking tab to install.



5. Remove locking ring and push operator out of timer control panel.

NOTE: Make certain that tab on operator seats into notch of timer control panel during reassembly. Notches in locking ring are to face away from timer control panel. A screwdriver can be inserted into slots of locking ring for tightening and loosening purposes.



6. Reassemble in reverse order.
7. Check for proper operation.

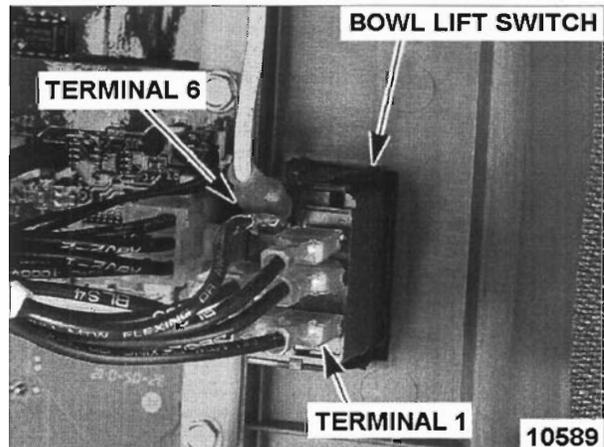
BOWL LIFT SWITCH



WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: The bowl lift switch is not keyed and can be installed upside down. The switch terminals are numbered for wiring purposes. Make certain that terminals one and four are installed closest to the top of the control panel. Terminals four, five, and six will be next to the timer control board when properly installed.

1. Remove CONTROL PANEL.
2. Note locations of wires and disconnect wiring from switch.



EARLY PRODUCTION SHOWN

3. Note terminal numbers on switch with how switch is mounted in the control panel.
4. Remove switch.
5. Reassemble parts removed in reverse order.
6. Check for proper operation of bowl lift.

CONTACTOR 1CON

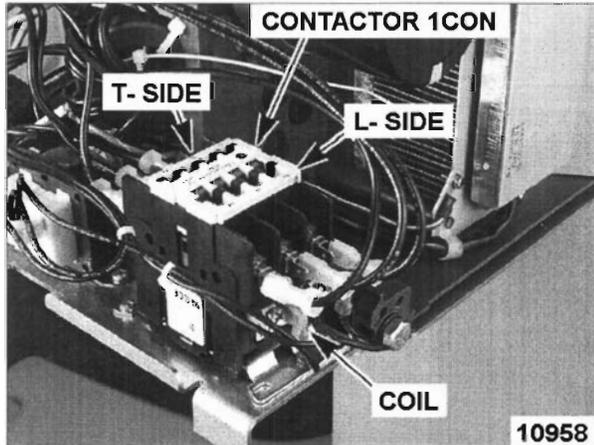


WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

CONTACTS - TEST

NOTE: The contactor connects the high side outputs (terminals U, V & W) from the drive to the motor. Output phases from the drive cannot be measured with a standard volt meter due to the high switching frequencies involved. To check the operation of the individual contacts, a continuity or resistance check across the contacts when power is removed from the mixer will need to be made.

1. Follow DRIVE SERVICE POSITION PROCEDURE to place drive into the service position and ensure capacitive bus circuit is below 50VDC.
2. Set meter to ohms (Ω) or continuity.
 - A. Place meter leads across L1/T1 contacts.
 - 1) Manually engage contacts by pressing down on the manual contact button of the contactor.



- 2) Meter should indicate continuity or approximately 0.0 ohms.
- B. Repeat for remaining contacts.

COIL - TEST

1. Follow DRIVE SERVICE POSITION PROCEDURE to place drive into the service position and ensure capacitive bus circuit is below 50VDC.
2. Connect power to the mixer.
3. Make sure mixer conditions are set to operate mixer (bowl in position, bowl guard closed, and bowl support in the up position).
4. Set meter to AC voltage.
5. Place meter leads across terminals of contactor coil.
6. Set timer control to stir speed and HOLD.
7. Press START button while observing voltage.
 - A. If 24VAC is present, but contactor does not energize, replace contactor.
 - B. If 24VAC is not present, check mixer conditions, and related wiring.

ELECTRICAL OPERATION

SEQUENCE OF OPERATION

Mixer - Standard Timer Board

Refer to schematic diagram AI1771 for the electrical sequence of operation.

NOTE: The position of the time knob selects timer mode (countdown or count up). Set mix time between 00:00 seconds and 50:00 minutes, press 1PB start switch and timer counts down to zero then stops.

Rotate the time knob CCW until timer displays Hold and enters count up mode. Press 1PB start switch and the timer counts up continuously until 2PB stop switch is pressed.

1. Conditions.
 - A. Mixer connected to correct supply voltage and is properly grounded.
 - 1) drive energized and self check performed.
 - 2) Supply voltage to bowl lift switch 2/5 contacts.
 - 3) Transformer T1 energized.
 - a. Timer board energized at J7-1 & J7-7, self check performed and display lit.
 - a) Software version displayed.
 - b) Timer displays time (or HOLD if feature is selected) and speed selection
 - c) Timer ready contacts close.
 - b. 24VDC from timer board J7-12 to one side of:
 - a) Start switch 1PB - 4.
 - b) Bowl in switch 3LS - C.
 - c) Bowl height switch 2LS-C.
 - 4) Bowl height switch 2LS - N.C. closed.
 - a. 24 VAC input to timer board at J7-8 thru bowl height switch N.C. contacts.

NOTE: This signal tells the timer that the bowl is not raised. This allows stir speed to be operated with the start switch held in, only if the bowl guard and bowl-in switches are closed. Position of speed select switch does not affect condition.

 - a) Relay coil K1 energized and K1 N.O. contacts close.
 - B. Bowl support in lowered position.
 - 1) Down limit switch N.C. contacts open.
 - C. Bowl guard switch 1LS open.
 - 1) Wire cage open.
 - D. Stop switch 2PB closed.
 - E. Bowl not in position.
 - 1) Bowl-in switch 3LS-N.O. contacts open.

NOTE: In order to accommodate customers that use bowl trucks, the bowl lift circuit can be operated without the bowl-in switch operated.
2. Bowl lift switch held in raise position.

NOTE: Stir speed can be enabled with start switch held in.

 - A. Supply voltage to linear actuator thru bowl lift switch 2/3 contacts, and K1 contacts to black wire on actuator.
 - B. Supply voltage to linear actuator thru bowl lift switch contacts 5/6 to white wire (COM).
 - C. Down limit switch N.C. contacts close as bowl is raised from lowered position.

NOTE: If the bowl switch is released prior to the maximum height, switch contacts 2/3 and 5/6 open and remove power from the actuator.
3. Bowl placed on support as instructed in operator manual.
 - A. Bowl locked into position.
 - 1) Bowl-in switch 3LS-N.O. closed, 24VAC to J7-9 on timer board.
 - a. Relay coil K4 energized and K4 N.O. contacts close.
 - B. Bowl guard cage closed.
 - 1) Bowl guard switch 1LS N.O. contacts close.
4. Bowl raised to highest position.
 - A. Bowl Height Switch N.C. contacts open.
 - 1) 24VDC removed from timer board J7-8.
 - a. Relay coil K1 de-energized and K1 N.O. contacts open.
 - B. Bowl Height Switch N.O. contacts close.
 - 1) 24VDC thru timer board J7-6 to one side of K2-1 N.O. contacts.

5. Time and speed values entered into timer control.
6. Start switch operated closed (momentary).
 - A. Relay coil K2 energized thru bowl guard switch 1LS, stop switch 2PB and timer board J7-10.
 - 1) K2-1 N.O. contacts close and provide the latching circuit contacts thru timer board J7-11 that allow K2 relay coil to remain energized when start switch is released.
 - 2) 1CON energized thru K2-2 N.O. contacts.
 - B. Input conditions to timer board μ -control at J7-10, J7-11, J7-9 and J7-8 are met.
 - 1) With input conditions satisfied, run/stop contacts on timer board close and energize K3 relay coil.
 - a. K3 contacts close and provide the run signal (run equals closed contact condition) to drive at FWD and CM terminals.
 - b. Timer board communicates run speed to drive.
 - C. Timer starts (countdown or count up).
 - D. drive activates U, V, & W 3 phase voltage output to energize motor thru 1CON contacts.

NOTE: The drive constantly monitors mixer operation and will vary the frequency and voltage output depending on speed setting and mix load.
7. Motor remains energized and timer counts until one of the following occurs.
 - A. Stop switch 2PB operated or bowl guard 2LS switch opened.
 - 1) K2 relay coil de-energized.
 - a. K2-2 contacts open, 1CON de-energized and motor stops.
 - b. K2-1 latching circuit contacts open.
 - 2) Input condition removed from timer board μ -control at J7-10.
 - a. Run/stop contacts on timer board open and de-energize K3 relay coil.
 - a) K3 contacts open and remove the run signal (stop equals open contact condition) to drive at FWD and CM terminals.
 - b. Timer board communication to drive stops.
 - B. Bowl-in Switch 3LS opened.
 - 1) K4 relay coil de-energized and K4 contacts open.
 - a. Relay coil K2 de-energized.
 - a) K2-2 contacts open, 1CON de-energized and motor stops.
 - b) K2-1 latching circuit contacts open.
 - 2) Input condition removed from timer board μ -control at J7-9.
 - a. Run/stop contacts on timer board open and de-energize K3 relay coil.
 - a) K3 contacts open and remove the run signal (stop equals open contact condition) to drive at FWD and CM terminals.
 - b. Timer board communication to drive stops.
 - C. Bowl Height Switch 2LS opened.
 - 1) Bowl Height Switch N.O. contacts open and relay coil K2 de-energized.
 - a. K2-2 contacts open, 1CON de-energized and motor stops.
 - b. K2-1 latching circuit contacts open.
 - 2) Input condition removed from timer board μ -control at J7-6.
 - a. Run/stop contacts on timer board open and de-energize K3 relay coil.
 - a) K3 contacts open and remove the run signal (stop equals open contact condition) to drive at FWD and CM terminals.
 - 3) Timer board communication to drive stops.
 - 4) Bowl Height Switch N.C. contacts close and 24VDC at timer board J7-8.
 - a. Relay coil K1 energized and K1 N.O. contacts close.
 - b. Input condition applied to timer board μ -control at J7-8.

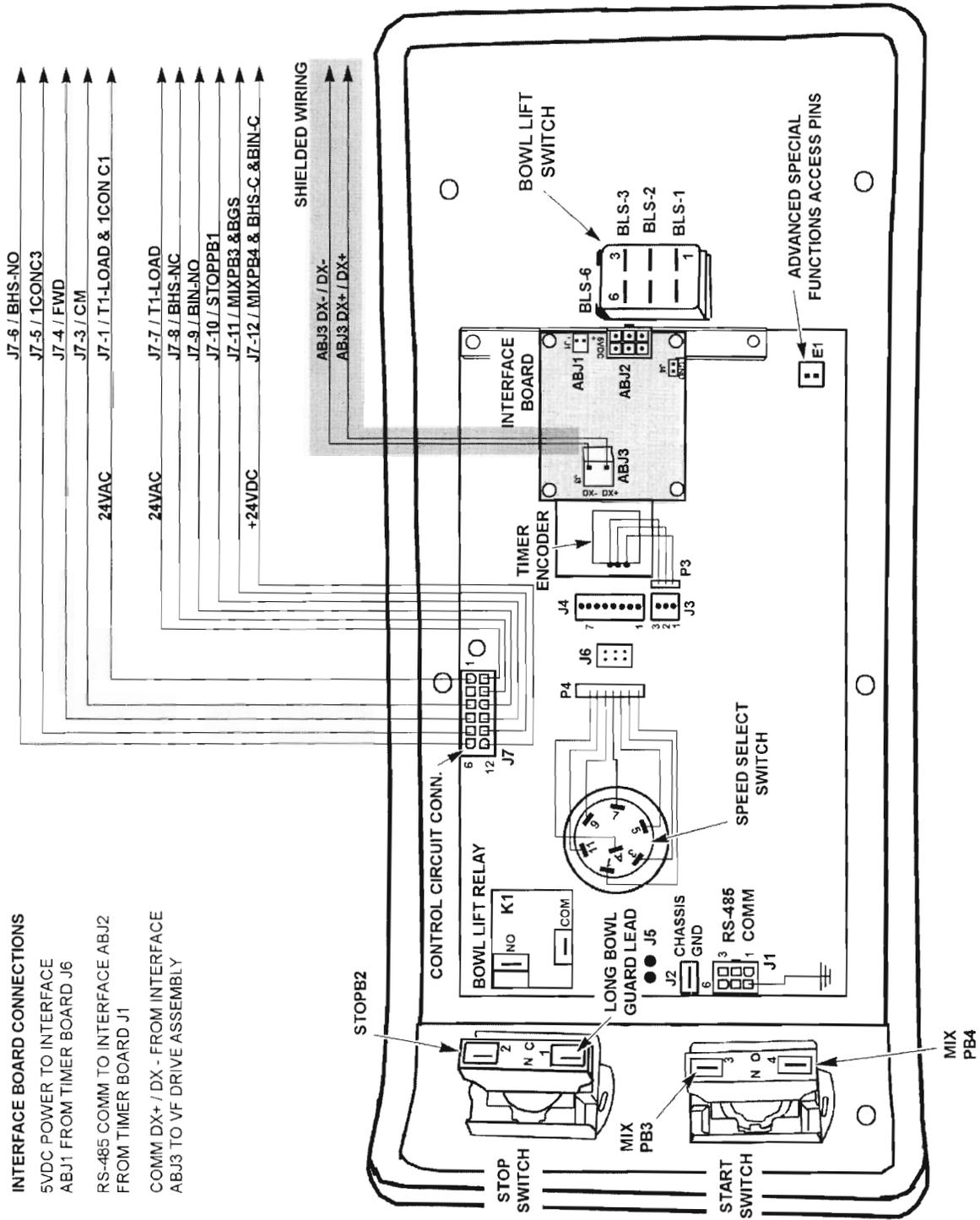
- D. Timer reaches 00:00 (if countdown feature is used) and timer board opens timer ready contacts momentarily.
 - 1) Relay coil K2 de-energized.
 - a. K2-2 contacts open, 1CON de-energized and motor stops.
 - b. K2-1 latching circuit contacts open.
 - 2) Input condition removed from timer board μ -control at J7-10 and J7-11.
 - a. Run/stop contacts on timer board open and de-energize K3 relay coil.
 - a) K3 contacts open and remove the run signal (stop equals open contact condition) to drive at FWD and CM terminals.
 - 3) Timer board communication to drive stops.
 - 4) Beeper sounds for 3 seconds.
- 8. With motor stopped, hold bowl lift switch in lower position.
 - A. Supply voltage to linear actuator thru bowl lift switch 2/1 contacts, down limit switch N.C. contacts to red wire on actuator.
 - B. Supply voltage to linear actuator thru bowl lift switch 5/4, to white wire (COM) on actuator.
 - C. Down limit switch N.C. contacts open as bowl is lowered to lowest position.

NOTE: Stir speed can be ran while bowl is lowered if bowl guard switch and bowl in switch are closed.

NOTE: Bowl will raise or lower and is not dependent on bowl guard switch or bowl in switch.

