

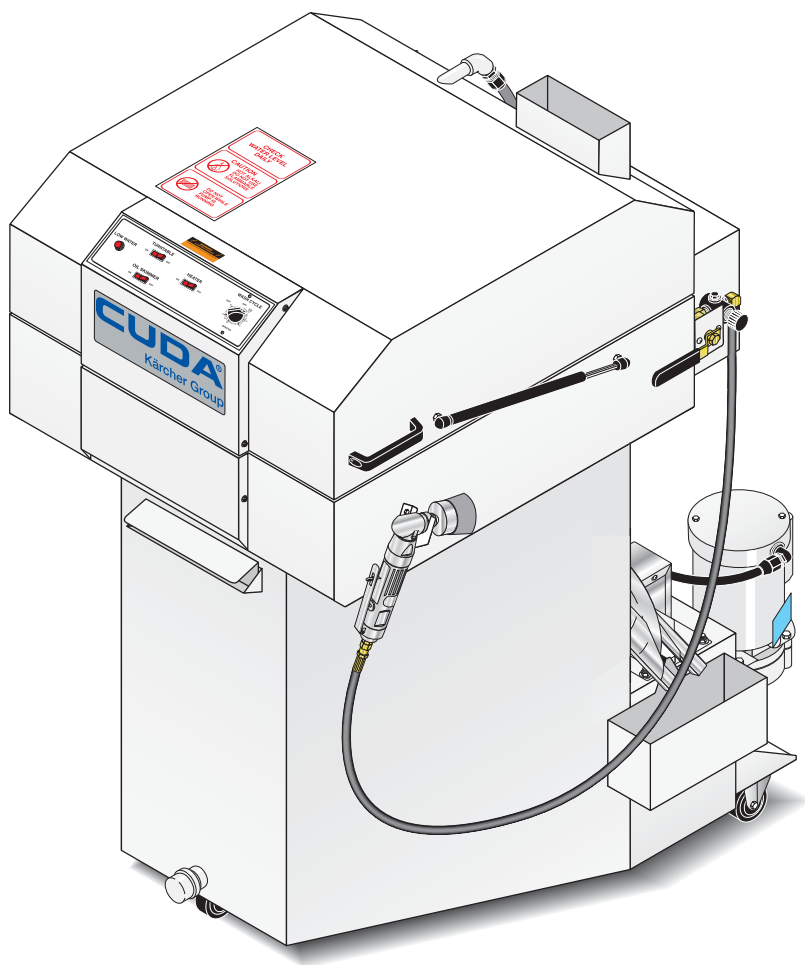
2216 Series

CUDA[®]

Kärcher Group

Operator's Manual

Automatic Parts Washer Compact Top Load



MODELS:	1.043-451.0
	1.043-452.0
	1.043-453.0
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	1.043-530.0
	1.043-531.0
	1.043-532.0
	1.043-534.0
	1.043-539.0



WARNING:

This product can expose you to chemicals which are known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information about this regulation: www.P65Warnings.ca.gov

For the Cuda Dealer nearest you, consult our web page at www.CudaUSA.com



8.941-287.0-AM 08/10/18

Machine Data Label

Model: _____

Date of Purchase: _____

Serial Number: _____

Dealer: _____

Address: _____

Phone Number: _____

Sales Representative: _____

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How To Use This Manual

This manual contains the following sections:

- How to Use This Manual
- Safety
- Operations
- Maintenance
- Parts List

The HOW TO USE THIS MANUAL section will tell you how to find important information for ordering correct repair parts.

Parts may be ordered from authorized dealers. When placing an order for parts, the machine model and machine serial number are important. Refer to the MACHINE DATA box which is filled out during the installation of your machine. The MACHINE DATA box is located on the inside of the front cover of this manual.

Model:	_____
Date of Purchase:	_____
Serial Number:	_____
Dealer:	_____
Address:	_____
Phone Number:	_____
Sales Representative:	_____

The model and serial numbers will be found on a decal attached to the machine.

SAFETY section contains important information regarding hazardous or unsafe practices of the machine. Levels of hazards are identified that could result in product damage, personal injury, or severe injury resulting in death.

The OPERATIONS section is to familiarize the operator with the operation and function of the machine.

The MAINTENANCE section contains preventive maintenance to keep the machine and its components in good working condition. They are listed in this general order:

- Maintaining The Machine
- Daily Maintenance
- Using the Oil Skimmer System
- Single Phase Heating Element
- Three Phase Heating Element
- Single Phase Thermostat
- Three Phase Thermostat
- Turntable Motor
- Replacement Procedure
- Pump Seal
- Timers and Switches on the Control Panel
- Troubleshooting the Electrical System
- Testing Individual Components
- Wash Cycle and Heater Timers
- Thermostat
- Troubleshooting

The PARTS LIST section contains assembled parts illustrations and corresponding parts list. The parts lists include a number of columns of information:

- **REF** – column refers to the reference number on the parts illustration.
- **PART NO.** – column lists the part number for the part.
- **QTY** – column lists the quantity of the part used in that area of the machine.
- **DESCRIPTION** – column is a brief description of the part.
- **NOTES** – column for information not noted by the other columns.

NOTE: If a service or option kit is installed on your machine, be sure to keep the KIT INSTRUCTIONS which came with the kit. It contains replacement parts numbers needed for ordering future parts.

NOTE: The manual part number is located on the lower right corner of the front cover.

Introduction & Safety Information

This manual is intended as a guide for safely installing, operating and maintaining your automatic parts washer.

We reserve the right to make changes at any time without incurring any obligation.

Owner/User Responsibility:

The owner and/or user must have an understanding of the manufacturer's operating instructions and warnings before using this machine. Warning information should be emphasized and understood. If the operator is not fluent in English, the manufacturer's instructions and warnings shall be read to and discussed with the operator in the operator's native language by the purchaser/owner, making sure that the operator comprehends its contents.

Owner and/or user must study and maintain for future reference the manufacturers' instructions.

Save these Instructions

This manual should be considered a permanent part of the machine and should remain with it if machine is resold.

When ordering parts, please specify model and serial number. Use only identical replacement parts.

This machine is to be used only by trained operators.

General Safety Information



WARNING: To reduce the risk of injury, read operating instructions carefully before using.

AVERTISSEMENT: Pour réduire le risque de blessures, lire attentivement les instructions de fonctionnement avant l'utilisation.

1. Read the owner's manual thoroughly. Failure to follow instructions could cause a malfunction of the parts washer and result in death, serious bodily injury and/or property damage.

WARNING: This equipment incorporates electrical parts that tend to produce arcs or sparks. Therefore, when located in a garage, it should be installed 18" (457mm) or more above the floor.

AVERTISSEMENT: Cet équipement comprend des pièces qui produisent des étincelles et, par conséquent, lorsque l'appareil se trouve dans un garage, il devrait être installé à 18" (457mm) ou plus du sol.



WARNING: This is a heated parts cleaner. Use only nonflammable, noncombustible, water-based cleaning compounds in this machine. Do not fill or contaminate with any flammable or combustible material such as gasoline, alcohol, mineral spirits, etc. Drain parts to be cleaned of any combustible or flammable

material before placing inside cabinet. Failure to observe this warning will create an extremely hazardous condition.

AVERTISSEMENT: Ceci est un nettoyant pour les pièces chauffées. Utiliser uniquement des produits de nettoyage à base d'eau, ininflammable et non combustible dans cette. Ne pas remplir ou contaminer avec une substance inflammable ou combustible comme de l'essence, de l'alcool, de l'essence minérale, etc. Drainer les pièces à nettoyer de toute substance combustible ou inflammable avant de les placer à l'intérieur de l'armoire. Le non-respect de cet avertissement créera une condition extrêmement dangereuse.



DANGER: Keep water away from electric wiring or fatal electric shock may result.

DANGER: Garder le jet d'eau à l'écart de tout câblage électrique ou des chocs électriques mortels pourraient survenir.

2. All installations must comply with local codes. Contact your electrician, plumber, utility

company or the selling dealer for specific details.

Install the machine in compliance with the National Electric Code. Connect to a properly sized lockable disconnect and ground machine using the grounding stud inside the main electrical panel.

3. Do not locate this machine in the vicinity of any flammable vapor, liquids or solids.
4. To protect the operator from electrical shock, the machine must be electrically grounded. It is the responsibility of the owner to connect this machine to a grounded receptacle of proper voltage and amperage ratings. Do not touch machine with wet hands or while standing in water. Always disconnect the power before servicing.
5. Do not touch machine with wet hands or while standing in water. Always disconnect the power before servicing.
6. Never make adjustments on machine while it is in operation except those prescribed in this manual.



WARNING: Use extreme caution when opening the door of this parts washer. Hot water/detergent vapors will be emitted. Stand Back! Hot cleaning solution could cause serious injury.

AVERTISSEMENT: Faire preuve d'extrême prudence au moment d'ouvrir le volet de cette partie de la laveuse. De l'eau chaude/des vapeurs de détergent seront émises. Se tenir à l'écart! Une solution de nettoyage chaude haute pression pourrait causer des blessures graves.

7. Before servicing the machine, refer to all safety data sheets (SDS's) on the material identified in the waste stream. You must comply with all warnings and wear all protective clothing stated on the SDS.

WARNING: Slips and falls from wet surfaces could cause serious injury.

