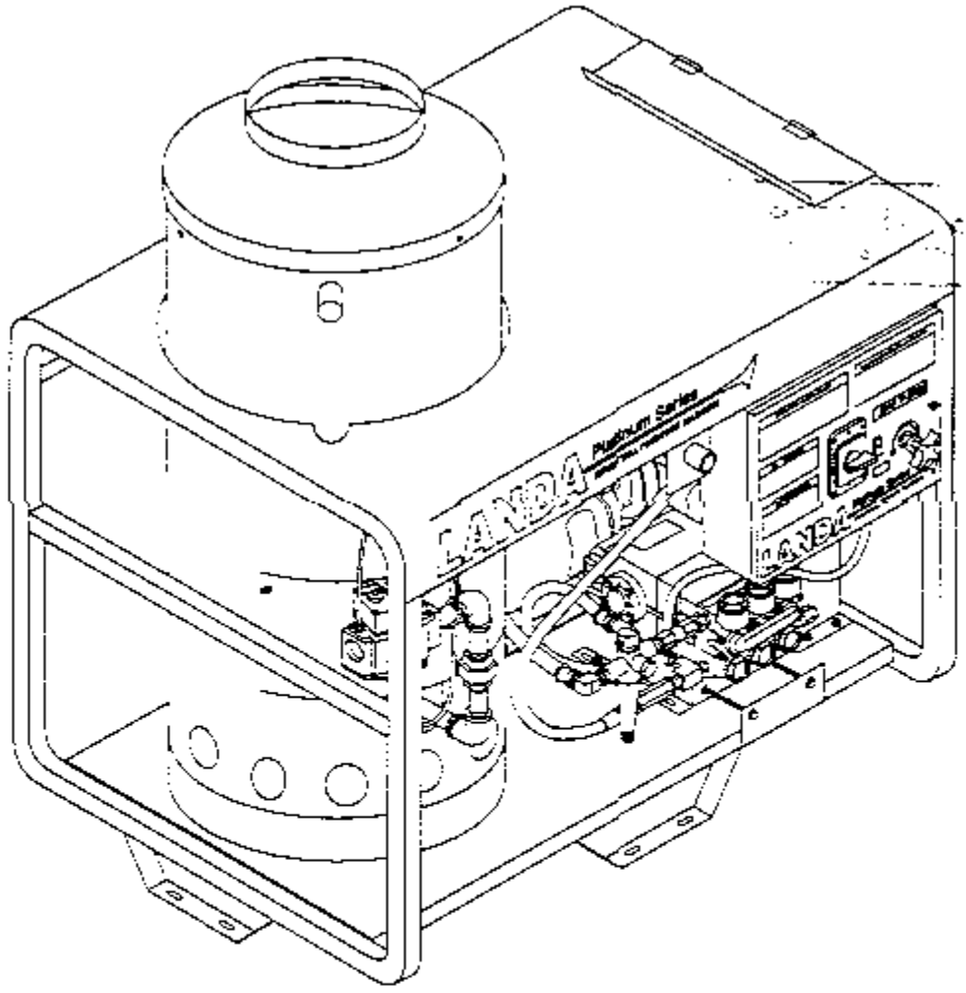
4/95

LANDA | **Platinum Series** | **INDUSTRIAL PRESSURE WASHERS**

ENG/ELP SERIES OPERATOR'S MANUAL

- **ENG/ELP3-30031D**
- **ENG/ELP3-11021D**
- **ENG/ELP3-15021A**
- **ENG/ELP4-20021A**
- **ENG/ELP4-20021B**
- **ENG/ELP4-20021C**
- **ENG/ELP4-30021A**
- **ENG/ELP4-30021B**
- **ENG/ELP4-30021C**

(All Units are CGA Approved)



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INTRODUCTION

Thank you for purchasing a Landa Pressure Washer.

This manual covers the operation and maintenance of the ENG/ELP3-11021D, 4-20021A, 4-20021B, 4-20021C, 4-30021A, 4-30021B, 4-30021C, 3-30031D, and 3-15021A washers. All information in this manual is based on the latest product information available at the time of printing.

Landa, Inc. reserves the right to make changes at any time without incurring any obligation.

The ENG/ELP Series was designed for commercial duty use of 8 hours per day, 5 days per week.

When ordering parts, please specify model and serial number.

Owner/User Responsibility:

The owner and/or user must have an understanding of the manufacturer's operating instructions and warnings before using this Landa 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.

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

⚠ WARNING

IMPORTANT SAFETY INSTRUCTIONS

1. **"CAUTION** — To Reduce the Risk of Injury, Read Operating Instructions Carefully Before Using." Failure to follow instructions could cause a malfunction of the pressure washer and result in death, serious bodily injury and/or property damage.
2. All installations must comply with local codes. Contact your electrician, plumber, utility company, or the selling distributor for specific details.

   To comply with the National Electrical code (NFPA 70) and provide additional protection from risk of electric shock, this pressure washer is equipped with a UL approved ground fault circuit interrupter (GFCI) power cord for machines rated 250 V 30 amp or less, single phase.

WARNING: FLAMMABLE LIQUIDS CAN CREATE FUMES WHICH CAN IGNITE CAUSING PROPERTY DAMAGE OR SEVERE INJURY.

3. Risk of explosion - do not spray flammable liquids. Operate only where open flame or torch is permitted.

WARNING: KEEP WATER SPRAY AWAY FROM ELECTRIC WIRING OR FATAL ELECTRIC SHOCK MAY RESULT. READ WARNING TAG ON ELECTRICAL CORD.

4. To protect the operator from electrical shock, the machine must be electrically grounded. It is the responsibility of the owner to connect this machine to a UL grounded receptacle of proper voltage and amperage ratings. Do not spray water on or near electrical components. Do not touch machine with wet hands or while standing in water. Always disconnect power before servicing.

WARNING: GUN KICKS BACK — HOLD WITH BOTH HANDS.

5. Grip cleaning wand securely with both hands before starting the cleaner. Failure to do this could result in injury from a whipping wand.

WARNING: HIGH PRESSURE STREAM OF FLUID THAT THIS EQUIPMENT CAN PRODUCE CAN PIERCE SKIN AND ITS UNDERLYING TISSUES, LEADING TO SERIOUS INJURY AND POSSIBLE AMPUTATION

6. High pressure developed by these units can cause bodily injury or damage. Use caution when operating. Do not point the gun at anyone or at any part of the body. This machine is to be used only by qualified operators.
7. Never make adjustments on machine while it is in operation.

WARNING: HIGH PRESSURE SPRAY CAN CAUSE PAINT CHIPS OR OTHER PARTICLES TO BECOME AIRBORNE AND FLY AT HIGH SPEEDS

8. Eye safety devices must be worn when using this equipment.

"WARNING — Risk of Asphyxiation. Use This Product Only In A Well Ventilated Area."

9. When the unit is working, do not cover or place in a closed space where ventilation is insufficient.
10. Units with shut-off guns should not be operated with the gun in the off position for extended periods of time as this may cause damage to the pump.

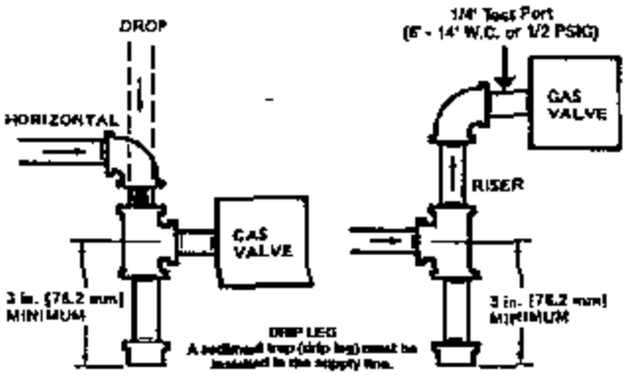
ELECTRICAL

The unit, when installed, must be electrically grounded in accordance to local codes, Check for proper power supply using a volt meter; check the serial plate for the correct requirements.

GAS PIPING

All piping must comply with local codes and ordinances of the National Fuel Gas Code: A sediment trap or drip leg must be installed in the supply line to the burner.

Figure 1

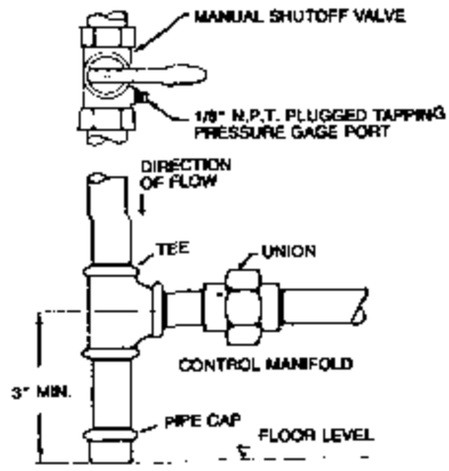


A union shall be installed in the gas line adjacent to and upstream from the control manifold and downstream from the manual main shut-off valve.

An 1/8" N.P.T. plugged tapping accessible for test gauge connection shall be installed immediately upstream of the gas supply connection for the purpose of determining the gas supply pressure to the burner, and to prevent damage to gas valve.

If a manual gas shut off valve is not in the gas supply line within six feet of the machine and in an accessible location, one shall be installed.

Figure 2



Location of Union and Drip Leg for Connecting Conversion Burner to House Piping.

A manual shut-off valve shall be installed in the gas supply line external to the appliance. **See Figure 2.** The gas line should be a separate supply direct from the meter to the burner. It is recommended that new pipe be used and located so that a minimum amount of work will be required in future servicing. The piping should be so installed as to be durable, substantial and gas tight. It should be clear and free from cutting burrs and defects in structure of threading. Cast iron fittings or aluminum tubing should not be used for the main gas circuit. Joint compounds (pipe dope) should be used sparingly on male threads only and be approved for all gases.

Propane Gas

The following pipe sizes should be used between the regulator and the gas valve on the burner.

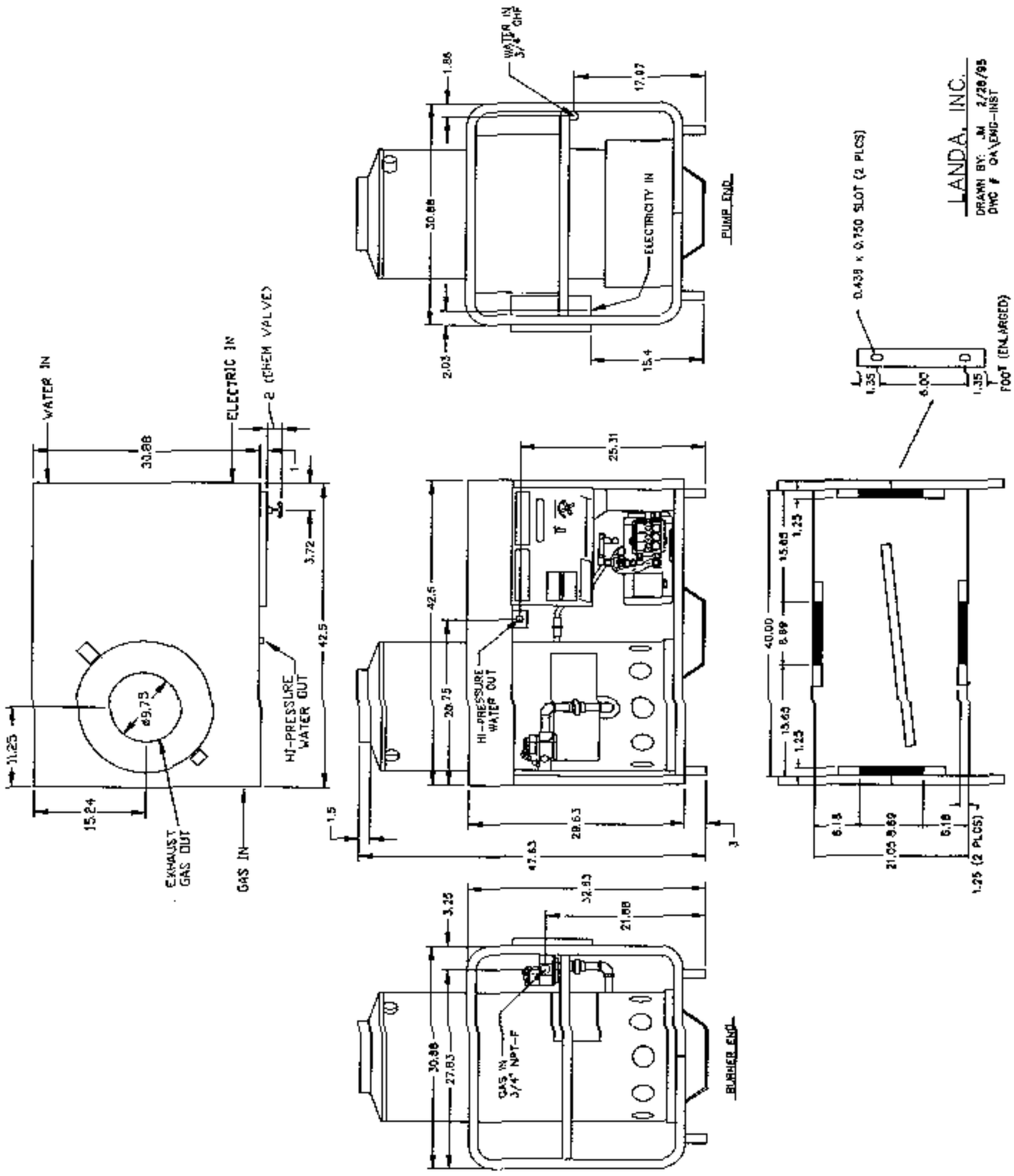
Distance From Regulator	Pipe Size
0 - 50'	1" 1 PS
50' - 100'	1-1/2" 1 PS
100' - 200'	1-3/4" 1 PS

Natural Gas

The following pipe sizes should be used between the meter and the cleaner.

Distance From Meter	Pipe Size
0 - 50'	1-1/2" 1 PS
50' - 100'	2" 1 PS
100' - 200'	2-1/2" 1 PS

INSTALLATION GUIDE



VENTING

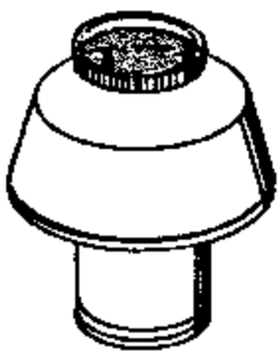
If the unit is used indoors, regulations or ventilation concerns may call for a chimney or furnace pipe.
When venting the unit, if the cleaner is to be in an enclosed area with a chimney on it, be sure the chimney is the same size as the stack on the cleaner. Poor draft will cause the unit to soot and not operate efficiently. When placing the unit for installation, keep in mind that the unit should be positioned in such a manner that the stack will be as straight as possible and protrude through the roof of the building at a proper location and at sufficient height to eliminate downdraft. The chimney of a gas fired unit should be installed with a down draft diverter.

