

EASY-KLEEN

PRESSURE SYSTEMS LTD.

MANUFACTURER OF HIGH PRESSURE CLEANING EQUIPMENT

OWNER'S MANUAL

Caribou Series Industrial Hot Water Fully Electrically Heated



BEFORE YOU BEGIN!



HIGH-PRESSURE WASH EQUIPMENT AND THE SPRAYS THAT THEY GENERATE CAN CAUSE SERIOUS INJURY. THINK SAFETY FIRST!

The forces generated by high-pressure sprays can penetrate clothing or skin and cause severe personal injury. Additionally, the high-pressure spray and material dislodged by it may be deflected back toward you and/or persons or objects nearby. Water or water combined with cleaning agents or soap can make floors and other surfaces slippery, creating the possibility of persons or objects falling. Power cords and high-pressure hoses create a further hazard and should always be stored neatly when not in use. During any cleaning operation, hoses and power cords should be laid flat on the ground and away from areas where they may become entangled in objects or cause tripping of persons passing by. Always consider the surrounding environment and conditions before beginning any cleaning operation.

- Eye protection, safety footwear, and protective clothing should always be worn when using this equipment.
- Never place any part of your body in front of the high-pressure nozzle.
- Never direct the high-pressure spray at yourself or any other person.
- Never allow children to operate the pressure washer.
- Hold the trigger gun/wand assembly securely with both hands when operating the pressure washer.
- Never direct the high-pressure spray at any electrical device or the pressure washer itself.
- Never operate electrically powered pressure washers where they will be exposed to rain or other forms of precipitation or spray.
- Never operate the pressure washer with damaged parts or components.
- Never allow the machine or accessories to freeze.
- Do not drive over or crush high-pressure hoses or allow them to come in contact with sharp objects.
- Do not operate electrically heated system without first supplying water to the heat exchanger tank. Fill the water tank with clean water to safe levels of operation.
- Do not attempt to move or pull the machine (portable equipment) by the high-pressure hose or electrical cord.
- When not in use, turn the machine OFF and depress the trigger gun to remove residual system pressure.
- Do not operate the system without a water supply.
- Do not allow the machine to operate (by-pass) for extended periods with the trigger gun closed or without discharging water.
- Avoid rapid triggering and releasing of the gun. Smooth triggering will extend the life expectancy of the system components.

High-pressure wash system components are sensitive to solid matter and debris that may be present in the fluid moving through them. Additionally, material allowed to enter hoses and various connections when the equipment is improperly moved or stored can increase the potential for failure. To avoid component fouling, poor system performance, and costly downtime, always ensure that a clean water supply and when possible, a clean environment is provided to the machine.

EASY-KLEEN

PRESSURE SYSTEMS LTD.

MANUFACTURER OF HIGH PRESSURE CLEANING EQUIPMENT

1-800-315-5533

This manual contains operational information that is specific for the Electrically Heated Industrial Hot Water Fully Electric Models.

Read the following instructions carefully before attempting to assemble, install, operate, or service this pressure washer. Failure to comply with these instructions could result in personal injury and/or property damage.

Table Of Contents

<i>IMPORTANT SAFETY INFORMATION</i>	<i>1</i>
<i>SPECIFICATIONS</i>	<i>4</i>
<i>INTRODUCTION</i>	<i>5</i>
<i>GENERAL INFORMATION</i>	<i>6</i>
<i>ELECTRIC HEAT EXCHANGER</i>	<i>7</i>
<i>STARTUP AND ADJUSTMENT PROCEDURES</i>	<i>8</i>
<i>MAINTENANCE</i>	<i>9</i>
<i>QUICK DIAGNOSTICS & SOLUTIONS GUIDE</i>	<i>10</i>
<i>EQUIPMENT PREVENTATIVE MAINTENANCE</i>	<i>11</i>
<i>PROTECTING THE SYSTEM FROM FREEZING</i>	<i>13</i>
<i>HEAT EXCHANGER DIAGRAM</i>	<i>14</i>
<i>MANUFACTURER'S WARRANTY</i>	<i>16</i>
<i>SERVICE MANUAL</i>	<i>19</i>
<i>DIAGNOSTICS AND SOLUTIONS GUIDES</i>	<i>20</i>

IMPORTANT SAFETY INFORMATION

Easy-Kleen's first priority is the safe operation of our high pressure cleaning equipment. This can be achieved by following the operation and maintenance instructions as explained in this manual and all other enclosed information.

This manual contains essential information regarding the safety hazards, operation, and maintenance associated with this machine. The manual should always remain with the machine, including if it is resold.

ALL CAUTIONS AND SAFETY WARNINGS MUST BE FOLLOWED TO AVOID PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT.

THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS AND MUST ALWAYS BE ATTENDED TO DURING OPERATION.



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

1. Read the instructions in this manual carefully before attempting to assemble, install, operate, or service this pressure washer. Failure to comply with the instructions could result in personal injury and/or property damage.



WARNING: Use protective eyewear and clothing when operating equipment in order to avoid personal injuries.



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



WARNING: Keep water spray away from electrical wiring.

3. All electrically powered equipment must be grounded at all times to prevent fatal electric shocks. Do not spray water on or near electrical components. Do not touch electrical components while standing in water or when hands are wet. Always make sure machine is disconnected from power source before servicing. Ensure machine is plugged into a ground fault interrupter when in use.



WARNING: Risk of injection or severe injury to persons. Keep clear of nozzle spray.

4. High pressure spray can cause serious injuries. Never point pressurized spray at any person or animal. Handle the spray assembly with care.



WARNING: Risk of injury. Hot surfaces can cause burns.



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



WARNING: Trigger gun kicks back. Hold with both hands.

5. Hold on firmly to the gun and wand during start up and operation of the machine. Do not attempt to make adjustments while the trigger gun is in operation.

6. Make sure all quick coupler fittings are properly secured before operating pressure washer.



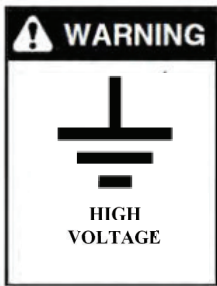
WARNING: Risk of injury from falls when using ladder.

7. Do not overreach or stand on anything unstable. Keep good balance and make sure to keep steady footing at all times.



WARNING: Protect from freezing.

8. It is important to keep your machine from freezing in order to keep it in its best working condition. Failure to protect your machine from freezing may cause damage to the machine and personal injuries may occur as a result.



WARNING: High Voltage.

9. For machines with an electric motor or 120V burner – **THE MACHINE MUST BE ELECTRICALLY GROUNDED.** Must be connected to a GFCI (Ground Fault Circuit Interrupter). All service must be done with the machine disconnected from the supply circuit.

10. Protect high pressure hoses from sharp objects and vehicles. Inspect condition of hoses prior to use, or serious injury could occur.

11. Do not pass acids or other caustic or abrasive fluids through the pump.

12. Never run pump dry of water or let the pump run with the trigger gun released for more than 2 minutes.

13. Do not attempt to operate this machine if fatigued or under the influence of alcohol, prescription medications, or drugs.

14. Some of the maintenance procedures involved in this machine require a certified technician (these steps are indicated throughout this manual). Do not attempt to perform these repairs if you are not qualified.

If you need further explanation of any of the information in this manual, suspend any activity involving the equipment and call our toll free number for assistance at: 1-800-315-5533.