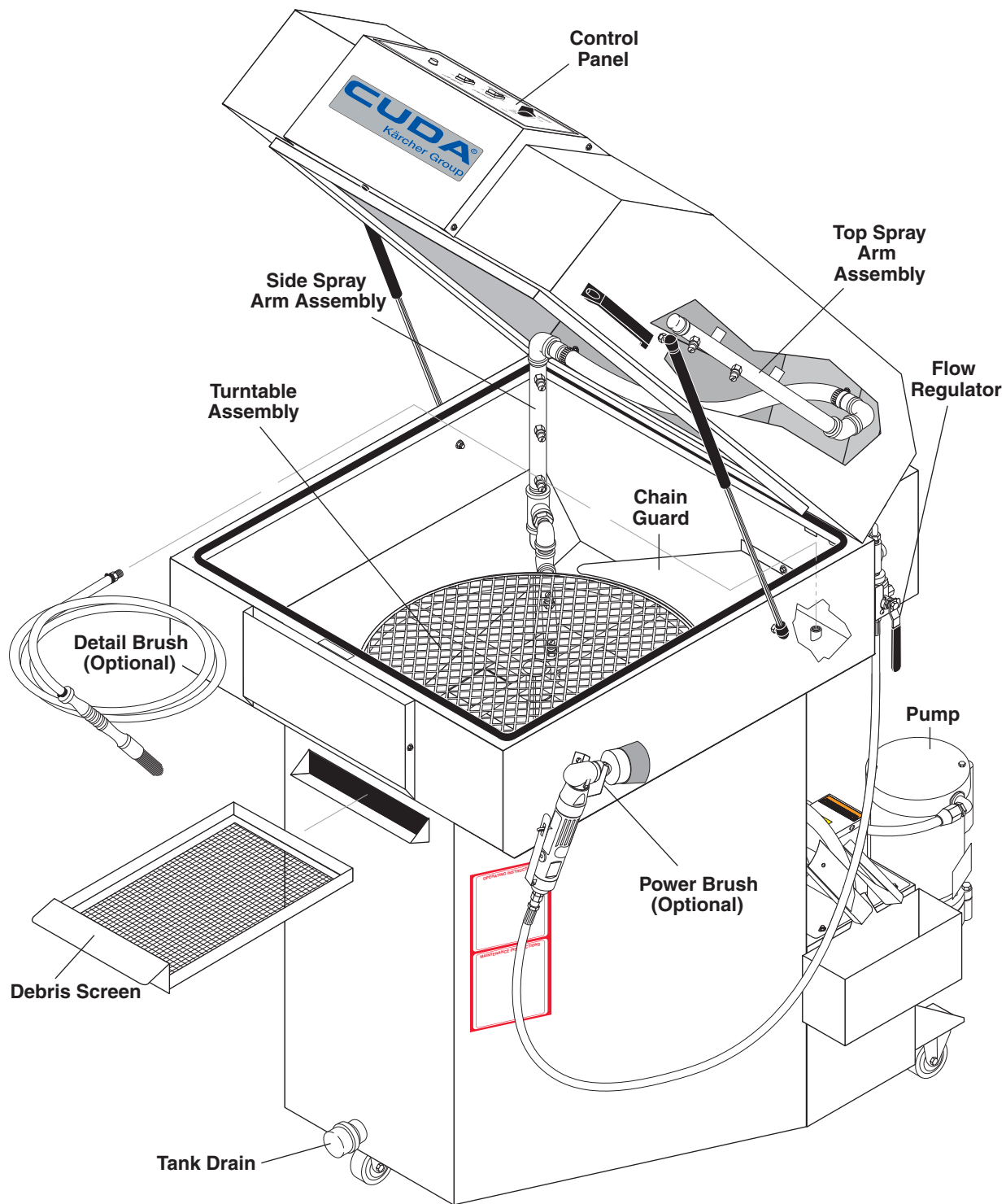
AVERTISSEMENT: Les chutes et les trébuchements causés par des surfaces humides pourraient causer des blessures graves.

8. Use caution when lifting items in and out of parts basket to prevent back injuries.
9. When the machine is working, do not cover or place in a closed space where ventilation is insufficient. Avoid installing machines in small confined areas.
10. In cold climates, this parts washer will freeze if not in operation and must be located in a heated enclosure.
11. Maintain an unobstructed work area around the machine and keep the floor free of water, oil, grease or other foreign substances.
12. Always ensure that your parts washer is clean. Pump and heating elements could be damaged by continued build-up of sludge.

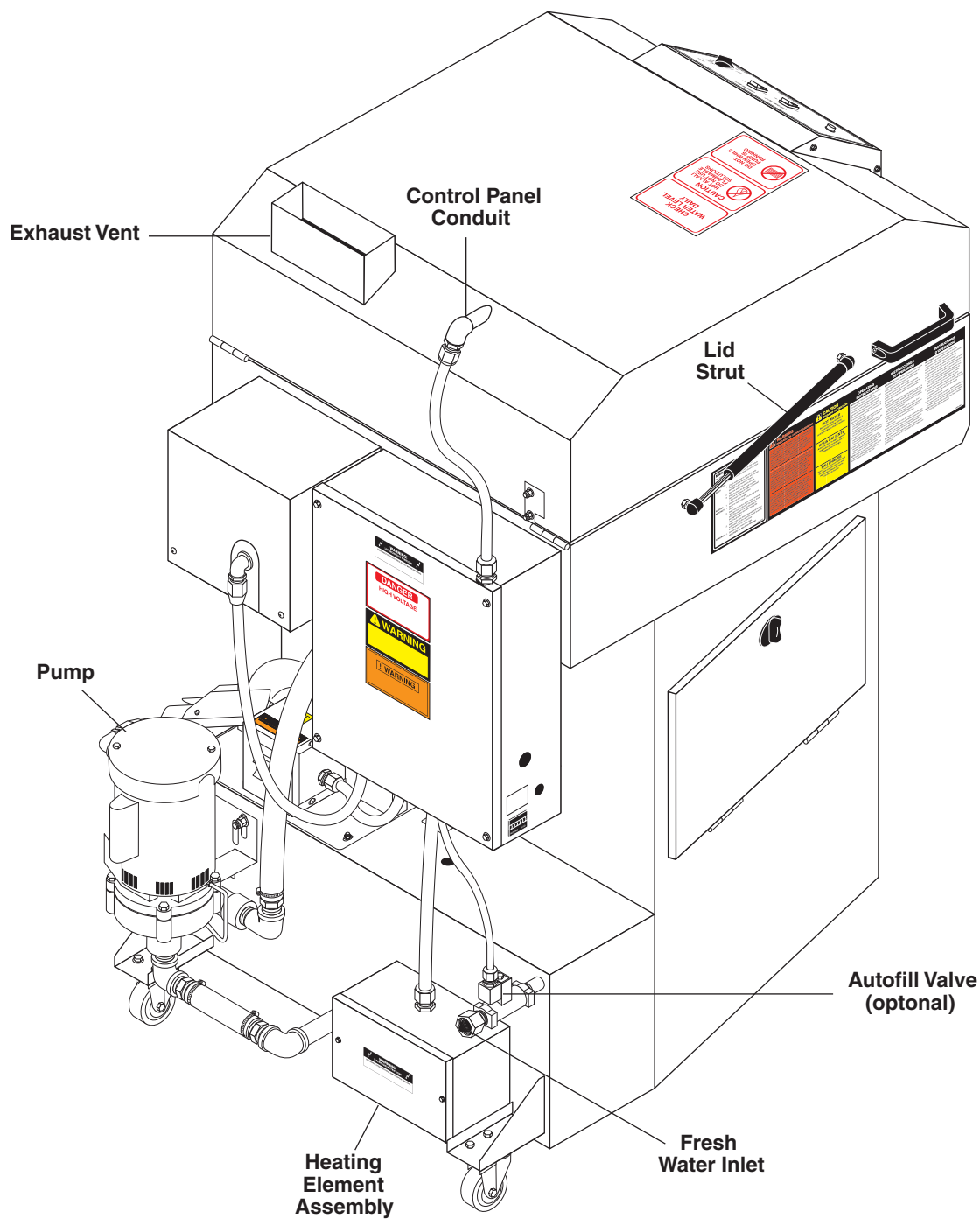
13. Check water level daily. Never allow water level to drop below pump inlet screen or heating elements.
14. Before discarding the spent washing solution, check with your local EPA or sewer district for disposal regulations.
15. Do not operate the machine with the lid or door open and do not override the safety switch.
16. After the machine stops, wait 10 seconds before opening the lid or door.

This automatic parts washer is designed to operate safely and efficiently. Before you begin to install and use the machine, please familiarize yourself with the major components.

Component Identification - Front



Component Identification - Rear



Installation

Before You Begin

To prepare to install the machine, choose an unobstructed, level site that allows convenient access for operators and maintenance personnel. Sources for water and electrical power should be located near the installation site. If your machine is equipped with the optional power brush and hand detail brush you must also run a compressed air line to the installation site.

If you have any questions regarding the installation, please contact your dealer

Step 1: Make Electrical Connections

NOTE: The machine can only operate on the type of electrical power indicated on the machine identification tag. Read and understand the machine identification tag to determine the electrical power requirements before installing the machine.

All machines require a suitable user-supplied power cord and a fused disconnect.

WARNING: Electrical shock could cause serious injury or death. For 230V and 460V machines, all electrical installation tasks must be performed by a licensed, professional electrician to ensure safe and proper operation. The installation must comply with the National Electric Code and all applicable state and local codes.

Step 2: Connect A Compressed-air Line And Accessories

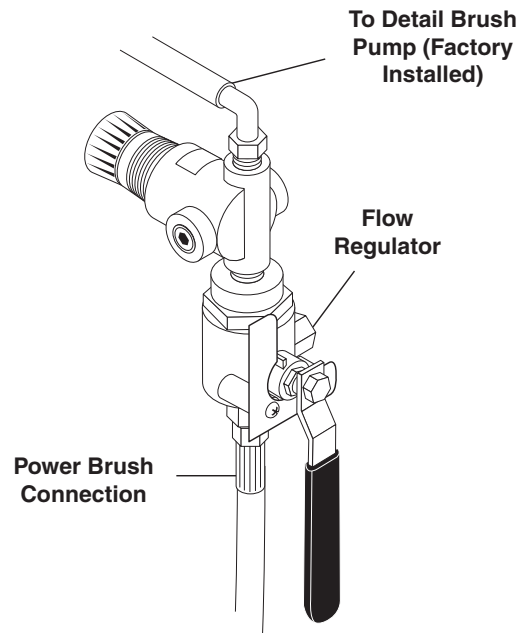
This step is required for machines equipped with the optional power brush and hand detail brush.

If your machine does not have these options, skip the following procedure.

NOTE: To ensure proper operation and to minimize the possibility of premature component failure, make sure the compressed air is supplied at 75 to 90 psi. We also recommends an in-line moisture trap and an in-line lubricator on the main air supply line. Refer to the documentation provided with the power brush for more information.

1. Remove the power brush from the box, install the wire brush in the chuck, and connect the air hose.

2. Familiarize yourself with the three-way air flow select valve, then install a fitting to accommodate a connection to your compressed-air supply.



3. Connect the shop compressed-air line to the machine.
4. Connect the hose from the power brush to the air flow select valve.
5. Hang the power brush on the bracket mounted along the right side of the machine.