Input - BTU Per Hour	Draft Hood and Flue Pipe Size
250,000 – 320,000	8 inch
320,000 – 410,000	9 inch
410,000 – 600,000	10 inch
600,000 – 750,000	12 inch

NOTE: If the flue pipe exceeds 10 ft. in length, or contains more than two elbows, use next size larger pipe and draft hood, or burner will not ignite. No movable flue pipe damper should be used on any installation.

DRAFT DIVERTER should be installed above the heating coil. The diverter serves to sever the chimney effect created in all sections of furnace pipe positioned below to enhance the draft through the burner. It also helps prevent freezing of the coil due to wind chill factors.

Figure 4
Optional



When the heating appliance is installed in a tightly closed room without ventilation openings to the outdoors or other rooms, provisions shall be made for supplying air for combustion through special openings, one near the floor line and the other near the ceiling, each to be sized on the basis of one square inch or more of free area for each 1,000 BTU input per hour. **See Figure 5.**

When a room is of unusually tight construction and has a kitchen and/or bathroom ventilating fan, which may be used for exhausting air to outdoors - or has a vented fireplace - it is recommended that combustion air be supplied to the enclosed room through intakes extending to the outside of the building and terminating in downturned fittings, suitably arranged to prevent obstruction from snow or rain, and including a protecting screen not smaller than 1/4 inch mesh.

Figure 5

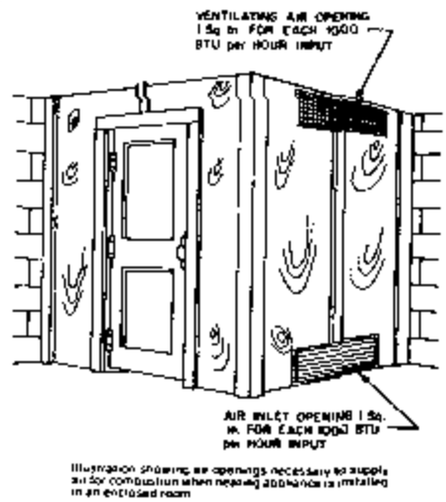


Illustration showing air openings necessary to supply air for combustion when heating appliance is installed in an enclosed room

WATER SOURCE

Water source for unit should be supplied by a 5/8" I.D. garden hose with a city water pressure of not less than 30 psi. If the water supply is inadequate, or if the garden hose is kinked, the unit will run very rough and the burner will not fire.

WATER CONNECTION

Connect the high pressure hose by pulling the coupler collar back and then inserting it onto the discharge nipple. Secure it by pushing the collar forward.
Attach the wand into the trigger gun using teflon tape on the pipe threads to avoid leaks.

INSPECTING AND TESTING GAS PIPING

The building structure should not be weakened by installing of the gas piping. The piping should not be supported by other piping, but should be firmly supported with gas hooks, straps, bands or hangers. Butt or lap welded pipe should not be run through or in an air duct or clothes chute.

Before turning gas under pressure into piping, all openings from which gas can escape should be closed. Immediately after turning on gas, the system should be checked for leaks. This can be done by watching the 1/2 cubic foot test dial and allowing 5 minutes to show any movement, or by soaping each pipe connection and watching for bubbles. If a leak is found, make the necessary repairs and repeat the above test.

Defective pipes or fittings should be replaced and not repaired. Never use a flame or fire in any form to locate gas leaks, use a soap solution.

After the piping and meter have been checked completely, purge the system of air. **DO NOT** bleed the air inside an enclosed room.

The appliance and its individual shut-off valve must be disconnected from the gas supply piping system during the pressure testing of that system at test pressure in excess of 1/2 psig, or damage to the gas valve will occur.

GAS PRESSURE

The ideal incoming gas pressure is 11" wc (minimum 6" wc, maximum 14" wc or 1/2 psig). The correct operating manifold pressure for natural gas is 3.5" wc The operating manifold pressure for propane gas is 11" wc. By adjusting the gas valve pressure regulator between 3" and 4" w.c. a side range can be achieved.

If the desired input rating cannot be obtained within the above manifold pressure adjusting range, the next size larger or smaller burner orifice should be used.

WARNING & CHECK LIST

WARNING

1. Installation or servicing of gas appliances and controls must only be performed by qualified personnel. After installation or servicing, test manual valve, operating valves, pressure regulation, and automatic shut-off valve for proper operation.
2. Install in a suitable dry location. The unit must be located in an area properly protected from the weather.
3. Shut off gas and electricity before starting installation or service. Turn back on to test or operate.
4. **DO NOT** connect appliances before pressure testing gas piping. Damage to gas valve may result. (6" - 14" W.C.P, or 1/2 PSIG)
5. **DO NOT** insert any object other than suitable pipe or tubing in the inlet or outlet of the gas valve. Internal damage may occur and result in a hazardous condition.
6. **DO NOT** grip gas valve body with a pipe wrench or vise. Damage may result causing gas leakage. Use inlet or outlet bosses or a special body wrench.
7. **DO NOT** short the gas valve terminals.
8. **DO NOT** allow any flame to impinge on the regulator vent tubing if supplied. It may clog and cause gas valve malfunction.
9. **DO NOT** use the gas cock to adjust gas flow.
10. In case of failure of main burner to shut off, turn off gas supply.
11. Keep all combustible materials away from gas appliances. **DO NOT** allow lint or dust to collect in burner area.
12. Dials must only be operated by hand. Never use pliers, wrenches or other tools to turn dials.
13. Leak test with a soap solution after installation or service with the main burner on. Coat pipe and tubing joints, gaskets, etc. Bubbles indicate leaks.
14. If the unit is installed in an enclosed room, care should be taken to ensure that an adequate supply of air is available for combustion and ventilation. (1 sq. inch per 1000 BTU)

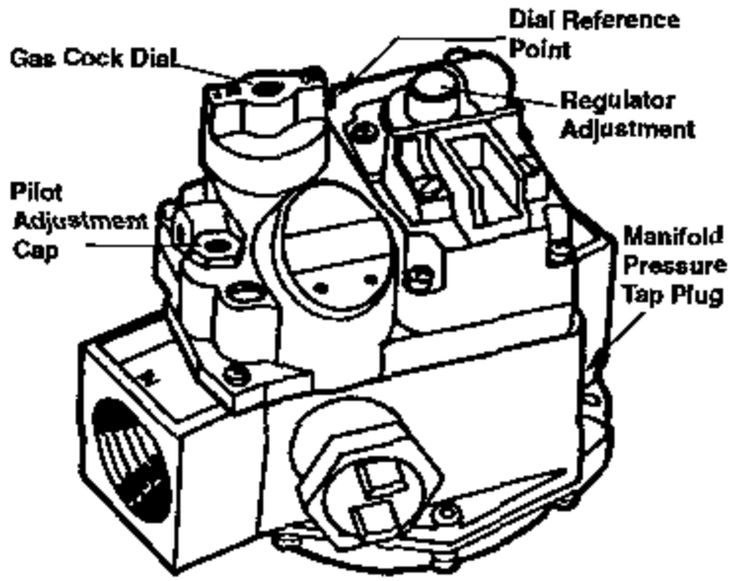
CHECK LIST BEFORE STARTING

	YES	NO
1. Has gas supply been inspected by an authorized contractor to meet local codes?	____	____
2. Is unit protected from downdraft and excessive wind?	____	____
3. Is unit shielded from moisture of water spray?	____	____
4. Is the voltage correct and circuit breaker and supply cord adequate according to specifications and serial plate notation?	____	____
5. Is the unit electrically grounded?	____	____
6. Is there ample water supply?	____	____
7. Have all flammable liquids or gases been removed from installation location?	____	____
8. Is there adequate gas supply for the BTU rating of the burner?	____	____
9. Is incoming gas supply pressure to unit between 6" - 14" water column inches or 1/2 PSIG?	____	____
10. Has the proper gas regulator been installed for pressure and volume?	____	____

	YES	NO
11. Is the unit properly vented to allow adequate air flow?	____	____
12. Are the propane tanks large enough, according to rating of the unit, to prevent freezing?	____	____
13. Have gas lines been checked for gas leaks?	____	____
local codes?	____	____
14. Have all operators using this unit been instructed properly & have they read the manual?	____	____
15. Has the Unit been installed according to operator's manual instructions?	____	____

⚠CAUTION!

If "NO" has been checked on any of the above fifteen questions, do not operate this unit.



FOR YOUR SAFETY READ BEFORE LIGHTING

WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly.

B. **BEFORE LIGHTING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

FOR YOUR SAFETY "WHAT TO DO IF YOU SMELL GAS"

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone.

Follow the gas supplier's instructions.

- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read operators manual before operating this machine. Failure to read operation and warning instructions may result in personal injury or property damage.
2. Turn all switches off.
3. Review installation instructions.
4. Connect the water supply hose to the inlet connector and turn the water on. Check for water leaks and tighten as needed.
5. Connect power cord to proper electrical outlet according to serial plate information. Push in GFCI reset button, where applicable.
6. Turn on the main gas supply.
7. Partially depress and turn control Gas Cock Dial to "OFF" position.
8. Wait five minutes to allow gas which may have accumulated in the main burner compartment to escape.
9. Turn Gas Cock Dial to "PILOT" position.
10. Depress Gas Cock Dial and light Pilot. Hold in depressed position for about 1/2 minute.

    NOTE: Sufficient time must be allowed for a proper size pilot flame to heat the thermocouple and hold the safety magnet in a locked-up position. Also, time must be allowed for air to escape from the lines during the first operation.
11. Release Dial and turn to full "ON"
12. Attach the desired high pressure nozzle into the wand quick coupler by pulling the coupler collar back and then inserting the nozzle and securing it by pushing the coupler collar forward.

line with the pump on. If compressed air is available, an air fitting can be screwed into the float tank strainer fitting and by injecting compressed air, all water will be blown out of the system. The use of a draft diverter will prevent the wind chill factor from freezing the coil.

Low Pressure Diagnosis
(Units with shut-off gun)
Refer to Trouble Shooting Chart for low pressure. If by referring to the chart, the trouble is found to be either the unloader of pump, your next step is to determine whether, in fact, the unloader or the pump is the problem. This can be done by eliminating the unloader from the system and attaching a 50' charge hose directly to the pump. If high pressure is developed in this manner the pump is good, and the unloader needs to be repaired or replaced. If low pressure is still present the pump needs repairing. **CAUTION:** When using this procedure to test components keep shut-off gun open at all times.

High Limit Hot Water Thermostat
For safety, each unit is equipped with a high limit control switch. In the event the temperature of the water should exceed its operating temperature the high limit control will turn the burner off until the water cools.

Pumps
Use only SAE 30 weight non-detergent oil. Change oil after first 50 hours of use. Thereafter, change oil every three months or at 500 hour intervals. Oil level should be checked through use of dipstick found on top of pump, or red dot visible through oil gauge window. Oil should be maintained at that level.

HEATING COILS

To Check Water Heater Coil for Leaks
With the main burners "OFF" start the pumping unit and allow to run for a few minutes. Check into the burner compartment with a drop light or flashlight. If no leaks are visible, then water dripping from coils is from condensation in the flue gases, when the burners are on.

Condensation from Heating Coil
When cold water is being pumped into the water heater coils, and the burners are on, condensation will form on the coils and drip down into the burner compartment, giving the appearance of a leaking coil, particularly on cold humid days.

Deliming Coils

In alkaline water areas, lime deposits can accumulate rapidly inside the coil pipes. 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 chemicals. In areas where alkaline water is an extreme problem, periodic use of Landa Deliming Powder will remove lime and other deposits before coil becomes plugged. (See Deliming Instructions for use of Landa Deliming Powder.)

Periodic flushing of coils is recommended.

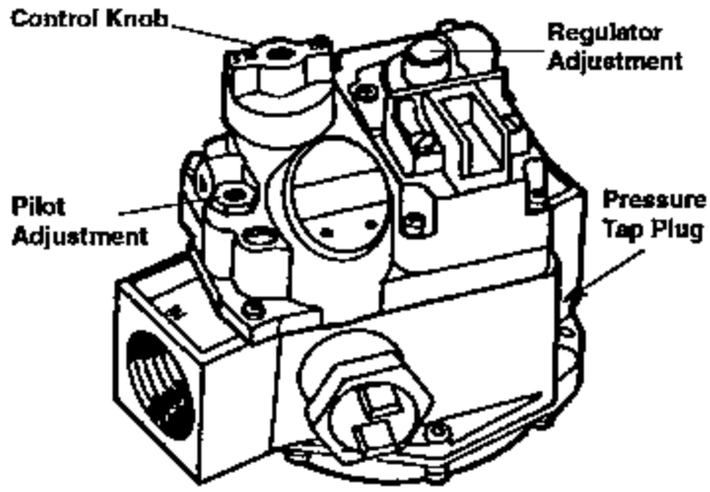
Step 1 Fill a container with 4 gallons of water, then add 1 lb. of deliming powder. Mix thoroughly.

Step 2 Remove nozzle from gun assembly and put gun into container.

Step 3 Attach a short section (3-5 ft.) of garden hose to machine to siphon solution from container or add mixture to float tank. Turn pump switch on, allowing solution to be pumped through coils back into the container. Solution should be allowed to circulate 2-4 hours.

Step 4 After circulating solution flush entire system with fresh water. Reinstall nozzle in gun.

Figure 6

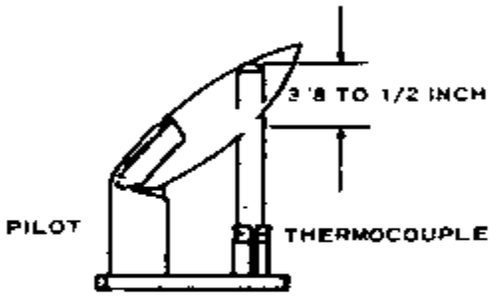


GAS VALVE REGULATOR ADJUSTMENT

Adjustment of the built-in regulator isn't normally necessary, since it is preset at the factory. However, field adjustment may be accomplished as follows:

1. Attach manometer at pressure tap port.
2. Remove regulator adjustment screw cap.
3. With small screwdriver, rotate adjustment screw clockwise to increase or counterclockwise to decrease gas pressure.

