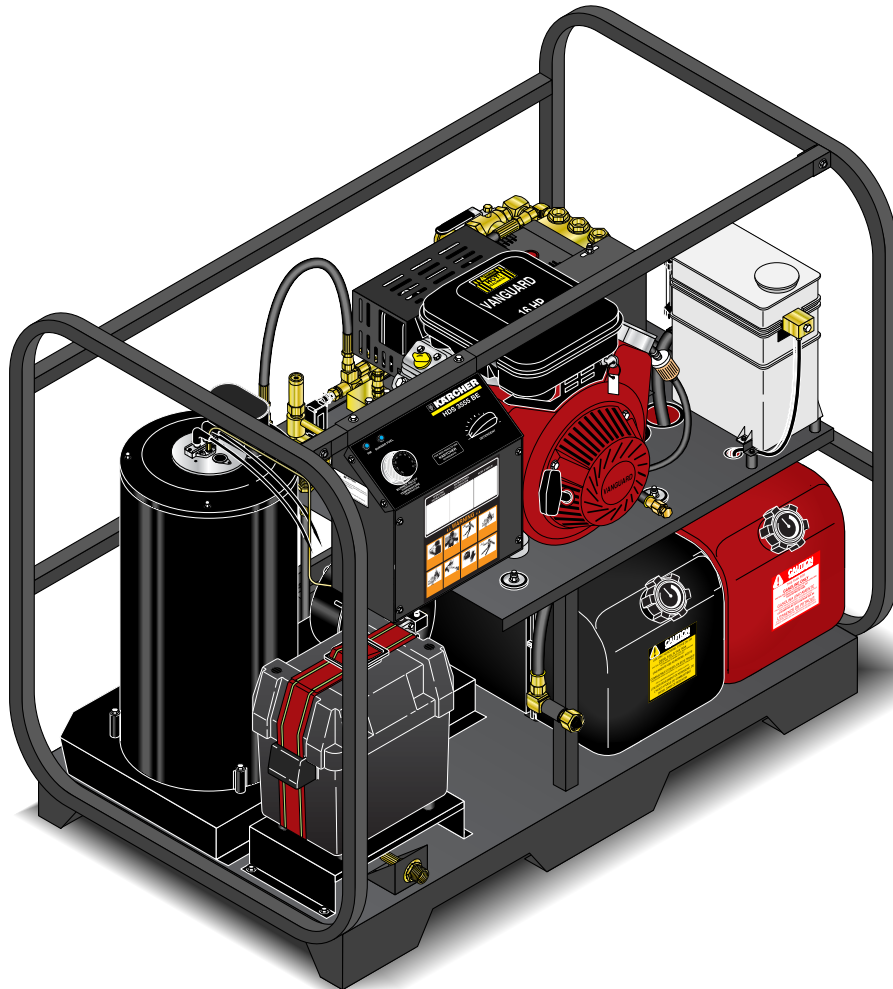


# KÄRCHER

## OPERATOR'S MANUAL



**HDS 4.0/32 Pe Cage - 1.575-615.0**  
**HDS 5.0/32 Pe Cage - 1.575-616.0**  
**HDS 5.5/35 Pe Cage - 1.575-617.0**

To locate your local Kärcher Commercial Pressure Washer Dealer nearest you,  
please visit [www.karchercommercial.com](http://www.karchercommercial.com)

05/25/18



**WARNING:**

This product and accessories may contain a chemical 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](http://www.P65Warnings.ca.gov)

9.800-103.0-N



## CONTENTS

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Introduction & Important Safety Information	4-6
Component Identification	7
Assembly Instructions	8
Operation Instructions	9-10
Detergents & General Cleaning Techniques	11
Shutting Down & Cleanup	12
Storage	12
Maintenance	13-14
Troubleshooting	15-18
Preventative Maintenance	19
Exploded Views & Parts List	20-23
Control Box & Parts List	24-25
Float Tank Assembly	26
Pump Assembly	27
Unloader Assembly	28
Blower Assembly & Parts List	29
Burner & Coil Assembly & Parts List	30
Coil & Blower Assembly & Parts List	31
Hose & Spray Gun Assembly & Parts List	32
Fuel Tanks Assembly & Parts List	33
Engine Assemblies & Parts List	34-35
Specifications	36-37
KT.2 Series Pump Exploded View & Parts List	38-39
VRT 3 Unloader Exploded View & Parts List	40

Model Number \_\_\_\_\_

Serial Number \_\_\_\_\_

Date of Purchase \_\_\_\_\_

The model and serial numbers will be found on a decal attached to the pressure washer. You should record both serial number and date of purchase and keep in a safe place for future reference.

## INTRODUCTION & IMPORTANT SAFETY INFORMATION

Thank you for purchasing this Pressure 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 pressure washer. 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.

The operator must know how to stop the machine quickly and understand the operation of all controls. Never permit anyone to operate the engine without proper instructions.

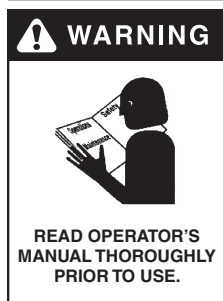
### SAVE THESE INSTRUCTIONS

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 operator

## IMPORTANT SAFETY INFORMATION



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

1. Read the owner's manual thoroughly. Failure to follow instructions could cause malfunction of the machine and result in death, serious bodily injury and/or property damage.
2. Know how to stop the machine and bleed pressure quickly. Be thoroughly familiar with the controls.
3. Stay alert — watch what you are doing.



**DANGER:** Keep wand, hose, and water spray away from electric wiring or fatal electric shock may result.

4. All installations must comply with local codes. Contact your electrician, plumber, utility company or the selling distributor for specific details.



**WARNING:** This machine exceeds 85 db appropriate ear protection must be worn.



**WARNING:** High pressure spray can cause paint chips or other particles to become airborne and fly at high speeds. To avoid personal injury, eye, hand and foot safety devices must be worn.

5. Eye, hand, and foot protection must be worn when using this equipment.

6. Keep operating area clear of all persons.



**WARNING:** Flammable liquids can create fumes which can ignite, causing property damage or severe injury.

**WARNING:** Risk of explosion — Operate only where open flame or torch is permitted.



**WARNING:** Risk of fire — Do not add fuel when the product is operating or still hot.

**WARNING:** Do not use gasoline crankcase draining or oil containing gasoline, solvents or alcohol. Doing so will result in fire and/or explosion.