Step 3: Connect A Water Line

A dedicated water line simplifies the filling process and allows you to maintain the appropriate water level much more easily. **If you do not wish to connect the machine to a dedicated water line, skip this step.**

The APW is equipped with a water supply inlet valve through which you can connect the machine to a dedicated water line. The valve is located at the left rear corner of the machine.

If you wish to connect the machine to a dedicated water line, keep in mind that the machine is designed for portability and some maintenance tasks require that you move the machine. **DO NOT** make a permanent connection from your shop water supply to the machine.

To connect the machine to your shop water supply, install a 1/2"NPT (male) by 5/8" (female) connection to the water supply inlet valve, then connect to a nearby water spigot using a suitable burst-proof hose.

Step 4: Fill The Machine With Water And Add Detergent

1. Fill the sump with water until the water indicator light on the control panel turns off. The sump capacity is 30 gallons.

NOTE: Monitor the water level carefully.

2. 120V Machines: Flip the heater switch to the ON position. The sump water will reach operating temperature (160 – 180 °F) in approximately 2-3 hours.
230V and 460V Machines: Turn the heater timer to the 2 Hour position. The sump water will reach operating temperature (160 – 180 °F) in approximately two hours.
3. While the sump water is heating, add the appropriate quantity of factory approved detergent to the wash chamber. We recommend mixing the detergent with warm water in a separate bucket/ container and then pouring the dissolved detergent into the sump.

NOTE: Factory approved detergent is the only detergent approved for use with this automatic parts washer. It is specially formulated with rust inhibitors and anti-foaming agents to optimize performance and minimize maintenance. The use of any other detergent during the warranty period will void the warranty. In addition, using factory detergents will extend your 90 day labor warranty to 1 year.

4. Close the lid.
5. Turn the wash cycle timer to 2 hours for the first time, and allow the machine to complete the cycle to dissolve the detergent into the water.

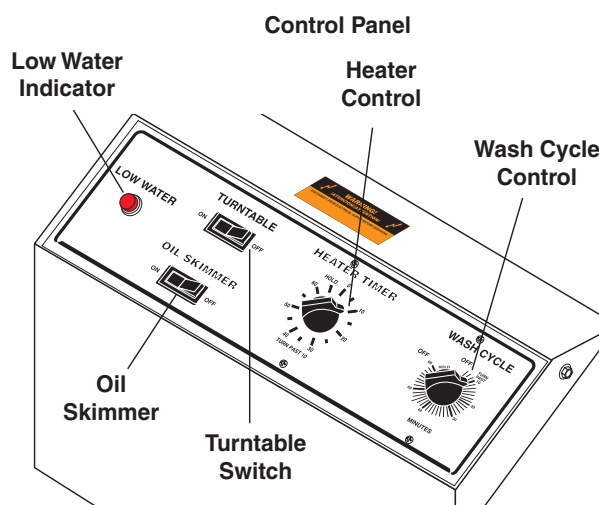
When the machine stops, and after the wash water reaches operating temperature, it is ready for use. Refer to **Operation** for complete operating instructions.

Main Operating Components

Familiarize yourself with the main operating components before operating the machine.

Control Panel

The control panel is located on the front center of the lid. It contains the heater, wash cycle skimmer and turntable controls.



Heater Control

Single Phase Machines: The heater control is a simple illuminated rocker switch. It controls the heating element in the sump chamber. The heater control illuminates when the heating system is on. The heating system is thermostatically set at the factory to reach a high temperature of 180 °F. The temperature is adjustable using the thermostat (See **Thermostat** Section).

NOTE: 120V machines contain an internal power relay that automatically disconnects power to the heater when the pump turns on; the heater and pump cannot run simultaneously. After long wash cycles it may be necessary to let the machine sit idle for a period of time to allow the wash solution to reheat to operating temperature.

The illuminated heater control is also a low-water indicator; if the wash solution is low, the heater control will not light up and the heating system will not operate.

Three Phase Machines: The heater control is a 12-hour timer switch. It controls the heating element in the sump chamber. The heating system is thermostatically set at the factory to reach a high temperature of 180°F. The temperature is adjustable using the thermostat (See **Thermostat**).

Wash Cycle Control

The wash cycle control is a 15 minute (120V - no hold) or 60-minute (220V -with hold) timer switch with a hold feature. When set between 1 and 60 minutes, the timer automatically shuts off the pump and turntable when the wash cycle is complete. When set to **Hold** (220V Only), the pump and turntable run continuously until manually shut off.

Turntable Switch

The turntable switch is a simple rocker switch that enables you to disconnect power to the turntable motor. Set to **ON**, the turntable rotates during the wash cycle. Set to **OFF**, the turntable does not rotate during the wash cycle. The switch is useful for washing large parts that would otherwise impede turntable rotation.

Low Water Indicator

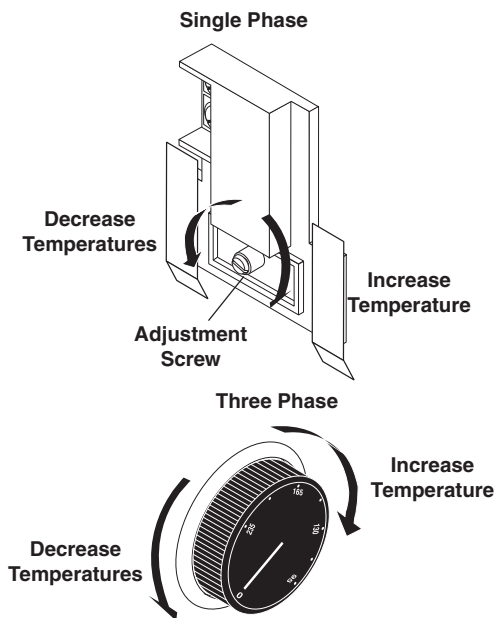
The low water indicator light illuminates if the wash solution in the sump is low.

Thermostat

The thermostat is located inside the heating element and thermostat enclosure. The thermostat is factory-set to heat the wash solution to a maximum temperature of 180°F.

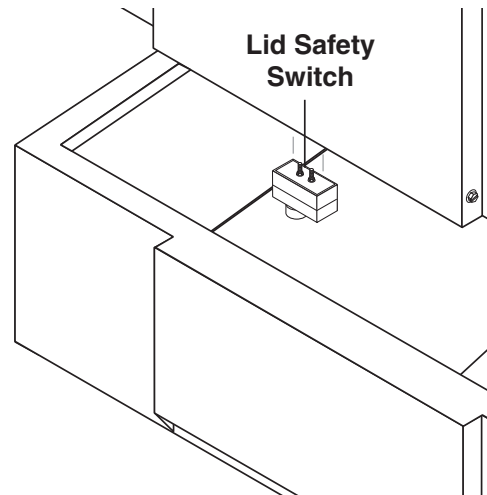
Adjusting the Thermostat

To adjust the thermostat, rotate the adjustment screw or knob clockwise to increase the temperature, or counter-clockwise to decrease the temperature.



Lid Safety Switch

The lid safety switch is located on the front edge of the cleaning chamber. It ensures that the water pump and turntable motor do not operate if the lid is open or unsecured. The safety switch is adjustable.

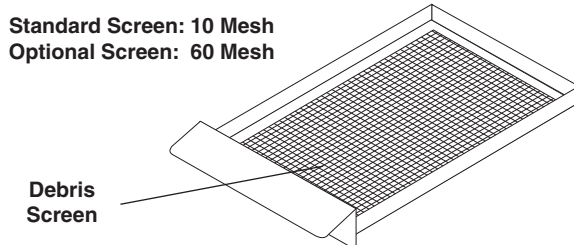


Adjusting the Safety Switch

To adjust the safety switch, loosen the two screws to the left of the lid latch, move the lid latch strike plate up or down, then tighten the screws. When properly adjusted, you should hear a slight "click" as the lid latch closes and compresses the lid seal and the lid closure safety switch. There is also a mercury switch in the control panel that stops the machine from running in case the lid switch is accidentally pushed.

Debris Screen

The debris screen is located just below the wash chamber, and is accessible from the front of the machine. The debris screen continuously filters debris particles from the cleaning solution to ensure blockage-free spray nozzle operation, and also provides a safeguard against small parts that might accidentally be washed through from the cleaning chamber.



The frequency at which you must clean the debris screen depends on machine usage. In general, you should clean the screen before operating the machine each day.

NOTE: *Never operate the machine without the debris screen in place and never remove the screen while the machine is operating.*

The screen is specially sized to filter particles that could clog the spray nozzles or damage the water pump.

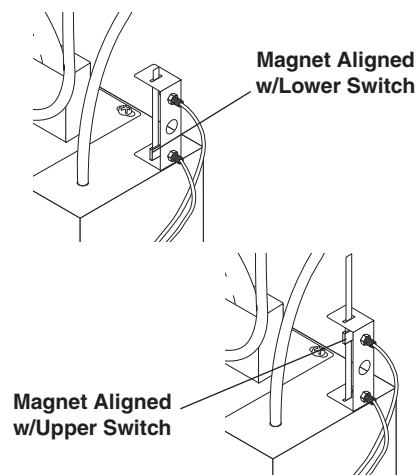
Operating the machine without the debris screen in place could cause spray nozzle clogging or water pump failure.

Water Level

Under typical operating conditions the machine loses 3 to 5 gallons of water per day to evaporation. It is important that you monitor and maintain the water level daily to minimize the risk of burning out the heating element or ruining the pump.