4. Replace regulator adjustment screw cap.



Pilot Burner Adjustment

1. Remove Pilot Adjustment Cap.
2. Adjust pilot key to provide properly sized flame.
3. Replace Pilot Adjustment Cap.

Pressure Relief Valve

Each unit is equipped with a relief valve to relieve pressure in the system when higher than normal operating pressures are encountered. Unusually high pressures come from an object plugging the spray nozzle. This problem can easily be remedied by removing the obstruction. If operating pressure of unit is found to be normal and relief valve continues to leak, repair or replace valve.

PROPANE GAS

General Safety Precautions

Have a qualified gas service person assist in any gas burner installation or service. Few maintenance people or mechanics are knowledgeable in gas controls or related safety practices. Propane Gas is heavier than air; unburned Propane Gas will gravitate to the floor rather than rise out of the stack. Hence, adequate floor space and good ventilation are especially important with propane systems.

Gas Pressure Requirements

All propane fired units operate on gas phase only. They are designed to operate at a pressure of 11" water column (between 1/3 and 1/2 of one PSI), and are often operated at even higher pressures when extra heat is needed.

Exterior regulators are needed to control the system. propane bottles are not included with unit. A high pressure regulator should be installed on propane bottle and a low pressure regulator attached to the pressure washer.

Propane Cylinder Capacity

An important consideration with propane systems is the capacity of the supply cylinder relative to the needs of the burner. The burner operates on propane as a gas; as gas is used from the propane cylinder, the liquid in the cylinder boils to maintain gas pressure. This boiling process cools the liquid, and in a heavy, continuous-demand situation, the liquid temperature can fall to the point at which it cannot provide gas as rapidly as is needed. In this case, it may be necessary to warm the PROPANE CYLINDER by directing a warm spray, not over 120°, on the cold cylinder, or by manifolding two propane bottles together to increase total vaporization capacity. It is recommended that a minimum 100 lb. propane bottle be used on the unit, depending on the length of running time desired.

BURNER FEATURES

Operated Automatic Valve

This machine is equipped with a thermopile self-powered combination gas control. This System is designed as a constant burning pilot. Lighting of the pilot is accomplished by manually lighting the pilot. A thermostat and flow switch control the main solenoid valve.

Care of Main Burner

Due to condensation from heater coils dripping down on the burners, a scale build-up may occur in the burner jet orifices.

1. **TO REMOVE BURNER MANIFOLD FROM WATER HEATER COIL:**
   Turn off the gas to the main burner by turning the knob to the "OFF position on the gas valve and main gas supply.
   Disconnect the pilot and ignition lines from the gas valve. Disconnect union in main burner line below thermostat. (Remove the nuts from the U-bolts, item 9 on page 16.) Slide burner manifold out through shell opening.

2. **TO CLEAN BURNER JETS:**
   Select proper size drill for type gas involved. Use pin vise to hold drill and ream out each jet orifice. CAUTION: Do not ream out orifices to a larger size.

If the water heater will be exposed to freezing weather, an anti-freeze solution should be circulated through the coils by whatever means are available for the particular system the water heater is used on.

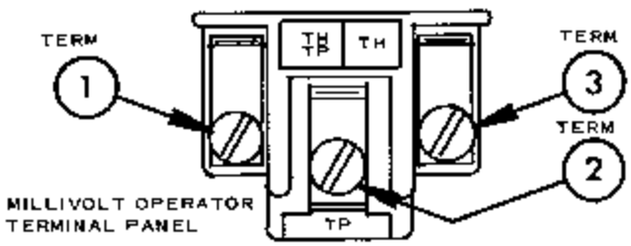
BURNER TROUBLESHOOTING

Millivolt Check

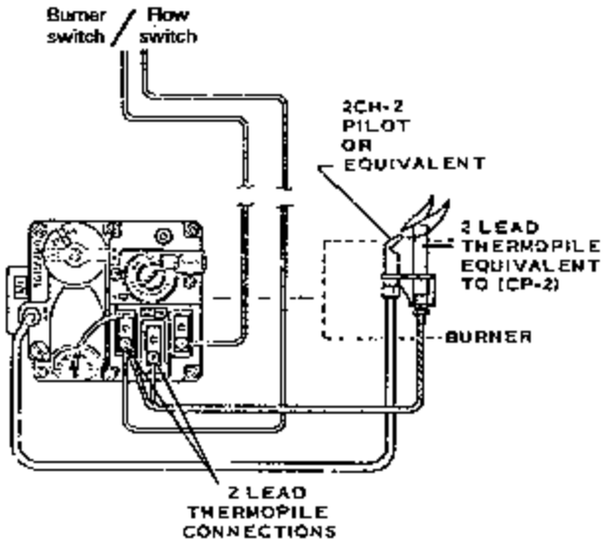
This machine has a thermopile self-powered combination gas control. Before checking the millivolt system, the following operations should be performed and observations made:

1. Inspect system for proper wiring.
2. The switch leads and all wire connections should be cleaned and tightened to eliminate all unnecessary resistance.
3. Clean and/or adjust pilot for maximum flame impingement on the thermopile.
4. If pilot will not remain lit when gas cock dial is released, check automatic pilot (Step D).

The millivolt system and individual components may be checked with a DC millivolt meter having a 0-1000MV range. Conduct each check shown in chart below by connecting meter test leads to terminals as indicated. All readings are closed circuit:



Check Test	To Test	Connect Meter Leads To Terminals	Switch Flow & Burner Contacts	Meter Reading Should Be
A	Complete System	2 & 3	Closed	100 MV or More
B	Thermo-pile Output	1 & 2	Open	Greater than 250
C	System Resistance	1 & 3	Closed	Less than 35
D	Auto/ Pilot Dropout	1 & 2	Open	Between 120 - 30 MV



A. Complete Millivolt System Check

("A" Reading - Switch contacts CLOSED - Gas Cock Dial "ON" - Main burner should come ON).

1. If the reading is more than 100 millivolts and the automatic valve still does not come on, replace the automatic valve operator.
2. If the closed circuit reading ("A" Reading) is less than 100 millivolts, determine cause for low reading - proceed as follows:

B. Thermopile Output Reading Check

("B" Reading - Switch contacts OPEN - Main burner OFF)

If the minimum 250 millivolt reading is not obtainable, readjust pilot for maximum millivolt output. If millivolt reading is still below minimum specified, replace thermopile.

C. System Resistance Check

("C" Reading = Switch contacts CLOSED - Gas Cock "ON" - Main burner should be ON)

If the "C" Reading is more than that specified for the system being checked, this indicates the resistance in the system is excessive and must be reduced. To correct:

a. Clean and tighten switch leads and connections.

b. Shorten switch lead wires and/or replace with heavier gage wire.
c. Cycle switch rapidly to clean contacts.

D. Automatic Pilot Dropout Check

1. Hold Gas Cock Dial depressed in pilot position until maximum output is observed. Then extinguish pilot and observe meter.
2. Dropout of automatic pilot magnet (sound should be audible) should occur between 120 millivolts and 30 millivolts. If dropout occurs outside these limits, change the automatic pilot magnet assembly.

No Spark - No Pilot Gas	Spark - But No Pilot Gas	Pilot Gas - But No Spark	Pilot Lit - But Main Burner Won't Come On	Pilot Cycles Off and On by Itself	Main Burner Shuts Down	POSS. CAUSES	POSS. CURE
•						No Main Power	Restore Power
•						Faulty Limit Switch	Test/Replace
	•					No Gas supplied to Pilot Valve	Check for Availability of Gas
	•					Manual Valves in "OFF" Positions	Turn Main Valve and Gas Cock to full "ON." Check Pilot Key Adj.
	•			•		Faulty Pilot Valve	Test Gas Valve
•	•		•	•		Faulty Wiring	Test Wiring
	•					Restricted Pilot Line or Clogged Pilot Orifice	Clean Pilot Tubing and Orifices
		•				Broken or Shorted Electrode Assembly	Test Replace
			•		•	Low Pilot Flame	Check Inlet Press. Pilot Orifice Poss. Adjust w/Pilot Key
			•		•	Improper Alignment of Sensor in Pilot Flame	Adjust Alignment - see Sketch page
			•			Faulty Main Gas Operator in Gas Control	Test Gas Valve Repair/Replace
			•			Faulty Flame Sensor	Test Sensor, Wiring Repair/Replace
					•	Pilot flame being drawn away from sensor	Check Inlet Press, Manual Valve must be full "on"
					•	Faulty Limit	Test/Replace

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE(s)	SOLUTION
LOW OPERATING PRESSURE	Faulty pressure gauge	Install new gauge
	Insufficient water supply	Use larger garden hose; clean filter washer 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 misadjusted unloader valve (Where applicable)	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 (where applicable)	Rebuild or replace as needed
	Chemical metering valve left open sucking air, or faulty metering valve	Close and/or replace metering valve
	Slow motor RPM	Check incoming voltage
LOW WATER TEMPERATURE	Improper size of gas lines	See Page 3 for sizing of gas lines
	Low gas pressure	Increase gas pressure to machine
	Improper pressure regulator	Specify BTU, building gas pressure and 11wc" to machine for correct sizing of regulator
	Low gas valve pressure	Increase gas pressure as described on Page 10
	Soot buildup on coils not allowing heat transfer	Clean coils
	Improper burner nozzle	See specifications on Page 42

TROUBLE SHOOTING

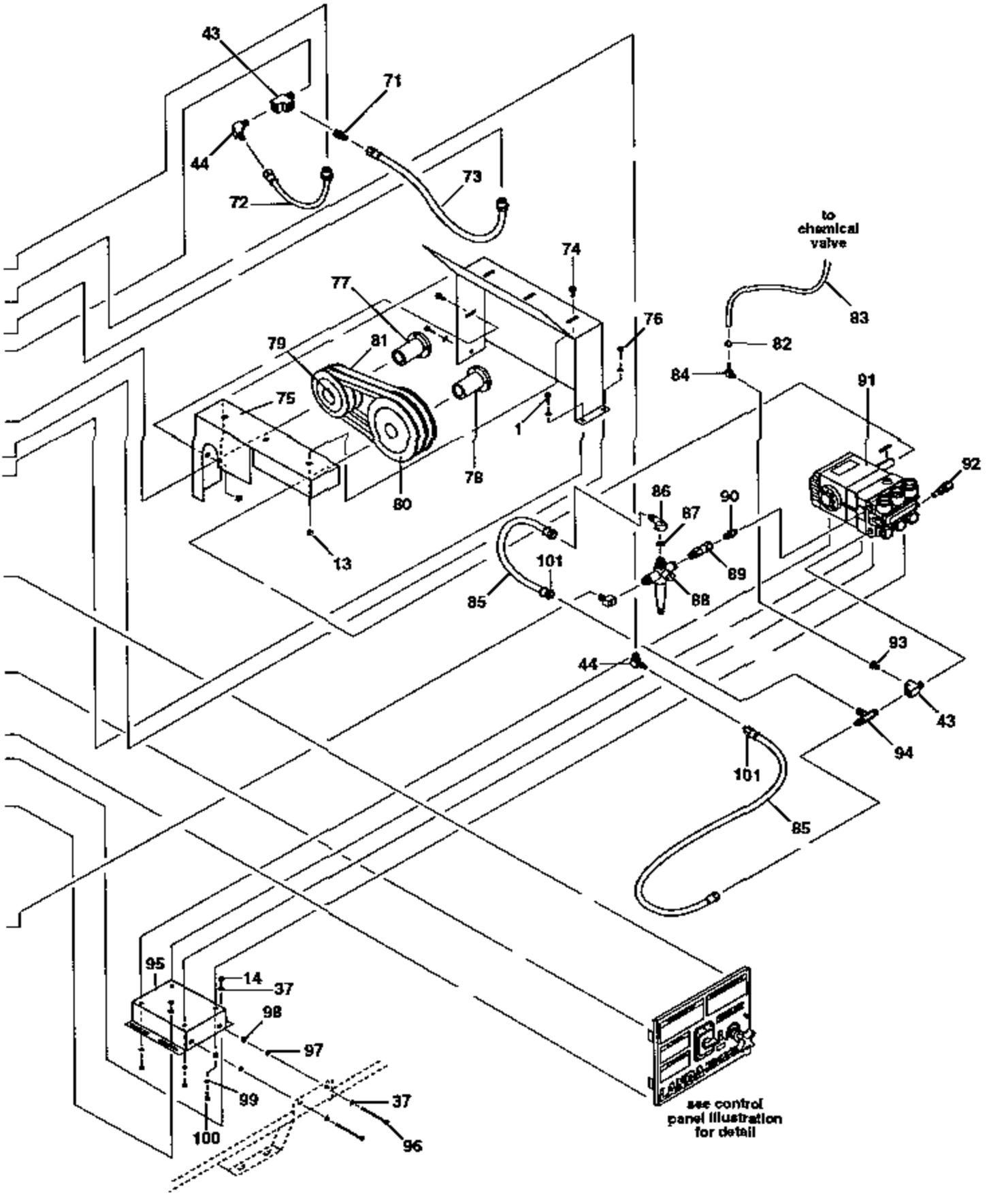
PROBLEM	POSSIBLE CAUSE(s)	SOLUTION
WATER TEMPERATURE TOO HOT	Incoming water to unit warm or hot	Lower incoming water temperature
	Gas pressure too high	See specifications for proper gas pressure
	Chemical line sucking air	Tighten all clamps. Check chemical lines for holes
	Defective high limit switch	Replace
	Incorrect burner nozzle size	See specifications on page 42 for proper size
	Insufficient water supplied	Check water G.P.M. to machine
	Restricted water flow	Check nozzle for obstruction, proper size
CHEMICAL NOT DRAWING	Air leak	Tighten all clamps. Check chemical lines for holes
	Chemical metering valve packing not tight or packing worn	Tighten nut. Replace valve or packing
	Filter screen on chemical suction hose plugged	Clean or replace
	Dried up chemical plugging metering valve	Disassemble and clean thoroughly
	High viscosity of chemical	Dilute chemical to specifications
	Restriction behind float tank screen removed	Install restriction
	Hole in chemical line(s)	Repair hole
	Strainer basket plugged	Remove and clean
	Connections on selector valve loose	Put teflon tape on all pipe connections
	Chemical solenoid not opening (where applicable)	Check flow switch, replace chemical solenoid

