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GAS FIRED ELECTRIC DRIVEN CLEANER

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MACHINE RECORD

SERIAL NUMBER

DATE OF PURCHASE

PLACE OF PURCHASE

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MACHINE UNPACKING

ALL CLEANERS ARE CAREFULLY INSPECTED AND CARTONED TO PROTECT AGAINST SHIPPING DAMAGE. IF THERE IS DAMAGE OR MISSING PARTS, THE TRANSPORTATION COMPANY AGENT SHOULD MAKE A NOTATION TO THAT EFFECT ON THE BILL. REFER TO THE PARTS LIST IN THIS MANUAL AND ADVISE WHAT PARTS ARE MISSING OR DAMAGED. IF AVAILABLE, GIVE THE INVOICE NUMBER ON ALL ORDER BILLS. THIS PROCEDURE WILL ENABLE NEEDED PARTS TO BE SHIPPED QUICKLY.

THANK YOU for choosing our product. Please READ ALL Installation, Operation, and Maintenance instructions before operating the machine

NOTE: Refer to CLEANER MODEL for **SERIAL NUMBER** location

IMPORTANT SAFETY INSTRUCTIONS

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

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Do not leave this machine unattended when it is operating.
6. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
7. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the motor and repair.
8. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
9. Always point the gun assembly in a safe direction and do not direct spray on the cleaner.

⚠ **WARNING:** RISK OF INJECTION OR SEVERE INJURY. KEEP CLEAR OF NOZZLE. DO NOT DIRECT DISCHARGE STREAM AT PERSONS. THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS.

⚠ **AVERTISSEMENT:** RISQUE D'INJECTION ET DE BLESSURES GRAVES. SE TENIR À L'ÉCART DU JET. NE PAS DIRIGER LE JET DE SOTIE VERS D'AUTRES PERSONNES CONFIER L'UTILISATION LE JET DE SOTIE VERS D'AUTRES PERSONNES. CONFIER L'UTILISATION DE CE MATÉRIEL À UN OPÉRATEUR QUALIFIÉ.

10. Do not operate the machine if any mechanical failure is noted or suspected.

11. Do not start the machine unless the gun assembly is firmly gripped by the machine operator. Failure to do this could result in injury from a flying hose and gun assembly.

12. When starting a job, survey the area for possible hazards and correct before proceeding.

13. If chemicals are used in conjunction with this equipment, read and follow the product label directions.

14. During normal operation of this machine, hot discharges and surfaces may be produced. Avoid burns by being aware of these areas and staying clear of them during and immediately after equipment operation.

15. Do not start the burner unless a full flow of water is coming from the gun. Air leaks, insufficient water to the machine, or an open soap valve with no chemical means less than full flow through the coil. This could cause hose failure and burns to the operator.

WARNING: **OPEN FLAME:** Do not operate this machine in an area with combustible materials. A suitable fire extinguisher should be available in operating area.

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made. This will prevent accidental contact with any hazardous parts.
2. Drive belts must be inspected and tightened periodically to operate at optimum levels
3. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.
4. Always use the correct size spray tip found in the GENERAL section of the **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug-in or un-plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

DANGER: To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building.

5. Use only fuel for the water heater burner specified in the BURNER section of **MODEL SPECIFICATIONS**. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
6. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
7. Stacking, where required, must be installed in accordance with all local codes. A draft

diverter must be installed on a machine connected to an exhaust stack to prevent improper operation. (See GENERAL section of **MODEL SPECIFICATIONS** for stack size).

8. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
9. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

There are four main things to consider when installing your machine.

1. **GAS LINE** Consider all gas consuming appliances, on the gas line. Total the BTU's required and refer to the chart to get proper line size. Note: A 90 degree elbow is like adding ten feet to the total length. Below is a chart showing the recommended pipe size based on the maximum BTU/hr input to the machine. These pipe sizes are based on proper water column pressure for various gases and on a 0.5 inch pressure drop per 100 feet of pipe.

A. Find your maximum BTU across the top of the chart.

B. On left hand column, read closest distance from meter to machine.

C. The number in the square indicates proper pipe size (in inches).

FUEL SUPPLY**:** This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

2. **GAS PRESSURE**: Gas pressure to the control is the next step.

Natural gas (N.G.) maximum inlet pressure is 9 inches of water column. With the burner on, the inlet pressure should not fall more than 1.5 inches of water column. Manifold pressure should be regulated to the heat required, but in no case less than 3 inches of water column, or more than five inches of water column. Liquid propane (L.P.) maximum inlet pressure is 13 inches water column. Minimum inlet pressure is 10 inches water column. With the burner on, the inlet pressure should not fall more 1 inch of water column. A regulator must be placed in the gas line before the gas control inlet. The combination gas valve does not have a regulator with L.P.. The manifold pressure will be 1 inch of water column less than the inlet pressure or 10 to 12 inches of water column.