SPECIFICATIONS

INDUSTRIAL HOT WATER FULLY ELECTRICALLY HEATED								
MODEL	GPM	PSI	HEATER INPUT	MOTOR HP	TOTAL AMP 3PH			DIMENSIONS L" x W" x H"
					208	460	575	
EH411E24A	4	1200	24 KW	5	72.5	33.3	26.6	32 x 28 x 52
EH411E48A	4	1200	48 KW	5	134.8	62.2	49.7	32 x 28 x 52
EH420E24A	4	2000	24 KW	5	77.1	35.5	28.4	32 x 28 x 52
EH420E448A	4	2000	48 KW	5	139.6	64.4	51.8	32 x 28 x 52
EH420E472A*	4	2000	72 KW	5	N/A	93.3	74.4	48 x 28 x 52
EH430E424A	4	3000	24 KW	7.5	85	39.1	31.3	32 x 28 x 52
EH430E448A	4	3000	48 KW	7.5	147.5	68	54.4	32 x 28 x 52
EH430E472A*	4	3000	72 KW	7.5	N/A	96.5	76.9	48 x 28 x 52
EH440E448A	4	4000	48 KW	10	154	70.9	56.7	32 x 28 x 52
EH440E472A*	4	4000	72 KW	10	N/A	99.8	79.9	48 x 28 x 52
EH450E448A	4	5000	48 KW	15	N/A	75.9	60.7	36 x 54 x 36
EH450E472A*	4	5000	72 KW	15	N/A	104.8	83.9	48 x 54 x 36
EH550E448A	5	5000	48 KW	20	N/A	82.8	66.5	36 x 54 x 36
EH550E472A*	5	5000	72 KW	20	N/A	112.2	89.8	48 x 54 x 36
EH535E448A	5	3500	48 KW	10	154	70.9	56.7	32 x 28 x 52
EH535E472A*	5	3500	72 KW	10	N/A	99.8	79.9	48 x 28 x 52
EH562E448A	5.6	2000	48 KW	7.5	147.5	68	54.4	32 x 28 x 52
EH562E472A*	5.6	2000	72 KW	7.5	N/A	96.9	77.6	48 x 28 x 52
EH612E448A	6	1200	48 KW	5	139.6	64.4	51.8	32 x 28 x 52
EH620E448A	6	2000	48 KW	10	147.5	68	54.4	32 x 28 x 52
EH620E472A*	6	2000	72 KW	10	N/A	96.9	77.6	48 x 28 x 52
EH812E2448A*	8	1200	48 KW	7.5	147.5	68	54.4	32 x 28 x 52
EH812E2472A*	8	1200	72 KW	7.5	N/A	96.9	77.6	48 x 28 x 52
EH820E2448A*	8	2000	48 KW	10	154	70.9	56.7	32 x 28 x 52
EH820E2472A*	8	2000	72 KW	10	N/A	99.8	79.9	48 x 28 x 52
EH830E2448A*	8	3000	48 KW	15	165	75.9	60.7	36 x 54 x 36
EH830E2472A*	8	3000	72 KW	15	N/A	104.8	83.9	48 x 54 x 36
EH1030E2472A*	10	3000	72 KW	20	N/A	112.2	89.8	48 x 54 x 36
EH1030E2496A*	10	3000	96 KW	20	N/A	141.3	113.1	48 x 54 x 36
EH1030E24115A*	10	3000	115 KW	20	N/A	164.3	131.4	48 x 54 x 36
* MODELS HAVE DOUBLE COILS								

INTRODUCTION

Thank you for selecting a quality Easy-Kleen product. We are pleased to have you included among the many satisfied owners of Easy-Kleen machines. Years of engineering have gone into the development of these fine products and only top quality components and materials are used throughout. Each machine is carefully tested and inspected before leaving our plant to ensure years of dependable performance.

To continue to receive satisfactory performance, remember that this machine represents a substantial investment on your part, and if properly cared for and maintained, it will return this investment many times over. As with all mechanical equipment, your machine requires proper operation and maintenance as outlined in this manual for maximum trouble free life.

This manual has been prepared under the direction of our engineering and service technicians. Their experience in designing, manufacturing, installing, and servicing our equipment from our company's inception, is condensed in this manual. They know what information end users need in order to get optimal performance from their pressure washer. Please read carefully.

This manual contains information that will be specific for your pressure washer as well as similar models.

Carefully review any additional manuals that have been included with your system and follow **ALL ADDITIONAL OPERATING INSTRUCTIONS AND SAFETY NOTICES**. They are specific for the quality components that have been used to manufacture your machine and are an integral part of operating and maintenance procedures.

The management & staff at Easy-Kleen are proud of the equipment that we design and manufacture, and we thank you for making us your # 1 choice in pressure washers. If you have any questions, please do not hesitate to call us at: **1-800-315-5533**.

Our goal is that you will be satisfied with the performance, quality, and service you receive from Easy-Kleen and that if you need to replace this machine in years to come, you will give us the opportunity to continue supplying your equipment.

PLEASE READ MANUALS CAREFULLY BEFORE USING THE MACHINE. EXAMINE THE MACHINE AND CRATE CAREFULLY FOR SHIPPING DAMAGE OR MISSING PARTS. REPORT ANY SHORTAGES OR DAMAGE CLAIMS TO FREIGHT CARRIER OR DEALER PROMPTLY.

GENERAL INFORMATION

The electrical single heater consists of a, single coil heat exchanger, control components, thermo probe, float switch, high pressure hoses, and connections.

THIS MACHINE SHOULD BE PROTECTED FROM FREEZING AT ALL TIMES. (SEE MAINTENANCE)

Installation Location

Place system in any suitable location. Adjust the leg bolts to level the unit. It is recommended to provide ample room and support for installation, maintenance, and operation of elevated systems. Drainage should be provided near the unit.

The pumping unit is designed to be located on top of the heat exchanger, although it may be located beside it.

System Functions

In every Electrically Heated System the following standard features can be found:

1. Automatic start circuit complete with manual override
2. Automatic time delay stop circuit
3. Automatic temperature controlled heat exchanger
4. Thermal safety shutdown on pumping system to protect pump components
5. Low water shutdown circuit to protect heating elements from lack of water in the heat exchanger
6. Corrosion resistant incoloy heating elements (tube type)
7. 50' of 3/8" steel braided hose
8. High pressure trigger gun
9. Lance complete with chemical valve
10. Chemical injection system
11. Complete motor fusing and overload protections

Note: Some of these features may not apply to your build. Check with serial and model number for features that come with your pressure washer.

ELECTRIC HEAT EXCHANGER

Functional Description

The function of our heat exchangers is to enhance an existing high pressure cold water wash system by enabling it to create hot water downstream of the high pressure pump. It also allows the system to operate automatically, virtually eliminating the problems that are often associated with “hands-on” controls. High pressure cold water is circulated through a tubular coil which is submerged in hot water in an unpressurized tank. The cold water is then heated by the surrounding hot water.

Motor controls, as well as other system controls and safety features, are provided with the heat exchanger and are enclosed within the unit eliminating the need for separate pump control.

Our heat exchangers have been designed with the maximum efficiency in mind. There is no need for messy and potentially dangerous fuel storage nor venting. The unit may be located in any convenient location. High pressure hot water is only the squeeze of a trigger away, and our heat exchangers deliver it to you instantaneously; **NO WARM UP PERIOD.**

Cold Inlet Water Connection

Inlet connection to the heat exchanger is made by connecting a high pressure discharge hose (optional) from the discharge port of the high pressure pump unit to one of the fittings provided on top of the heat exchanger. **DO NOT EXCEED MAXIMUM SYSTEM PRESSURE.**

Hot Water Discharge Connection

Discharge connection is made from the fitting opposite the inlet to the hose/gun/lance assembly, or to plumbing for remote station(s) operation.