**WARNING:** Risk of fire — Do not spray flammable liquids.

7. Allow engine to cool for 1-2 minutes before refueling. If any fuel is spilled, make sure the area is dry before testing the spark plug or starting the engine. (Fire and/or explosion may occur if this is not done.)

Gasoline engines on mobile or portable equipment shall be refueled:

- a. outdoors;
- b. with the engine on the equipment stopped;
- c. with no source of ignition within 10 feet of the dispensing point; and
- d. with an allowance made for expansion of the fuel should the equipment be exposed to a higher ambient temperature.

## IMPORTANT SAFETY INFORMATION

In an overfilling situation, additional precautions are necessary to ensure that the situation is handled in a safe manner.

**WARNING: Risk of injury. Disconnect battery ground terminal before servicing.**

8. When in use, do not place machine near flammable objects as the engine is hot.
9. Oil burning appliances shall be installed only in locations where combustible dusts and flammable gases or vapors are not present. Do not store or use gasoline near this machine.
10. Use No. 1 or No. 2 heating oil (ASTM D306) only. **NEVER** use gasoline in your fuel oil tank. Gasoline is more combustible than fuel oil and could result in a serious explosion. **NEVER** use crankcase or waste oil in your burner. Fuel unit malfunction could result from contamination.
11. Do not confuse gasoline and fuel oil tanks. Keep proper fuel in proper tank.



**WARNING: Risk of injury. Hot surfaces can cause burns. Use only designated gripping areas of spray gun and wand. Do not place hands or feet on non-insulated areas of the pressure washer.**

12. Transport/Repair with fuel tank EMPTY or with fuel shut-off valve OFF.



**CAUTION: Hot discharge fluid. Do not touch or direct discharge stream at persons.**

**WARNING: This machine produces hot water and must have insulated components attached to protect the operator.**

13. To reduce the risk of injury, close supervision is necessary when a machine is used near children. Do not allow children to operate the pressure washer. **This machine must be attended during operation.**



**WARNING: Grip cleaning wand securely with both hands before starting. Failure to do this could result in injury from a whipping wand.**

14. Never make adjustments on machine while in operation.

15. Be certain all quick coupler fittings are secured before using pressure washer.



**WARNING: High pressure developed by these machines will cause personal injury or equipment damage. Keep clear of nozzle. Use caution when operating. Do not direct discharge stream at people, or severe injury or death will result.**



**WARNING: Protect machine from freezing.**

16. To keep machine in best operating conditions, it is important you protect machine from freezing. Failure to protect machine from freezing could cause malfunction of the machine and result in death, serious bodily injury, and/or property damage. Follow storage instructions specified in this manual.

17. Inlet water must be clean fresh water and no hotter than 90°F.



**WARNING: Risk of asphyxiation. Use this product only in a well ventilated area.**

18. Avoid installing machines in small areas or near exhaust fans. Adequate oxygen is needed for combustion or dangerous carbon monoxide will result.

19. Manufacturer will not be liable for any changes made to our standard machines or any components not purchased from us.

20. The best insurance against an accident is precaution and knowledge of the machine.



**WARNING: Be extremely careful when using a ladder, scaffolding or any other relatively unstable location. The cleaning area should have adequate slopes and drainage to reduce the possibility of a fall due to slippery surfaces.**

21. Do not allow acids, caustic or abrasive fluids to pass through the pump.

22. Never run pump dry or leave spray gun closed longer than 1-2 minutes.

## IMPORTANT SAFETY INFORMATION

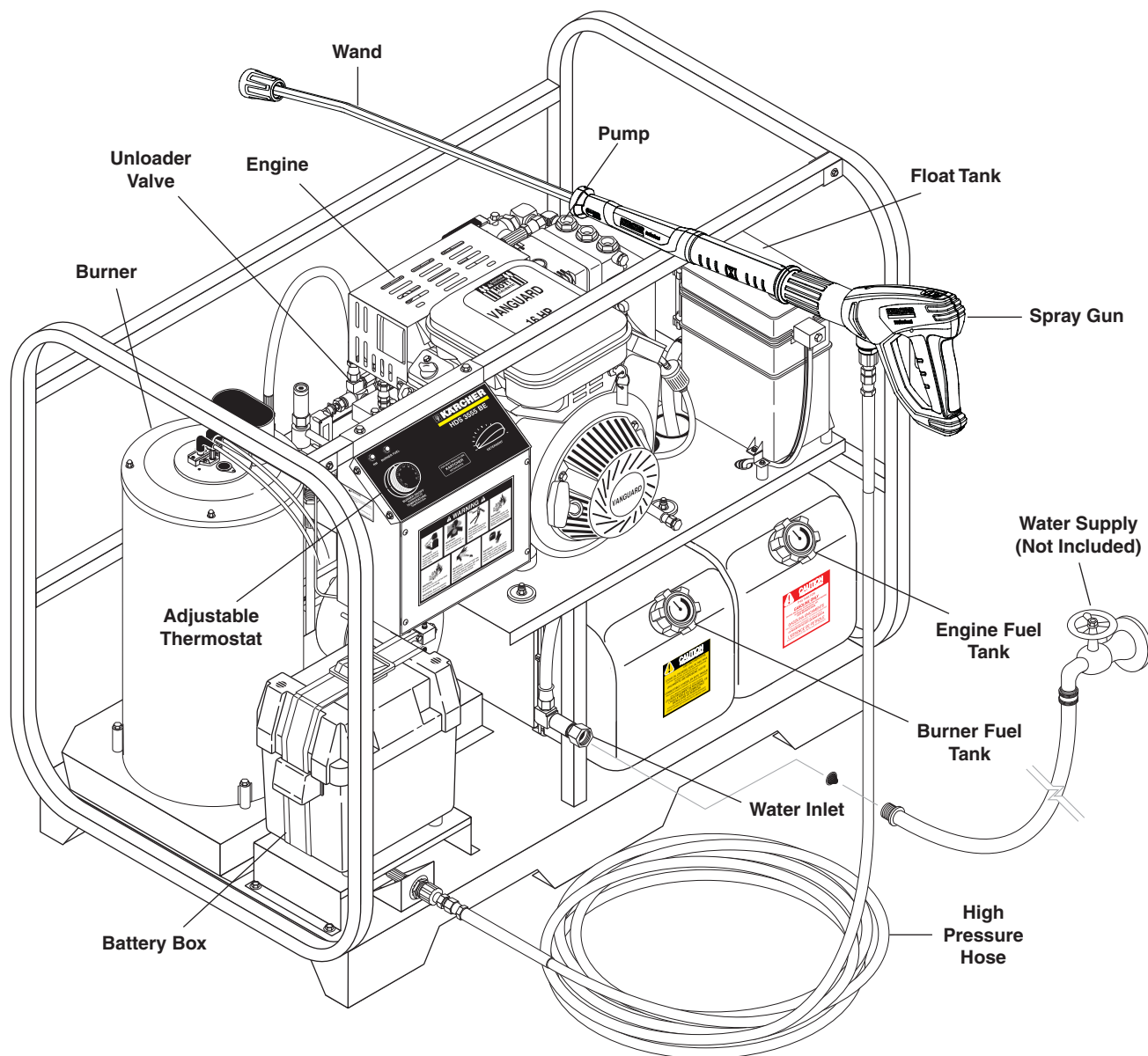
23. Machines with shut-off spray gun should not be operated with the spray gun in the off position for extensive periods of time as this may cause damage to the pump.
24. Protect discharge hose from vehicle traffic and sharp objects. Inspect condition of high pressure hose before using or bodily injury may result.
25. Before disconnecting discharge hose from water outlet, turn burner off and open spray gun to allow water to cool below 100° before stopping the machine. Then open the spray gun to relieve pressure. Failure to properly cool down or maintain the heating coil may result in a steam explosion.
26. Do not overreach or stand on unstable support. Keep good footing and balance at all times.
27. Do not operate this machine when fatigued or under the influence of alcohol, prescription medications, or drugs.
28. In oil burning models, use only kerosene, No. 1 home heating fuel, or diesel. If diesel is used, add a soot remover to every tankful.