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE(s)	SOLUTION
PUMP RUNNING NORMALLY BUT PRESSURE LOW ON INSTALLATION	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
	Nozzle incorrectly sized	Check and replace if necessary (See serial plate for proper size)
	Worn piston packing	Check and replace if necessary
FLUCTUATING PRESSURE	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
PUMP NOISY	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
PRESENCE OF WATER IN OIL	Oil seal worn	Check and replace if necessary
	High humidity in air	Check and change oil twice as often
WATER DRIPPING FROM UNDER PUMP	Piston packing worn	Check and replace if necessary
	O-Ring plunger retainer worn	Check and replace if necessary
OIL DRIPPING	Oil seal worn	Check and replace if necessary
EXCESSIVE VIBRATION IN DELIVERY LINE	Irregular functioning of the valves	Check and replace if necessary
RELIEF VALVE LEAKS WATER	Relief valve defective	Replace or repair

ENG/ELP EXPLODED VIEW

Right Side

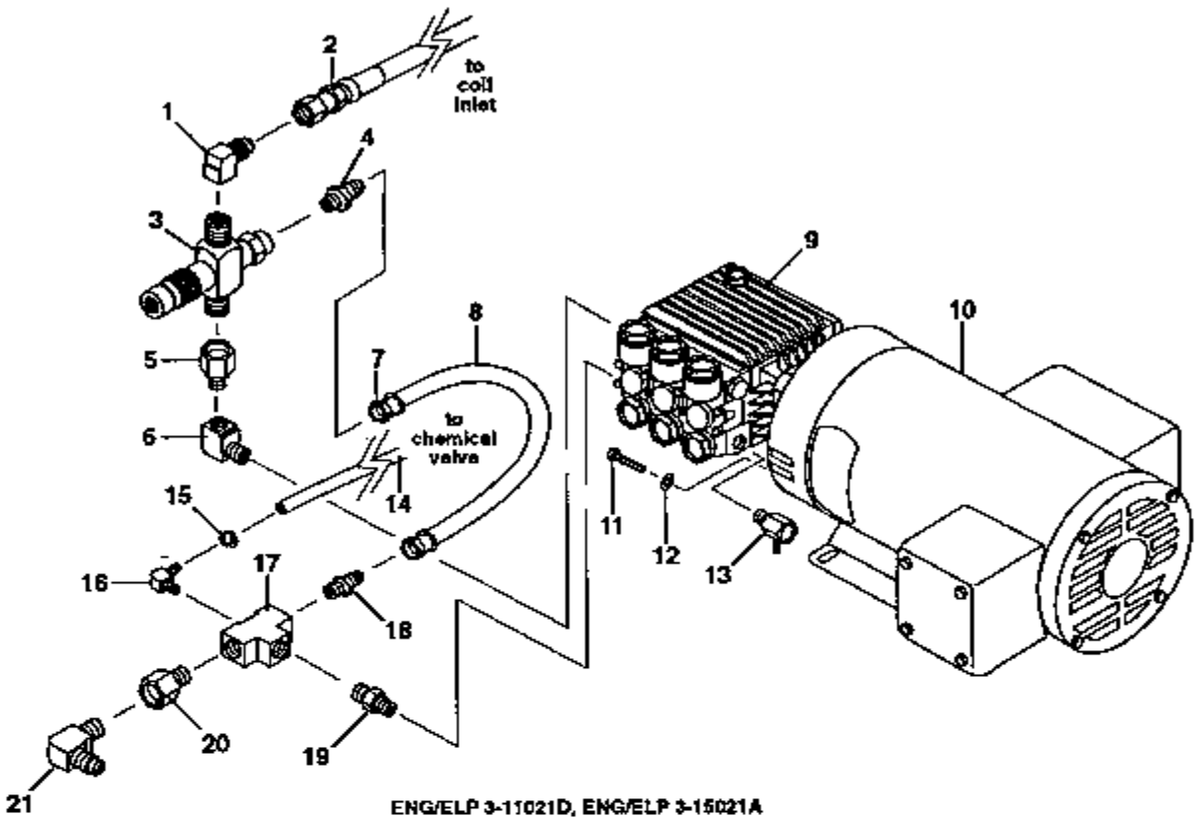


ENG/ELP PARTS LIST

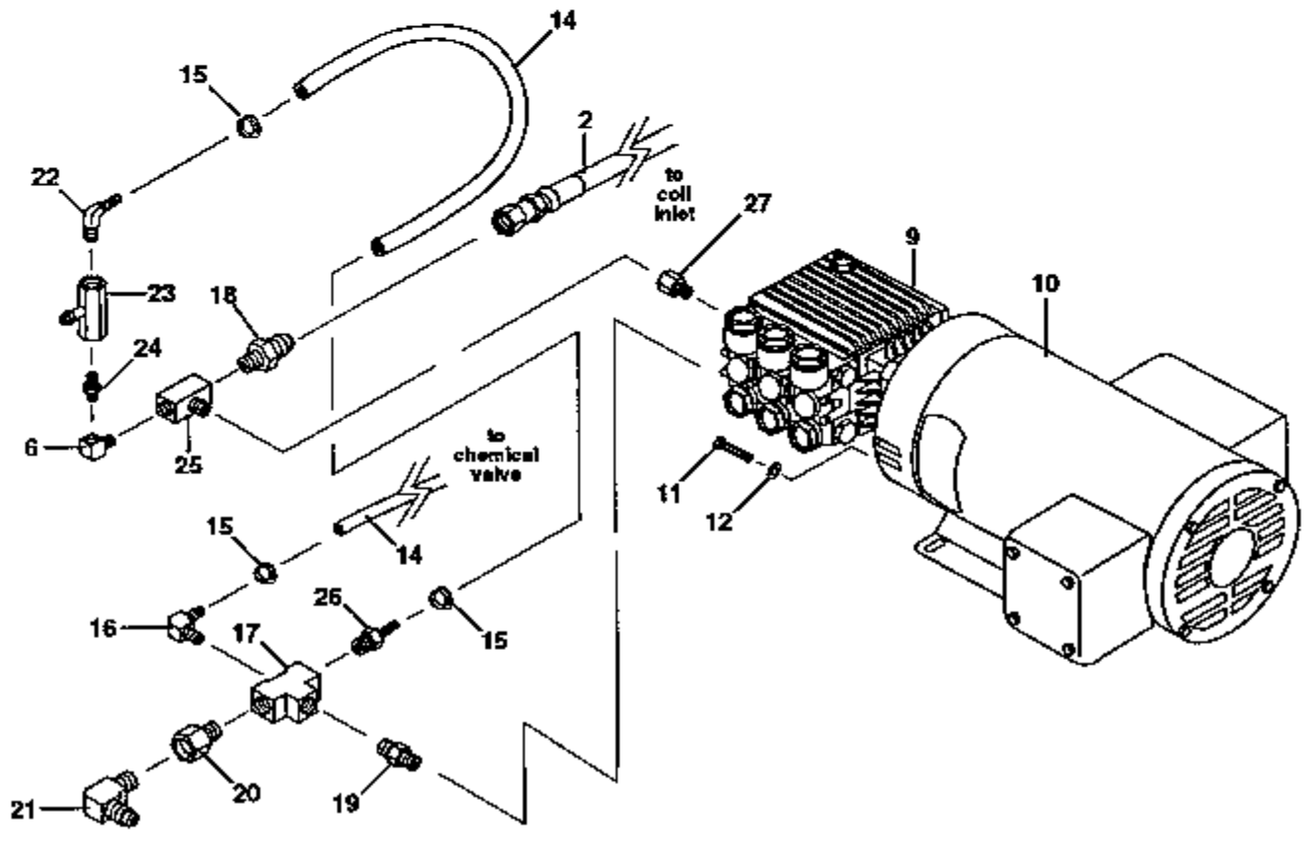
ITEM	PART NO.	DESCRIPTION	QTY
1	90-300210	Screw, #14 x 1", Tek, Blk, Zinc	23
2	2-01104	Trim, 1/16", Black /ft.	4
3	95-07163075	Top, Burner Wrap, 18", ENG/VNG-S	1
	10-02025A	Label, "Hot/Caliente" with Arrows Warning	3
4	95-07121207	Lid & Hinges, Plastic Float Tank	1
5	95-07163603	Cover, ENG	1
6	95-07101241V	Insulation Retainer Band	2
7	17-22282	Nut, 10/32" Keps	8
8	90-1994	Screw, 10/32" x 1-1/4" RH, SL, Blk	8
9	90-10130	U-Bolt, 5/16" x 1" Pipe	3
10	95-07121213V	ENG/VNG-S Coil	1
11	7-0142	Insulation Blanket, w/Foil /sq. ft.	10
12	95-07163073	Coil Wrap, 18, ENG/VNG-S	1
13	90-2018	Nut, Cage, 10/32" x 16 ga	6
14	90-2002	Nut, 3/8", ESNA, NC	12
15	90-4007	Washer, 3/8" x 1-1/2", Fender	4
16	2-0133	Screw, 10/32" x 1/2", Knob	2
17	95-07163076	Door, Burner, ENG/VNG-S	1
	10-99077	Label, Pilot Light Warning	1
	10-99032	Label, Pilot Light Hole	1
18	2-00293	Elbow, 3/4" Black, 90°	3
19	2-00164	Nipple, 3/4" x 6", Black Pipe	1
20	2-00162	Nipple, 3/4" x 3", Black Pipe	4
21	90-1001	Bolt, 1/4" x 3/4", NC HH	2
22	2-0087	Union, 3/4", Black Pipe	1
23	7-7000HC	Valve, Gas, 7000 MVRHC 3/4" x 3/4"	1
	7-7LPKIT	Δ LPG Regulator Kit (LP only)	1
24	7-0150	Tubing, Aluminum, 1/4" Dead Soft /in.	36
25	90-5006	Holder, Zinc	1
26	90-40001	Washer, 1/4", Flat, Blk, Zinc	3
27	90-2006	Nut, 5/16", Hex, NC	1
28	7-7036	Thermopile, ENG, 44"	1
29	7-7CH	Pilot Assembly	1
	7-7017	Δ Orifice, Pilot LP (LP Only)	1
30	95-07162025	Bracket, Pilot Light, ENG	1
31	10-99079	Label, Platinum Series	1
32	95-07163600	Cage, ENG/ELP	1
33	4-02120000	Hose, 3/4", Push-On /ft.	2
34	2-10942	Swivel, 1/2" MP x 3/4" GHF w/Strainer	1
35	2-1902	Strainer, Inlet Garden Hose	1
36	10-09004	Δ Label, Hot Water Outlet	1
37	90-4002	Washer, 3/8", Flat	18
38	90-1016	Bolt, 3/8" x 1"	8

