

Operations Manual

Model 805

NORTH STAR ENGINEERED PRODUCTS



PREPARATION FOR USE AND
INSTALLATION INSTRUCTIONS

UNPACKING INSTRUCTIONS:

- A.** Never top load centrifuge- use forklift or pallet jack on bottom skid only.
- B.** Never stack or place anything on top of centrifuge when wrapped or unwrapped.
- C.** Examine exterior of machine for any sign of damage, and note on bill of lading.
 - 1. Scratched or damaged parts of machine.
 - 2. Broken pallet.
- D.** Remove outer shipping shrink-wrap.
 - 1. Remove any cardboard attached to machine.
 - 2. Basket may be removed at this time as per step F at this point, (the machine will be considerably lighter and easier to move).
 - 3. Maneuver machine near desired location.
 - 4. Remove machine from shipping pallet by removing bolts through legs and sliding or walking machine off the pallet. **CAUTION:** machine weighs approximately 1000#, (do not use electrical boxes, lid hinge frame, or curb assembly to lift the machine, lift with skirt or legs).
- E.** Open lid of centrifuge fully and remove perforated basket. See step A of service manual, (**CAUTION:** basket weights 350#).
 - 1. It is best to remove basket from machine with a overhead hoist. Lift basket straight up and completely out of machine and set aside.
 - 2. Remove all cardboard packing inside curb assembly.
 - 3. Inspect and make certain that the basketball is lightly greased with medium weight lithium grease. Do not reinstall basket until machine is bolted in place.
- F.** Inspect exterior of machine for damage.
 - 1. Dents and scratches in lid, curb assembly or control box.
 - 2. Inspect motor hanger for cracks in casting that may occur if the machine was dropped during shipping.
 - 3. Remove 2291SS control panel, (see step N of service manual) and inspect for loose or cracked parts.

G. Installation:

1. Maneuver machine to its desired location. Enough room should be allowed behind machine to give adequate clearance for service work.
2. Mark location of holes through the two front legs and the rear leg.
3. Remove the machine and drill mounting holes (recommend using 2- $\frac{1}{2}$ " X $\frac{1}{2}$ " lag bolts and lead anchors into concrete). Mounting hardware is not provided.
4. Replace machine and loosely bolt through two front legs and rear leg.
5. Using the 1- $\frac{1}{4}$ " leveling bolt (2400-163) on the rear of the belt guard, level the machine as nearly as possible. It will be necessary to use metal shims under rear leg, if it is raised during this process.
6. Tighten all mounting bolts.
7. Gently replace basket assembly as per step B of service manual. Cardboard packing should have been removed from under and around basket already. If not, remove the cardboard now before replacing basket.
8. Turn basket slightly to be sure basket is properly seated on the hex basketball.

MOUNTING PRECAUTIONS:

- A.** Never use resilient pads under legs- this will increase vibration.
- B.** Mount machine on a level surface.
- C.** If installed on a wooden floor, and excessive vibration is felt, install a 4 X 4 jack under each leg from the floor below.
- D.** Mounting bolts should be checked periodically for tightness.

OPERATING INSTRUCTIONS

A. Loading: 805 model

1. Never load basket with more than dry weight capacity (100#) or above top of basket.
2. Load unevenly with a balanced load; do not allow anything to hang over the top of basket.
3. Loads should remain a few inches below the inside of the basket top.

B. Operation:

1. The machine is equipped with a timer, with a range of 4 minutes (longer timers optional).
2. Lift lid, load machine evenly, close lid completely. Check to make sure emergency button is pulled out, then press green start button to start machine.
3. Lid lock light will come on, lid will lock, and machine will run for pre-set time. Do not try to open the lid while red light is lit.
4. At the end of the cycle, the centrifuge will automatically stop. Open lid only after red light has gone out.

C. Emergency stop:

This machine is equipped with a push-pull emergency stop button. If the machine vibrates excessively or becomes noisy during the cycle, or if it is obvious that something is between the basket and the curb, push the emergency stop button. Wait until the red signal light goes out before attempting to open the lid. Rebalance the load, checking to make certain that nothing has dropped between the basket and curb, or investigate and correct the cause of noise or vibration. Re-start the machine.

D. Safety Operation:

1. The lid must be closed for the centrifuge to start. The lid safety cam #2286-B will trip a micro switch, completing the initial part of the circuit.
2. When the start button is activated power is sent to a delay relay, which supplies power to the lid lock solenoid for two seconds.

3. Closure of the lid lock solenoid locks the lid and trips another micro switch.
4. Power is sent through the emergency stop button and dif in the out position, power is sent to the motor relay, starting the motor.
5. The residual energy module R.E.M. #2554 senses motor RPM and controls a contactor which in turn holds the lid lock solenoid closed while the motor is turning. This safety must operate to continue to keep the lid locked. If it does not, the delay relay will release after two seconds, opening the lid lock solenoid and its associated micro switch, shutting down the entire panel.

TOOLS

The tools and test equipment required for routine maintenance and most repairs for your North Star centrifuge are as follows:

- 1 ea. – Open-end wrenches (1/4” to 1”)
- 1 ea. – Hex head Allen wrenches (1/8”, 3/16”, and 5/16”)
- 1 – 8” slip joint pliers
- 1 - #6 Slot head screwdriver
- 1 - #2 Phillips head screwdriver
- 1 – Grease gun designed to fit 5/16” grease fittings and medium weight lithium grease
- 1 - Socket wrench set from 1/4” to 1” (3/8” or 1/2” drive)
- 1 – Adjustable wrench (crescent type) with capacity up to 1-1/2”
- 1 – 16 oz. Claw or ball peen hammer
- 1 – Rubber mallet or lead hammer
- 1 – Set of feeler gauges to use at .070 to .090 inches (must fit through 1/2” hole to gauge runner gap)
- 1 – 1/2” Brass drift
- 1 – 3/16” Brass drift
- 1 – VOM or AMP meter

WARRANTY

Warranty information is contained on last page of this manual, please read for details.

