

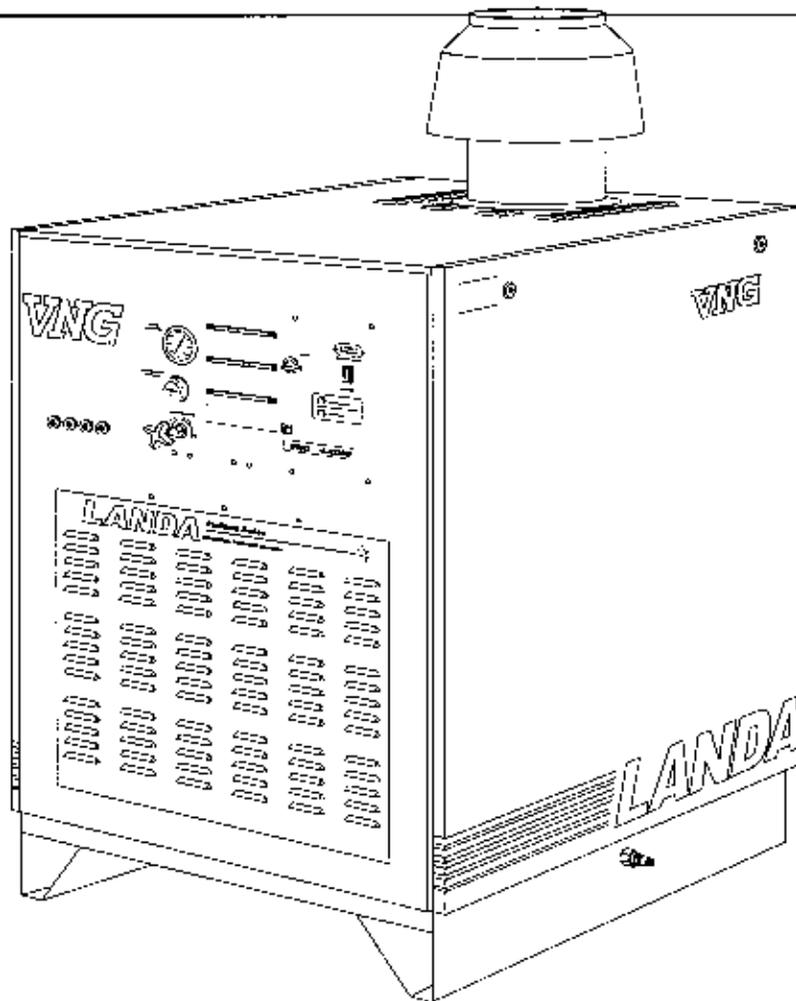
LANDA

Platinum Series
INDUSTRIAL PRESSURE WASHERS



VNG/VLP SERIES OPERATOR'S MANUAL

- | | | |
|---------------------|---------------------|---------------------|
| ■ VNG/VLP3-11021D | ■ VNG/VLP4-30021A | ■ VNG/VLP6-30021C |
| ■ VNG/VLP3-11021D/R | ■ VNG/VLP4-30021A/R | ■ VNG/VLP6-30021C/R |
| ■ VNG/VLP4-20021A | ■ VNG/VLP4-30021B | ■ VNG/VLP6-30021F |
| ■ VNG/VLP4-20021A/R | ■ VNG/VLP4-30021B/R | ■ VNG/VLP6-30021F/R |
| ■ VNG/VLP4-20021B | ■ VNG/VLP4-30021C | ■ VNG/VLP8-25021B |
| ■ VNG/VLP4-20021B/R | ■ VNG/VLP4-30021C/R | ■ VNG/VLP8-25021B/R |
| ■ VNG/VLP4-20021C | ■ VNG/VLP4-30021F | ■ VNG/VLP8-25021C |
| ■ VNG/VLP4-20021C/R | ■ VNG/VLP4-30021F/R | ■ VNG/VLP8-25021C/R |
| ■ VNG/VLP4-20021F | ■ VNG/VLP6-30021B | ■ VNG/VLP8-25021F |
| ■ VNG/VLP4-20021F/R | ■ VNG/VLP6-30021B/R | ■ VNG/VLP8-25021F/R |



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For technical assistance or the Landa Dealer nearest you, call 800-LANDA-4-U (800-526-3248)

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INTRODUCTION

Thank you for purchasing a Landa Pressure Washer.

This manual covers the operation and maintenance of the VNG/VLP3-11021D, 3-11021D/R, 4-20021A, 4-20021A/R, 4-20021B, 4-20021B/R, 4-20021C, 4-20021C/R, 4-20021F, 4-20021F/R, 4-30021A, 4-30021A/R, 4-30021B, 4-30021B/R, 4-30021C, 4-30021C/R, 4-30021F, 4-30021F/R, 6-30021B, 6-30021B/R, 6-30021C, 6-30021C/R, 6-30021F, 6-30021F/R, 8-25021B, 8-25021B/R, 8-25021C, 8-25021C/R, 8-25021F, and 8-25021F/R 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 VNG/VLP Series was designed for commercial duty 8 hours per day, 5 days per week.

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

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 it if unit is resold.

When ordering parts, please specify model and serial number.

IMPORTANT SAFETY INSTRUCTIONS



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

1. Read the owner's manual thoroughly. Failure to follow instructions could cause malfunction of the unit 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.



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

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



WARNING: Keep water spray away from electrical 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: Equipment can produce a high pressure stream of fluid that can pierce skin and its underlying tissues, leading to serious injury and possible amputation.

6. High pressure developed by these units can cause personal injury or equipment damage. Use caution when operating. Do not direct discharge stream at people, or severe injury and/or death may result. This machine is to be used only by qualified operators.

Do not direct discharge stream at people, or severe injury and/or death may result. This machine is to be used only by qualified operators.

7. Never make adjustments on machine while in operation.



WARNING: High pressure can cause paint chips or other particles to become airborne and fly at high speeds.

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



WARNING: Risk of asphyxiation. Use this product 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 gun should not be operated with the trigger in the off position for extensive periods of time as this may cause damage to the pump.

11. Protect from freezing.
12. Be certain all quick coupler fittings are secured before using pressure washer.
13. Do not allow acids, caustic, or abrasive fluids to pass through the pump.
14. Inlet water must be cold.
15. Do not allow CHILDREN to operate the pressure washer at any time.
16. The best insurance against an accident is precaution, and knowledge of the machine.
17. Do not operate this product when fatigued or under the influence of alcohol or drugs. Keep operating area clear of all persons.
18. Do not replace LP Tank while unit is running. Serious injury could result.



WARNING: Use vapor fuel only.

19. The VLP models are designed to run on vapor propane fuel. Do not use liquid fuel. Have a qualified serviceman install and service your equipment.

20. Never expose a spark or flame where there may be unburned gas present.

21. L.P. gases are heavier than air and will spill out on the floor. Therefore always provide adequate space and ventilation around these units. Install the machine 18" above the floor.
22. Landa will not be liable for any changes made to our standard units, or any components not purchased from Landa.

23. Do not overreach or stand on unstable support. Keep good footing and balance at all times.
24. Follow the maintenance instructions specified in the manual.
25. When making repairs disconnect from electrical source and shut off gas valve.
26. Turn burner off and cool to 100° before turning machine off.



WARNING: If you smell gas, shut off the gas supply to the appliance

27. Extinguish any open flame, and test all joints with a soap solution. If the odor persists, call your gas supplier immediately.

28. This machine must be attended during operation.

29. Not suitable for connection to Type B gas vent if the stack temperature exceeds 243° C (470° F).
30. A draft hood shall be installed if this machine is going to be permanently installed and vented to the outside of the building.

INSTALLATION

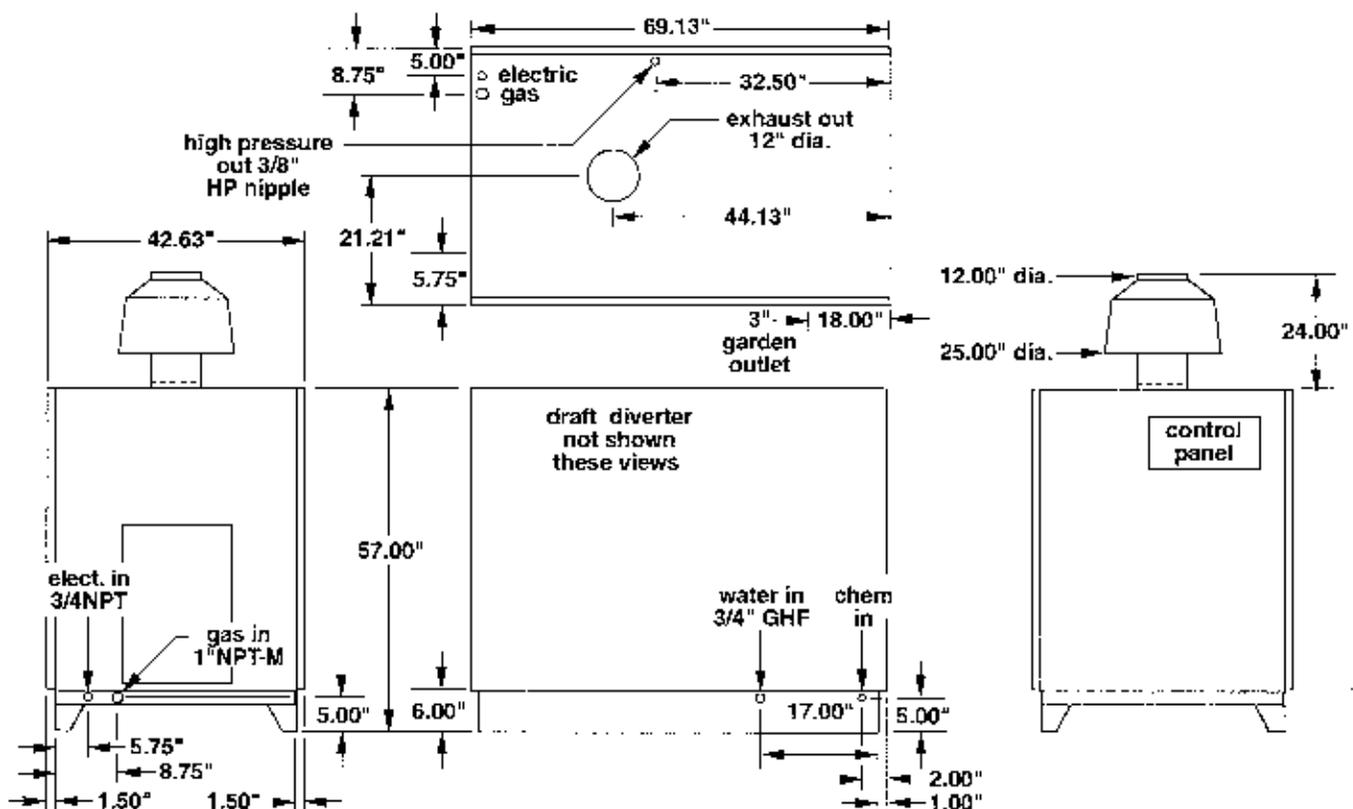
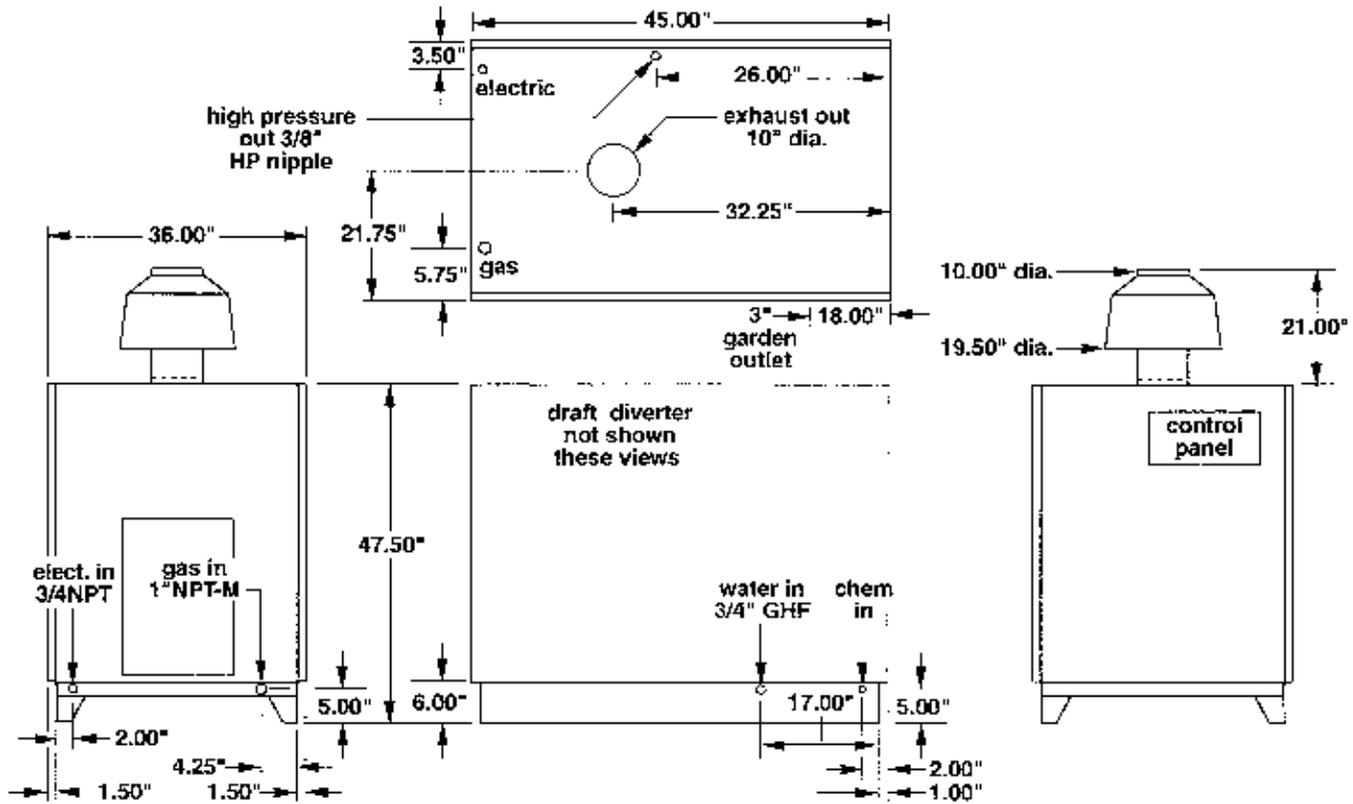
Place machine in a convenient location providing ample support, draining and room for maintenance.

Location:

This machine is certified for indoor installation. Its location should protect the machine from damaging environmental conditions, such as wind, rain and freezing.

1. The machine should be run on a level surface where it is not readily influenced by outside sources such as strong winds, freezing temperatures, rain, etc. The unit should be located considering accessibility of the components and the refilling of detergents, adjustments and maintenance. Normal precautions should be taken by the operator of the unit to prevent excess moisture from reaching the power unit or electrical controls.
2. It is recommended that a partition be made between the wash area and the machine to prevent direct spray from the gun from coming in contact with the machine. Excess moisture reaching the pressure washer or the electrical controls will reduce the life of the unit and may cause electrical shorts.
3. During installation of the unit, beware of poorly ventilated locations or areas where exhaust fans may cause an insufficient supply of oxygen. Sufficient combustion can only be obtained when there is a sufficient supply of oxygen available for the amount of fuel being burned.

VNG Installation Guide



If it is necessary to install a unit in a poorly ventilated area, outside fresh air may have to be piped to the burner and a fan installed bringing the air into the area

4. Do not locate near any combustible material. Keep all flammable material at least 20 feet away.

Allow enough space for servicing the unit.

Local code will require certain distances from floor and walls. (Two feet away should be adequate.)

AVOID SMALL LOCATIONS OR AREAS NEAR EXHAUST FANS.

Gas Codes:

Confer with local gas company and with proper municipal officials regarding any specific code or regulations governing the installation. The installation must conform to local codes.

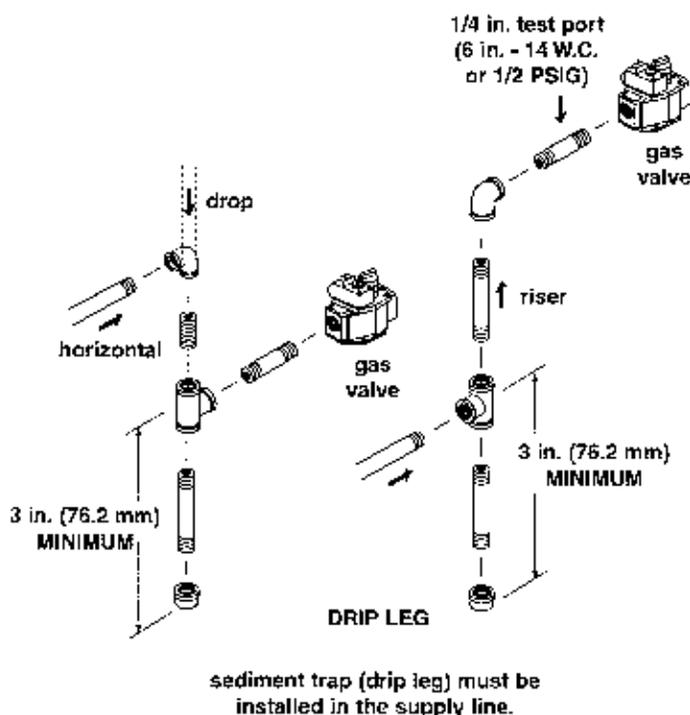
Electrical:

The unit, when installed, must be electrically grounded in accordance with 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

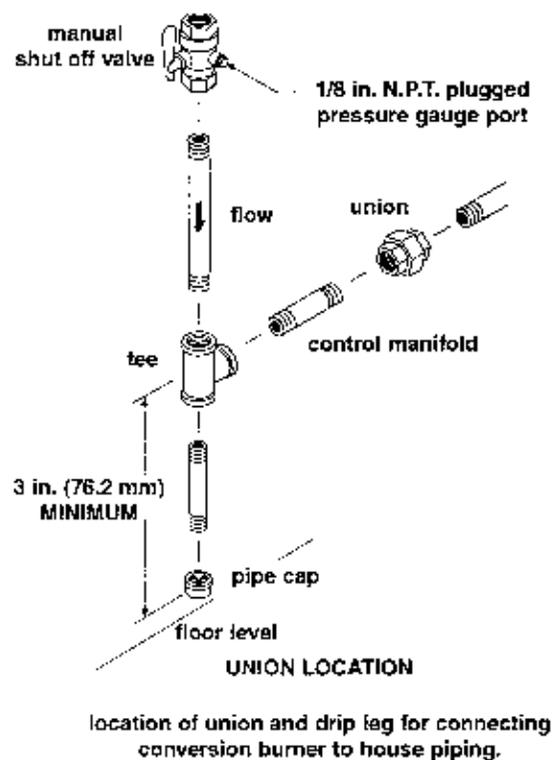


A union shall be installed in the gas line adjacent to and upstream from the control manifold and downstream from the manual main shut-off valve.

A 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



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 installed 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 - 59'	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 Regulator	Pipe Size
0 - 59'	1-1/2" 1 PS
50' - 100'	2" 1 PS
100' - 200'	2-1/2" 1 PS

Venting:

Because this machine is installed indoors, regulations or ventilation concerns may call for a chimney or furnace pipe.

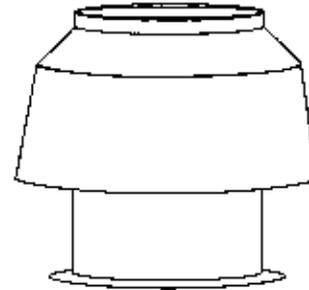
When venting the unit, if the machine is to be in an enclosed area with a stack on it, be sure the flue pipe is the same size as the stack on the machine. Poor draft will cause the unit to soot and not operate efficiently. When placing the unit for installation, keep in mind that the unit should be positioned 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 down draft. The flue pipe of a gas fired unit should be installed with a down draft diverter.

Input - BTU Per Hour	Draft Hood & 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

Draft Diverter:

The draft diverter should be installed at least one (1) foot above the heating coil. The diverter serves to sever the chimney effect created in all sections of flue 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



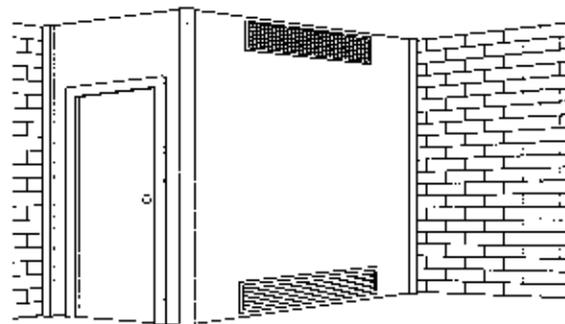
standard on all machines

When the pressure washer 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 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

ventilating air opening
1 square inch for each
1000 BTU per hour input.



ventilating air opening
1 square inch for each
1000 BTU per hour input.

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.

Inspection and Testing Gas Piping:

The building structure should not be weakened by installing 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.

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. The gas valve pressure regulator can be adjusted between 3" and 4" wc. natural gas or 6" and 11" wc for propane.

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 gas back on to test or operate.
4. **DO NOT** connect pressure washer 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 the gas flow.
10. In case main burner fails 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

	YES	NO
Has gas supply been inspected by an authorized contractor to meet local codes?		
Is unit protected from downdraft and excessive wind?		
Is unit shielded from moisture or water spray?		
Is the voltage correct and are the circuit breaker and supply cord adequate according to specifications and serial plate notation?		
Is the unit electrically grounded?		
Is there ample water supply?		
Have all flammable liquids or gases been removed from installation location?		
Is there adequate gas supply for the BTU rating of the burner?		
Is incoming gas supply pressure to unit between 6"-14" water column inches or 1/2 psig?		
Has the proper gas regulator been installed for pressure and volume?		
Is the unit properly vented to allow adequate air flow?		
Are the propane tanks large enough, according to the rating of the unit, to prevent freezing?		
Have gas lines been checked for gas leaks?		
Have all operators using this unit been instructed properly and have they read the manual?		
Has the unit been installed according to operator's manual instructions?		

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 an electronic ignition system. 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 turn the gas control. 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. Forced 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.



CAUTION: This machine is equipped with an electronic ignition system. Lighting of the pilot is accomplished through electronic spark ignition. Do not attempt to light the appliance manually as a burn injury or electrical shock may result.

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

OPERATING INSTRUCTIONS



1. **STOP!** Read operator's 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 water supply hose to the inlet connector and turn water on. Check for water leaks and tighten as needed.
5. Turn on the main gas supply and turn the gas valve control knob into the "ON" position (see page 9).
6. Close the steam knob and chemical valve by turning clock wise and setting the temperature control knob between 200° - 225°.
7. Attach the desired high pressure nozzle into the wand quick coupler by pulling the coupler collar back and inserting the nozzle. Secure nozzle by pushing the coupler collar forward.
8. Turn the pump switch on and pull the trigger on the spray gun to activate the pressure switch which will then start the machine. When spray gun is closed more than one (1) minute, a time delay feature will turn the machine off.
9. For hot water, push the burner switch to the ON position and pull the trigger on the spray gun. Sparking begins, pilot gas ignites and then the ignitor/sensor will turn the main burner on. Optional remote control requires the pump switch to be turned ON before the burner and chemical switches will turn on.
10. To apply detergent, open the chemical valve counter clockwise making sure that the chemical pick up tube is in the chemical solution and not sucking air. On optional remotes the chemical switch needs to be turned to the OFF position then turned to the ON position to activate the chemical solenoid.
11. **To Stop:** Turn the burner switch off and place the chemical pick-up tube into fresh water. Open the chemical valve and trigger gun allowing chemical lines to be flushed and the burner to cool. Otherwise, coil damage will result.
12. When steam is needed, remove the side panel and turn the steam knob counterclockwise. Then turn the temperature adjustment knob to 275°
13. After water has cooled, turn pump switch to OFF position. If the machine is going to be off for an extended period of time, put the manual valve on the gas valve into the OFF position.
14. Turn the water off. Protect from freezing.

PREVENTIVE MAINTENANCE

1. Check to see that the water pump is properly lubricated.
2. Follow winterizing instructions to prevent freeze damage to the pump and coils.
3. Always neutralize and flush chemical from system after use.
4. If water is known to be high in mineral content, use a water softener in your water system or de-scale as needed.
5. Do not allow acidic, caustic or abrasive fluids to be pumped through the system.
6. Always use high grade quality Landa cleaning products.
7. Never run pump dry for extended periods of time.
8. Periodically delime coils as per instructions.

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

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

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

GENERAL OPERATING TECHNIQUES

If dirt comes off relatively easy and no grease and oil are present, cleaning with cold water will normally suffice. However, when grease and oil are present, hot water will greatly speed up the process.

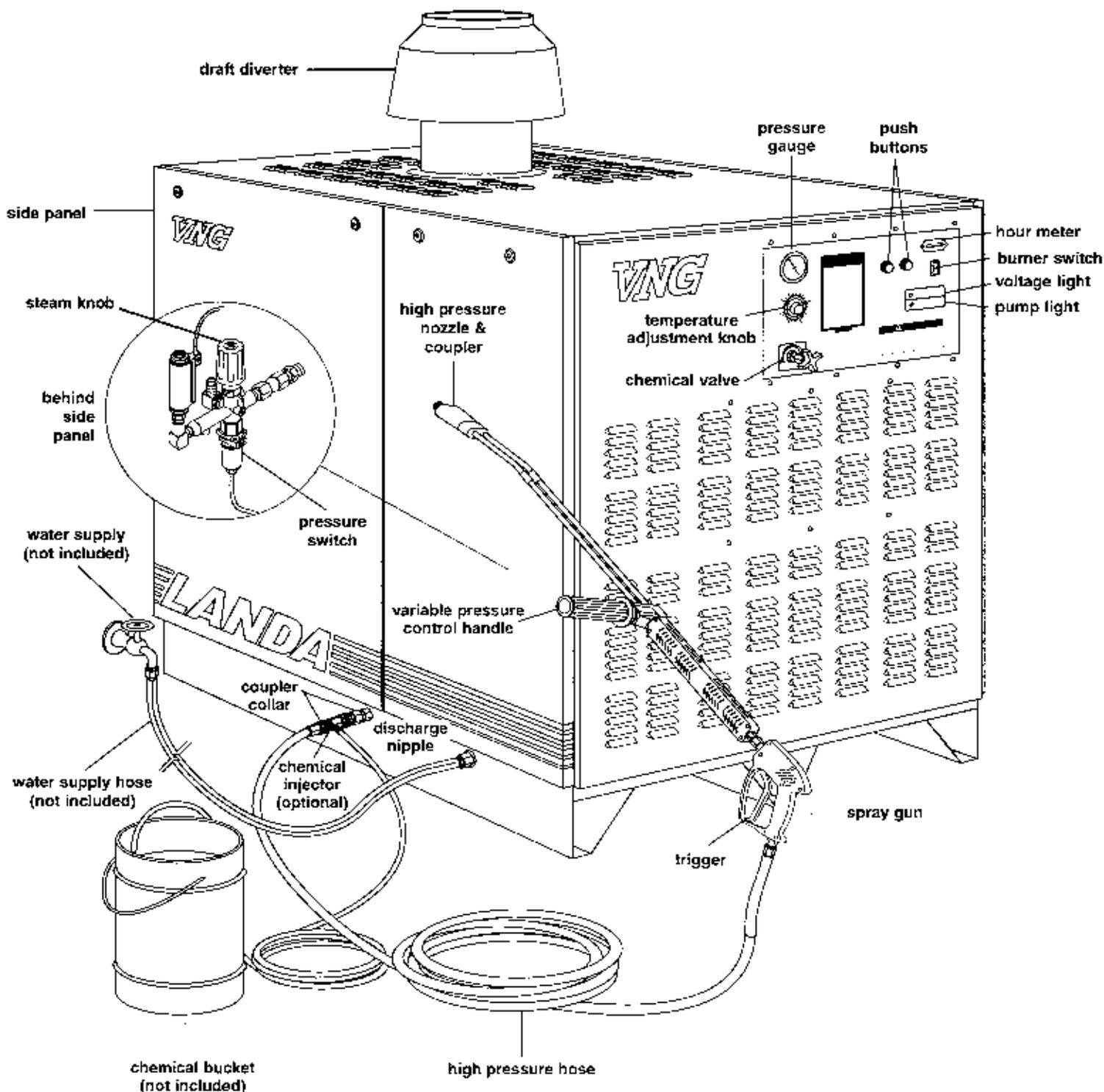
Clean with the spray nozzle a foot or so from the surface being cleaned. For more difficult cleaning, move the nozzle in closer.