MAXIMUM BTU INPUT

NATURAL GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2
0 - 100	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2
0 - 150	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
0 - 200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

LP GAS

	200,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000	850,000	900,000	950,000	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000
0 - 50	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
0 - 100	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2
0 - 150	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2
0 - 200	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 1/2

WARNING

CARBON MONOXIDE HAZARD

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

3. **VENTILATION**: The gas fired machine must be vented. See the VENTING section of this manual.
4. **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFICATIONS.**

OTHER ITEMS TO CONSIDER BEFORE INSTALLATION

1. **LOCATION**: This machine should be installed by only qualified technicians. The machine should be set upon a level surface where it will not be affected by strong winds, rain, snow, extreme heat, and freezing temperatures. Install the machine considering locations for chemical pick-up, fuel connections, electrical connections, water hook-up, venting, and maintenance.
   All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart under item 4 for your cord selection.
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing.
3. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54).
5. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust to collect in the burner area.
6. **.QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Gas Code ANSI Z223.1/ NFPA No. 54.
7. **BARRIER:** We recommend that a barrier be installed between the machine and wash area to prevent spray from the wand from coming in direct contact with electrical controls, motors and transformers. This will increase the machine's life and lessen electrical problems.
8. **CHEMICALS:** Mix chemicals per the chemical manufacturers printed directions. Follow all mixing, handling, application, and disposal instructions. Wear gloves, boots, goggles, and protective clothing appropriate for the chemical being used.

ELECTRICAL INSTALLATION

WARNING

ELECTRICAL SHOCK HAZARD

1. **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. The circuit must match that specified in the ELECTRICAL section under **MODEL SPECIFICATIONS**.
2. **EXTENSION CORD:** The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong plugs and 3-pole cord connectors that accept the plug from the product. Use only extension cords that are intended for outdoor use. These extension cords are identified by a marking "Acceptable for use with outdoor appliances; store indoors while not in use." Use only extension cords having an electrical rating not less than the rating of the product. Do not use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. Do not abuse extension cord and do not yank on any cord to disconnect. Keep cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting the product from the extension cord.

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

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

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

EXAMPLE: Machine Amp Draw 51, use 55 (2 Conductor).

The thermostat type of cord shall be C, PD, E, EO, EN, S, SO, SRD, SJ, SJO, SV, SVO, SP.

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

FUEL INSTALLATION

1. **N.G. AND L.P.:** Caution must be taken to ensure that no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting the pilot burner.
2. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve.
3. **LEAK TEST:** All the gas connections should be tested for leaks per the LEAK TEST instructions found in the **GAS VALVE SERVICING**..
4. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed on the gas valve, and main burner and pilot burner jets changed.
5. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot burner jets changed.
6. **L.P. FIRED MACHINES:** This machine should be installed with consideration to cold weather. As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank (s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found the in **MODEL SPECIFICATIONS**.
7. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot burner per LIGHTING PILOT BURNER instructions.

WATER INSTALLATION

1. **WATER TEMPERATURE VARIATION:** On machines not equipped with a temperature control device, the temperature of the discharged water is dependant on the incoming water temperature. Some minor adjustment to the fuel input may be required if the incoming water is significantly different than 50 degrees fahrenheit.
2. **WATER CONDITIONS**: Local water conditions affect the coil and spray tip more adversely than any other element. In areas where troublesome conditions may exist with like equipment (such as water heaters), we recommend the use of a water softener.
3. **FREEZING:** This machine must be protected from freezing according to STORAGE section of **MACHINE MAINTENANCE**.
4. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

VENTING

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

The information contained herein is offered for reference only. You must comply with local codes and investigate through your gas and other utility companies when installing, as there may be some special local requirements you must comply with. Also see ANSI Z223.1

GAS FIRED MACHINES operate on the "Natural Draft" principle that rising heat creates an air lift. To eliminate a draft through the combustion chamber and cause pilot outages, a bell type draft diverter must be used.

OIL FIRED MACHINES use a forced air burner. The oil burner can be influenced by "Natural Draft" even though they have their fan. A bell type draft diverter must be used here also.

OIL OR GAS FIRED MACHINES ARE NOT TO BE CONNECTED TO A TYPE B GAS VENT.

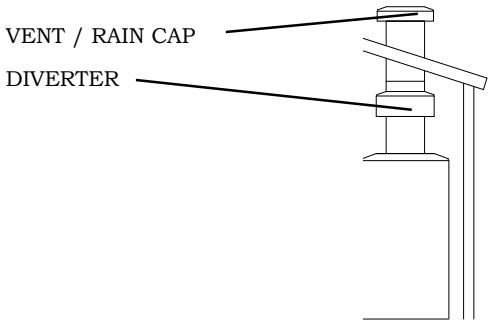
NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

DRAFT DIVERTERS:

1. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
2. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine.
3. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.
4. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

VENTING INSTALLATION INFORMATION:

1. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.
2. Straight Stacking through the a roof is preferred. Horizontal runs are not desirable, but if necessary, be sure to pitch the stack upward at a rate of two inches per foot. When horizontal stacks are used, vertical stacking must extend at least two feet for every foot of horizontal stack.
3. Stack Extension above the roofline should be sufficient to clear the peak of the roof. Refer to the ANSI Z223.1.
4. A Rain Cap that is U.L. approved should be installed on the stack.



OPERATING INSTRUCTIONS

PRE START-UP

1. The first time the machine is operated, after repairs have been made, or if the machine has set for a period of time (30 days or more) follow the following procedures.
   A. Check the tension of the belt (if so equipped) per instructions in **MACHINE MAINTENANCE**.
   B. Flush the machine per instructions in **MACHINE MAINTENANCE**.
   C. Install float tank drain plug (if so equipped).
   D. Open float tank ball valve (if so equipped).

- **CAUTION:** Always use the factory supplied pressure wash hose with your machine. Do not substitute other hoses as a potential safety problem may develop.
- **CAUTION:** If machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm machine can cause damage to the pump packings and other components.