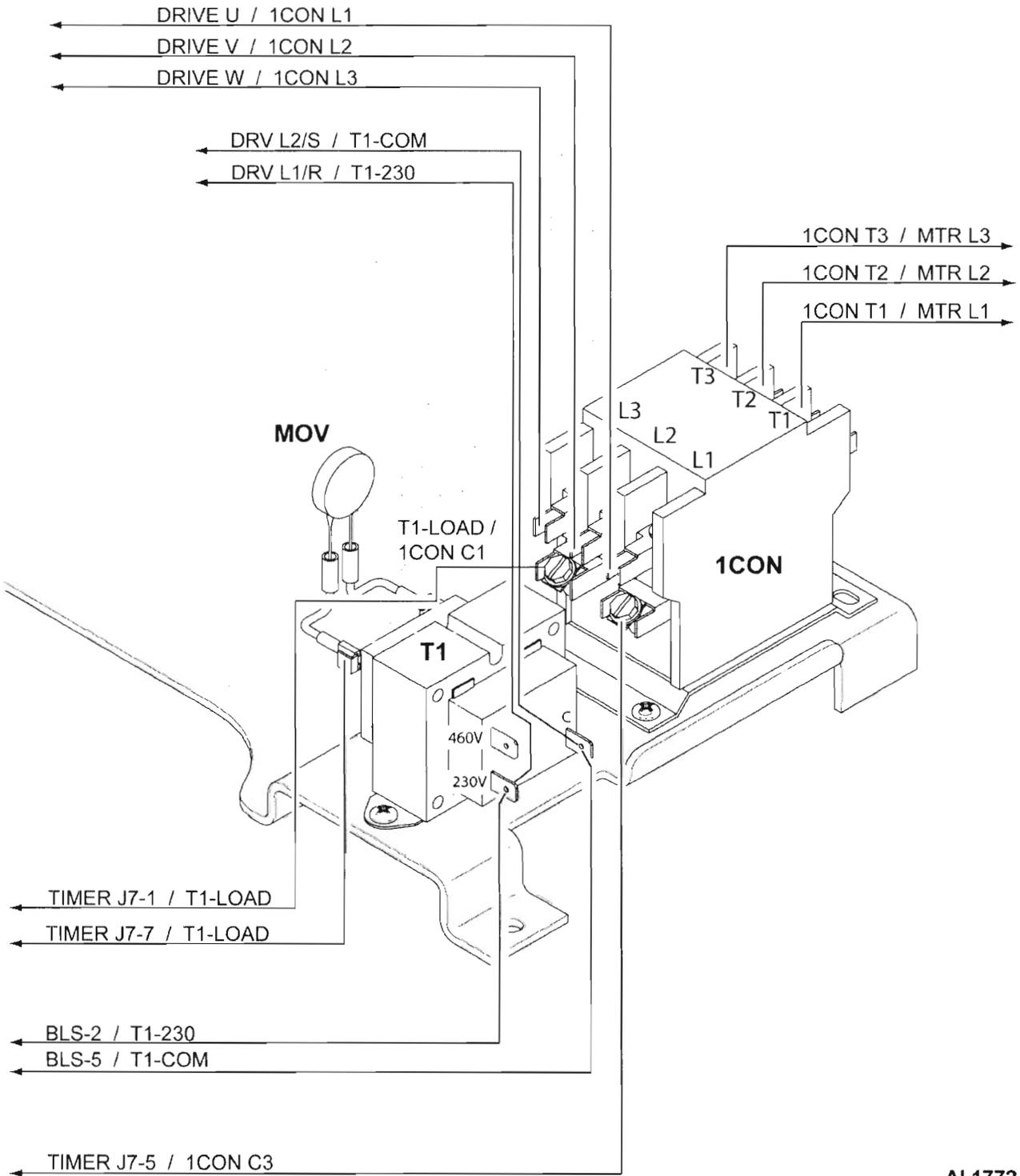
WIRING AND ELECTRICAL DIAGRAMS

Timer Control Wiring Diagram



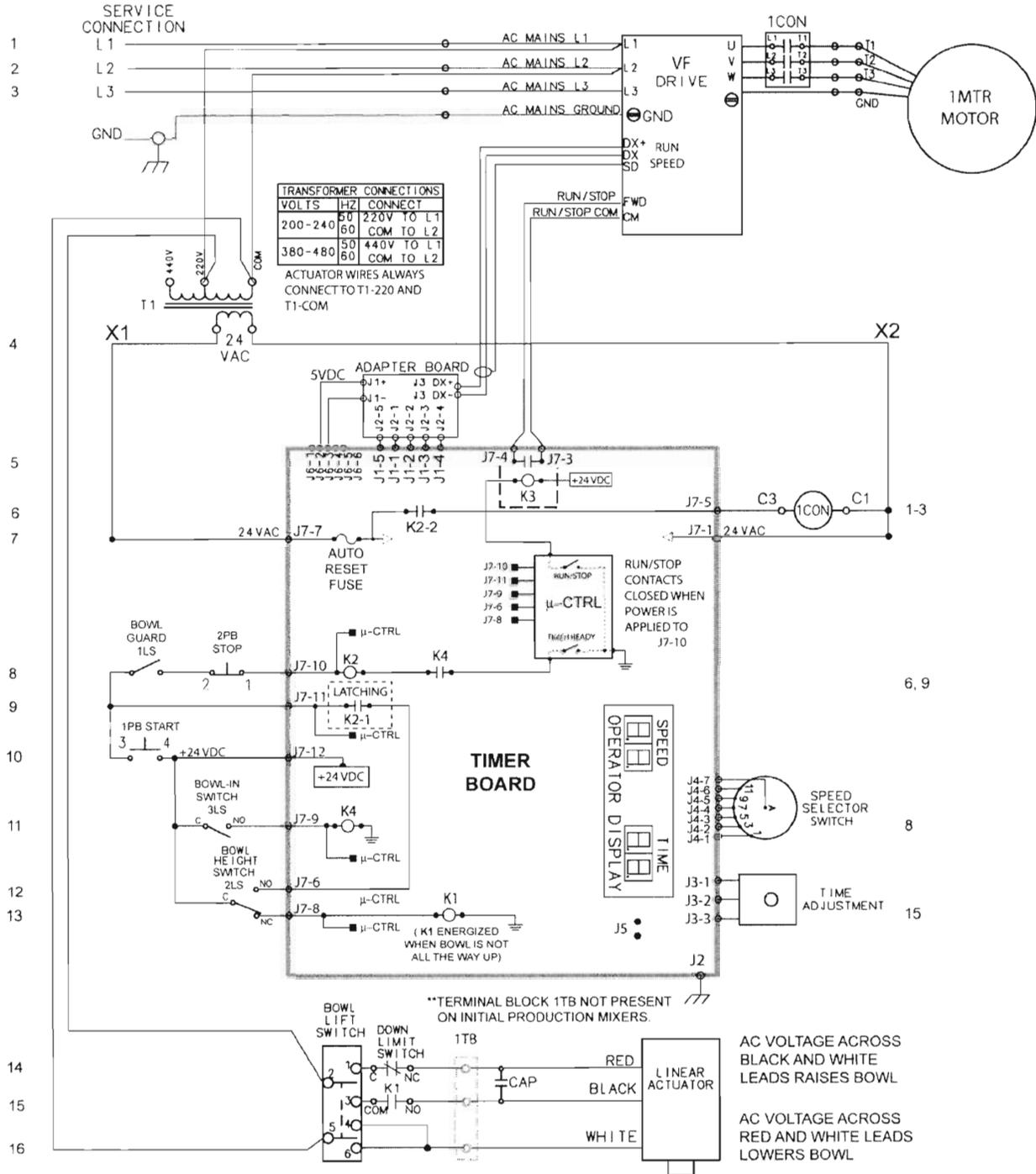
10957

Drive Mount Assembly Plate Electrical Components



AI 1772

HL800 AND HL1400 LEGACY MIXERS - ELECTRICAL OPERATION



TRANSFORMER CONNECTIONS		
VOLTS	HZ	CONNECT
200-240	50	220V TO L1
	60	COM TO L2
380-480	50	440V TO L1
	60	COM TO L2

ACTUATOR WIRES ALWAYS CONNECT TO T1-220 AND T1-COM

SWITCH STATE TABLE		
SWITCH	CONDITION	RESULT
BOWL IN	OPEN	BOWL OUT
	CLOSED	BOWL IN MIX POSITION
BOWL GUARD	OPEN	CAGE OPEN
	CLOSED	CAGE IN MIX POSITION
BOWL HEIGHT	OPEN	BOWL/YOKE NOT UP
	CLOSED	BOWL/YOKE FULLY RAISED
BOWL HEIGHT NC	OPEN	BOWL LIFT FULLY RAISED
	CLOSED	READY TO RAISE BOWL
DOWN LIMIT	OPEN	BOWL LIFT FULLY LOWERED
	CLOSED	READY TO LOWER BOWL
BOWL LIFT	OPEN	BOWL AT REST
	2&3-5&6	RAISING BOWL
	2&1-5&4	LOWERING BOWL

- INITIAL CONDITIONS**
1. NO POWER TO MIXER
 2. BOWL GUARD OPEN
 3. BOWL NOT IN
 4. BOWL YOKE IN DOWN POSITION
- TIMER READY CONTACTS OPEN**
1. DURING SELF TEST AND SPECIAL FUNCTIONS
 2. WHEN TIMER COUNTS DOWN TO ZERO
 3. NO VOLTAGE AT J7-9

Legacy 140/80
WIRING DIAGRAM
200-230/50/60/3
400-460/50/60/3



DERIVED FROM: F-34927 REV C

AI1771

COMPONENT FUNCTION

- Drive, Variable Frequency** The drive powers the AC induction three phase motor and receives Run/Stop and speed commands from the timer control board. The control board on the drive monitors input voltages and current, bus voltage condition, motor temperature and output current for each phase. The drive consists of four main devices.
 - Control Board
 - Power Board
 - Power Module
 - Bus Capacitors

- Motor (AC Induction)** Powered by three switching phase outputs from the drive, the motor provides high torque at low RPM.

- Board, Timer Control** Monitors condition inputs from various limit and position switches on the mixer. Allows operator to set mix time and operational speed. Displays an error code if a fault is recognized by the drive. Special function feature can be accessed by the technician.

- Board, Interface** Converts communications between timer control board and drive.

- Timer Encoder** Sets mix time, hold (count-up), or values when in special functions mode.

- Speed Select Switch** Sets agitator speed.

- Contactors (1CON)** Connects the drive high side phase outputs to the motor.

- Down Limit Switch** Removes power from actuator when actuator is at its lower limit of travel.

- Bowl IN Switch** Signals timer control board that bowl is in locked position on bowl support. Mixer will not run unless switch is operated.

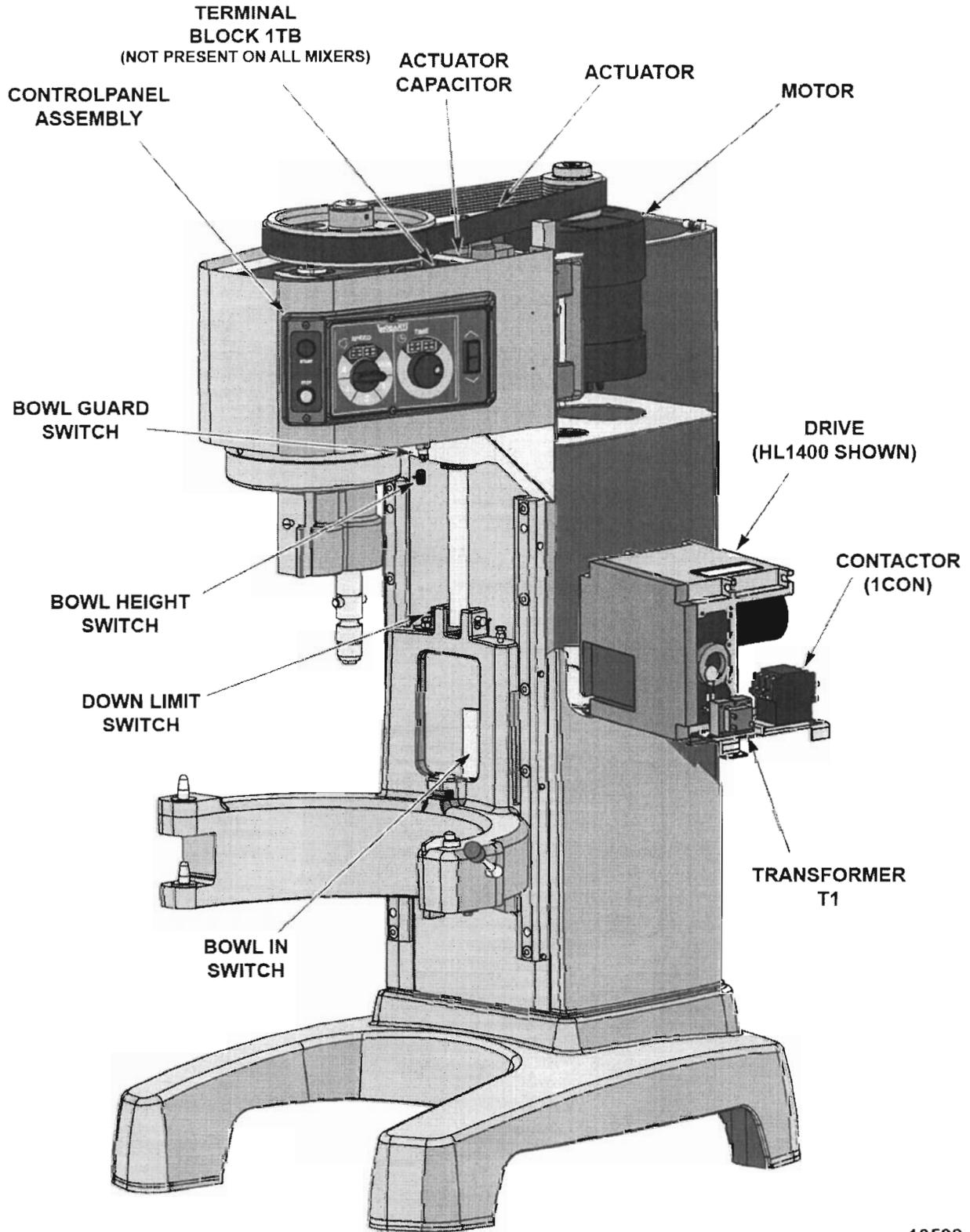
- Bowl Height Switch** When operated, allows mixer to operate in speeds other than the slow STIR. Signals timer control board that bowl is at maximum height. Sets bowl to beater clearance.

- Bowl Guard Switch** Prevents operation of agitator and attachment hub when bowl guard is open. Actuator can be raised or lowered with bowl guard open.

- Bowl Lift Switch** Controls actuator.

- Actuator** AC (230V) powered. Provides means of lifting and lowering bowl support. Contains mechanical brake controlled by solenoid (orange wire). Brake solenoid is energized when bowl lift switch is operated (up or down).

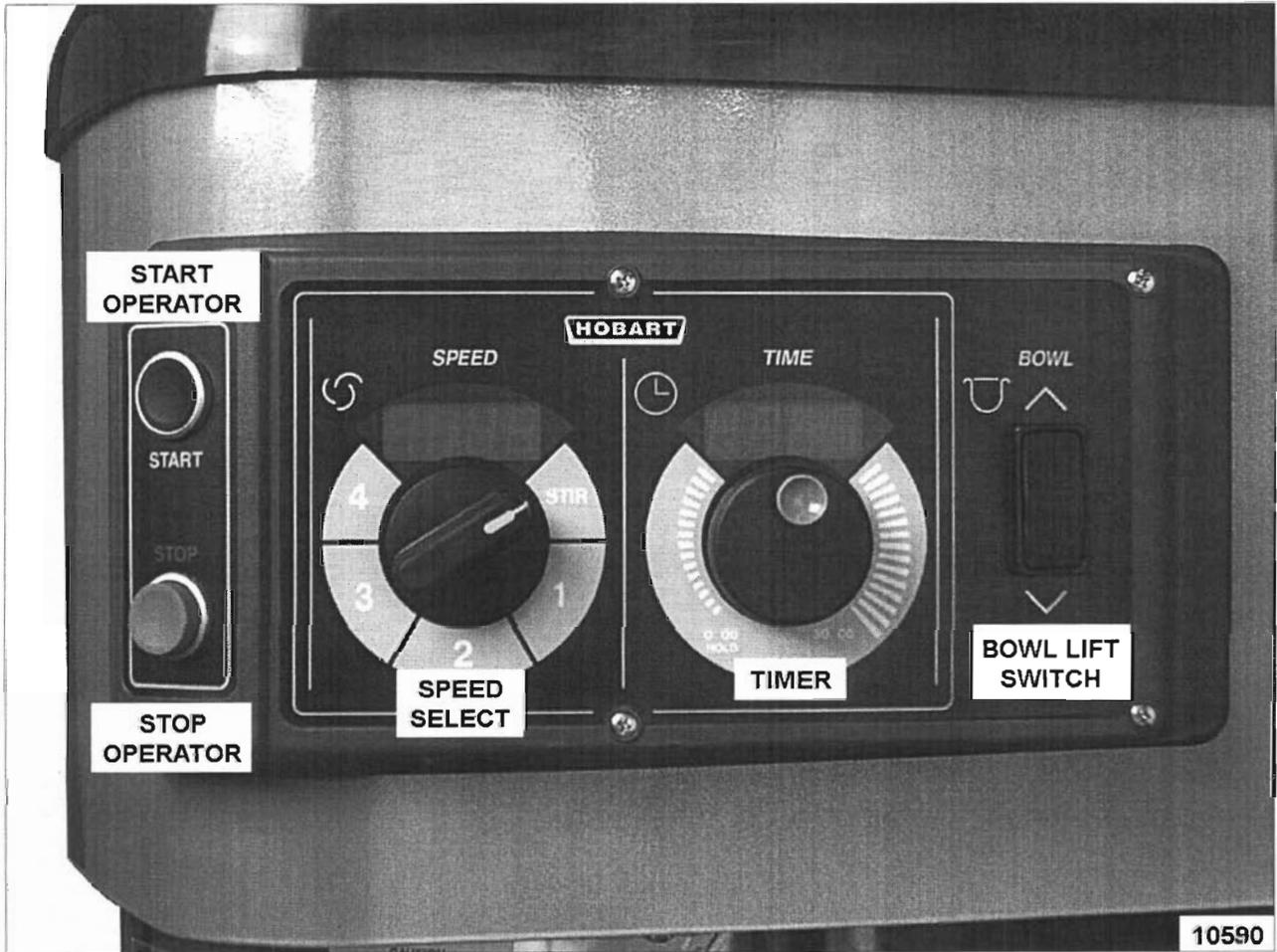
COMPONENT LOCATION



OVERALL FRONT VIEW

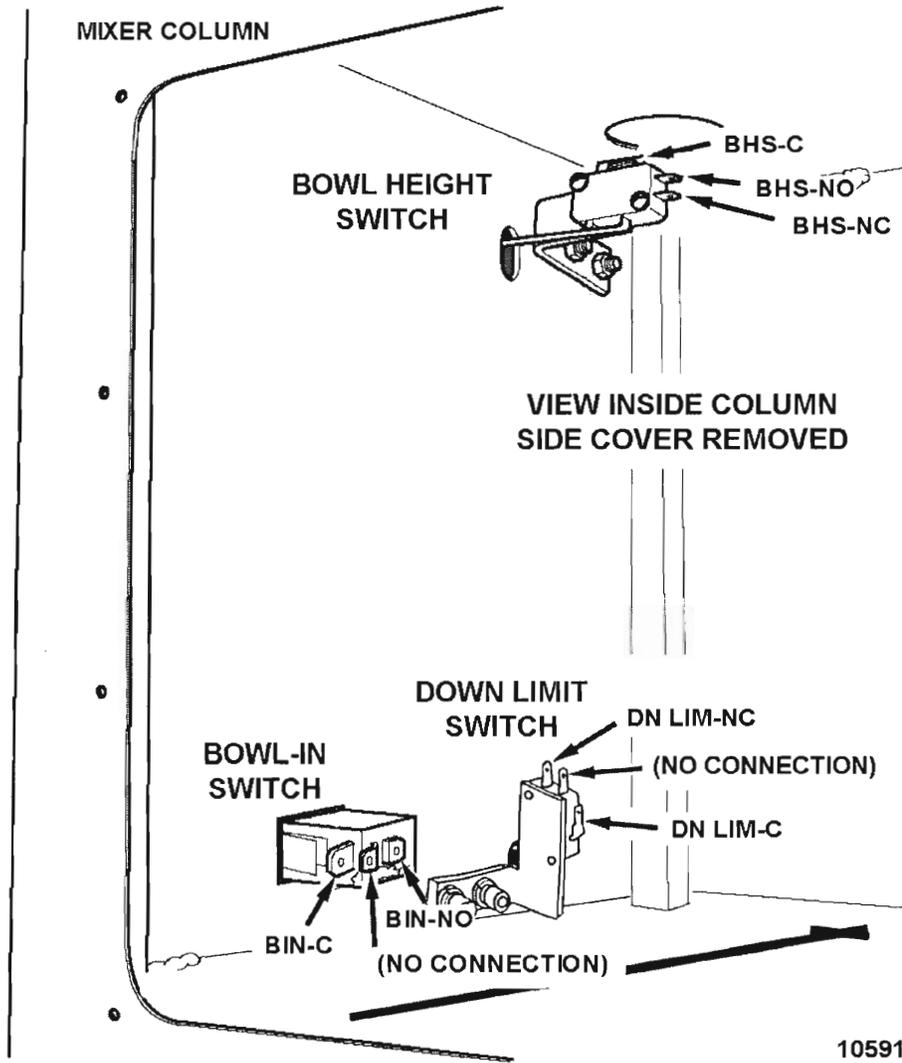
10592

Control Panel Assembly



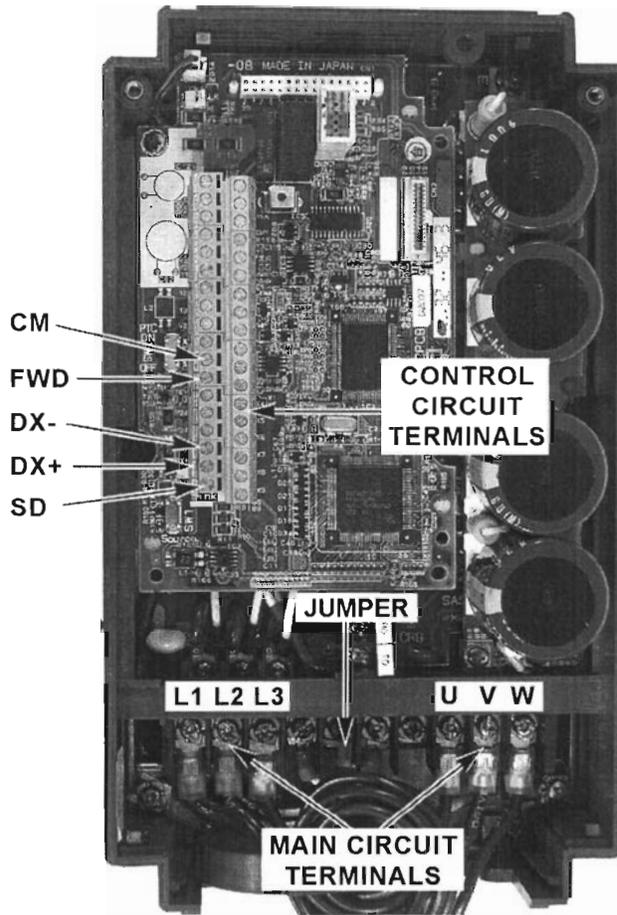
CONTROL PANEL ASSEMBLY

Column Mounted Components



Drive Layout

HL800 - DRIVE



--- LEGEND ---

CONTROL CIRCUIT TERMINALS

- CM = COMMON.
- FWD = INPUT TO DRIVE TO ACTIVATE
3 PHASE VOLTAGE OUTPUT TO MOTOR.
TIMER BOARD K3 CONTACTS CLOSED
EQUALS RUN SIGNAL.
- DX- RUN SPEED COMMUNICATIONS
- DX+ = BETWEEN DRIVE AND TIMER
BOARD.
- SD