If the unit is equipped with a shut-off gun and various nozzle patterns, use the wide patterns for easy soil removal jobs and the narrow patterns on the more difficult jobs or for tight areas such as cracks and holes.

In most cases, faster results and better chemical economy will be obtained by applying the chemical and letting it "set" for a few minutes prior to rinsing. This enables the chemical to do its soil penetrating and loosening work.

Most cleaning work terminates with a high pressure rinse as part of the normal cleaning procedure. In some cases, however, the last operation may be application of a chemical or detergent (sanitizing, for example). After such work, run the unit for 20-30 seconds to clear pump and lines.

VNG-L W/O REMOTE



MAINTENANCE AND SERVICE

Spray Nozzles

Each unit is equipped with one or more spray nozzles, depending on model. Different spray nozzles are calibrated for each machine depending on the flow and pressure of that particular model. Spray nozzles vary in bore size and angle of spray. Popular spray angles are 0°, 15°, 25°, 40°. When ordering, please specify size and angle of nozzle. Nozzle size for each machine is located on the serial plate.

Unloader Valves:

Unloader valves relieve pressure in the line when a shut-off gun is closed. Unloader valves are preset and tested at the factory before shipping. Occasional adjustment of the unloader may be necessary to maintain correct pressure. (See section in manual on unloaders for correct procedure in adjusting valve.)

Winterizing Procedure:

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

During winter months, when temperatures drop below 32° F, protecting your machine against freezing is necessary. Siphoning a small amount of antifreeze into the system is recommended. This is done by pouring a 50:50 mix of antifreeze and water into the float tank and then siphoning 100% antifreeze through the chemical 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 the Trouble Shooting Chart for low pressure. If by referring to the chart, the trouble is found to be either the unloader or the 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 the 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 the dipstick found on the top of the pump or by the red dot visible through the oil gauge window. Oil should be maintained at that level.

HEATING COIL

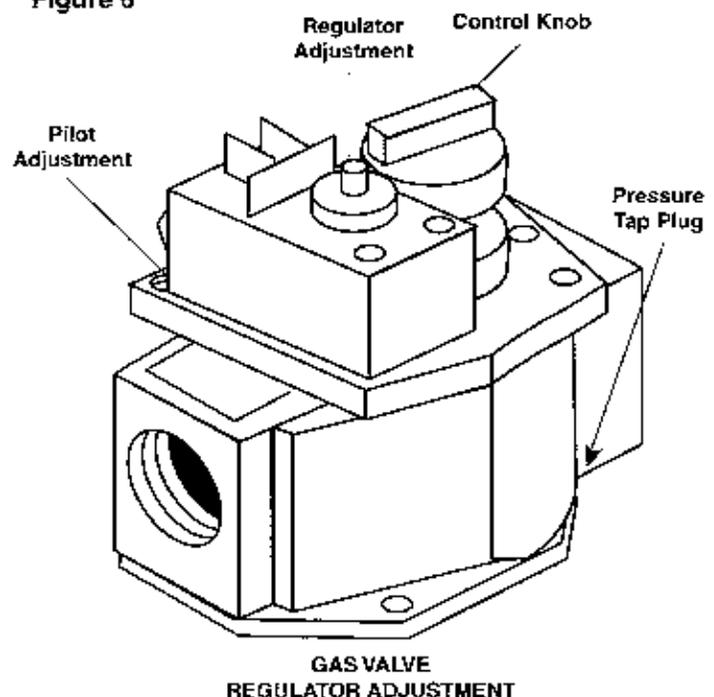
Condensation from Heating Coil

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

To Check Water Heater Coil for Leaks:

With the main burner "OFF" start machine and allow it to run a few minutes. Check into the burner compartment with a drop light or flashlight. If no leaks are visible, then water dripping from coil is from condensation in.

Figure 6



Deliming Coil:

Periodic coil is recommended.

1. Fill a container with 4 gallons of water, then add 1 lb. of deliming powder. Mix thoroughly.
2. Remove nozzle from gun assembly and put gun into container.

3. Attach a short section (3-5 ft.) of garden hose to machine to siphon solution from an elevated container or add mixture to the float tank. Turn pump switch on allowing solution to be pumped through coil and back into the container. Solution should be allowed to circulate 2-4 hours.
4. After circulating solution flush entire system with fresh water. Reinstall nozzle in gun.

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 a small screwdriver, rotate the adjustment screw clockwise to increase or counterclockwise to decrease gas pressure.
4. Replace regulator adjustment screw cap (see Figure 6).

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.)

Pressure Relief Valve

Each unit is equipped with a relief valve to relieve pressure in the system when higher than normally operating pressures are encountered. If operating pressure of unit is found to be normal and relief valve continues to leak, repair or replace the valve. **CAUTION:** Relief valve can become obstructed by deposits and must be unscrewed at least once per year to allow discharge.

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 vapor propane fuel 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 the unit. A high pressure regulator should be installed on the 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 vapor gas. As gas is used from the propane cylinder, the liquid in the cylinder boils to maintain vapor 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 vapor 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° F, on the cold cylinder or by manifolding two propane bottles together to increase total vaporization capacity. It is recommended that a minimum 100 lb. vapor 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 an Intermittent Pilot Ignition System. This System is designed to eliminate the need for a constant burning pilot. Lighting of the pilot is accomplished through electronic spark ignition each time the burner and flow switch call for heat. The pilot is not burning when there is no call for heat. Do not attempt to light the appliance manually as a burn injury or electrical shock may result. The pilot light will remain on and the main gas valve is turned off when the spray gun is closed.

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 the 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 44 on page 20 on the VNG-S units.) 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 coil by whatever means are available for the particular system the water heater is used on.

To Adjust Pressure Regulator

Adjustment of the Pressure Regulator is not normally necessary since it is preset at the factory. However, field adjustment may be accomplished as follows:

1. Manometer attachment may be accomplished at the pressure tap plug.
2. Remove regulator adjustment screw cap (see Figure 6).
3. With small screwdriver, rotate adjustment screw "clockwise" to increase, or "counterclockwise" to decrease pressure.
4. Replace regulator adjustment screw.

TROUBLESHOOTING

BURNER		
PROBLEM	POSSIBLE CAUSE	SOLUTION
FLOW & BURNER SWITCH ON. NO SPARK, NO PILOT GAS	A. No main power	With power switch on, open trigger gun and set your test meter to the 24 volt scale. Probe terminals TH and TR. If you do not read 24 volts, the problem is not the ignition system. Perform normal system checks of main power, transformer, thermostat, and the limit control. If you do read 24 volts at TH and TR, the problem is in the ignition system. Check for loose or defective wiring. If wiring is good, replace the ignition control unit.
	B. Faulty transformer	
	C. Faulty burner & flow switch	
	D. Faulty ignition control unit	
HAVE SPARK, NO PILOT GAS FLOW	Main gas supply turned off	Set test meter to 24 volt scale.
		1. Be sure main gas valve (gas cock or selector arm) is turned on.
		2. With gas on and system sparking, probe terminals PV and TR. If pilot gas does not flow with 24 volts at these terminals, replace gas valve.
		3. If you do not read 24 volts at terminals PV and MV/PV, replace the ignition control unit.
HAVE PILOT GAS, NO SPARK	A. Defective ignitor/sensor and/or its wiring.	Set test meter to ohm scale
		1. Disconnect the wire from the IGN terminal on the ignition control unit.
	B. Faulty ignition control unit	2. Touch one meter probe to the tip of the ignitor/sensor rod in the pilot. Touch the other probe to the quick-connect at the other end of ignitor/sensor wire.
		3. If you have continuity from the tip of the ignitor/sensor rod to the connector and no spark, replace the ignition control unit.
		4. If you do not have continuity through the wire and the ignitor/sensor, check for a loose wire connection in the wire. Repair as needed.
		5. Check to see if spark shorts to furnace through a cut in the ignitor wire.

TROUBLESHOOTING
Burner Continued

PROBLEM	POSSIBLE CAUSE	SOLUTION
HAVE PILOT FLAME, MAIN BURNER WILL NOT TURN ON	Faulty main valve coil in the gas valve	Set test meter to 24 volt scale
	Faulty ignitor/sensor and/or its wiring	With pilot flame on ignitor/sensor, probe terminals MV and MV/PV on the ignition control unit. If you read 24 volts here, but not at the gas valve, there is a loose wiring connection. Repair or replace as needed.
	Ground wire not attached to machine chassis	If you do read 24 volts at MV and MV/PV and the pilot flame is impinging on the ignitor/sensor rod, the problems may be:
	Faulty ignition control unit	a. Faulty ignitor/sensor and/or its wiring.
		b. Faulty ignition control unit.
		Set test meter to the ohm scale. Turn burner switch off.
Check continuity through the green ground wire and its connections.		
	Reconnect the ignitor/sensor wire and the ground wire.	
	Turn burner switch on. With the pilot burning and the flame on the ignitor/sensor rod, the main burner should turn on. If it does not, replace the ignition control unit.	
SHORT-CYCLING OF MAIN BURNER. MAIN BURNER TURNS OFF BEFORE THE BURNER SWITCH OR FLOW SWITCH IS TURNED OFF	Draft condition pulls flame away from ignitor/sensor rod.	Check the thermostat by bypassing at terminals 6 & 7.
		Set thermostat high. With main burner on, observe the pilot flame impingement on the ignitor/sensor.
	Faulty thermostat or water temperature is too high	If pilot flame is small and draft condition pulls flame from ignitor sensor rod, the burner will turn off and then on again. a. Adjust pilot flame higher or clean pilot orifice b. Bend ignitor/sensor rod closer to pilot flame
		If flame impingement on the ignitor/sensor is stable and the system short-cycles, check the limit switch
		Set test meter to 110 volt scale a. When the system cycles off, probe the switch terminals of the limit switch. b. If you read 24V across the switch terminals the limit switch is open. Replace the limit switch.
	A pilot flame set too high will also cause burner to short cycle. Pilot flame lifts over ignitor/sensor.	

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	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
	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 5 for sizing of gas lines
	Low gas pressure	Increase gas pressure to machine
	Improper pressure regulator	Specify BTU, building gas pressure and 11" wc to machine for correct sizing of regulator
	Low gas valve pressure	Increase gas pressure as described on page 12
	Soot buildup on coils not allowing heat transfer	Clean coils
	Improper burner nozzle	See specifications on page 90

TROUBLESHOOTING

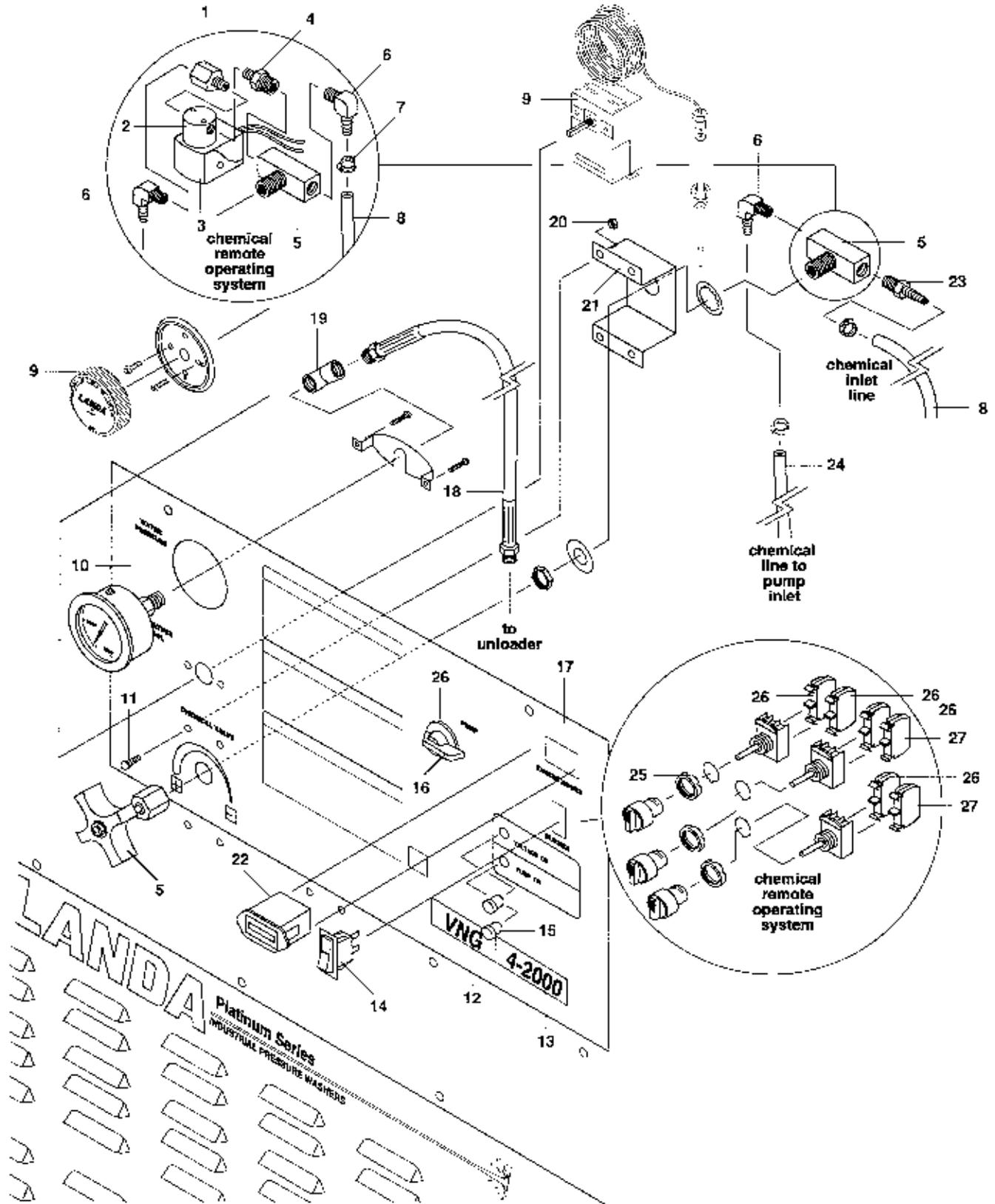
PROBLEM	POSSIBLE CAUSE	SOLUTION
WATER TEMPERATURE TOO HOT	Incoming water to unit warm or hot	Lower incoming water temperature
	Gas pressure too high	See specifications for proper gas pressure
	Chemical line sucking air	Tighten all clamps Check chemical lines for holes
	Defective high limit switch	Replace
	Incorrect burner nozzle size	See specifications on page 90 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	
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

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
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 valves defective	Replace or repair

VNG CONTROL PANEL

(All)



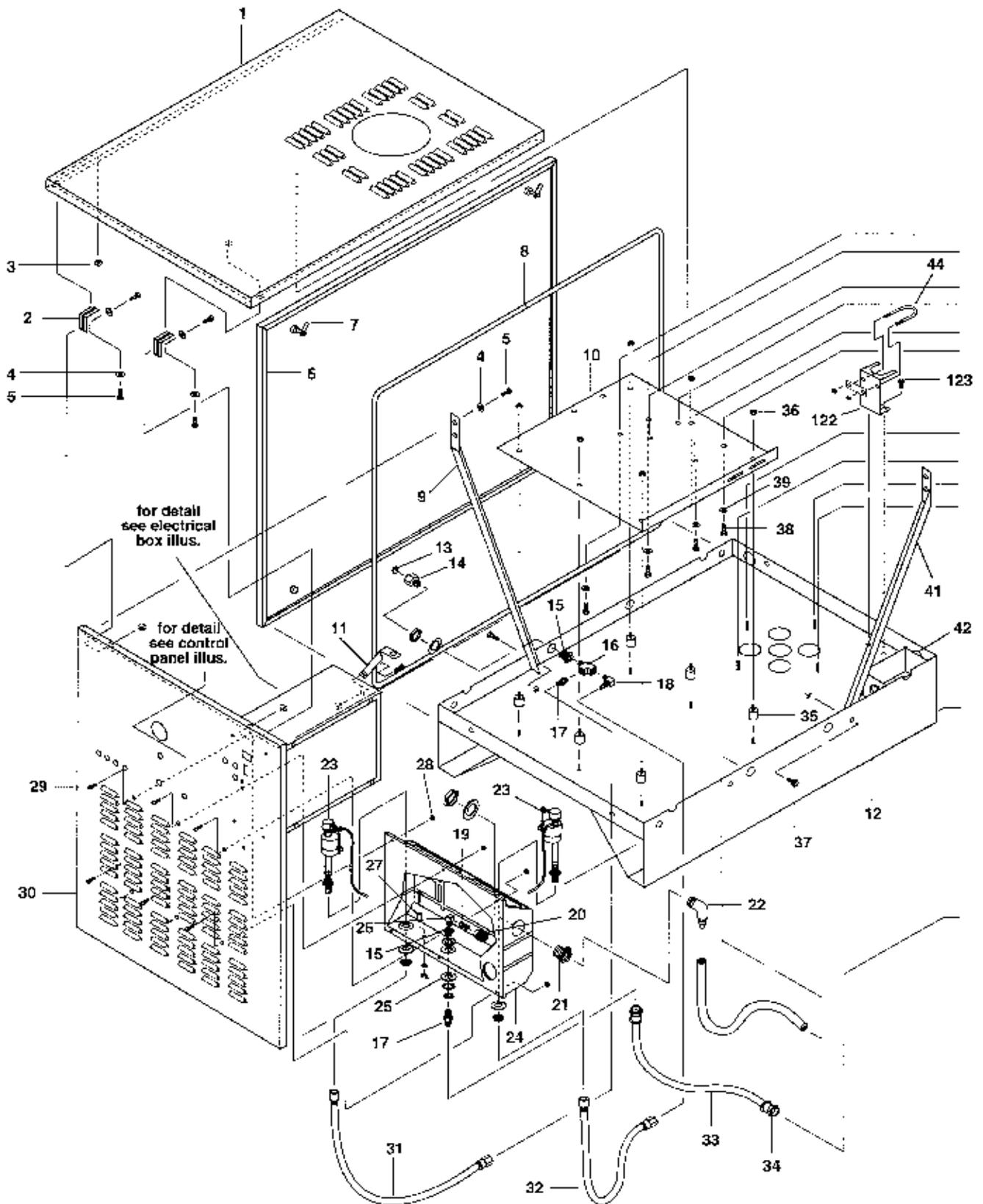
VNG CONTROL PANEL

(All) • PARTS LIST

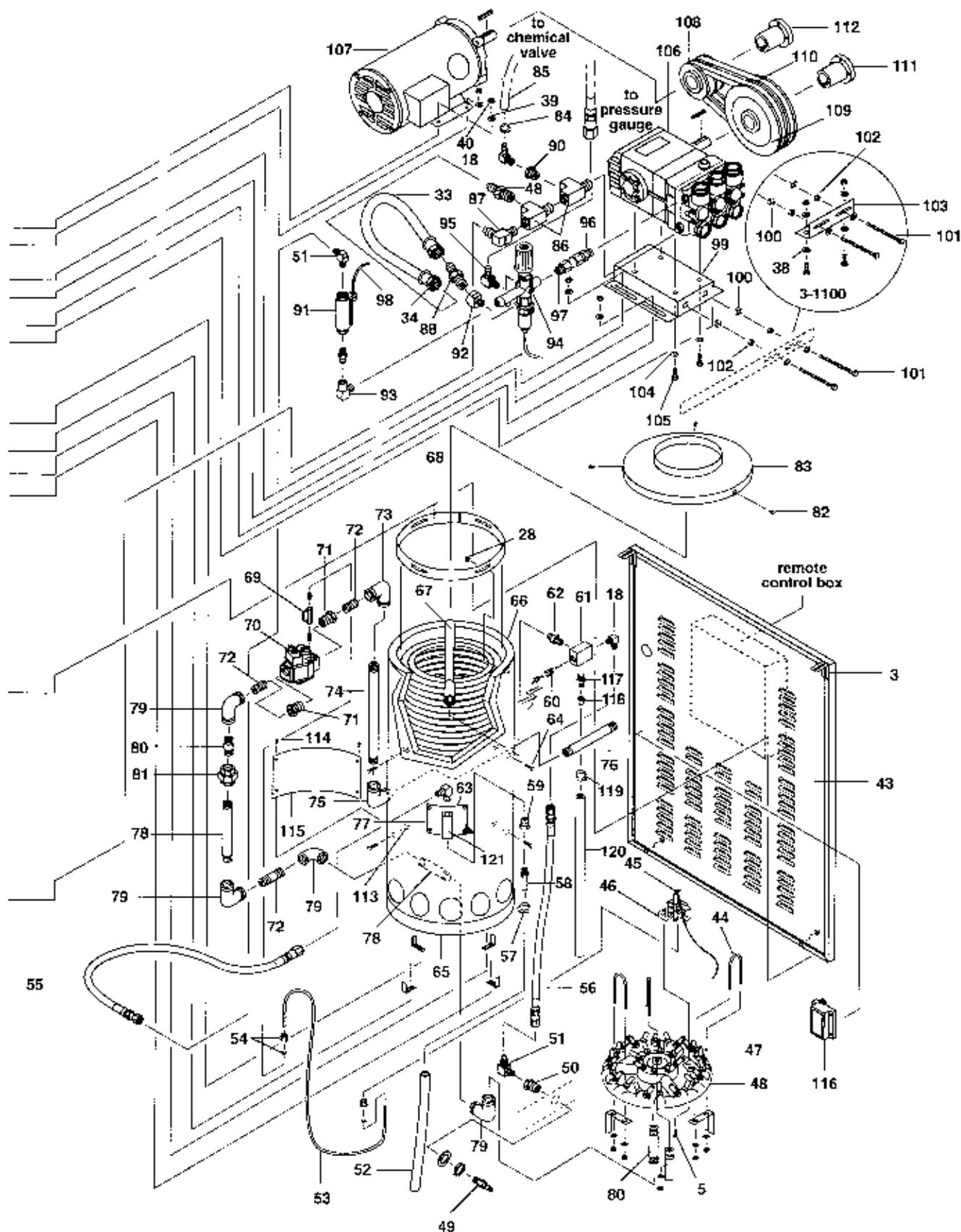
ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	2-11031	Adapter,, 1/4" x 1/8" (Remote only)	1	13	95-07163012	Panel, Control, VNG-Large	1
2	6-140159	Valve, Chemical Solenoid, Less Coil (Remote Only)	1	14	6-020251	Switch, Corvette 120V & 220V	1
3	6-140160	Solenoid Coil, 120V (Remote Only)	1	15	6-02053	Light, Indicator, Red, 125V	2
4	2-1055	Nipple, 1/4" x 1/8" Pipe, (Remote Only)	1	16	6-021633	Switch, 2 Pos. GE, C-2000	1
5	2-3015	Valve/Control, Metering	2	17	10-99015	Label, VNG Control Panel	1
6	2-1089	Hose Barb, 1/4" Barb, x 1/4" Pipe, 90°(Remote Qty-2)	1		10-99031	Label, VNG Control Panel w/Remote	1
7	2-9000	Clamp, Screw, #4	6	18	4-02021216	Hose, 1/4" x 16", 100R2, Press Loop	1
8	4-02080000	Tube, 1/4" x 1/2", CLR Vinyl /ft.	12	19	2-0026	Elbow, 1/4" Female, Pipe	1
9	4-05088	Thermostat, General 302°	1	20	17-22282	Nut, 10/32" Keps	8
10	4-05035	Gauge, 0-5000 PSI	1	21	95-07163038	Support, Metering Valve, VNG	2
11	901991	Scrow, 10/32" x 1/2" BH Soc Blk	8	22	4-050822	Hour Meter, ENM, 115V AC	1
12	10-103110	▲ Label, 3-1100	1	23	2-1085	Hose Barb, 1/4" Barb x 1/4" ML Pipe	2
	10-1042000	▲ Label, 4-2000	1	24	4-02090000	Hose, 1/4" x 1/2", Braided Vinyl /ft.	6
	10-1043000	▲ Label, 4-3000	1	25	6-021630	Switch, Sele GE C-2000, Remote	3
	10-2063000	▲ Label, 6-3000	1	26	6-02626	Block, Contact GE, C-200 NO	3
	10-2082500	▲ Label, 8-2500	1	27	6-021623	Block, Contact GE C-200 NC	3

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VNG-S EXPLODED VIEW
LEFT SIDE