Automatic Controls

Automatic controls include water temperature control, low heat exchanger water level shut off, and pump motor control circuit complete with time delay stop. Motor circuit fusing and overload protection are also provided. In addition all heat exchanger control circuits have provisions for connecting a flow switch and optional pump thermal protector.

The thermostat maintains tank water temperature at approximately 180 degrees F (82 degrees C). A level switch in the tank will open if the water level should drop to a point where operation of the unit is affected.

Electrical Supply Hookup

Electrical service for the system is run to the terminal block on the electrical panel labeled L1, L2, and L3. A ground lug is also provided. This unit must be properly grounded to prevent electrical shock. A fused disconnect is to be provided according to local codes. Refer to ID plate for voltage and total connected load.

ALL ELECTRICAL WORK TO BE PERFORMED BY A QUALIFIED ELECTRICIAN.

WARNING: THIS CONTROLLER MUST BE PROVIDED WITH SUITABLE OVERLOAD AND OVERCURRENT PROTECTION IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE PART 1.

UNIT TO BE CONNECTED TO A (GFCI) OR TWIST LOCK PLUG OR PERMANENT CONNECTION.

Motor/Motor Control Connection

The high pressure pump motor is to be connected to the motor contactor overload connections labeled T4, T5, and T6. Be sure that the motor current (see FLA rating on motor plate) is within the current rating of the motor overload, and that the overload is set to the proper current level. A ground lug is also provided for the motor circuit. Electrical leads from a flow switch (optional) are to be connected to the terminal strip labeled **FLOW SWITCH CONNECT**, at terminals 7 & 8. An optional thermo probe may be connected at terminals 9 & 10. The purpose of this probe is to protect the high pressure pump from overheating. A thermally activated switch within the probe will open when the pump temperature is too high, stopping the unit. The system will start again only when the temperature has been lowered to an appropriate temperature. On units that are not equipped with this feature, a jumper wire (installed at the factory), must connect terminals 9 & 10 and it is suggested that another type of thermal protector be used.

STARTUP AND ADJUSTMENT PROCEDURES

Installation

Install the Electrically Heated System in accordance with pumping package and heat exchanger directions. See pump and heat exchanger directions. This equipment should be installed and serviced by qualified personnel.

Turning Power On

Do not turn power on until the heat exchanger is filled with water as severe damage may occur if water is not above heater elements. To fill heat exchanger, remove 1 ¼" pipe plug from the elbow fill pipe located on the heat exchanger. Insert water hose and fill. Heater tank will require approximately 70 gallons (265 liters) of water on initial fill. After a water level has reached the fill elbow, the power may now be turned on. It will take 15 to 20 minutes for the heat exchanger to reach operating temperature.

WATER WILL EXIT THE FILL PIPE WHILE THE HEATER TEMPERATURE IS RISING. This is due to the heat expansion of the cold water just added. This will stop after the heater has reached its operating temperature. Replace and hand tighten the 1 ¼" fill pipe plug. After initial heating of the tank, leave the main power on to the equipment. This will ensure hot cleaning solution is available instantly on pump start up.

Turning Water On

Turn the inlet water supply on after the pumping package has been installed. See pumping package section for details.

CAUTION! BEFORE PUMPING PACKAGE IS STARTED FOR THE FIRST TIME, OR AFTER MAINTENANCE HAS BEEN PERFORMED ON ANY SUPPLY OR DISCHARGE WATER LINES, ALL AIR MUST BE PURGED FROM THE SYSTEM. FAILURE TO DO SO MAY RESULT IN SYSTEM DAMAGE.

System Operation

CAUTION: Pressure cleaning gun must be HELD ONTO SECURELY when the pump is turned on as serious personal injury may be inflicted if spray wand is allowed to move freely. High pressure spray can cause **SERIOUS BODILY HARM - HANDLE WITH CARE - NEVER POINT SPRAY AT ANY PART OF THE BODY**. Proper protective equipment should be worn if corrosive chemicals are used. With pumping unit turned off, pull the gun trigger to ensure that the water is running through the nozzle. Check the supply line to ensure there are no kinks in the hose. Release the gun trigger. Place the operators switch, located on the heat exchanger, in the "A" automatic position. You are now ready to clean.

Pressure Regulation

This unit has been adjusted at the factory and preset at the designed specifications. **DO NOT READJUST IN AN ATTEMPT TO INCREASE PUMP PRESSURE.** This will only increase the regulation pressure which will cause internal pump damage or motor overload.

MAINTENANCE

DAILY

To ensure a problem-free system, simple visual checks can be performed. Check for leaks in inlet supply, pumping system, pump to heater hose, gun(s), and high pressure hose. Check and refill chemical concentrate. Check pump oil level/condition. Check nozzle condition. If badly worn or leaking conditions are found, qualified personnel should repair or place components with new original or equivalent manufacturers parts.

Check equipment for proper operation. Nozzle spray should be uniform in flow, angle, and pressure. Clean if nozzle is plugged and replace if worn. If a heavy pulsation in the hose or spray is observed, repair of the pumping system is required.

WEEKLY

After the first week of operation, it is recommended that 1litre of motor oil be added to the heat exchanger tank through the 1¼" fill pipe. This oil creates a vapor barrier and slows evaporation of water in the tank.

Check heat exchanger water level. The level must be up to the filler pipe neck. Add water if necessary. If cold water has been added, heating may cause the expanding water to escape through the filler plug. This will stop after operating temperature has been reached.

MONTHLY

Check system for operation. Automatic start/stop, hot high pressure water, and smooth operation should be noted. Check tank water level, refill if necessary. Should the tank ever be completely emptied, 450 g of perafilm P must be added to the tank. This prevents corrosion.

Change oil in pump crankcase. Note the condition of the oil when drained. If found to be creamy, the water seals in pump may have to be removed and replaced. Follow the pump manual directions.

FAILURE TO MAINTAIN YOUR PRESSURE WASHER/EQUIPMENT, INCLUDING REGULAR MAINTENANCE OF PUMP AND SYSTEM COMPONENTS, WILL VOID MANUFACTURER'S WARRANTY.

QUICK DIAGNOSTICS & SOLUTIONS GUIDE

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Pulsation	Excessive pressure and/or temperature of fluid being pumped.	- Check pressures and/or temperature. Reduce to acceptable level. Reduce pressure.
	Unloader/regulator set too high of pressure. Running pump dry.	- Reduce Pressure.
	Faulty Pulsation Dampener	- Do not run pump without water. Check pre-charge, if low, re-charge it or install a new one.

EQUIPMENT PREVENTATIVE MAINTENANCE

Regular inspection and maintenance of your system is the best defense against equipment failure and costly downtime. Additionally, the high-pressure wash systems can create safety hazards. Simple checks, performed by the operator of the equipment or maintenance personnel on a regular basis, will help to ensure safe operation and that the system's maximum performance and life cycle is achieved. The guidelines below pertain to the basic system and components only. Further consideration should be given to optional accessories when included.