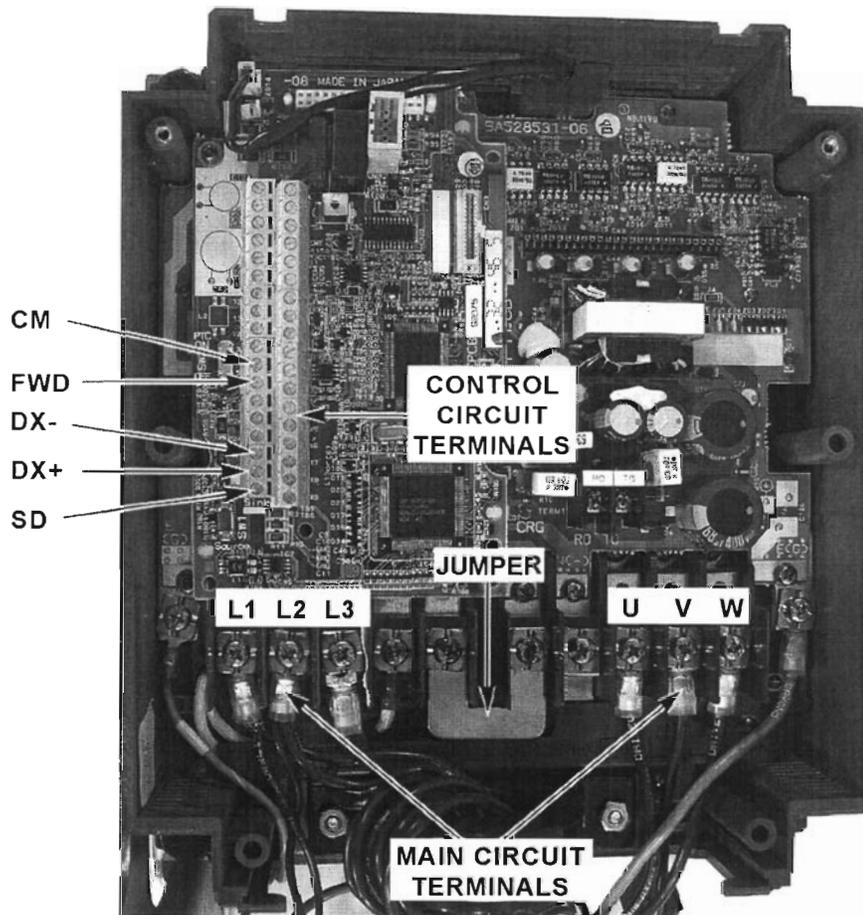
MAIN CIRCUIT TERMINALS

- L1 = LINE 1 AC VOLTAGE IN.
- L2 = LINE 2 AC VOLTAGE IN.
- L3 = LINE 3 AC VOLTAGE IN.
- G = GROUND.
- U
- V = 3 PHASE VOLTAGE
- W OUTPUT TO MOTOR*.

*OUTPUT VOLTAGE DEPENDS ON
SPEED SETTING AND MIX LOAD.

10919

HL1400 - DRIVE



--- LEGEND ---

CONTROL CIRCUIT TERMINALS

CM = COMMON.
 FWD = INPUT TO DRIVE TO ACTIVATE
 3 PHASE VOLTAGE OUTPUT TO MOTOR.
 TIMER BOARD K3 CONTACTS CLOSED
 EQUALS RUN SIGNAL.
 DX- RUN SPEED COMMUNICATIONS
 DX+ = BETWEEN DRIVE AND TIMER
 BOARD.
 SD

MAIN CIRCUIT TERMINALS

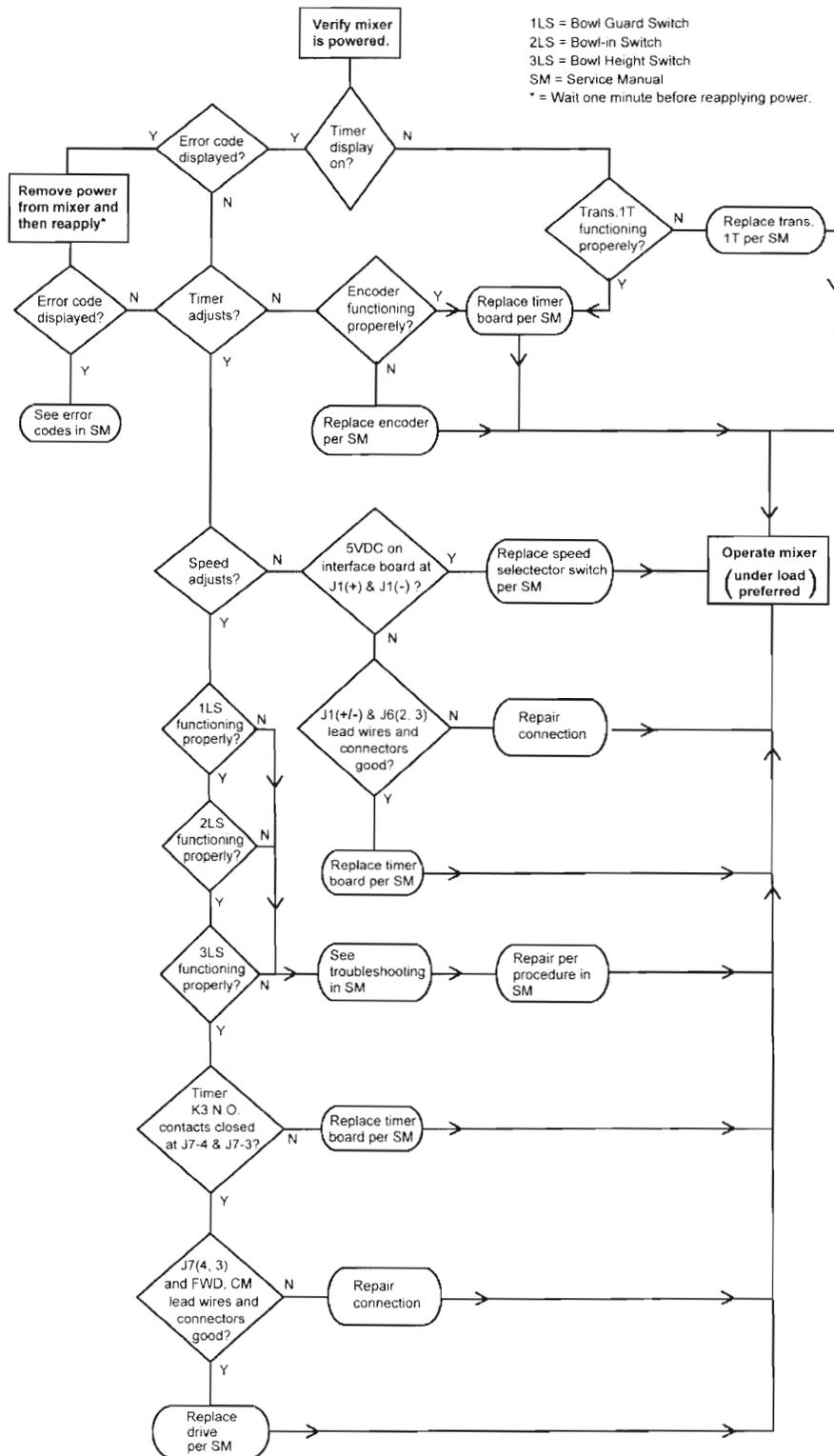
L1 = LINE 1 AC VOLTAGE IN.
 L2 = LINE 2 AC VOLTAGE IN.
 L3 = LINE 3 AC VOLTAGE IN.
 G = GROUND.
 U
 V = 3 PHASE VOLTAGE
 W OUTPUT TO MOTOR*.

*OUTPUT VOLTAGE DEPENDS ON
 SPEED SETTING AND MIX LOAD.

10920

TROUBLESHOOTING

QUICK REFERENCE FLOW CHART



A11858

NOTE: The drive constantly monitors its operation while the mixer is running. If an error occurs, the timer control will display a flashing error message (ER**) in the time speed display, where the ** will be the actual error number. The error codes are generated by and stored in the drive. The error message will continue to flash until power to the mixer is cycled and the error condition is corrected. The mixer will not operate as long as an error code exists.

ERROR CODES			
Error Code	Fault Description	Possible Causes	Suggested Actions
ER_1	Over current (Protects drive)	Low supply voltage or momentary power interruption.	<ol style="list-style-type: none"> 1. Check supply voltage to mixer. 2. Cycle power to mixer. Wait one minute for the DC bus voltage to bleed down then reconnect power.
		Batch size too large.	<ol style="list-style-type: none"> 1. Reduce batch size. See REFERENCE MATERIAL under GENERAL.
		Drive terminals U, V or W short-circuited or grounded.	<ol style="list-style-type: none"> 1. Check motor lead wire connections. 2. Check motor resistance. 3. Check resistance between drive terminals U, V & W.
ER_11	Bus over voltage 359VDC or greater on 240VAC mixers. 748VDC or greater on 460VAC mixers.	High supply voltage or drive malfunction.	<ol style="list-style-type: none"> 1. Check supply voltage to mixer. Leave meter connected and check for sudden spikes in supply voltage when mixer is turned ON (under load) along with other equipment on the same line. 2. Cycle power to mixer. Wait one minute for the DC bus voltage to bleed down then reconnect power. 3. Check DC bus circuit voltage at terminals P(+) & N (-). If voltage reading is consistently low and supply voltage is within tolerance, replace drive.
ER_12	Bus under voltage 239VDC or less on 240VAC mixers. 456VDC or less on 460VAC mixers.	Low supply voltage, momentary power interruption or drive malfunction.	<ol style="list-style-type: none"> 1. Check supply voltage to mixer. Leave meter connected and check for sudden drops in supply voltage when mixer is turned ON (under load) along with other equipment on the same line. 2. Cycle power to mixer. Wait one minute for the DC bus voltage to bleed down then reconnect power. 3. Check DC bus circuit voltage at terminals P(+) & N (-). If voltage reading is consistently low and supply voltage is within tolerance, replace drive.

ERROR CODES			
Error Code	Fault Description	Possible Causes	Suggested Actions
ER_13	Input voltage phase lost to Drive.	Phase lost on 3 phase voltage supply.	<ol style="list-style-type: none"> 1. Check supply voltage to mixer between all 3 phases with mixer off. 2. Check supply voltage to mixer with mixer turned ON (under heavy load) along with other equipment on the same line.
		Building supply voltage problem (phase lost) during peak business operation and mixer under heavy load.	<ol style="list-style-type: none"> 1. Request customer contact building owner or qualified electrician. 2. Reduce batch size. See REFERENCE MATERIAL under GENERAL.
		Drive malfunction.	<ol style="list-style-type: none"> 1. Replace drive.
Er15	Over heating of drive.	Drive heat sink temperature above 194°F.	<ol style="list-style-type: none"> 1. Disconnect power to mixer and allow drive to cool. 2. Check internal fan for operation. 3. Check drive heat sink fins for clogging. Remove debris. 4. Reduce room ambient temperature; or move mixer to a cooler location (away from heat sources).
		Drive malfunction.	<ol style="list-style-type: none"> 1. If over heating occurs repeatedly, replace drive.
Er17	drive over loaded. (Protects drive)	Mixing in Stir speed. Batch size too large. Low supply voltage causing low motor torque.	<ol style="list-style-type: none"> 1. Select Speed 1, Speed 2 or Speed 3 for mixing. 2. Reduce batch size. See REFERENCE MATERIAL under GENERAL. 3. Check supply voltage to mixer.
		Motor malfunction.	<ol style="list-style-type: none"> 1. Check motor resistance.
		Drive malfunction.	<ol style="list-style-type: none"> 1. Replace drive.
E20	Drive Internal fault.	Momentary power interruption or power loss while drive was communicating with timer board.	<ol style="list-style-type: none"> 1. Cycle power to mixer. Wait one minute for the DC bus voltage to bleed down then reconnect power. If this does not clear the error code, replace drive.

NOTE: If error code is displayed on timer board, refer to ERROR CODES for complete description.

GENERAL - ALL MODELS	
SYMPTOM	POSSIBLE CAUSE
Mixer will not run (no timer board display)	<ol style="list-style-type: none"> 1. Circuit breaker open. 2. T1 Transformer malfunction. 3. Timer board malfunction. 4. Wiring harness connections loose or malfunction.
Motor will not operate (bowl is up and display is on).	<ol style="list-style-type: none"> 1. 1PB start switch momentary contacts not closing. 2. 2PB stop switch contacts open. 3. Bowl guard switch open or malfunction ([b_gd] displayed on timer). 4. 1CON malfunction. 5. Timer board malfunction. 6. Drive malfunction. 7. Motor malfunction 8. Wiring harness connections loose or malfunction.
Mixer will not run, but timer counts up/down when 1PB start button is pushed.	<ol style="list-style-type: none"> 1. Run/Stop circuit open. 2. Run/Stop input signal to timer missing. 3. Timer board malfunction. 4. Wiring harness connections loose or malfunction.
Mixer runs, but stops when 1PB start switch is released.	<ol style="list-style-type: none"> 1. Bowl height switch malfunction. 2. Timer board malfunction.
<p>Mixer runs continuously, but will stop when 2PB stop button is held in or bowl guard is opened.</p> <p>In count-down mode, timer counts down to zero, beeps, and resets to default time. Repeats cycle continuously.</p>	<ol style="list-style-type: none"> 1. Start switch malfunction.
Mixer motor hums and does not run.	<ol style="list-style-type: none"> 1. Incorrect supply voltage. 2. 1CON malfunction. 3. Drive malfunction. 4. Motor malfunction. 5. Transmission malfunction. 6. Batch size too large. See REFERENCE MATERIAL under GENERAL.
Mixer motor shuts off during operation.	<ol style="list-style-type: none"> 1. Incorrect supply voltage. 2. Batch size too large. See REFERENCE MATERIAL under GENERAL. 3. Wiring incorrect from drive to motor. 4. Motor overheated or malfunction, drive overheated or malfunction. 5. Timer board malfunction. 6. Bowl-in switch disengaging. 7. Bowl height switch disengaging. 8. Bowl guard switch open.

GENERAL - ALL MODELS	
SYMPTOM	POSSIBLE CAUSE
Mixer lacks power.	<ol style="list-style-type: none"> 1. Incorrect supply voltage. 2. Batch size too large. See REFERENCE MATERIAL under GENERAL. 3. Belt tension incorrect. 4. Wiring incorrect from drive to motor. 5. Drive malfunction. 6. Motor malfunction. 7. Transmission malfunction.
Mixer motor runs backwards.	<ol style="list-style-type: none"> 1. Wiring incorrect from drive to motor. 2. Drive malfunction.
Mixer noisy.	<ol style="list-style-type: none"> 1. Motor malfunction. 2. Transmission gears worn (improperly meshing) low on oil or damaged. 3. Planetary gears worn (improperly meshing) or low on lubricant. 4. Agitator shaft low on grease. 5. Belt loose or worn or belt reinstalled upside down. 6. Slideway out of adjustment. 7. Worn bearing. 8. Wiring incorrect from drive to motor. 9. Drive malfunction.
Bowl lift will not raise or lower.	<ol style="list-style-type: none"> 1. Bowl-in switch contacts open. 2. Bowl height switch N.O. contacts open (bowl will not raise). 3. Timer board malfunction (K1 contacts open; (bowl will not raise). 4. Bowl down limit switch N.C. contacts open (bowl will not lower). 5. Slideways are adjusted too tight. 6. Linear actuator malfunction.
Bowl lift stalls with load in bowl.	<ol style="list-style-type: none"> 1. Slideways out of adjustment (too tight). 2. Low or no lubrication on slideways. 3. Incorrect voltage to actuator. 4. Actuator malfunction.
Banging sound when bowl support is lowered.	<ol style="list-style-type: none"> 1. Slideways out of adjustment (too tight).
Bowl support drifts downward after bowl lift switch is released.	<ol style="list-style-type: none"> 1. Actuator brake circuit malfunction.
Clunking sound when mixer is operating.	<ol style="list-style-type: none"> 1. Slideways out of adjustment (too loose). 2. Drive belt slipping. 3. Transmission gear malfunction. 4. Planetary gear malfunction. 5. Agitator shaft low on grease.
Mixer motor runs, but planetary does not rotate.	<ol style="list-style-type: none"> 1. Belt tension too loose or belt malfunction. 2. Transmission gear/key malfunction. 3. Planetary gear/key malfunction.