***Follow the maintenance instructions specified in the manual.***



## COMPONENT IDENTIFICATION



**Pump** — Delivers a specific gpm to the high pressure nozzle which develops pressure.

**Spray Gun** — Controls the application of water and detergent onto cleaning surface with trigger device. Includes safety latch.

**Unloader Valve**— Safety device which allows pressure to be released when spray gun is closed.

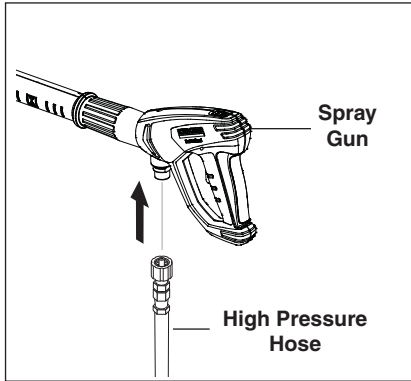
**High Pressure Hose** — Connect one end to water pump discharge nipple and the other end to spray gun.

**Adjustable Thermostat** — Safety control which prevents temperatures from going above adjustable setting.

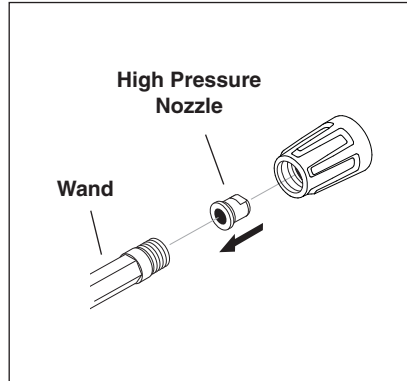
**Wand** — Must be connected to the spray gun.

**NOTE:** If trigger on spray gun is released for more than 2 minutes, water will leak from valve. Warm water will discharge from pump protector onto floor. This system prevents internal pump damage.

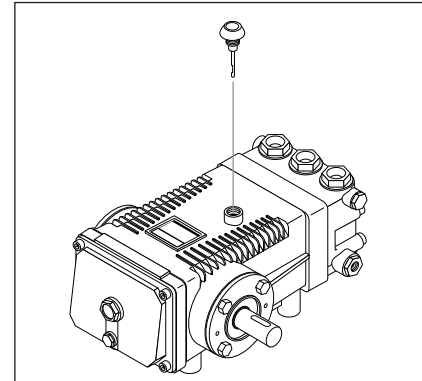
## ASSEMBLY INSTRUCTIONS



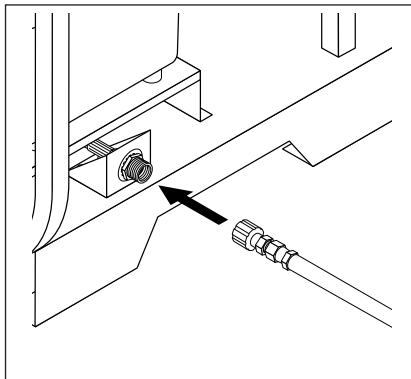
**STEP 1:** Attach the high pressure hose to the spray gun using teflon tape on hose threads.



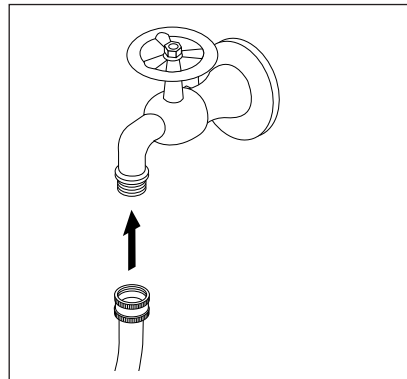
**STEP 2:** Remove Wand end and first place the the high pressure nozzle as shown. Replace end of wand.



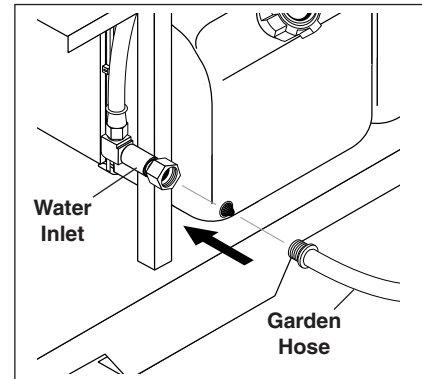
**STEP 3:** Remove shipping cap and install oil dipstick. Check pump oil level by using dipstick or observe oil level in oil window (if equipped). Use 30 wt. non detergent oil.



**STEP 4:** Connect the high pressure hose to the pump discharge fitting. Push coupler collar forward until secure.



**STEP 5:** Connect garden hose to the cold water source.



**STEP 6:** Check inlet filters, remove debris, then connect the garden hose to pump water inlet. **CAUTION: Do not run the pump without water or pump damage will result.**

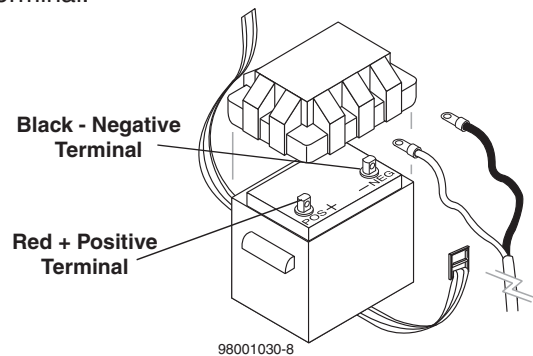
## BATTERY INSTALLATION

Due to Federal Regulations concerning shipment of corrosive chemicals, batteries are not shipped with this machine.