**VNG-S EXPLODED VIEW
RIGHT SIDE**



VNG-S EXPLODED VIEW PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	95-07163056	Panel, Top VNG-S	1	25	90-4017	Washer 1-3/16" x 2-1/4", STL RBR (3-1100 Qty 1; 4-2000, 3000 - Qty 2)	
2	95-04163034	L-Bracket, VNG	4	26	2-1024	Elbow, 1/2" Street	1
3	90-2022	Nut, Cage, 1/4" x 16 ga	16	27	2-0151	Plug, Float Tank	1
4	90-40001	Washer, 1/4", Flat, SAE, Blk, Zinc	16	28	17-22282	Nut, 10/32" Keps	12
5	90-1001	Bolt, 1/4" x 3/4", NC HH	18	29	90-1999	Screw, 10/32" x 3/4" BH SOC CS	3
6	95-07163062	Panel, Side, VNG-S	2	30	95-07163058	Panel, Control, VNG-S	1
	10-99016G	▲ Label, VNG Logo Gray	2	31	4-02100030	Inlet Hose, 30" Supply Water, (All models)	1
	10-990161G	▲ Label, VLP Logo Gray	2	32	4-02100045	Inlet Hose, 45" Supply Water (4-2000, 3000)	1
	10-99028	▲ Label, Landa Stripe Right	1	33	4-02110000	Hose, 1/2" Push-On /ft.	3
	10-99029	▲ Label, Landa Stripe Left	1	34	2-1105	Swivel, 1/2" JIC Fem, Push-on	4
7	90-50033	Latch, Vise Action	4	35	2-0101	Isolator, 5/16", Vibration	6
	95-07163082	▲ Hex Key, T-Handle	1	36	90-2001	Nut, 5/16", ESNA, NC	6
8	2-011041	Trim, 1/16", w/sponge /ft.	28	37	90-1996	Screw, 3/8" x 3/4" HH NC, WHIC LOC	2
9	95-07163064	Brace, Left Side, VNG-S	1	38	90-1016	Bolt, 3/8" x 1", NC HH	8
10	95-07121013	Platform, Motor (3-1100)	1	39	90-4002	Washer, 3/8" SAE, Flat	18
	95-071210136	Platform, Motor, 3/16" (4-2000, 3000)	1	40	90-2002	Nut, 3/8", ESNA, NC	8
11	95-07163032	Brace, Electrical Box, VNG	1	41	95-07163066	Brace, Right side, VNG-S	1
12	95-07163052	Base, VNG-S	1	42	6-0411	▲ Cover, Plate, Junction Box Box, Junction, WTRPRE, 3 Hole, 3/4"	1
	10-99016	▲ Label, VNG Logo	1		6-0517	▲ Strain Relief, 3/4"	1
	10-990161	▲ Label, VLP Logo	1	43	95-07163060	Panel, Burner End, VNG-S	1
13	2-1902	Strainer, Inlet Garden Hose	1		10-02023	▲ Label, LP	1
14	2-100942	Swivel, 1/2" MP x 3/4" GHF w/Strainer	1		10-02024	▲ Label, NG	1
15	2-11041	Connector, 1/2", Anchor	2	44	90-10130	U-Bolt, 5/16" x 1", Pipe	3
16	2-1042	Tee, 1/2" Street	2	45	7-70236	Pilot Electronic Ignition	1
17	2-1053	Nipple, 1/2" JIC x 1/2" Pipe (4-3000 restrictor)	4	46	95-07162025	Bracket, Pilot Light	1
18	2-0054	Elbow, 1/2" JIC x 1/2", 90°	5		90-25	Screw, 10/32" x 1/4", Slot Rnd MS ZN	2
19	2-100601	Modified Close Nipple, 1/2" NPT 5/16" (3-1100 restrictor)	1	47	7-7022	Jet, Orifice, 638-69 (see Specification Page for drill out specs)	44
	2-10070	Nipple, 1/2" Hex (4-2000 restrictor)	1	48	7-7011	Burner Ring, x-44	1
20	2-1908	Strainer, 1/2" General, Inline	1	49	2-2007	Nipple, 3/8" x 3/8" NPT ST Mal	1
21	2-010050	Bulkhead, 3/4"	1	50	2-11039	Connector, 3/8" Anchor	1
22	2-0100379	Adapter, 3/4" x 3/4" MT x Insert	1				
	4-02120000	▲ Hose, 3/4" Push-on /ft.	3				
23	2-3014	Valve, Fluidmaster, 400A Float (3-1100 - Qty 1; 4-2000, 3000 - Qty 2)					
24	2-0114	Tank, Plastic Universal, Float	1				

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VNG-S EXPLODED VIEW

PARTS LIST (continued)

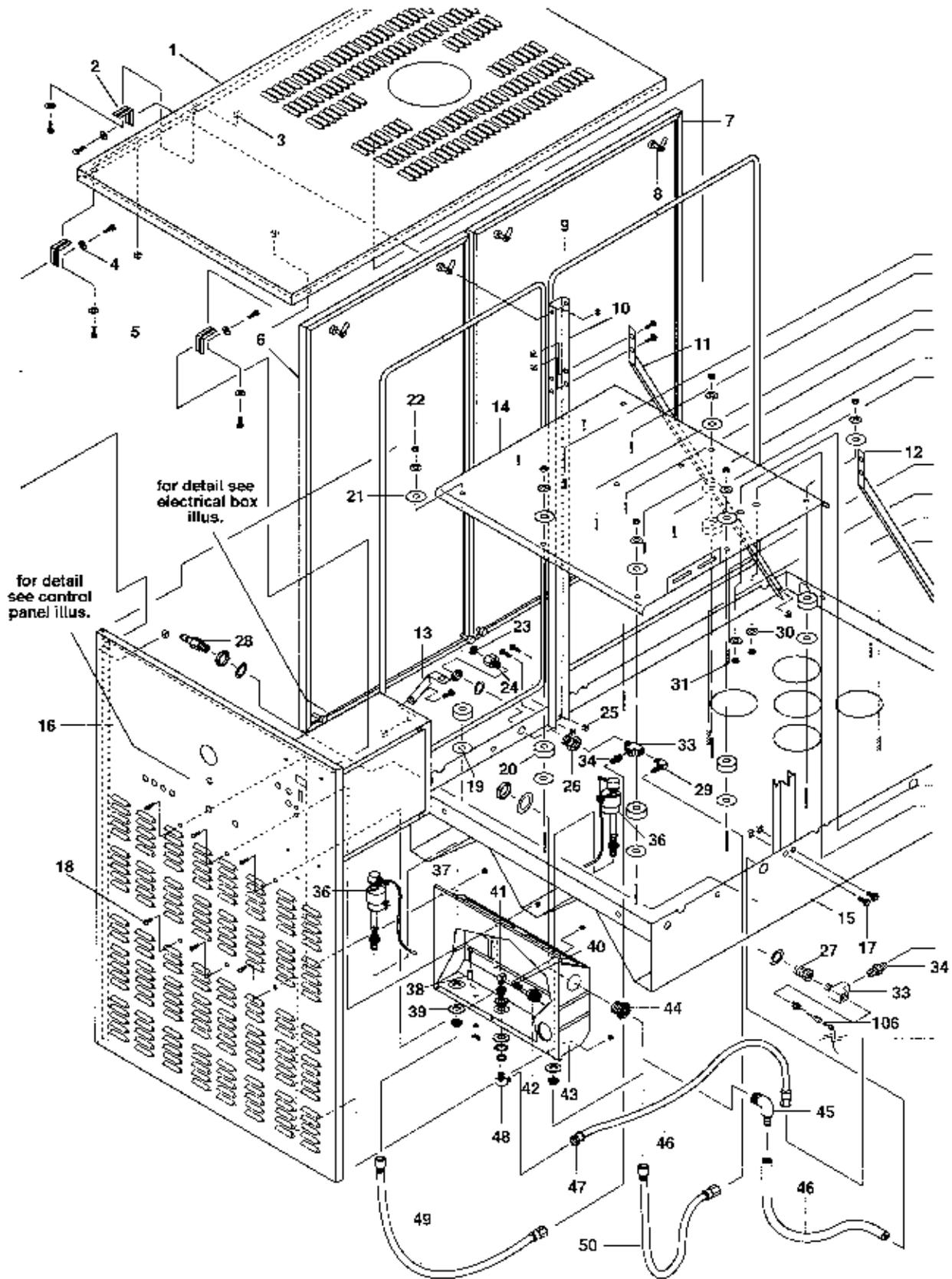
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51	2-1060	Elbow, 1/2" JIC x 3/8", 90°	2	77	90-2999	▲ Screw, #10 x 1/2" Tek HH	4
52	4-02120000	Hose, 3/4" Push-on /ft.	2	78	2-00164	Nipple, 3/4" x 6", Blk Pipe	2
53	7-0150	Tubing, Aluminum, 1/4" Dead Soft /inch	36	79	2-00293	Elbow, 3/4" Blk	3
54	2-1118	Connector, 1/4" Tubing x 1/4" MPT	2	80	2-00162	Nipple, 3/4" x 3", Blk Pipe	2
55	4-02037725	Hose, 25" x 3/8", 100R1, Pres Loop (3-1100)	1	81	2-0087	Union, 3/4" Blk Pipe	1
55	4-02047725	Hose, 25" x 3/8", 100R2, Pres Loop (4-2000, 3000)	1	82	90-300210	Screw, #14 x 1", Tek	3
56	4-02047736	Hose, 36", 3/8", 100R2, Pres Loop (All models)	1	83	95-07163075	Top, Burner Wrap, 18", VNG-S	1
57	2-9004	Clamp, Screw, #12	1	84	2-9000	Clamp, Screw, #4	6
58	81-22550	Valve, Pop-Off, 1200 psi (3-1100)	1	85	4-02090000	Hose, 1/4" x 1/2", Braided /ft.	6
	81-22560	Valve, Pop-Off, 2400 psi (4-2000)	1	86	2-1042	Tee 1/2" Street	2
	81-22565	Valve, Pop-Off, 3600 psi (4-3000)	1	87	2-1062	Elbow, 1/2" JIC x 1/2" 90°	1
59	2-1076	Bushing, 1/2" x 1/4" Pipe	2	88	2-1053	Nipple, 1/2" JIC x 1/2" Pipe	1
60	4-05088	Thermostat, General 302 DGK	1	89	2-1051	Nipple, 1/2" JIC x 1/4" Pipe	1
61	95-07101226	Block, Discharge, Brass 1/2"x1/2"	1	90	2-1076	Bushing, 1/2" x 1/4" Pipe	1
62	2-0008	Nipple, 1/2" Hex, Steel	1	91	6-02173	Switch, Flow ST-5	1
63	2-0010	▲ Nipple, 1/2" x 4", Galv	1	92	2-10260	Elbow, 45°, 1/4" Street	1
64	90-1994	Screw, 10/32" x 1-1/4", RH, SL Blk	8	93	2-00270	Elbow, 3/8" Male Pipe	1
65	95-07163073	Coil Wrap, 18", VNG-S	1	94	5-3226	Unloader, Suttner St-261 w/switch	1
	10-99077	▲ Label, VNG Burner Instructions	1	95	2-1060	Elbow, 1/2" JIC x 3/8", 90°	1
66	10-99032	▲ Label, Pilot Light Hole, VNG	1	96	2-0051	Nipple, 1/2" JIC, 3/8" Pipe	1
	7-0142	Insulation Blanket, w/Foil /sq. ft.	10	97	2-0079	Switch, 1/2" JIC Fem, 3/8" Male	1
67	95-07121213V	VNG-S Coil	1	98	6-02174	Switch, Reed, Replacement	1
68	95-07101241V	Insulation Retainer Band, VNG-S	2	99	95-07121113	Rail, Pump Combo	1
69	2-3006	Valve, 1/4", Jomar T-91LPL, Ball	1	100	90-2019	Nut, Cage, 3/8" x 12 ga	2
70	7-70002	Valve, Gas, 24V, 1" x 1", Electronic Ignition	1	101	90-10220	Bolt, 3/8" x 3-1/2", Tap	1
71	2-001359	Bushing, 1" x 3/4", Blk Steel, Hex	2	102	90-2007	Nut, 3/8", Hex, NC	2
72	2-00163	Nipple, 3/4" x 2", Blk	3	103	95-07141110	Retainer, Pump Take-up, Plated (3-1100)	1
73	2-00295	Elbow, 1" x 3/4", Reducing Blk	1	104	1-96701600	Washer (All models)	4
74	95-07163077	Pipe, 1" NPT 18", Blk, Sch. 40	1	105	1-99303700	Screw (3-1100)	4
75	2-00291	Elbow, 1" Blk Pipe	1	105	1-99364400	Screw (4-2000, 3000)	4
76	2-00132	Nipple, 1" x 6", Blk Pipe	1	106	5-2302	Pump, General, T-991 (3-1100)	1
77	95-07121113	Insulation Retainer Plate	1		5-2304	Pump, General, T-1011 (4-2000)	1
	7-0144	▲ Gasket, Retainer Plate	1		5-2305	Pump, General, T-2011 (4-3000)	1
				107	5-1043	Motor, 2 HP, 1 PH, 3450 35K23Y685 (3-1100)	1
					5-1040	Motor, 6 HP, 1 PH, 1725 (4-2000, 230 1 PH)	1
						▲ Not Shown	

VNG-S EXPLODED VIEW**PARTS LIST (continued)**

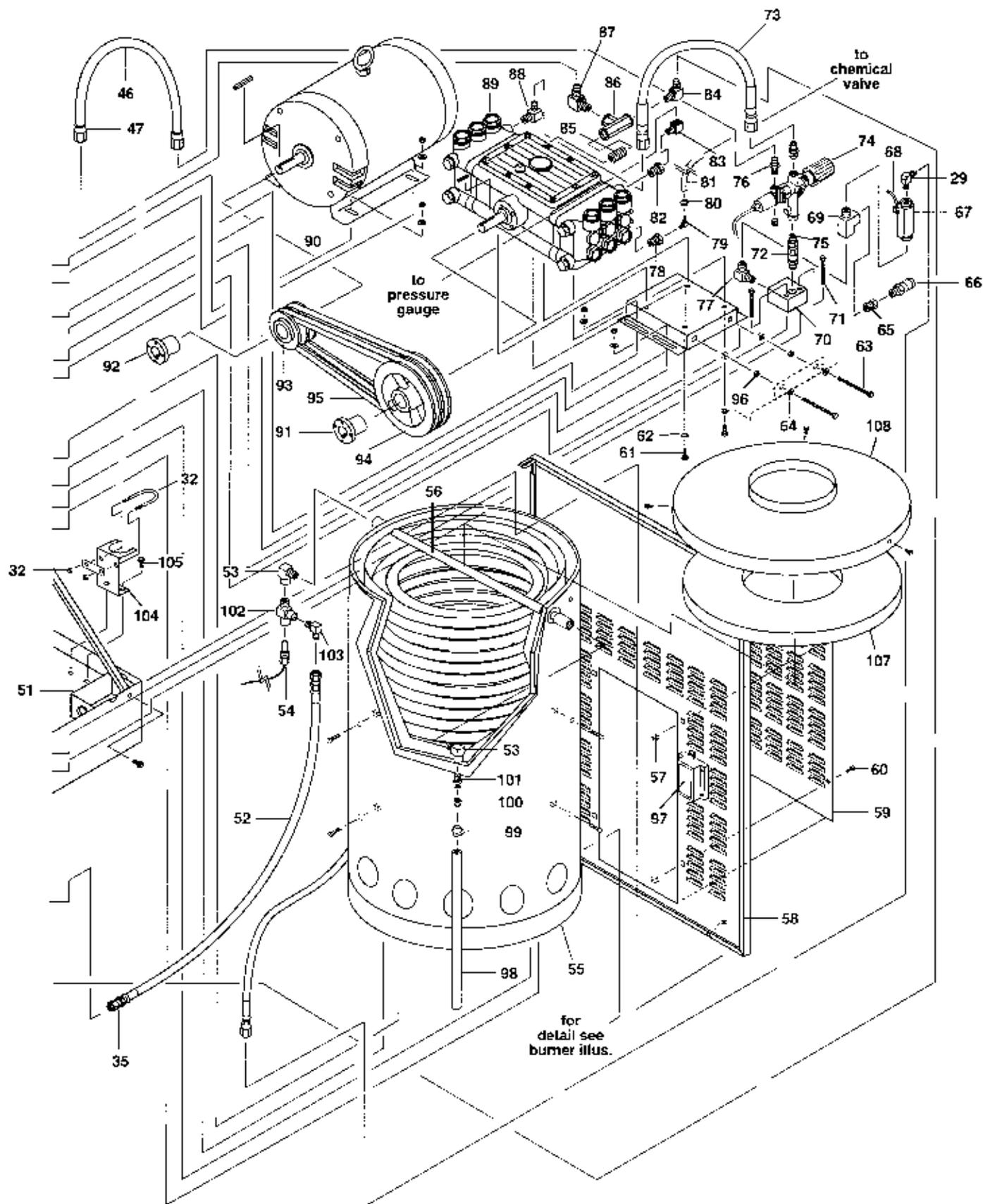
ITEM	PART NO.	DESCRIPTION	QTY
106	5-1011	Motor, 5 HP, 3 PH, 1725, M3218T (4-2000, 230V & 460V 3 PH)	1
	5-1013	Motor, 7.5 HP, 1 PH, 1725, L1510T (4-3000, 230V, 1 PH)	1
107	5-10145	Motor, 7.5 HP, 3 PH, 1725, M3311T (4-3000, 230V, 3 PH)	1
108	5-40102858	Pulley, Bore, AK 28 x 5/8" (3-1100)	1
	5-40205101	Pulley, 2 AK 51 H (4-2000)	1
	5-40504501	Pulley, 2 BK 45 H (4-3000)	1
109	5-40108401	Pulley AK 84 H (3-1100)	1
	5-40208401	Pulley, 2 AK 84 H (4-2000)	1
	5-40508001	Pulley, 2 BK 80 H (4-3000)	1
110	5-601035	Belt, A-35 (3-1100)	1
	5-602036	Belt, AX 36 (4-2000)	2
	5-604036	Belt, BX 36 (4-3000)	2
111	5-512024	Bushing, H x 24 mm	1
112	5-511113	Bushing, H x 1-1/8" (4-2000)	1
	5-511138	Bushing, H x 1-3/8" (4-30000)	1
113	90-2018	Nut, Cage, 10/32" x 16 ga	2
114	2-0133	Screw, 10/32" x 1/2", Knob	2
115	95-07163076	Door, Burner, VNG-S	1
116	7-70151	Ignition, Elec Control	1
117	2-3400	Holder, Rupture Disk	1
118	2-3450	Rupture Disk 5000 PSI	1
119	2-9004	Clamp, Screw #12	1
120	4-02130050	Hose, 7/8", Push-on, Conduit /ft	2
121	2-0046	Tee, 1/2", Street	1
122	95-07163035	Bracket, Gasline Support VNG	1
123	90-300210	Screw, #14 x 1" Tex, Blk, Zinc	2

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VNG-L EXPLODED VIEW LEFT SIDE



**VNG-L EXPLODED VIEW
RIGHT SIDE**



VNG-L EXPLODED VIEW PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY	ITEM	PART NO.	DESCRIPTION	QTY
1	95-07163010	Panel, Top, VNG-L	1	30	90-4001	Washer, 5/16", Flat, SAE	4
2	95-07163034	L-Bracket, VNG	8	31	90-2006	Nut, 5/16", Hex, NC	2
3	90-2022	Nut, Cage, 1/4" x 16 ga	19	32	90-10130	U-Bolt, 5/16" x 1" Pipe	1
4	90-40001	Washer, Flat, SAE., Blk, Zinc	17	33	2-1042	Toe, 1/2" Street	1
5	90-1001	Bolt, 1/4" x 3/4", NC HH	17	34	2-1053	Nipple, 1/2" JIC x 1/2" Pipe	2
6	95-07163020	Panel, Side, Small, VNG-L	2	35	4-02067736	Hose, 3/8" x 1/2", 100R2, Pres Loop	1
	10-99027	Label, VNG Stripe	2	36	2-3014	Valve, Fluid Master 400A, Float	2
7	95-07163018	Panel, Side, Large, VNG-L2		37	17-22282	Nut, 10/32" Keps	6
	10-99028	Label, VNG, Landa/Stripe Right	1	38	2-0151	Plug, Float Tank	1
	10-99029	Label, VNG, Landa/Stripe Left	1	39	90-4017	Washer, 1-3/16" x 2-1/4", STL RBR	2
	10-99016G	Label, VNG Logo (Gray)	2	40	2-1006	Nipple, 1/2" Close (restrictor)	1
	10-990161G	Label, VLP Logo (Gray)	2	41	2-1024	Elbow, 1/2" Street	1
8	90-50033	Latch, Vise Action	8	42	2-1906	Strainer, 1/2" Basket	1
	95-07163082	▲ Hex Key, T-Handle	1	43	2-01164	Tank, Plastic Universal Float	1
9	2-011041	Trim, 1/16", w/Sponge /ft.	55	44	2-010050	Bulkhead, 3/4"	1
10	95-07163022	Vertical Support, VNG-L	2	45	2-0100379	Adapter, 3/4" x 3/4" MT x Insert	1
11	95-07163024	Brace, Left Side, VNG-L	1	46	4-02120000	Hose, 3/4" Push-on /ft.	8
12	95-07163026	Brace, Right Side, VNG-L	1	47	2-11050	Swivel, 3/4" JIC Fem Push-on	4
13	95-07163032	Brace, VNG Electrical Box	1	48	2-10630	Elbow, 3/4" JIC x 1/2", 90°	2
14	95-07163040	Power Platform, 8-2500	1	49	4-02100030	Inlet Hose, 30° Supply Water	1
15	95-07163000	Base, VNG-L	1	50	4-02100045	Inlet Hose, 45° Supply Water	1
16	95-07163012	Panel, Control, VNG-L	1	51	6-04110	Box, Junction, WTRPRF, 3 Hole, 3/4"	1
	10-99016	Label, VNG, Logo	1		6-0411	Cover Plate, Junction Box	1
	10-990161	Label, VLP, Logo	1		6-0517	▲ Strain Relief, 3/4"	1
17	90-1996	Screw, 3/8" x 3/4" HH NC, Whiz Loc	14	52	4-02067770	Hose 70" x 1/2", 100R2 Press Loop	1
18	90-1999	Screw, 10/32" x 3/4" BH SOC CS	6	53	2-0032	Elbow, 1/2", Street	2
19	2-0108	Bumper Pad	21	54	4-05091	Switch, Snap 275 Hi-limit	1
20	2-0104	Pad, Hard Rubber	7	55	95-07163083	Wrap Outer 30° ENG/VNG Large	1
21	9-50070	Washer, 3/8" x 1-1/2", Fender SAE	7		7-7002	Burner Assy, HWG-75, (8-2500)	1
22	90-2002	Nut, 3/8", ESNA, NC	15	56	95-07121222	Coil, Dura, 25" DIA. Sch 80 VNG L	1
23	2-1902	Strainer, Inlet Garden Hose	1	57	90-2018	Nut, Cage, 10/32" x 16 ga	4
24	2-10942	Swivel, 1/2" MP x 3/4" GHF w/Strainer	1	58	95-07163014	Panel, Burner End, VNG-L	1
25	90-2019	Nut, Cage, 3/8" x 12 ga	12	59	95-071630106	Cover, Burner Access, VNG-L	1
26	2-11041	Connector, 1/2" Anchor	2	60	90-1991	Screw, 10/32" x 1/2" BH SOC Blk	4
27	2-11039	Connector, 3/8" Anchor	1	61	1-99369900	Screw	4
28	2-20070	Nipple, 3/8" x 3/8" NPT ST Male	1				
29	2-1060	Elbow, 1/2" JIC x 3/8", 90°	2				

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VNG-L EXPLODED VIEW

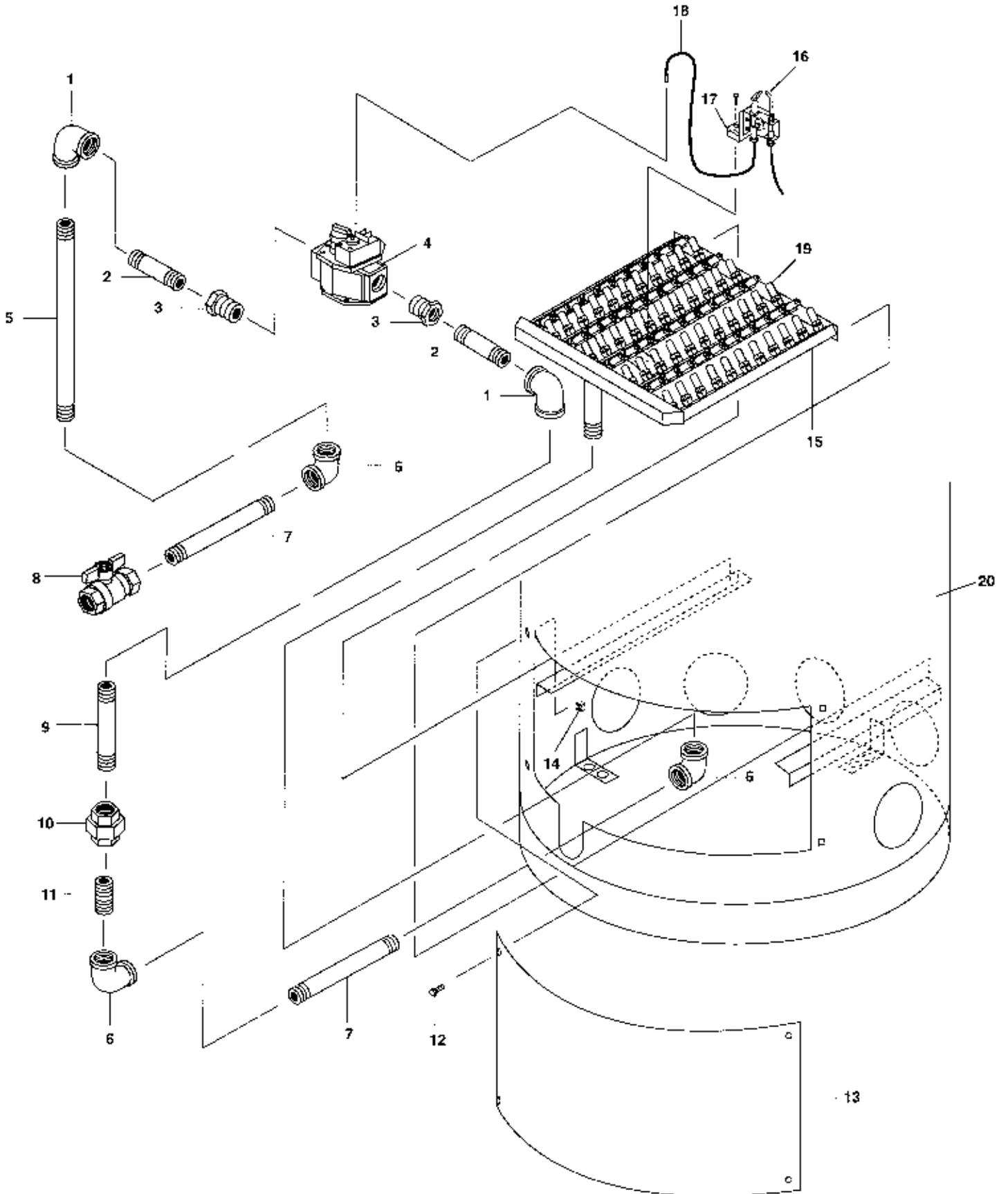
PARTS LIST (continued)

ITEM	PART NO.	DESCRIPTION	QTY
62	1-96710600	Washer	4
63	90-1025	Bolt, 3/8" x 5-1/2", NC HH Tap	2
64	90-4002	Washer, 3/8" x SAE, Flat	10
65	2-1074	Bushing, 3/8" x 1/4" Pipe	1
66	81-22565	Valve, Pop-off, 3600 psi	1
67	6-02173	Switch, Flow, ST-5	1
68	6-02174	Switch, Reed, Replacement ST-5	1
69	2-1041	Tee, 3/8" Street	1
70	95-07101215	Bracket, Unloader, 1/2" x 1/2"	1
71	90-1011	Bolt, 5/16" x 2", NC HH	2
72	2-0079	Swivel, 1/2" JIC Fern x 3/8" Male	1
73	4-02067728	Hose 28" x 1/2", 100R2 Press Loop	1
74	5-3225	Unloader, Suttner, St-261 w/Switch	1
75	2-0051	Nipple, 1/2" JIC x 3/8" Pipe	1
76	2-1051	Nipple, 1/2" JIC x 1/4" Pipe	1
77	2-20027	Elbow, 3/8" Female, Pipe	1
78	2-1076	Bushing, 1/2" x 1/4" Pipe	1
	2-1076	Bushing, 1/2" x 1/4" Pipe	1
79	2-1089	Hose Barb, 1/4" Barb x 1/4" Pipe, 90°	1
80	2-9000	Clamp, Screw #4	4
81	4-02090000	Hose, 1/4" x 1/2" Braided Vinyl /ft.	6
82	2-1074	Bushing, 3/8" x 1/4" Pipe	1
83	2-1022	Elbow, 1/4" Street	1
84	2-10620	Elbow, 3/4" JIC x 3/4", 90°	2
85	2-1007	Nipple, 1/2" Hex	1
86	2-1033	Tee, 3/4", Female Pipe	1