If a warranty situation occurs, contact the factory directly (419 726-2645). You must provide the serial # of your machine when warranty is involved.

PREVENTATIVE MAINTENANCE

These schedules will vary depending on use of machine. If used often, accelerate schedule accordingly.

ALWAYS TURN OFF POWER TO MACHINE BEFORE DOING ANY WORK ON IT.

Every 5 days or 15 hours of operations during the first 30 days of service, or when a new brake shoe is installed: Adjust brake for wear on the brake shoe with 2307 brake screw. See INSTRUCTIONS FOR ADJUSTING BRAKE section, further back in this manual, for details. This procedure is for the electric solenoid brake system. Every 60 days, turn off power to machine and check brake adjustment and adjust.

Every 90 days turn off power to machine and...

1. Remove basket. See step A of service manual for details. Inspect #3588 stainless steel ball cap for wear (replace if necessary). Inspect hex basketball for wear or rounding of corners of hex ball, (replace if necessary). If basketball is worn or rounded, inspect inside of center post for rounding of corners, (replace if necessary). Lubricate hex basketball and ball cap with medium weight lithium grease.
2. Remove the 3 fasteners securing the curb (outer stainless shell) to the base. Lift off the curb. See step D of service manual for details.
3. Inspect brake shoe lining, if brake lining is worn to within 1/8" of shoe replace with new brake shoe, (the rivets may score the hub, replace worn shoe at once to avoid damage to the brake hub). See step J of service manual for details.
4. Lubricate brake shoe and brake arm (2306) at lube points with medium weight lithium grease. See step K of service manual for details.
5. Inspect trunnion rubbers and bumper rubbers for wear (replace if necessary). See step G of service manual for details.
6. Inspect pulleys on motor and center unit for wear or rounding of belt drive area, (replace if necessary). See step G and M of service manual for details.
7. Inspect drive belt for wear and proper belt tension (belt should be as loose as possible without slipping on startup). Replace and adjust as necessary. See step L of service manual for details.

8. Re-install curb. See step E of service manual for details.
9. Lubricate 1189 hex ball, then place basket gently on basketball. See step B of service manual for details.
10. Remove 2291SS control panel cover, (POWER SHOULD BE OFF TO MACHINE BEFORE ENTERING THE CONTROL BOX). See step N of service manual for details.
11. Lubricate 2254-1 lid lock lever with medium lithium grease.
12. Lubricate 2399-B lid hinge brake with medium weight lithium grease.
13. Test the fall of the lid. It should not fall freely. Adjust 2398 hex cap screw to control fall of lid. See step Q of service manual for details.
14. Adjust lid lock lever adjusting screw #2256 if the lid can be raised above recessed area in curb assembly. See step R of service manual for details.
15. Inspect labels on machine. Replace any worn labels.

SUMMARY OF SAFETY INFORMATION

Basic safety for your North Star centrifuge includes these important points:

1. Keep all safety and brake components adjusted to factory specifications.
2. Perform the scheduled or preventative maintenance on a regular basis.
3. Never force the lid of the machine open.
4. Use the emergency stop button if needed to stop the machine.
5. Always disconnect the power to the machine before doing any work on the machine.
6. Maintain all labels in a good readable condition and contact North Star for replacements of labels.
7. Put the machine out of order and disconnect the power if any unsafe condition arises.
8. Never defeat or bypass any of the safety systems built into the machine.

SAFETY TESTS:

Perform these simple safety tests every 30 days to check the safety systems of your machine. If any problems develop between tests take the machine out of service, disconnect the power to the machine and repair the cause of the malfunction.

Every 30 days:

1. LID BRAKE TEST:

Open the lid, so that it is 18 inches from the curb top, and then test again at 8 inches from the curb top. It should not fall freely, but should stay in place in both positions. If the lid closes by itself from either position tighten the lid brake adjusting screw (2398), until the lid will not fall on its own from either position.

2. LID LOCK TEST:

Start the machine and try to lift the lid. The lid should be locked. If the lid can be lifted more than ½" above the recessed area of curb, adjust the lid lock adjusting screw as follows: loosen the jam nut (2556) and turn the adjusting screw (2256-B) ½ turn counter clockwise. Tighten the jam nut. Again start the machine, and attempt to open the lid. If the lid can be opened more than just ½" repeat adjustment procedure. Once the lid has been adjusted so that it will not open ½" while machine is running check to be sure that the adjusting bolt (2256-B) is not binding on the lid lock cam (2253-B). The lid lock solenoid (5128 or 5129) must be able to close completely. If the solenoid cannot close completely, it will make a loud humming noise. If after repeated attempts, the lid lock cannot be adjusted, check the lid lock cam (2253-B) for cracks and keyways on the shaft (3208) and cam (2253-B) for wear.

NEVER attempt to run the centrifuge if the lid lock cannot be adjusted or any component is broken or disconnected, put the machine out of service and contact North Star Service Department at (419) 726-2645.

3. EMERGENCY STOP TEST:

Start the machine. After one minute, press the emergency stop button and record the time it takes from when the button is depressed until the lid releases. If it takes longer than 60 seconds, adjust the brake as outlined in the brake adjustment section of this service manual. If the brake cannot be adjusted so that the lid releases in 60 seconds, check the lignin thickness on the brake shoe. When the lining is less than 1/8", replace the brake shoe. If the lid lock never releases or the lid can be opened while the basket is turning, put the machine out of order, disconnect power to the machine and call North Star Service Department at (419) 726-2645.