NOTE: *Add detergent each time you add water. Add detergent after you clean the sump chamber each month, and more frequently if your cleaning cycle maintenance period is more frequent, and if you notice specific low-detergent indicators (**See Detergents and Additives**).*

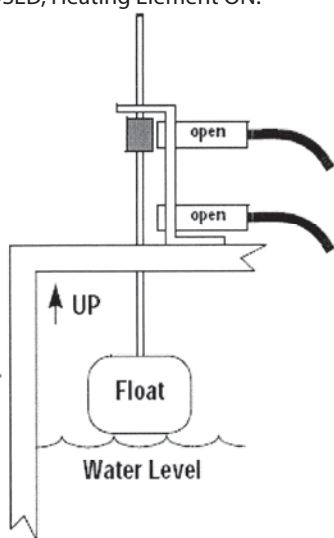
Low Water Shut-off System



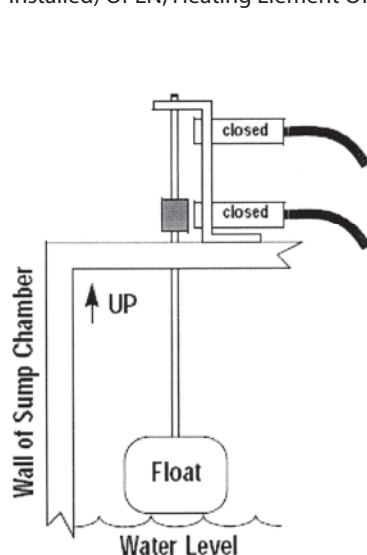
The low water shut-off system shuts down the machine if the wash solution in the sump chamber drops below a safe level. The system uses two reed switches and a float rod mounted on the right outer wall of the sump chamber to control the water level. If the wash solution drops below the lower reed switch, the low water indicator light on the control panel turns on and the system disconnects power to the heating element, the pump, and the turntable motor. To reset the system, add water to the sump until the low water indicator light turns off.

Automatic Water Fill Diagram:

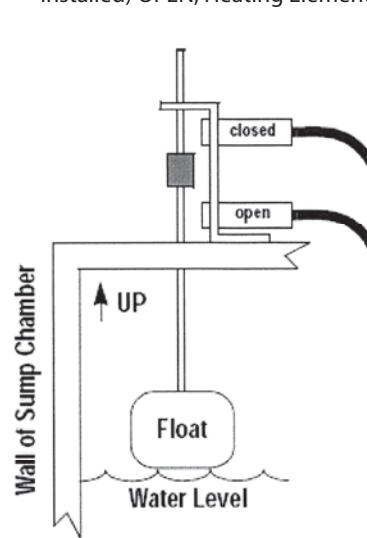
WATER LEVEL OK:
Both Switches OPEN, Automatic Water Fill Valve (if installed) CLOSED, Heating Element ON.



LOW WATER LEVEL
Top Switch CLOSED, Bottom Switch CLOSED, Automatic Water Fill Valve (if installed) OPEN, Heating Element Off.

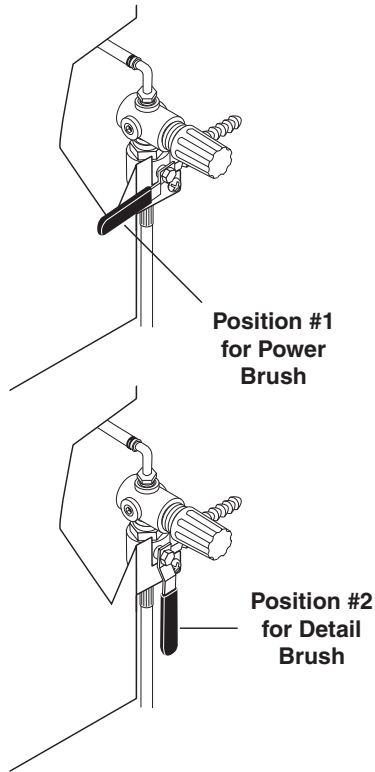


SUMP FILLING:
Top Switch CLOSED, Bottom Switch OPEN, Automatic Water Fill Valve (if installed) OPEN, Heating Element Off.



Air Flow Valve (Optional)

The air flow valve is located on the right rear corner of the machine. It is a three-way ball valve that controls the flow of compressed air to the power brush and the hand detail brush.



Power Brush (Optional)

The power brush is located on the right front corner of the machine.

Refer to **Connect a Compressed-Air Line and Accessories** detailed installation information.

NOTE: The power brush is a standard component on the Deluxe Edition. It is available as an option on the base model. For ordering information, contact your dealer.

Using the Power Brush

WARNING: Particles dislodged by the power brush could cause serious injury to your eyes. Always wear approved eye protection when using the power brush.

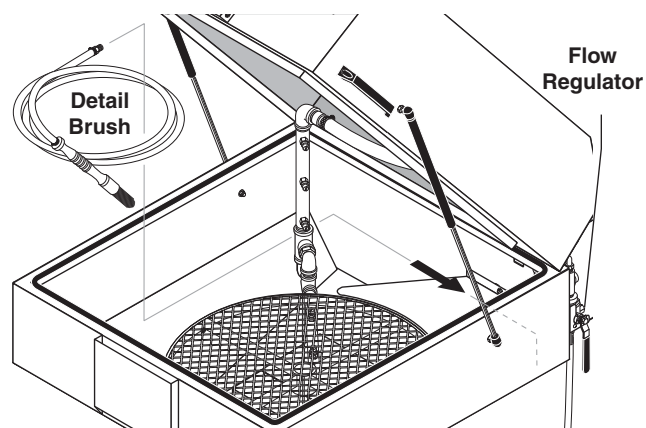
With stiff stainless steel bristles turning at 1800 RPM, the power brush easily removes carbon deposits, old gasket material, or other tightly-adhered materials from parts before washing.

To turn on the power brush, position the air flow select valve appropriately, then push the power brush lever lock forward with your thumb and squeeze the throttle lever to control the speed of the brush.

Detail Brush and Flow Regulator (Optional)

The detail brush is located on the front inside wall of the wash chamber. The flow regulator is located on the right rear corner of the machine. The detail brush uses a continuous flow of hot cleaning solution through its nylon bristles to help you clean delicate or lightly soiled parts. The flow regulator controls the flow of cleaning solution through the detail brush.

WARNING: Hot, high-pressured cleaning solution could cause serious injury. Always wear rubber gloves and approved eye protection when handling hot cleaning solution.



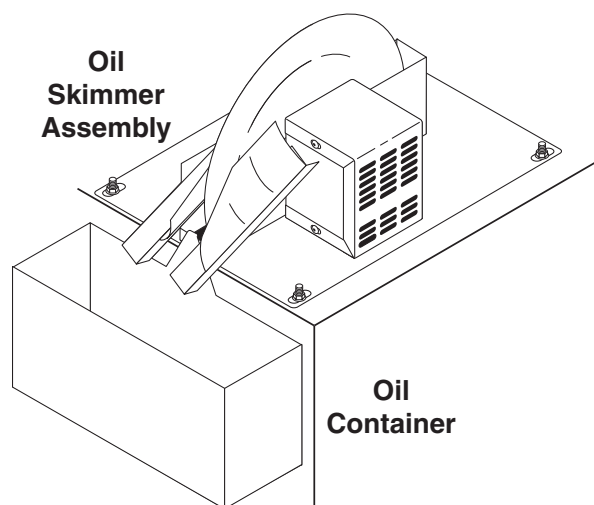
Adjusting the Flow of Cleaning Solution

The flow of cleaning solution through the detail brush is pre-set at the factory. If you need to adjust the flow, pull out the flow regulator knob, then rotate it clockwise to decrease the flow or counterclockwise to increase the flow. After adjusting, push the knob back in to lock it.

NOTE: The detail brush is a standard component on the Deluxe Edition. It is available as an option on the base model. For ordering information, contact your dealer.

Automatic Oil Skimmer System (Standard)

The automatic oil skimmer system consists of a skimmer assembly that includes an electric motor that rotates a disk in the sump water. The oil adheres to the disk and is wiped off by wiper blades and deposited in a container. The gear motor is controlled by a rocker switch on the control panel. See information in **Maintenance Section** for detailed operation.



Detergents And Additives

Detergents

Manufacturer's detergents are the only detergents approved for use with our Automatic Parts washers. They are specially formulated with rust inhibitors and anti-foaming agents to optimize performance and minimize maintenance. The use of any other detergent during the warranty period will void the warranty.

To monitor the relative concentration of the detergent in the wash solution, periodically examine the wash solution in the sump chamber for the following indicators:

- **Rust inside the machine:** not enough detergent
- **Excessive foaming:** not enough detergent
- **Thick, white residue on parts after washing:** too much detergent

To maintain proper detergent concentration under typical operating conditions, add detergent each month after cleaning the sump chamber. Follow recommended detergent quantities. Use pH kit to determine the proper amount of detergent to use. If you need help interpreting test results, contact customer service.

Rust Inhibitor Additive

Factory detergents protect the entire inside of your machine against the degenerative effects of water evaporation. A rust inhibitor additive actually evaporates with the water and continuously coats and protects metal surfaces, even while your machine is sitting idle. For more information, contact your dealer or call customer service.

Preparing The Machine For Use

Before you begin to wash parts, it is important that you properly prepare the machine. Before you begin to use the machine each day:

- check the water level and add water to the sump tank if necessary;
- heat the water to operating temperature
- verify that none of the spray nozzles are clogged; and

clean the debris screen.

Washing Parts

The following procedure assumes that the heater is on and the sump water is at operating temperature.

To wash parts, perform the following procedure.

WARNING: Hot, high-pressured cleaning solution could cause serious injury. Always wear rubber gloves and approved eye protection when loading and unloading the machine.

1. Load large, heavy parts directly onto the turntable. Load small, light parts in the small parts basket, if available. Make sure none of the parts extend beyond the edge of the turntable and make sure large, light parts (valve covers, for example) are secured to the turntable.

NOTE: For optimum cleaning performance, provide a slight clearance between parts to allow adequate flow of cleaning solution around and between them.

2. Close and latch the lid.

*NOTE: If you are washing large parts that might impede turntable rotation, flip the turntable switch **OFF**.*

3. Set the wash cycle timer to between 1 and 60 minutes for a timed wash cycle, or set it to **Hold** for a continuous wash.
4. When the machine automatically stops (or after you manually stop the wash cycle), lift the lid and wait a few moments to allow the parts to cool and dry before removing them. Most parts flash-dry in seconds.

Shutting Down The Machine

To shut down the machine at the end of the day:

- set the wash cycle control to **OFF**;
- **120V machines**: set the heater control to **ON** to enable automatic turn-on the following day; **230V and 460V machines**: set the heater control to **OFF** to prevent unattended heater operation;
- shut off the water at the supply spigot (if a dedicated water supply is installed); and
- shut off the compressed air at the supply line (if installed).

WARNING: For 230V and 460V machines, if the heater is left on unattended the water could evaporate and the oil and grease in the wash chamber could catch fire.

- For periods of extended shut-down (weekends and holidays, for example), disconnect power to the machine.
- If your machine is equipped with an optional programmable heater timer, periodically verify the settings to prevent inadvertent unattended operation.