ITEM	PART NO.	DESCRIPTION	QTY
87	2-1062	Elbow, 1/2" JIC x 1/2" 90°	1
88	2-0053	Elbow, 1/2" JIC, 3/8", Steel, 90°	1
89	5-2309	Pump, General, T-1631 (8-2500)	1
90	5-1025	Motor, 15 HP 3 PH, 1725 RPM M2513T (6-3000, 8-2500)	1
91	5-522158	Bushing, P1 x 1-5/8" (6-3000, 8-2500)	1
92	5-512024	Bushing, H x 24 mm (6-3000)	1
	5-512032	Bushing, H x 32 mm (8-2500)	1
93	5-406040	Pulley, 2TB 40 (6-3000, 8-2500)	1
94	5-40505501	Pulley, 2BK 55 H (6-3000)	1
	5-40508001	Pulley, 2BK 80 H (8-2500)	1
95	5-604046	Belt, BX 46 (6-3000)	2
	5-604051	Belt, BX 51 (8-2500)	2
96	90-2007	Nut, 3/8" Hex, NC	2
97	7-70151	Ignition, Electronic, Control	1
98	4-02130050	Hose, 7/8" Push On, Conduit /ft	2
99	2-9014	Clamp, Conduit, CL9	1
100	2-3450	Rupture Disk, 5000 PSI	1
101	2-3400	Rupture Disk Holder	1
102	2-0046	Tee, 1/2", Street	1
103	2-0054	Elbow, 1/2" Jic x 1/2" 90 DGR.	1
104	95-07163035	Bracket, Gas Line, Support VNG	1
105	90-300210	Screw, #14 x 1" Tek, Blk, Zinc	2
106	4-05088	Thermostat, General, 302 DGR	1
107	7-014834	Insulation, Tank Head, 30" ENG/VNG	1
108	95-071630751	Top, Burner, Wrap, 30" ENG/VNG	1

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VNG-L BURNER ASSEMBLY



**VNG-L BURNER ASSEMBLY
PARTS LIST**

ITEM	PART NO.	DESCRIPTION	QTY
1	2-00295	Elbow, 1" x 3/4" Reducing, Blk	2
2	2-00162	Nipple 3/4" x 3", Black Pipe	2
3	2-001359	Bushing, 1" x 3/4" Black Steel Hex	2
4	7-70002	Valve, Gas, 7000 DERHC	1
5	95-07163077	Pipe, 1" NPT x 18 Blk Sch.40	1
6	2-00291	Elbow, 1", Black Pipe, 90°	3
7	2-00139	Nipple, 1" x 8" Black Pipe	2
8	7-7012	Valve, Gas Shut-Off 1" NPT	1
9	95-07163078	Pipe, 1" NPT x 11", Black Pipe, Sch.40	1
10	2-0086	Union, 1", Black Pipe	1
11	2-00171	Nipple, 1", Close, Black Pipe	1
12	90-19710	Screw, 1/4" x 3/4" HH NC, Whiz Loc	4

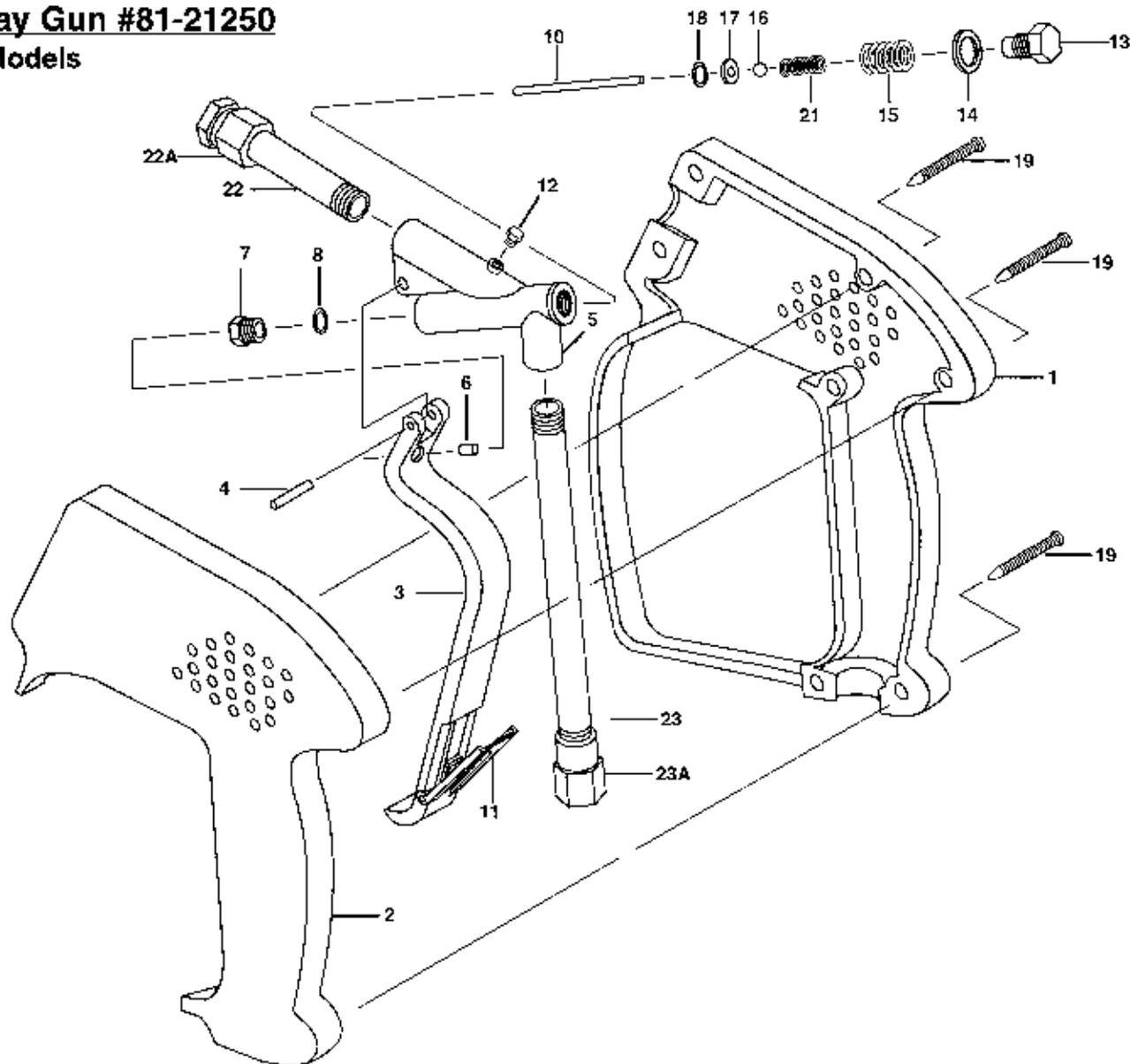
ITEM	PART NO.	DESCRIPTION	QTY
13	95-07163084	Door, Burner, Large, ENG/VNG	1
14	90-19710	Nut, Cage, 1/4" x 12 GA	4
15	95-07162069	Burner Square, Assy Landa Less Jets	1
16	7-70236	Pilot, Natural Gas Electronic	1
17	95-07163085	Splash Guard, Pilot Light ENG/VHGL	1
18	7-0150	Tubing, Aluminum 1/4" /per in	36
18	4-02067736	Hose 36" X 1/2", 100R2, Pres Loop	1
19	7-7022	Jet, Oriface #69 Drill out to #54	
20	95-07163083	Wrap, Outer, 30" ENG/VNG Large Coil	1

**VNG6-3000 PUMP ASSEMBLY
PARTS LIST**

ITEM	PART NO.	DESCRIPTION	QTY
1	4-02090000	Hose, 1/4" x 1/2" Braided Vinyl /ft.	6
2	2-9000	Clamp, Screw, #4	4
3	2-1089	Hose Barb, 1/4" Barb x 1/4", Pipe, 90°	1
4	2-1022	Elbow, 1/4" Street	1
5	5-3225	Unloader, Suttner, ST-261w/Switch	1
6	2-1076	Bushing, 1/2" x 1/4" Pipe	1
7	5-2306	Pump, General, TS-2021-L	1
8	95-07121112	Rail, Pump, Combo	1
9	90-2019	Nut, Cage, 3/8" x 12 ga	2
10	1-96710600	Washer	4
11	1-99364400	Screw	4
12	90-2007	Nut, 3/8", Hex, NC	2
13	90-4002	Washer, 3/8", SAE, Flat	2
14	90-1025	Bolt, 3/8" x 5-1/2", NC, HH Tap	2
15	2-1042	Top, 1/2" Street	2
16	2-1053	Nipple 1/2" JIC x 1/2" Pipe	1
17	2-10630	Elbow, 3/4" JIC x 1/2", 90°	2
18	2-0051	Nipple, 1/2" JIC x 3/8" Pipe	1
19	2-0079	Bushing, 3/4" x 1/4" Pipe	1
20	2-10260	Elbow, 45°, 1/4" Street	1
21	2-1051	Nipple 1/2" JIC x 1/4" Pipe	1
22	2-1105	Swivel, 1/2" JIC, Female Push-on	2
23	4-02110000	Hose, 1/2" Push-on /ft.	1.5
24	2-1060	Elbow, 1/2" JIC x 3/8", 90°	1
25	6-02173	Switch, Flow, STS	1
26	6-02174	Switch, Reed, Replacement	1
27	2-00270	Elbow, 3/8", Male, Pipe	1

Spray Gun #81-21250

All Models



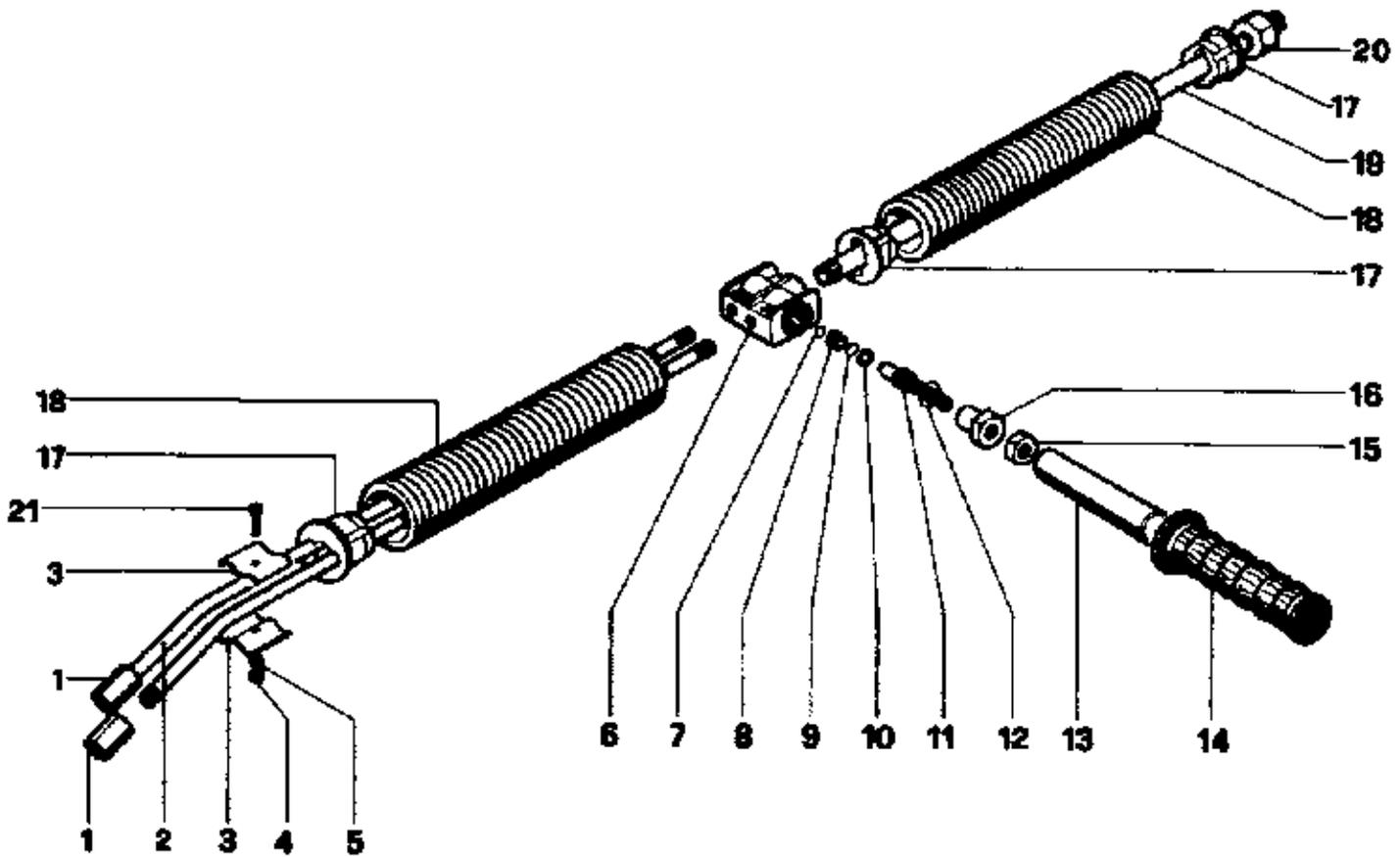
ITEM	PART NO.	DESCRIPTION	QTY
1	81-21401	Housing, Right Half	1
2	81-21402	Housing, Left Half (only with item #19)	1
3	81-21234	Trigger	4
4	81-21214	Pin	1
5	81-21405	Valve Body	1
6	81-21213	Cam, Trigger	1
7	81-21211	Guide Sleeve	1
8	81-21210	‡O-Ring	1
10	81-21209	‡Control Belt	1
11	81-21235	Lock	1
12	81-21220	Plug	1

ITEM	PART NO.	DESCRIPTION	QTY
13	81-21208	Cap	1
14	81-21415	‡Aluminum Seal Washer	1
15	81-21206	‡Valve Spring	1
16	81-21205	‡Valve Ball, SS	1
17	81-21218	‡Valve Seat, SS	1
18	81-21217	‡O-Ring	1
19	81-21254	Self Tapping Screw	7
21	81-21251	‡Spring	1
22	81-21242	Discharge Tube	1
22A	81-21241	Discharge Fitting, SS	1
23	81-21243	Inlet Tube	1
23A	81-21244	Inlet Fitting	1

‡ 81-21227 Repair Kit (Items 8, 10, 14-18, 21)

VARIABLE PRESSURE WAND #4-011142A

VNG3-1100 • VNG4-2000

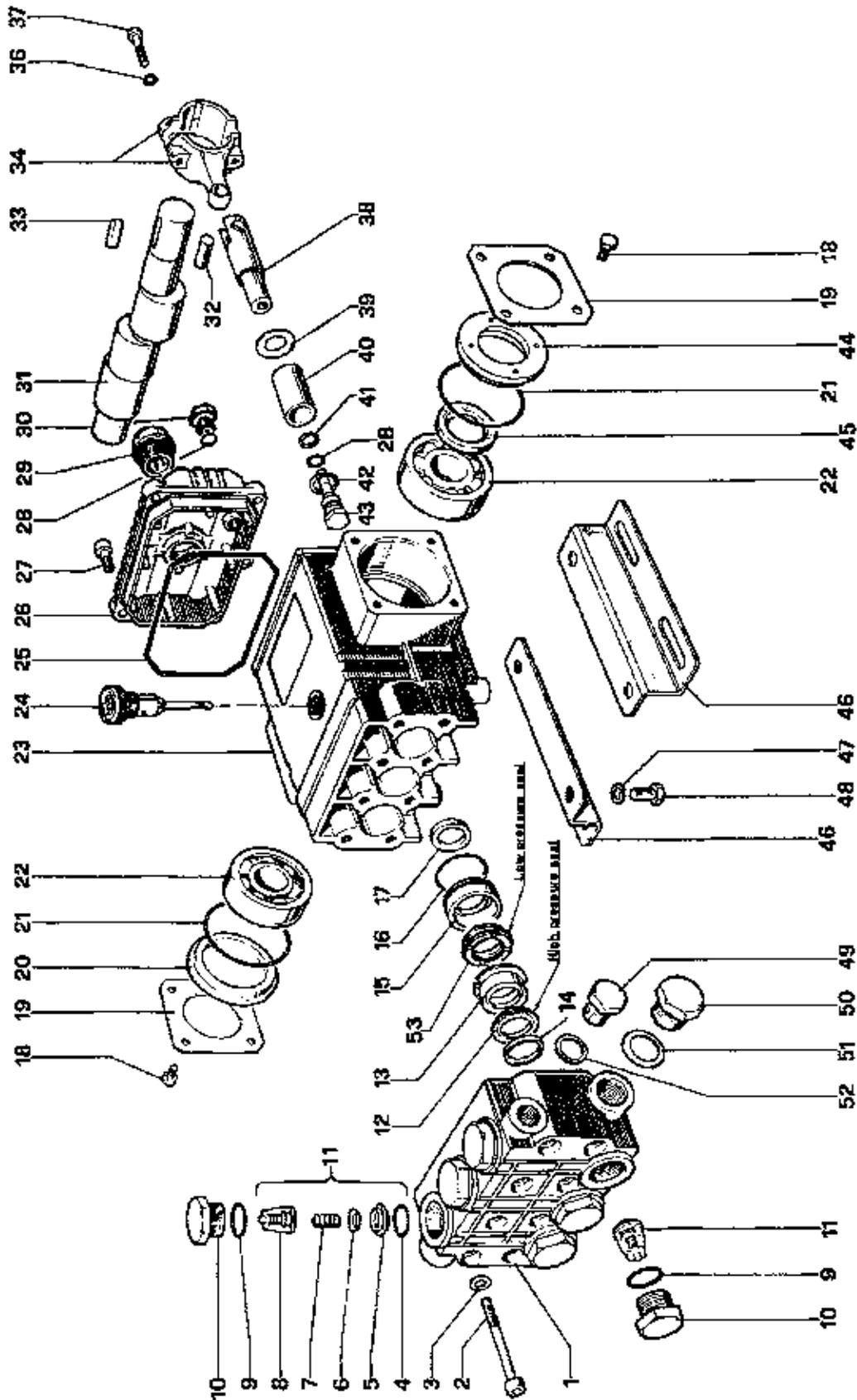


ITEM	PART NO.	DESCRIPTION	QTY
1	1-94481200	Nipple	1
	1-94513000	Nipple	1
2	1-18007289	Tube	2
3	1-18008134	Separator	2
4	1-92197500	Nut	1
5	1-96688000	Washer	1
6	1-10007141	Faucet	1
7	1-90357500	‡ O-Ring	1
8	1-10008566	‡ Valve Seat	1
9	1-90357700	‡ O-Ring	1
10	1-90503300	‡ Anti-extrusion Ring	1
11	1-10007366	‡ Sutter	1

ITEM	PART NO.	DESCRIPTION	QTY
12	1-90383500	‡ O-Ring	1
13	1-10007961	Handle Core	1
14	1-94557000	Handle	1
15	1-92237500	Nut	1
16	1-10007270	Nipple	1
17	1-18008251	Tube Spacer	4
18	1-18007951	Guard	2
19	1-18203389	Tube	1
20	1-94483200	Nipple	1
21	1-99156700	Screw	1
22	2-1013	Coupling, Hex, 1/8"	1
	1-VPKIT	‡ Repair Kit (contains items 7, 8, 9, 10, 11, 12)	

PUMP T-991 #5-2302

3-1100



PUMP T-991 #5-2302

3-1100 • PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY
1	1-50120741	Pump Head	1
2	1-99317500	Screws	8
3	1-96701400	Washers	8
4	1-90384100	O-Rings (Kit 1)	6
5	1-36200366	Valve Seats (Kit 1)	6
6	1-36200176	Valve Plates (Kit 1)	6
7	1-94737600	Springs (Kit 1)	6
8	1-36200251	Valve Guides (Kit 1)	6
9	1-90384700	O-Rings (Kit 4)	6
10	1-98222000	Caps (Kit 4)	6
11	1-36703201	Valve Assembly (Available only in Kit 1)	6
12	1-90270300	Packing (Available only in Kits 19 & 27)	3
13	1-50216670	Intermediate Ring (Available only in Kits 21 & 27)	3
14	1-50100051	Head Ring (Available only in Kits 22 & 27)	3
15	1-50080570	Packing Retainer (Available only in Kits 22 & 27)	3
16	1-90361200	O-Rings (Available only in Kits 22 & 27)	3
17	1-90161400	Oil Seal (Available only in Kit 23)	3
18	1-99180700	Screw	8
19	1-50150074	Crankcase Cover	2
20	1-50211651	Spacer	1
21	1-90409700	O-Rings	2
22	1-91832900	Ball Bearing 6305	2
23	1-50010422	Crankcase	1
24	1-98210300	Oil Dip Stick	1
25	1-90392000	O-Ring	1
26	1-50160322	Crankcase Cover	1
27	1-99183700	Screw	5
28	1-90358500	O-Rings (Kit 6)	4
29	1-97596800	Oil Level Indicator	1
30	1-98204100	Cap	1

ITEM	PART NO.	DESCRIPTION	QTY
31	1-50021835	Crankshaft	1
32	1-97733000	Wrist Pin	3
33	1-91489000	Key	1
34	1-50030001	Connecting Rod	3
36	1-96693900	Washer	6
37	1-99192700	Screw	6
38	1-50050156	Piston Guide	3
39	1-96728600	Washer	3
40	1-50040409	Piston	3
41	1-90506700	Anti-Extrusion Ring (Kit 6)	3
42	1-96728000	Washer (Kit 6)	3
43	1-47219566	Piston Screw (Kit 6)	3
44	1-50211551	Spacer	1
45	1-90163400	Oil Seal	1
46	1-50200074	Pump Feet	2
47	1-96701600	Washer	4
48	1-99303700	Screw	4
49	1-98210000	Cap	1
50	1-98217600	Cap	1
51	1-96751400	Washer	1
52	1-96738000	Washer	1
53	1-90269800	Packing, Low Pressure	3

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

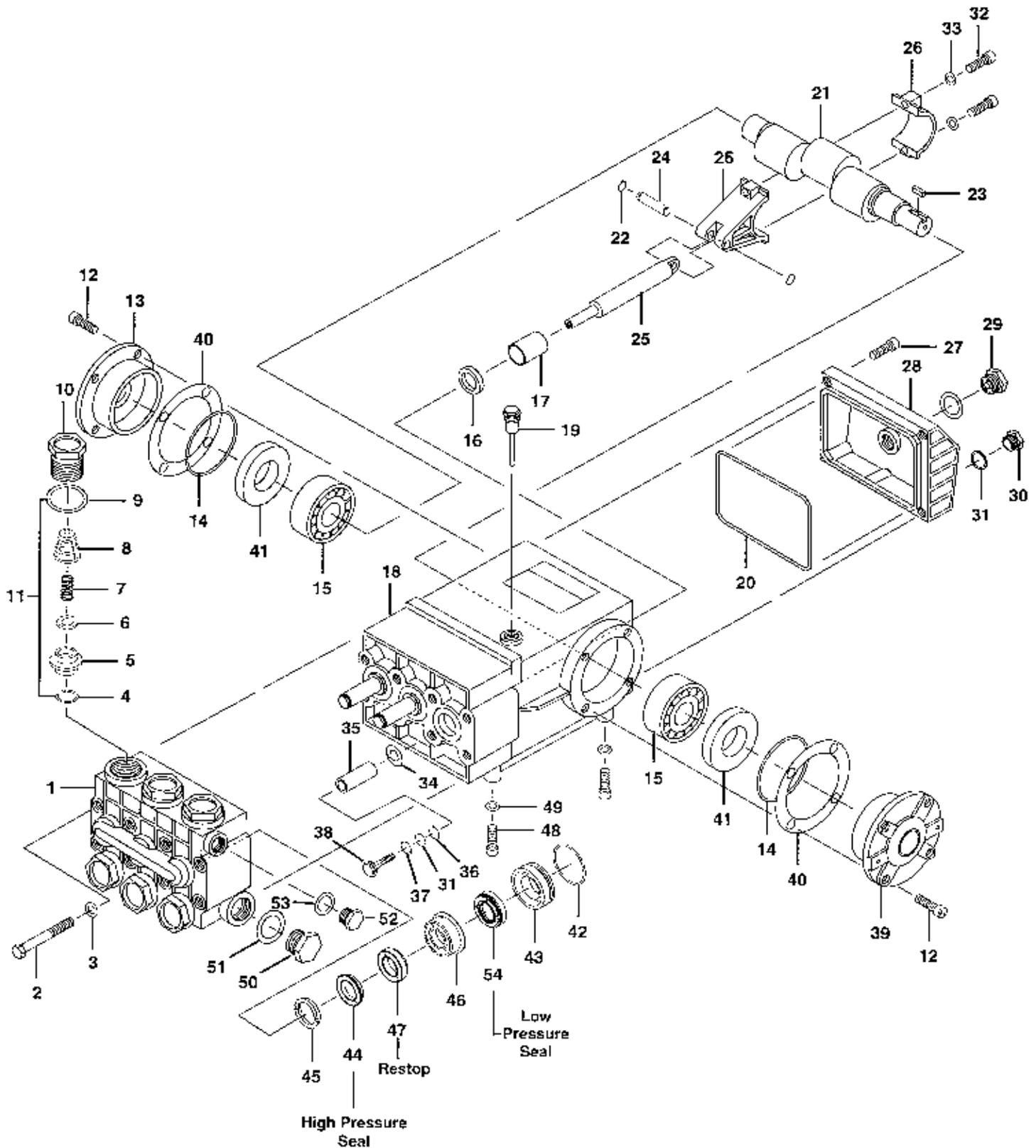
1-ZMVT00L	Packing Insertion Tool
1-26019400	Packing Extractor, Slap Hammer
1-26093400	Packing Extraction Socket, T991

Torque Specs			
Position	Ft./lbs	Position	Ft./lbs
2	14.7	37	8.8
10	73.7	43	14.7
18	7.3	48	14.7
27	7.3	49	29.4
29	13.2	50	29.4
30	14.7		

*Decrease torque by 20% if threads are lubricated

Repair Kits	1-0001	1-0004	1-0006	1-0019	1-0020	1-0021	1-0022	1-0023	1-0027
Assembly Pos.#	4, 5, 6 7, 8, 11	9, 10	28, 41 42, 43	12	13	14	15, 16	17	12, 13, 14, 15, 16
# of Assemblies	6	6	3	6	3	6	3	3	1