GENERAL - ALL MODELS	
SYMPTOM	POSSIBLE CAUSE
Mixer planetary operates, but attachment hub does not rotate.	<ol style="list-style-type: none"> 1. Bevel gear/key malfunction. 2. Attachment bevel pinion malfunction. 3. Bevel gear and pinion out of adjustment.
Oil leak.	<ol style="list-style-type: none"> 1. Transmission planetary seal malfunction. 2. Attachment hub not sealed properly to transmission case. 3. Drain plug not sealed or installed properly.
Not mixing ingredients at bottom of bowl.	<ol style="list-style-type: none"> 1. Bowl to beater clearance set incorrectly. 2. Bowl height switch actuator arm bent. 3. Batch recipe incorrect. See REFERENCE MATERIAL under GENERAL. 4. Incorrect agitator for recipe.
Mixer appears to run in wrong speed.	<ol style="list-style-type: none"> 1. Speed selector switch malfunction. 2. Timer board set to wrong model type or timer board malfunction. 3. Communication cable malfunction. 4. Drive malfunction. 5. Motor malfunction.
Mixer runs in one speed only (changing speed on timer board has no affect).	<ol style="list-style-type: none"> 1. Speed select switch malfunction. 2. Communications cable malfunction. 3. Interface board malfunction. 4. Timer board malfunction. 5. Drive malfunction.
Can not adjust time.	<ol style="list-style-type: none"> 1. Timer encoder malfunction. 2. Timer board malfunction. 3. Wiring connections loose or malfunction.
Bowl lock frozen.	<ol style="list-style-type: none"> 1. Contaminates between bowl pin or handle and bushing. 2. Mechanical malfunction.
Timer problems Timer does not count up. Timer does not count down. Mixer will not shut off at end of timed cycle. Segment missing. Won't go into hold.	<ol style="list-style-type: none"> 1. Timer board malfunction.

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CONDENSED SPARE PARTS LIST

LEGACY HL800 & HL1400 QUART MIXERS	
Part No.	Description
874684	Timer Board
916183-1	Drive, HL1400 (10 HP)
916184-1	Drive, HL800 (5 HP)
87711-322-3	Contact Block (Start Switch)
87711-322-4	Contact Block (Stop Switch)
875723	Encoder Assembly (Time Selection)
875724	Knob, Timer
874631	Potentiometer Assembly (Speed Selection)
874630	Speed Select Knob
87711-330-1	Rocker Switch (Bowl Lift)
87713-107-4	Contactactor
294500-54	Transformer
87711-248	Bowl Height Switch (Bowl Up)
87711-338	Front Panel Switch (Bowl In)
874958-2	Reed Switch and Plug (Bowl Guard)
874493	Belt
68045	Oil Seal

SECTION 4

CATALOG OF REPLACEMENT PARTS

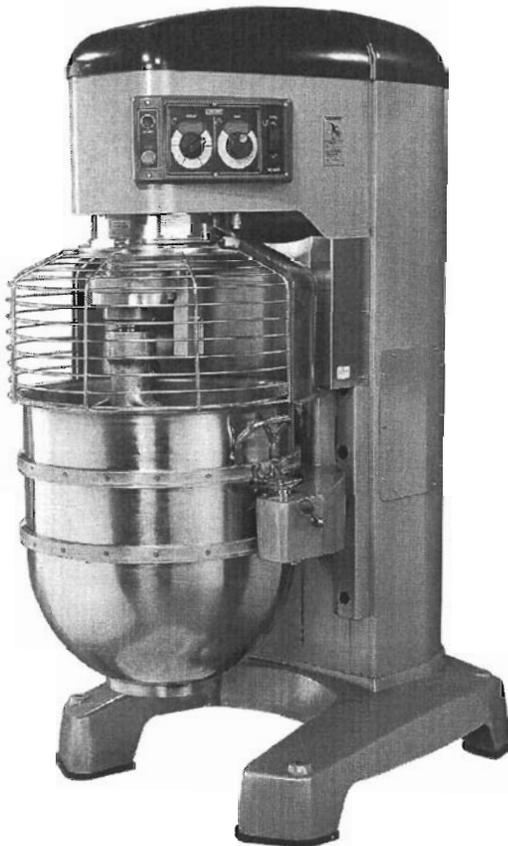
HOBART LEGACY

80 & 140 QUART MIXERS

MODELS HL800 & HL1400



CATALOG OF REPLACEMENT PARTS



LEGACY MIXER

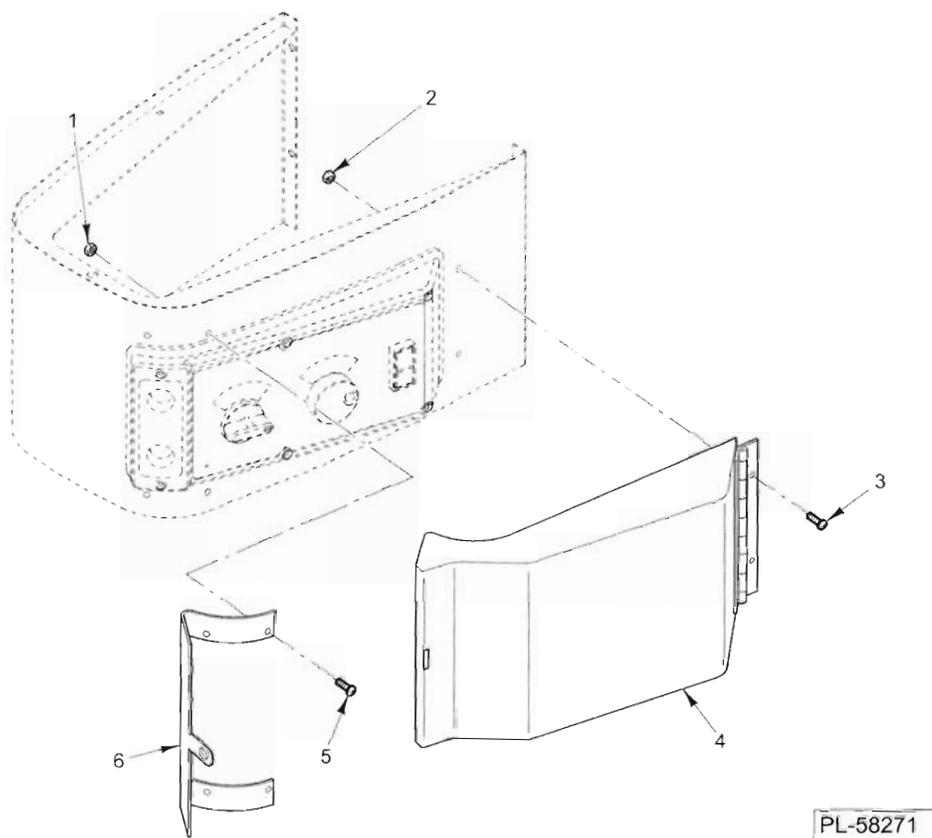
HL800	ML-134306
HL800C	ML-134322
HL1400	ML-134334
HL1400C	ML-134337

PRIOR MLS COVERED IN THIS MANUAL

HL1400	ML-134300
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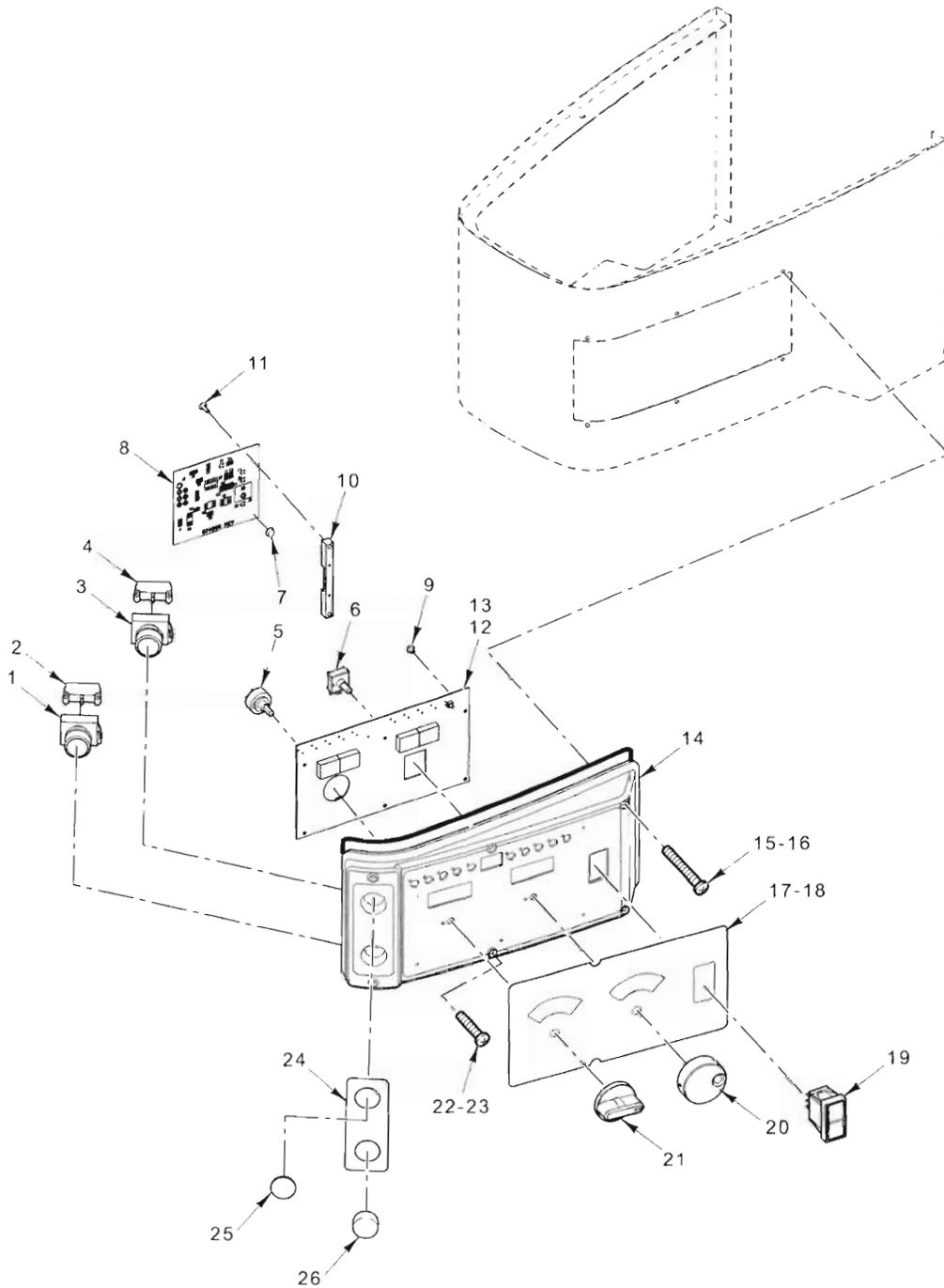
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**CONTROL PANEL COVER (HL800C & HL1400C)
(ML-134322 & ML-134337)**

ILLUS. PL-58271	PART NO.	NAME OF PART	AMT.
1	NS-038-04	Lock Nut 1/4-20 Hex.....	4
2	NS-038-04	Lock Nut 1/4-20 Hex.....	2
3	SC-128-74	Mach. Screw 1/4-20 x 5/8 Tx. Button Hd. (SST).....	2
4	00-874526	Cover Assy.....	1
5	SC-128-74	Mach. Screw 1/4-20 x 5/8 Tx. Button Hd. (SST).....	4
6	00-874530	Hasp.....	1

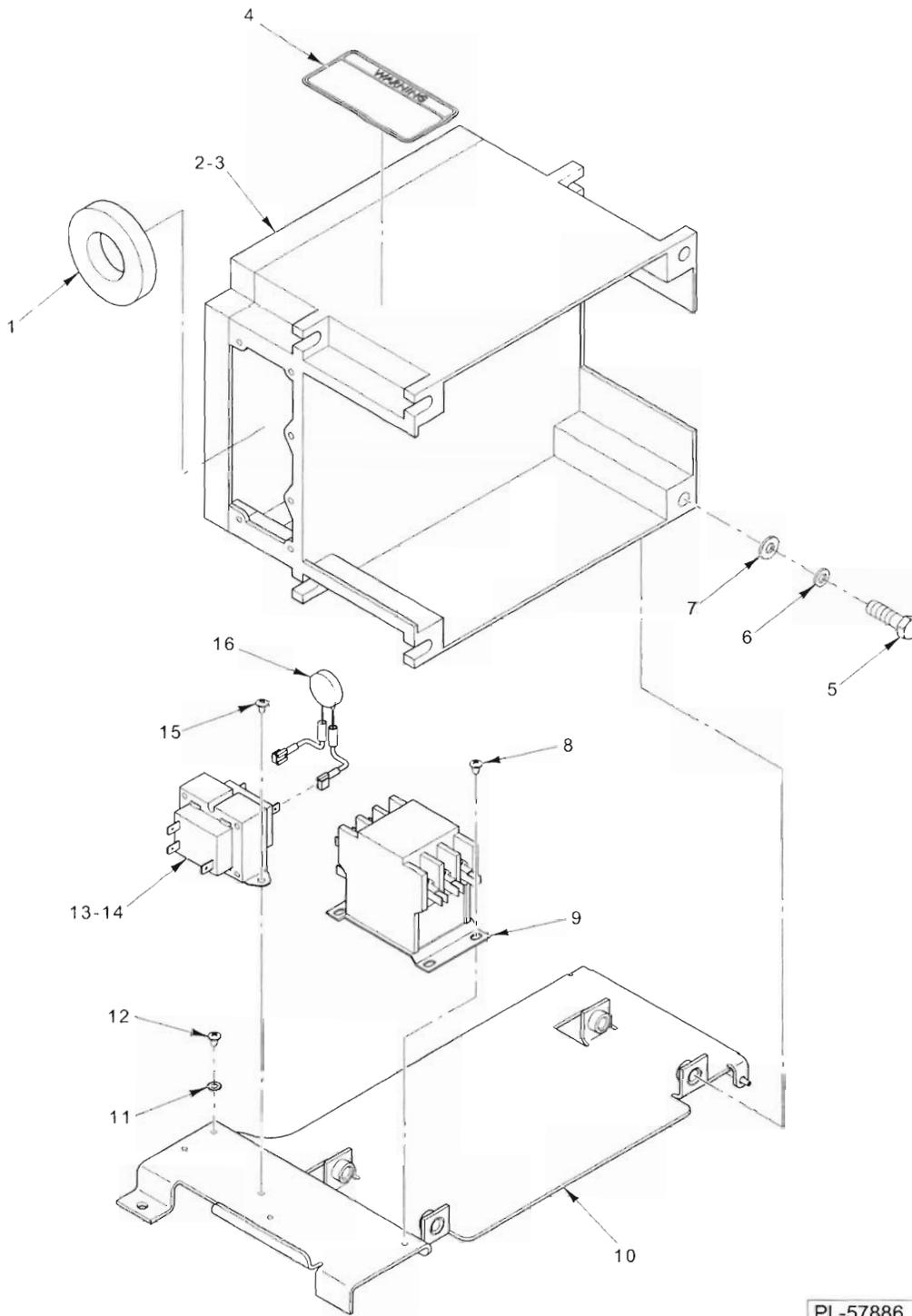


PL-58270

CONTROL PANEL

CONTROL PANEL

ILLUS. PL-58270	PART NO.	NAME OF PART	AMT.
1	00-478752-00002	Switch – Operator (Start).....	1
2	00-087711-322-3	Block – Contact (Start).....	1
3	00-478752-00001	Switch – Operator (Stop).....	1
4	00-087711-322-4	Block – Contact (Stop).....	1
5	00-874631	Selector – Switch Assy. (Speed Selector).....	1
6	00-875723	Encoder Assy. (Time Selector).....	1
7	00-916063	Bumper.....	1
8	00-874922	Interface – Circuit Board Assy.....	1
9	SD-039-23	Self-Tapping Screw 6-32 x 1/4 Hex. Washer Hd., Type RL.....	6
10	00-916061	Block – Interface.....	1
11	SD-038-49	Self-Tapping Screw 6-32 x 1/2 Hex. Washer Hd., Type RL.....	2
12	00-874684	PCB Assy. (Timer Board).....	1
13	00-874685	PCB Assy. (Timer Board) (With Recipe Timer).....	1
14	00-873945	Panel – Control.....	1
15	SC-128-40	Mach.Screw 8-32 x 2 1/4 Phil. Oval Hd (ML-134300, ML134306, & ML-134334).....	2
16	00-874468	Extension – Screw (ML-134322 & ML-134337).....	2
17	00-916231	Label – Overlay.....	1
18	00-916232	Label – Overlay (With Recipe Timer).....	1
19	00-087711-330-1	Switch – Rocker (Bowl Lift).....	1
20	00-875724	Knob – Timer.....	1
21	00-874630	Knob – Speed Selector.....	1
22	SC-128-39	Mach. Screw 8-32 x 1 1/2 Phil. Hd. (SST).....	4
23	SC-128-84	Mach. Screw 8-32 x 1/2 Tx. Flat Hd. (SST) (ML-134322 & ML-134337).....	1
24	00-875963	Label (Mix/Stop).....	1
25	00-478753-00001	Cap – Round Push Button (Flush).....	1
26	00-478751-00001	Cap – Round Push Button (Extended).....	1

