

Operation Manual



**Electric Driven
Oil Fired Steam**



This symbol is used to identify safety information about hazards that can result in personal injury. A signal word (DANGER, WARNING, or CAUTION) is used with the alert symbol to indicate the likelihood and the potential severity of injury. In addition, a hazard symbol may be used to represent the type of hazard.



Indicates a hazard which, if not avoided, *will result in death or serious injury.*



Indicates a hazard which, if not avoided, *could result in death or serious injury.*



Indicates a hazard which, if not avoided, *might result in minor or moderate injury.*



CAUTION, when used *without* the alert symbol, indicates a situation that *could result in damage to the equipment.*

Read Safety Manual before operating

For additional service and maintenance information, see the Service Manual

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Installation

Location

This machine should be installed by only qualified technicians. The machine should be set upon a level surface where it will not be affected by strong winds, rain, snow, extreme heat, and freezing temperatures. Install the machine considering locations for chemical pick-up, fuel connections, electrical connections, water hook-up, venting, and maintenance.

Electrical

Connect machine to an electrically grounded circuit that is fused or circuit-breaker-protected. The circuit must match that which is specified in the ELECTRICAL section under MODEL SPECIFICATION.

Extension Cord

The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machine's performance. Use only extension cords that are intended for outdoor use. These extension cords are identified by a marking "Acceptable for use with outdoor appliances; store indoors while not in use." Use only extension cords having an electrical rating not less than the rating of the product. Do not use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. Do not abuse extension cord and do not yank on any cord to disconnect. Keep cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting the product from the extension cord.

WARNING

**ELECTRICAL
SHOCK
HAZARD**



WARNING

To reduce the risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

Copper Wire Size Minimum AWG	Machine AMP Draw* 3 Conductor Wires	Machine AMP Draw* 2 Conductor Wires
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

Based on Ambient Temperature of 86°F (30°C)

Based on no more than 100 feet

* Use AMP Draw indicated the same or higher than your machine output.

EXAMPLE: Machine AMP Draw 51, use 55 (2 Conductor):
The thermostat type of cord shall be C, PD, E, EO, EN, S, So, SRD, SJ, SJO, SV, SVO, SP.

The thermo set plastic types shall be ET, ETT, ETLB, ETP, ST, STO, SRDT, SJT, SJTO, SVT, SVTO, and SPT.

Venting

This machine emits carbon monoxide, a deadly gas, and must be vented if used in an enclosed area. Improper venting can cause poor combustion, delayed ignition, down drafts, and the possibility of freezing the coil. Contact your distributor or local heating and air conditioning dealer for proper materials. Local codes must be observed.

Water Supply

This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the MODEL SPECIFICATIONS.

Barrier

We recommend a barrier be installed between the machine and wash area to prevent moisture from coming in direct contact with electrical controls, motors and transformers. This will increase the machine's life and lessen electrical problems.

Water Temperature Variation

On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50°F.

Water Conditions

Local water conditions affect the coil adversely more than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.

Freezing

This machine must be protected from freezing according to storage section of MACHINE MAINTENANCE.

CAUTION

Always use the factory supplied pressure wash hose with your machine. Do not substitute other hoses as a potential safety problem may develop.

CAUTION

If the machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to pump and other components.



Cold Weather

As the weather becomes colder, fuel becomes thicker and may become so viscous that the fuel will not flow properly. As viscosity increases, the thicker oil can cause delayed ignition, poor spray patterns, and rumbling fires. As moisture will quickly destroy fuel pumps, make certain that tank openings are secure and moisture cannot enter. In cold weather areas, frost build up will occur in fuel tanks. As the weather warms it turns to condensate, and the water will be in the tank. Keep the tank clear of water, as moisture reaching the fuel pump will cause rust, and the pump will bind. A full fuel tank will lessen condensation build up.



Chemicals

Mix chemicals per the chemical manufacturer's printed directions. Follow all mixing, handling, application, and disposal instructions. Wear gloves, boots, goggles, and protective clothing appropriate for the chemical being used.

Venting

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.

Draft Diverters (stacked cleaners)

Oil fired machines use a force air burner. The oil burner can be influenced by "natural Draft" even though they have their own fan. A bell type draft diverter must be used here also.

A draft diverter must be used on all cleaners that are stacked. This included any chimney even if not expelled to the outside.

Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.

The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.