PUMP T-1011 #5-2304
4-2000



PUMP T-1011 #5-2304

4-2000 • PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY
1	1-47120841	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 (Kit 1-0001)	6
6	1-36200176	Valve Plates (Kit 1-0001)	6
7	1-94737600	Springs (Kit 1-0001)	6
8	1-36200251	Valve Guides (Kit 1-0001)	6
9	1-90384700	O-Rings (Kit 1-0004)	6
10	1-98222000	Caps (Kit 1-0004)	6
11	1-36703201	Valve Assembly (Available only in Kit 1-0001)	6
12	1-99303900	Screws	8
13	1-47150122	Side Crankcase Cover (Closed)	1
14	1-90391300	O-Rings	2
15	1-91837500	Tapered Roller Bearings	2
16	1-90162500	Oil Seals (Available only in Kit 1-0002)	3
17	1-90912600	Bushings	3
18	1-47010422	Crankcase	1
19	1-98210600	Oil Dip Stick	1
20	1-90392200	Cover O-Ring	1
21	1-47021735	Crankshaft USA version	1
22	1-90055700	Snap Rings	6
23	1-91487800	Snap Rings	1
24	1-97738000	Wrist Pins	3
25	1-47050454	Piston Guides	3
26	1-47030001	Connecting Rods	3
27	1-99183700	Screws	5
28	1-47160022	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 T1011	3
36	1-90506700	Anti-Extrusion Rings (Kit 1-0006)	3

ITEM	PART NO.	DESCRIPTION	QTY
37	1-96728000	Washers (Kit 1-0006)	3
38	1-47219566	Piston Screws (Kit 1-0006)	6
39	1-47150022	Crankcase Open Cover	2
39	1-47150122	Crankcase Closed Cover	1
40	1-97567800	Shims	2
41	1-90164800	Oil Seal (Available only in Kit 1-0003)	1
42	1-90361600	O-Rings T1011 (Kits 1-0010, 1-0028)	3
43	1-47080570	Packing Retainers T1011 (Kits 1-0010, 1-0028)	3
44	1-90270500	Packings T1011 (Avail. only in Kits 1-0069, 1-0028)	6
45	1-47100051	Head Rings T1011 (Avail. only in Kits 1-0007, 1-0028)	6
46	1-47216970	Intermediate Rings T1011 (Kit 1-0028)	3
47	1-90270400	Restop (Kits 1-0028, 1-0069)	3
48	1-99364400	Screws	4
49	1-96710600	Washers	4
50	1-98217600	Cap	1
51	1-96751400	Washer	1
52	1-98210000	Cap	1
53	1-96738000	Washer	1
54	1-90271000	Packing, Low Pressure (Avail. only in Kits 1-0028, 1-0069)	3

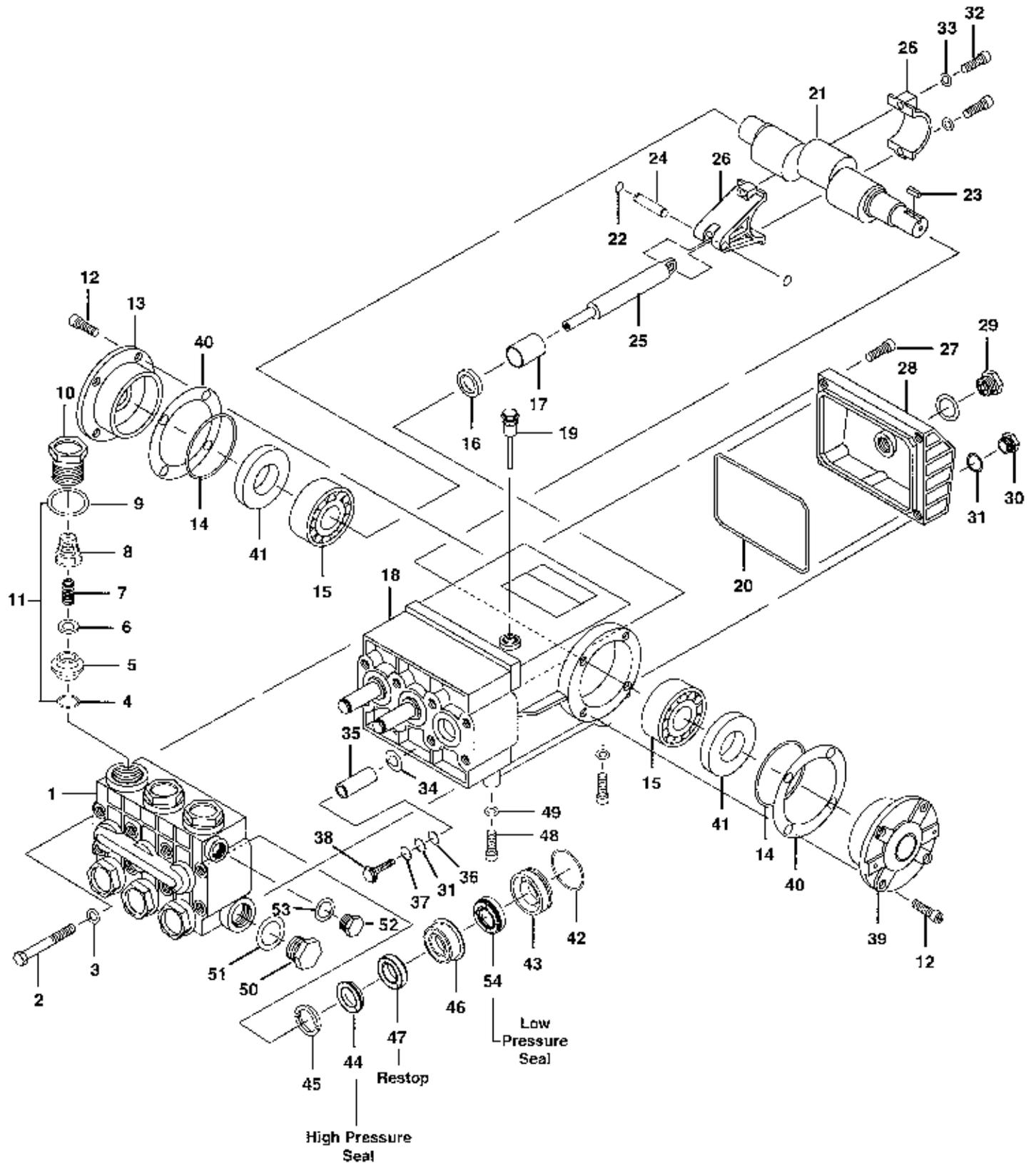
For proper pump repair and ease of packing insertion/ extraction, the following tools are recommended:

1-ZMVT00L	Packing Insertion Tool
1-26019400	Packing Extractor, Slap Hammer
1-26093400	Packing Extraction Socket, T1011

Torque Specs*			
Position	FL/lbs	Position	FL/lbs
2	22.1	30	14.7
10	73.7	32	14.7
12	14.7	38	14.7
27	7.3	49	29.4
29	13.2	51	29.4

KIT NO.	1-0001	1-0002	1-0003	1-0005	1-0006	1-0007	1-0008	1-0028	1-0069
Assembly (Pos.#)	4, 5, 6, 7, 8	16	41	9, 10	31, 36, 37, 38	45	42, 43	42, 43, 44, 45, 46, 47, 54	44, 47, 54
# Of Assemblies	6	3	2	6	3	6	3	1	6

PUMP T-2011 #5-2305
4-3000



PUMP T-2011 #5-2305 4-3000 • PARTS LIST

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 (Kit 1-0001)	6
6	1-36200176	Valve Plates (Kit 1-0001)	6
7	1-94737600	Springs (Kit 1-0001)	6
8	1-36200251	Valve Guides (Kit 1-0001)	6
9	1-90384700	O-Rings (Kit 1-0005)	6
10	1-98222200	Valve Caps (Kit 1-0005)	6
11	1-36703201	Valve Assembly	6
(Available only in Kit 1-0001)			
12	1-99303900	Screws	8
13	1-47150122	Side Crankcase Cover (Closed)	1
14	1-90391300	O-Rings	2
15	1-91837500	Tapered Roller Bearings	2
16	1-90162500	Oil Seals	3
(Available only in Kit 1-0002)			
17	1-90912600	Bushings	3
18	1-47010422	Crankcase	1
19	1-98210600	Oil Dip Stick	1
20	1-90392000	Cover O-Ring	1
21	1-47021735	Crankshaft	1
22	1-90055700	Snap Rings	6
23	1-91487800	Snap Rings	1
24	1-97798000	Wrist Pins	3
25	1-47050356	Piston Guides	3
26	1-47030001	Connecting Rods	3
27	1-99191200	Screws	5
28	1-47160122	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

ITEM	PART NO.	DESCRIPTION	QTY
37	1-96728000	Washers (Kit 1-0006)	3
38	1-47219566	Piston Screws (Kit 1-0006)	3
39	1-47150022	Side Crankcase Cover (Open)	1
40	1-97567800	Shims	2
41	1-90164800	Oil Seal	1
(Available only in Kit 1-0003)			
42	1-90361600	O-Rings	3
(Kits 1-0010, 1-0028)			
43	1-47080570	Packing Retainers	3
(Kits 1-0010, 1-0028)			
44	1-90270500	Packings	6
(Available only in Kits 1-0028, 1-0069)			
45	1-47100051	Head Rings	6
(Available only in Kits 1-0007, 1-0028)			
46	1-47216970	Intermediate Rings (Kit 1-0028)	3
47	1-90270400	Restop (Kit 1-0028, 1-0069)	3
48	1-99364400	Screws	4
49	1-96710600	Washers	4
50	1-98217600	Cap	1
51	1-96751400	Washer	1
52	1-98210000	Cap	1
53	1-96738000	Washer	1
54	1-90271000	Low Pressure Seal	3
(Kit 1-0028, 1-0069)			

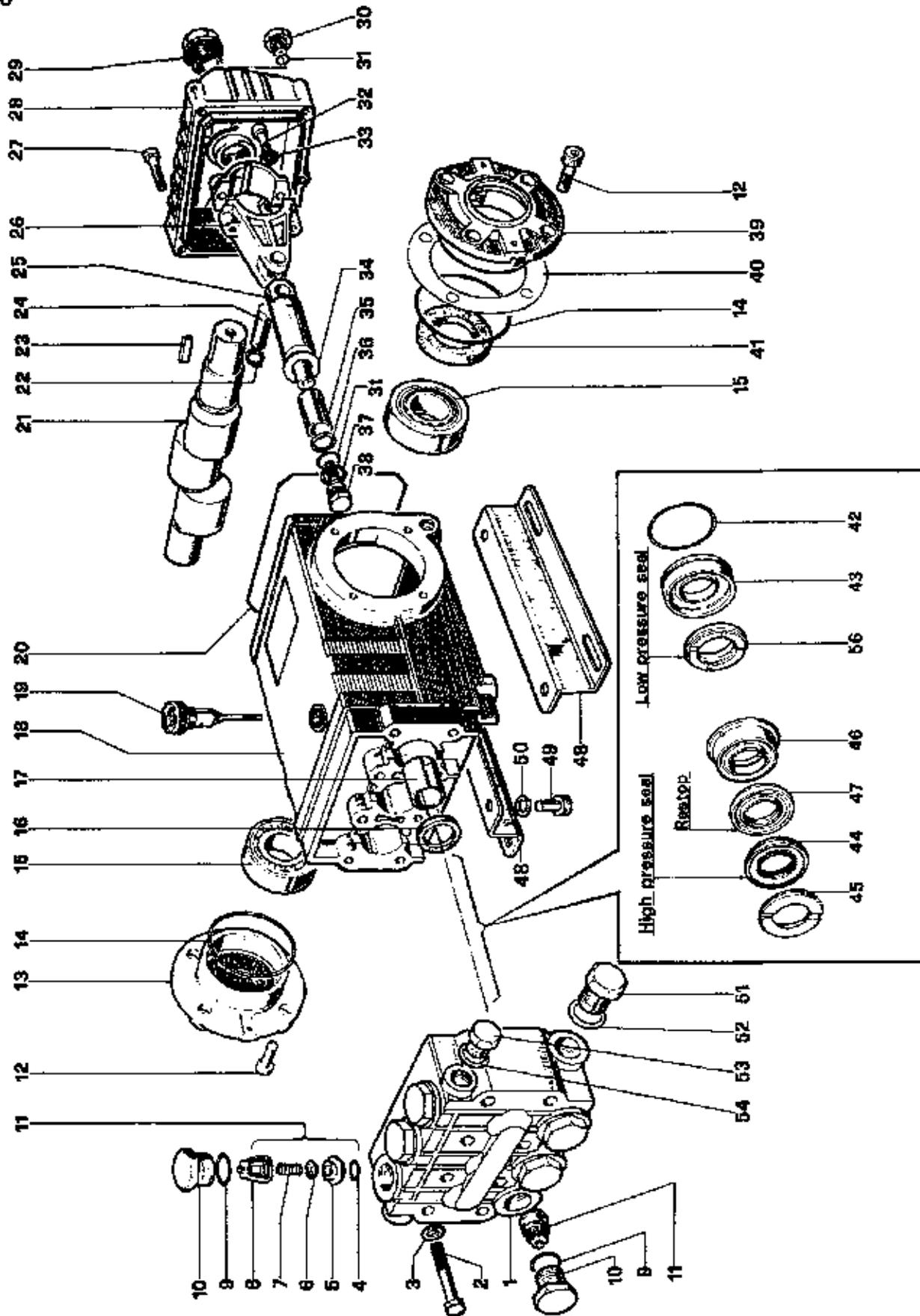
For proper pump repair and ease of packing insertion/ extraction, the following tools are recommended:

1-ZMVTOOL	Packing Insertion Tool
1-26019400	Packing Extractor, Slap Hammer
1-26093400	Packing Extraction Socket, TS-2021

Torque Specs			
Position	Fl./lbs	Position	Fl./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		

KIT NO.	1-0001	1-0002	1-0003	1-0005	1-0006	1-0007	1-0008	1-0028	1-0069
Assembly (Pos. #)	4, 5, 6, 7, 8	16	41	9, 10	31, 36, 37, 38	45	42, 43	42, 43, 44, 45, 46, 47, 54	44, 47, 54
# Of Assemblies	6	3	2	6	3	6	3	1	6

PUMP TS2021-L #5-2306
6-3000



PUMP TS2021-L #5-2306

6-3000

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 (Kit 1-0001)	6
6	1-36200176	Valve Plates (Kit 1-0001)	6
7	1-94737600	Springs (Kit 1-0001)	6
8	1-36200251	Valve Guides (Kit 1-0001)	6
9	1-90384700	O Rings (Kit 1-0005)	6
10	1-98222200	Valve Caps (Kit 1-0005)	6
11	1-36703201	Valve Assembly (Available only in Kit 1-0001)	6
12	1-99303900	Screws	8
13	1-47150122	Side Crankcase Cover (Closed)	1
14	1-90391300	O Rings	2
15	1-91837700	Tapered Roller 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	1-90392200	Cover O-Ring	1
21	1-57021735	Crankshaft	1
22	1-90055700	Snap Rings	6
23	1-91487800	Snap Rings	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	1-47160122	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

ITEM	PART NO.	DESCRIPTION	QTY
35	1-47040409	Pistons	3
36	1-90506700	Anti-Extrusion Rings (Kit 1-0006)	3
37	1-96728000	Washers (Kit 1-0006)	3
38	1-47219566	Piston Screws (Kit 1-0006)	3
39	1-47150022	Side Crankcase Cover (Open)	1
40	1-97567800	Shims	2
41	1-90164800	Oil Seal (Kit 1-0003)	1
42	1-90361600	O Rings (Kit 1-0010, 1-0028)	3
43	1-47080570	Packing Retainers (Kit 1-0010, 1-0028)	3
44	1-90270500	Packings (Kit 1-0028, 1-0069)	6
45	1-47100051	Head Rings (Kit 1-0007, 1-0028)	6
46	1-47216970	Intermediate Rings (Kit 1-0028)	3
47	1-90270400	Restop (Kit 1-0028, 1-0069)	3
48	1-47200074	Pump Feet	2
49	1-99364400	Screws	4
50	1-96710600	Washers	4
51	1-98217600	Cap	1
52	1-96751400	Washer	1
53	1-98210000	Cap	1
54	1-96738000	Washer	1
56	1-90271000	Low Pressure Seal (Kit 1-0028, 1-0069)	3

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

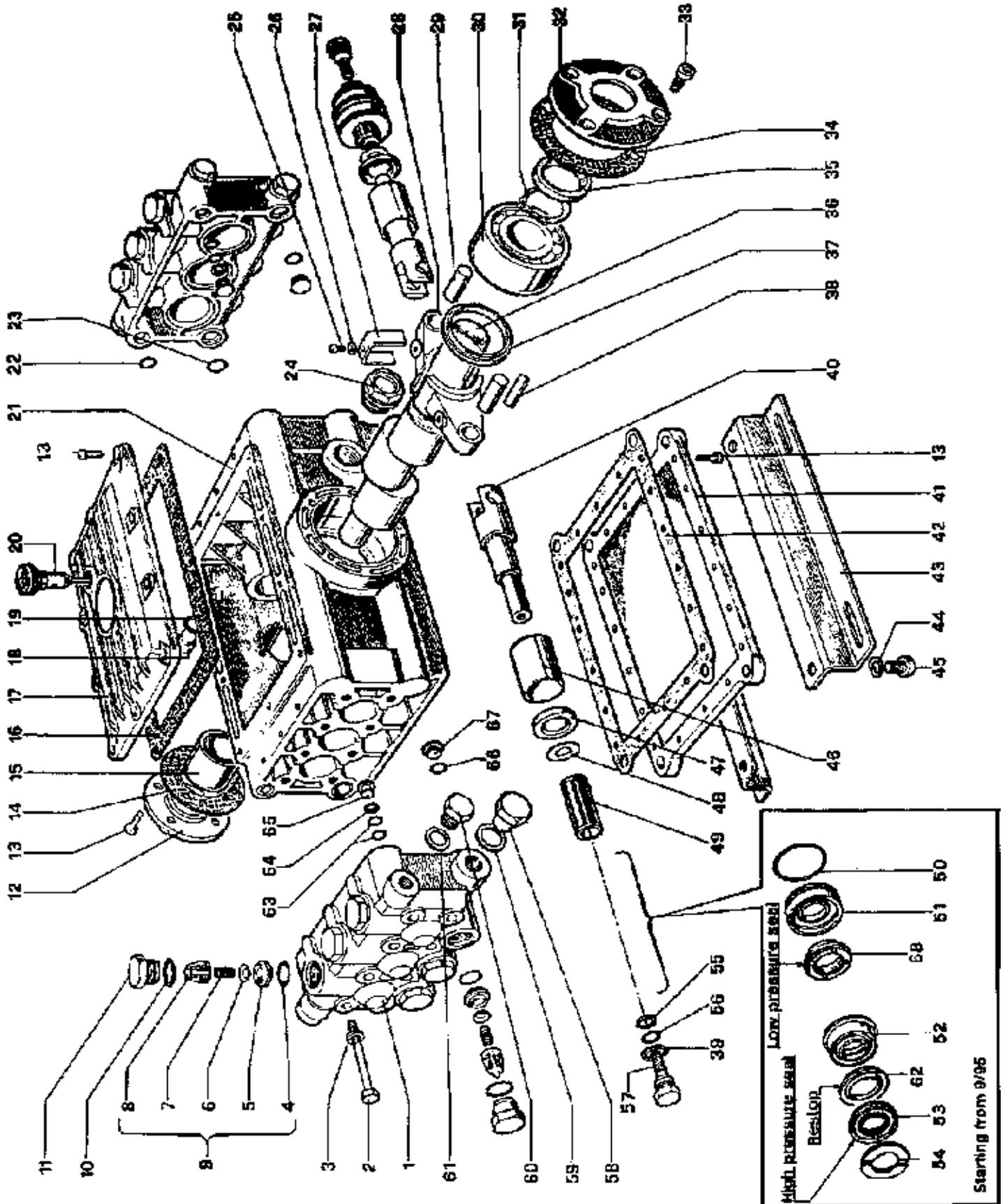
1-ZMVT00L	Packing Insertion Tool
1-26019400	Packing Extractor, Slap Hammer
1-26093400	Packing Extraction Socket, TS-2021

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		

Repair Kits	1-0001	1-0002	1-0003	1-0004	1-0006	1-0007	1-0008	1-0028
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

PUMP T-1631 #5-2309
8-2500



PUMP T-1631 #5-2309 8-2500

ITEM	PART NO.	DESCRIPTION	QTY
1	1-48120241	Pump Head	2
2	1-99320600	Screws	16
3	1-96702000	Washers	16
4	1-90384100	O-Rings (Kit 1-0001)	12
5	1-36200366	Valve Seats (Available only in Kit 1-0001)	12
6	1-36200176	Valve Plates (Available only in Kit 1-001)	12
7	1-94737600	Springs (Available only in Kit 1-0001)	12
8	1-36200251	Valve Guides (Available only in Kit 1-0001)	12
9	1-36703201	Valve Assembly (Available only in Kit 1-0001)	12
10	1-90384700	O-Rings (Available only in Kit 1-0004)	12
11	1-98222200	Caps (Available only in Kit 1-0004)	12
12	1-48160122	Crankcase Cover	1
13	1-99183700	Screws	32
14	1-48211984	Cover Gasket	1
15	1-91837000	Tapercod Poling Bearing	1
16	1-48211884	Cover Gasket	1
17	1-48211422	Crankcase Cover	1
18	1-98204100	Caps	1
19	1-90358500	O-Ring	1
20	1-98209700	Cap	1
21	1-48010402	Crankcase	1
22	1-90382700	O-Rings	4
23	1-90383900	O-Rings	4
24	1-97598800	Oil Level Indicator	1
25	1-99153700	Screws	6
26	1-96691000	Washers	6
27	1-48217074	Yokes	6
28	1-48030122	Connecting Rods	3
29	1-97737400	Wrist Pins	1
30	1-91847500	Bearing	1
31	1-90069500	Snap Ring	4
32	1-48150122	Crankcase Cover	6
33	1-99303900	Screws	6
34	1-48211284	Cover Gasket	3
35	1-90167000	Oil Seal	3
36	1-48020135	Crankshaft	3
37	1-48212389	Connecting Rod Ring	3
38	1-91497500	Key	3
39	1-96728000	Washers (Kit 1-0006)	2
40	1-48050154	Piston Guides	2

ITEM	PART NO.	DESCRIPTION	QTY
41	1-48211622	Crankcase Cover	2
42	1-48211784	Cover Gasket	3
43	1-48200074	Pump Feet	3
44	1-96710600	Washers	6
45	1-99369900	Screws	6
46	1-90915000	Bushings	3
47	1-90162700	Oil Seals (Kit 1-0024)	3
48	1-97286600	Washers (Kit 1-0006)	2
49	1-47040509	Pistons	4
50	1-90361600	O-Rings (Kits 1-0014, 1-0029)	4
51	1-47080670	Packing Retainers (Avail. only in Kits 1-0014, 1-0029)	1
52	1-47216700	Intermediate Rings (Avail. only in Kits 1-0029, 1-0149)	1
53	1-90272500	Packing, High Pressure (Avail. only in Kits 1-0029, 1-0148)	1
54	1-46100051	Head Rings (Available only in Kits 1-0011, 1-0029)	6
55	1-90506700	Anti-Extrusion Rings (Kit 1-0006)	6
56	1-90358500	O-Rings (Available only in Kit 1-0006)	6
57	1-47219566	Piston Screws (Kit 1-0006)	6
58	1-98217600	Caps	4
59	1-96751400	Washers	4
60	1-98210000	Caps	4
61	1-96738000	Washers	4
62	1-90273000	Restop (Kits 1-0029, 1-0148 1-0149)	6
63	1-90358000	O-Ring	4
64	1-90503700	Seal Ring	2
65	1-48220470	Internal Plug	3
66	1-90382500	O-Ring	2
67	1-48220370	Internal Plug	2
68	1-90272800	Packing, Low Pressure (Avail. only in Kits 1-0029, 1-0149)	3

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

1-26019400 Packing Extractor, Slap Hammer

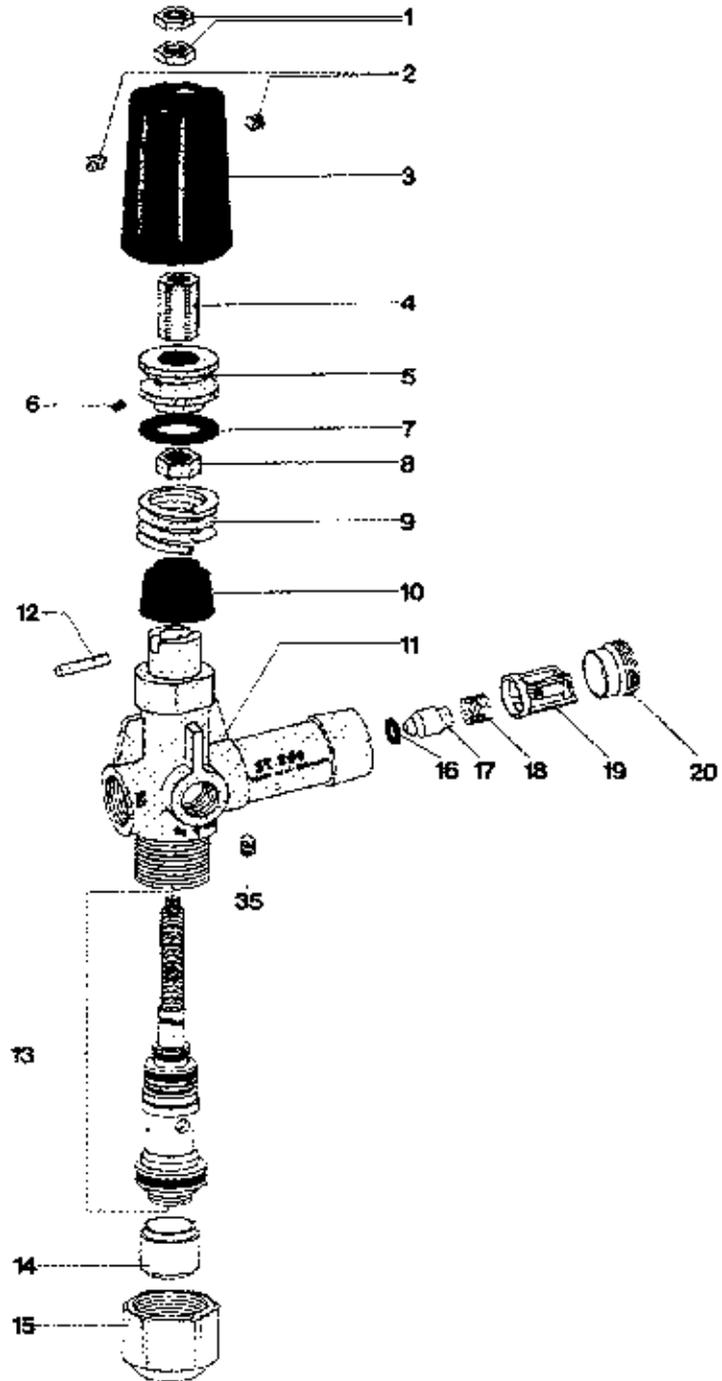
1-26093500 Packing Extractor, Socket T-991