Red Cable is attached to battery (+) positive terminal, black cable is connected to battery (-) negative terminal.



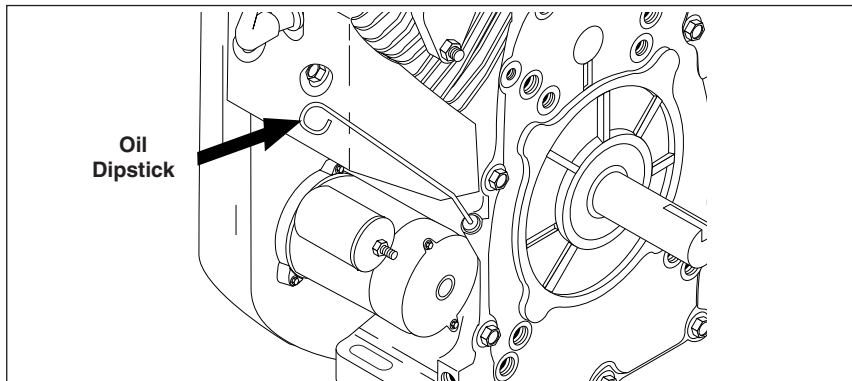
Local purchase of battery will be the responsibility of the owner. Automotive type 12 Volt Group 24 battery is recommended for placement within the weather resistant box. Follow safety and installation instructions furnished with the battery.



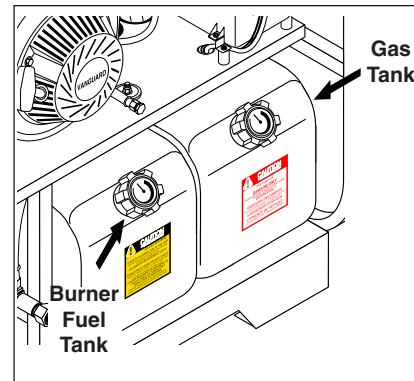
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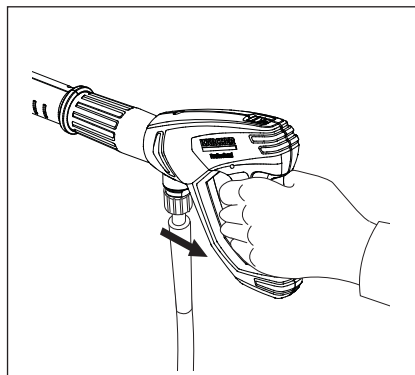
## OPERATION INSTRUCTIONS



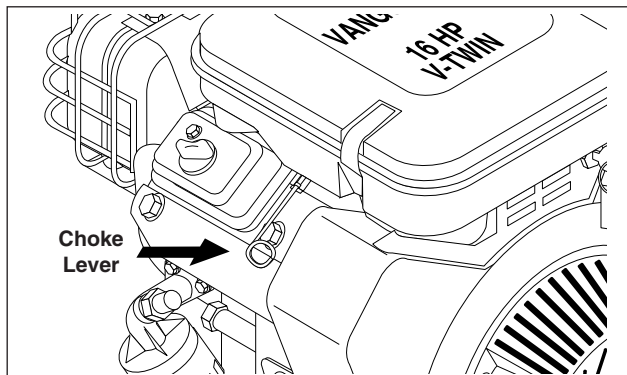
**STEP 1:** Check engine oil level. Oil level should be level with the bottom of the oil filler neck. Be sure the machine is level when checking the oil level. (Refer to the engine's operating manual included with machine.) We recommend that the oil be changed after the first 5 hours of use, then once every 50 hours. **NOTE:** Improper oil levels will cause low oil sensor to shut off engine. **IMPORTANT! Do not run engine with high or low oil levels as this will cause engine damage.**



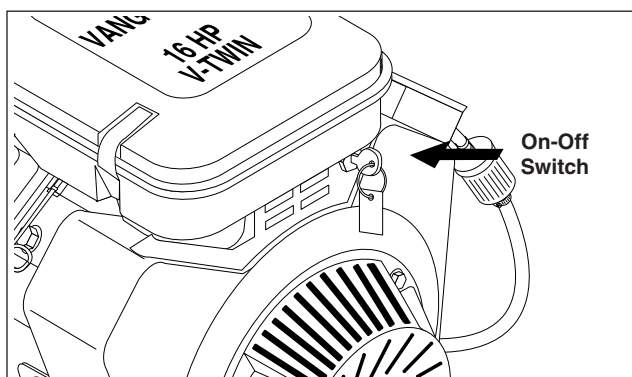
**STEP 2:** Fill gas tank and burner fuel tank with proper fuel. Do not confuse gasoline and fuel oil tanks. Keep proper fuel in proper tank.



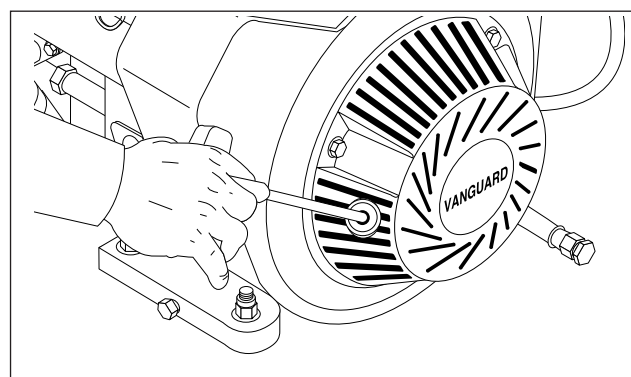
**STEP 3:** Trigger the spray gun to eliminate trapped air then wait for a steady flow of water to emerge from the spray nozzle.



**STEP 4:** Pull the choke lever out to the "Choke" position (on a warm engine, leave the choke lever in the run position). Push the choke lever to the "Closed" position. To restart a warm engine, leave the choke lever in the "Open" position.