Installation of a draft diverter *WILL not prevent the coil from freezing*. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

Venting Installation Information

Never reduce the stack size. The diverter and stacking should be the same size as the stack opening on the



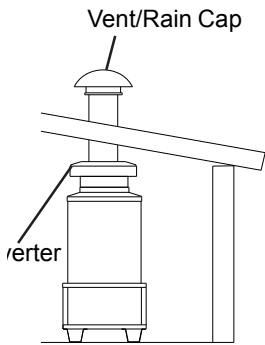
WARNING

**Carbon
Monoxide
Hazard**



machine.

Straight stacking through the roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at



least two feet for every foot of horizontal stack.

Stack extension above the roofline should be sufficient to clear the peak of the roof (refer to ANSI Z223.1 page 100 of SPECIFICS).

A rain cap U.L approved should be installed on the stack.



WARNING

**ELECTRICAL
SHOCK
HAZARD**



WARNING

This machine should be operated only by personnel instructed in and familiar with its operation. The discharge produced is up to 300°F/150°C and can cause serious bodily injury to you and anyone coming in contact with it.

Operating Instructions

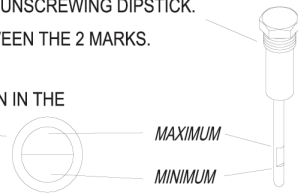
Pre Start-Up

The first time the machine is operated, after repairs have been made or if the machine has set for a period of time (30 days or more), follow these procedures:

A. Flush the machine per instructions in MACHINE

CHECK THE OIL LEVEL BY UNSCREWING DIPSTICK.
THE LEVEL SHOULD BE BETWEEN THE 2 MARKS.

OIL LEVEL IS ALSO SHOWN IN THE
ROUND INDICATOR.



MAINTENANCE.

B. Check the tension of the belt (if so equipped)

Electrical: Connect the machine to an electrically grounded circuit that is fuse or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, the have on installed by a qualified electrician.

Oil Level: Check the oil level in the water pump.

Belt: Make sure belt tension and condition is as specified in MACHINE MAINTENANCE.

Stack Cover: Remove the stack cover (if so equipped).

Fuel Filter: Inspect fuel filter for evidence of water contaminants.

Fuel: Make sure the fuel lines are open (CAUTION: Closed valves will DAMAGE the fuel pump and void warranty). Use #1 or #2 diesel. Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of MODEL SPECIFICATIONS for the fuel tank capacity.

Water Supply: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure of 40 PSI/ 0.68 BAR.

Lime: Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the spray tip, impact nozzle and coil pipe.

Float Tank: Check the float tank (if so equipped) to assure it is full and the float valve shuts off securely.

Float Tank Drain Plug: Install drain plug (if so equipped).

Float Tank Ball Valve: Check the position of the ball valve on the outlet side of the float tank (if so equipped) that it is in the open position.

Combi (if equipped):

Note: In process of making steam, the water flow through the coil has to be decreased. The amount of water is determined by the pressure and water temperature of your location.

If the incoming water temperature is as high as 70°F, the amount of water going through the coil has to decrease very little.

If the incoming water temperature is as low as 40°F, the amount of water going through the coil has to be decreased.

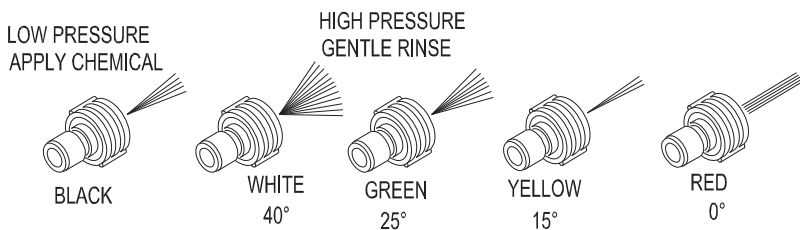
The water temperature is relative to the season variation and should be taken into consideration when operating steam.

Combi Setting (if equipped)

1. Set temperature control at 300°F/150°C MAXIMUM.
2. Completely open the water bypass metering valve (if so equipped) handle turning it counter clockwise found on the pump or coil inlet assembly.
3. With a small common screw driver, turn the screw on the metering valve (if so equipped) clockwise to DECREASE the temperature and counter clockwise to INCREASE the temperature.

Quick-Connect Spray Tips

These tips have fixed spray patterns that are more consistent than those produced by an adjustable nozzle.



WARNING

Risk of injection or severe injury. Keep clear of nozzle. DO NOT direct discharge stream at persons. This equipment is to be used only by trained operators.



CAUTION

A good flow of water must be flowing from the end of a gun for 30 seconds before proceeding. Lack of water can cause damage to the water pump and like components.

CAUTION

On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 3 minutes, water pump damage may occur.