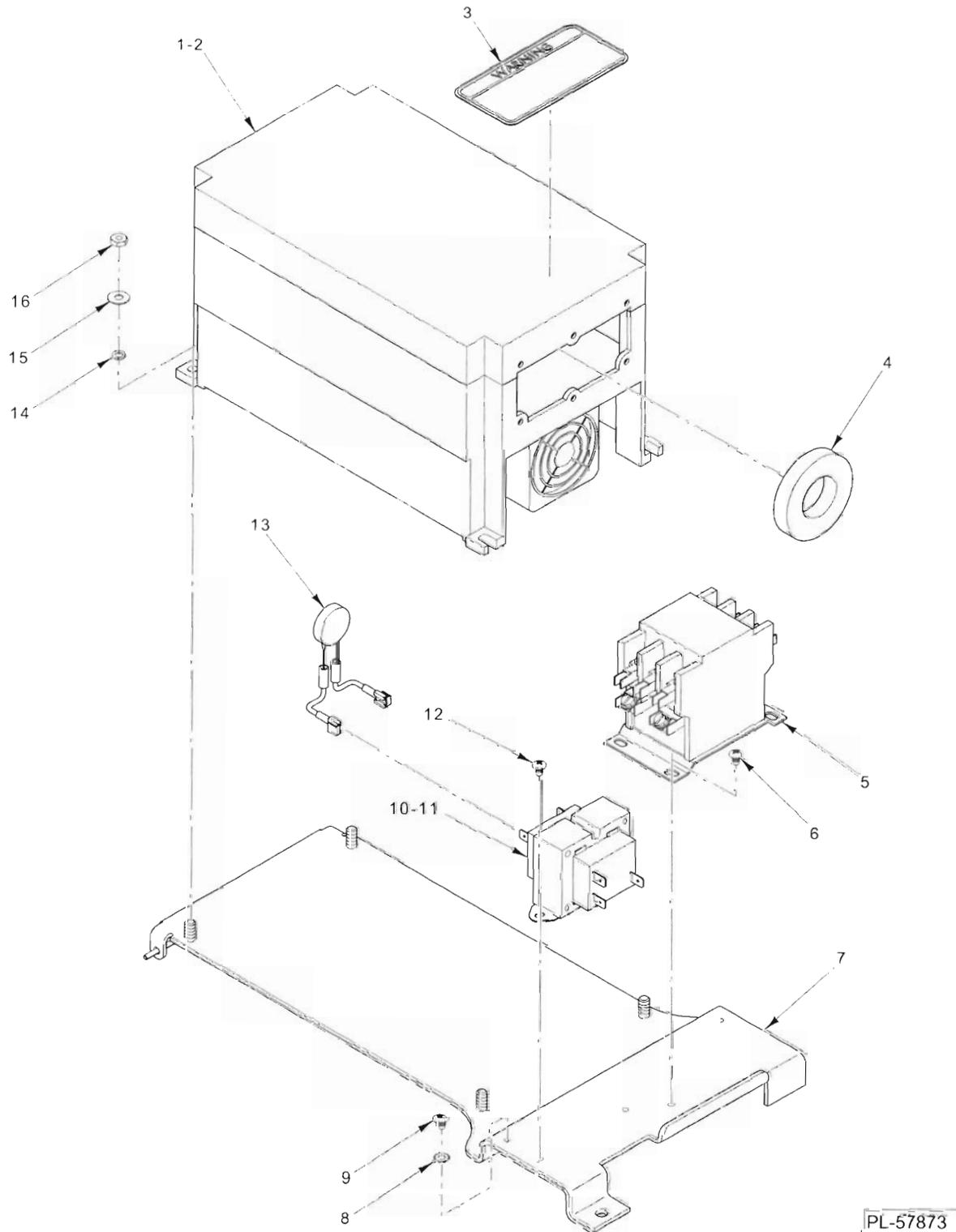


PL-57886

**ELECTRICAL COMPONENTS (HL1400 SERIES)
(ML-134300, ML-134334, & ML-134337)**

**ELECTRICAL COMPONENTS (HL1400 SERIES)
(ML-134300, ML-134334, & ML-134337)**

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-57886			
1	00-916185-00001	Ferrite	1
2	00-916183-00001	Drive – Controller (230 V.)	1
3	00-916183-00002	Drive – Controller (460 V.)	1
4	00-438131-00174	Label – Warning.....	1
5	SC-118-09	Cap Screw 3/8-16 x 1 1/4 Hex. Hd.	4
6	WL-004-02	Lockwasher 3/8 Helical.....	4
7	WS-006-36	Washer.....	4
8	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	2
9	00-087713-107-4	Contact (30 Amp./Aux., 3 Ph.)	1
10	00-875974	Plate – Drive Mount Assy.....	1
11	WL-007-06	Lockwasher #8 External	1
12	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	1
13	00-294500-00054	Transformer (208-240 V.).....	1
14	00-913588	Transformer (460 V.).....	1
15	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	2
16	00-916176	IC MOV Sub-Assy. (230 V.)	1
	00-916361-00001	Harness – Main Power	1

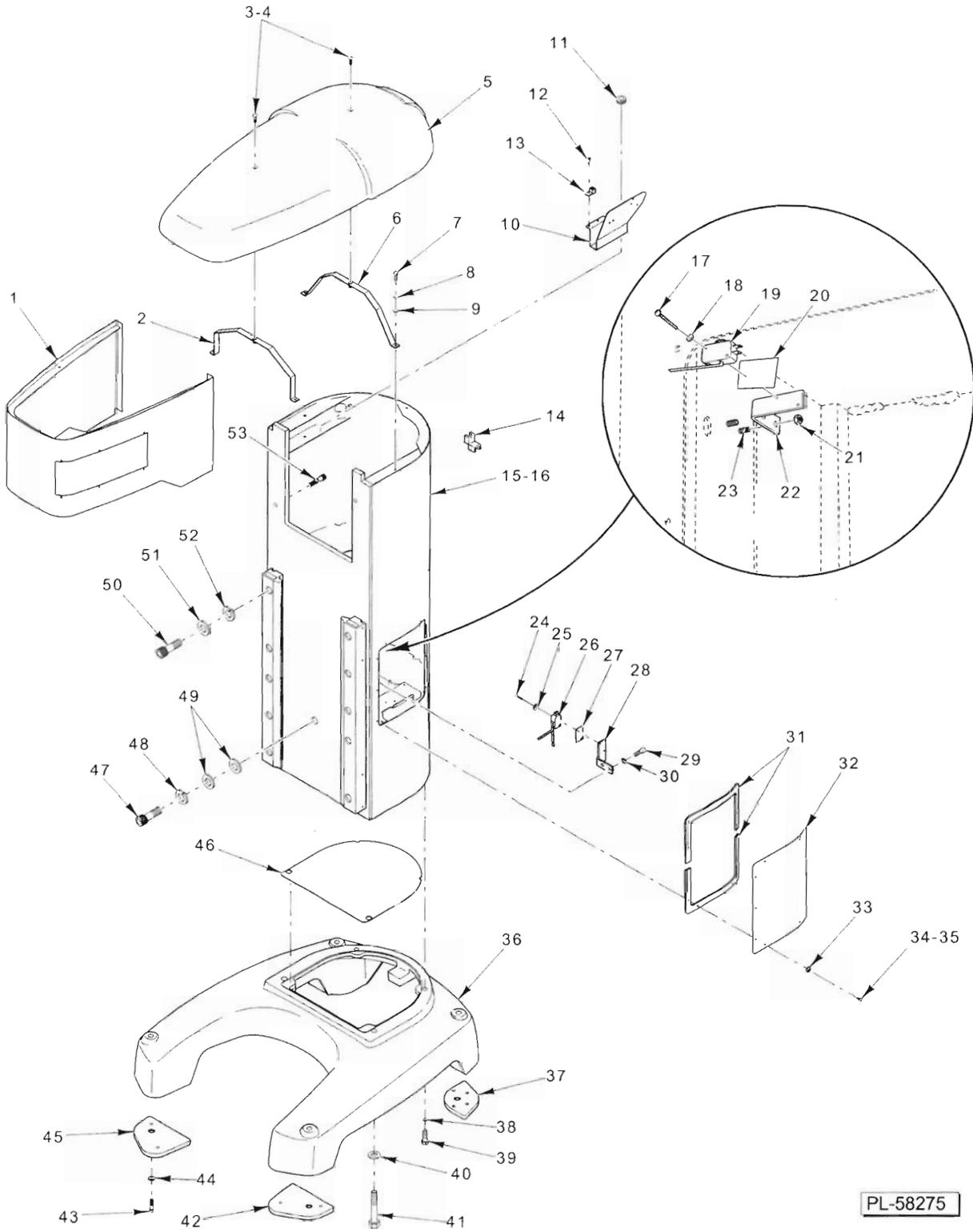


PL-57873

**ELECTRICAL COMPONENTS (HL800 SERIES)
(ML-134306 & ML-134322)**

**ELECTRICAL COMPONENTS (HL800 SERIES)
(ML-134306 & ML-134322)**

ILLUS. PL-57873	PART NO.	NAME OF PART	AMT.
1	00-916184-00001	Drive – Controller (230 V.)	1
2	00-916184-00002	Drive – Controller (460 V.)	1
3	00-438131-00174	Label – Warning	1
4	00-916185-00001	Ferrite	1
5	00-087713-107-4	Contactora (30 Amp./Aux., 3 Ph.)	1
6	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	2
7	00-916098	Plate – Drive Mount Assy.	1
8	WL-007-06	Lockwasher #8 External	1
9	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	1
10	00-294500-00054	Transformer (208-240 V.)	1
11	00-913588	Transformer (460 V.)	1
12	SD-015-39	Self-Tapping Screw 8-32 x 1/4 Phil. Pan Hd., Type TT	2
13	00-916176	IC MOV Sub-Assy. (230 V.)	1
14	WS-002-51	Washer	4
15	WL-003-22	Lockwasher #10 Helical	4
16	NS-009-22	Nut 10-24 Hex	4
	00-916361-00001	Harness – Main Power	1

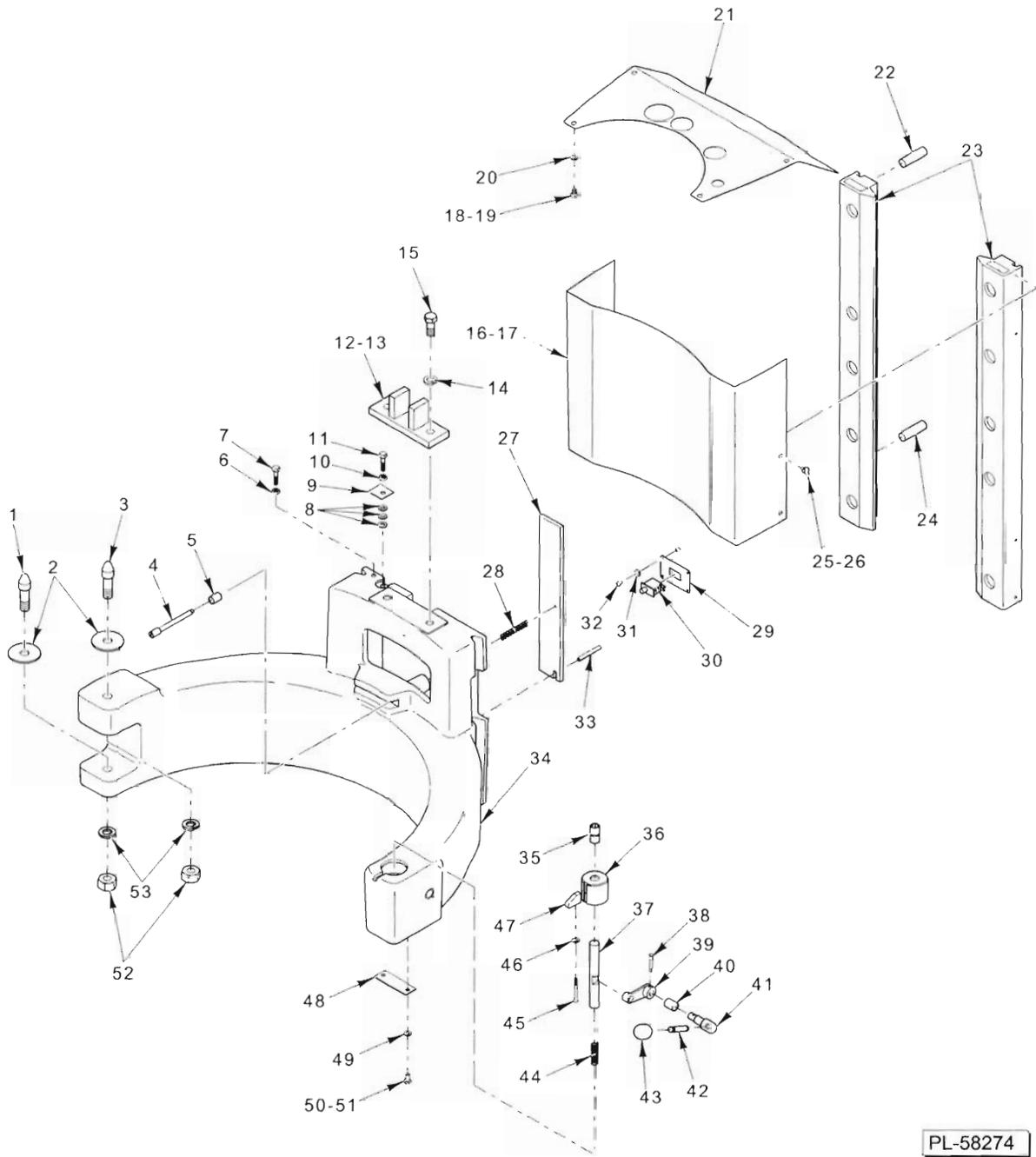


BASE AND PEDESTAL

PL-58275

BASE AND PEDESTAL

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58275			
1	00-875860	Wrapper Assy. – Transmission.....	1
2	00-874569	Strap Assy. – Top Cover.....	1
3	SC-120-29	Mach. Screw 1/4-20 x 1 Phil. Oval Hd.(ML-134300, ML-134306, & ML-134334).....	2
4	SC-128-63	Mach. Screw 1/4-20 x 2 Tx. Flat Hd. (SST) (ML-134322 & ML-134337).....	1
5	00-875786	Top – Cover.....	1
6	00-874571	Strap Assy. – Top Cover.....	1
7	SC-036-06	Cap Screw 1/4-20 x 1 Hex Hd.....	5
8	WL-003-38	Lockwasher 1/4 Helical.....	4
9	WS-003-43	Washer.....	4
10	00-916173	Shield – Wire.....	1
11	FE-021-13	Grommet.....	1
12	SD-029-02	Self-Tapping Screw 10-24 Slotted Pan Hd., Type F.....	2
13	00-118544-00002	Lug – Ground.....	1
14	00-875918	Protector – Edge.....	1
15	00-916056-00002	Pedestal (ML-134306 & ML-134322).....	1
16	00-916051-00002	Pedestal (ML-134300, ML-134334, & ML-134337).....	1
17	SC-060-40	Mach. Screw 4-40 x 3/8 Slotted Rd. Hd.....	2
18	WL-003-03	Lockwasher # 4 Helical.....	2
19	00-087711-00248	Switch – Bowl Height.....	1
20	00-873376	Insulator.....	1
21	NS-009-30	Nut 10-32 Hex.....	2
22	00-874578	Bracket – Bowl Height Switch.....	1
23	00-113631-00040	Stud – Self-Clinching.....	2
24	SC-060-40	Mach. Screw 4-40 x 3/8 Slotted Rd. Hd.....	2
25	WL-003-03	Lockwasher # 4 Helical.....	2
26	00-087711-00248	Switch – Down Limit.....	1
27	00-873376	Insulator.....	1
28	00-873371	Bracket – Down Limit Switch.....	1
29	SC-089-02	Cap Screw 1/4-20 x 3/4 Hex Socket Hd.....	2
30	WL-003-38	Lockwasher 1/4 Helical.....	2
31	00-875815	Seal – Side Panel.....	2
32	00-874386-00001	Cover – Side.....	1
33	WS-023-22	Washer (SST).....	8
34	SD-009-41	Self-Tapping Screw 8-32 x 3/8 Phil. Pan Hd. (SST) (ML-134300, ML-134306, & ML-134334).....	8
35	SC-128-66	Mach. Screw 8-32 x 1/2 Tx. Button Hd. (SST) (ML-134322 & ML-134337).....	8
36	00-873960-003-2	Base.....	1
37	00-874149	Pad – Foot (Rear).....	1
38	WL-004-11	Lockwasher 1/2 Helical.....	2
39	SC-037-01	Cap Screw 1/2-13 x 1 1/2 Hex Hd.....	2
40	WL-004-19	Lockwasher 5/8 Helical.....	2
41	SC-037-36	Cap Screw 5/8-11 x 3 1/2 Hex Hd.....	2
42	00-874150	Pad – Rear.....	2
43	SC-110-03	Cap Screw 3/8-16 x 3/4 Socket Hex Hd.....	8
44	WS-005-49	Washer.....	8
45	00-874153	Pad – Foot.....	1
46	00-874327	Plate – Pedestal Bottom.....	1
47	SC-110-55	Cap Screw 1/2-30 x 1 1/4 Socket Hex Hd.....	1
48	WL-004-11	Lockwasher 1/2 Helical.....	1
49	WS-008-04	Washer.....	2
50	SC-040-69	Cap Screw 1/2-20 x 2 Hex Soc. Hd.....	10
51	WL-004-11	Lockwasher 1/2 Helical.....	10
52	WS-008-04	Washer.....	10
53	SC-120-38	Cap Screw 5/16-18 x 1 Hex Hd.....	4
	00-916443-00001	Seal.....	1