ENG/ELP PUMP ASSEMBLIES EXPLODED VIEW

ENG/ELP3-300, 1100, 1500

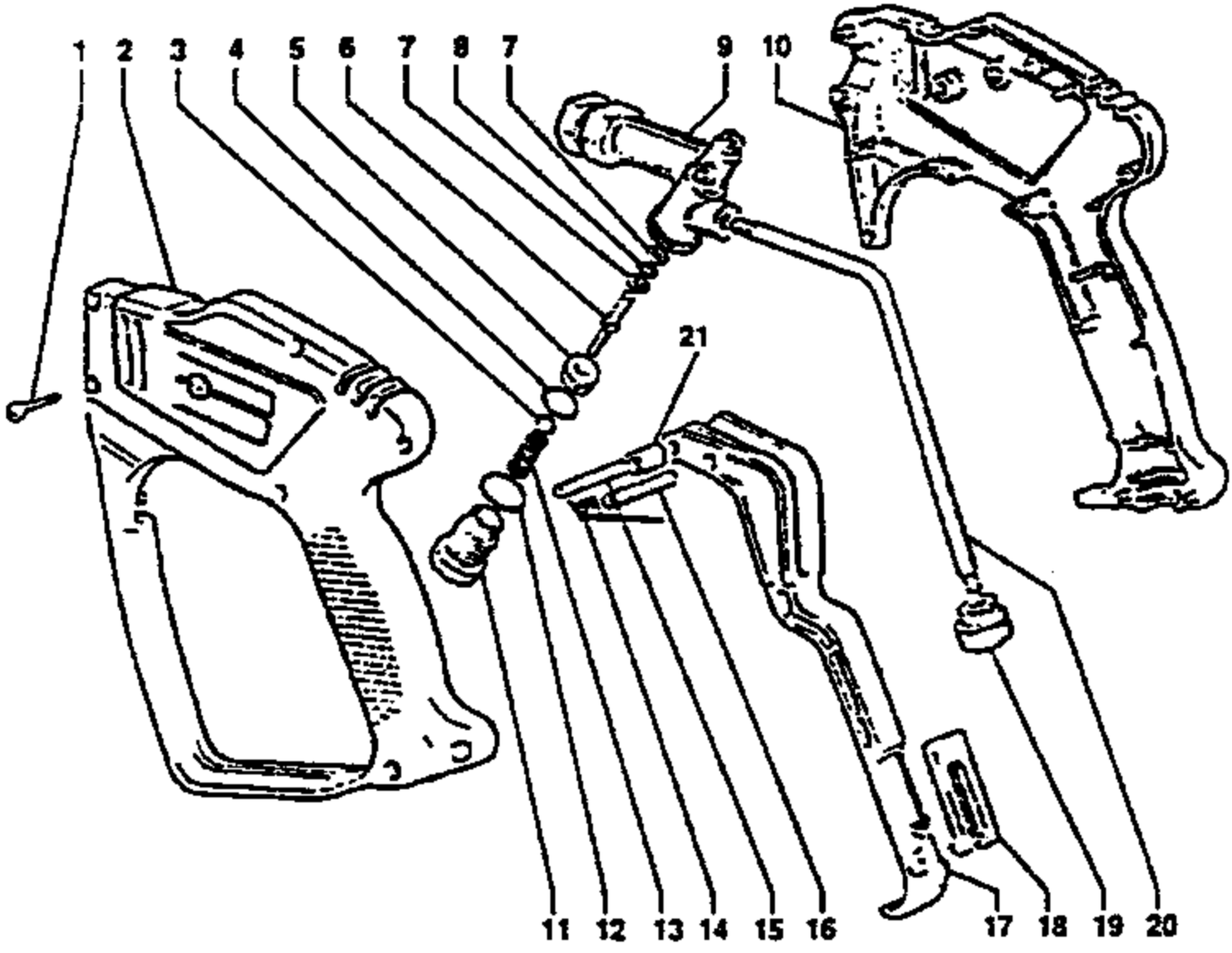


ENG/ELP 3-11021D, ENG/ELP 3-15021A



ENG/ELP 3-30031D

SHUT-OFF GUN #4-01215
All Models

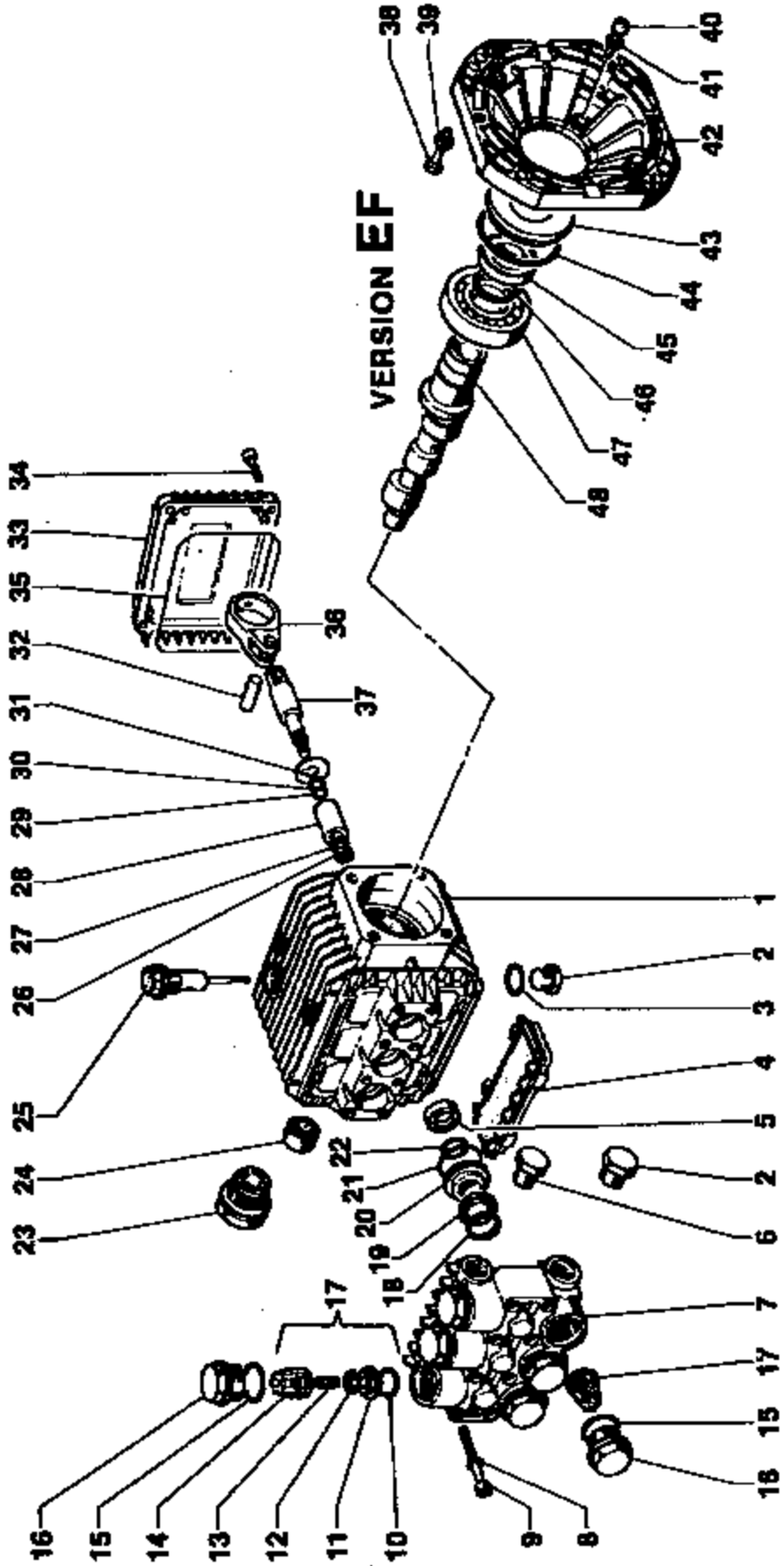


ITEM	PART NO.	DESCRIPTION	QTY
1	1-16307700	Screw	7
2	1-30150184	Left Housing	1
3	1-14744310	Δ Ball	1
4	1-10305901	Δ O-Ring	1
5	1-30201251	Δ Seat	1
6	1-30150251	Δ Pin	1
7	1-10400400	Δ Back-up Ring	1
8	1-10310990	O-Ring	1
9	1-30151935	Housing	1
10	1-30150684	Right Housing	1
11	1-30150831	Plug	1

ITEM	PART NO.	DESCRIPTION	QTY
12	1-10306401	Δ O-Ring	1
13	1-30150751	Spring	1
14	1-30151351	Spring	1
15	1-30150451	Pin	1
16	1-30021231	Pin	1
17	1-30150984	Trigger	1
18	1-30151084	Locking Lever	1
19	1-30151731	Inlet Fitting	1
20	1-30151156	Inlet Tube	1
21	1-30150351	Bushing	1
Δ	1-YKITG4550	Repair Kit	

PUMP TT9071EF-B #5-23010

ENG/ELP3-30031D • ENG/ELP3-11021D • ENG/ELP3-15021A



PUMP TT9071EF-B #5-23010

ENG/ELP3-30031D • ENG/ELP3-11021D • ENG/ELP3-15021A
PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY
1	1-51010622	Crankcase	1
2	1-98210000	Plug	2
3	1-90383300	O-Ring	1
4	1-51209102	Protector	1
5	Kit #1-0083	Oil Seal	3
6	1-98204100	Plug	1
7	1-51120022	Manifold, Aluminum	1
	1-51120041	Manifold, Brass	1
8	1-96693800	Washer	8
9	1-99194300	Screw	8
10	1-90384100	O-Ring (Kit #1-0001)	6
11	Kit #1-0001	Valve Seat	6
12	Kit #1-0001	Valve Plate	6
13	Kit #1-0001	Spring	6
14	Kit #1-0001	Valve Cage	6
15	1-90384700	O-Ring (Kit #1-0084)	6
16	1-98221800	Valve Cap (Kit #1-0084)	6
17	1-36703201	Valve Assembly (Kit #1-0001)	6
18	Kit #1-0096, 1-0097	Head Ring	3
19	Kit #1-0096, 1-0097	Packing	3
20	Kit #1-0086, 1-0096	Packing Retainer	3
21	1-90360400	O-Ring (Kit #1-0086, 1-0096, 1-0097)	3
22	1-90383500	O-Ring (Kit #1-0086, 1-0096, 1-0097)	3

ITEM	PART NO.	DESCRIPTION	QTY
23	1-97596800	Sight Gauge	1
24	1-91801400	Needle Bearing	1
25	1-98210300	Oil Dip Stick	1
26	1-92221600	Nut	3
27	1-96700800	Washer	3
28	1-51040009	Plunger	3
29	1-90357200	O-Ring	3
30	1-90502200	Back Up Ring	3
31	1-96707000	Finger Washer	3
32	1-97731000	Connecting Rod Pin	3
33	1-51160022	Crankcase Cover	1
34	1-99186700	Screw	4
35	1-51210184	Cover Gasket	1
36	1-51030022	Connecting Rod End	3
37	1-51050056	Connecting Rod	3
38	1-99334500	Screw	4
39	1-96710400	Washer	4
40	1-99186700	Screw	4
41	1-96693800	Washer	4
42	1-10034422	Flange	1
43	1-50211551	Spacer	1
44	1-90409700	O-Ring	1
45	1-90164400	Oil Seal	1
46	1-90066700	Snap Ring	1
47	1-91837300	Bearing	1
48	1-51020935	Crankshaft (TT9071EF-B)	1

KITS AVAILABLE

Kit No.	1-0001	1-0083	1-0084	1-0086	1-0096	1-0097
DESCRIPTION	VALVE ASSEMBLY	PISTON OIL SEAL	VALVE CAP ASSEMBLY	PACKING RETAINER	PACKING ASSEMBLY	PACKING
ITEM NO.'S INCLUDED	10, 11 12, 13 14, (17)	5	15, 16	20, 21 22	18, 19 20, 21 22	18, 19 21, 22
NUMBER OF ASSEMBLIES	6	3	6	3	1	3
NUMBER OF CYLINDERS	1	1	1	1	3	1

PUMP EZ-2542S • #5-23130 • PARTS LIST

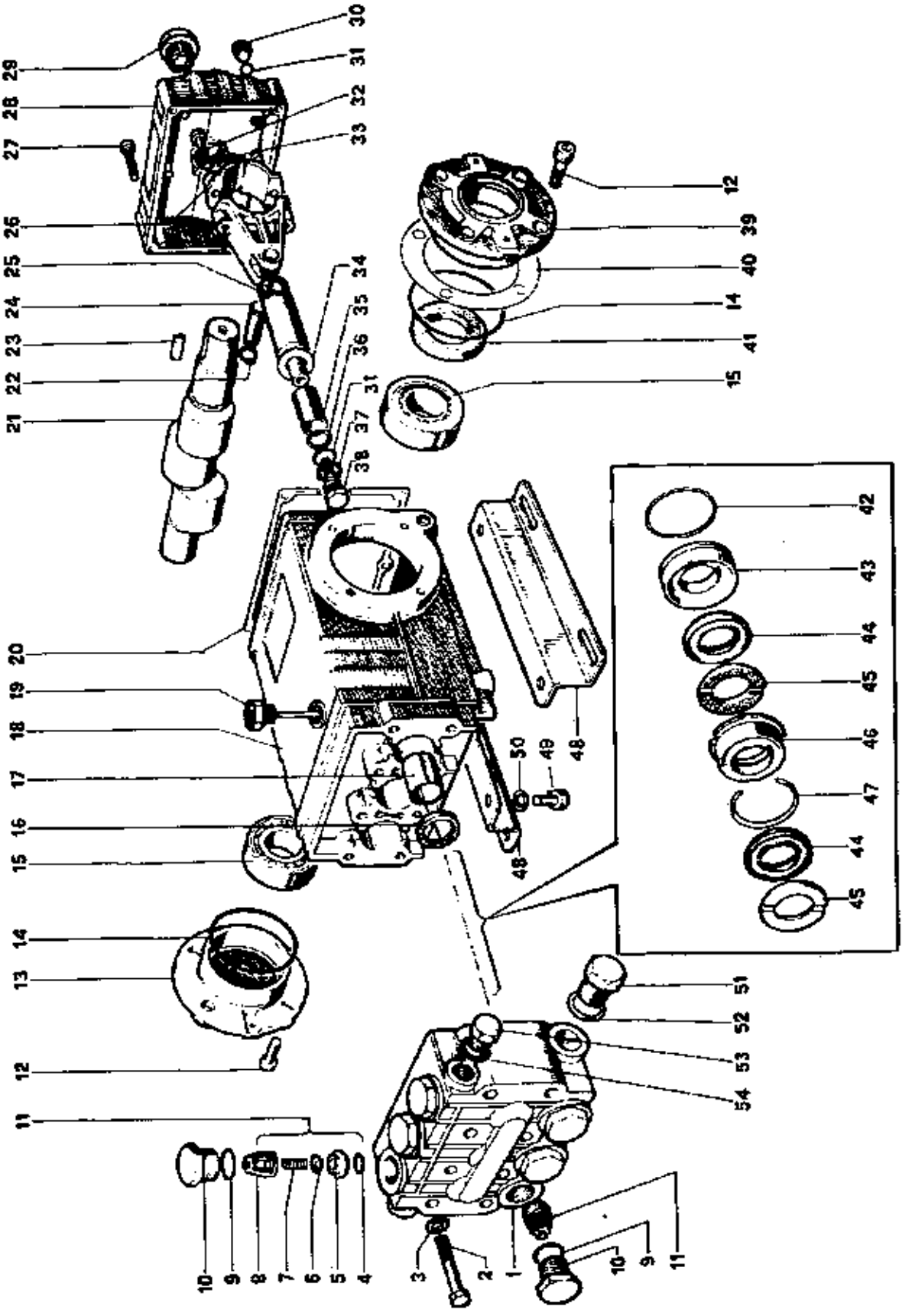
ENG/ELP4-2000

ITEM	PART NO.	DESCRIPTION	QTY
1	1-44120441	Pump Head	1
2	1-99317500	Screw	8
3	1-96701400	Washer	8
4	1-90384100	O-Ring (Available in Kit 1-0123)	6
5	1-36200366	Valve Seal (Available in Kit 1-0123)	6
6	1-36200176	Valve (Available in Kit 1-0123)	6
7	1-94737600	Spring (Available in Kit 1-0123)	6
8	1-36202551	Valve (Available in Kit 1-0123)	6
9	1-90384700	O-Ring (Available in Kit 1-0124)	6
10	1-98222600	Cap (Available in Kit 1-0124)	6
11	1-36711501	Valve Assembly (Available in Kit 1-0123)	6
14	1-44211801	Spacer	1
15	1-90409700	O-Ring	1
17	1-90161400	Oil Seal (Available only in Kit 1-0023)	3
18	1-44010022	Crankcase	1
19	1-98210300	Oil Dip Stick	1
22	1-44050066	Piston Guide	3
23	1-44030022	Connecting Rod	3
24	1-90392000	O-Ring	1
25	1-44160022	Rear Cover	1
26	1-99183700	Screw	5
27	1-90358500	O-Ring	1
28	1-98204100	Cap Screw	1
29	1-97734000	Pin	3
30	1-96735000	Washer	3
31	1-90502200	Anti-Ext. Ring	3
32	1-90357200	O-Ring	3
33	1-44040109	Piston (18 mm)	3
34	1-96700800	Washer	3
35	1-92221600	Nut	3
40	1-90361200	O-Ring (Available in Kit 1-0126, 1-0131)	3
41	1-44080170	Packing Retainer (Available in Kit 1-0126, 1-0131)	3
42	1-44216170	Intermed. Ring (Available in Kit 1-0126, 1-0131)	3
43	1-90268300	Packing (Available in Kit 1-0127, 1-0131)	3
44	1-90268200	Packing (Available in Kit 1-0127, 1-0131)	6
45	1-44100151	Head Ring (Available in Kit 1-0129, 1-0131)	6
46	1-98210000	Cap Screw	1
47	1-98217600	Cap Screw	1
48	1-96738000	Washer	1
49	1-96751400	Washer	1
50	1-98196600	Gauge Port Plug	1
55	1-90063500	Clr-Clip	1
56	1-44021665	Crankshaft	1
57	1-91856800	Bushing	1
58	1-91409700	O-Ring	1
59	1-99460000	Screw	4
60	1-96719500	Washer	4
61	1-10050422	Elect. Flange	1
62	1-90169000	Seal	1
63	1-96693800	Washer	4
64	1-99101200	Screw	4