Maintaining The Machine

To ensure optimum performance and trouble-free operation, observe the following maintenance schedule consistently.

Daily Maintenance

- Check the water level; add water if necessary.
- Clean the debris screen.

Weekly Maintenance

- **Detergent Concentration Level:** Check detergent level weekly to maintain concentration level which decreases when water is added. The pH level of this detergent must be in accordance with the detergent manufacturer's recommendation.
- Remove oil and grease from the wash solution by using the oil skimmer.
- For oily or extremely soiled parts, it is recommended the oil skimmer be operated on a more frequent basis.
- Examine spray nozzles; clean and align if necessary (See **Cleaning and Aligning the Spray Nozzles**).
- Wipe down the exterior of the machine using spray degreaser and a soft, damp cloth. **TO PREVENT ELECTRICAL COMPONENT FAILURE, DO NOT SPRAY THE MACHINE WITH WATER.**

NOTE: Degreaser spray and a damp cloth will usually remove all dirt and grime from the machine. For particularly stubborn soap deposits, use a soft cloth dampened with warm solution from the wash chamber.

Monthly Maintenance

- Drain and clean out the sump chamber (See **Cleaning out the Sump**).

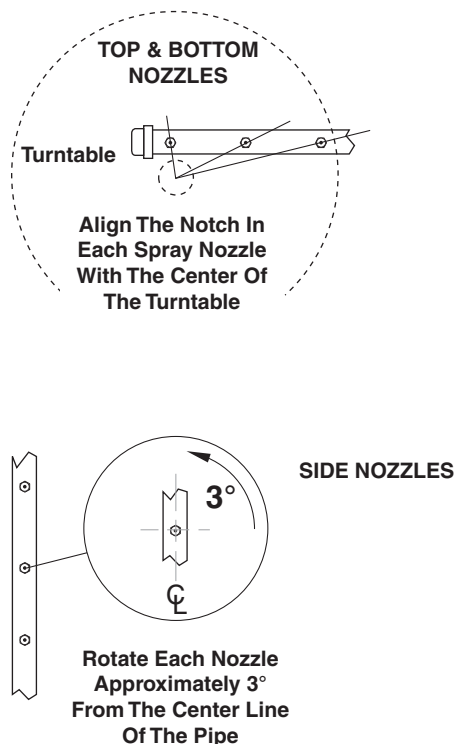
Cleaning and Aligning the Spray Nozzles

To ensure optimum cleaning performance, it is important that you examine the spray nozzles periodically and clean and align them if necessary.

To clean a plugged nozzle, remove it from the spray pipe and use a small wire brush to free the nozzle of any obstructions. When you replace the nozzle on the spray pipe, make sure you align it according to the figure to maintain a proper spray pattern.

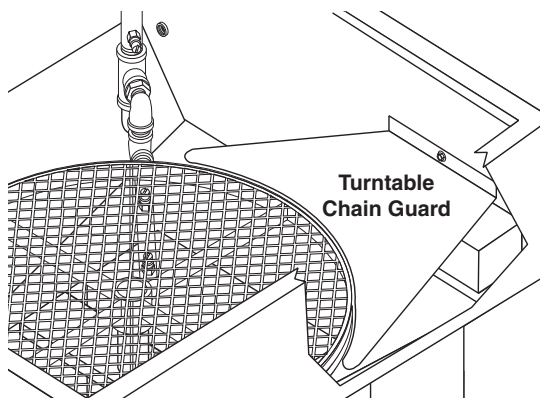
NOTE: The spray nozzles are sized and positioned to optimize the distribution of cleaning solution in the wash chamber. If you remove the nozzles make sure

you replace them in the correct position on the appropriate pipe. Spray nozzle specifications are stamped on the face of each nozzle, as shown.



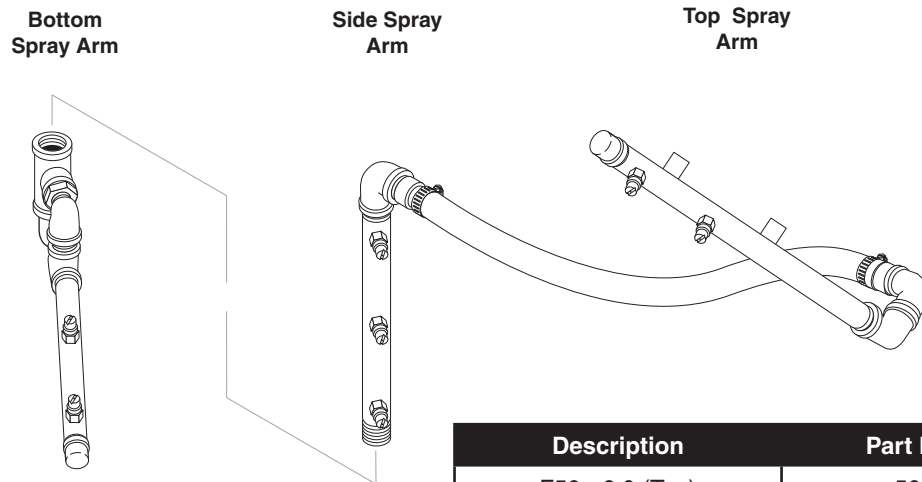
Cleaning out the Sump

1. Remove the turntable and the debris screen. To remove the turntable:
 - a. Remove the turntable chain guard using a 5/16" wrench or socket
 - b. Disengage the chain from around the perimeter of the turntable.



NOTE: When you disengage the chain from the turntable, be sure to maintain some chain tension to ensure that the chain does not disengage from the drive pulley.

- c. Pull up evenly on the turntable to remove it from the center pin.

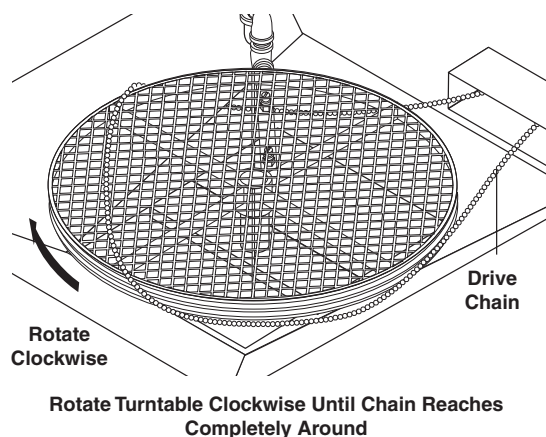


Description	Part Number
F50 - 6.0 (Top)	500.265
F50 - 4.0 (Side)	500.001
F90 - 4.0 (Bottom)	500.127

2. Drain the wash solution from the sump chamber. To drain the solution either use the sump drain or a small submersible pump.
3. Remove sand and other debris from the bottom of the sump chamber. To remove the debris either flush it out through the sump drain, or vacuum it out using a wet/dry Vac. Dispose of the debris in accordance with applicable local, state, and federal regulations.

NOTE: Take special care to ensure that the heating element and the low-water float are free of debris. A build up of debris around the heating element will decrease heating performance and may cause the element to overheat and fail. A build up of debris around the float may cause the low water shut-off system to malfunction.

4. Refill the sump with fresh clean water.
5. Replace the debris screen and turntable. To connect the drive chain to the turntable.



6. Heat the wash water to operating temperature, then add detergent according to directions on label.
7. Run the machine through a 30-minute wash cycle.

Using the Oil Skimmer System

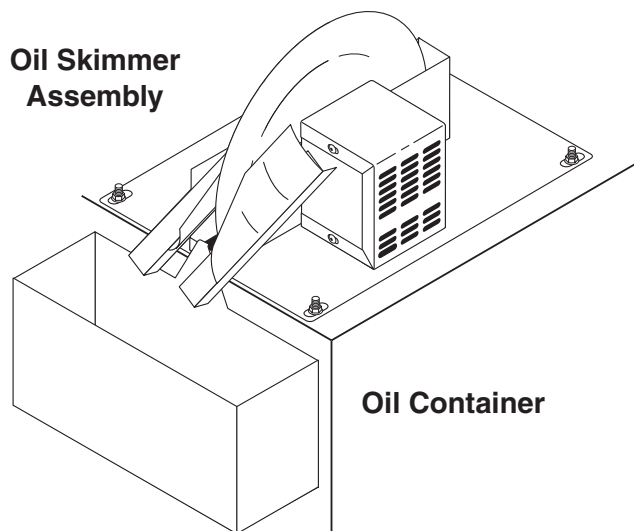
The oil skimmer system is most effective if used when the cleaning solution in the sump is cool. The frequency at which you must remove the oil from the wash solution will depend on machine usage. Under typical operating conditions you may need to remove the oil every day. If the oil skimmer runs longer than 10-15 minutes, the detergent and vapor rust inhibitor content in the sump should be checked. The detergent and inhibitor can be removed with extensive use of the skimmer, so be certain to check chemical levels after running the skimmer to determine if you require a higher frequency chemical maintenance cycle than weekly.

IMPORTANT: The skimmer motor is equipped with a thermal overload switch which protects the skimmer from overheating. If you attempt to use the oil skimmer system when the wash solution is hot, the thermal overload will probably trip and the motor will shut off until it cools. Under normal skimming conditions (when the wash solution is cool) the thermal overload should not trip.

To remove oil from the cleaning solution, perform the following procedure:

1. Allow the machine to sit idle for at least 30 minutes to allow the oil to float to the surface of the wash solution.

2. Ensure that the oil collection container is in place, then turn the skimmer switch to the "ON" position.



3. Allow the oil skimmer to operate until it is no longer extracting oil from the cleaning solution.

Tip: While extracting oil from the cleaning solution, oil will flow off the wiper blades in a fine continuous stream. Water will flow off the blades in droplets. Once droplets begin to flow off the wiper blades, stop the skimmer motor.

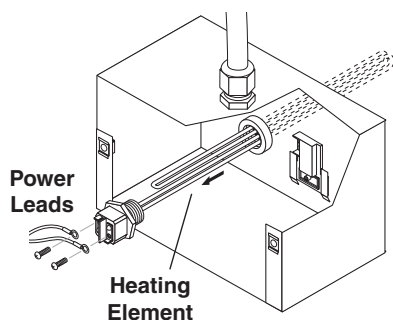
4. Dispose of the oil in the collection container in accordance with local and state regulations, then replace the container.