4. MICRO SWITCH TEST:

Disconnect power to machine. Remove control panel. Inspect the mounting plates for both the lid closed micro and the lid locked micro (K-221), to be sure that the mounting screws are tight. Close the lid. The lid closed cam (2286-B) should strike the micro switch arm so that a "click" is heard when the contact points close inside the micro switch. The closure of the contact points can also be verified by testing the continuity across the micro switch terminals. Close the lid. Depress the lid lock lever (2254-1) should strike the micro switch arm so that a "click" is heard when the contact points close inside the micro switch. The closure of the contact points can be verified by the continuity across the micro switch terminals. After adjustment, be certain that neither the lid lock lever (2254-1) nor the lid closed cam (2286-B) or the micro switch arm is able to strike the plastic body of the micro switches.

5. CHECK GAURDS AND PROTECTIVE COVERS:

Inspect the belt guard cover, the control panel cover, and the motor fan cover, to be sure they are in place and secure.

SERVICE MANUAL FOR 805

INTRODUCTION: This manual provides specific step-by-step instructions to assist in repairing and replacing specific parts of your machine. It is designed to be used in conjunction with other materials including, parts list, parts manual, electrical diagram, brake assembly bulletin, trouble shooting guide, preventative maintenance schedule and the summary of safety information. Together, they provide adequate information to repair most of the machine.

ALWAYS TURN OFF PWER TO MACHINE BEFORE DOING ANY SERVICE WORK.

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NORTH STAR ENGINEERED PRODUCTS SERVICE MANUAL FOR
805 FLUID DRIVE MODEL

A. TO REMOVE BASKET:

1. CAUTION: Basket is heavy (350 LBS. Empty). You will require assistance to remove the basket
2. Raise lid, secure from falling if need be.
3. Basket can be lifted straight up and out of machine, no tools are needed. Do not get fingers, etc., between curb sidewall and basket. Do not drop basket.

B. TO REPLACE BASKET:

1. CAUTION: Basket is heavy you will require assistance to lift basket, or use an overhead hoist.
 - A. Before replacing basket:
 1. Inspect (3588) ball cap for wear – replace if necessary.
 2. Inspect corners of hex ball, if they are rounded – replace hex ball. If hex ball is damaged, inspect inside of center post of basket for basket.
 3. Grease top of hex ball with medium weight lithium grease. Failure to do so may result in excessive vibration and/or excessive wear to center post and hex basketball.
 4. Examine your drain to be certain it is not blocked.
 2. Place the basket **gently** on the hex basketball. **Do not drop basket.** Rotate the basket by hand until it engages the hex ball and falls into position.
 - A. If after removing and replacing basket – some vibration occurs – try basket in another position on the hex basket ball (6 positions possible).

C. REPLACE STAINLESS STEEL BALL CAP (3588):

1. Remove basket as per step A.
2. Remove Phillips head screw in center of ball cap (Phillips screw threads into the end of shaft to secure ball cap). Use a screwdriver underneath edge of 3588 to pop it off. It snaps into and out of place.
3. To replace, place in proper position and use a rubber mallet to snap down into hex ball. Replace Phillips screw through center of ball cap and thread into shaft.

4. Lightly grease top of hex ball with medium weight lithium grease.
5. Gently replace basket as per step B.

D. TO REMOVE CURB:

16. Remove basket as per step A.
17. Remove 3 fasteners on inside of curb that secures curb to skirt legs.
18. Remove curb (if stuck, simply rock to break loose glue on rubber mounts).

E. TO REPLACE CURB:

1. Inspect gaskets on legs, 31680, replace if necessary.
2. Replace curb on skirt assembly and align holes.
3. Replace the 3 fasteners to fasten curb to skirt. Hand start fasteners with gasket and bent washers (gasket goes against curb).
4. Tighten the 3 fasteners in a clockwise fashion, do not over tighten.
5. Put lid down and check lid/curb alignment.
6. If curb and lid are not properly aligned, tighten appropriate curb fastener to refine alignment.
7. Do not tighten bolts so tight that you bend the curb.
8. Replace basket as per step B.
9. Check outside of curb for leaks after first use.

F. TO REPLACE BRAKE SOLENOID:

1. Turn off power to machine.
2. Remove basket and curb as per steps A and D.
3. Remove wires and insulation at brake solenoid (mark and replace in same position).
4. Remove solenoid shield.
5. Remove brake solenoid mounting screws.

6. Remove pin in brake solenoid plunger (remember how it was connected).
7. Replace brake solenoid (check voltage).
8. Replace linkage and pin.
9. Depress solenoid plunger and check brake adjustment as per step J.
10. This is a good opportunity to inspect and replace (trunnion and bumper rubbers, brake shoe and lubricate brake pins). See steps J, K, and G.
11. Replace wires to brake solenoid and reinsulated terminals.
12. Replace curb and basket as per steps E and B.

G. TO REPLACE CENTER UNIT, AND/OR TRUNNION AND BUMPER RUBBERS, BUMPER TRUNNION CAPS, PULLEY AND TRUNNION RING ASSEMBLY.

1. Remove basket and curb as per steps A and D.
2. Remove the two trunnion caps (2 bolts per cap). Note that lip on underside of cap is toward outside of machine. Replace the same way when reassembling.
3. Remove wires at brake solenoid (mark wires so they can be replaced the same way).
4. Remove drive belt per step L.
5. Lift center unit straight up pout of skirt and set aside. (**CAUTION:** this unit weighs approx. 150 lbs).
6. To change pulley sheaves and/or pulley on center unit:
 - A. Remove unit as per step G, 1-5.
 - B. Remove threaded fasteners in pulley sheaves and replace with new sheaves.
 - C. To remove pulley hub from shaft, remove set screws and pull off of keyed shaft.
 - D. Replace pulley hub and pulley sheaves in same position as per old pulley. (When unit is back in place, the unit

pulley and the motor pulley should be in the same plane).