2. Read and observe all items in "CLEANER INSTALLATION".

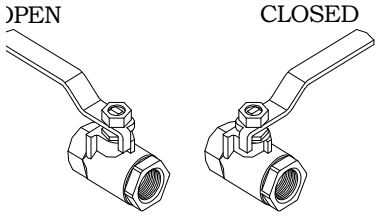
START-UP

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

WARNING

ELECTRICAL SHOCK HAZARD

- **ELECTRICAL**: Connect the machine to an electrically grounded circuit that is fused or circuit breaker protected. Do not use any type of adapter. If the correct type of receptacle is not available, have one installed by a qualified electrician.
- **OIL LEVEL**: Check the oil level in the water pump, the gear case (if so equipped), and the engine.
- **BELT** (if so equipped): Make sure the belt tension and condition is as specified in **MACHINE MAINTENANCE**.
- **METERING VALVE** (if so equipped): Make sure the metering valve is closed before operation. If air enters the system through this valve, poor performance and machine damage will occur. Refer to the metering valve insert for proper operation.
- **FUEL FILTER**: Inspect the fuel filter for any evidence of water contaminants.
- **FUEL**: Make sure the fuel is the type specified in the BURNER section of **MODEL SPECIFICATIONS**
- **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.
- **WATER SUPPLY**: This machine must have a water supply meeting or exceeding the maximum discharge volume specified in the PERFORMANCE section, and a minimum water inlet pressure specified in GENERAL section of the **MODEL SPECIFICATIONS**.
- **LIME:** Water containing large amounts of lime, calcium or other similar materials can produce a coating on the inside of the impact nozzle or spray tip and coil pipe.
- **FLOAT TANK**: Check the float tank to assure it is full and the float tank valve shuts off securely.
- **BALL VALVE**: Check the position of the ball valve (if so equipped) on outlet line of the float tank assuring that it is in the open position.



1. Light the pilot per LIGHTING PILOT in **GAS VALVE SERVICE**.
2. Select temperature (if so equipped).
3. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn on the pump switch.

   CAUTION: A good flow of water must be flowing from the end of a gun within 30 seconds, before proceeding. Lack of water can cause damage to the water pump.

   CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 3 minutes, water pump damage may occur.
4. Turn the switch to the burner position. NOTE: .The .burner will Ignite within 5 to 30 seconds.

   CAUTION: OIL FIRED MACHINE Do not run the machine with the burner switch in the on position when the fuel tank is empty. This will cause damage to the fuel pump and void warranty.

   CAUTION: Do not operate with the trigger gun valve closed for more than 3 minutes or water pump damage may occur.
5. To **CLEAN**:

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

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

6. **TO APPLY CHEMICAL**:

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

   Mix chemicals per label instructions. Use necessary safety precautions.

   A. Insert chemical screen into chemical container

   B. Adjust metering valve (if so equipped).

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

7. To **RINSE:** (For cold water rinse, turn the burner switch off.)

   A. If the machine is equipped with a panel mounted metering valve, close the chemical metering valve. NOTE: It is advisable to dip the chemical screen in a container of clean water and open the valve 1 minute to clean the valve of any remaining residue.

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

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

SHUT-DOWN

1. Turn the burner switch off. (If not already done so in the cold water rinse.)
2. After cool, clear water is coming from the end of the wand, turn the pump switch to off.
3. Turn off the water supply.
4. Disconnect from the electrical supply.
5. Replace the stack cover (if so equipped)
6. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
7. Replace stack cover (if so equipped).

COMBINATION OPTION INSTRUCTIONS

WARNING: This machine should be operated only by personnel instructed in and familiar with its operation. The discharge produced is 300°F / 150°C and can cause **SERIOUS BODILY INJURY** to you and anyone coming in contact with it.

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

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

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

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

1. Install the open gun assembly.
2. Open the ball valve on coil inlet assembly.
3. Set the temperature control to 300°F MAXIMUM.
4. For startup see “START UP” section on the previous page.
5. Regulate the temperature indicated on the thermometer to 300°F by turning the regulating valve on the coil inlet assembly clockwise to DECREASE the temperature and counter clockwise to INCREASE the temperature.
6. For shut down follow “SHUT DOWN” previously shown on this page.
7. Close the ball valve on the coil inlet assembly.

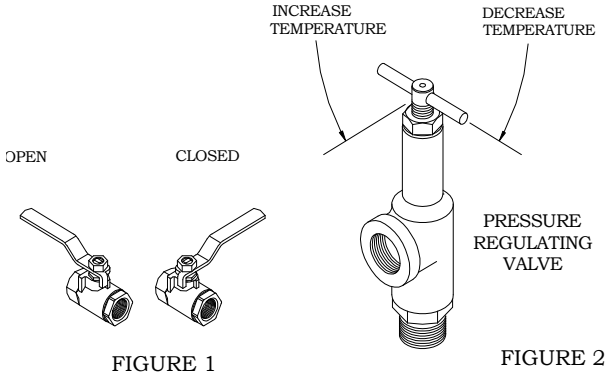


FIGURE 1

FIGURE 2

MACHINE MAINTENANCE

ELECTRIC DRIVEN GAS FIRED CLEANERS

FLUSHING

1. Connect machine to an electrically grounded circuit that is fuse or circuit breaker protected.
2. Connect machine to a pressurized water supply meeting the requirements specified in the GENERAL section of the **MODEL SPECIFICATIONS**.
3. Turn on the water supply.
4. Check the float tank (if so equipped) to assure it is full and the float valve shuts off securely.
5. Check the position of the ball valve (if so equipped) on outlet line of the float tank assuring it is in the open position.
6. Remove spray tip from gun assembly.
7. With gun assembly in hand, turn on the pump switch. On trigger gun models hold the trigger gun valve in open position. **CAUTION:** DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.
8. When clean water flows from gun, turn off the switch.
9. Reinstall spray tip.
10. With gun assembly in hand, turn on the switch. On trigger gun models hold the trigger gun valve in open position.
11. When clean water flows from gun, turn off the pump switch.
12. If freezing conditions may exist, refer to "STORAGE" section.
13. Turn off and disconnect the water supply.
15. Disconnect electrical supply.