Repairing The Machine

The following procedures outline the steps necessary to replace specific items on the machine that could wear out or otherwise fail.

Single Phase Heating Element

1. Disconnect power to the machine.
2. Remove the cover from the heating element and thermostat enclosure (Two 5/16" Screws).
3. Detach the power leads from the heating element.



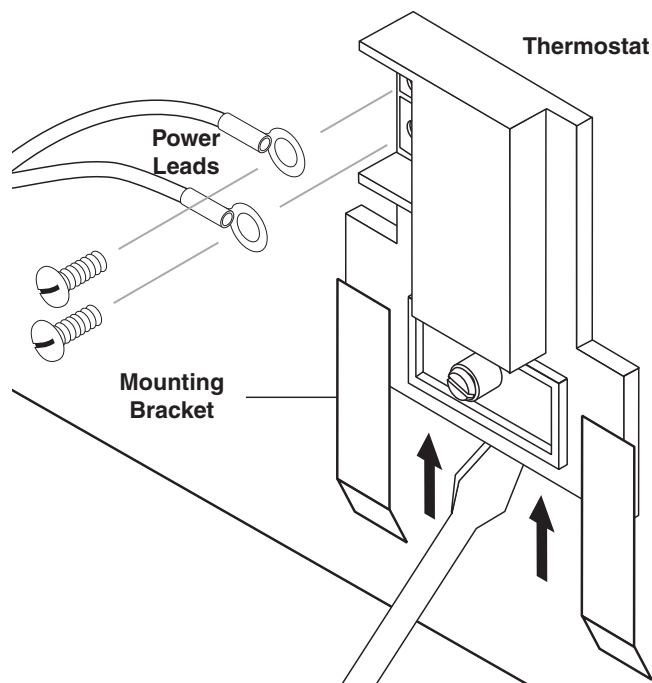
4. Use an ohm meter to measure the resistance of the heating element. The resistance should be approximately 10 Ohm; if not, replace the heating element (See **Heating Element**).

Three Phase Heating Element

A three phase heating element is a complex component. Please contact your dealer for testing instructions.

Single Phase Thermostat:

1. Disconnect power to the machine.
2. Remove the cover from the heating element and thermostat enclosure (Two 5/16" Screws).
3. Detach the power leads from the thermostat.



4. Using a large flat-head screwdriver, pry the thermostat out of the mounting bracket, then remove it from the machine.
5. Set the thermostat to 120 °F, warm it to just above 120°F, then test for continuity.

If there **is** continuity the thermostat is no longer functional; replace the thermostat.

6. Allow the thermostat to cool to room temperature, then test for continuity.

If there **is not** continuity the thermostat is no longer functional; replace the thermostat.

Three Phase Thermostat

A three phase thermostat is a complex component. Please contact your dealer.

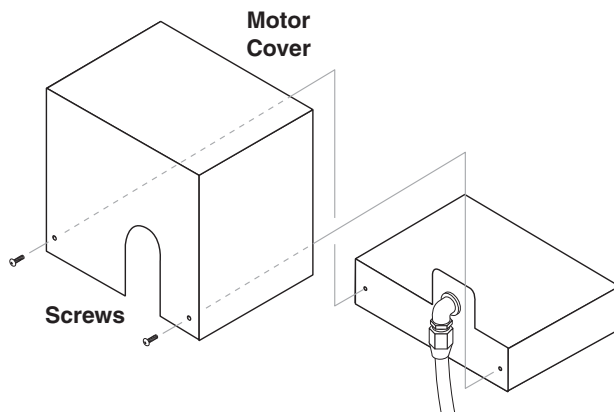
Turntable Motor

Required Tools and Equipment

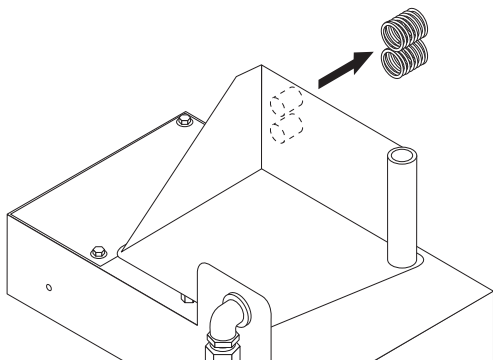
- 5/16" wrench or socket
- 1/8" hex key
- medium phillips-head screwdriver

Replacement Procedure

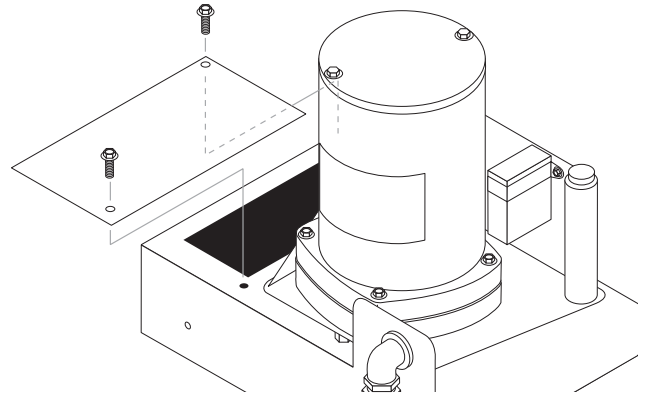
1. Disconnect power to the machine.
2. Disengage the drive chain from the turntable.
3. Taking care not to kink or tangle the chain, place it on the turntable and close the lid.
4. Remove the turntable motor cover (Two Screws; Use a 5/16" Wrench or Socket).



5. Remove the compression spring between the motor and the rear wall of the wash chamber.

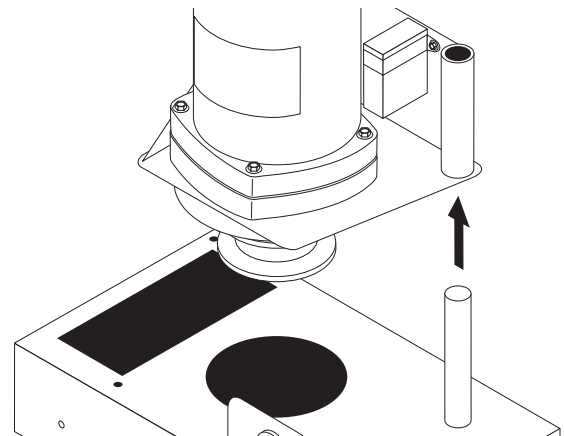


6. Remove the drive pulley access plate (Two 5/16" Screws).

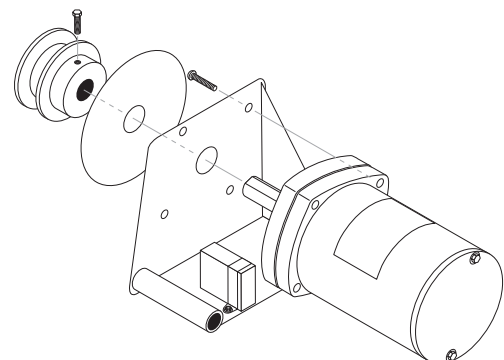


7. Disconnect all power leads from the motor, taking care to mark them for reassembly.
8. Raise the motor and bracket to remove the assembly from the pivot pin.

NOTE: You may have to reach into the drive pulley access hole with your fingers to free the chain from the drive pulley.



9. Use a 1/8" hex key to remove the pulley and steam shield disk from the drive motor shaft, then remove the four screws holding the motor to the mounting bracket.



10. Install the new motor. Installation is the reverse of removal.

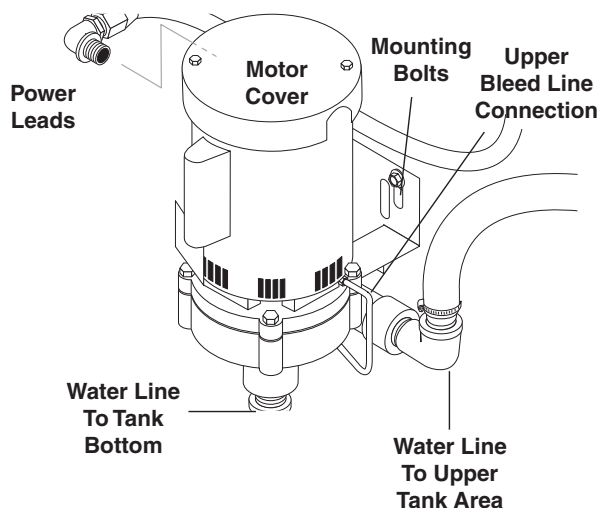
Pump Seal

Required Tools and Equipment

- 1/2" wrench
- 9/16" wrench
- medium flat-head screwdriver
- large flat-head screwdriver
- small phillips-head screwdriver
- hammer or rubber mallet

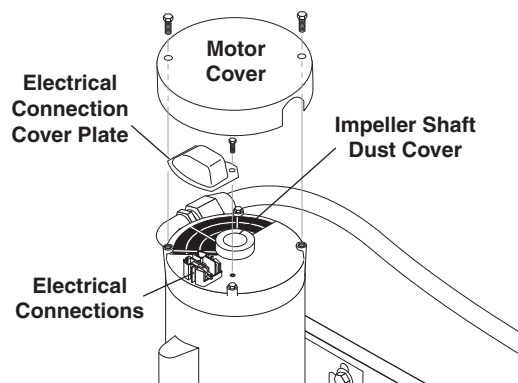
Replacement Procedure

Before you disassemble the pump to replace the pump seal, examine figure below to familiarize yourself with the pump components.

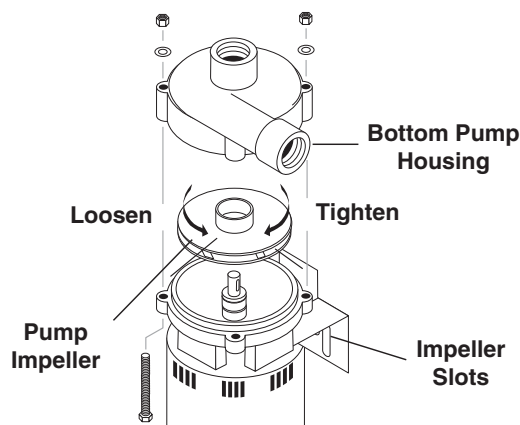


1. Disconnect power to the machine.
2. Drain the wash solution from the sump.
3. Remove the motor cover.

4. Remove the electrical connection cover plate, disconnect the power leads from the pump, and remove the impeller shaft dust cover.