TORQUE SPECS			
Position	Ft./lbs.	Position	Ft./lbs.
2	14.7	35	11.0
10	73.7	39	14.7
12	7.3	46	29.4
26	7.3	47	29.4
28	14.7		

REPAIR KIT#	1-0023	1-0123	1-0124	1-0126	1-0127	1-0128	1-0129	1-0131
ASSEMBLY (POS. #)	17	4, 5, 6, 7, 8, 11	9, 10	40, 41	43, 44	42	45	40, 41, 42 43, 44, 45
# OF ASSEMBLIES	3	6	6	3	3/6	3	6	1/2
# OF CYLINDERS	3	3	3	3	3	3	3	1

PUMP • TS2021 • #5-2307
ENG/ELP4-3000



PUMP • TS2021 • #5-2307 • PARTS LIST

ENG/ELP4-3000

For proper pump repair and ease of packing insertion/extraction, the following tools are recommended:

1-ZMVTOOL Packing Insertion Tool

1-26019400 Packing Extractor, Slap Hammer

1-26093400 Packing Extractor, Socket T-991

TORQUE SPECS			
Position	Ft./lbs.	Position	Ft./lbs.
2	22.1	32	8.8
10	73.7	38	14.7
12	14.7	49	29.4
27	7.3	51	29.4
29	13.2	53	29.4
30	14.7		

ITEM	PART NO.	DESCRIPTION	QTY
1	1-47120941	Pump Head	1
2	1-99320600	Screws	8
3	1-96702000	Washers	8
4	1-90384100	O-Rings (Kit 1-0001)	6
5	1-36200366	Valve Seats (Available only in Kit 1-0001)	6
6	1-36200176	Valve Plates (Available only in Kit 1-0001)	6
7	1-94737600	Springs (Available only in Kit 1-0001)	6
8	1-36200251	Valve Guides (Available only in Kit 1-0001)	6
9	1-90384700	O-Rings (Available only in Kit 1-0004)	6
10	1-98222200	Caps (Available only in Kit 1-0004)	6
11	1-36703201	Valve Assembly (Available only in Kit 1-0001)	6
12	1-99303900	Screws	8
13	1-47150522	Side Crankcase Cover (Closed)	1
14	1-90391300	O-Rings	2
15	1-91837500	Tapered Rolling Bearings	2
16	1-90162500	Oil Seals (Available only in Kit 1-0002)	3
17	1-90912600	Bushings	3
18	1-47010522	Crankcase	1
19	1-98210600	Oil Dip Stick	1
20	1-47211984	Cover Gasket	1
21	1-47021735	Crankshaft	1
22	1-90055700	Snap Rings	6
23	1-91487800	Key	1
24	1-97738000	Wrist Pins	3
25	1-47050356	Piston Guides	3
26	1-47030001	Connecting Rods	3
27	1-99191200	Screws	5
28	1-47160422	Rear Crankcase Cover	1
29	1-97596800	Oil Level Indicator	1
30	1-98204100	Cap	1
31	1-90358500	O-Rings (Kit 1-0006)	4
32	1-99309900	Screws	6
33	1-96701400	Washers	6
34	1-96728600	Washers	3
35	1-47040409	Pistons	3
36	1-90506700	Anti-extrusion Rings (Kit 1-0006)	3
37	1-96728000	Washers (Available only in Kit 1-0006)	3
38	1-47219566	Piston Screws (Available only in Kit 1-0006)	3
39	1-47150322	Side Crankcase Cover (Open)	2
40	1-97567800	Shims	2
41	1-90164800	Oil Seals (Available only in Kit 1-0003)	2
42	1-90361600	O-Rings (Kit 1-0028)	3
43	1-47080570	Packing Retainers (Available only in Kit 1-0028)	3
44	1-90270500	Packings (Available only in Kit 1-0008, 1-0028)	6
45	1-47100051	Head Rings (Available only in Kit 1-0007, 1-0028)	6
46	1-47216670	Intermediate Rings (Available only in Kit 1-0028)	3
47	1-90518200	"Long Life" Rings (Kit 1-0028)	3
48	1-47200074	Pump Feet	2
49	1-99364400	Screws	4
50	1-96710600	Washers	4
51	1-98217600	Cap	1
52	1-98751400	Washer	1
53	1-98210000	Cap	1
54	1-96738000	Washers	1

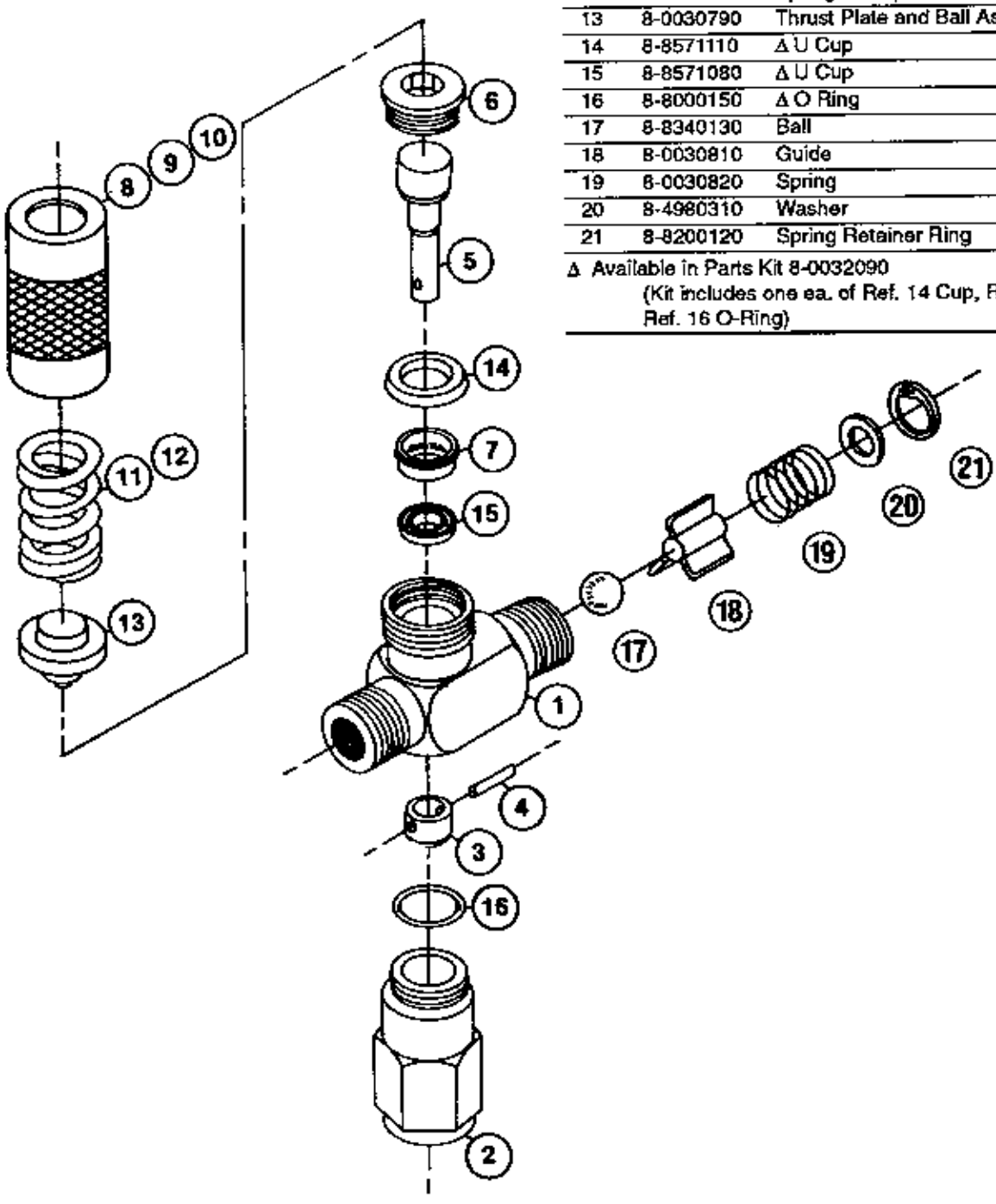
REPAIR KIT #	1-0001	1-0002	1-0003	1-0004	1-0006	1-0007	1-0008	1-0028
	Valve Assembly	Piston Oil Seal	Crankshaft Oil Seal	Valve Cap Assembly	Piston Retainer	Head Ring	Packing	Packing Assembly
ASSEMBLY (POS. #)	4, 5, 6, 7, 8, 11	16	41	9, 10	31, 36, 37, 38	45	44	42, 43, 44, 45, 46, 47
# OF ASSEMBLIES	6	3	2	6	3	6	6	1

UNLOADER • #5-3201

ENG/ELP2-1100, ENG/ELP3-1100

ITEM	PART NO.	DESCRIPTION	QTY
1	8-0030800	Body w/Seat Assembly	1
2	8-0030691	By-Pass Fitting w/Seat Assembly	1
3	8-0030130	By-Pass Poppet	1
4	8-0030050	Pin	1
5	8-0030110	Piston	1
6	8-00303500	Stop	1
7	8-0030080	Spacer	1
8	8-0030420	Adjusting Nut 500 psi	1
9	8-0030430	Adjusting Nut 1000 psi	1
10	8-0030440	Adjusting Nut 1500 psi	1
11	8-0030181	Spring 500 & 1000 psi	1
12	8-0030321	Spring 1500 psi	1
13	8-0030790	Thrust Plate and Ball Assembly	1
14	8-8571110	Δ U Cup	1
15	8-8571080	Δ U Cup	1
16	8-8000150	Δ O Ring	1
17	8-8340130	Ball	1
18	8-0030810	Guide	1
19	8-0030820	Spring	1
20	8-4980310	Washer	1
21	8-8200120	Spring Retainer Ring	1

Δ Available in Parts Kit 8-0032090
(Kit includes one ea. of Ref. 14 Cup, Ref. 15 Cup, Ref. 16 O-Ring)



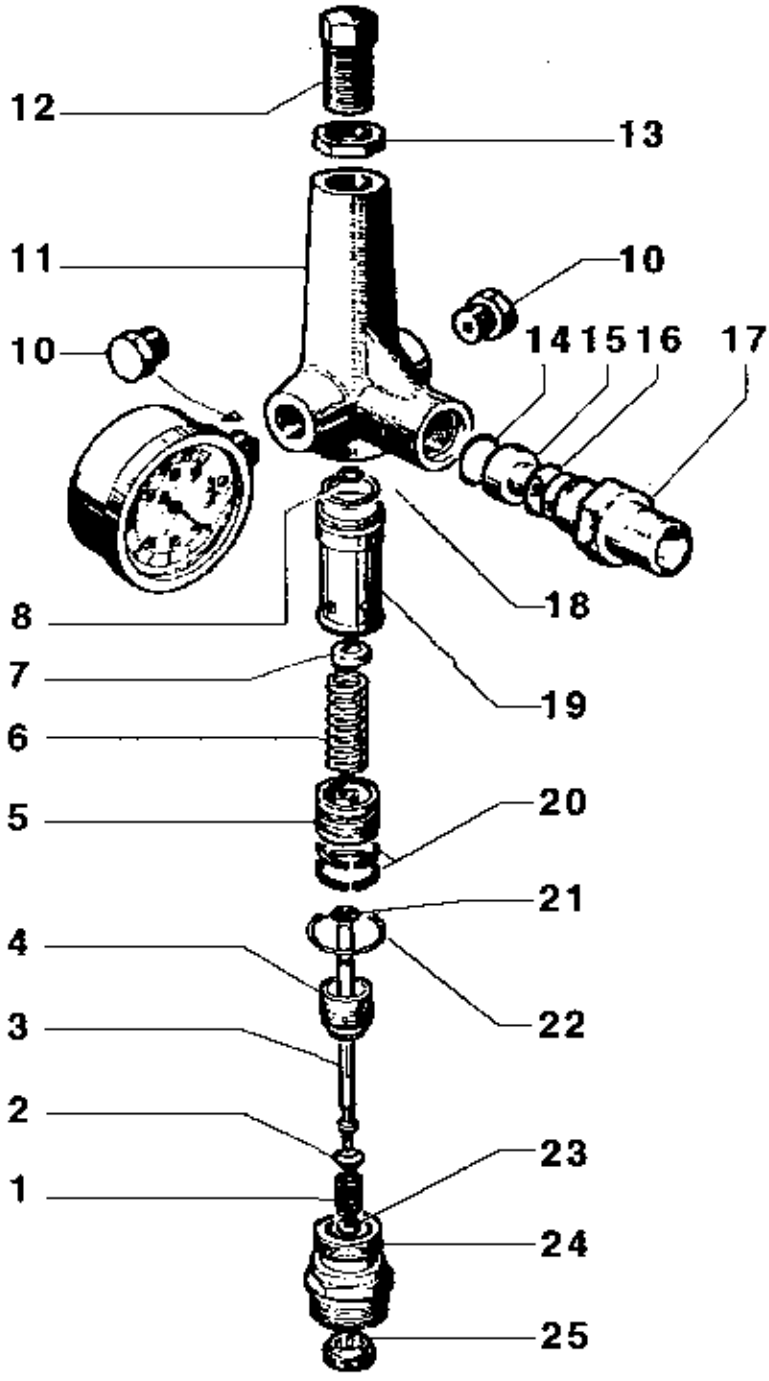
UNLOADER #5-30011

K5.1 (3-4 GPM) • 2000 - 3000 psi
ENG/ELP4-2000, ENG/ELP4-3000

ITEM	PART NO.	DESCRIPTION	QTY
1	1-94737400	Spring * ‡	1
2	1-36300866	Valve * ‡	1
3	1-36303066	Control Rod ‡	1
4	1-36303466	Seat Insert * ‡	1
5	1-36303270	Piston * ‡	1
6	1-94743000	Spring * ‡	1
7	1-36303170	Spring Plate ‡	1
8	1-90357200	O-Ring *	1
9		Pressure Gauge	1
10	1-98204100	Cap	2
11	1-36302841	Unloader Body	1
12	1-36300164	Pressure Adjusting Screw	1
13	1-92256000	Nut	1
14	1-90362300	O-Ring	1
15	1-10007766	Nozzle (K5.1)	1
16	1-90383300	O-Ring *	1
17	1-10007870	Nipple (K -5.1)	1
18	1-90384500	O-Ring *	1
19	1-36302970	Rod Guide	1
20	1-92772200	Compression Rings * ‡	4
21	1-90050900	Retaining Ring * ‡	1
22	1-90385900	O-Ring * ‡	1
23	1-92192500	Nut * ‡	1
24	1-36305070	Valve Seat ‡	1
25	1-36303570	Ring Nut * ‡	1
	5-3200	Restrictor	1