DAILY MAINTENANCE SHOULD INCLUDE THE FOLLOWING:

- Check that all water supply and high pressure discharge hoses as well as all power cords do not create an obstruction that may cause anyone to trip or fall.
- Check that all controls, switches, and disconnects are readily accessible and can be reached quickly in case of emergency.
- Check inlet water supply valves and hoses for signs of leakage and correct where needed.
- Check inlet water supply hose for kinks or other forms of restriction that can interrupt proper flow into the system.
- Check that all electrical cords and wires are properly secured/connected and do not pose a potential hazard for electrocution. All electrical supply and motor connections must include a ground wire.
- Check that the area around the unit is clear and dry.
- Check that all moving parts such as belts, pulleys, motor fans, etc., are clear of debris that could become entangled or otherwise come in contact with them.
- Check the pump oil sight glass or dipstick for the correct oil level and signs of contaminants (water or metallic particles).
- Untangle the high pressure hose if needed.
- Check the hose for nicks, cuts, and abrasions that can lead to leaks.
- Check that the nozzle is clear of debris and operates correctly.
- Check for adequate water to the unit.
- Check that the chemical tank is full.
- Check that the chemical tube is clear and in the tank.

WEEKLY:

1. Check and clean inlet filters and screens.
2. Check and clean the chemical filter/screen.
3. Check for signs of water and/or oil leaking around the pump.

MONTHLY

1. Update your record of inspections, problems, or any potential problems.
2. Check for any oil leaks at the crankcase, crankshaft, or piston seals.
3. Check controls are working within specifications.

QUARTERLY

1. Change the pump oil every 3 months or 500 hours of use, whichever occurs first.
2. Check the inlet and discharge valve assemblies and O-rings should be checked or changed every 3 months.

Recommendation for Oil Changes and Component Replacement

1. Change the oil in the pump after the first 50 hours and every 500 hours after the initial oil change.
Use SAE 30 W Non-Detergent for GP Pumps and Hydraulic 68 for EK Pumps.
2. Change all other components on the pump as needed.

PROTECTING THE SYSTEM FROM FREEZING

If the equipment will be used or stored in areas where it will be exposed to temperatures below 0° Celsius (32° Fahrenheit) for any period of time, precautions must be taken to prevent damage due to freezing. **DRAINING THE SYSTEM DOES NOT OFFER ADEQUATE PROTECTION.** Use of a high quality plumbing antifreeze or automotive windshield washer antifreeze is recommended. Glycol based antifreeze may be used, but be sure to follow the manufacturer's directions for correct mixture and for proper disposal after use. The following method may be used to protect the system when not in use.

1. Disconnect the power supply to the machine and turn off all control switches (turn off engine on gas powered machines).
2. Turn off the water supply.
3. Relieve any trapped pressure in the system by squeezing the trigger gun but leave high pressure hose(s) attached to the discharge.
4. Remove supply hose.
5. Fill a clean container of sufficient size to supply the machine with enough antifreeze solution for approximately two minutes operation (i.e. 8 gallons for a 4 GPM system).
6. Connect a short hose to the inlet of the system and submerge the open end in the antifreeze close to the bottom of the container.
7. Restore power to the machine and turn control switch to MANUAL position (Start engine on gas powered machines).
8. Open and hold trigger gun until antifreeze is discharged from nozzle. (Most antifreeze compounds will foam slightly when discharged from system). Discharged antifreeze may be directed back into container for reuse or proper disposal.
9. Close the trigger gun momentarily to force solution through by-pass loop.
10. Repeat steps 1, 3, and 4.

If desired, compressed air may be connected to the inlet connection of the system to force the remaining antifreeze solution from the system; however, air pressure should be regulated to no more than 80 PSI.

HEAT EXCHANGER DIAGRAM

The design feature of our Heat Exchanger allows high pressure cold water to be heated in an unpressurized tank. Cold water entering the heat exchanger passes through a coil submerged in heated water. Electrical controls for the exchanger and pumping package are mounted on the outside of the tank. The protective outer wrap and front panel enclose the controls.

After filling the water tank to the level indicated in Fig3, turn the heat exchanger switch to the "ON" position. Once the heater has reached the set temperature, water may drip through a small hole in the 90 deg. elbow to prevent pressure from building up which can naturally occur when water is heated to high temperature.