E. Reinstall center unit as per step I.

H. TO REPLACE TRUNNION RING:

1. Remove trunnion ring as per step G.
2. Slide 3 bumper rubbers onto square ends of trunnion hangers.
3. Place trunnion ring in hangers on machine base (they will only fit properly one way). Check that the bumper rubbers are properly seated in the hangers. If not consult factory.
4. Replace the 3 bumper caps (be sure that lip on the underside of the bumper cap is toward the outside of the machine). Hand start the bolts.
5. Tighten bolts securely.

I. TO RE-INSTALL THE CENTER UNIT:

1. Remove the center unit as per step G.
2. Replace center unit into trunnion ring with brake solenoid in back right side (opposite motor).
3. Replace trunnion caps as they were before you removed the center unit. (Lip on underside of cap goes toward outside of machine).
4. Hand start bolts.
5. Tighten bolts securely.
6. Test movement of center unit.
 - A. Stand at left front of machine and rock the top of the shaft away from and toward you. The top of the shaft should move about $\frac{1}{2}$ " off center.
 1. If too loose or tight, shim accordingly or call factory for service.
7. Reconnect wires on brake solenoid as they were.
8. Replace drive belt as per step L.

9. Replace curb and basket as per steps E and B.

J. TO ADJUST OR REPLACE BRAKE SHOE:

1. Remove basket and curb as per steps A and C.
2. Remove and save the two snap rings (2314) and nylon washers on top on the brake pin studs with a screwdriver.
3. Depress brake solenoid plunger to relieve tension on shoe.
4. Brake shoe now pulls straight up off the pins.
 - A. If stuck, tap lightly upward on both sides of the shoe using soft metal or wood.
 - B. Move linkage around to lessen tension on shoe.
5. After old shoe is removed, clean old dirt and grease from brake pins. Lightly grease sides of pins with medium lithium grease.
6. Install new brake shoe on brake pins, with casting number facing down on 2400-280 brake (casting #2400-271).
 - A. Adjust linkage with solenoid plunger to align pins with holes in brake.
 - B. Adjustment may be needed on 2307 bolt to fit new shoe on.
 - C. Tap new shoe straight down on pins with rubber mallet.
 - D. Replace nylon washers and snap rings (2314). Pliers work best on snap rings.
 - E. Adjust brake with 2307 adjusting screw.
 1. Manually press in solenoid plunger and turn brake hub.
 2. If brake hub turns freely, use ½” open end wrench to loosen the lock nut off 2307 screw (counter clockwise) until brake shoe just touches brake hub.
 3. Now turn the 2307 adjusting screw (clockwise) until brake hub just turns freely (about ¾ of a turn).
 4. If brake is adjusted correctly the solenoid plunger will travel only 3/8” to ½” to release the brake.

5. Tighten lock nut to hold 2307 screw in place.

NOTE: Brake will need more frequent adjustment during the first 30 days of operation, or when a new brake is installed.

6. Lube the 3 grease fittings on the brake assembly. One on the 2306 brake-adjusting arm and two on the brake shoe. See INSTRUCTIONS FOR ADJUSTING BRAKE section for details.

7. Reinstall curb and basket as per steps E and B.

K. TO LUBRICATE BRAKE SYSTEM:

There are two grease fittings on either end of the brake shoe. The third grease fitting is located on the 2306 brass brake-adjusting arm. To grease the brake shoe and adjusting arm remove basket and curb as per steps A and C. The brake shoe and adjusting arm should be greased every time the curb and basket is removed for any maintenance. See INSTRUCTIONS FOR ADJUSTING BRAKE section for details.

L. TO REMOVE OR REPLACE BELT GUARD, BELT, BELT TENSION SPRING AND ADJUST BELT TENSION.

1. Belt guard is held down with 1 hex head capscrew. Remove capscrew and slid guard away from machine and free of motor shaft.
2. Pull motor hanger away from machine to relieve tension on 2400-285 belt tension spring, then flip 2167 belt tension bolt away from hanger 2400-337. Remove old belt.
3. Belt can now be replaced. Put belt on center unit pulley, then on motor pulley.
4. Pull motor hanger 2400-337 away from machine beyond the length of the 2400-285 spring and flip 2167 bolt into place.
5. **do not over tighten belt.** It should be as loose as possible without slipping. If too tight: shorten 2400-285 belt tension spring. If too loose: shim out spring with flat washers.

M. TO REPLACE MOTOR OR MOTOR PULLEY:

1. Remove drive belt as per step L.
2. If changing pulleys only skip to step 5.

3. Disconnect conduit from splice box on motor. Disconnect wires from motor, mark wires for reconnection. See electrical diagram for details and wire locations.
4. Motor and motor hanger can now be lifted straight up and be removed.
5. If changing pulleys only, disconnection of wire and conduit, simply lift motor and hanger until hinge pins are free and turn motor on its side.
6. To replace pulley sheaves and/or pulley hub from motor:
 - A. Remove bolts through pulley sheaves and remove old pulley sheaves.
 - B. To remove pulley hub (does not need to be removed to replace sheaves only), remove set screw and slide pulley hub past key and off of end of shaft.
 - C. To replace pulley hub, position shaft and key, tighten set screws.
 - D. To replace pulley sheaves, hand start the four bolts through the sheaves, and then tighten securely.
 - E. To replace pulley hub, position shaft and key, tighten set screws.
 - F. To replace pulley sheaves, hand start the four bolts through the sheaves, then tighten securely.
7. If you are replacing the motor with a North Star replacement motor, follow this simple procedure: the new motor will come with motor hanger, pulley hub and pulley. Simply slide motor hanger hinge pins into place, then reconnect wires to motor splice box the same fashion they were removed. See wiring diagram in owners manual.
8. Replace the belt, belt tension spring (2400-285) and belt guard as per step L.