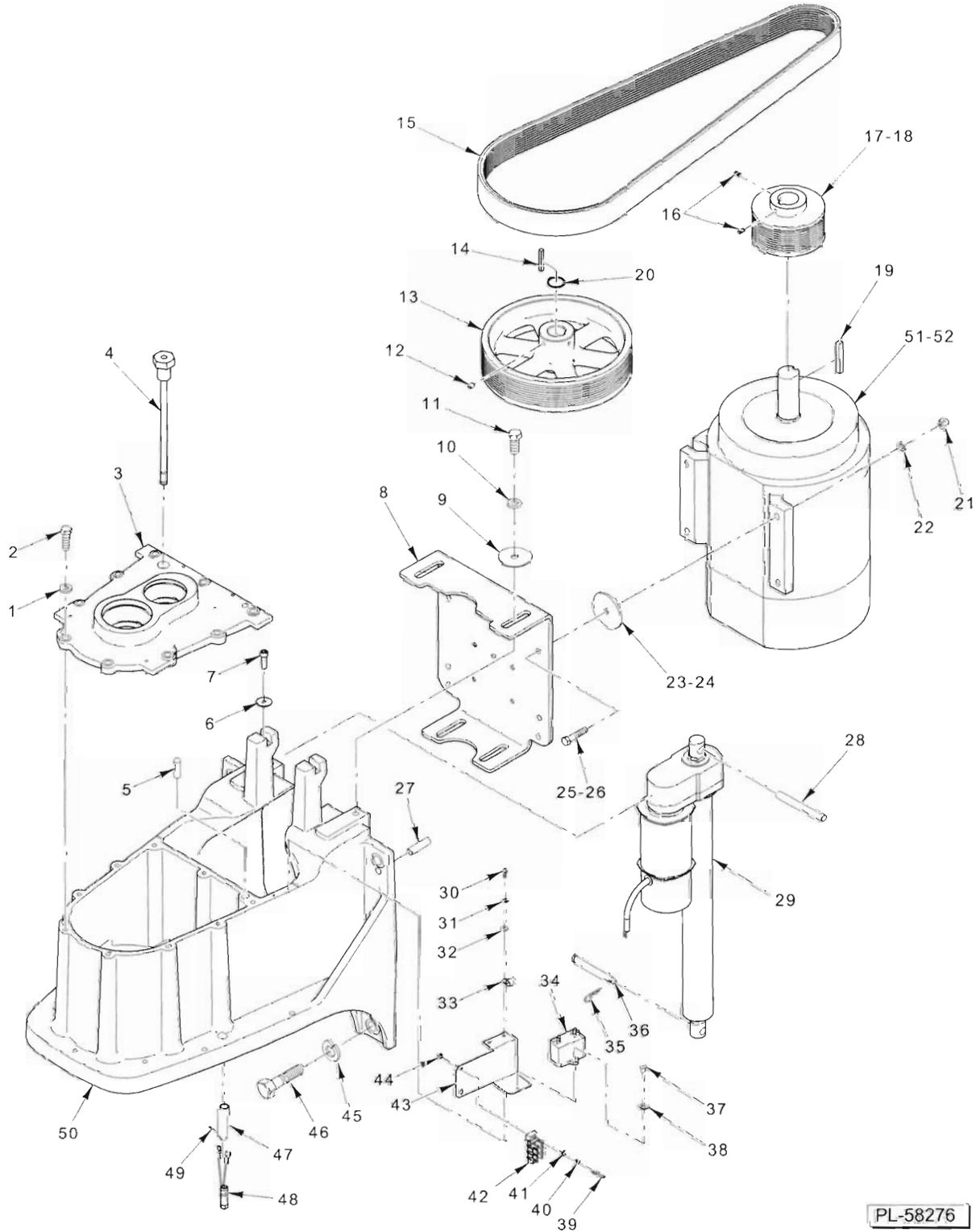


PL-58274

BOWL SUPPORT

BOWL SUPPORT

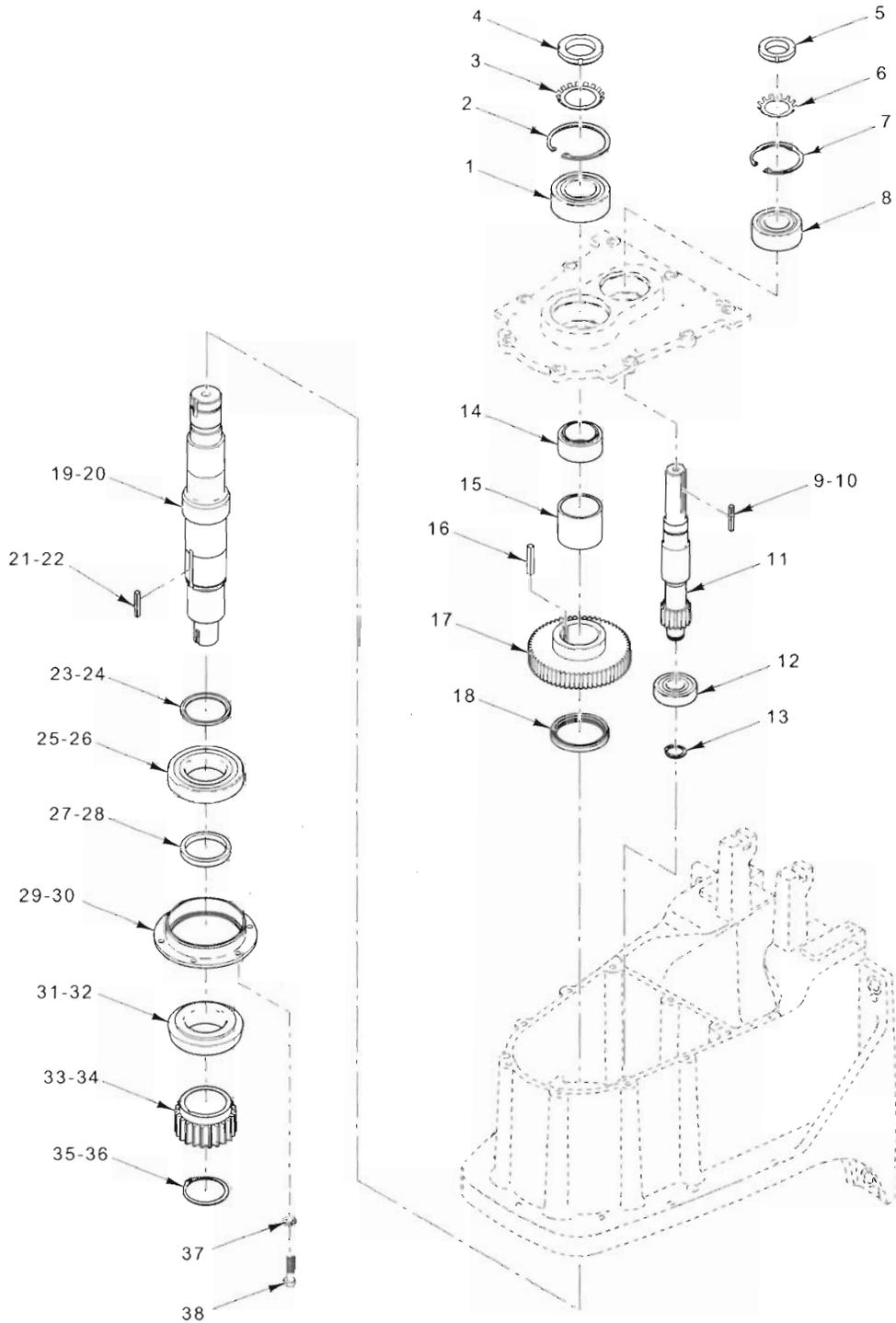
ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58274			
1	00-916021	Pin – Bowl.....	1
2	00-916022	Bushing – Bowl Support	2
3	00-916351	Pin – Upper Bowl.....	1
4	00-874387	Pin – Limit.....	1
5	00-874492	Bushing – Bowl In	1
6	NS-013-14	Nut ⁵ / ₁₆ -18 Hex	1
7	SC-041-13	Cap Screw ³ / ₁₆ -18 x 1 Hex Hd. (SST)	1
8	WS-006-36	Washer.....	3
9	00-916359	Plate – Stop Bowl Travel.....	1
10	NS-013-14	Nut ⁵ / ₁₆ -18 Hex	1
11	SC-041-13	Cap Screw ³ / ₁₆ -18 x 1 Hex Hd. (SST)	1
12	00-873352-00002	Actuator – Bracket (ML-134300, ML-134334, & ML-134337).....	1
13	00-873352-00003	Actuator – Bracket (ML-134306 & ML-134322).....	1
14	WL-004-11	Lockwasher ¹ / ₂ Helical.....	2
15	SC-062-88	Cap Screw ¹ / ₂ -13 x 1 ¹ / ₄ Hex Hd.	2
16	00-916087	Apron – Back (ML-134306 & ML-134322).....	1
17	00-916088	Apron – Back (ML-134300, ML-134334, & ML-134337).....	1
18	SC-041-86	Cap Screw ¹ / ₄ -20 x ³ / ₈ Hex Hd. (ML-134300, ML-134334, & ML-134306).....	4
19	SC-128-80	Mach. Screw 10-32 x ³ / ₈ Phil. Fil. Hd.(ML-134322 & ML-134337).....	4
20	WL-006-17	Lockwasher ³ / ₈ Helical.....	4
21	00-874597	Apron – Top.....	1
22	00-011800-00143	Pin – Dowel ¹ / ₂ x 1 ³ / ₄ SAE	2
23	00-479598	Slideway	2
24	00-011800-00143	Pin – Dowel ¹ / ₂ x 1 ³ / ₄ SAE	2
25	00-070641-00009	Screw – Thumb.....	4
26	SC-128-69	Mach. Screw 10-24 x ³ / ₈ Tx. Button Hd. (SST) (ML-134322 & ML-134337).....	4
27	00-874566-00002	Plate – Bowl In Switch	1
28	00-873377	Spring – Bowl Pin	1
29	00-874479	Plate – Bowl In Switch	1
30	00-087711-00338	Switch – Bowl In	1
31	WL-003-12	Lockwasher #8 Helical.....	2
32	SC-018-33	Mach. Screw 8-32 x ⁵ / ₁₆ Phil. Pan Hd.....	2
33	RP-004-28	Pin – Roll 0.250	1
34	00-873337	Yoke – Bowl.....	1
35	00-874390	Bushing – Bowl Lock	1
36	00-874376	Button – Bowl Rest	1
37	00-874391	Pin – Bowl	1
38	00-874388	Detent – Clevis Pin	1
39	00-874218	Clevis – Bowl Lock.....	1
40	00-874138	Bushing – Bowl Pin	1
41	00-874220	Handle – Bowl Pin	1
42	00-874197	Shaft – Bowl Pin Handle	1
43	00-875356	Handle – Lift Lever.....	1
44	00-874198	Spring – Bowl Pin	1
45	SC-092-27	Cap Screw 8-32 x 1 ³ / ₄ Hex Socket Hd.....	1
46	WL-003-12	Lockwasher #8 Helical.....	1
47	00-874380	Ramp – Wear.....	1
48	00-874199	Strap – Spring Retaining.....	1
49	WL-003-38	Lockwasher ¹ / ₄ Helical.....	2
50	SC-036-14	Cap Screw ¹ / ₄ -20 x ¹ / ₂ Hex Hd. (ML-134300, ML-134334, & ML-134306).....	2
51	SC-121-72	Mach. Screw ¹ / ₄ -20 x ¹ / ₂ Tx. Button Hd. (SST) (ML-134322 & ML-134337).....	2
52	NS-013-40	Nut ⁵ / ₈ -11 Hex.....	2
53	WL-004-18	Lockwasher ³ / ₈ Helical	2
	00-874139	Handle Assy. – Bowl Lock (Incls. Items 41, 42, & 43) (ML-134300, ML-134334, & ML-134306)	1
	00-874139-00002	Handle Assy. – Bowl Lock (Incls. Items 41, 42, & 43) (ML-134322 & ML-134337)	1



TRANSMISSION CASE AND MOTOR

TRANSMISSION CASE AND MOTOR

ILLUS.	PART NO.	NAME OF PART	AMT.
	PL-58276		
1	WL-019-09	Lockwasher $\frac{3}{8}$ Helical.....	9
2	SC-118-09	Cap Screw $\frac{3}{8}$ -16 x $1\frac{1}{4}$ Hex Hd.....	9
3	00-874653	Cover – Transmission.....	1
4	00-916182	Dipstick – Weldment.....	1
5	00-557555	Dowel.....	2
6	00-916352	Washer – Flat.....	2
7	SC-040-15	Cap Screw $\frac{5}{16}$ -18 x $1\frac{1}{4}$ Hex Socket Hd.....	2
8	00-874441-00002	Plate – Motor Mounting.....	1
9	WS-008-40	Washer.....	4
10	WL-019-11	Lockwasher $\frac{1}{2}$ Helical.....	4
11	SC-062-88	Cap Screw $\frac{1}{2}$ -13 x $1\frac{1}{4}$ Hex Hd.....	4
12	SC-075-15	Set Screw $\frac{5}{16}$ -18 x $\frac{3}{8}$ Hex Hdls., Cup Pt.....	2
13	00-916003	Sheave – Driven (10L).....	1
14	00-875419-00069	Key – Chamfered.....	1
15	00-874493	Belt.....	1
16	SC-075-15	Set Screw $\frac{5}{16}$ x $\frac{3}{8}$ Hex Hdls., Cup Pt.....	2
17	00-875805	Sheave – Drive (ML-134300, ML-134334, & ML-134337).....	1
18	00-875939	Sheave – Motor (ML-134306 & ML-134322).....	1
19	00-875419-00081	Key $\frac{5}{16}$ x $\frac{5}{16}$ x $2\frac{3}{8}$	1
20	RR-007-02	Retaining Ring.....	1
21	NS-013-22	Nut $\frac{3}{8}$ -16 Hex.....	4
22	WL-004-06	Lockwasher $\frac{3}{8}$ Helical.....	4
23	00-875940	Spacer (ML-134306 & ML-134322).....	4
24	00-873363	Spacer (ML-134300).....	4
25	SC-118-08	Cap Screw $\frac{3}{8}$ -16 x $1\frac{3}{4}$ Hex Hd. (ML-134306 & ML-134322).....	4
26	SC-124-91	Cap Screw $\frac{3}{8}$ -16 x $2\frac{1}{2}$ Hex Hd. (ML-134300, ML-134334, & ML-134337).....	4
27	00-508208	Pin – Dowel.....	2
28	00-874315	Pin – Actuator (Upper).....	1
29	00-916565	Actuator Assy.....	1
30	SC-018-20	Mach. Screw 10-24 x $\frac{1}{2}$ Slotted Pan Hd.....	2
31	WL-003-22	Lockwasher #10 Helical.....	2
32	WS-002-51	Washer.....	2
33	00-078752-00012	Clamp ($\frac{3}{8}$ In.).....	1
34	00-110979-00100	Capacitor.....	1
35	PC 003-50	Pin – Cotter.....	1
36	00-874117-00002	Pin – Clevis.....	1
37	SD-009-41	Self-Tapping Screw 8-32 x $\frac{3}{8}$ Phil. Pan Hd. (SST).....	1
38	WS-023-22	Washer.....	1
39	SC-009-68	Mach. Screw 8-32 x $\frac{3}{4}$ Slotted Rd. Hd.....	2
40	WL-003-15	Lockwasher #8 Helical.....	2
41	WS-023-22	Washer.....	2
42	00-916269	Block – Terminal $\frac{1}{4}$ QC.....	1
43	00-916270	Mount – Capacitor.....	1
44	NS-009-12	Mach. Hex Nut 8-32 STL.....	2
45	WL-004-19	Lockwasher $\frac{5}{8}$ Helical.....	4
46	SC-129-34	Cap Screw $\frac{5}{8}$ -11 x $1\frac{1}{2}$ Hex Hd.....	4
47	00-874128	Extension – Bowl Guard Switch.....	1
48	00-874958-00001	Reed – Switch & Plug.....	1
49	SC-075-14	Set Screw 6-32 x $\frac{1}{8}$ Hex Hdls., Cup Pt.....	1
50	00-874641	Case – Transmission.....	1
51	00-875993-00002	Motor Assy. (5 Hp.) (ML-134300, ML-134334, & ML-134337).....	1
52	00-875997-00001	Motor Assy. (3 Hp.).....	1
	00-916360-00001	Harness – Main Control.....	1
	00-916361-00001	Harness – Main Control.....	1