CAUTION

Do not run the machine with the burner switch in the on position when the fuel tank is empty or with tank valve closed. This will cause damage to the fuel pump and void warranty.

Each tip is color-coded for easy identification. *Black* has a larger hole for low-pressure soap application. *White* (40°) produces a wide-fan spray for general cleaning and rinsing. *Green* (25°) provides a narrower-fan spray for tough stains in general cleaning applications. *Yellow* (15°) maintains a tight-fan spray with intense cleaning power for heavy-duty cleaning and paint preparation. *Red* (0°) creates a concentrated pinpoint water jet for stubborn stains on concrete, masonry, or steel, and for stripping paint.

* Not all machines come equipped with all Quick-Connect Spray tips

Start-Up

Refer to the MAINTENANCE SCHEDULE for any maintenance to be performed before operation.

1. Select temperature (if so equipped).
2. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn the switch to the 'pump' position.
3. Turn the switch to the "burner" position.

Combi (if equipped): Install the open gun assembly.

To clean:

Start on the lower portion of the area to be cleaned and work up using long, even, overlapping strokes.

Dirt is generally removed easily if grease and/or oil are not present; however, if grease and/or oil are present, hot water and chemical will accelerate in the cleaning process.

Combi (if equipped): Regulate the temperature indicated on the thermometer to 300°F by turning the regulating valve.

To apply chemical:

Use factory recommended chemicals for best cleaning action and for extended pump life. Contact your dealer for chemicals available. Follow instructions on the chemical container.

Mix chemicals per label instructions. Use necessary safety precautions.

Insert chemical screen into chemical container.

Adjust metering valve (if so equipped).

If the gun assembly is equipped with variable or multiple nozzle assembly, adjust as desired.

To rinse:

If the machine is equipped with a panel mounted metering valve, close the chemical metering valve (if so equipped).

NOTE: It is advisable to dip the chemical screen in a container of clean water and open the valve 1 minute to clean the valve of any remaining residue.

If the gun assembly is equipped with variable or multiple nozzle assembly, open and close to clean nozzle of any remaining residue.

After a clear flow of water is noted from the end of the wand, start from the top, working downward using long, overlapping strokes.



Shut-Down

Turn the switch to the pump 'position' (if not already done so in the cold water rinse).

After cool, clear water is coming from the end of the wand, turn switch to the 'off' position.

Combi (if applicable): Completely close the water bypass metering valve (if so equipped) handle turning it clockwise found on the pump assembly.

Install the trigger gun assembly.

Turn off the water supply.

If freezing conditions may exist, refer to STORAGE in MACHINE MAINTENANCE.

Replace stack cover (if so equipped).

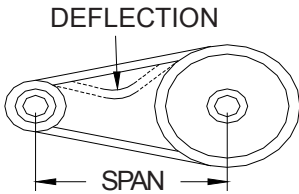
Machine Maintenance

Belt Tension

Deflection for each inch of span between pulley centers with a 6-pound force applied in the middle of the span.

Example: A 6-pound force applied at the middle of an 8-inch span should produce a deflection of $\frac{8}{64}$ inch or $\frac{1}{8}$ inch.

Belts can be tightened or loosened by loosening the nuts holding the pump assembly to the motor mount. Then tighten or loosen the j-bolt on the motor mount. Retighten the pump assembly after the desired tension is reached.



Spray Tip Maintenance

Remove the spray tip from the gun assembly.

Blow out debris with the compressed air from the outside in. Any debris remaining in the inlet side of the nozzle should be cleaned out. If lime or chemical scale is present in the inlet side, the nozzle may be soaked in de-scaling solution or replaced. If the tip is worn, replace with one specified in the GENERAL section of MODEL SPECIFICATIONS or MODEL EXPLODED VIEW.

Before replacing spray tip flush the machine per "FLUSHING."

Reinstall spray tip to gun assembly.



Coil Back Pressure Check

A regular maintenance schedule for descaling your heating coil is essential to insure its longevity.

The frequency of descaling depends upon the amount of use and the condition of the water.

1. Check the condition of your water pump unloader valve. Remove the hose and gun assembly from the coil outlet.
2. Remove any flow restrictions, such as guns and hoses, from the coil outlet.
3. Install a pressure gauge between the water pump and coil inlet.

Discharge Volume	Back Pressure
GPM	Requiring Descaling
2-3	50 PSI
3-4	75 PSI
4-5	100 PSI
6	150 PSI
8-10	175 PSI
Use a 1000 PSI pressure gauge	

4. Turn on the water supply. Check the float valve (if so equipped) to assure float tank is full and the float valve shuts off securely.
5. Check the position of the ball valve (if so equipped) on the outlet line of the float tank assuring it is in the open position.
6. Turn on the switch to the "PUMP" position. If the coil back pressure reading is above that found in the chart above then your machine needs to be de-scaled.