N. TO REMOVE AND REINSTALL CONTROL PANEL COVER, 2291SS (ON BACK OF MACHINE).

TURN OFF POWER TO MACHINE BEFORE REMOVING COVERS.

1. To remove 2291SS, remove the 12 hex head screws from back panel. (If back panel is stuck on box lightly pry loose at gasket).

2. To replace 2291SS, hand start all screws, then tighten in an even manner until gasket compresses and seals.

O. TO REPLACE LID SOLENOID

1. Remove control panel (2291SS) per step N.
2. Remove pin and spacers in lid solenoid plunger.
3. Remove wires on solenoid (mark and replace in same place on new solenoid).
4. Remove the four screws holding lid solenoid to control panel.
5. Replace solenoid (check voltage, be sure replacement solenoid matches control voltage.)
6. Install lid solenoid link, spacers, and pin.
7. Depress lid solenoid plunger until completely shut.
8. Check micro switch adjustment:
 - A. Micro switch arm should close and click shut, but should not hit the black plastic body of the switch.
 1. Lid solenoid has some up and down adjustment.
 2. Micro switch mount plate has some up and down adjustment.
9. Replace wires on solenoid spades. See wiring diagram if unsure of placement.
10. Turn on power to machine and test run through a cycle to be sure lid solenoid and micro switch are adjusted properly.

P. TO ADJUST OR REPLACE K-221 MICRO SWITCH:

1. To replace lid closed micro:
 - A. Remove control panel cover (2291SS) as per step N.
 - B. If replacing lid-closed micro, remove mounting plate (2283), mark and remove wires to micro switch, then unbolt and replace micro (do not over tighten bolts through micro or it will crack the body of the micro). Replace the wires identically, reinstall the mount plate then adjust as per next step.

- C. To adjust micro – close lid of machine and check that lid closed cam (North Star part #2286-B) is closing the micro. Be sure that micro switch arm is not hitting the black body of the micro switch.
 - D. Micro switch mount plate can be adjusted up and down and tilted to refine adjustment. Also, lid closed cam (North Star part #2286-B) can be adjusted on hinge shaft by loosening the set screw. Be sure all screws and set screws are tight when adjustment is completed.
2. To replace and adjust lid locked micro:
- A. To replace lid locked micro, remove mount plate (2284), then mark and remove wires (so they can be replaced in identical way). Then, unbolt and replace micro (do not over tighten bolts through micro or it will crack the body of the micro). Replace the wires in identical positions (see wiring diagram if unsure). Reinstall the mount plate then adjust as per next step.
 - B. To adjust, this micro should close and click shut, but not hit the body of the micro switch when the lid lick solenoid is completely closed.
 - 1. Depress solenoid plunger, if it does not close completely; adjust solenoid up and down on mounting screws.
 - 2. Depress plunger again, micro switch arm should click closed but not hit the body of the micro, (nor should the lid lick lever). Adjust micro by raising, lowering or tilting the mounting plate.
 - 3. Secure all screws.
 - 4. Turn on power and test run machine (if either micro fails to close, the machine will not run).
 - 5. Turn power off and replace control panel cover.

Q. TO LUBRICATE AND ADJUST LID HINGE BRAKE (NORTH STAR PART #2399-B)

- 1. To lubricate (scheduled maintenance every 60 days).
 - A. Remove control panel cover (#2291SS) per step N.

- B. Use a medium weight lithium grease on the 5/16" grease fitting on the hinge brake (part #2399-B0. Check lid adjustment.
- 2. To adjust fall of lid – open and close lid – stop at various distances above the curb – lid should stay in place by itself, it should not fall freely, but can be pulled shut easily.
 - A. If too loose or falls too freely – tighten 2398 bolt on lid hinge brake – check lid again, adjust as needed.
 - B. If lid is too tight, loosen 2398 bolt, check again, and adjust as needed.

R. TO LUBRICATE AND ADJUST LID LOCK LEVER (NORTH STAR PART #2254-1)

- 1. Remove control panel cover (#2291) as per step N.
- 2. To lubricate lid lock lever – there is a 5/16" grease fitting on the 2254-1, use a medium weight lithium grease.
- 3. To adjust lid lock lever.
 - A. Lid lock lever should fit behind lid lock cam such that the lid cannot be opened more than 1/2" above the curb when lid lock solenoid is closed, (so that fingers cannot be inserted under lid when lid is locked).
 - B. To adjust – there is a bolt (#2256-B) with a lock nut, in the end of the lid lock lever.
 - 1. If lid can be opened more than 1/2" when locked, loosen lock nut and adjust bolt until head or 2256-B bolt is as tight against the vertical surface of the 2253-B lid lock cam as possible, BUT STILL ABLE TO LOCK AND UNLOCK WITHOUT CATCHING OR JAMMING. Adjust as needed, tighten lock nut into place.
 - 2. If lid lock lever cannot close completely, loosen lock nut on adjusting bolt and turn bolt in until lever is just able to close without jamming. (Lid solenoid will buzz or hum loudly if jammed or unable to close completely). Tighten lock nut into place.
 - 3. Operate lid lock lever and solenoid several times and test lid lock adjustment. Then replace control panel cover.