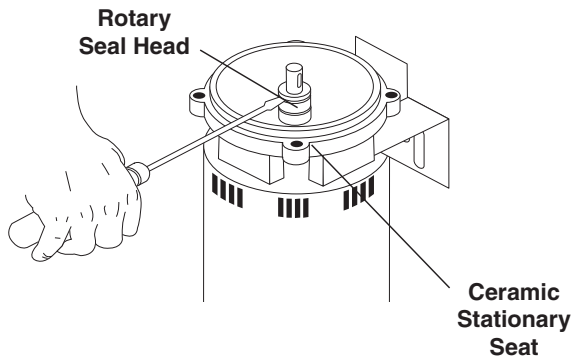
5. Remove the two 9/16" mounting bolts to separate the pump from the machine.
6. Separate the pump from the two water hoses.
7. Disconnect the bleed line at the upper connection.
8. Remove the bottom of the pump housing to expose the impeller (Four 9/16" Bolts).



NOTE: Mark the bottom and top of the pump housing before removing the bottom to ensure proper alignment when you reassemble the pump.

9. Insert a large flat-head screwdriver in the slot on the top of the impeller shaft to immobilize it.
10. Insert the tip of a small phillips-head screwdriver into the slot on the edge of the impeller, and firmly tap the screwdriver with hammer to loosen the impeller.
11. Remove the impeller from the shaft.
12. Using a flat-head screwdriver, carefully remove first the rotary seal head, then the ceramic stationary

seat from the shaft. Be careful not to scratch or mark the shaft.



13. Carefully clean the stationary seat cavity and shaft.
14. Use the glycerine lubricant provided with the seal kit to lubricate the new seal head and stationary seat, then carefully slide them into position on the shaft.

NOTE: The rotary seal head and ceramic stationary seat are precision components and must be handled accordingly. Be especially careful with the sealing surface between the components so as not to contaminate it with dirt or other debris.

15. Install the impeller.
16. Reassemble the pump and replace it on the machine. Installation is the reverse of removal.

Timers and Switches on the Control Panel

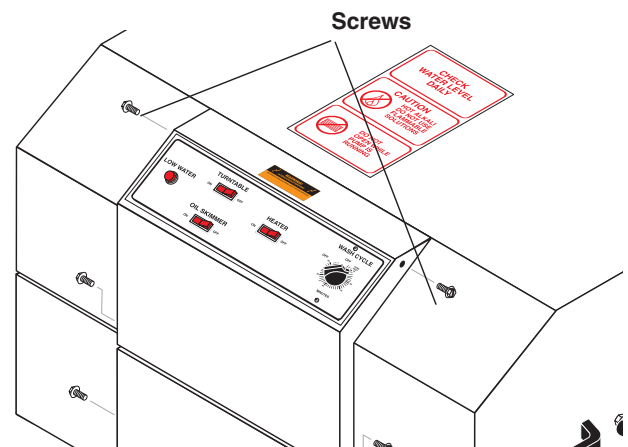
Required Tools and Equipment

- 5/16" wrench or socket
- 1/2" wrench or deep socket
- small phillips-head screwdriver
- small flat-head screwdriver

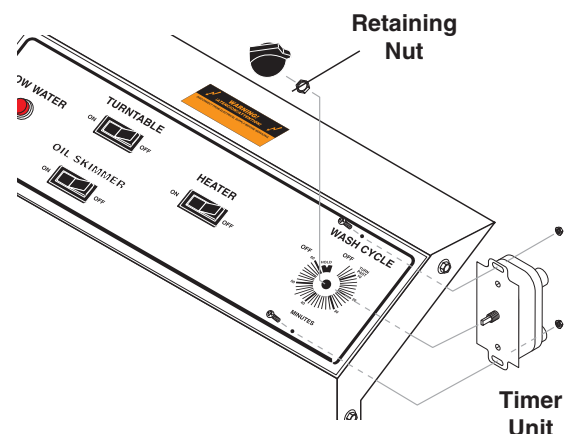
Replacement Procedure

1. Disconnect power to the machine.
2. Loosen the compression fitting on the back of the lid to allow enough slack in the wires to access the rear of the control panel when you remove it.

3. Remove the control panel from the lid (Six Screws) Use a 5/16" Wrench or Socket.



4. Remove the two screws, retaining nut, and o-ring that hold the timer switch to the control panel.



5. Pull the control panel away from the lid. From the rear of the panel remove the component you wish to replace.
6. Attach the power leads to the new component, then reassemble the control panel and replace it on the machine. Installation is the reverse of removal.

Troubleshooting

Troubleshooting the Electrical System

To troubleshoot the electrical system first eliminate the possibility of a blown fuse or a bad connection, then refer to Testing Individual Components to determine which component is causing the problem.



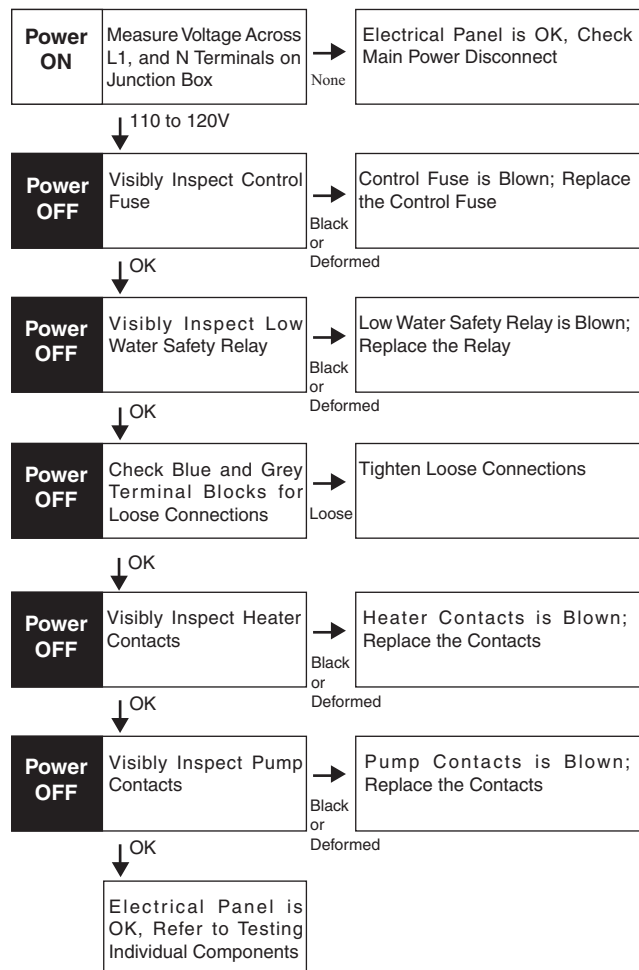
DANGER: Keep water away from electric wiring or fatal electric shock may result.

- Electrical troubleshooting should be performed by qualified personnel only.
- Avoid contact with power leads, terminals, and fuses when power is connected.
- Disconnect power to machine before removing fuses or other electrical components.

120V Machines

To troubleshoot the electrical system on 120V machine, use the exploded view on pages 34-35 to eliminate the possibility of a blown relay or a bad connection, then refer to **Testing Individual Components** to determine which component is causing the problem.

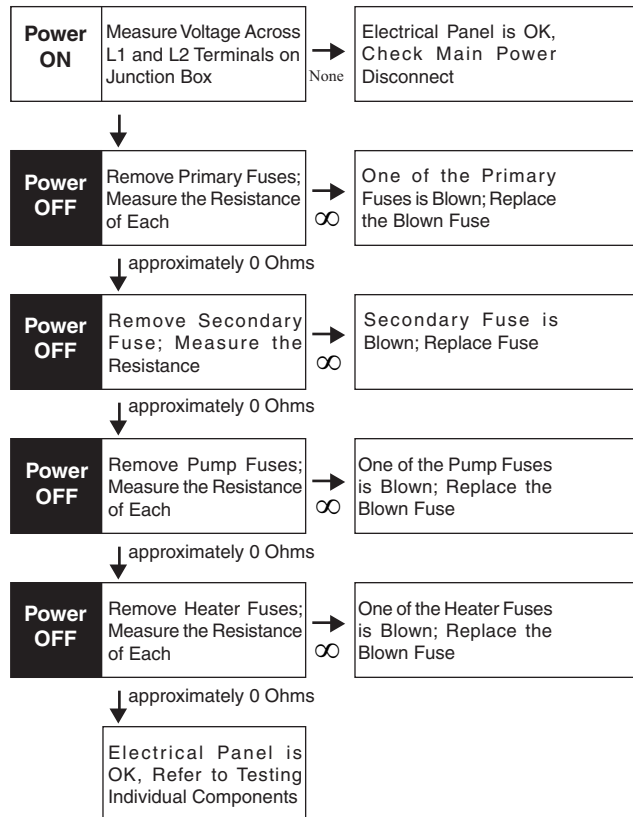
Troubleshooting the 120V Electrical Panel



230V and 460V Machines

To troubleshoot the electrical system on 230V and 460V machines, use the exploded view on pages 36-37 to eliminate the possibility of a blown fuse or a bad connection, then refer to **Testing Individual Components** to determine which component is causing the problem.

Troubleshooting the 230V Electrical Panel

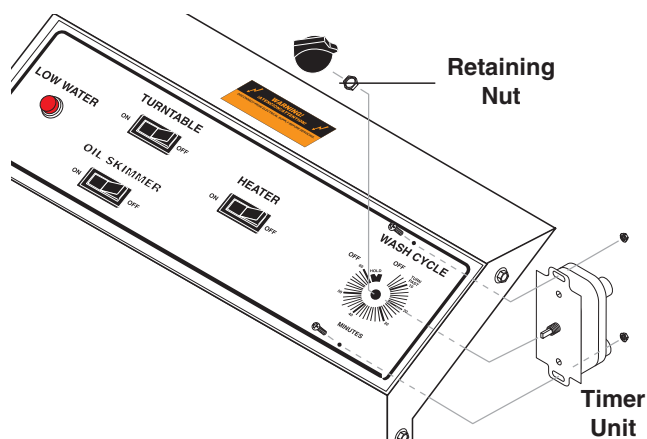


Testing Individual Components

NOTE: The following troubleshooting procedures require the use of a volt/ohm meter. If you are not familiar with using a volt/ohm meter do not attempt to perform the following troubleshooting procedures. If you need assistance please contact your dealer.