Torque Specs*			
Position	Ft.lbs	Position	Ft.lbs
2	22.1	33	14.7
11	73.7	45	29.4
13	7.3	57	14.7
18	14.7	58	20.4
24	13.2	60	29.4
25	5.1		

Repair Kits	1-0001	1-0004	1-0006	1-0011	1-0012	1-0013	1-0024	1-0029
Assembly Pos.#	4, 5, 6 7, 8, 9	10, 11	39, 55, 56, 57	54	53	52, 62	47	50, 51, 52, 53, 54, 62
# of Assemblies	6	6	3	6	6	3	3	1

UNLOADER
ST261 • 5-3225
 All Models

ITEM	PART NO.	DESCRIPTION
1	84-040001620	Nut
2	84-040003090	Set Screw
3	84-200260547	Adjustment Handle
4	84-010004480	Adjustment Insert
5	84-100001700	Adjusting Screw
6	84-040001630	Set Screw
7	84-020000134	1Glide Ring
8	84-040001610	Nut
9	84-060000301	Spring
10	84-020002850	Bushing
11	84-010001680	Forged Housing
12	84-040001490	Pin
13	84-200261526	Valve Kit
14	84-010001775	Spacer
15	84-010001690	Stop Nut
16	84-050000050	§ O-Ring
17	84-040000440	§ Valve Poppet
18	84-060000310	§ Spring
19	84-9020001290	§ Valve Cage
20	84-010001700	Retainer
	84-200260528	§ Outlet Valve Kit

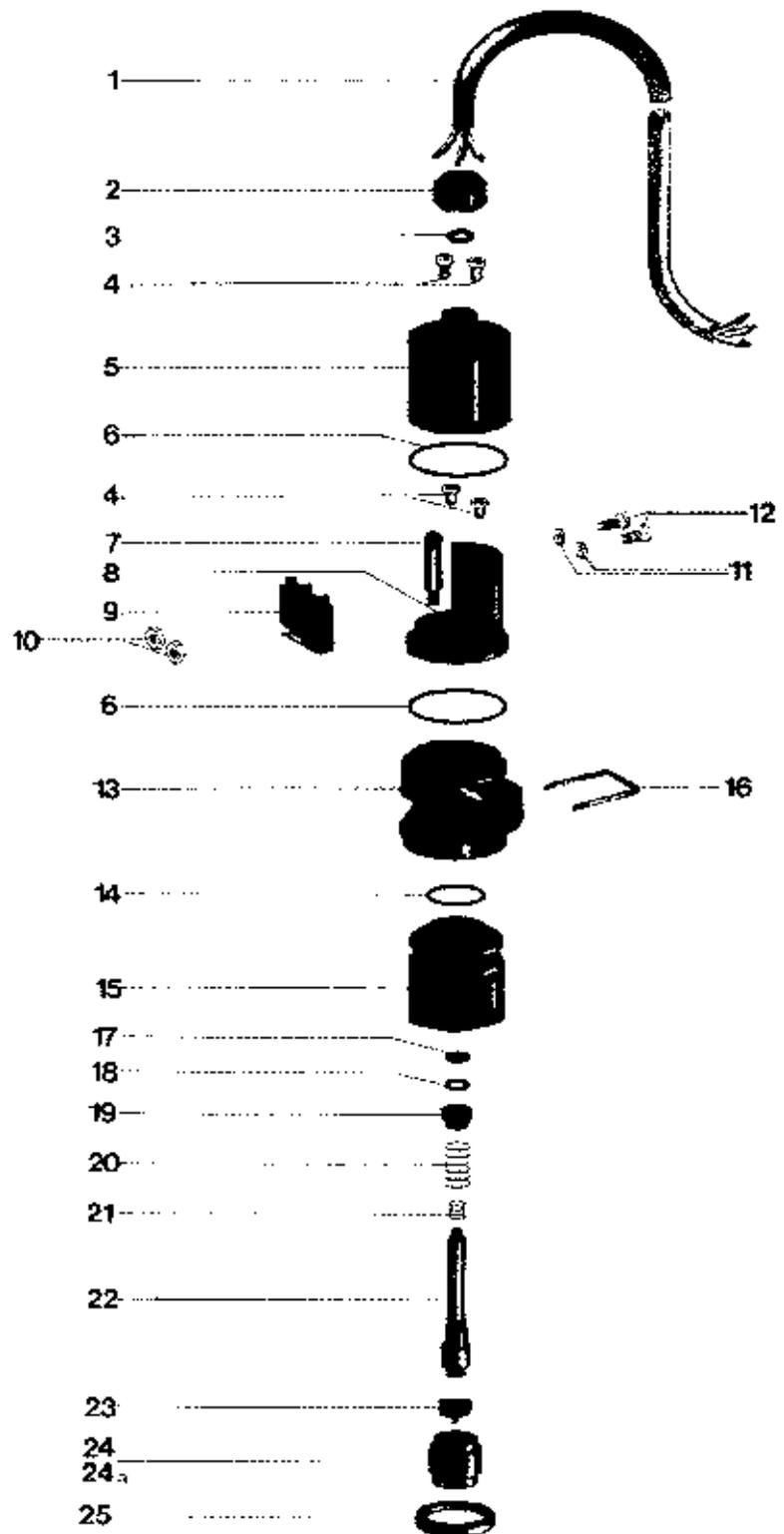


UNLOADER

ST261SW • 84-200260513

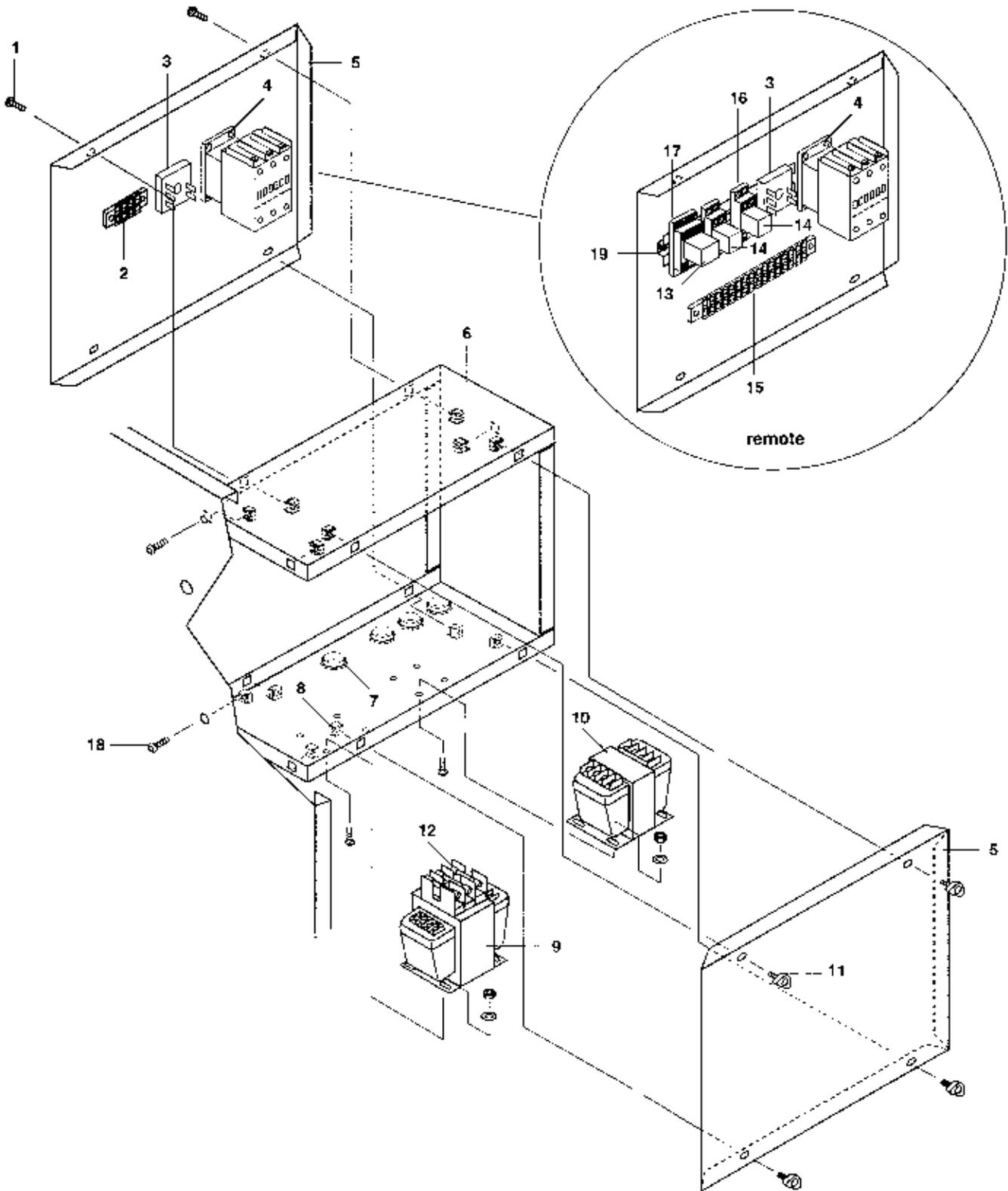
All Models

ITEM	PART NO.	DESCRIPTION
1	84-200260541	Cable (45°)
2	84-010001740	Nut
3	84-050000050	O-Ring
4	84-050000450	Screw (2)
5	84-020001320	Bell Housing
6	84-050000490	O-Ring
7	84-010001750	Stud
8	84-020001330	Switch Mount
9	84-090000050	Switch
10	84-040000470	Nut a(2)
11	84-050000530	Washer (2)
12	84-040000560	Screw (2)
13	84-010001765	Brass Housing
14	84-050000430	O-Ring
15	84-010001695	Adapter
16	84-060000385	U-Cup
17	84-050000740	§ Back-up Ring
18	84-050000010	§ O-Ring
19	84-010002410	§ Retainer
20	84-060000550	§ Spring
21	84-060000370	§ Spring
22	84-200260521	§ Switch Rod
23	84-020001470	§ Pin Guide
24	84-010001775	Spacer (ST-261)
24a	84-010001770	Spacer (old ST-260)
25	84-020001285	Seal
	84-200261527	Repair Kit



VNG ELECTRICAL BOX

All Models



VNG ELECTRICAL BOX

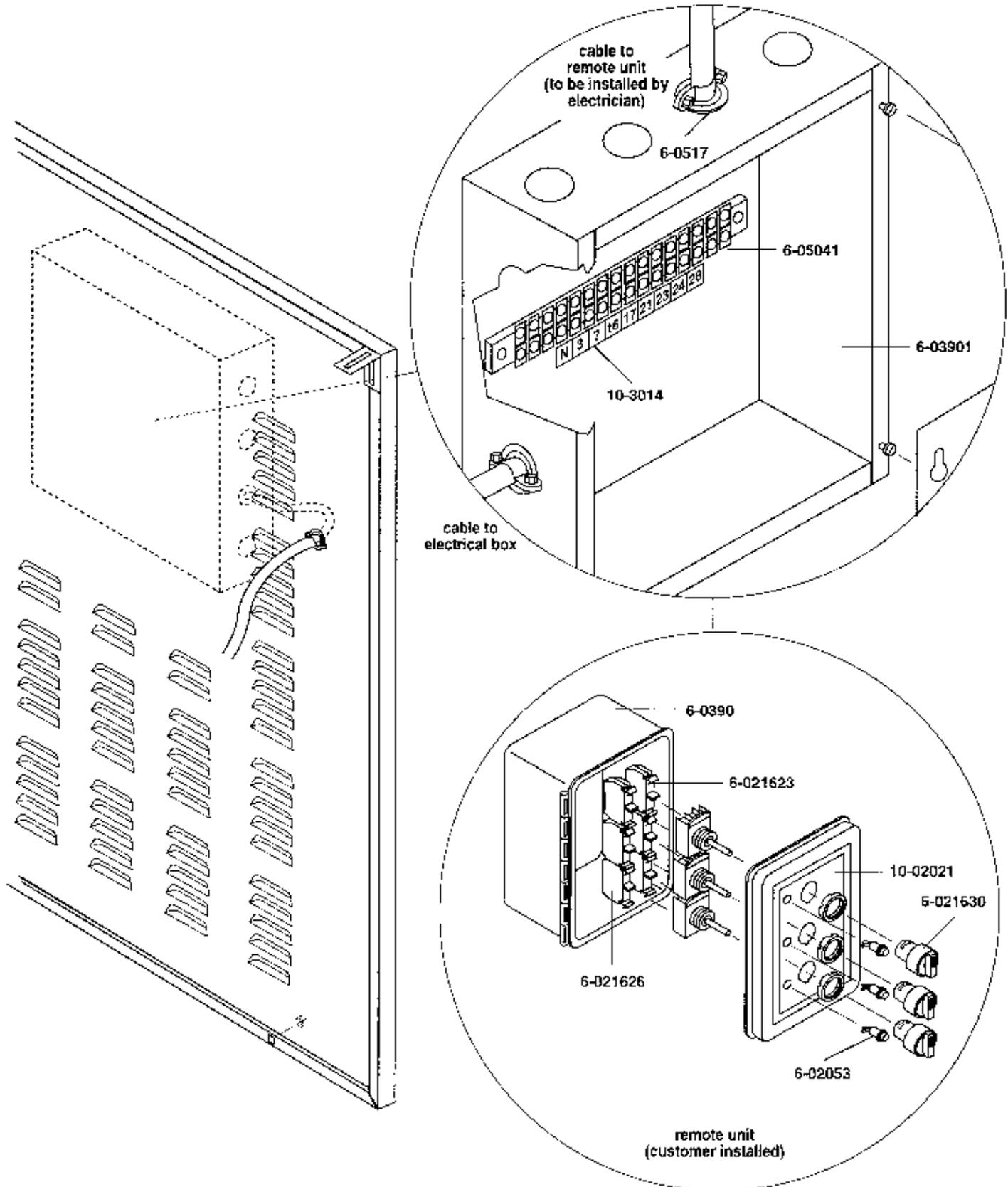
All Models • PARTS LIST

ITEM	PART NO.	DESCRIPTION	QTY
1	90-1991	Screw 10/32" x 1/2" BIR	12
2	6-0504	Block Terminal, 4 Pole	1
3	6-03680	Timer Solid State 120V 1 min	1
4	6-1218	Contactors GE C-2000 3-11	1
		CL049A310MS	
	6-1221	4-2, 4-3A, 6-3B, 8-25B,	1
		CL06A311MIS	
	6-1212	4-2B, CL02A310TJ	1
	6-1205	4-2F, 4-3F CL00A310TJ	1
5	6-1215	4-3B, 6-3C CL25A310TJS	1
	6-1209	4-3C, CL01A310TJ	1
	95-07163030	Panel, Elec Box Side	2
	6-1257	▲ Overload GE RTAIS 4-2B	1
	6-1254	▲ Overload GE RTAIN 4-2C, F	1
	6-1262	▲ Overload GE RTA2E 4-3A	1
	6-1259	▲ Overload GE RTAIU 4-3B	1
	6-1255	▲ Overload GE RTAIP 4-3C	1
	6-1254	▲ Overload BD FGZIN 4-3F	1
	6-1263	▲ Overload GE RTA2F 6-3, 8-25B	1
	6-1258	▲ Overload GE RTAIT 6-3, 8-25C	1

ITEM	PART NO.	DESCRIPTION	QTY
6	95-07163028	Box Elec VNG-L	1
7	6-0517	Strain Relief, 3/4"	4
8	90-2018	Nut, Cage 10/32" x 16 Ga	8
9	6-052352	Transformer 240/480 - 120V	1
		.050 KVA	
10	6-052363	Transformer .050 KVA 24V	1
11	90-19942	Screw 10/32" x 3/4" Hex Wash	4
12	6-02295	1/2 Amp Fuse 480V	2
	6-02294	1 Amp fuse 240V	2
	6-02297	▲ Fuse GDL 1/2 Amp 120V Glass	1
13	6-036210	Relay Latch (2) RH2LBUAL120	1
14	6-03621	Relay 120V RH2B-UL-AC120	2
15	6-05041	Block, Terminal, 16 Pole	1
	6-0505	Bar, Jumper (All Models)	2
16	6-03541	Base, Relay, SH2B-05	2
17	6-035210	Relay, Socket, SH3B-05	1
18	90-1998	Screw, 1/4" x 3/4" BH SOC CS	4
19	6-021595	Din Rail	1
		▲ Not Shown	