S. TO REPLACE LID HINGE, LID CLOSED LEVER, LID HINGE FRAME, LID HINGE BRAKE AND LID LOCK CAM:

1. Remove control panel cover (#2291SS) as per step N.
2. Loosen set screw on lid closed lever and lid lock cam, slide lid lock cam toward outside of box, remove key from hinge shaft.
3. Remove lid hinge brake adjusting bolt (#2398), save this bolt.
4. Remove nuts from bolts through lid hinge frame, then remove two bolts through end of lid hinge frame. (CAUTION: Use 3/16" brass rod or soft metal to drive bolts out so that you do not flare out the ends of the bolt or damage the threads.
5. Use a 1/2" brass rod or other soft metal (so as not to flare out end of hinge shaft) to drive the lid hinge shaft slowly through the hinge frame and control box, being sure that it is not hung up on hinge frame or lid hinge brake.
6. If replacing lid lock cam or lid closed lever only, remove hinge shaft enough to slip off old piece and slip on new piece.
7. Slide new (or old) lid hinge shaft through the lid hinge frame and into the control box (check to be sure nylon washers are between lid hinge frame and control box). Use a brass or other soft metal to pound on lid hinge shaft to prevent flaring out end of shaft. (There may be waterproofing rubber washers (2400-149G) glued to the side of the control box with contact cement. Be sure these are not loose- use some grease on the hinge shaft to slide through these washers. Replace and re-glue if broken free from box.
8. Replace lid closed safety lever, lid hinge brake, and lid cam on shaft before going through opposite side of control box.
9. Be sure nylon washers are in place between lid hinge frame and control box.
10. Center new hinge shaft.
11. Install key in lid hinge shaft and slide lid lock cam over key and lock set screw in place.
12. Close lid of machine and turn hinge shaft so that flat surface of lid lock cam is vertical- so that when the lid lock solenoid is closed, the lid lock lever is locked behind the lid lock cam.

13. Reinstall and/or tighten (2398) bolt through lid hinge brake to lock the lid hinge shaft in place (so that it will not turn while drilling new holes in hinge shaft).
14. Double check lid lock cam positioning – **be sure it is correct.**
15. Drill the new holes straight down through the lid hinge (if needed) and lid hinge shaft (use sharp ¼” or D drill).
16. Install the new lid hinge bolts and nuts securely.
17. Adjust the lid hinge brake so that the lid will close but not fall freely as per step Q.
18. Adjust the lid lock lever adjusting bolt so that the lid lock lever will close when the lid lock solenoid is closed and the lid cannot be opened more than ½” above the curb when locked as per step R.
19. Adjust lid closed cam (2286-B) so that lid closed micro is closed, then tighten into place with set screw as per step P.
20. Test run machine several times and double-check all adjustments.
21. Replace control panel cover as per step N.

T. TO REPLACE TIMER:

1. Inside timer: 805
 - A. Turn off power to machine.
 - B. Remove control panel as per step N.
 - C. Mark and remove wires to timer.
 - D. Remove the mounting screws holding timer to control panel.
 - E. Install new timer, reconnect wires to identical positions on new timer. (Double check voltage on replacement part).
 - F. Set timer for desired length of cycle.
 - G. Replace back panel cover and test run machine.

U. TO REPLACE OTHER ELECTRICAL PARTS:

1. TURN OFF POWER to machine.

2. Remove control panel cover as per step N.
3. Mark and remove the wires leading to the part (so wires can be replaced identically on the new part).
4. Remove the screws (or other fasteners) holding the part to the control panel and remove old part.
5. Check voltage of replacement part to be sure it is the same as your CONTROL voltage.
6. Install new part in control panel and replace wires in the same position as on the old part (see wiring diagram for details).
7. Test run machine, then replace control panel cover as per step N.

INSTRUCTIONS ON HOW TO ASSEMBLE AND DISASSEMBLE A DRIVE UNIT

The hex basketball is a press fit on the square at the top of the shaft. First remove the Phillips head screw, located at the top of the stainless ball cap. The hex ball and hex basketball is now ready to be removed. It will be necessary to drive this casting off the shaft, using a lead hammer if possible, or by protecting the casting with a piece of wood when driving it off with a hammer. Next, remove the rubber shaft seal, which covers the upper shaft nut. Lay the drive unit on its side and loosen the pipe plug in the oil housing. Do not completely remove the pipe plug, since the oil would escape, but it is most convenient to loosen it before further disassembly. Now loosen the two set screws on the brake hub.

If it is not possible to lift the hub off the shaft, it may be necessary to drive the hub off as follows: Since the hub is keyed on the shaft, it is necessary to drive the hub straight along the vertical axis of the shaft. Remove the six cap screws securing the bottom end cover to the outer housing and turn the entire unit upside-down. Place a board on the floor to protect the end of the shaft. Now, using the weight of the drive unit and grasping the drive unit by its trunnions, thump the end of the shaft on the board to assist in driving the brake hub off the shaft itself. This action should drive the hub and the top end cover with bearing off the shaft and drive unit assembly, while driving this assembly off the shaft, observe the shaft key so not to damage the bearing while driving it off.

To remove the bearing from the top end cover, remove the three cap screws securing the bearing cap to the top end cover. At this time, the brake shoe should be removed so the bearing can be removed. Now turn the top end bell over and drive the bearing out, using a heavy drift along the inner edge of the bearing, which will be exposed when turning over the top end cover assembly.

To remove the bottom bearing only, it is not necessary to go through the above procedure, since it can be removed from the bottom of the drive unit as follows: Remove the cap screw and washer at the bottom of the shaft end of the drive unit. Now remove the four cap screws securing the pulley sheaves to the pulley hub. Remove the two set screws in the pulley hub and pry the pulley hub off the shaft. Remove the square key. Now remove the six cap screws securing the bottom end cover to the drive unit housing. With the drive unit in an upright position, tap this assembly lightly on the floor to assist in removing the bottom end cover from this assembly. Now that the bottom end cover is removed from the assembly, remove the snap ring securing the bottom bearing to the bottom housing. Using a drift, drive this lower bearing out of the bottom housing, since the bearing edge will be visible from the underside of this housing.

Endplay in the shaft itself is normal and all adjustments or measurements made on the shaft should be made with the shaft driven fully down, since it is normally used with a heavy basket on the shaft holding it in the full down position.