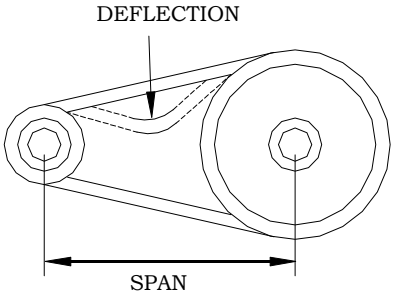
STORAGE

1. Rinse the Soap Line by inserting the screen into a container of clear water and open the metering valve 1 minute to clean it of any remaining residue. Be sure the chemical metering valve is closed when finished.
2. Disconnect the water supply.
3. Remove the spray tip nozzle from gun assembly and wire to machine.
4. Check the position of the ball valve (if so equipped) on the outlet of the float tank assuring it is in the closed position.
5. Attach an air chuck to the air valve stem on the pump assembly. With the trigger gun in the open position, apply air until a mixture of air and very little water is coming from the gun wand Then turn switch to the burner position and depress the vacuum switch. Run it for 45 seconds allowing any remaining water to turn to steam.
6. Fill a 1-gallon container with Ethylene Glycol type antifreeze. Minimum should be a mixture of ½ antifreeze and ½ water strength before each use, as the antifreeze will dilute with each use.
7. Install a 2-ft. Garden hose to the water inlet. Insert the other end into a container of antifreeze solution.
8. With the discharge gun assembly in hand, turn on the switch. On trigger gun models hold the trigger gun valve in open position.
9. Turn off the switch just prior to running out of antifreeze mixture.
10. Disconnect electrical supply.
11. Disconnect gun and hose.
12. Place machine in a dry place protected from weather conditions.

SPRAY TIP MAINTENANCE

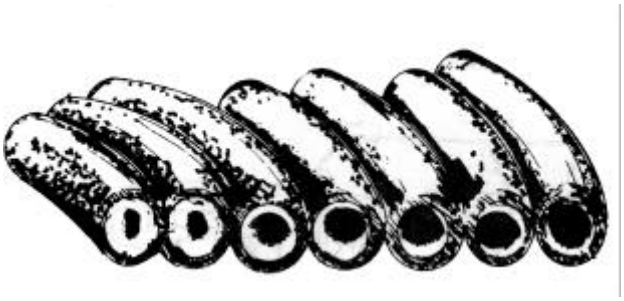
1. Remove the spray tip from the gun assembly.
2. Blow out debris with compressed air from the outside in. Any debris remaining in the inlet side of the nozzle should be cleaned out. If lime or chemical scale is present in the inlet side, the nozzle may be soaked in descaling solution or replaced. If the tip is worn, replace with one specified in the GENERAL section of **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.
3. Before replacing spray tip flush the machine per "FLUSHING".
4. Reinstall Spray tip to gun assembly.

BELT TENSION



1. Correct belt tension will allow a 1/64-inch deflection for each inch of span between pulley centers with a 6-pound force applied in the middle of the span. EXAMPLE: A 6-pound force applied at the middle of an 8 inch span should produce a deflection of 8/64 inch or 1/8 inch.
2. Belts can be tightened or loosened by loosening the nuts holding the pump assembly to the motor mount. Then tighten or loosen the j-bolt on the motor mount. Retighten the pump assembly after the desired tension is reached.

COIL BACK PRESSURE CHECK



Above is a cross section view showing the progressive liming of coils.

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

DISCHARGE VOLUME GPM	BACK PRESSURE REQUIRING DESCALING
2-3 GPM	50 PSI
3-4 GPM	75 PSI
4-5 GPM	100 PSI
6 GPM	150 PSI
8-10 GPM	175 PSI

USE A 1000 PSI PRESSURE GAUGE

3. Turn on the water supply. Check the float valve (if so equipped) to assure float tank is full and the float valve shuts off securely.
4. Check the position of the ball valve (if so equipped) on the outlet line of the float tank assuring it is in the open position.
5. Turn on the pump switch. If the coil back pressure reading is above that found in the GENERAL section of the **MODEL SPECIFICATIONS** then your machine needs to be descaled.

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

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

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

ACCESSORIES

PART NO.	DESCRIPTION
Y02-00001	0-1000 PSI (69 BAR) Pressure Gauge
Z01-00070-1.....	3/8" x 100 Yards Thread Tape