A separate descaling pump is recommended so that scale and other chemicals will not come in contact with your water pump and cause premature wear.

NOTE: Contact your local dealer for descaling of your unit.

7. Disconnect the water supply.
8. Disconnect the electrical supply.
9. Reinstall the hose and gun assembly.
10. Remove the pressure gauge.

Descaling instructions are available upon request.

CAUTION

If the machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to pump and other components.

 WARNING

**ELECTRICAL
SHOCK
HAZARD**

**CAUTION**

A good flow of water must be flowing from the end of a gun for 30 seconds before proceeding. Lack of water can cause damage to the water pump and like components.

Flushing

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting the requirements specified in the GENERAL section of the MODEL SPECIFICATIONS.
3. Turn on the water supply.
4. Check the float tank (if so equipped) to assure it is full and the float valve shuts off securely.
5. Check the position of the ball valve (if so equipped) on outlet line of the float tank assuring it is in the open position.
6. Remove spray tip from gun assembly.
7. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn switch to the PUMP position.

Storage

1. Rinse the chemical line by inserting the screen into a container of clear water and open the metering valve 1 minute to clean it of any remaining residue. Be sure the chemical metering valve is closed when finished.
2. Check the position of the ball valve (if so equipped) on the outlet of the float tank assuring it is in the closed position.
3. Attach an air chuck to the air valve stem on the pump assembly. With the trigger gun in the open position, apply air until a mixture of air and very little water is coming from the gun wand. Then turn switch to the "BURNER" position and depress the vacuum switch. Run it for 45 seconds allowing any remaining water to turn to steam. Allow it to blow for 60 seconds. Turn switch to the "OFF" position.
4. Remove the air chuck.
5. Fill a 1-gallon container with Ethylene Glycol type antifreeze. Minimum should be a mixture of ½ antifreeze and ½ water strength before each use, as the antifreeze will dilute with use.
6. FLOAT TANK EQUIPPED: Pour the anti-freeze solution into the float tank.
7. WITHOUT FLOAT TANK: Install a 2-ft. garden hose to the water inlet. Insert the other end into a container of antifreeze solution.
8. Turn on the switch to the "PUMP" position.
9. Turn off the switch just prior to running out of antifreeze mixture.
10. Disconnect electrical supply.
11. Fill the fuel tank with kerosene or #1 or #2 diesel.
12. It is recommended to install a coil cover to keep coil free of debris.
13. Drain the float tank.
14. Place machine in a dry place protected from weather condition.

Machine Maintenance Schedule

MOTOR DRIVEN OIL FIRED CLEANERS

Oil Bath Water Pump:

	daily	Each HR 1 st 8 HRS	AFTER 1 st 50	EVERY 50 HRS	EVERY 100 HRS	EVERY 500 HRS	YEARLY
Oil Level- check and add as needed per PUMP SERVICE insert	•						
Oil Change- drain and refill per PUMP SERVICE insert			•			•	
CAUTION: Used oil must be disposed into an environmentally safe container and brought to an oil recycling center							
Oil Contamination- milky color indicates water	•						

Hoses:

Blistering, loose covering	•						
Abrasion of cover exposing reinforcement	•						
Cuts exposing reinforcement	•						

Belts:

Cracks or fraying	•						
Belt tension- For correct belt tension, see MACHINE MAINTENANCE insert	•						

Filter-Water:

Check water inlet hose screen for debris		•		•			
Check float tank screen for debris	•						

Leaks:

Check for water and build up of scale at pipe connections	•						
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Fuel:

Adequate fuel supply	•						
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Filter-Fuel:

If contaminants are present see FUEL FILTER insert	•						
Remove and replace fuel filter.						•	

Screen-Fuel Pump:

Check fuel pump screen for debris. See OIL BURNER MAINTENANCE insert					•		
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Burner Nozzle:

Replace nozzle as specified in BURNER section of MODEL SPECIFICATIONS or BURNER ASSEMBLY insert							•
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Guards and Shields:

Check that all guards and shields are in place and secure							•
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Troubleshooting