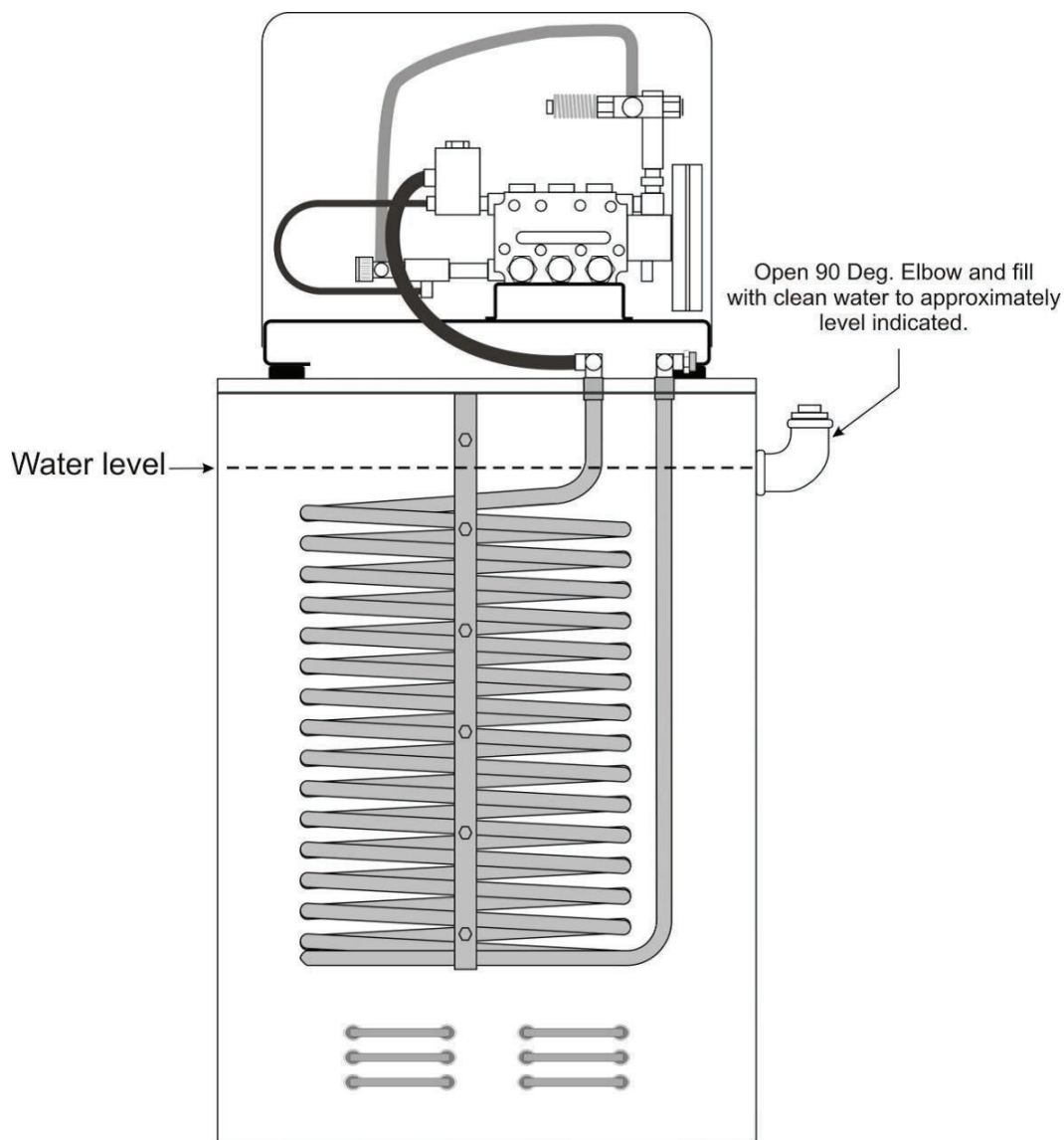
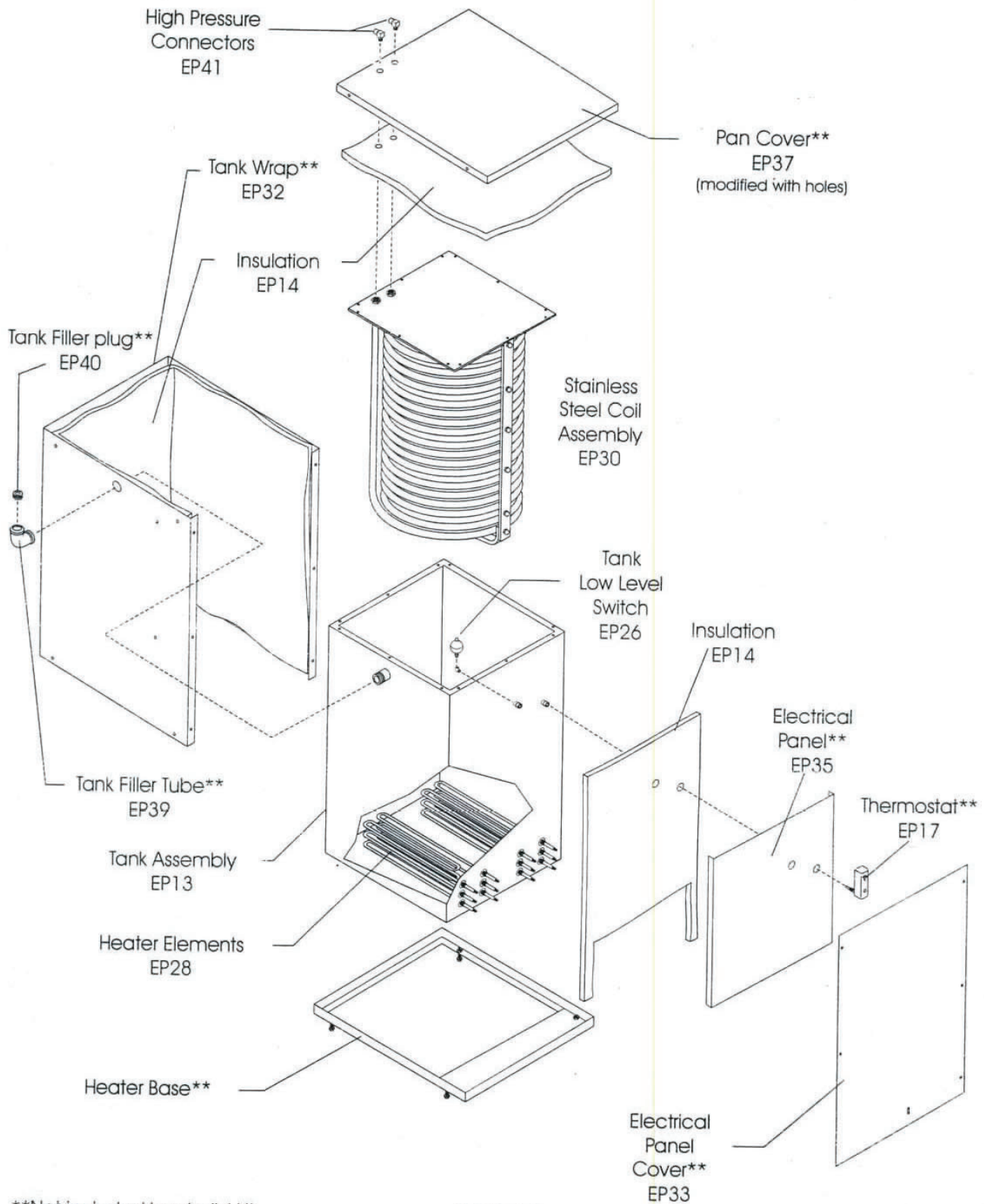


FIGURE 3
Heat Exchanger

48 KW HEAT EXCHANGER



**Not included in rebuild kit

Drawing 1



PRESSURE SYSTEMS LTD.

MANUFACTURER OF HIGH PRESSURE CLEANING EQUIPMENT

MANUFACTURER'S WARRANTY

This Warranty is active as of January 01, 2021. If you purchased your machine before this date, please see our previous warranty policies. Thank you for your purchase of an Easy-Kleen pressure cleaning system. All original equipment are warranted for a specific period and on the conditions set forth, that the product is free from defect in materials and workmanship as follows:

WARRANTY TIME LINE		
Electric Motors	1 Phase	18 Months
	3 Phase	24 Months
	For warranty of these items, manufacturer needs to be contacted	
Oil Burners	Ignitors, Fuel Solenoid, Burner Motor, Fuel Assembly, Drive Shaft, Electrodes Blower, Wheel Fuel Pump	1 Year for Parts
Propane /Natural Gas Burners	Burner Rings, Gas Valves, Gas Valve Control Board	1 Year
Fitting	All Fittings, Brass Stainless Steel, Steel, Etc.	30 Days
Heating Coils	*Damage due to neglect, freezing or hardwater is not covered	5 years - limited
Gas Motors	Must contact Honda/Kohler for Warranty	
Lifan Motor	Contact Easy-Kleen for Warranty	1 Year (for commercial use)
Frames	*Paint is not covered under the manufacturer’s warranty due to aggressive environment or natural wear.	7 Years
Plastic Tanks	Water or Fuel	1 Year
Accessories /Wear Items	Unloader, Regulating Valves, Safety Valves, Jetter Valves, Check Valves, Foot Valves, Pulsation Dampeners, Trigger Guns, Rotary Nozzles, Chemical Injectors, Hose (Jetter Hose Not Included), Hose Reels, Sandblast Kits, Surface Cleaner, Water Broom, Water Strainer, Belts, Ball Valves, Swivels, Balanced Relief Valves, Accumulator Lances	90 Days
Electrical Components	Switches, Time Over Loads, Contactors, Transformer, Thermostat, Vacuum Switches, Flow and Pressure Switches, Relays, Primary Controls	90 Days
Non-Warranty Items	Fuel Filters, Nozzles, O- Rings, Thermo Relief Valves (Pump Seals, Valves, Plungers)	
ANY PARTS NOT LISTED ABOVE CALL FOR WARRANTY TIME FRAMES		
PUMP WARRANTY TIME LINE		
Cat Pumps	Direct Drive Pumps	2 Years
	Car Wash Pumps (Including all models used in Car Wash or Portable Fresh Water Pressure Cleaning applications	5 Years
	All other pumps not listed above	1 Year
Giant Pumps	Pressure Washer and Self- Serve Car Wash Applications	5 Years
	All other Giant Pumps, Industrial and Consumer Pumps	1 Year
	Lifetime on Manifolds due to Manufacture defects	
AR Pumps	Plunger Pumps	5 Years
	Axial Pumps	1 Year
	AR Accessories	90 Days
General Pumps	Manifolds	5 Years
	Pressure Washer Pumps	5 Years
EK Pumps	Manifolds	5 Years
	Pumps	1 Year
	Accessories	90 Days
	Manufacturer does not cover wet end of Pump Seals, Valves, and Plungers.	

What is a Limited Warranty?