NOTE: All Gauges are Glycerin Filled ¼ NPT

MACHINE MAINTENANCE

ELECTRIC DRIVEN GAS FIRED CLEANERS	DAILY	EACH HR FIRST 8 HRS	AFTER FIRST 50 HRS	EVERY 50 HRS	EVERY 100 HRS	EVERY 500 HRS	YEARLY
1. **OIL BATH WATER PUMP:**							
Oil Level – check and add as needed per **PUMP SERVICE** insert.	●						
Oil Change – drain and refill per **PUMP SERVICE** insert. **CAUTION:** Used oil must be disposed into an environment safe container and brought to an oil recycling center.			●			●	
Oil Contamination – Milky color indicates water	●						
2. **HOSES:**							
Blistering, Loose Covering.	●						
Abrasion of cover exposing reinforcement.	●						
Cuts exposing reinforcement.	●						
3. **BELTS:**							
Cracks or fraying	●						
For correct belt tension, see **MACHINE MAINTENANCE** insert.		●		●			
4. **FILTER – WATER:**							
Check water inlet hose screen for debris	●						
Check float tank screen for debris	●						
5. **SPRAY TIP:**							
Check Tip for debris.	●						
6. **FUEL:**							
Adequate fuel supply.	●						
7. **PUMP MOTOR WITH GREASE FITTINGS:**							
Remove drain plug. Use 1 or 2 full strokes of Shell "DOLIUM R", Chevron "SR1 No. 2" or Texaco "PREMIUM RB". Operate for 20 minutes and replace drain plug.							●
8. **GUARDS AND SHIELDS:**							
Check that all guards and shields are in place and secure.	●						
9. **FREEZING TEMPERATURES:**							
Freezing temperatures break coils and water pumps. See STORAGE in the **MACHINE MAINTENANCE** section for cold weather instructions.	●						

CLEANER TROUBLESHOOTING

ELECTRIC MOTOR DRIVEN PRESSURE CLEANERS

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Poor Cleaning Action.	A. Hard water. B. Low Pressure. C. Little or no chemical being drawn. D. Improper chemical. E. Improper chemical mixture. F. Low Discharge Pressure.	A. Connect machine to water softener. B. See "Low operating pressure" C. See "Machine will not draw chemical". D. Obtain proper chemical. E. Mix chemicals per the label. Follow all mixing, handling, application, and disposal instructions. F. See "Low operating pressure"
2. Machine will not draw chemical.	A. No chemical solution. B. Metering valve not open. C. Chemical line strainer clogged.Air leak in chemical line. D. Metering valve clogged. E. Restrictor orifice too large or missing.	A. Replenish supply. B. Turn metering valve knob to open. C. Remove screen and clean. D. Tighten all fittings and hoses for the chemical line. E. Disassemble and clean. Install proper size orifice.
3. Low operating pressure	A. Insufficient water supply. B. Incoming water hose too small. C. Water supply hose too long. D. Belt slippage. E. Worn Belt. F. Spray tip worn or wrong size. G. Dirty or worn check valves in water pump. H. Water supply hose kinked. I. Inlet filter screen clogged. J. Motor runs slow. K. Air leak in inlet plumbing. L. Defective water pump. M. Leaking discharge hose. N. Chemical metering valve open and sucking air. O. Defective unloader valve. P. Inlet ball valve not fully open (if so equipped)	A. The water supply must meet or exceed the maximum discharge volume specified in the PERFORMANCE section, and minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFCATIONS** section. B. Use larger water supply hose. C. Use shorter water supply hose. D. Tighten belt per instructions in **MACHINE MAINTENANCE** insert. E. Replace belt per **CLEANER EXPLODED VIEW.** F. Replace with spray tip specified in the GENERAL section of **MODEL SPECIFICATIONS**. G. See **PUMP TROUBLESHOOTING**. H. Straighten hose. I. Clean water filter screen or hose inlet screen. J. See "Pump engine starts slow or overheats and stops". K. Tighten all fittings. L. See **PUMP TROUBLESHOOTING**. M. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Disconnect the power and replace hose. N. Resupply chemical, place soap screen in water, or shut off metering valve. O. Repair or replace unloader valve. P. Open inlet ball valve completely. (Handle parallel w/valve body).

CLEANER TROUBLESHOOTING (CONT.)