* Repair Kits #1-0058 - K-5 (includes. Nos. 1, 2, 4, 5, 6, 8, 16, 18, 20, 21, 22, 23, 25)

‡ Rebuild Kits #1-0060- K-5 (includes Nos. 1, 2, 3, 4, 5, 6, 7, 20, 21, 22, 23, 24, 25)



ENG/ELP ELECTRICAL BOX/CONTROL PANEL • PARTS LIST

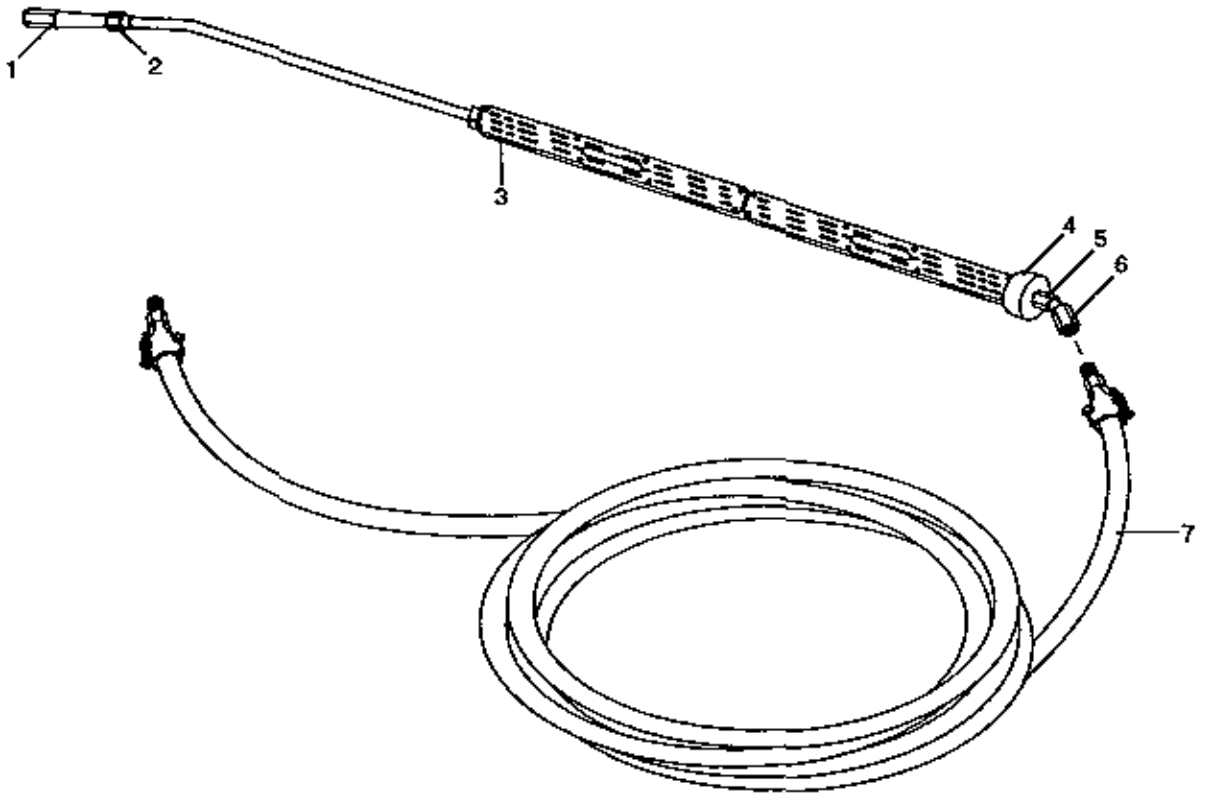
All Models

ITEM	PART NO.	DESCRIPTION	QTY
1	6-0517	Strain Relief, 3/4"	3
2	90-16	Screw, 8/32" X 3/4" BH SOC CS	2
3	90-200490	Nut, 8/32", Keps	6
4	90-1991	Screw, 10/32" x 1/2" BH SOC	5
	90-1999	Δ Screw, 10/32" x 3/4" GH SOC	1
5	17-22282	Nut, 10/32", Keps	4
6	6-0504	Block, Strip, Terminal, 4-Poledr	1
7	6-021595	Din Rail Track, /inch	4
8	90-2018	Nut, Cage, 10/32" x 16 ga	7
9	4-02080000	Tube, 1/4" x 1/2" Clr Vinyl /ft.	8
10	4-02090000	Hose, 1/4" x 1/2", Braided Vinyl /ft.	2.5
11	2-9000	Clamp, Screw, #4	4
12	2-30158	Valve, Metering	1
13	6-052352	Transformer, 240/480 - 120V .060 KVA	1
14	6-02294	Fuse, ATMR, 1 Amp, 240V (4-2000B, 4-3000B)	2
14	6-02295	Fuse, ATMR, 1/2 Amp, 460V (4-2000C, 4-3000C)	2
15	6-02297	Fuse, GDL, 1/2 Amp, 120V (All 3 PH)	1
16	90-300210	Screw, #14 x 1", Tek, Blk, Zinc	2
17	10-020ENG	Label, ENG	1
	10-020ELP	Label, ELP	1
18	102-31100	Label, 3-1100	1
	10-2031500	Label, 3-1500	1
	10-2042000	Label, 4-2000	1
	10-2043000	Label, 4-3000	1
19	95-07500072	Cover, Electrical Box, ENG	1
	10-99024	Label, ENG Control Panel	1
20	95-07121117	Switch Plate (230V 1 PH units)	1
	95-07121120	Plate, Switch, Push Buttons, ENG (3 PH units)	1
21	2-0133	Screw, 10/32" x 1/2", Knob	1
22	6-020251	Switch, Curvette, 120V & 220V	1
23	6-020201	Switch, 3 Pos. 115V - 230V, 1 PH (1 PH units)	1
24	6-1103	Contactor, Spectra, 700, CR7CBA (4-30021C)	1
	6-1105	Contactor, Spectra, 700, CR7CCA (4-20021B)	1
	6-1108	Contactor, Spectra, 700, CR7CEA (4-30021B)	1
	6-1110	Contactor, Spectra, 700, CR7CFA (4-20021C)	1
	6-1112	Contactor, Spectra, 700, CR7CHA (4-30021A)	1
25	6-1114	Overload, Spec, CR7G1WM, 7 - 10 amp (4-20021C)	1
	6-1115	Overload, Spec, CR7G1WN, 10 - 13 amp (4-30021C)	1
	6-1116	Overload, Spec, CR7G1WP, 12 - 15 amp (4-20021B)	1
	6-1119	Overload, Spec, CR7G1WT, 21 - 26 amp (4-30021B)	1
	6-1121	Overload, Spec, CR7G1TD, 7 - 10 amp (4-30021A)	1
26	6-0920	Push Button GE, Green (3 PH units)	1
27	6-0921	Push Button, GE, Red (3 PH units)	1

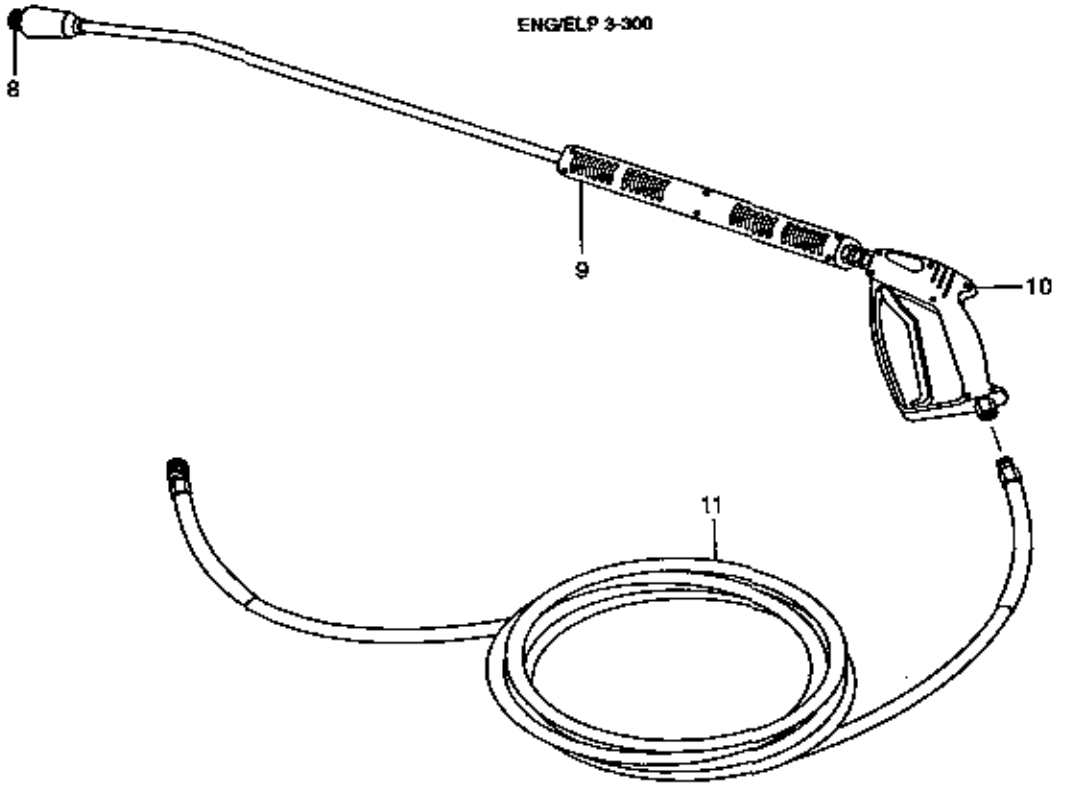
Δ Not Shown

ENG/ELP HOSE & GUN ASSEMBLY

All Models



ENG/ELP 3-300



ENG/ELP 3-1100, 3-1500, 4-2000, 4-3000

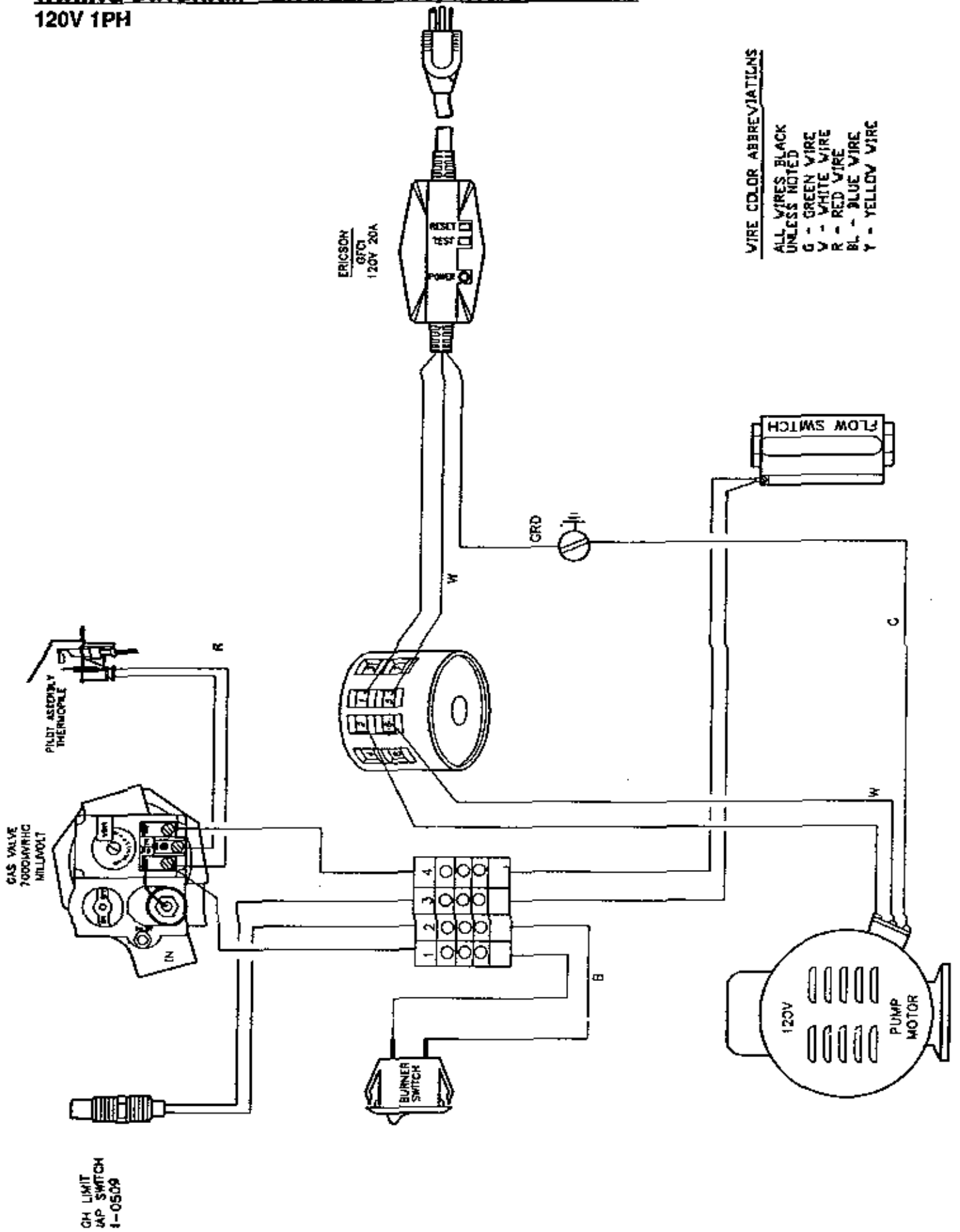
ENG/ELP HOSE & GUN ASSEMBLY

All Models

ITEM	PART NO.	DESCRIPTION	QTY
1-6 incl.	4-01111	Wand, Steam Assembly w/Nozzle	1
1	4-2000	Nozzle, Steam 1/16"	1
2	2-1097	Coupling, 3/8" x 1/4" Reducing	1
3	4-0111424	Spray Lance, 47"	1
4	2-0104	Pad, Hard Rubber	1
5	2-0058	Elbow, 1/4", Pipe, 45°	1
6	2-0069	Adapter, 1/4" x 3/8", Steel	1
7	4-02228850	Hose, 50' x 1/2", Steam Only	1
8	2-2001	Coupler, 1/4" Male	1
9	4-0111021	Lance, Spray, Insulated, 35.5 SS	1
10	4-01215	Gun, Shut-Off, YG3600	1
11	4-02043450	Hose, 50' x 3/8", 100R2	1