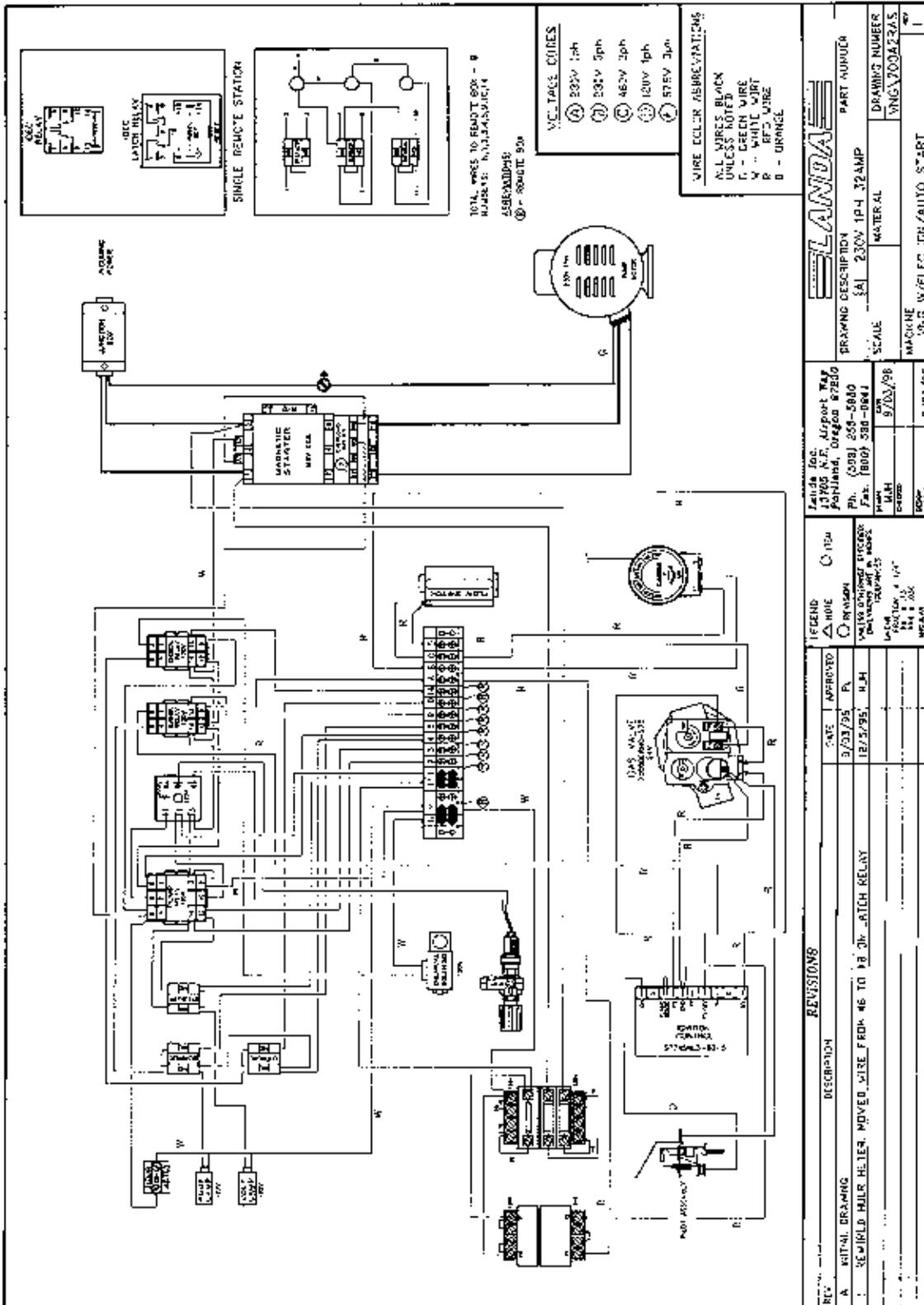
VNG REMOTE ELECTRICAL BOX

All Models



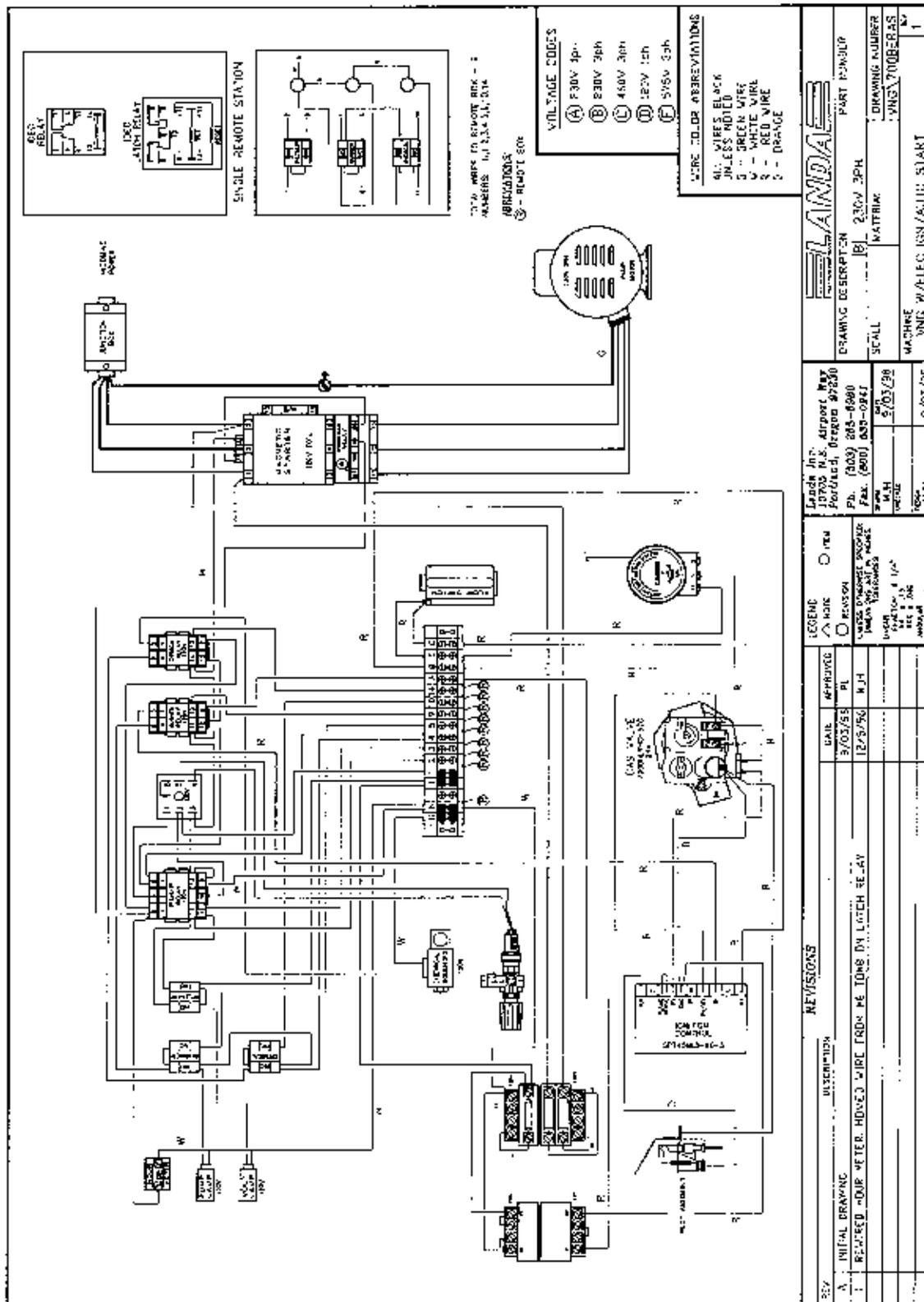
WIRING DIAGRAM

230V 1 PH 32 Amps w/Elec. Ign/Auto Start



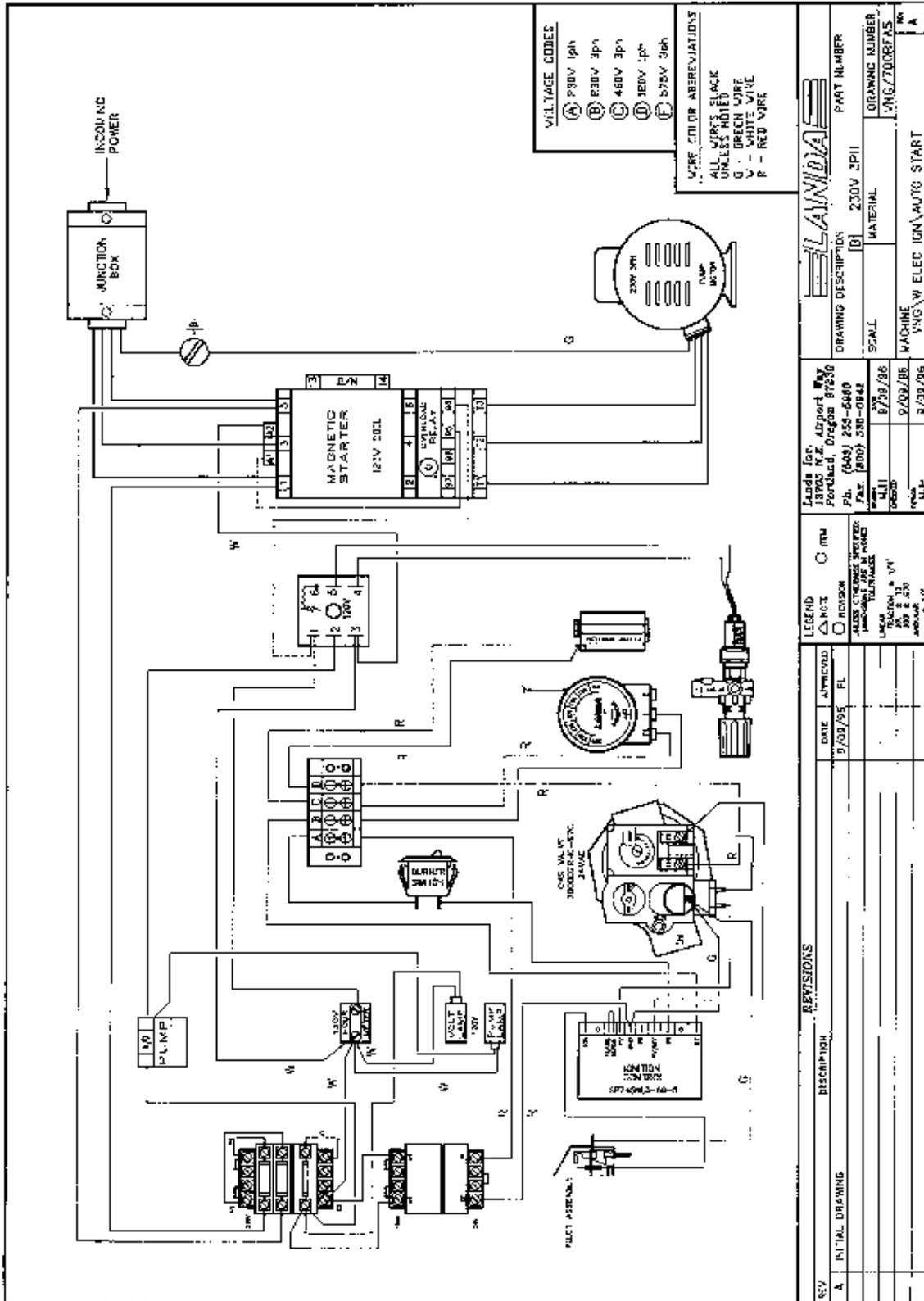
WIRING DIAGRAM

230V 3 PH w/Elec. Ign/Auto Start



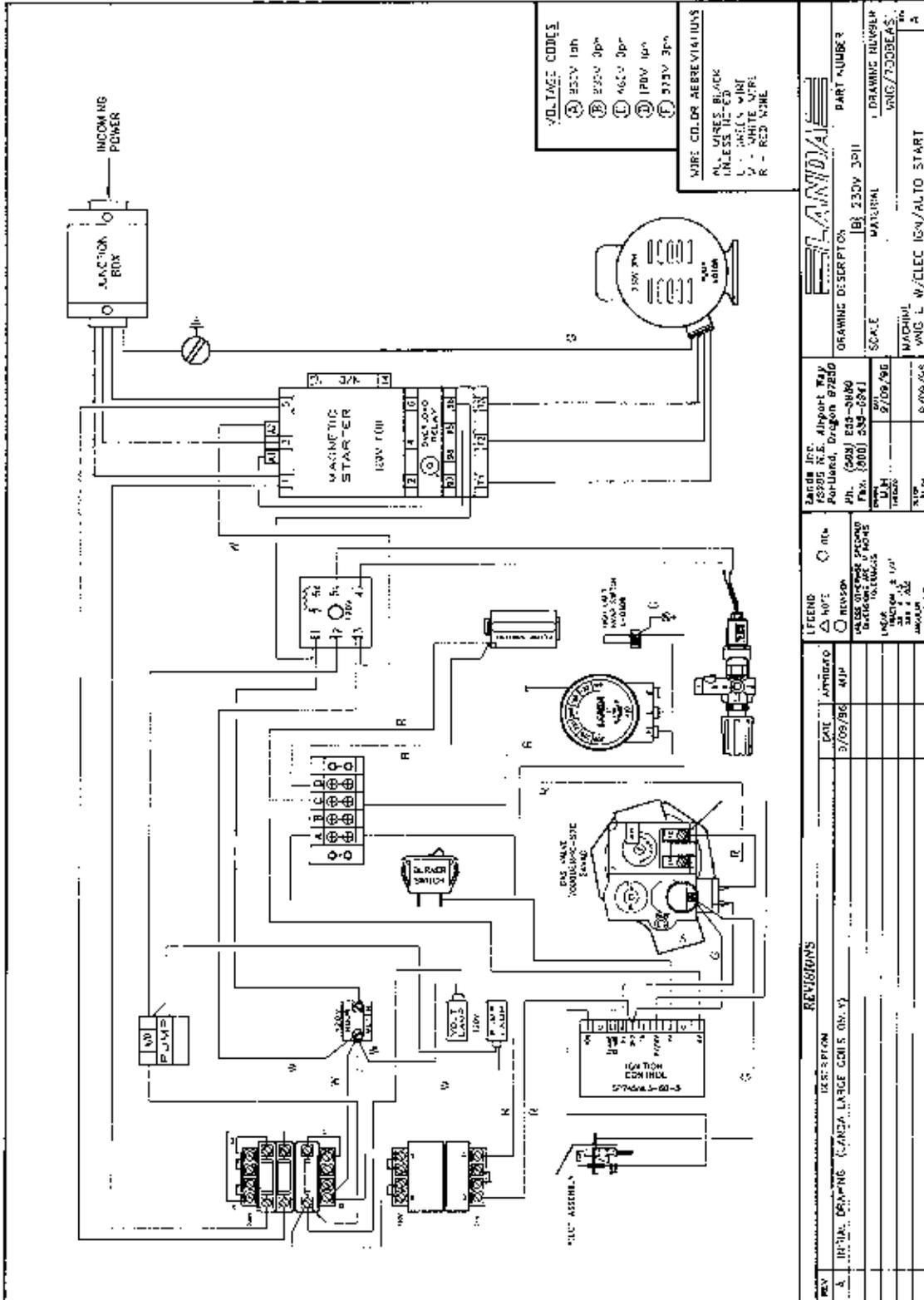
WIRING DIAGRAM

230V 3 PH w/Elec. Ign/Auto Start



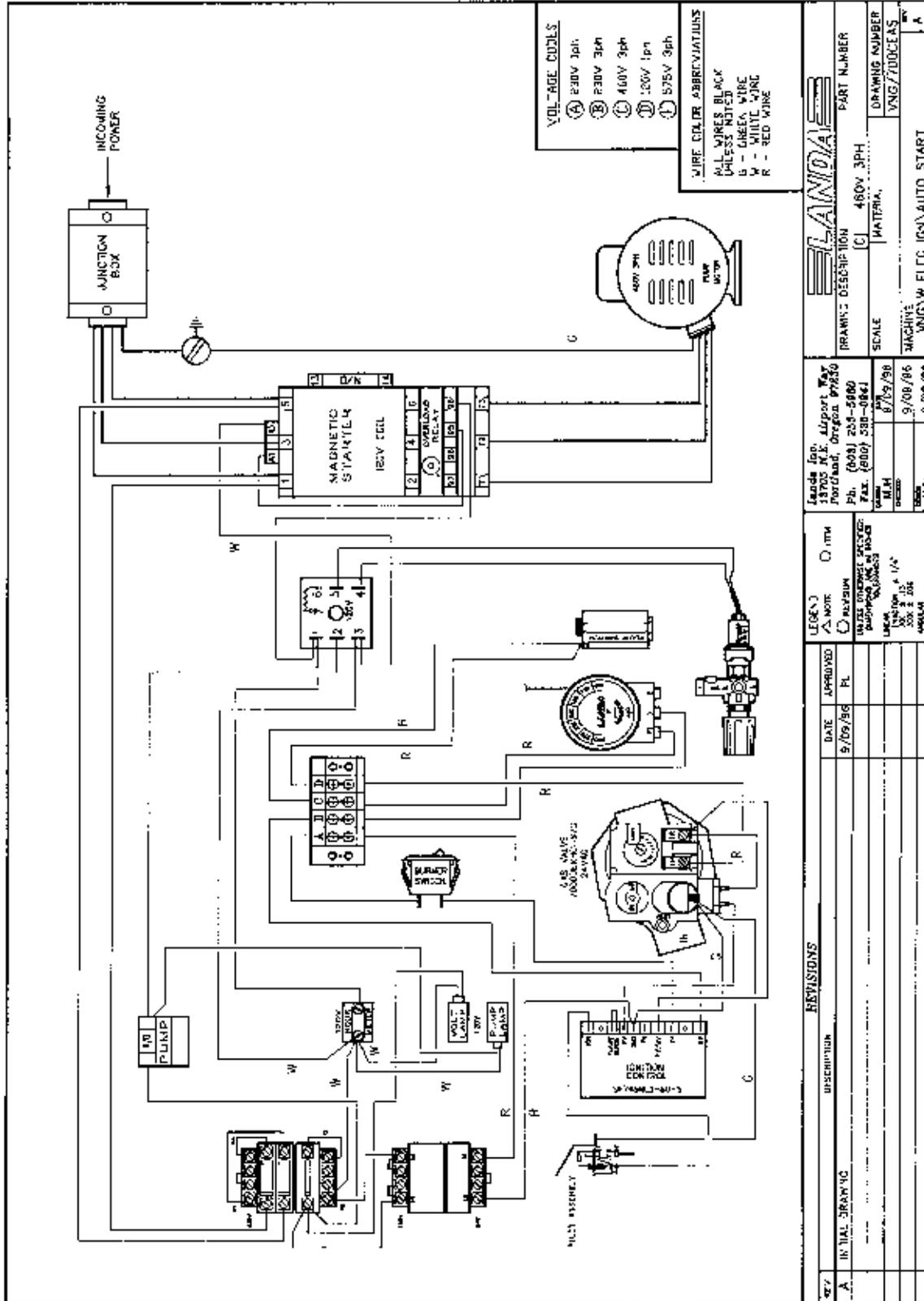
WIRING DIAGRAM

VNG-L 230V 3 PH w/Elec. Ign/Auto Start



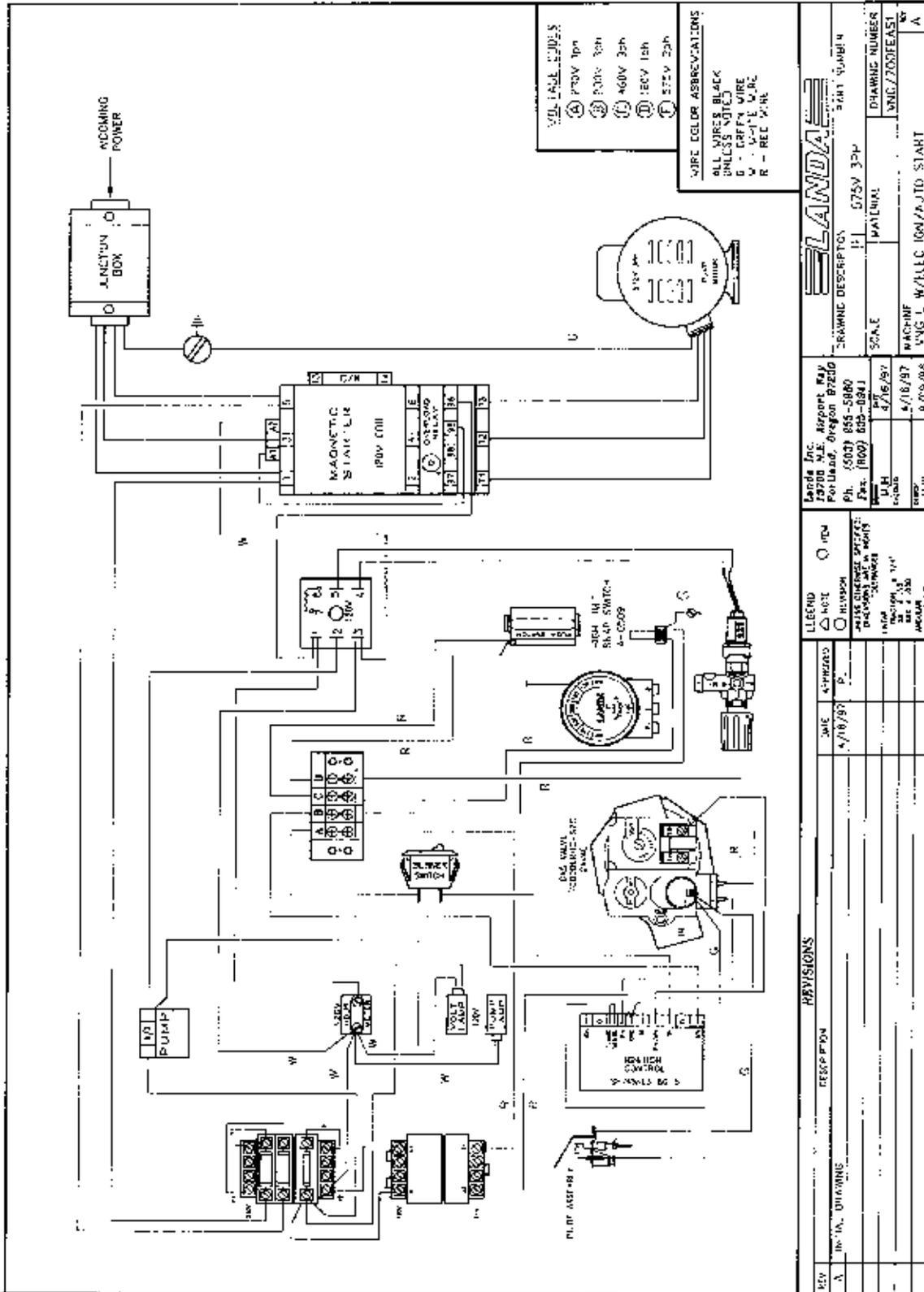
WIRING DIAGRAM

460V 3PH w/Elec. Ign/Auto Start

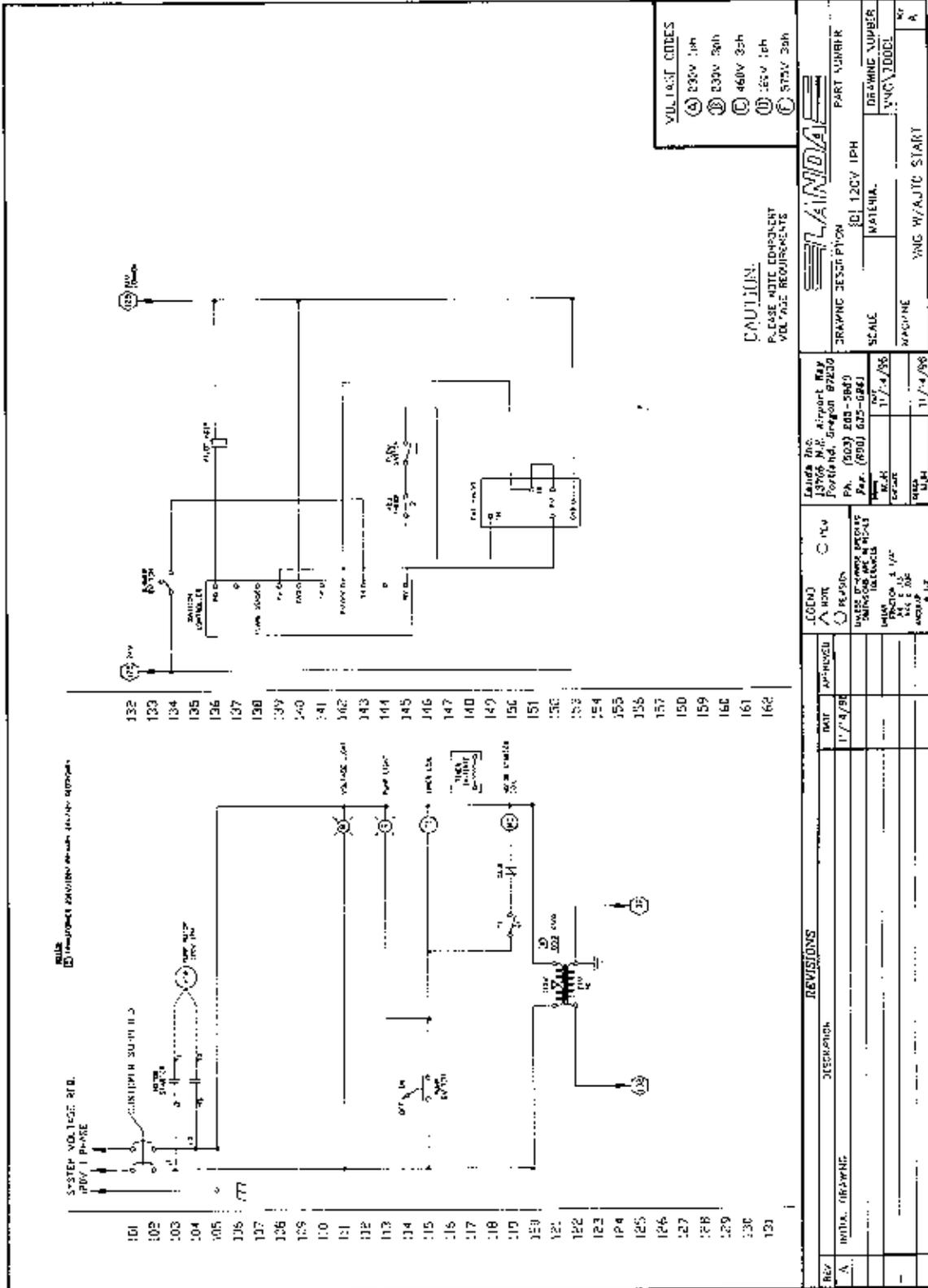


Wiring Diagram

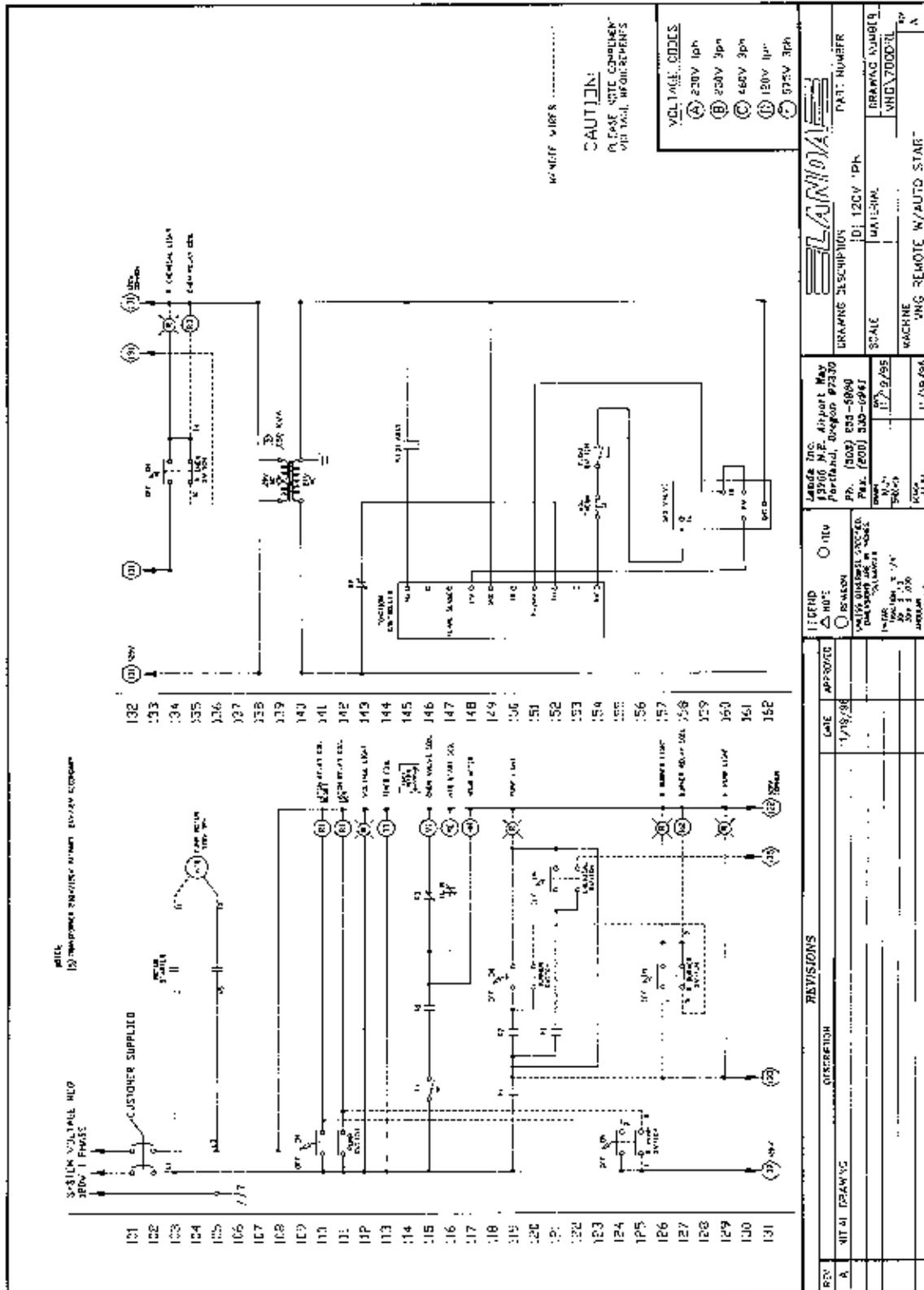
VNG-L 575V 3PH w/Elec. Ign/Auto Start



Wiring Diagram 120V 1 PH w/Auto Start

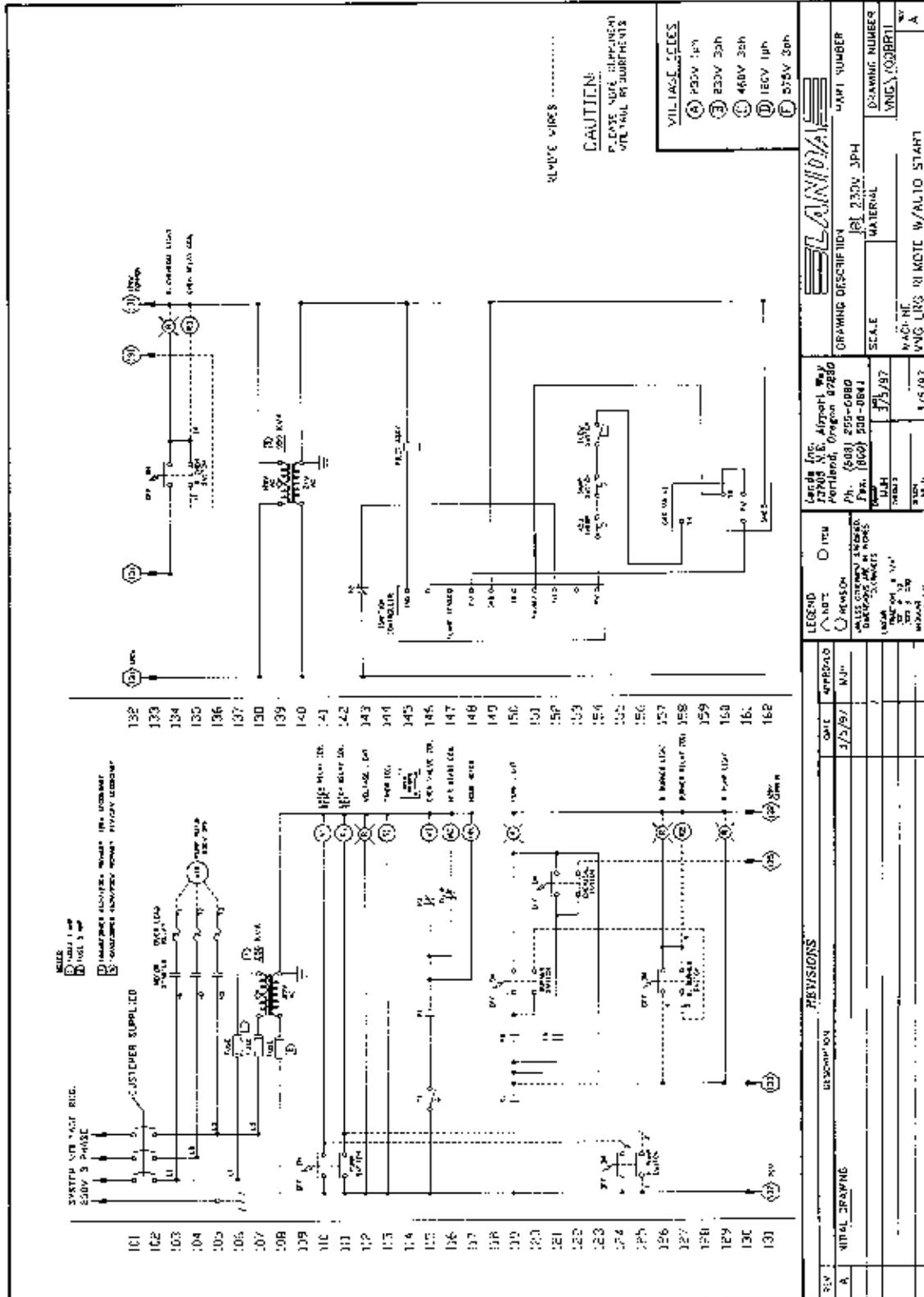


Wiring Diagram 120V 1 PH Remote w/Auto Start

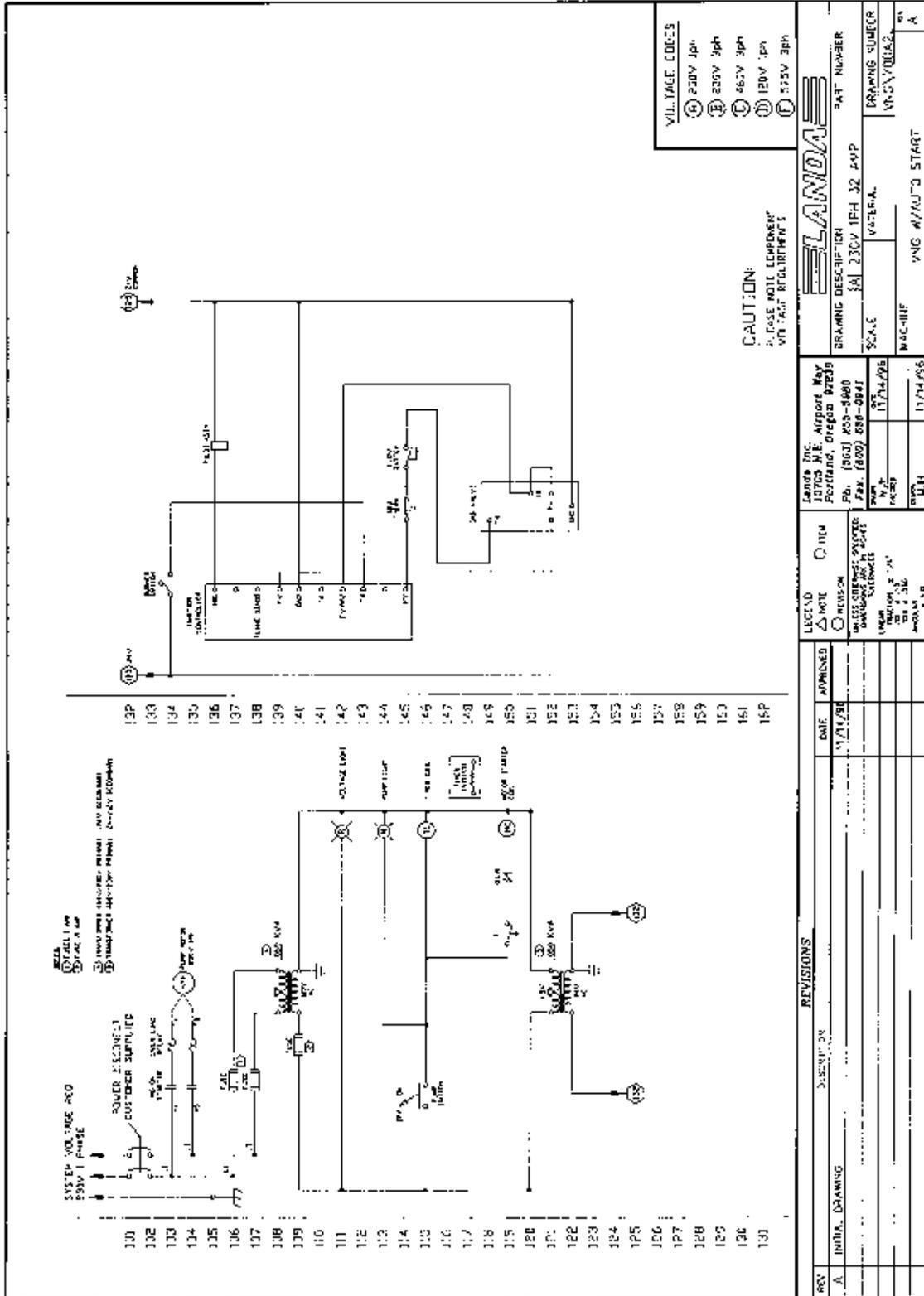


Wiring Diagram

VNG-L Remote 230V 3 PH w/Auto Start

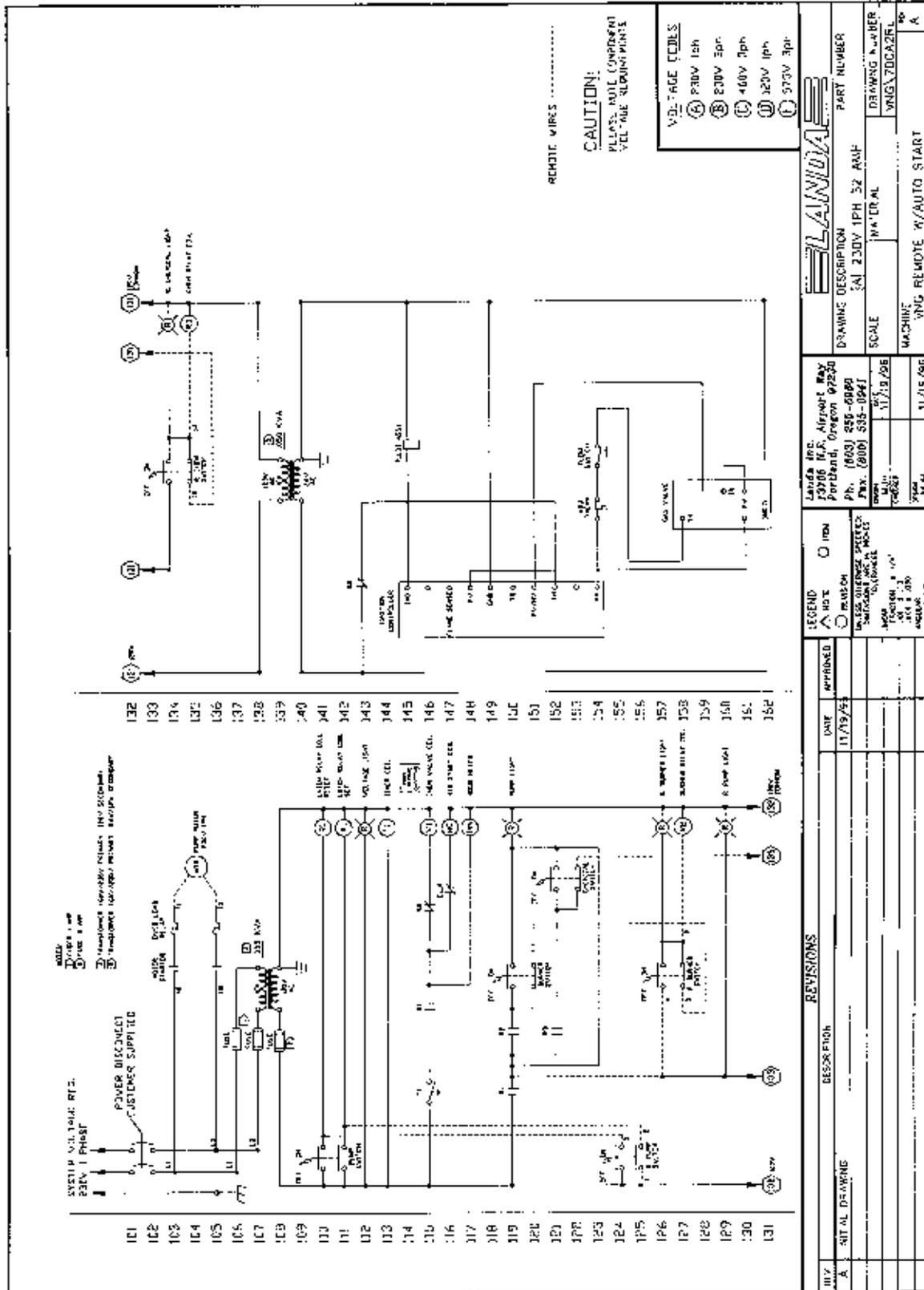


Wiring Diagram 230V 1PH 32 Amp w/Auto Start

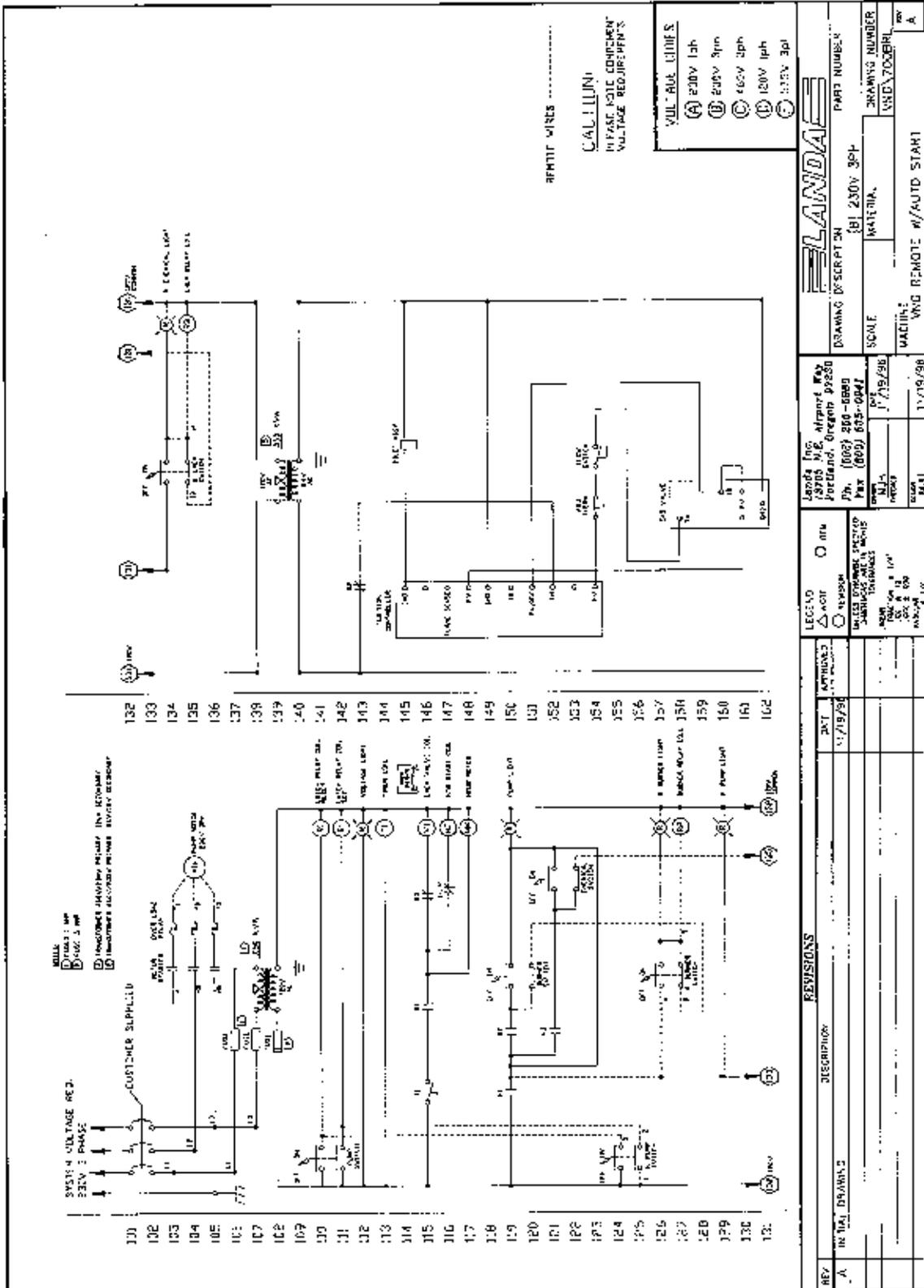


Wiring Diagram

VNG Remote 230V 1 PH 32 Amps w/Auto Start

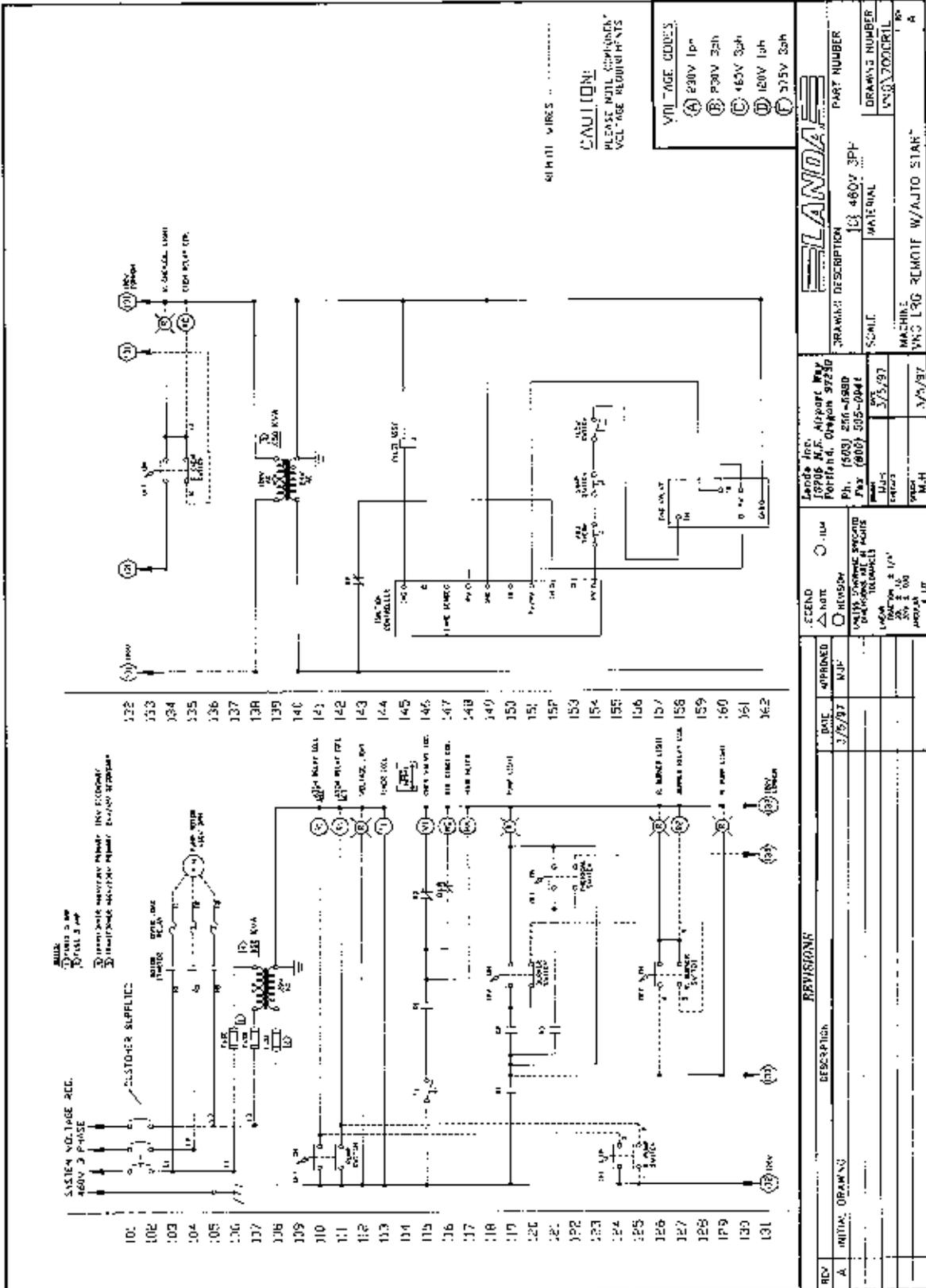


Wiring Diagram VNG Remote 230V 3PH w/Auto Start



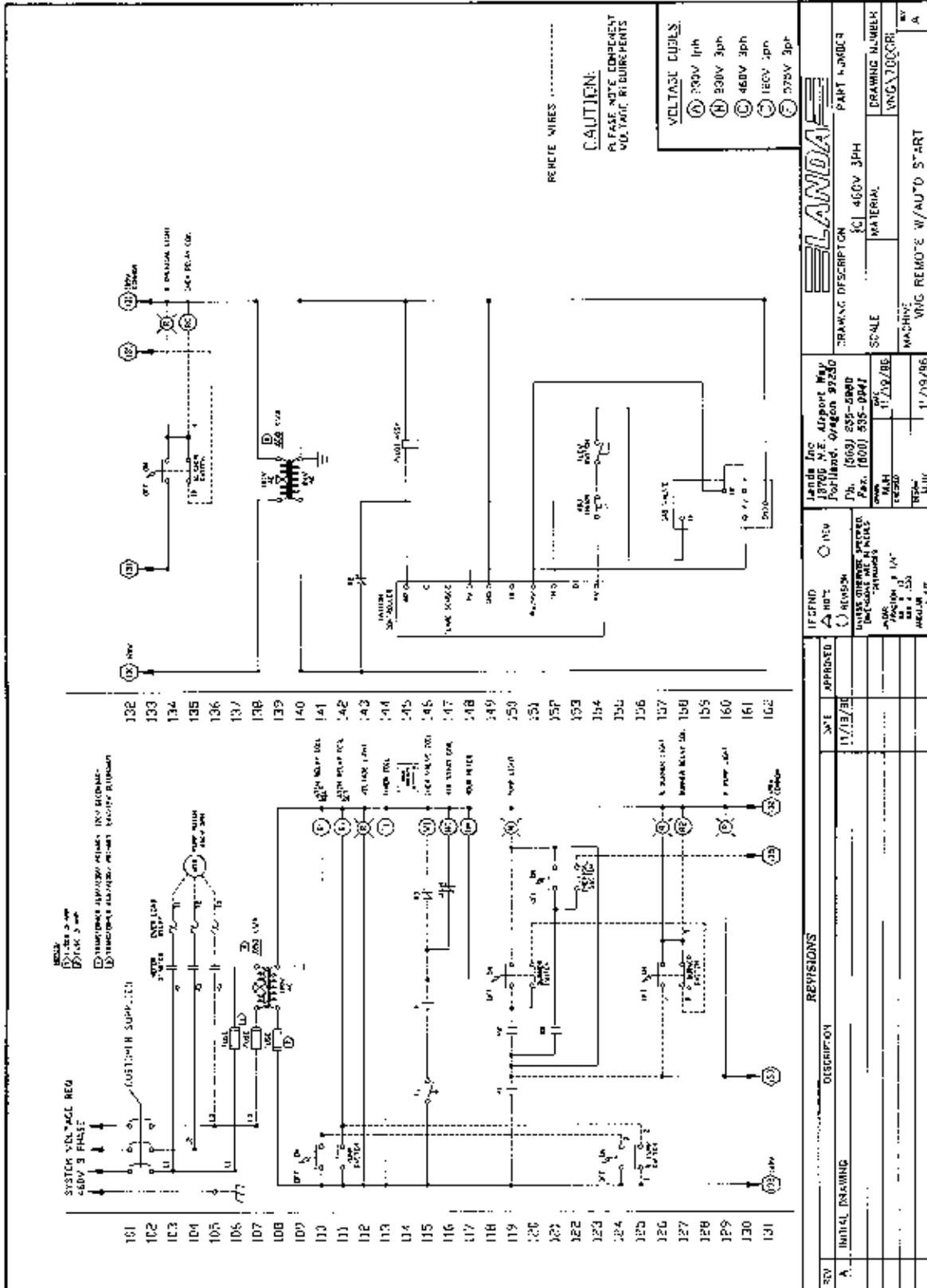
Wiring Diagram

Vng-L Remote 460V 3 PH w/Auto Start



Wiring Diagram

460V 3 PH Remote w/Auto Start



ROSWIRINGDIAGRAM

2 STATION PARALLEL WIRING INSTRUCTIONS

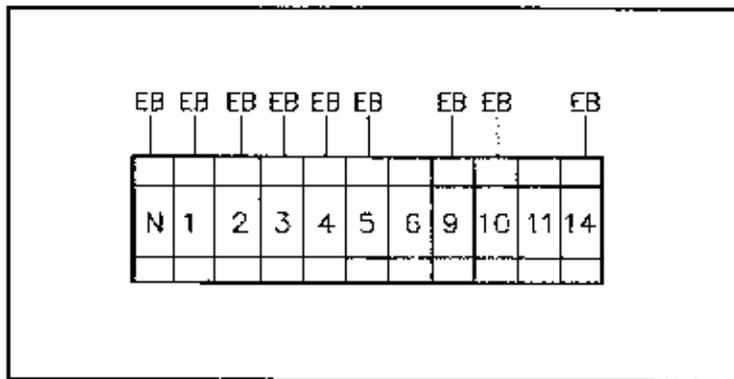
JOIN NUMBERED WIRES FROM REMOTE STATIONS TO CORRESPONDING TERMINATION BLOCKS IN JUNCTION BOX LOCATED AT REAR OF MACHINE.

DWG # \VNGENG\701A
 DATE: 9/05/96
 DWG BY: M.J.H

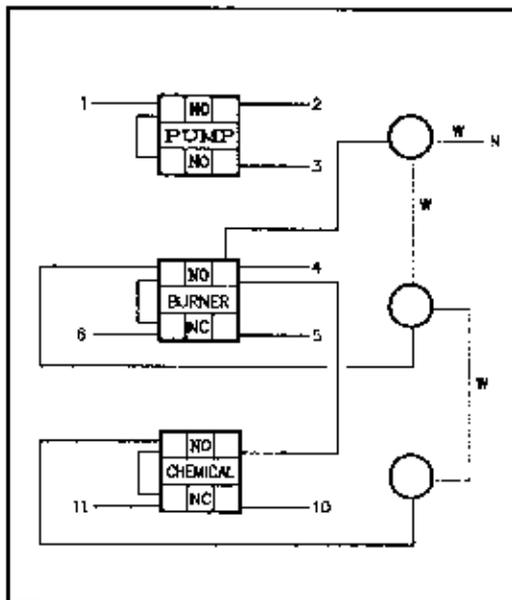
LEGEND:

ALL WIRES BLACK UNLESS NOTED
 EB = ELECTRICAL BOX
 N = NEUTRAL
 W = WHITE WIRE

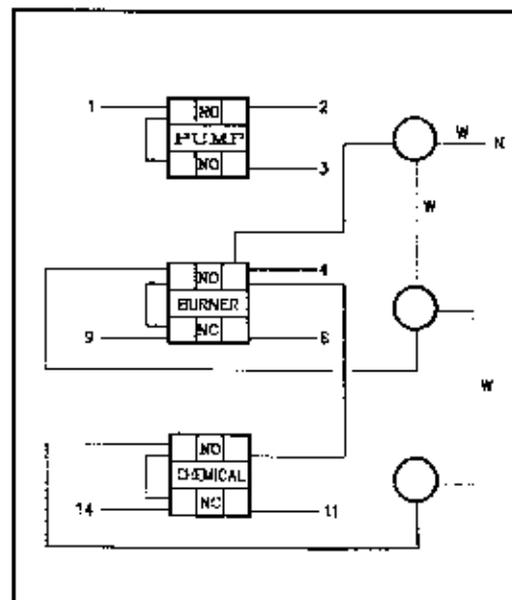
TERMINATION JUNCTION BOX



REMOTE STATION 1

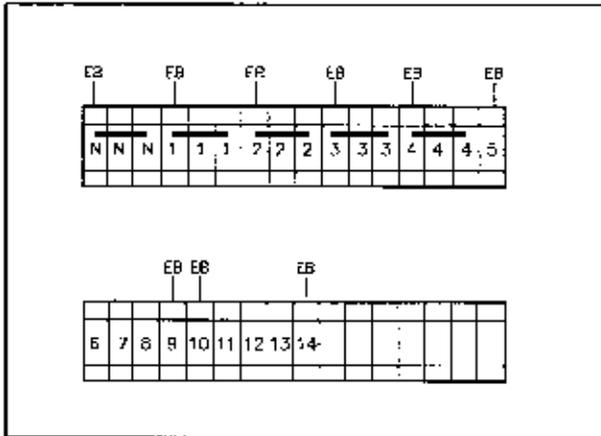


REMOTE STATION 2



ROS WIRING DIAGRAM

TERMINATION JUNCTION BOX



4 STATION PARALLEL WIRING INSTRUCTIONS

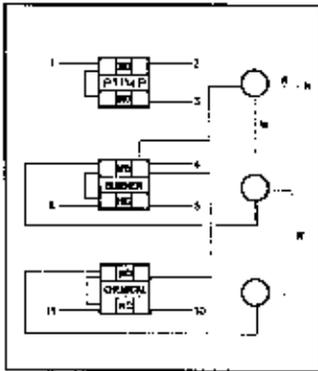
JOIN NUMBERED WIRES FROM REMOTE STATIONS TO CORRESPONDING TERMINATION BLOCKS IN JUNCTION BOX LOCATED AT REAR OF MACHINE

DWG # VNGENC703A
DATE: 9/05/96
DWG BY: M.J.H

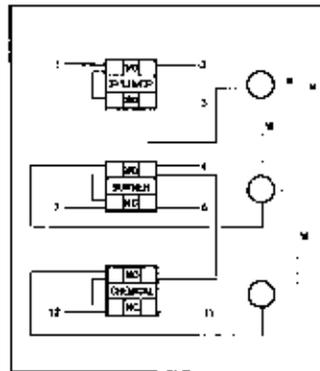
LEGEND:

ALL WIRES BLACK UNLESS NOTED
EB = ELECTRICAL BOX
N = NEUTRAL
W = WHITE WIRE

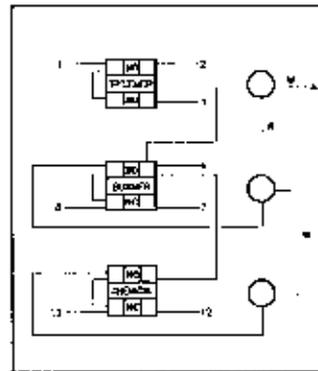
REMOTE STATION 1



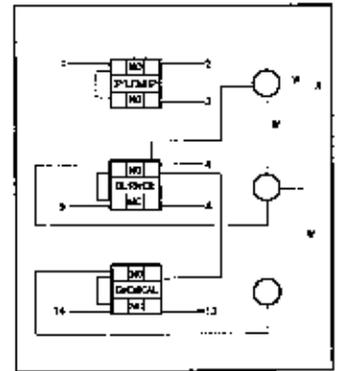
REMOTE STATION 2



REMOTE STATION 3



REMOTE STATION 4



BURNER SPECIFICATIONS

MODEL	BURNER ASSEMBLY	JET SIZE	GAS VALVE	PILOT ORIFICE CONVERSION
VNG3-1000	X - 44	#56	3/4" 7000MV4HC	No
VNG4-2000	X - 44	#54	3/4" 7000MVRHC	No
VNG4-3000	X - 44	#54	3/4" 7000MVRHC	No