ELECTRIC MOTOR DRIVEN PRESSURE CLEANERS

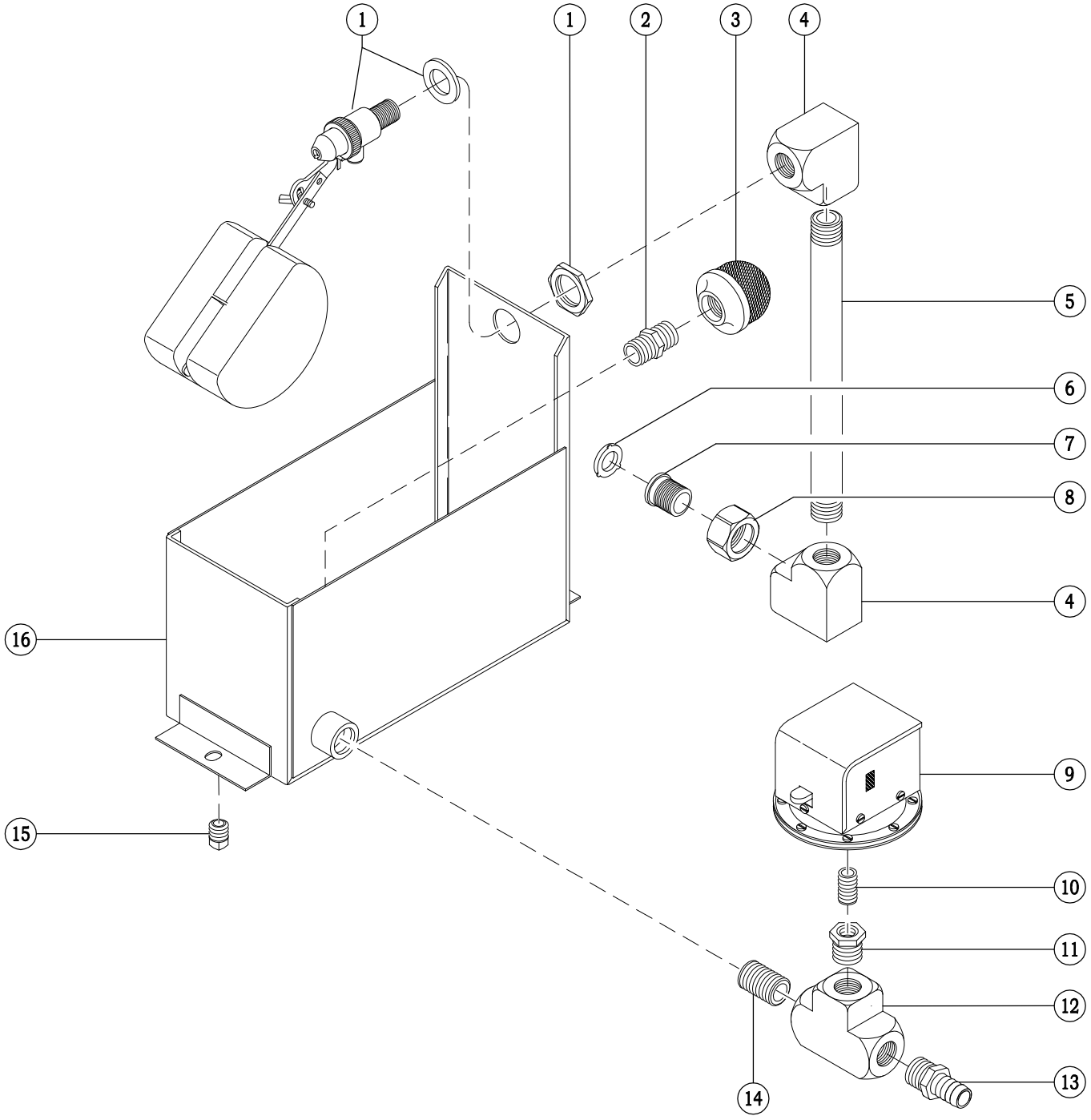
TROUBLE	POSSIBLE CAUSE	REMEDY
4. Excessive, unusual noise.	A. Defective Pump. B. Defective motor. C. Pulleys rubbing. D. Misalignment of pump & motor	A. See **PUMP TROUBLESHOOTING**. B.Call service technician or take engine to Repair/Warranty station. C. Adjust shields or pulley(s). D. Realign pump and engine.
5. .Belts slipping.	A. Belts too loose. B. Excessive Back Pressure. C. Defective Water Pump.	A. Tighten belt per instructions on **MACHINE MAINTENANCE**. B. See "Excessive Back Pressure" below. C. See **PUMP SERVICE**.
6. Excessive Back Pressure	A. Spray tip built up with lime. B. Water pump turning too fast. C. Coil built up with lime. D. Relief valve defective.	A. Remove and clean, or replace spray tip with tip specified in the *GENERAL* section of **MODEL SPECIFICATIONS**. Flush machine per *FLUSHING* in **MACHINE MAINTENANCE** B. See **MODEL SPECIFICATIONS**. C. Delime coil. D. Remove and replace.
7. Excessive vibration.	A. Defective Belt. B. Defective Pump. C. Defective accumulator	A. Remove and replace using belt specified in **CLEANER EXPLODED VIEW** or the *GENERAL* section of **MODEL SPECIFICATIONS**. B. See **PUMP TROUBLESHOOTING.** C. Recharge/Replace.
8. Pump motor will not start (motor does not hum)	A. No Power. B. Defective motor starter or ON/OFF switch. C. Defective motor.	A. Use a different outlet,check fuses in main disconnect switch. Replace fuse if blown. B. Call service technician. C. Call service technician, or take motor to Repair/Warranty station.
9. Pump motor will not start (motor hums)	A. Pump frozen. B. Defective motor. C. Defective water pump. D. Excessive back pressure	A. Machine must be thoroughly warmed to above freezing. B. Call service technician or take motor to Repair/Warranty station. C. See **PUMP SERVICE**. D. See "Excessive Back Pressure" above.
10. Pump motor starts slow or overheats and stops.	A. Low voltage B. Excessive back pressure C. Defective motor	A. See "Low voltage" below. B. See "Excessive Back Pressure" above. C. Call service technician, or take motor to Repair/Warranty station.
11. Pump motor stops and will not start.	A. Motor starter "kicked out" (if so equipped) or thermal overload tripped. B. Excessive back pressure. C. Defective motor.	A. Turn motor starter off to reset, then turn on, or push thermal overload reset button on motor. B. See "Excessive Back Pressure". above. C. Call service technician, or take motor to Repair/Warranty station.
12. Low voltage	A. Incoming voltage incorrect. B. Not large enough extension cord. C. Too long extension cord	A. Have a qualified technician check the motor terminal voltage. Correct voltage is in **MODEL SPECIFICATIONS**. B. Use an extension cord with amperes or watts rating as high or higher than that of the **MODEL SPECIFICATIONS**. C. Shorten extension cord.
13. Machine shocks operator	A. Machine improperly grounded. B. Outlet not grounded	A. **STOP!** Operating machine. Call service technician. B. Have properly wired outlet installed.