Warranty is a written guarantee by the manufacturer of a product, promising to repair or replace parts which have a defect in material or workmanship. "Limited" means that the Warranty is for a specified period of time, and has certain other restrictions. Parts will be warranted for the time periods specified in this published warranty. Any exceptions must be approved by Easy-Kleen Pressure Systems Ltd..

Warranty Start Date

The warranty coverage begins on the date of original purchase and applies to the original components only.

Right to Inspect

Easy-Kleen and its service centers reserve the right to inspect the customer's Easy-Kleen products to determine if a defect in materials or workmanship exists prior to the commencement of any covered repair. It is the customer's responsibility to contact the Easy-Kleen authorized service center and make the arrangements for inspection and/or repair.

Limitations Of Liability

Easy-Kleen liability for special, incidental, or consequential damages is expressly disclaimed. In no event shall Easy-Kleen's liability exceed the purchase price of the product in question. Easy-Kleen makes every effort to ensure that all illustrations and specifications are correct, however, these do not imply a warranty that the product is merchantable or fit for a particular purpose, or that the product will actually conform to the illustrations or specifications. Our obligation under this warranty is expressly limited at our option to the replacement or repair at our manufacturer location, if such part or parts at inspection shall disclose to have been defective. Easy-Kleen does not authorize any other party, to make any representation or promise on behalf of Easy-Kleen or to modify the terms, conditions, or limitations in any way. It is the buyer's responsibility to ensure that the installation and use of Easy-Kleen products conform to local codes. While Easy-Kleen attempts to ensure that its products meet national codes, it cannot be responsible for how the customer chooses to use or install the product. **THE WARRANTY CONTAINED HEREIN IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY.**

Easy-Kleen reserves the right to make any changes to an Easy-Kleen product at any time without incurring any obligation with respect to any product line previously, ordered, sold, or shipped.

Customer Responsibility

It is the customer's responsibility to maintain the equipment in accordance with the instructions provided in the Operator's Manual. Easy-Kleen recommends that you keep records and receipts; you may be asked to prove that the maintenance instructions have been followed. It is also the customer's responsibility to operate the equipment in a safe manner, and for the use for which it was designed. If a defect in materials or workmanship occurs, it is the customer's responsibility to cease operating the equipment until repairs are made. Damage which occurs from continued operation after a defect is identified may not be covered by this warranty. Your authorized service center should be contacted immediately so that repairs can be made in a timely manner.

Repair at an Authorized Dealer

To obtain warranty service under the terms and conditions of the Easy-Kleen Limited Warranty, you must deliver portable equipment to an authorized Easy-Kleen service center. For stationary models or instances when delivery is not possible, the customer should make arrangements for a service call from the service center. At the time of repair, you must provide proof of purchase. Easy-Kleen recommends that the service center from whom the machine was purchased be contacted for the warranty repair. If that is inconvenient, any authorized Easy-Kleen service center may complete the repairs. If the service center is requested to complete repairs at the customer's location, please note that the service center may charge for pickup & delivery, or for travel time and mileage. These charges are not covered under the Easy-Kleen Limited Warranty and are the customer's responsibility.

Changes in this Policy

Easy-Kleen reserves the right to make any changes to a Easy-Kleen product at any time without incurring any obligation with respect to any product previously, ordered, sold, or shipped.

Service Parts Warranty

Service parts are warranted for 90 days from date of purchase. However, if the part is installed on a unit which has more than 90 days remaining on the original warranty, the part is covered according to the chart on the previous page.

Warranty Repairs

Repairs covered under the conditions of this warranty must be performed by an authorized Easy-Kleen service center. Warranty claims must first contact Easy-Kleen's Service Department to be issued a preauthorized repair number (PARN). You will need a copy of your invoice and the equipment serial number.

If new parts are needed, they will be invoiced to you as normal. Defective parts are to be sent to us **PREPAID** for warranty consideration. If a part is found to be defective, a credit will be issued to cover the costs of parts. All work is to be performed at the manufacturers' place of business when returned **PREPAID**. This warranty will not cover labor if warranty work is conducted at the customer's place of business. Road service will be charged at the normal rate in these situations.

Note* Due to original equipment manufacturer's requirements, Easy-Kleen is not permitted to perform warranty repairs or claims for electrical motors, gas, or diesel engines. Please contact Easy-Kleen service department for a local warranty representative.

Warranty Does Not Cover:

- When warranty part is warranted, the warranty time frame does not restart.
- Warranty freight cost will be covered by Easy-Kleen for the first 30 days of sale of the machine due to manufacture defect or workmanship.
- Neglect of the periodic maintenance as specified in the owner's manual.
- Improper repair or maintenance.
- Operating methods other than those indicated in the owner's manual.
- The use of non-genuine Easy-Kleen parts or accessories other than those approved by Easy-Kleen.
- Exposure of chemical agents, such as: Sea Water, Sea Breeze, Salt, or other environmental phenomena.
- Collision, fuel contamination or deterioration, neglect, unauthorized alteration or misuse.
- Warranty does not cover travel or time if a service call is needed.
- Warranty does not apply when pump or accessory is altered or used in excess of recommended speeds, pressure, temperatures, or handling fluids not suitable for pump or accessory material.
- Construction warranty does not apply to normal wear.
- Warranty does not apply to normal wear (such as but not limited to seals, packing valves, plungers and sealing O-Rings), freight damage, freezing damage or damage caused by parts or accessories not supplied by Easy-Kleen.
- After 30 days freight will become chargeable.
- Warranty covers In-House Labour and Parts if manufacture defect is repaired at an Easy-Kleen approved Service Center.

Warranty Does Not Cover Defects Caused By:

- Improper or negligent operation or installation, accident, abuse, misuse, neglect, unauthorized modifications, including, but not limited to, the failure of the customer to comply with recommended product maintenance schedules.
- Improper repairs
- Neglected maintenance/incorrect operation (specified in the Owner/Operator's Manual)
- Unapproved devices or attachments
- Water sediments, rust corrosion, thermal expansion, scale deposits or a contaminated water supply or use of chemicals not approved or recommended by Easy-Kleen Pressure Systems Ltd.
- Improper voltage, sudden voltage spikes or power transients in the electrical supply
- Usage which is contrary to the intended purpose of the equipment
- Natural calamities or disasters including, but not limited to, floods, fires, wind, freezing*, earthquakes, tornados,

Shipping Claims

Freight Damage – is defined by product arriving with observable damage to package and/or product.

- 1.1 Freight damages **MUST** be reported immediately
- 1.2 Damaged packaging must be photographed immediately for records
- 1.3 If freight company is arranged by dealer, then it is incumbent on them to contact their own freight company and file a claim directly with them. If freight was arranged by Easy-Kleen, then contact Easy-Kleen Pressure Systems Ltd. with the following information (regardless of receipt or refusal of shipment).
 - 1.4.1 Purchase order of product
 - 1.4.2 Pictures of damage
 - 1.4.3 List of products effected
 - 1.4.3.1 Model Number of Product
 - 1.4.3.2 Serial Number of Product

Hidden Damage - is defined by product arriving and the package having no visible signs of damage. Upon opening the packing damage is noted on the product.