When assembling the drive unit, remove the pipe plug in the oil chamber with the drive unit laying on its side (with fill plug up so that the oil does not escape). Now start tightening the upper shaft nut down until the proper gap setting (.075) between the impellers in the drive unit, which can be visible through the oil hole in the oil chamber. It would be necessary to turn the shaft nut down, which will raise the shaft and open up the gap setting to the desired setting, and can be measured with a feeler gauge. Usually, this will result in having one or two threads exposed above the upper shaft nut.

This is intended as a guide only, and should not be interpreted as an accurate setting. After achieving the proper gap setting, tighten the two allen set screws securely in the brake hub and in the upper shaft nut.

If oil is lost in oil chamber, dump the remaining oil into a measuring device and add enough oil to have a total of 72 oz. in the oil chamber. Caution: since too much oil could make it into a direct drive, which causes a severe burden on the motor and could cause motor damage. Too little oil will cause the unit to spin too slowly for the pulley specs on a PF90 machine.

If, upon disassembly, the shaft is badly scored or worn due to a seized bearing, it will be necessary to replace the shaft; a tight press fit is required on these parts.

3210 DRIVE UNIT ASSEMBLY

PART NUMBER	DESCRIPTION
3588	Stainless steel ball cap
1189	Hex basket ball
2400-211	Main unit shaft
2400-216	Upper shaft nut
2400-218	Lower shaft nut (N-08)
2400-219	Bearing lock washer (W-08)
2400-178	Clutch runner key (1/4" key)
2400-226	Brake hub key (3/8" key)
3732	9 cast iron pulley
3733	11" cast iron pulley
2400-149	Pulley hub washer
3728	Pulley hub (1-3/4" bore)
3729	Pulley spacer ring (1-3/4" bore)
2400-208	Bottom end cover
2400-205	Lower main bearing
2400-395	Retaining ring
2400-212	Lower clutch drive housing
2400-213	Clutch driver
2400-214	Upper clutch runner
2400-215	Upper clutch drive housing
2021	3/8" socket pipe plug
2400-204	Top end plate
2400-206	Upper main bearing
3381	Top bearing seal
3382	Seal sleeve
3383	Top bearing cap oil seal
2400-210	Brake hub
2400-223	Lower shaft bushing
2400-224	Clutch busing
2400-259	"O" ring seal
2400-282	Water seal (shaft)
2400-207	Drive housing
2400-444	Trunnion rubber

PARTS LIST FOR FOLLOWING PAGE (805 UNIT)

ELECTRICAL CONTROL PANEL PARTS (805)

PART #	DESCRIPTION
2621	START BUTTON
2620	STOP BUTTON
K-221	(2) MICRO SWITCH
5128	LID LOCK SOLENOID (220V)
5129	LID LOCK SOLENOID (110V)
2444	240 VOLT 0-10 MINUTE TIMER
2445	120 VOLT 0-10 MINUTE TIMER
5431-1	MOTOR CONTACTOR (220V)
5432-1	MOTOR CONTACTOR (110)
2450	TIME DELAY RELAY (220V)
2451	TIME DELAY RELAY (110V)
5422	BRAKE SOLENOID (220V)
5421	BRAKE SOLENOID (110V)
2554	REM
2836	TRANSFORMER 460V-110V

**PARTS LIST FOR ELECTRICAL CONTROL PANEL FOR FOLLOWING
PAGE**

SOLUTIONS:

1. Something wrapped around shaft.
2. Basket may not be fully engaged with hex ball.
3. Bad bushing in center unit.
4. Worn shaft.
5. Replace pulleys.
6. Replace bumper and trunnion rubbers.
7. Inspect or replace hex ball and/or center post.
8. Inadequate or loose machine mounting.

PROBLEM: Starting amps excessive.

SOLUTIONS:

1. Something wrapped around shaft.
2. Bearing in unit and/or motor going bad.
3. Belt tension too tight.
4. Check for correct runner gap and check oil quantity in fluid drive.
5. Bad bushing in center unit.
6. Worn shaft.

PROBLEM: Water on center unit.

SOLUTION:

1. Drain restricted.

PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
2964	Lighted stop button
2621	Green start push button
2624	Clear rubber boot for 2521
3686	Lid handle (S.S.)
3149	Lid hinge frame (aluminum)
3205	Lid (S.S.)
3207	Curb assembly (S.S.)
3579	Skirt assembly (S.S.)
3726	Basket assembly (S.S.)

MOTOR ASSEMBLIES AND ASSOCIATED PARTS

5 H.P. MOTOR ASSEMBLIES

PART NO. 3215-8	208/60/3 motor assembly*
PART NO. 3215-3	230/60/3 motor assembly*
PART NO. 3215-4	460/60/3 motor assembly*
PART NO. 3215-5	574/60/3 motor assembly*

***MOTOR ASSEMBLIES INCLUDE:**

5 H.P. motor	Designate voltage required
2400-337	Motor hanger
3734	Motor pulley hub-1-1/8" bore
3732	9" cast iron pulley
2392	1/2" sealtite conduit
2393	Motor fan cover plate
2202	Motor hanger brass pins (5/8"rd X 2.25"lg.)

PARTS ASSOCIATED WITH MOTOR ASSEMBLY

2168	Tension bolt bracket (cast iron)
2167	Belt tension bolt w/pin (brass)
2400-285	Belt tension spring (replacement spring is longer than needed and will have to be cut to proper length to accommodate the intended belt). A belt too tight will cause bearing failure in drive unit and/or motor.
2400-163SS	Leveling bolt (S.S.) 3/4"-10 X 2" H.H. bolt
2400-164SS	Jam nut (S.S.) 3/4"-10 for 2400-163 SS

Delay Relay	Solid state circuit used to allow current to travel for a certain period of time.
Lid Lock Assembly	Assembly used to keep lid locked when the machine is in operation.
Lid Hinge Brake	Adjustment located on hinge shaft that keeps lifted lid from
Micro switch	Component used to open and close a circuit.
Solenoid	Electrical component that activates lid lock device.
Skirt	The machine base.
Relay	A device having a coil and one or more contacts, which is needed to switch power off and on within a circuit.