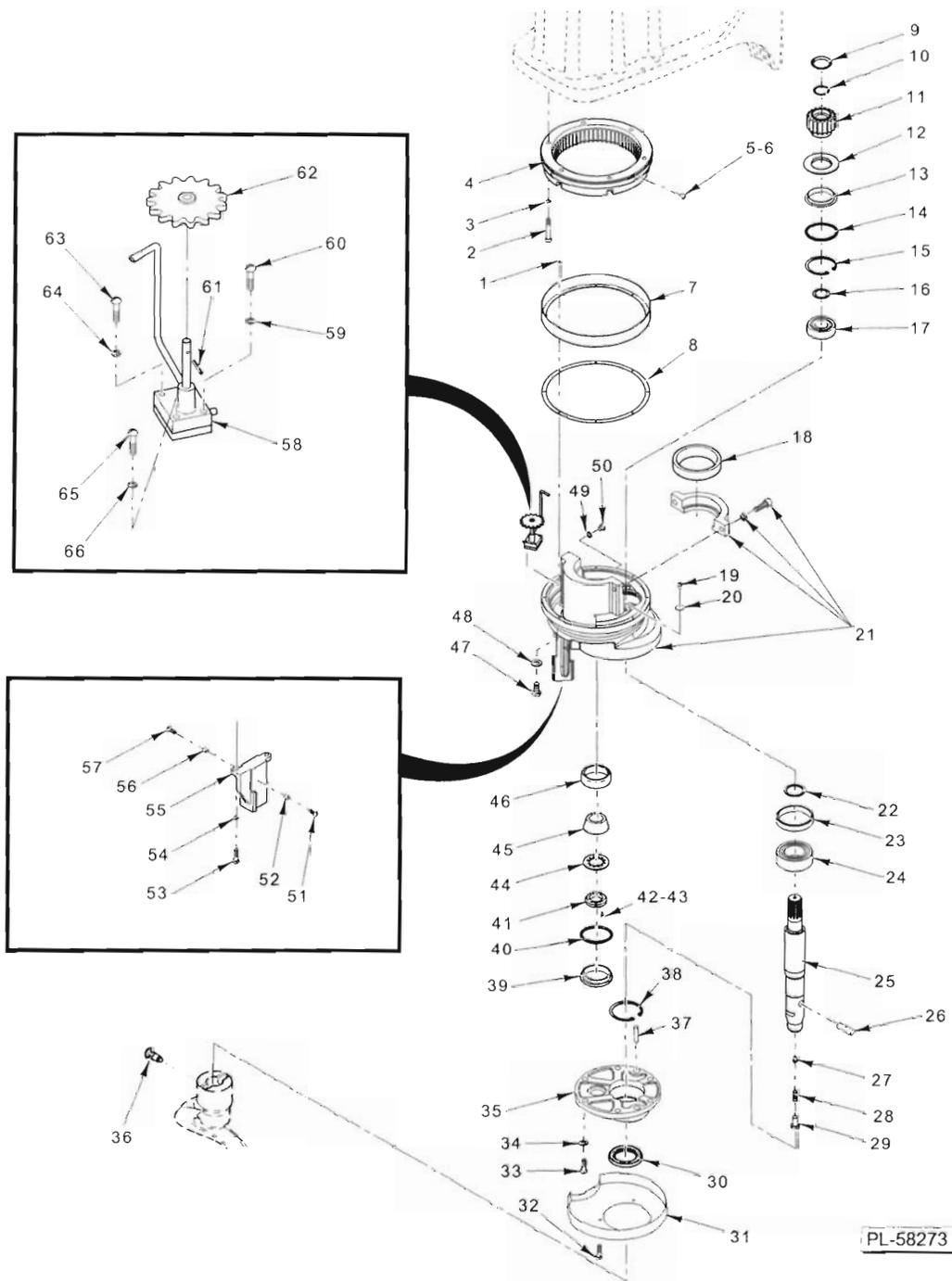


PL-58098

TRANSMISSION

TRANSMISSION

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58098			
1	BB-021-59	Bearing – Ball	1
2	RR-012-21	Retaining Ring	1
3	WL-012-10	Lockwasher	1
4	NS-034-10	Lock Nut	1
5	NS-034-08	Lock Nut	1
6	WL-012-08	Lockwasher.....	1
7	RR-004-24	Retaining Ring	1
8	BB-021-56	Bearing – Ball	1
9	00-875419-00079	Key – Chamfered	1
10	00-875419-00078	Key – Chamfered (ML-134306 & ML-134322).....	1
11	00-916178	Shaft – Input	1
12	BB-018-22	Bearing – Ball	1
13	RR-009-07	Retaining Ring	1
14	00-874564	Spacer – Upper (W/O Att. Hub)	1
15	00-874565	Spacer – Lower (W/O Att. Hub)	1
16	00-875419-00079	Key $\frac{5}{16} \times \frac{5}{16} \times 1\frac{1}{2}$	1
17	00-874448	Gear.....	1
18	00-874454	Seal – Oil	1
19	00-875855	Shaft – Planetary (ML-134306 & ML-134322).....	1
20	00-874452	Shaft – Planetary (ML-134300, ML-134334, & ML-134337).....	1
21	00-875419-00078	Key – Chamfered (ML-134306 & ML-134322).....	1
22	00-875419-00066	Key – Chamfered (ML-134300, ML-134334, & ML-134337)	1
23	00-064467	Spacer – Upper (Lower Planetary) (ML-134306 & ML-134322).....	1
24	00-067900	Spacer – Upper (Lower Planetary) (ML-134300, ML-134334, & ML-134337).....	1
25	BB-007-07	Bearing – Ball Sgl. Rod (ML-134306 & ML-134322)	1
26	BB-021-49	Bearing – Ball Sgl. Rod (ML-134300, ML-134334, & ML-134337)	1
27	00-875858	Spacer – Lower (Lower Planetary) (ML-134306 & ML-134322).....	1
28	00-874567	Spacer – Lower (Lower Planetary) (ML-134300, ML-134334, & ML-134337).....	1
29	00-875857	Carrier – Lower Bearing (ML-134306 & ML-134322)	1
30	00-874451	Carrier – Lower Bearing (ML-134300, ML-134334, & ML-134337)	1
31	BR-003-11	Bearing – Roller Cone (ML-134306 & ML-134322)	1
32	BR-003-29	Bearing – Roller Cone (ML-134300, ML-134334, & ML-134337)	1
33	00-064386	Gear – Sun (ML-134306 & ML-134322)	1
34	00-067904	Gear – Sun (ML-134300, ML-134334, & ML-134337).....	1
35	RR-004-14	Retaining Ring (ML-134306 & ML-134322).....	1
36	RR-011-96	Retaining Ring (ML-134300, ML-134334, & ML-134337).....	1
37	WL-003-48	Lockwasher $\frac{5}{16}$ Helical	6
38	SC-123-75	Cap Screw $\frac{5}{16}$ -18 x $\frac{3}{4}$ Hex Button Hd.	6

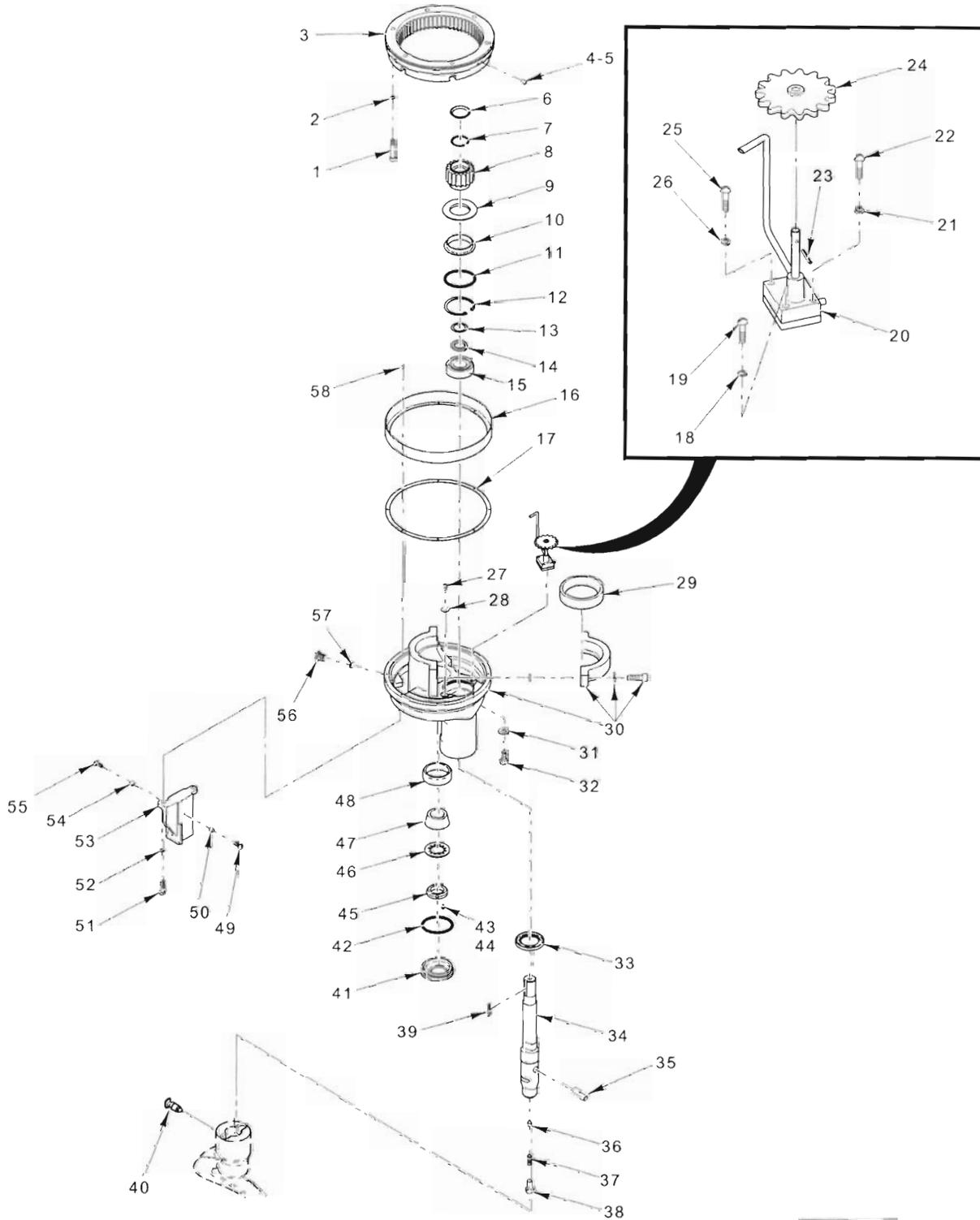


PLANETARY (HL1400 SERIES) (ML-134300, ML-134334, & ML-134337)

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58273			
1	SC-009-70	Mach. Screw 8-32 x 1/4 Slotted Rd. Hd. (SST).....	8
2	SC-040-28	Cap Screw 3/8-16 x 2 1/2 Hex Socket Hd.....	6
3	WL-019-92	Lockwasher 3/8 Helical.....	6
4	00-438050	Gear - Internal	1
5	SC-021-37	Mach. Screw 1/4-20 x 3/8 Slotted Rd. Hd. (SST) (ML-134300 & ML-134334)	3
6	SC-128-80	Mach. Screw 1/4 -20 x 3/8 Phil. Fil. Hd. (ML-134337)	3

PLANETARY (HL1400 SERIES) (ML-134300, ML-134334, & ML-134337)

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58273			
7	00-064478	Extension	1
8	00-064464	Gasket	1
9	00-060071	Cap – Oil Retaining.....	1
10	RR-006-08	Retaining Ring	1
11	00-067886	Pinion – Internal (18T) (Incls. Item 12)	1
12	00-065372	Deflector – Oil	1
13	00-073011	Baffle – Planetary Oil	1
14	00-067500-00021	O-Ring	1
15	RR-004-24	Retaining Ring	1
16	00-068277	Shim – Internal Pinion.....	1
17	BB-021-56	Bearing – Ball	1
18	BR-003-30	Bearing – Roller Assy.....	1
19	SC-011-72	Mach. Screw 1/4-20 x 3/8 Slotted Phil. Hd.....	2
20	WS-003-46	Washer.....	2
21	00-874690	Planetary Assy. (Incls. Items 53, 54, 55, & Bearing Cap)	1
22	00-067902	Spacer – Agitator Shaft.....	1
23	00-067903	Locator – Bearing	1
24	BB-021-55	Bearing – Ball	1
25	00-916037	Shaft – Agitator	1
26	00-873953	Pin – Agitator Shaft.....	1
27	00-007744	Set Screw Hdis., Cone Pt	1
28	SC-047-41	Set Screw 3/8-16 x 3/8 Hex Hdis., Cup Pt.....	1
29	00-064723	Plug – Agitator Shaft.....	1
30	00-068045	Seal – Oil	1
31	00-874669	Cover – Planetary (ML-134300, ML-134334, & ML-134337).....	1
32	00-080531	Screw – Nylok Hex Hd.....	2
33	SC-120-28	Cap Screw 1/2-13 x 2 Hex Hd.....	6
34	WL-004-11	Lockwasher 1/2 Helical.....	6
35	00-067921-00001	Plate – Bearing	1
36	00-874145	Plunger Assy.....	1
37	00-011800-00237	Dowel.....	2
38	RR-006-07	Retaining Ring	1
39	00-437496-00002	Cap – Seal	1
40	00-067500-00021	O-Ring	1
41	00-065275	Bearing – Special Lock Nut	1
42	00-065277	Cap Screw – Socket Hd.....	1
43	WL-003-15	Lockwasher #8 Helical.....	1
44	00-064982	Washer – Tongue.....	1
45	BR-003-13	Bearing – Roller Cone	1
46	BR-003-14	Bearing – Roller Cup	1
47	SC-129-38	Cap Screw 7/16-20 x 1 Hex Hd. (SST)	1
48	WS-021-20	Washer	1
49	WS-021-20	Washer.....	1
50	00-064465-00001	Plug – Oil Fill.....	1
51	SC-021-54	Mach. Screw 5/16-18 x 7/8 Slotted Rd. Hd.(SST)	1
52	00-874181	Spacer – Scraper Arm	1
53	SC-041-31	Cap Screw 3/8-16 x 1 1/4 Hex Hd. (SST)	1
54	WL-006-28	Lockwasher 3/8 Helical.....	1
55	00-874649	Bracket – Bowl Scraper (ML-134300, ML-134334, & ML-134337).....	1
56	00-874181	Spacer – Scraper Arm	1
57	SC-021-54	Mach. Screw 5/16-18 x 7/8 Slotted Rd. Hd. (SST)	1
58	00-290232-00002	Pump Assy. – Oil (Incls. Items 59 thru 61).....	1
59	WL-003-22	Lockwasher #10 Helical.....	1
60	SC-060-87	Mach. Screw 10-32 x 3/4 Slotted Rd. Hd. (SST).....	1
61	RP-002-08	Pin – Roll 0.078	1
62	00-064614	Gear – Drive Assy.....	1
63	SC-009-68	Mach. Screw 8-32 x 3/4 Slotted Rd. Hd.	1
64	WL-003-15	Lockwasher #8 Helical.....	1
65	SC-009-51	Mach. Screw 10-32 x 7/8 Slotted Rd. Hd. (SST).....	2
66	WL-003-22	Lockwasher #10 Helical.....	2

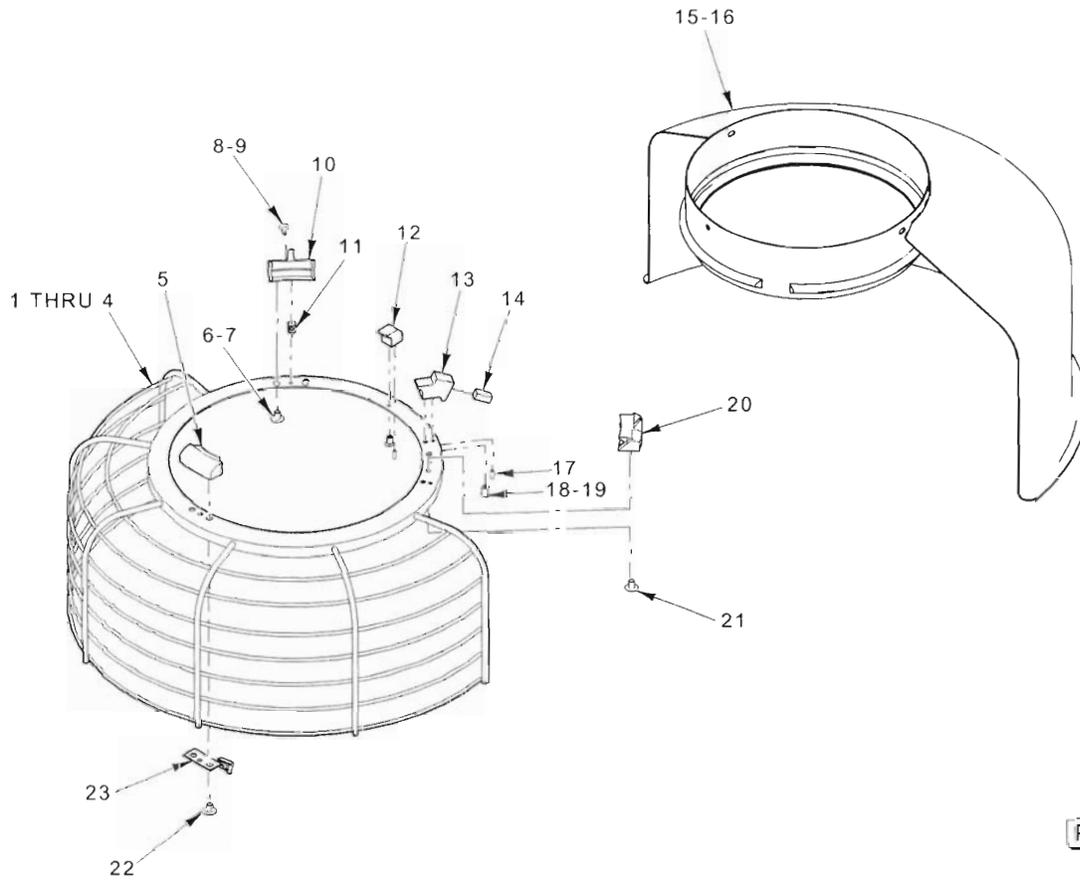


PL-58272

PLANETARY (HL800 SERIES) (ML-134306 & ML-134322)

PLANETARY (HL800 SERIES) (ML-134306 & ML-134322)

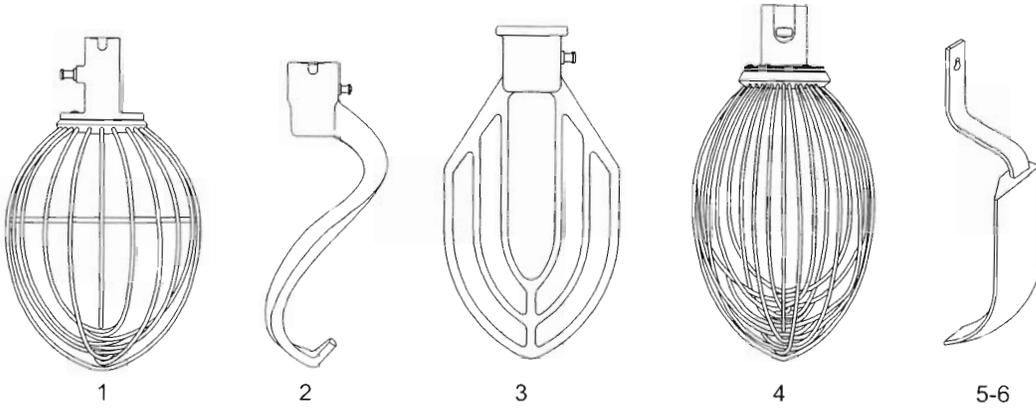
ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58272			
1	SC-040-27	Cap Screw $\frac{3}{8}$ -16 x 2 $\frac{1}{4}$ Hex Socket Hd.....	6
2	WL-019-92	Lockwasher $\frac{3}{8}$ Helical.....	6
3	00-438121	Gear – Internal.....	1
4	SC-128-74	Mach. Screw $\frac{1}{4}$ -20 x $\frac{5}{8}$ Tx Button Hd. (SST) (ML-134322)	3
5	SC-021-39	Mach. Screw $\frac{1}{4}$ -20 X $\frac{5}{8}$ Slotted Rd. Hd. (ML-134306).....	3
6	00-060071	Cap – Oil Retaining.....	1
7	RR-005-08	Retaining Ring	1
8	00-064732	Pinion – Internal Oil Assy. (Incls. Item 9).....	1
9	00-065372	Deflector – Oil.....	1
10	00-073011	Baffle – Planetary Oil.....	1
11	00-067500-00021	O-Ring	1
12	RR-004-24	Retaining Ring	1
13	00-060768	Shim – Internal Pinion.....	1
14	00-065408	Spacer – Agitator Shaft.....	1
15	BB-006-36	Ball Bearing	1
16	00-064478	Extension	1
17	00-064464	Gasket	1
18	WL-003-22	Lockwasher #10 Helical.....	2
19	SC-009-51	Mach. Screw 10-32 x $\frac{7}{8}$ Slotted Rd. Hd. (SST).....	2
20	00-290232-00002	Pump Assy. – Oil (Incls. Items 21 thru 26).....	1
21	WL-003-22	Lockwasher #10 Helical.....	1
22	SC-060-87	Mach. Screw 10-32 x $\frac{3}{4}$ Slotted Rd. Hd. (SST).....	1
23	RP-002-08	Pin – Roll 0.078	1
24	00-064614	Gear – Drive Assy.....	1
25	SC-009-68	Mach. Screw 8-32 x $\frac{3}{4}$ Slotted Rd. Hd.	1
26	WL-003-15	Lockwasher #8 Helical.....	1
27	SC-011-72	Mach. Screw $\frac{1}{4}$ -20 x $\frac{3}{8}$ Slotted Phil. Hd.....	2
28	WS-003-46	Washer.....	2
29	BR-003-12	Bearing – Roller Cap	1
30	00-916068	Planetary Assy. (Incls. Items 51, 52, 53, & Bearing Cap).....	1
31	WS-021-20	Washer.....	1
32	SC-129-38	Cap Screw $\frac{7}{16}$ -20 x 1 Hex Hd. (SST)	1
33	00-916065	Seal – Oil	1
34	00-916048	Shaft – Agitator	1
35	00-873953	Pin – Agitator Shaft.....	1
36	00-007744	Set Screw Hex Hdls., Cone Pt.....	1
37	SC-047-41	Set Screw $\frac{3}{8}$ -16 x $\frac{3}{8}$ Hex Hdls., Cup Pt.....	1
38	00-064723	Plug – Agitator Shaft.....	1
39	00-875958	Key – Chamfered	1
40	00-874145	Plunger Assy.....	1
41	00-437496-00002	Cap – Seal.....	1
42	00-067500-00021	O-Ring	1
43	00-065277	Cap Screw – Socket Hd.....	1
44	WL-003-15	Lockwasher #8 Helical.....	1
45	00-065275	Bearing – Special Lock Nut	1
46	00-064982	Washer – Tongue.....	1
47	BR-003-13	Bearing – Roller Cone	1
48	BR-003-14	Bearing – Roller Cup	1
49	SC-021-54	Mach. Screw $\frac{5}{16}$ -18 x $\frac{7}{8}$ Slotted Rd. Hd. (SST)	1
50	00-874181	Spacer – Scraper Arm	1
51	SC-041-31	Cap Screw $\frac{3}{8}$ -16 x 1 $\frac{1}{4}$ Hex Hd.....	1
52	WL-006-28	Lockwasher $\frac{3}{8}$ Helical.....	1
53	00-873284	Bracket – Bowl Scraper	1
54	00-874181	Spacer – Scraper Arm	1
55	SC-021-54	Mach. Screw $\frac{5}{16}$ -18 x $\frac{7}{8}$ Slotted Rd. Hd. (SST)	1
56	00-064465-00001	Plug – Oil Fill.....	1
57	WS-021-20	Washer.....	1
58	SC-009-70	Mach. Screw 8-32 x $\frac{1}{4}$ Slotted Rd. Hd. (SST).....	8