- 2.1 Hidden damage **MUST** be reported immediately.
- 2.2 Hidden damage claims cannot be reported on items received more than 6 months prior.
- 2.3 When hidden damage is discovered, contact Easy-Kleen Pressure Systems Ltd. with the following information.
 - 2.3.1 Purchase Order of product
 - 2.3.2 Pictures of damage
 - 2.3.3 Model number of product
 - 2.3.4 Serial Number of product

Missing Part Claims

1. Items missing from Purchase Order **MUST** be reported immediately.
 - 1a. When missing products are noticed, contact Easy-Kleen Pressure Systems Ltd. with the following information
 - i. Purchase Order of product
 - ii. Model number of products that are believed to be missing from shipment

Easy-Kleen Pressure Systems Ltd., will advise on course of action to remedy situation.
2. Items missing from inside box of product
 - 2a. When missing products are noticed, contact Easy-Kleen Pressure Systems Ltd. with the following information
 - i. Purchase Order of product
 - ii. Model and Serial number of products
 - iii. Items missing from package

Easy-Kleen Pressure Systems Ltd., will advise on course of action to remedy situation.

EASY-KLEEN

PRESSURE SYSTEMS LTD.
MANUFACTURER OF HIGH PRESSURE CLEANING EQUIPMENT

SERVICE MANUAL

This manual is intended for technical personnel to assist in the diagnosis and repair of issues with pressure washers.

This manual is not intended for use by non-technical personnel.

It is advised to always refer to competent technical personal when repairs are advised to avoid equipment damage or potential personal injury.

If you have any technical questions please do not hesitate to call us at 1-800-315-5533.

DIAGNOSTICS AND SOLUTIONS GUIDES

Fluid System Diagnostics - Flow & Pressure

PROBLEM	POSSIBLE CAUSE	SOLUTION
No Flow	No power	Make sure pump is operating. Check drive belts and couplings, make necessary adjustments.
	Trigger gun valve	Check trigger gun, repair or replace.
	No water source	Ensure water supply is not restricted and hoses are in good repair and not kinked.
	Clogged spray nozzle	Check spray nozzle, repair or replace.
	Clogged inlet filter	Check inlet filter, repair or replace.
	Float Valve stuck (optional)	Float valves can become stuck in the "UP" position. Manually dislodge and inspect for problems.
	Faulty unloader valve	Remove and check for proper action, repair or replace.
Low pressure, adequate flow	Incorrect or no spray nozzle	Nozzle should be properly sized for the system. Low pressure indicates that the nozzle in use is too large.
	Worn spray nozzle	Replace nozzle when it shows signs of internal erosion.
	Debris in valves	Clean valves and check o-rings for pits and cracks.
	Lance on low pressure	Adjust pressure so the water flows through properly.
	Unloader is not adjusted correctly	Adjust unloader to proper level.
	Pressure gauge inaccurate	Use a new pressure gauge on a quick connect at outlet to check system pressure and replace if gauge is faulty.
	Bad pump packings	If low pressure persists, pump packings may need replaced.
Low pressure, low flow	Volume Improperly adjusted	If unit has volume adjustment, it may need readjustment.
	Discharge leaks	Look for leaks on the discharge side of system.
	Downstream chemical injector (Dema)	Remove the injector and retest system. If the flow is restored, replace the injector.
	Loose drive belts	If belts do not have proper deflection, replace them.
	Pump not running at rated speed	Check engine throttle and see that the motor is rated for the same speed as the pump.
	Stripped pump drive coupling	Inspect coupling and repair or replace.
	Defective easy start valve (optional)	Check the start or throttle-back valve for proper operation.
	Malfunctioning motor or gear	Ensure that the motor or engine is working properly.
	Unloader stuck in bypass	Piston assembly may be stuck or fouled.
Low pressure, low flow - Bogs	Outlet restriction	Build up can restrict flow. If water is not flowing freely, flush with garden hose to isolate the clog or restriction.
	Clogged nozzle	Distorted spray pattern can indicate a clogged nozzle.
	Nozzle too small	Ensure nozzle is proper size for the system.
	Hose restriction	Correct any kinks or restrictions. Replace crushed hoses.
	Debris in the system	Debris can lodge in the discharge side of the system (valves, fittings, injectors, filters). Flushing with water may correct it.
Excessive pressure	Small spray nozzle	Nozzle must be properly sized for the rated flow and pressure. Reset unloader or pressure relief if nozzle size is changed.
	Faulty pressure gauge	Check the pressure gauge using a properly calibrated pressure gauge on quick connects at the equipment outlet.
	Improperly adjusted unloader	Adjust to the proper pressure using pressure gauge.
	Faulty unloader	Check the unloader action. If it is not working properly, it may need repaired or replaced.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Pump chatters, caviataion, vibration	Air in system	Inspect places where air can enter the system. i.e. fittings, hose, connections, etc.
	Chemical line not submerged	If the chemical valve is on, ensure that the chemical line is fully submerged in the chemical.
	Inlet line restricted	All inlet connections should be snug and not kinked to reduce the chances of pump starvation.
	Inadequate water supply	Water supply to the system must meet or exceed the rated flow (GPM) on the serial number plate. Faucet must be completely opened or water above the tank outlet in a gravity fed system.
	Float valve stuck (optional)	If float valve is stuck in the up position, water cannot enter the float tank. Unstick valve if possible or replace if necessary.
	Turbulence in float tank (optional)	Excessive turbulence allows the pump to draw air into the system. Correct excessive turbulence.
	Inlet or inlet strainer clogged	Regularly clean the inlet and inlet strainer to keep debris from entering the float tank.
	Water supply too hot	Inlet temperature should not exceed 140F - 160F range.
Inlet line vibrates	Air in system	Inspect places where air can enter the system, i.e., fittings, hose, connections, etc.
	Debris in inlet check valves	If there is no float tank and the outlet line does not vibrate, the inlet check valve may be clogged. Remove debris. Check o-rings under valves.
Outlet line vibrates	Air in system	Inspect places where air can enter the system, i.e., fittings, hose, connections, etc.
	Debris in inlet check valves	If there is no float tank and the outlet line does not vibrate, the inlet check valve may be clogged. Remove debris.
	Bad pump packing	If they show signs of wear or damage, replace them.
Inlet and outlet lines vibrate	Inlet and outlet check valves fouled	Look for the source of debris in the inlet and discharge check valves and remove them.