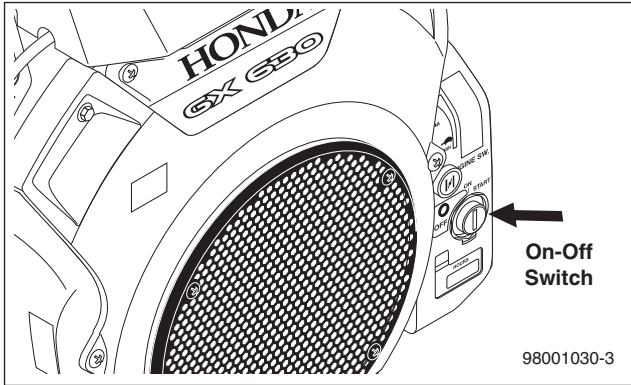
**STEP 5: (Pull Start Models)** Turn the engine switch to "Start" position.



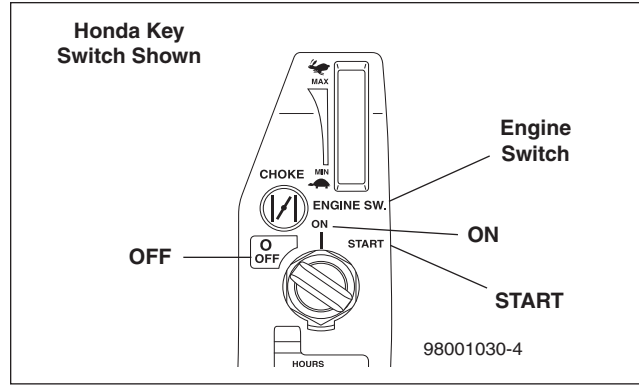
**STEP 6:** Pull the starter grip. If the engine fails to start after 2 pulls, squeeze the trigger gun to release pressure and repeat step. Return starter gently. After the engine warms up enough to run smoothly, move choke to run position and throttle to fast position.

**CAUTION: Small engines may kick back. Do not hold pull starter grip tightly in hand.**

## OPERATION INSTRUCTIONS



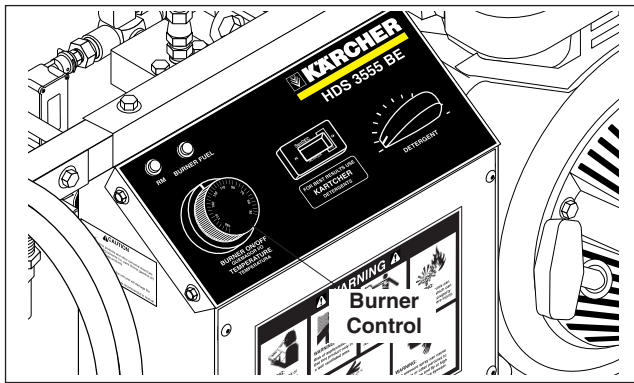
**STEP 7: (Electric Start Models)** Turn the engine switch to "Start" position.



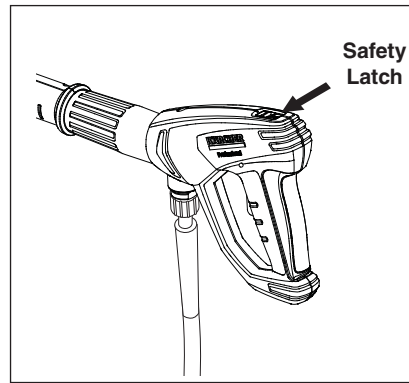
**STEP 8: (Electric Start Models)** Turn the key to the START position, and hold it there until the engine starts. If the engine fails to start within 5 seconds, release the key, and wait at least 10 seconds before operating the starter again.

**Using the electric starter for more than 5 seconds at a time will overheat the starter motor and can damage it.**

When the engine starts, release the key, allowing it to return to the ON position. If the choke knob has been pulled to the CLOSED position to start the engine, gradually push it to the OPEN position as the engine warms up.



**STEP 9:** Turn the burner "ON". Turn thermostat dial to the 210° mark.

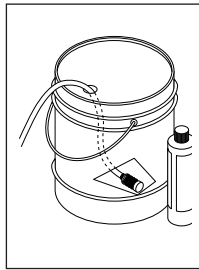


**⚠ WARNING! Never replace nozzle without engaging the safety latch on the spray gun trigger.**

## DETERGENTS & GENERAL CLEANING TECHNIQUES

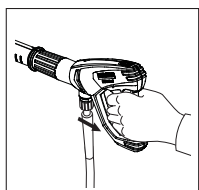
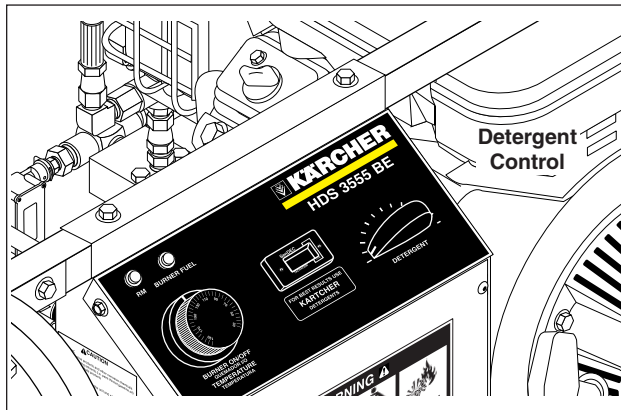


**WARNING:** Some detergents may be harmful if inhaled or ingested, causing severe nausea, fainting or poisoning. The harmful elements may cause property damage or severe injury.



**STEP 1:** Use detergent designed specifically for pressure washers. Household detergents could damage the pump. Prepare detergent solution as required by the manufacturer. Fill a container with pressure washer detergent. Place the filter end of detergent suction tube into the detergent container.

**STEP 2:** Open detergent metering valve.



**STEP 3:** Detergent will be drawn into the pump and coil and discharged under pressure. Never use anything that will damage the pump and coil.

**STEP 4:** With the engine running, pull trigger to operate machine. Liquid detergent is drawn into the

machine and mixed with water. Apply detergent to work area. Do not allow detergent to dry on surface.

**IMPORTANT:** You must flush the detergent from your machine after each use by placing the suction tube into a bucket of clean water and then running the pressure washer for 1-2 minutes.

### THERMAL PUMP PROTECTION

If you run the engine on your pressure washer for 3-5 minutes without pressing the trigger on the spray gun, circulating water in the pump can reach high temperatures. When the water reaches this temperature, the pump protector engages and cools the pump by discharging the warm water onto the ground. This thermal device prevents internal damage to the pump.