Pressure Cleaner

Trouble	Possible Cause	Remedy
Poor cleaning action	Hard water.	Connect machine to water softener.
	Low pressure.	See “low operating pressure.”
	Little or no chemical being drawn.	See “machine will not draw chemical.”
	Improper chemical.	Obtain proper chemical.
	Improper chemical mixture.	Mix chemicals per the label. Follow all mixing, handling, application, and disposal instructions.
	Low discharge pressure.	See “low operating pressure.”
Machine will not draw chemical	No chemical solution.	Replenish supply.
	Metering valve not open.	Turn metering valve knob to open.
	Chemical line strainer clogged. Air leak in chemical line.	Remove screen and clean
	Metering Valve clogged.	Tighten all fittings and hoses for the chemical line.
	Restrictor orifice too large or missing.	Disassemble and clean. Install proper size orifice.
Low operating pressure	Insufficient water supply.	The water supply must meet or exceed the maximum discharge volume specified in the PERFORMANCE section, and minimum water inlet pressure specified in the GENERAL section of the MODEL SPECIFICATIONS section.
	Incoming water hose too small.	Use larger water supply hose.
	Water supply hose too long.	Use shorter water supply hose.
	Belt slippage.	Tighten belt per instructions in MACHINE MAINTENANCE insert.
	Worn belt.	Replace belt per CLEANER EXPLODED VIEW.

	Spray tip worn or wrong size.	Replace with spray tip specified in the GENERAL section of MODEL SPECIFICATIONS.
	Dirty or worn check valves in water pump	See PUMP TROUBLESHOOTING.
	Water supply hose kinked.	Straighten hose
	Inlet filter screen clogged	Clean water filter screen or hose inlet screen.
	Motor runs slow.	See "Pump engine starts slow or overheats and stops."
	Air leak in inlet plumbing.	Tighten all fittings.
	Defective water pump.	See PUMP TROUBLESHOOTING.
	Leaking discharge hose.	If a water leak is found, DO NOT OPERATE THE MACHINE. Disconnect the power and replace hose.
	Chemical metering valve open and sucking air.	Re-supply chemical, place soap screen in water, or shut off metering valve.
	Defective unloader valve.	Repair or replace unloader valve.
	Inlet ball valve not fully open (if so equipped)	Open inlet ball valve completely (handle parallel w/ valve body).
Excessive, unusual noise	Defective pump.	See PUMP TROUBLESHOOTING.
	Defective motor.	Call service technician or take engine to repair/warranty station.
	Pulleys rubbing.	Adjust shields or pulley(s)
	Misalignment of pump & motor	Realign pump and engine.
Belts slipping	Belts too loose.	Tighten belt per instructions on MACHINE MAINTENANCE.
	Excessive back pressure.	See "Excessive back pressure" below.

	Defective water pump.	See PUMP SERVICE.
Excessive back pressure	Spray tip built up with lime.	Remove and clean, or replace spray tip with tip specified in the GENERAL section of MODEL SPECIFICATIONS. Flush machine per FLUSHING in MACHINE MAINTENANCE.
	Water pump turning too fast.	See MODEL SPECIFICATIONS.
	Coil built up with lime	De-lime coil.
	Relief valve defective.	Remove and replace.
Pump motor will not start (motor does not hum)	No power.	Use a different outlet, check fuses in main disconnect switch. Replace fuse if blown.
	Defective motor starter or ON/OFF switch.	Call service technician.
	Defective motor.	Call service technician, or take motor to Repair/Warranty station.
Pump motor will not start (motor hums)	Pump frozen.	Machine must be thoroughly warmed to above freezing.
	Defective motor.	Call service technician or take motor to Repair/Warranty station.
	Defective water pump.	See PUMP SERVICE.
	Excessive back pressure.	See "Excessive back pressure" above.
Pump motor starts slow or overheats and stops	Low voltage	See "Low voltage" below.
	Excessive back pressure.	See "Excessive back pressure" above.
	Defective motor.	Call service technician, or take motor to Repair/Warranty station.
Pump motor stops and will not start	Motor starter "kicked out" (if so equipped) or thermal overload tripped.	Turn motor starter off to reset, then turn on, or push thermal overload reset button on motor.
	Excessive back pressure.	See "Excessive back pressure" above.
	Defective motor.	Call service technician, or take motor to Repair/Warranty station.

Low voltage	Incoming voltage incorrect.	Have a qualified technician check the motor terminal voltage. Correct voltage is in MODEL SPECIFICATIONS.
	Not large enough extension cord.	Use an extension cord with amperes or watts rating as high as or higher than that of the MODEL SPECIFICATIONS.
	Too long extension cord.	Shorten extension cord.
Machine shocks operator	Machine improperly grounded.	STOP operating machine. Call service technician.
	Outlet not grounded	Have properly wired outlet installed.