Fluid System Diagnostics - Unloader

PROBLEM	POSSIBLE CAUSE	SOLUTION
Very low or no flow	Unloader stuck in bypass	Isolate the flow problem. If it occurs before the unloader discharge point, check the piston assembly to see if it is fouled or stuck in bypass mode.
Unloader will not unload	Debris in unloader	Take bottom nut off unloader, identify ball, spring and seat. Clean out any debris and reassemble.
	Severe leak on the outlet of unit	Check for leaks and repair.
Unloader (flow) cycles with system in bypass	No restrictions on the unloader	Check unloader bypass port to see if a flow restrictor is properly installed. Install one if none is present.
	Downstream leakage (excessive)	Causes the unloader to sense a continuing flow and divert it to the closed gun. Repair or replace.
	Accumulator downstream (option)	Remove the accumulator from the system.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Unloader (flow) cycles with system under pressure	Improper flow	Any variation in flow from what the orifice is sized can cause cycling. System must produce the rated flow constantly.
	Nozzle too small	A nozzle that is too small can cause the flow to be reduced.
	Nozzle clogged	A distorted spray pattern indicates a clogged nozzle.
	Improper unloader orifice	The system's rated output should indicate the proper sized orifice for your system.
	Unloader orifice clogged	Check the orifice for clogs and clear out any debris.
	Injector orifice clogged	If the system has a Venturi injector downstream of the unloader, check the orifice for clogs.
	Other downstream restriction	Scale buildup can restrict flow. Check: controls, valves, switches, trigger gun, and lance. Descale as necessary and begin preventive maintenance program for scale prevention.
	Pump not delivering the rated pressure	See low pressure or low flow diagnostics.
	High water supply pressure	Check inlet water supply for excessive pressure.
Unloader (pressure) produces smooth flow & low volume	Unloader adjusted too low	Adjust the unloader using the pressure gauge for the correct pressure.
	Spray nozzle clogged	A distorted spray pattern indicates a clogged nozzle.
	Spray nozzle too small	A small nozzle causes a reduced flow and cycling may result.
	Injector orifice blocked	If the system has a Venturi injector downstream of the unloader, check the orifice for clogs.
	System not delivering rated flow	See flow diagnostics.
Unloader (flow) produces smooth flow & low volume	Unloader adjusted too low	Adjust unloader and regulator until proper pressure is achieved.
	Unloader valve stuck in bypass	If unloader is sticking, repair or replace as necessary.
	Restriction in system	Downstream restrictions can cause a reduction in flow. Check: controls, valves, switches, trigger gun, and lance. Descale as necessary and begin preventive maintenance program for scale prevention.
Unloader (pressure) produces low flow and normal pressure	Unloader adjusted too low	If the unloader is diverting flow to bypass it may be adjusted too low, readjust as necessary.
	Spray nozzle too large	Ensure the proper nozzle is installed on system.
	Internal nozzle erosion	The number of hours of usage can give you a clue to the extent of the wear. If in doubt, change the nozzle.
	Insufficient pump pressure	Check pump seals and packings and tighten drive belts.
Unloader (flow) produces low flow & normal pressure	Unloader adjusted too low	If unloader is diverting flow to bypass, readjust using the pressure gauge.
	Nozzle too large	Ensure the proper sized nozzle is being used.
Unloader (pressure) leaks from main spring or adjusting bolt	Shaft O-ring in valve body worn	Check O-rings for wear or damage and replace as necessary.
Unloader (flow) pressure increases when trigger released	Unloader piston stuck or frozen	Check unloader shaft for proper action. Unstick piston and shaft or replace unloader.
	Bypass port clogged or restricted	Ensure that unloader bypass port is not clogged.
	Excessive tension on main spring	If tension is incorrect, adjust or replace as necessary.
Unloader (flow) leaks water around adjusting bolt	Sleeve O-ring worn	Check O-rings for wear or damage and replace as necessary.

Fluid System Diagnostics - Leaking

ANY LEAKS SHOULD BE REPAIRED AS SOON AS POSSIBLE TO PREVENT DAMAGE TO THE SYSTEM.

PROBLEM	POSSIBLE CAUSE	SOLUTION
From inlet	Garden hose washer	Ensure the washer is present and in good condition.
From low pressure (inlet) line fittings	Loose clamps or connections	Low pressure line should be properly sealed on barb and tightly clamped.
From float tank (option)	Float tank full of water or stuck	If float is not floating above water, check the float to see if it has filled up with water. If necessary, drain and seal.
From pressure fittings	Fittings not tightened or taped, or cracked	Usually metal to metal fittings should be taped with Teflon tape or lock tight to provide a tight seal.
From quick connects	Bad o-rings	If quick connect o-ring shows wear or damage, replace it.
From pump	Bad packing	If the seal leak is detected under the pump manifold, packing may be worn and in need of replacement.
From trigger gun	Bad rod o-rings	If o-rings show wear or damage, they may need replaced.
	Stripped connectors	Physical damage may not be apparent, but unseen warping from freezing or extreme pressure can still cause leakage.
From nozzle	Weep gun (optional)	If a weep gun has been installed, check the gun valve seat to ensure it is functioning properly.
	Damaged gun valve ball or seat	Inspect trigger gun valve assembly for damage or wear to ball or seat. Lodged debris can stop valve from closing. Repair with kit or replace.
From unloader	Bad o-rings or seals	If quick connect o-ring shows wear, damage or improper seating.
From variable pressure Lance (option)	Bad o-rings adjusting knob	Inspect o-rings for wear or damage and replace as necessary.
Unloader will not unload	Debris in unloader	Take bottom nut off unloader, identify ball, spring and seat. Clean out any debris and reassemble.
	Severe leak on the outlet of unit	Check for leaks and repair.
From pressure relief valve	System over pressure	See pressure and flow diagnostics to find the cause of the excessive pressure and correct it.
	Clogged nozzle	Spray pattern will be distorted if nozzle is clogged, clean out.
	Trigger gun valve not working	If trigger gun valve action is not correct, repair or replace.
	Excessive pressure spike	If water spurts from valve when trigger is released, check unloader adjustment. Pressure spike should be below the level where pressure relief valve is activated.
	Wear or damage to ball or seal	Inspect ball and seal for damage and adjust as necessary.
	Improper relief valve adjustment	Adjust valve properly.

Fluid System Diagnostics - Trigger Gun/Spray Nozzle

PROBLEM	POSSIBLE CAUSE	SOLUTION
No nozzle flow from nozzle when trigger depressed.	Broken piston rod in trigger gun	If water flows through discharge hose without gun, check trigger gun valve piston rod and replace if necessary.
	Missing metal insert in trigger gun (European style gun)	Inspect to assure insert is in place.
	Blockage in system past gun	Check nozzle or spray accessory for blockage and clear it.
Excess pressure when trigger gun is released	Excessive pressure spikes	After unloader increases pressure to a maximum, further adjustment will only increase the pressure spikes. Re-adjust to keep spiking to a minimum.
Flow not stopping when trigger gun released	Broken return spring on trigger gun	If trigger action is too loose, return spring may need replaced.
	Debris in gun valve	Debris in gun valve can stop piston return. Clear debris.
Trigger action sticks	Keeper plug too tight	It may be possible to loosen plug slightly without leakage but it will likely need replaced.
Trigger gun leaks	Worn or bad o-ring	Check trigger gun o-rings for wear or damage and replace.
	Stripped or loose connections	Physical damage may not be apparent but unseen warping from freezing or severe overpressure may still cause leaking.
No chemical	Chemical valve closed: Black nozzle	Open chemical valve. If it chatters with no chemical delivery, air is being drawn from the upstream side of the pump. Check fittings, connections and ensure the inlet line is fully submerged into the chemical jug.
	Chemical dried up in the injector	Inspect and clean as necessary.
	Chemical foot strainer clogged	May be a strainer or check valve. Ensure that the ball is not stuck or clogged.
	Chemical line kinked	Chemical line kinking or binding prevents chemical delivery.
	Chemical line too long	An overly long chemical line can prevent the pump from drawing chemical into the system. Try installing a shorter line.
	Chemical too dilute	Verify chemical strength.
	No adjustment for low pressure	Downstream injectors only - Low pressure is required for most injectors to draw chemical. If no adjuster exists it may need low pressure spray nozzle installed on the lance.
	Incorrect injector orifice	If not properly sized for the systems rated output, chemical delivery problems will result. Check serial plate for specs.
Excessive chemical	Valve improperly adjusted, check knob on injector	To properly adjust, a chemical flow meter may be used to precisely measure chemical flow.
	Chemical dilution too strong	Verify chemical strength.
Spray pattern irregular	Clogged nozzle	Spray pattern will be distorted if nozzle is clogged.
Volume proper, pressure low	Nozzle too large	Ensure that the nozzle is properly sized for the system.
	Internal nozzle wear	A loss of pressure may result from gradual nozzle wear. Replace with a nozzle of correct size.
Pressure proper, volume low	Clogged nozzle	Spray pattern will be distorted if nozzle is clogged. Check nozzle for clogging if the unit has a pressure unloader.