### CLEANING TIPS

Pre-rinse cleaning surface with fresh water. Place detergent suction tube directly into cleaning solution and apply to surface at low pressure (for best results, limit your work area to sections approximately 6 feet square and always apply detergent from bottom to top). Allow detergent to remain on surface 1-3 minutes. Do not allow detergent to dry on surface. If surface appears to be drying, simply wet down surface with fresh water. If needed, use brush to remove stubborn dirt. Rinse at high pressure from top to bottom in an even sweeping motion keeping the spray nozzle approximately 1 foot from cleaning surface. Use overlapping strokes as you clean and rinse any surface. For best surface cleaning action spray at a slight angle.

#### Recommendations:

- Before cleaning any surface, an inconspicuous area should be cleaned to test spray pattern and distance for maximum cleaning results.
- If painted surfaces are peeling or chipping, use extreme caution as pressure washer may remove the loose paint from the surface.
- Keep the spray nozzle a safe distance from the surface you plan to clean. High pressure wash a small area, then check the surface for damage. If no damage is found, continue to pressure washing.

#### CAUTION - Never use:

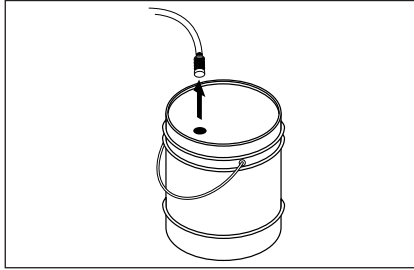
- Bleach, chlorine products and other corrosive chemicals
- Liquids containing solvents (i.e., paint thinner, gasoline, oils)
- Tri-sodium phosphate products
- Ammonia products
- Acid-based products

These chemicals will harm the machine and will damage the surface being cleaned.

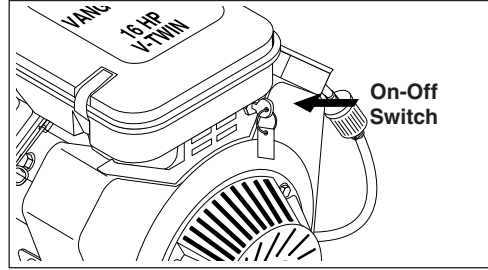
### RINSING

It will take a few seconds for the detergent to clear. Apply safety latch to spray gun. Remove black soap nozzle from the quick coupler. Select and install the desired high pressure nozzle. **NOTE:** You can also stop detergent from flowing by simply removing detergent siphon tube from bottle.

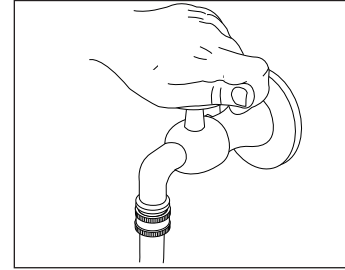
## SHUTTING DOWN AND CLEAN-UP



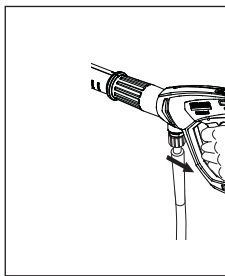
**STEP 1:** Remove detergent suction tube from container and insert into one gallon of fresh water. Open detergent metering valve. Pull trigger on spray gun and siphon water for one minute. Close detergent valve.



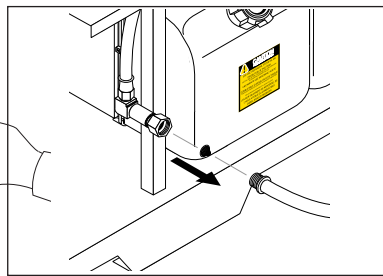
**STEP 2:** Turn off the engine.



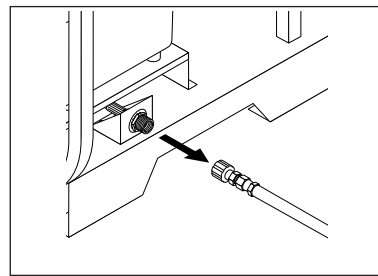
**STEP 3:** Turn off the water supply.



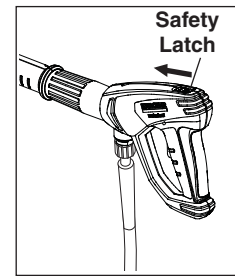
**STEP 4:** Press trigger to release water pressure.



**STEP 5:** Disconnect the garden hose from the water inlet on the machine.



**STEP 6:** Disconnect the high pressure hose from high pressure outlet.



**STEP 7:** Engage the spray gun safety lock.

## STORAGE

**CAUTION:** Always store your pressure washer in a location where the temperature will not fall below 32°F (0°C). The pump in this machine is susceptible to permanent damage if frozen. **FREEZE DAMAGE IS NOT COVERED BY WARRANTY.**

1. Stop the pressure washer, squeeze spray gun trigger to release pressure.
2. Detach water supply hose and high pressure hose.
3. Turn on the machine for a few seconds, until remaining water exits. Turn engine off immediately.
4. Drain the gas and oil from the engine.
5. Do not allow high pressure hose to become kinked.
6. Store the machine and accessories in a room which does not reach freezing temperatures.

**CAUTION:** Failure to follow the above directions will result in damage to your pressure washer.

When the pressure washer is not being operated or is being stored for more than one month, follow these instructions:

1. Replenish engine oil to upper level.
2. Drain gasoline from fuel tank, fuel line, fuel valve and carburetor.
3. Pour about one teaspoon of engine oil through the spark plug hole, pull the starter grip several times and replace the plug. Then pull the starter

grip slowly until you feel increased pressure which indicates the piston is on its compression stroke and leave it in that position. This closes both the intake and exhaust valves to prevent rusting of cylinder.

4. Cover the pressure washer and store in a clean, dry place that is well ventilated away from open flame or sparks. **NOTE:** The use of a fuel additive, such as STA-BIL®, or an equivalent, will minimize the formulation of fuel deposits during storage. Such additives may be added to the gasoline in the fuel tank of the engine, or to the gasoline in a storage container.

### After Extended Storage



**CAUTION:** Prior to restarting, thaw out any possible ice from pressure washer hoses, spray gun or wand.

### Engine Maintenance

During the winter months, rare atmospheric conditions may develop which will cause an icing condition in the carburetor. If this develops, the engine may run rough, lose power and may stall. This temporary condition can be overcome by deflecting some of the hot air from the engine over the carburetor area. **NOTE:** Refer to the engine manufacturer's manual for service and maintenance of the engine.