INSTRUCTIONS FOR ADJUSTING BRAKE

ELECTRIC BRAKE SYSTEM:

1. TURN OFF POWER TO MACHINE
2. REMOVE BASKET AND CURB.
3. CONSULT PREVENTATIVE MAINTENANCE SECTION BEFORE CONTINUING.
4. MANUALLY PRESS IN SOLENOID PLUNGER AND TURN BRAKE HUB.
5. IF BRAKE HUB TURNS FREELY IN STEP 3, USE ½" OPEN-END WRENCH TO LOOSEN LOCK NUT AND BACK OFF 2307 SCREW (COUNTERCLOCKWISE) UNTIL BRAKE SHOE TOUCHES BRAKE HUB.
6. TURN THE 2307 ADJUSTING SCREW (CLOCKWISE) UNTIL BRAKE HUB TURNS FREELY (ABOUT ¾ OF A TURN)
7. IF BRAKE IS ADJUSTED CORRECTLY, THE SOLENOID PLUNGER WILL TRAVEL ONLY 3/8" TO ½" TO RELEASE THE BRAKE.
8. TIGHTEN LOCK NUT TO HOLD 2307 SCREW IN PLACE.
9. REPLACE CURB AND BASKET.

TO REPLACE BRAKE SHOE:

1. REMOVE 2314 SNAP RING AND 2400-99-1 NYLON WASHER ON 2400-275-1 AND 2400-276-1 STUDS.
2. PULL OLD BRAKE SHOE STRAIGHT UP TO REMOVE.
3. CLEAN GREASE AND DIRT FROM STUDS.
4. LUBRICATE STUDS WITH A MEDIUM WEIGHT LITHIUM GREASE.
5. PUT ON A NEW BRAKE SHOE AND INSTALL SNAP RINGS.
6. LUBRICATE 3 GREASE FITTINGS.
7. ADJUST BRAKE SHOE.

LUBRICATE 3 LUBE POINTS EVERY 3 MONTHS, USE MEDIUM WEIGHT GREASE.

COST SAVINGS:

1. BE SURE TO REPLACE BRAKE SHOE BEFORE RIVETS SCORE HUB (ABOUT ONCE A YEAR, DEPENDING ON USAGE). BRAKE LINING SHOULD NEVER BE LESS THAN 1/8" FROM BRAKE SHOE.
2. KEEP BRAKE PROPERLY ADJUSTED. THIS WILL INCREASE SOLENOID LIFE AND DECREASE DOWNTIME.

TROUBLE SHOOTING GUIDE- MODEL 805

PROBLEM: Machine fails to start, lid is fully closed, start button activated, but machine does not start.

SOLUTIONS:

1. Emergency stop pushed in (pull out and restart).
2. Check incoming power supply.
3. Check timer.
4. Check lid closed micro (K-221), check if closed cam (2286-B) is loose.
5. Check time delay relay (replace).

PROBLEM: Lid locks light comes on and motor starts for only 2 seconds, then stops and lid unlocks.

SOLUTIONS:

1. Check timer
2. Lid lock micro switch needs adjustment or replaced.
3. Lid lock solenoid burned out or linkage jammed.
4. REM (2553) malfunction.
5. Lid lock cam (2652) loose or broken.

PROBLEM: Machine runs but the basket fails to spin.

SOLUTIONS:

1. Drive belt off pulley or belt is broken.
2. Brake may need adjustment.
3. Something wrapped around shaft.
4. Brake not releasing check brake solenoid. Check brake linkage and spring.
5. Basket not properly engaged on hex ball.
6. Top or bottom bearing failing in fluid drive.
7. Oil quantity in fluid drive (check to see if any oil is on the floor under center unit).
8. Runner gap is not correct inside center unit.
9. Bad bushing in center unit.
10. Drive belt slipping.

PROBLEM: Basket fails to accelerate.

SOLUTIONS:

1. Brake may need adjustment; brake may not be releasing check brake linkage and spring.
2. Something wrapped around shaft.
3. Oil quantity in fluid drive (check to see if any oil is on the floor under center unit).
4. Runner gap is not correct inside center unit.

PROBLEM: Braking time too long.

SOLUTION:

1. Brake may need adjustment, brake shoe lining worn, check brake linkage and spring.

PROBLEM: Lid stays locked at end of cycle, but machine stops and lid lock light goes out.

SOLUTIONS:

1. Lid lock solenoid burned out or linkage jammed.
2. Lid solenoid spring (3318) is broken.

PROBLEM: Lid stays locked and light stays on, but machine has stopped.

SOLUTIONS:

1. Check timer.
2. REM (2554) malfunction.

PROBLEM: Cycle longer than anticipated.

SOLUTIONS:

1. Check timer.
2. Brake may need adjustment, brake shoe lining worn, also check brake linkage and spring.

PROBLEM: Machine runs in wrong direction (correct rotation should be counter-clockwise).

SOLUTION:

1. Reverse 2 power leads on 3 phase motors.

PROBLEM: Lid falls too freely when open.

SOLUTIONS:

1. Adjust (2256) lid lock adjusting screw.
2. Adjust lid hinge brake.

PROBLEM: Clashing noise during acceleration or rattle during cycle.

SOLUTIONS:

1. Top or bottom bearing is failing.
2. Runner gap in center unit is incorrect.
3. A bad bushing in center unit.

PROBLEM: Basket gets up to full speed immediately.

SOLUTION:

1. Check for correct runner gap in center unit, check oil quantity in fluid drive also.

PROBLEM: Scored brake hub or noise when brake is applied.

SOLUTIONS:

1. Brake shoe lining worn.
2. Check brake linkage and spring.

PROBLEM: Excessive noise or vibration.