GAS WATER HEATER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature.	A. Low fuel pressure	A. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**
	B. Poor combustion	B. See "Poor Combustion".
	C. Improper fuel supply	C. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	D. Temperature control inoperative	D. See the **TEMPERATURE CONTROL** section.
	E. Incoming water temperature too low	E. Raise incoming water temperature.
2. Machine overheats (Dry steam – very little moisture, very hot steam)	A. Insufficient water	A. Increase water flow and pressure. Check coil back pressure.
	B. Temperature control inoperative	B. See the **TEMPERATURE CONTROL** section.
	C. Improper fuel supply	C. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	D. Improper fuel pressure	D. See FUEL section of the **MODEL SPECIFICATIONS** for specified fuel pressure.
	E. Incoming water temperature too high	E. Lower incoming water temperature.
3. Machine Smokes	A. Improper fuel supply	A. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	B. Improper burner jets	B. Remove and replace jets per **BURNER ASSEMBLY**.
	C. Loose burner jets	C. Tighten burner jets.
	D. Missing burner jets	D. Install appropriate burner jets see **BURNER ASSEMBLY**.
4. Machine fumes (exhaust burns eyes)	A. Improper fuel pressure	B. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
5. Poor Combustion	A. Low fuel pressure	A. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
	B. Improper fuel supply	B. Use fuel specified in FUEL section of the **MODEL SPECIFICATIONS**.
	C. Improper venting	C. See National Fuel Gas Code (ANSI Z223.1 and NFPA No. 54)
	D. Fuel pressure too high	D. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
6. Pilot will not stay lit	A. Check for drafts	A. Install draft diverter.
	B. Pilot flame not sharp blue	B. Clean pilot orifice.
	C. Defective thermocouple.	C. Test and/or replace thermocouple.
	D. Improper fuel pressure	D. See specified pressure in the FUEL section of **MODEL SPECIFICATIONS**.
	E. Incorrect pilot orifice	E. See pilot orifice specified in the FUEL section of **MODEL SPECIFICATIONS**.

ASSEMBLY, FLOAT TANK - P/N 2100-01121A

EXPLODED VIEW



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00631	VALVE, FLOAT	9	F04-00761B	SWITCH, VACUUM
2	120-10537	RESTRICTOR - 15/64 ORF	10	E13-00010-48	NIPPLE, PIPE
3	C04-00120	SCREEN, FILTRATION	11	E04-00005-48	BUSHING, PIPE
4	E08-00010-4	ELBOW, PIPE	12	E10-00005-4	TEE, PIPE
5	E14-00085-2	NIPPLE, PIPE	13	W02-10025-8	BARB, HOSE
6	C05-00271	WASHER, HOSE	14	E15-00010-58	NIPPLE, PIPE
7	C05-00260-1	ADAPTER, SWIVEL	15	E09-00002-P	PLUG, PIPE
8	C05-00270-1	NUT, GARDEN HOSE	16	2120-04120B	TANK, FLOAT

BREAKDOWN, FLOAT VALVE

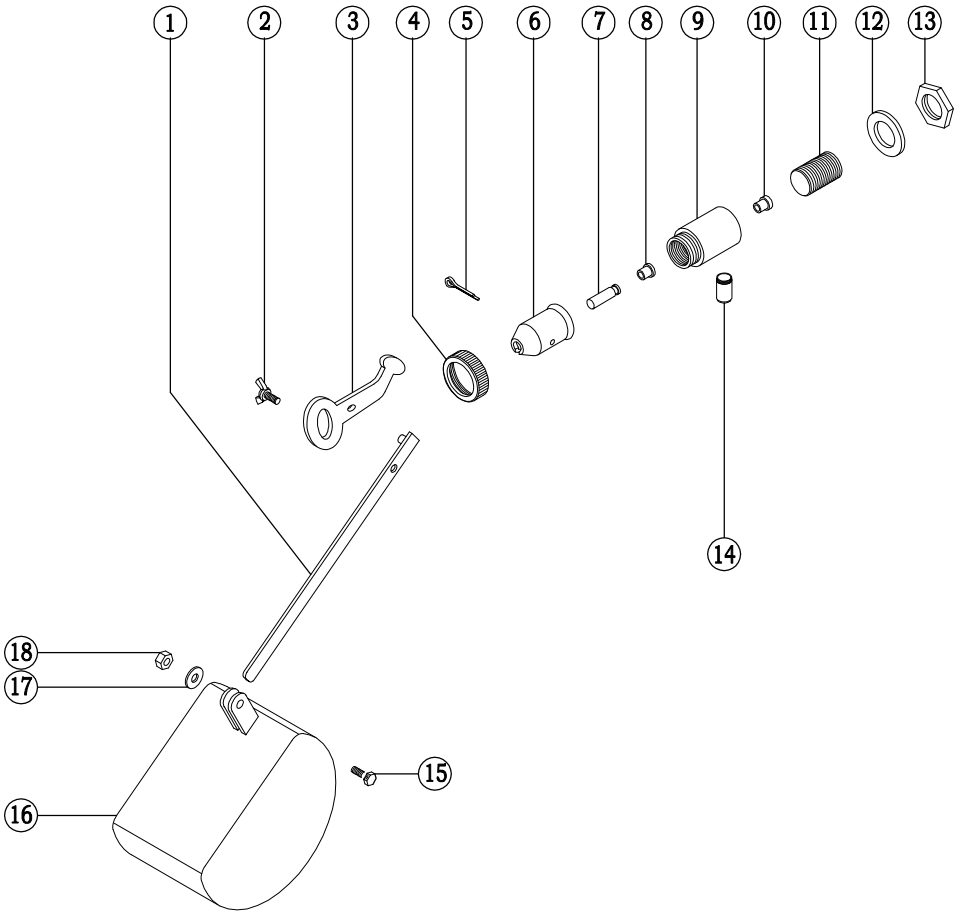
P/N C03-00631

SPECIFICATIONS

MAXIMUM VOLUME.....7 GPM / 26 LPM
MAXIMUM PRESSURE.....140 PSI / 10 BAR
MAXIMUM TEMPERATURE.....140°F / 60°C
PORT SIZE - INLET.....3/8 NPT