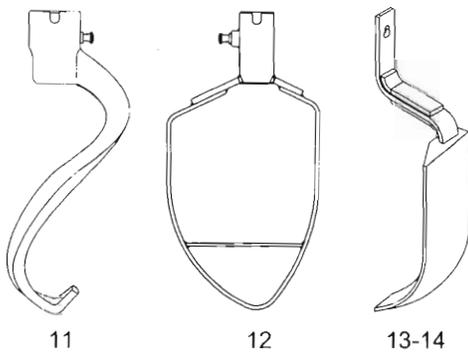
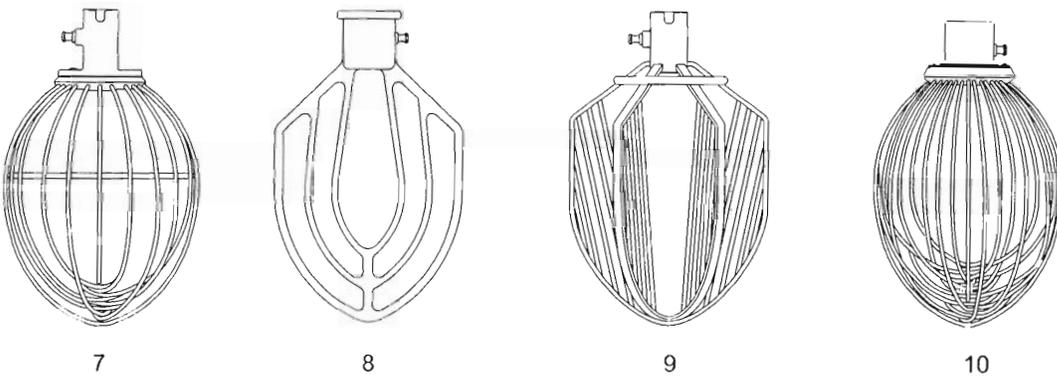
BOWL GUARD

BOWL GUARD

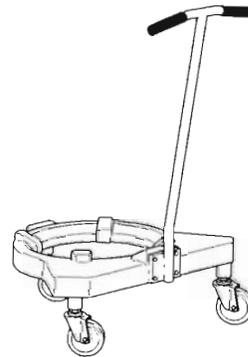
ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58269			
1	00-916155-00001	Wire – Cage (ML-134306)	1
2	00-916155-00002	Wire – Cage (ML-134322)	1
3	00-874953-00001	Wire – Cage (ML-134334 & ML-134300)	1
4	00-874953-00002	Wire – Cage (ML-134337)	1
5	00-874126	Shoe – Front	1
6	SC-122-45	Mach. Screw 1/4-20 x 3/8 Slotted Truss Hd.	6
7	SC-128-65	Mach. Screw 1/4-20 x 1/2 Tx. Button Hd. (SST) (ML-134322)	6
8	SC-123-07	Mach. Screw 8-32 x 1/2 Slotted Truss Hd.	1
9	SC-128-66	Mach. Screw 8-32 x 1/2 Tx. Button Hd. (SST) (ML-134322)	1
10	00-437433-00002	Shoe – Fixed	1
11	00-437720	Key – Shoe	1
12	00-438055	Bumper – Cage	1
13	00-437442	Retainer – Magnet	1
14	00-111941	Magnet	1
15	00-916152	Guard – Splash & Drip (ML-134306 & ML-134322)	1
16	00-874951	Guard – Splash & Drip (ML-134300, ML-134334, & ML-134337)	1
17	SC-009-68	Mach. Screw 8-32 x 3/4 Slotted Rd. Hd.	2
18	SC-122-44	Mach. Screw 8-32 x 3/8 Slotted Truss Hd.	2
19	SC-121-71	Mach. Screw 8-32 x 3/8 Tx. Button Hd. (SST) (ML-134322)	2
20	00-437433-00003	Shoe – Adjustable	1
21	SC-122-45	Mach. Screw 1/4-20 x 3/8 Slotted Truss Hd.	2
22	SC-122-45	Mach. Screw 1/4-20 x 3/8 Slotted Truss Hd.	4
23	00-875795	Stop – Cage	1
	00-916277-00001	Cage – Wire Assy. (ML-134334 & ML-134300)	1
	00-916277-00002	Cage – Wire Assy. (ML-134337)	1
	00-916154-00001	Cage – Wire Assy. (ML-134306)	1
	00-916154-00002	Cage – Wire Assy. (ML-134322)	1



40-QUART AGITATORS



60-QUART AGITATORS



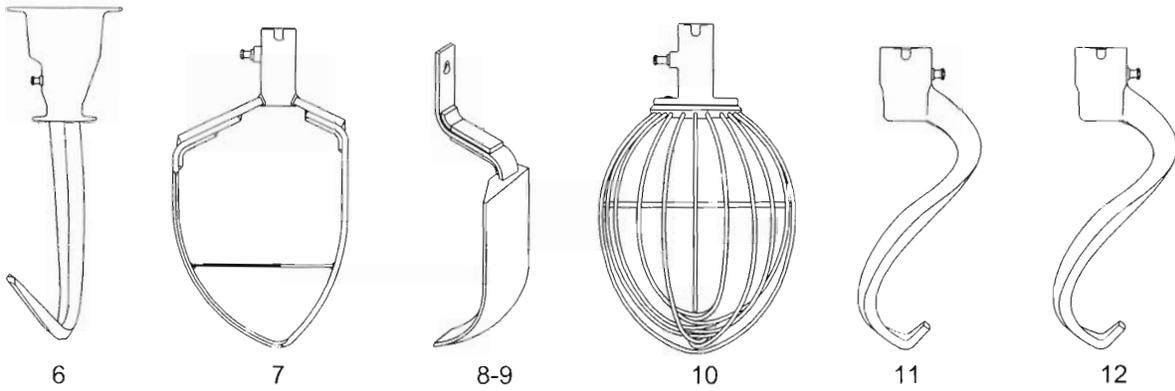
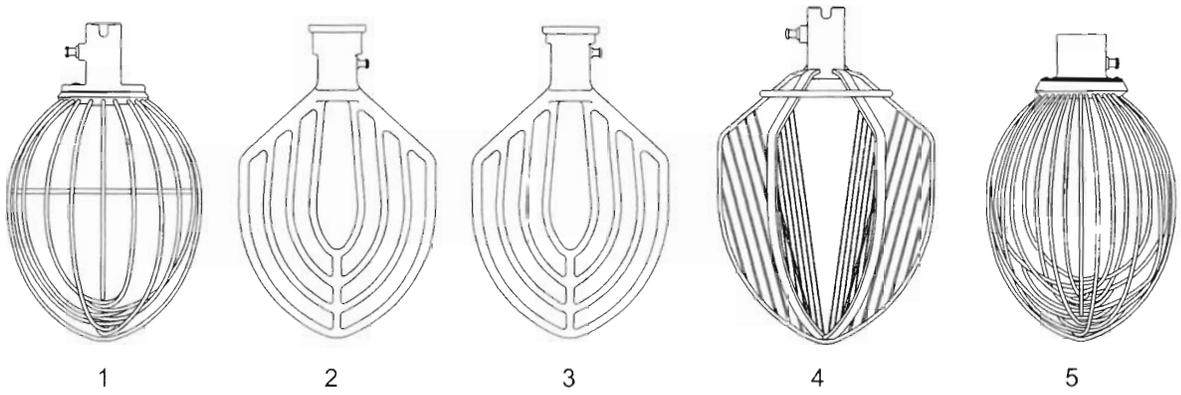
BOWL TRUCK

PL-58292

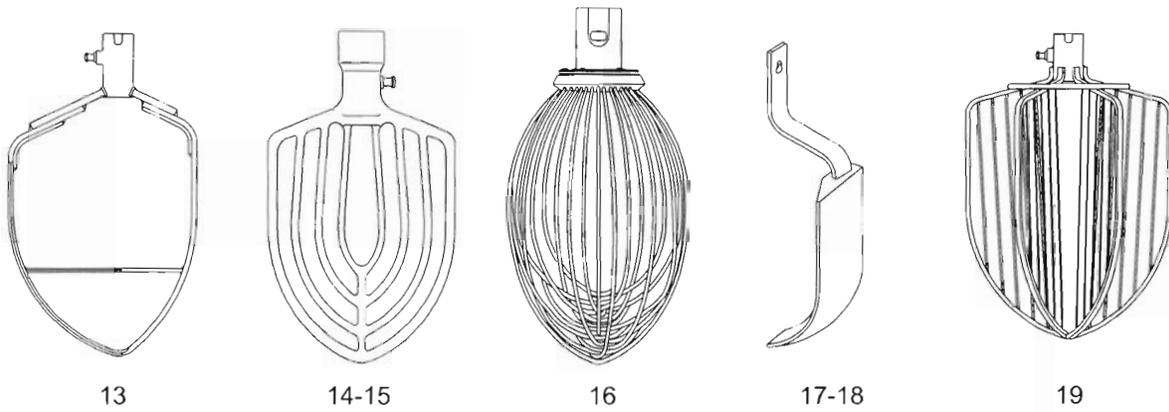
AGITATORS AND ACCESSORIES (40 & 60 QUART)

AGITATORS AND ACCESSORIES (40 & 60 QUART)

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-58292			
1	00-874250	"I" Wire Whip (40 Quart) (Packaged).....	1
2	00-874292	"ED" Dough Arm (40 Quart) (Packaged).....	1
3	00-874248	"B" Flat Beater (40 Quart) (Packaged).....	1
4	00-874249	"D" Wire Whip (40 Quart) (Packaged).....	1
5	00-874268	Bowl Scraper (40 Quart) (Incls. Item 6) (Packaged).....	1
6	00-435637-00004	Scraper – Bowl	1
7	00-874271	"I" Wire Whip (60 Quart) (Packaged).....	1
8	00-874172	"B" Flat Beater (60 Quart) (Packaged).....	1
9	00-874278	"C" Six Wing Whip (60 Quart) (Packaged).....	1
10	00-874190	"D" Wire Whip (60 Quart) (Packaged).....	1
11	00-874285	"ED" Dough Arm (60 Quart) (Packaged).....	1
12	00-874286	"P" Pastry Knife (60 Quart) (Packaged).....	1
13	00-874267	Bowl Scraper (60 Quart) (Incls. Item 14) (Packaged).....	1
14	00-435637-00001	Scraper – Bowl	1
15	00-916493	Bowl Truck Adapter (60-80-140 Quart) (Packaged).....	1
16	00-916495	Bowl Truck Adapter (40-60 Quart) (Packaged).....	1
17	00-874203	Bowl Truck (Packaged).....	1
18	00-873307	Bowl Truck (Packaged) (ML-134306 & ML-134322).....	1
19	00-873308	Bowl Truck (Packaged) (ML-134300, ML-134334, & ML-134337)	1
20	00-874288	Caster – Bowl Truck.....	3
21	00-916585	Bowl Truck (Packaged) (ML-134300 & ML-134334).....	1



80-QUART AGITATORS



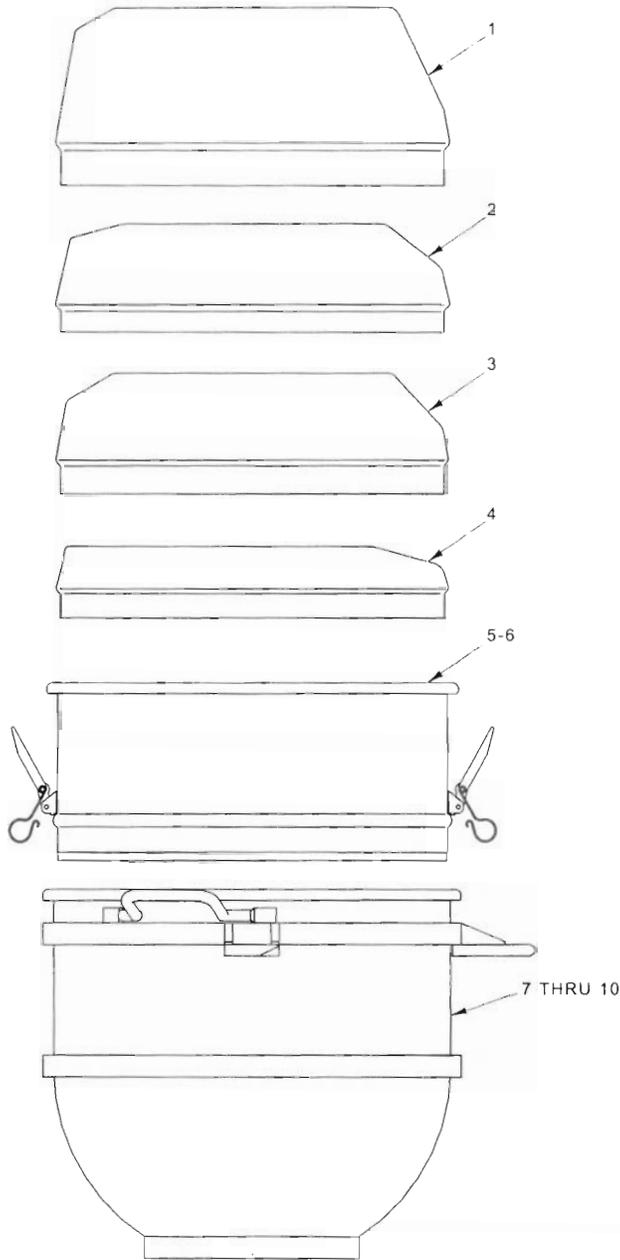
140-QUART AGITATORS

PL-57888

AGITATORS AND ACCESSORIES (80 & 140 QUART)

AGITATORS AND ACCESSORIES (80 & 140 QUART)

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-57888			
1	00-875931	"I" Wire Whip (80 Quart) (Packaged).....	1
2	00-874654	"B" Beater (80 Quart) (Packaged).....	1
3	00-916095	"B" Beater (80 Quart) (Packaged).....	1
4	00-875946	"I" Wire Whip (80 Quart) (Packaged).....	1
5	00-875866	"D" Wire Whip (80 Quart) (Packaged).....	1
6	00-874647	"ED" Dough Arm (80 Quart) (Packaged).....	1
7	00-875914	Pastry Knife (80 Quart) (Packaged).....	1
8	00-874700	Bowl Scraper (80 Quart) (Incls. Item 9) (Packaged).....	1
9	00-435637-00002	Scraper – Bowl.....	1
10	00-875929	"I" Wire Whip (140 Quart) (Packaged).....	1
11	00-875847	"ED" Dough Arm(140 Quart) (Packaged).....	1
12	00-875823	"ED" Dough Arm(140 Quart) (Packaged).....	1
13	00-875906	Pastry Knife (140 Quart) (Packaged).....	1
14	00-874409	"B" Flat Beater (140 Quart) (Packaged).....	1
15	00-916018	"B" Flat Beater (140 Quart) (Packaged).....	1
16	00-875863	"D" Wire Whip (140 Quart) (Packaged).....	1
17	00-874699	Bowl Scraper (140 Quart) (Incls. Item 18) (Packaged).....	1
18	00-435637-00003	Scraper – Bowl.....	1
19	00-875938	"I" Wire Whip (140 Quart) (Packaged).....	1



BOWL AND EXTENSIONS

ILLUS.	PART NO.	NAME OF PART	AMT.
PL-57889			
1	00-438081	Cover – Splash (40 Quart) (Packaged)	1
2	00-438082	Cover – Splash (60 Quart) (Packaged)	1
3	00-438083	Cover – Splash (80 Quart) (Packaged)	1
4	00-438084	Cover – Splash (140 Quart) (Packaged)	1
5	00-438104-00004	Bowl Extension Assy (60 Quart) (Packaged).....	1
6	00-438104-00002	Bowl Extension Assy (80 Quart) (Packaged).....	1
7	00-916175	Bowl Assy. (40 Quart) (Packaged).....	1
8	00-916174	Bowl Assy. (60 Quart) (Packaged).....	1
9	00-875846	Bowl Assy. (80 Quart) (Packaged).....	1
10	00-875845	Bowl Assy. (140 Quart) (SST) (Packaged).....	1

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