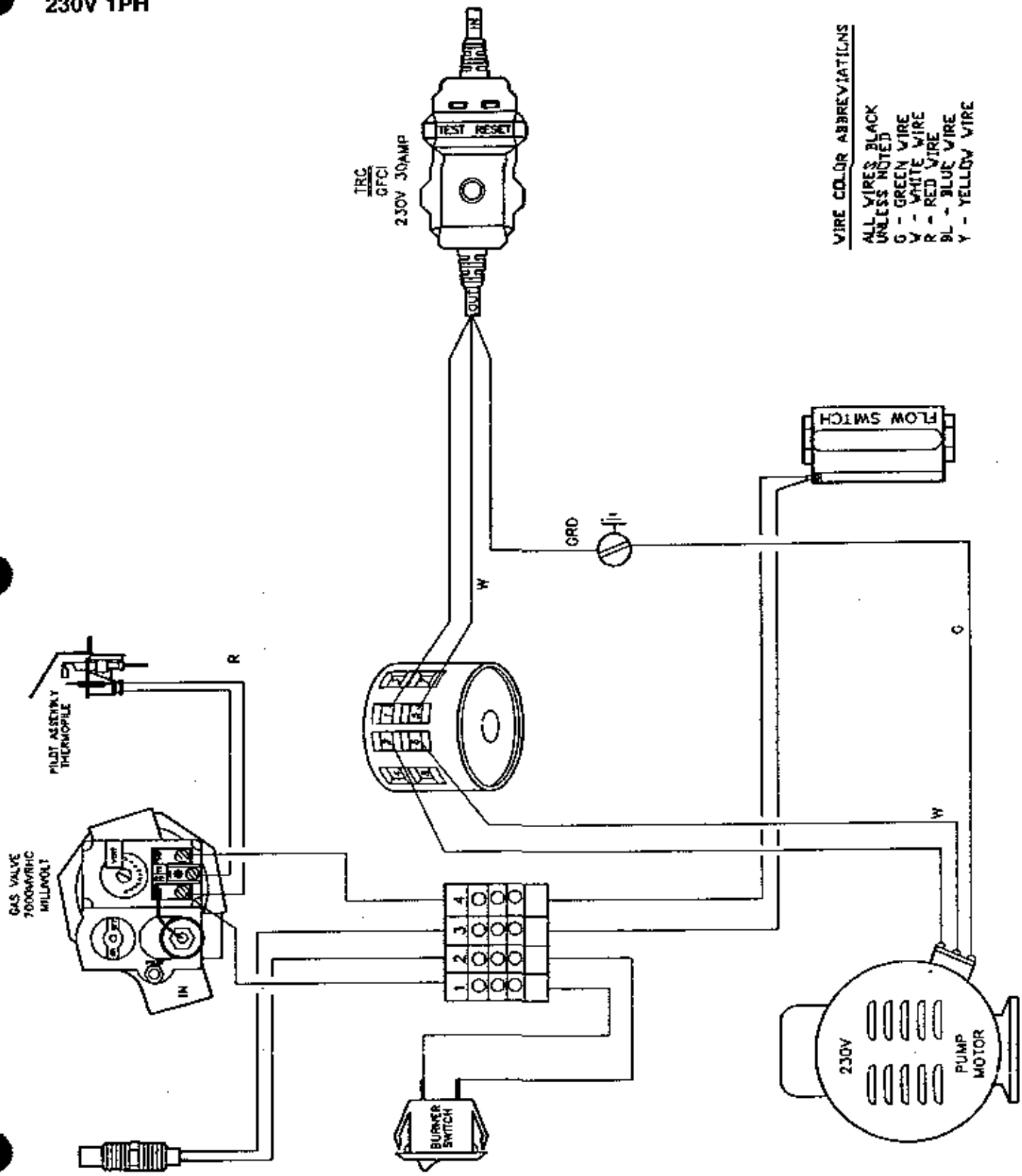
WIRING DIAGRAM • ENG/ELP3-300, ENG/ELP 3-1100

120V 1PH

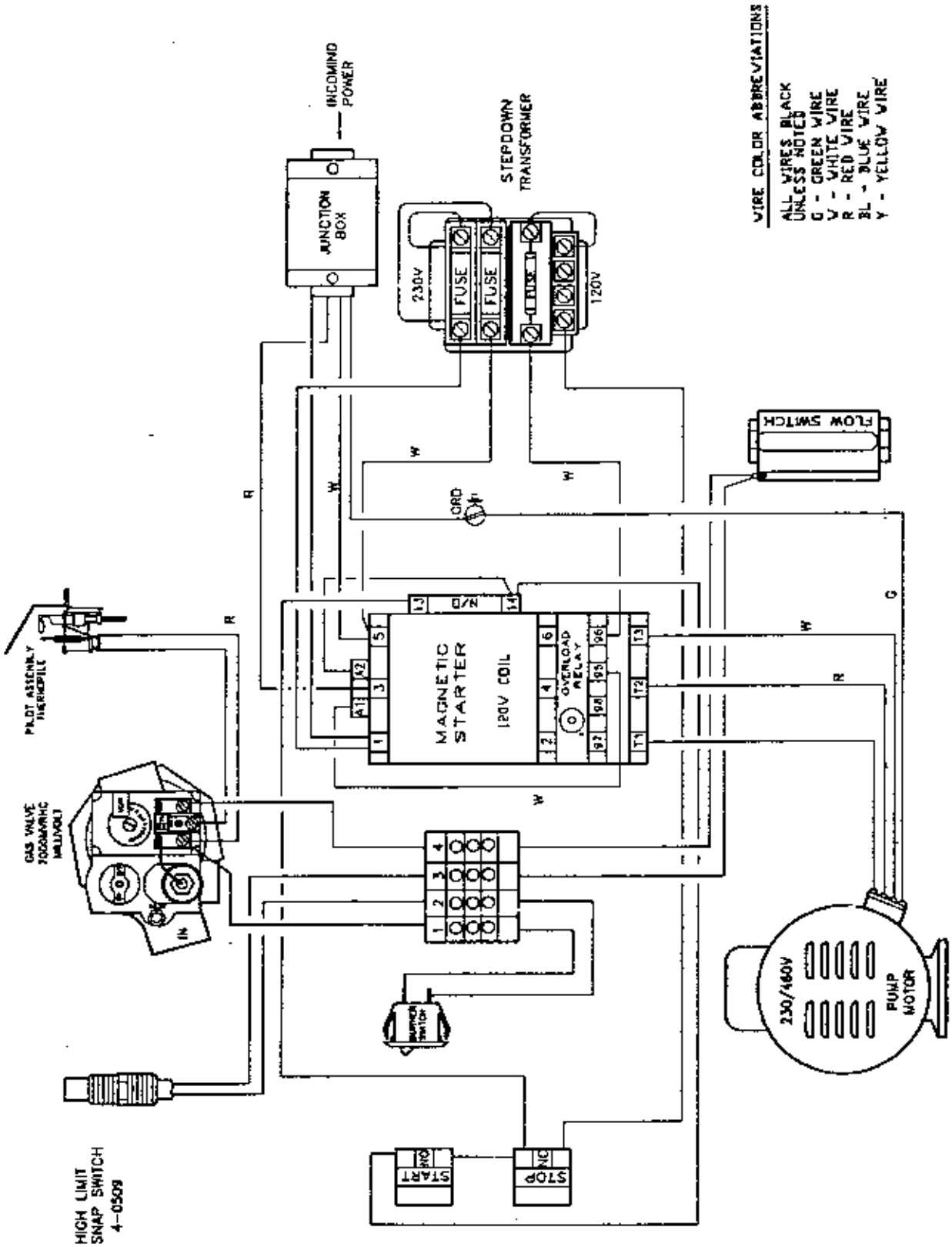


WIRING DIAGRAM • ENG/ELP3-1500, ENG/ELP 4-2000

230V 1PH



WIRING DIAGRAM • ENG/ELP4-2000, ENG/ELP4-3000
230V 3PH/460V 3PH



BURNER SPECIFICATIONS

MODEL	BURNER ASSEMBLY	JET SIZE	GAS VALVE	PILOT ORIFICE CONVERSION
ENG 3-1100	X-44	#56	7000 MVRHC	3/4 X 3/4
ENG 3-1500	X-44	#56	7000 MVRHC	3/4 X 3/4
ENG 4-2000	X-44	#54	7000 MVRHC	3/4 X 3/4
ENG 4-3000	X-44	#54	7000 MVRHC	3/4 X 3/4
ELP 3-1100	X-44	#69	7000 MVRHC	3/4 X 3/4
ELP 3-1500	X-44	#69	7000 MVRHC	3/4 X 3/4
ELP 4-2000	X-44	#65	7000 MVRHC	3/4 X 3/4
ELP 4-3000	X-44	#65	7000 MVRHC	3/4 X 3/4
ENG/ELP3-300	X-44	54/63	700 MVRHC	3/4 X 3/4

PULLEY and BELT CHART

MODEL	PUMP	PUMP PULLEY	PULLEY BUSHING/ BORE	PUMP RPM	MOTOR	MOTOR PULLEY	PULLEY BUSHING/ BORE	MOTOR RPM	BELT SIZE
ENG/ELP3-1100	TT9071	NA	NA	3450	2 HP 1Ø	NA	NA	3450	NA
ENG/ELP 3-1500	TT9071	NA	NA	3450	3 HP 1Ø	NA	NA	3450	NA
ENG/ELP4-3000	TS-2021	2BK80H	24mm	1050	7-1/2 1Ø, 3Ø	2BK45H	H X 1-3/8"	1725	BX 35(2)
ENG/ELP4-2000	EZ-2542S	2AK[illegible]H 5/4	24mm	1725	5 HP 1Ø/5 HP 3Ø	2AK[illegible]H 5/4	H x 1-1/8"	1725	AX [illegible](2) 3_3
ENG/ELP3-300	TT9071	NA	NA	3450	1.5 HP 1Ø	NA	NA	3450	NA

ENG/ELP MODEL SPECIFICATIONS

MODEL		ENG3-1100	ENG3-1500	ENG4-2000	ENG4-3000	ENG3-300
DISCHARGE	GPM	2.8	2.8	3.5	3.8	2.5
OPERATING PRESSURE	PSI	1000	1500	2000	3000	300
OPERATING TEMPERATURE§		200°F	200°F	200°F	200°F	310°F
BTU PER HOUR		280,000	280,000	400,000	400,000	440,000
BURNER TYPE		Natural Draft				
FUEL TYPE		*NG, LPG*				
BURNER ASSEMBLY		Ring type w/aspirating spud				
	Volts	Millivolt control				
	Stack Size	10	10	10	10	10
COILS	(ASTM A53 CLOSE COILING)	1/2" Sch 80				
PUMP		Tri-plunger				
PUMP MOTOR	HP	2	3	5HP-3Ph/6HP-1/Ph	7.5	1.5
	Volts	D*	A*	A, B, C*	A, B, C*	D
	Amps	18	14	A-28, B-15, C-7	A-36, B-25, C-15	12
HOSE		40' Single Wire Braid				Steam
SHUT-OFF GUN		Standard				NA
INSULATED WAND 42"		Standard				NA
NOZZLE		15°	15°	15°	15°	Steam
CHEMICAL CONTROL		Precision Metering Valve				
CONTROL SWITCH		Manual		Manual/Magnetic†		Manual
PAINT		Textured Polyester				
LENGTH/WIDTH/HEIGHT		44"/35"/47"				
NET WEIGHT	lbs	495	502	528	535	495

* Ac: 230V, 1 Ph Bc: 230V, 3 Ph Cc: 460V, 3 Ph Dc: 120V, 1Ph
** Varies with incoming water temperature
+ CSA Approved † CGA Approved Note: CGA does not approve Liquid Propane

LP units do not include propane tank

Discharge water temperature is dependent on ambient water temperature. (50°F ambient temp. + 150°F rise will produce 200F° discharge temperature.)

Note: There may be slight variances in gallonage and pressures due to variances allowed by manufacturers of our machine components. We attempt to keep our machine performance ± 5% of listed specifications.

BASIC FACTS

BASED ON 60° F	PROPANE	BUTANE
Formula	C_3H_8	C_4H_{10}
Vaporization Point (°F)	-43.7	31.1
Specific Gravity (Vapor)	1.522	2.006
Specific Gravity (Liquid)	0.508	0.584
Lbs. Per Gallon (Liquid)	4.23	4.87
B.T.U. Per Cubic Foot (Vapor)	2.563	3.390
B.T.U. Per Lb. (Vapor)	21.663	21.308
B.T.U. Per Gallon (Liquid)	91.740	103.830
Cubic Feet Per Lb. (Liquid)	8.607	6.53
Cubic Feet Per Gallon (Liquid)	36.45	31.8
Octane Number	125	91
Molecular Weight	44.09	58.12

To calculate running cost:

1 cubic ft./1,000 BTU

100 cubic ft./Therm

Therm/hour

50¢/Therm

Example: Using natural gas

400,000 BTU Machine

400 cubic feet

4 Therms/hour

4 x .50 = $2.00/hour to run

PRESSURE EQUIVALENTS

Simply stated, pressure is the force exerted by a gas or liquid attempted to escape from a container. It is useful to know how strong this "attempt to escape" is. Pressure can be measured with a manometer or with a pressure gauge. At the lower levels, it is expressed in "inches of water column", i.e., 11" W.C. Higher pressures are expressed in terms of the force exerted against a square inch of area. For example, 125 lbs. per square inch (125 PSI).

1" Water Column	=	50 oz./sq. in.	11" Water Column	=	6.35 oz./sq. in.
11" Water Column	=	4 lb./sq. in.	1 lb./sq. in.	=	27.71" Water Column
1 lb./sq. in.	=	2.04" Mercury	1" Mercury	=	.39 lb./sq. in.
1 Std. Atmosphere	=	14.73 lbs./sq. in.			

SUGGESTED MAINTENANCE SCHEDULE

x = Change • = Inspect	8 Hrs.	25 Hrs.	50 Hrs.	100 Hrs.	500 Hrs.	Yearly
PUMP						
Oil			x		x	
BURNER						
Pilot						•
Burner Jets						•
MISCELLANEOUS						
Spray Nozzles				•		
Hose (Kinks, Leaks)		•				
Belt Tension			•			
Float Tank Strainer				•		
Chemical Strainer				•		
Coil (Scale Build Up)				•		
ELECTRIC MOTOR						
Grease Bearing						Regrease