Wash Cycle and Heater Timers

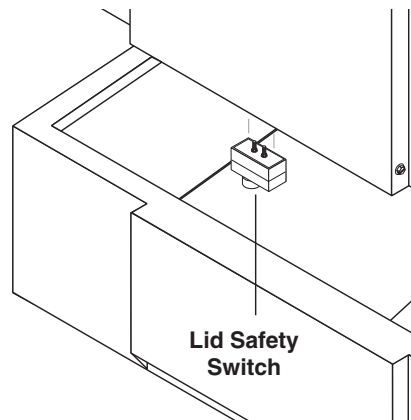
1. Disconnect power to the machine.
2. Remove the timer from the control panel and disconnect all wires (See **Timers and Switches on the Control Panel**).



3. With the timer in the **OFF** position, test for continuity using an ohm meter.
If there **is** continuity the timer is no longer functional; replace the timer.
4. With the timer in the **ON** position, test for continuity using an ohm meter.
5. If there **is not** continuity the timer is no longer functional; replace the timer.

Lid Safety Switch

1. Disconnect power to the machine.
2. Remove the switch from the control panel and disconnect all wires (See **Timers and Switches on the Control Panel**).

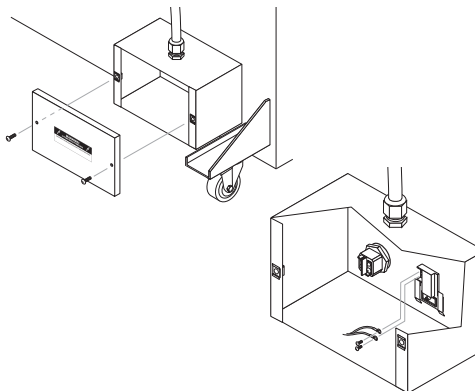


3. With the switch fully open (not depressed), test for continuity. If there **is** continuity the switch is no longer functional; replace the switch.
4. With the switch fully closed (depressed), test for continuity.

If there **is not** continuity the switch is no longer functional; replace the switch.

Heating Element (Single Phase)

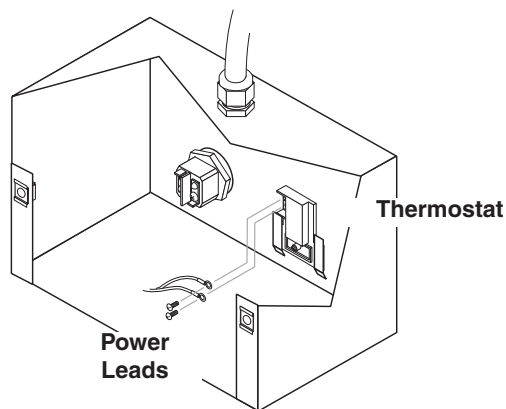
1. Disconnect power to the machine.
2. Remove the cover from the heating element and thermostat enclosure (Two Screws; Use a 5/16" Wrench or Socket).



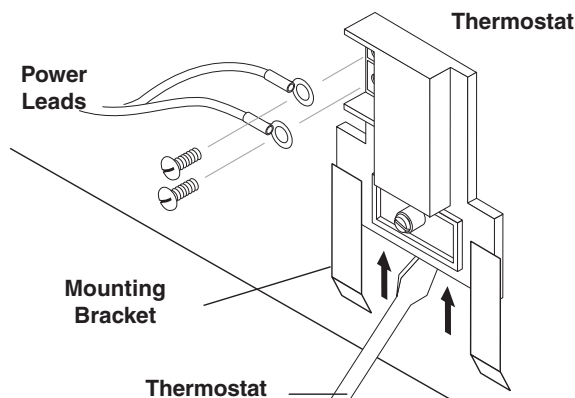
3. Detach the two power leads from the heating element.
4. Use an ohm meter to measure the resistance of the heating element. The resistance should be approximately 10 Ohms; if not, replace the heating element (See **Heating Element**). **For Three Phase Element contact your dealer.**

Thermostat

1. Disconnect power to the machine.
2. Remove the cover from the heating element and thermostat enclosure (Two Screws; Use a 5/16" Wrench or Socket).
3. Detach the two power leads from the thermostat.



4. Using a large flat-head screwdriver, pry the thermostat out of the mounting bracket, then remove it from the machine.

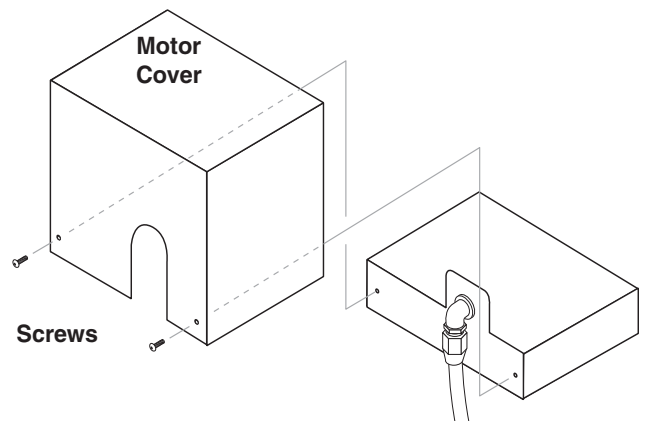


5. Set the thermostat to 120 °F, warm it to just above 120 °F, then test for continuity. If there **is** continuity the thermostat is no longer functional; replace the thermostat.

6. Allow the thermostat to cool to room temperature, then test for continuity. If there **is not** continuity the thermostat is no longer functional; replace the thermostat.

Start Capacitor

1. Disconnect power to the machine.
2. Remove the turntable motor cover (Two Screws; Use a 5/16" Wrench or Socket).
3. Visually inspect the start capacitor. If it appears swollen or deformed, it is failed; replace the start capacitor.



4. If the start capacitor is not visibly failed, remove it from the motor bracket, disconnect the wires, and test it for shorts using an ohm meter. If the ohm meter reads approximately 1 ohm, the start capacitor is no longer functional; replace the start capacitor.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
POOR CLEANING PERFORMANCE	Parts are obstructing each other	Check the position of parts on turntable; position parts to allow flow of cleaning solution around and between them.
	Low water level in sump	Check sump water level; add water if necessary.
	Clogged or improperly aligned spray nozzles	Check spray nozzles for obstructions and alignment; clean and align if necessary.
	Low detergent concentration 10-11 ph	Add 1-2 scoops of detergent and observe cleaning performance; add 1-2 scoops more if necessary. Measure PH of sump solution.
	Wash solution is not properly heated	See wash solution is not heating .
	Pump is not operating properly	See pump does not operate properly .
WASH SOLUTION NOT HEATING	Blown fuse	Refer to Troubleshooting the Electrical System .
	Wash solution in sump chamber is low, or the low water shut-off system is not working properly	Check the level of the wash solution; add water if necessary. Check the low water shut-off float to ensure that it operates smoothly.
	Thermostat is incorrectly set	Check thermostat setting; set to 180°.
	Excess debris is built up around heating element	Check for debris buildup around heating element; clean out if necessary.
	Line voltage is too low	Contact a licensed electrician to verify that the incoming line voltage meets requirements.
	Failed heater timer	Test the heat timer; replace if necessary.
	Failed thermostat	Test the thermostat; replace if necessary
	Failed heating element	Test the heating element; replace if necessary.
WASH SOLUTION TOO HOT	Failed thermostat	Replace the thermostat.
	Thermostat is incorrectly installed	Check the thermostat to ensure that it is correctly installed into the mounting bracket.
FOAMING	Machine operating with cold water	Bring water up to correct temperature
	Grease, high detergent motor oils, transmission oil, gear lubes	Do not place oil or transmission pan into machine without pouring oil out of it.
	Not enough detergent	Add more detergent, check pH level. Use defoamer.
WHITE POWDER ON PARTS	Solution is old	Change sump water and recharge with fresh detergent and vapor corrosion inhibitor.
	Water hardness and TDS (totally dissolved solids)	Use a water softener and/or change your sump water more frequently.
	Large parts can dry before solution runs off, leaving powdery residue	Turn heat down to approximately 140°

PROBLEM	POSSIBLE CAUSE	SOLUTION
MACHINE FAILS TO START WHEN "WASHING PARTS" PROCEDURE IS FOLLOWED	Main power disconnect is off	Verify that no service is being performed on the machine, then turn the main power disconnect on.
	Failed lid closure safety switch	Test the lid closure safety switch; replace if necessary (See Adjusting the Lid Safety Switch).
	Failed washer cycle timer	Test the wash cycle timer; replace if necessary (See Lid Safety Switch).
	Pump is not operating properly	See Pump does not operate properly section.
TURNTABLE DOES NOT OPERATE PROPERLY	Failed turntable motor	Contact a licensed electrician to test the motor; replace if necessary.
	Parts are obstructing turntable rotation	Check for parts obstructing rotation of the turntable; rearrange if necessary.
	Drive chain is not on the drive pulley	Check drive chain; realign on drive pulley if necessary.
	Turntable motor compression springs are not installed	Check the turntable motor compression springs; install if necessary (See Turntable Motor Assembly).
	Blown fuse	Check electrical panel for blown fuse; replace if necessary.
	Failed wash cycle timer	Test the electrical panel to eliminate the possibility of a blown fuse then contact a licensed electrician or a service representative to test the turntable motor.
	Failed start capacitor	Test the start capacitor; replace if necessary.
PUMP DOES NOT OPERATE PROPERLY	Low water level in sump	Check sump water level; add water if necessary.
	Pump Intake is plugged	Check pump intake for obstructions; clean out if necessary.
	Pump overload relay is tripped	Reset the motor overload relay.
	Blown fuse	Check electrical panel for a blown fuse; replace if necessary.
	Line voltage is too low	Contact a licensed electrician to verify that the line voltage meets requirements.
	Pump is failed	Contact a licensed electrician to test the pump, replace if necessary.
INTERIOR OF MACHINE IS RUSTING	Low detergent concentration or improper detergent usage	Our detergents contain adequate rust inhibitors to prevent rust. Verify that you are using manufacturer detergents at the correct concentration.
	Steam condensing on inside of cabinet and lid	Leave lid open during long idle periods.
PUMP LEAKS	Failed pump seal	Replace the pump seal, see Pump Seal.



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