VNG6-3000	EW-100	#54	1" 7000MVRHC	No
VNG8-2500	EW-70	#54	1" 7000MVRHC	No
VLP3-1000	X - 44	#69	3/4" 7000MV4HC Kit	Yes
VLP4-2000	X - 44	#65	3/4" 7000MV4HC-LP Kit	Yes
VLP4-3000	X - 44	#65	3/4" 7000MV4HC-LP Kit	Yes
VLP6-3000	EW-98	#66	1" 7000MV4HC-LP Kit	Yes
VLP8-2500	EW-66	#66	1" 7000MV4HC-LP Kit	Yes

PULLEY and BELT CHART

Model	Pump	Pump Pulley	Pulley Bushing Bore	Pump RPM	Motor	Motor Pulley	Pulley Bushing Bore	Motor RPM	Belt Size
VNG3-1000	T991	AK 84 H	24 mm	1160	2 HP	AK 28	5/8" Bore	3450	A-35
VNG4-2000A	T1011	2 AK 84 H	24 mm	980	7 HP	2 AK 51 H	1-1/8" Bushing	1725	(2) AX 36
VNG4-2000B, C	T1011	2 AK 84H	24 mm	980	5 HP	2 AK 51 H	1-1/8" Bushing	1725	(2) AX 36
VNG4-3000	T2011	2 BK 80 H	24 mm	897	7-1/2 HP	2 BK 45 H	1-3/8" Bushing	1725	(2) BX 36
VNG6-3000	TS202-1-L	2 BK 55 H	24 mm	1344	15 HP	2 TB 40	1-5/8" Bushing	1725	(2) BX 40
VNG8-2500	T1631	2 BK 80H	24 mm	851	15 HP	2 TB 40	1- 5/8" Bushing	1725	(2) BX 51

SPECIFICATIONS

MODEL		VNG3-1000+	VNG4-2000+	VNG4-3000+	VNG6-3000 ‡	VNG8-2500 ‡
DISCHARGE	GPM	2.8	3.9	3.5	5.2	7.9
OPERATING PRESSURE	PSI	500 - 1000	1000 - 2000	1500 - 3000	1500 - 3000	1250 - 2500
OPERATING TEMPERATURE	**	180° - 250° F				
BTU PER HOUR		245,000	350,000	300,000	600,000	750,000
BURNER TYPE		Natural Draft				
FUEL TYPE		Propane				
BURNER ASSEMBLY		Ring Type with Aspirating Spud				
	Volts	24 Volt				
	Stack Size	10"	10"	10"	10"	12"
COIL		1/2" Schedule 80				
PUMP		Tri-plunger				
PUMP MOTOR	HP	2	6(1 Ph), 5(3 Ph)	7-1/2	15	15
	Volts	D	A, B, C, F*	A, B, C, F*	B, C, F*	B, C, F*
	Amps	18	A-29, B-15, C-8, F-6	A-36, B-25, C-15, F-12	B-39, C-19, F-17	B-39, C-19, F-17
HOSE 50' Wire Braid		3/8" I.D. Single	3/8" I.D. Double		1/2" I.D. Double	
SHUT OFF GUN/TIME DELAY		Standard				
VARIABLE PRESSURE WAND		Standard				
NOZZLE		Four (4) 0°, 15°, 25°, 40°				
CHEMICAL CONTROL		Precision Meter Valve				
CONTROL SWITCH		Magnetic				
PAINT		Textured Polyester Powder Coating				
LENGTH/WIDTH/HEIGHT		48"/36"/48"			69"/43"/57"	
NET WEIGHT	lbs.	710	760	785	1,050	1,250

A = 230V, 1 Ph B = 230V, 3 Ph C = 460V, 3 Ph D = 120V, 1 Ph F = 575V, 3 Ph

** Operating temperature may vary depending on 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 200°F discharge temperature.)

NOTE: There may be slight variances in gallonage and pressures due to variances allowed by the 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 ₃ H ₈	C ₄ H 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	3.39
B.T.U. Per Lb. (Vapor)	21.663	21/3-9
B.T.U. Per Gallon (Liquid)	91.74	1-3/93-
Cubic Feet Per Lb. (Liquid)	8.607	7/53
Cubic Feet Per Gallon (Liquid)	3.45	31/9
Octane Number	125	1
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.			