## MAINTENANCE

### PREVENTATIVE MAINTENANCE

1. Check to see that water pump is properly lubricated.
2. Follow winterizing instructions to prevent freeze damage to pump and coils.
3. Always neutralize and flush detergent from system after use.
4. If water is known to have high mineral content, use a water softener in your water system, or de-scale as needed.
5. Do not allow acidic, caustic or abrasive fluids to be pumped through system.
6. Always use high grade quality cleaning products.
7. Never run pump dry for extended periods of time.
8. Use clean fuel: kerosene, No. 1 fuel oil, or diesel. Clean or replace fuel filter every 100 hours of operation. Avoid water contaminated fuel as it will damage the fuel pump.
9. If machine is operated with smoky or eye burning exhaust, coils will soot up, not letting water reach maximum operating temperature.
10. Never allow water to be sprayed on or near engine or burner assembly or any electrical component.
11. Periodically delime coils as per instructions.
12. Check to see that engine is properly lubricated.

It is advisable, periodically, to visually inspect the burner. Check air inlet to make sure it is not clogged or blocked. Wipe off any oil spills and keep equipment clean and dry.

The flow of combustion and ventilating air to the burner must not be blocked or obstructed in any manner.

The area around the pressure washer should be kept clean and free of combustible materials, gasoline and other flammable vapors and liquids.

### MAINTENANCE AND SERVICE

#### Unloader Valves:

Unloader valves are preset and tested at the factory before shipping. Occasional adjustment of the unloader may be necessary to maintain correct pressure.

#### Winterizing Procedure:

Damage due to freezing is not covered by warranty. Adhere to the following cold weather procedures whenever the washer must be stored or operated outdoors under freezing conditions.

During winter months, when temperatures drop below 32°F, protecting your machine against freezing is nec-

essary. Store the machine in a heated room. If this is not possible then mix a 50/50 solution of anti-freeze and water in the float tank. Turn the engine on to siphon the anti-freeze mixture through the machine. If compressed air is available, an air fitting can be screwed into the float tank by removing the float tank strainer and fitting. Then inject the compressed air. Water will be blown out of the machine when the trigger on the spray gun is opened.

#### High Limit Hot Water Thermostat:

For safety, each machine is equipped with a temperature sensitive high limit control switch. In the event that the water should exceed its operating temperature, the high limit control will turn the burner off until the water cools then it will automatically reset itself. The thermostat sensor is located on the discharge side of the heating coil. The thermostat control dial is located on the control panel.

#### Pumps:

Before running the pump check the pump crankcase for a proper oil level. A proper oil level is indicated by the red dot in the sight glass or between the high and low marks on the dipstick. Use only SAE 30 non-detergent oil. Change the initial oil after the first 50 hours and then change the oil every 500 hours or every three months.

When draining oil, clean inside of crankcase to remove all impurities. **CAUTION: When operating in damp places or with high temperature fluctuations oil must be changed immediately.**

#### Cleaning of Coils:

In alkaline water areas, lime deposits can accumulate rapidly inside the heating coil. This growth is increased by the extreme heat build up in the coil. The best preventative for liming conditions is to use high quality cleaning detergents. In areas where alkaline water is an extreme problem, periodic use of Coil Conditioner will remove lime and other deposits before coil becomes plugged. (See Deliming instructions for use of Coil Conditioner.)

#### Scale Protection:

1. Fill container with Kärcher scale inhibitor fluid Rm 110.
2. Obtain water hardness values from local water authority, or using a water hardness testing kit.
3. Adjust impulse transmitter in electric cabinet (preset at #5.)

WATER HARDNESS (°DH)	5	10	15	20	25	30
IMPULSE TRANSMITTER	10	8	7	6.5	6	5.5

## MAINTENANCE & SERVICE

When operating unit without a scale protection, the heater coil may become scaled.

### Rupture Disk:

If pressure from pump or thermal expansion should exceed safe limits, the rupture disk will burst allowing high pressure to be discharged through hose to ground. When disk ruptures it will need to be replaced.

### Fuel:

Use clean fuel oil that is not contaminated with water and debris. Replace fuel filter and drain tank every 100 hours of operation.

Use No.1 or No 2 Heating Oil (ASTM D306) only. NEVER use gasoline in your burner fuel tank. Gasoline is more combustible than fuel oil and could result in a serious explosion. NEVER use crankcase or waste oil in your burner. Fuel unit malfunction could result from contamination.

**CAUTION: If the fuel pump is allowed to run dry for any length of time it will be damaged.**

### Fuel Control System:

This machine utilizes a fuel solenoid valve located on the fuel pump to control the flow of fuel to the combustion chamber. The solenoid, which is normally closed, is activated by a flow switch when water flows through it. When the operator releases the trigger on the spray gun, the flow of water through the flow switch stops, turning off the electrical current to the fuel solenoid.

The solenoid then closes, shutting off the supply of fuel to the combustion chamber. Controlling the flow of fuel in this way gives an instantaneous burn-or-no-burn situation, thereby eliminating high and low water temperatures and the combustion smoke normally associated with machines incorporating a spray gun. Periodic inspection, to insure that the fuel solenoid valve functions properly, is recommended. This can be done by operating the machine and checking to see that the burner is not firing when the spray gun is in the OFF position.

When operating without the burner there must be heating fuel in the fuel tank. Otherwise the fuel pump has no lubrication and will run dry. This can cause damage to the coupling and to the fuel pump.

### Fuel Pressure Adjustment:

To control water temperature, adjust fuel pressure by turning the regulating pressure adjusting screw clockwise to increase, counterclockwise to decrease. Do not exceed 200 psi. **NOTE:** When changing fuel pump, a bypass plug must be installed in return port or fuel pump will not prime.

### Burner Nozzle:

Keep the tip free of surface deposits by wiping it with a clean, solvent saturated cloth, being careful not to plug or enlarge the nozzle. For maximum efficiency, replace the nozzle each season.

### Air Adjustment:

Machines are preset and performance tested at the factory - elevation 100'. A one-time initial correction for your location will pay off in economy, performance, and extended service life. If a smoky or eye-burning exhaust is being emitted from the stack, two things should be checked. First, check the fuel to be certain that kerosene or No. 1 home heating fuel is being used. Next, check the air adjustment on the blower assembly.



## TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
<b>LOW OPERATING PRESSURE</b>	Faulty pressure gauge	Install new gauge.
	Insufficient water supply	Use larger supply hose; clean filter at water inlet.
	Old, worn or incorrect spray nozzle	Match nozzle number to machine and/or replace with new nozzle.
	Belt slippage	Tighten or replace; use correct belt.
	Plumbing or hose leak	Check plumbing system for leaks. Retape leaks with teflon tape.
	Faulty or mis-adjusted unloader valve	Adjust unloader for proper pressure. Install repair kit when needed.
	Worn packing in pump	Install new packing kit.
	Fouled or dirty inlet or discharge valves in pump	Clean inlet and discharge valves.
	Worn inlet or discharge valves	Replace with valve kit.
	Obstruction in spray nozzle	Remove obstruction.
	Leaking pressure control valve	Rebuild or replace as needed.
	Slow engine RPM	Set engine speed at proper specifications.
	Pump sucking air	Check water supply and possibility of air seepage.
	Valves sticking	Check and clean or replace if necessary.
Unloader valve seat faulty	Check and replace if necessary.	
<b>BURNER WILL NOT LIGHT</b>	Little or no fuel	Fill tank with fuel.
	Improper fuel or water in fuel	Drain fuel tank and fill with proper fuel.
	Clogged fuel line	Clean or replace.
	Plugged fuel filter	Replace as needed.
	Mis-adjusted burner air bands	Readjust air bands for clean burn.
	Little or no fuel pressure from fuel pump	Increase fuel pressure to specification and/or replace fuel pump. Test with pressure gauge.
	Faulty burner transformer	Test transformer for proper arc between contacts. Replace as needed.
	(continued on next page)	Disconnected or short in electrical wiring

## TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
<b>BURNER WILL NOT LIGHT</b> (continued from previous page)	Flex coupling slipping on fuel pump shaft or burner motor shaft	Replace if needed.
	On-Off switch defective	Check for electrical current reaching burner assembly with burner switch on.
	Heavy sooting on coil and burner can cause interruption of air flow and shorting of electrodes	Clean as required.
	Improper electrode setting	Check and reset according to diagram in Operator's Manual.
	Fuel not reaching combustion chamber	Check fuel pump for proper flow. Check solenoid flow switch on machines with spray gun control, for proper on-off fuel flow control.
	Clogged burner nozzle	Clean as required.
	Thermostat faulty or slow engine speed	Increase engine RPM to increase voltage.
	Flow switch malfunction	Remove, test for continuity and replace as needed.
	Flow solenoid malfunction	Replace if needed.
<b>FLUCTUATING PRESSURE</b>	Valves worn	Check and replace if necessary.
	Blockage in valve	Check and replace if necessary.
	Pump sucking air	Check water supply and air seepage at joints in suction line.
	Worn piston packing	Check and replace if necessary.
<b>MACHINE SMOKES</b>	Improper fuel or water in fuel	Drain tank and replace contaminated fuel.
	Improper air adjustment	Readjust air bands on burner assembly.
	Low fuel pressure	Adjust fuel pump pressure to specifications.
	Plugged or dirty burner nozzle	Replace nozzle.
	Faulty burner nozzle spray pattern	Replace nozzle.
	Heavy accumulation of soot on coils and burner assembly	Remove coils and burner assembly, clean thoroughly.
	Misaligned electrode setting	Realign electrodes to specifications.
	Obstruction in smoke stack	Check for insulation blockage or other foreign objects.
	Low engine RPM	Increase RPM

## TROUBLESHOOTING

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>LOW WATER TEMPERATURE</b>	Improper fuel or water in fuel	Replace with clean and proper fuel.
	Low fuel pressure	Increase fuel pressure.
	Weak fuel pump	Check fuel pump pressure. Replace pump if needed.
	Fuel filter partially clogged	Replace as needed.
	Soot build-up on coils not allowing heat transfer	Clean coils.
	Improper burner nozzle	See nozzle specifications. (page 30)
<b>WATER TEMPERATURE TOO HOT</b>	Incoming water to machine warm or hot	Lower incoming water temperature.
	Fuel pump pressure too high	See specifications for proper fuel pressure.
	Fuel pump defective	Replace fuel pump.
	Detergent line sucking air	Tighten all clamps. Check detergent lines for holes.
	Defective temperature switch	Replace.
	Incorrect fuel nozzle size	See specifications for proper fuel nozzle. (page 30)
	Insufficient water supplied	Check water G.P.M. to machine.
	Restricted water flow	Check nozzle for obstruction, proper size.
<b>PUMP NOISY</b>	Air in suction line	Check water supply and connections on suction line.
	Broken or weak inlet or discharge valve springs	Check and replace if necessary.
	Excessive matter in valves	Check and clean if necessary.
	Worn bearings	Check and replace if necessary.
<b>PRESENCE OF WATER IN OIL</b>	Oil seal worn	Check and replace if necessary.
	High humidity in air	Check and change oil twice as often.
<b>WATER DRIPPING FROM UNDER PUMP</b>	Piston packing worn	Check and replace if necessary.
	O-Ring plunger retainer worn	Check and replace if necessary.
	Cracked piston	Check and replace if necessary.
	Pump protector	Lower water supply pressure. Do not run with spray gun closed longer than 2 minutes

## TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
<b>OIL DRIPPING</b>	Oil seal worn	Check and replace if necessary.
<b>EXCESSIVE VIBRATION IN DELIVERY LINE</b>	Irregular functioning of the valves	Check and replace if necessary.
<b>DETERGENT NOT DRAWING</b>	Air leak	Tighten all clamps. Check detergent lines for holes.
	Restrictor in float tank is missing	Replace restrictor. Check for proper orifice in restrictor.
	Filter screen on detergent suction hose plugged	Clean or replace.
	Dried up detergent plugging metering valve	Disassemble and clean thoroughly.
	High viscosity of detergent	Dilute detergent to specifications.
	Hole in detergent line(s)	Repair hole.
	Low detergent level	Add detergent, if needed.
<b>PUMP RUNNING NORMALLY BUT PRESSURE LOW ON INSTALLATION</b>	Pump sucking air	Check water supply and possibility of air seepage.
	Valves sticking	Check and clean or replace if necessary.
	Nozzle incorrectly sized	Check and replace if necessary (See serial plate for proper size).
	Unloader valve seat faulty	Check and replace if necessary.
	Worn piston packing	Check and replace if necessary.
<b>BURNER MOTOR WILL NOT RUN</b>	Fuel pump seized	Replace fuel pump.
	Burner fan loose or misaligned	Position correctly, tighten set screw.
	Defective control switch	Replace switch.
	Loose wire	Check and replace or tighten wiring.
	Defective burner motor	Replace motor.
<b>RELIEF VALVE LEAKS WATER</b>	Relief valve defective	Replace or repair



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