DIMENSIONS.....11.4 X 4.1 X 2.8 IN. / 290 X 104 X 71 MM
WEIGHT.....0.6 LB / 0.3 KG
MATERIAL.....BRASS, PLASTIC, BUNA-N

EXPLODED VIEW

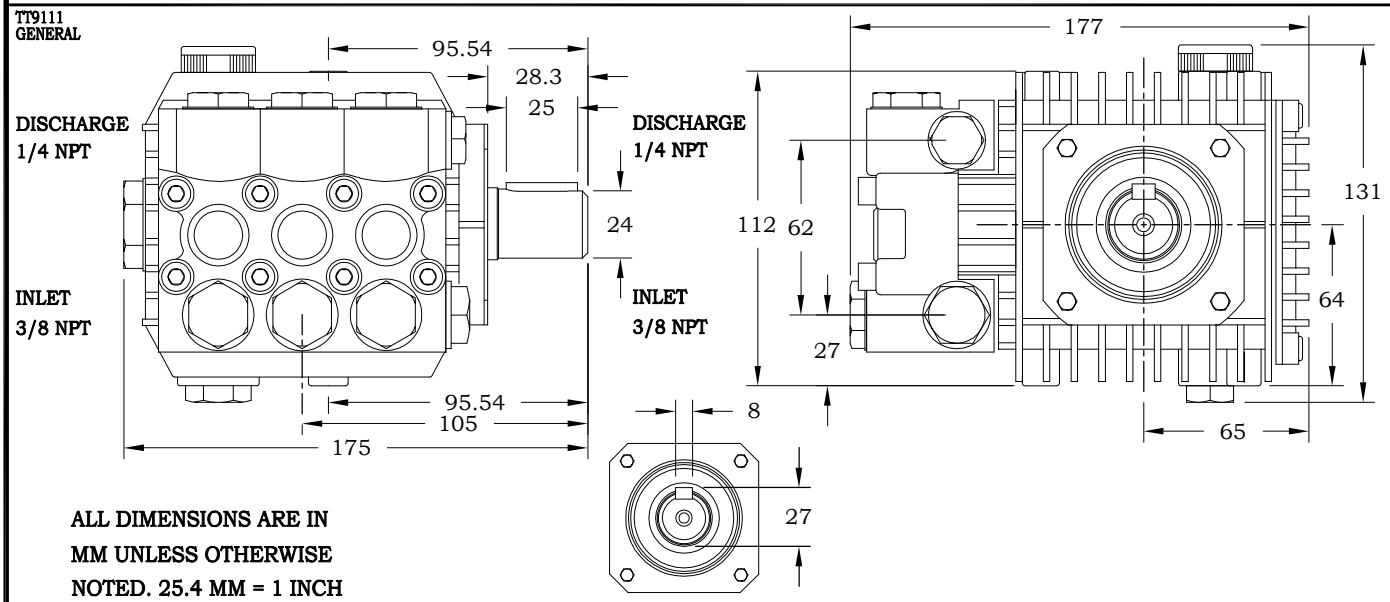


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00631-11	ARM, FLOAT	10	C03-00631-04	SEAT, VALVE
2	C03-00635-10	SCREW, WING	11	C03-00631-03	NIPPLE, BRASS
3	C03-00631-16	LEVER	12	C03-00631-02	WASHER, FLAT - RUBBER
4	C03-00631-09	NUT, RETAINER	13	C03-00631-01	NUT, HEX
5	C03-00631-17	KEY, COTTER	14	C03-00631-18	NIPPLE, TOE
6	C03-00631-08	GUIDE, PISTON ROD	15	C03-00631-10	SCREW, CAP
7	C03-00631-07	ROD, PISTON	16	C03-00628	FLOAT, PLASTIC
8	C03-00631-06	PISTON	17	H05-19000	WASHER, FLAT
9	C03-00631-05	HOUSING, VALVE	18	C03-00631-14	NUT, HEX

PUMP, WATER - P/N N07-00031

DIMENSIONS



ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED. 25.4 MM = 1 INCH

PERFORMANCE

DISCHARGE VOLUME.....3.0 GPM / 11.4 LPM

PUMP HEAD PRESSURE.....1300 PSI / 90.0 BAR

GENERAL

CRANKSHAFT ROTATION.....CLOCKWISE AND COUNTER CLOCKWISE

MAXIMUM SPEED.....1750 RPM

MAXIMUM PUMPED FLUID TEMPERATURE.....165°F / 74°C

INLET PRESSURE.....-9 IN HG @ 75°F TO 116 PSI / -0.3 BAR @ 24°C TO 8 BAR

WEIGHT (WET).....11.2 LBS / 5.1 KG

LUBRICATION

OIL CHANGE INTERVAL .....AFTER FIRST 50 HOURS THEN AFTER 500 HOURS

OIL TYPE.....SAE 20 OR SAE 30 (NON-DERTERGENT)

CRANKCASE CAPACITY.....11.2 FL OZ / 0.33 LT

TORQUE

VALVE PLUG.....33 FT LBS / 4.6 KG M

MOUNT TO CRANKCASE.....16 FT LBS / 2.2 KG M

PLUNGER NUT TO CROSSHEAD.....10 FT LBS / 1.0 KG M

REAR CRANKCASE COVER TO CRANKCASE.....7.0 FT LBS / 1.0 KG M

HEAD TO CRANKCASE.....8.8 FT LBS / 1.2 KG M

*__NOTE:__ When plunger nut is removed, install a new copper washer and flinger washer to ensure proper fit and seal of ceramic plunger. If same copper washers are reused cracking or a poor seal may result.

REPAIR PARTS PACKAGES

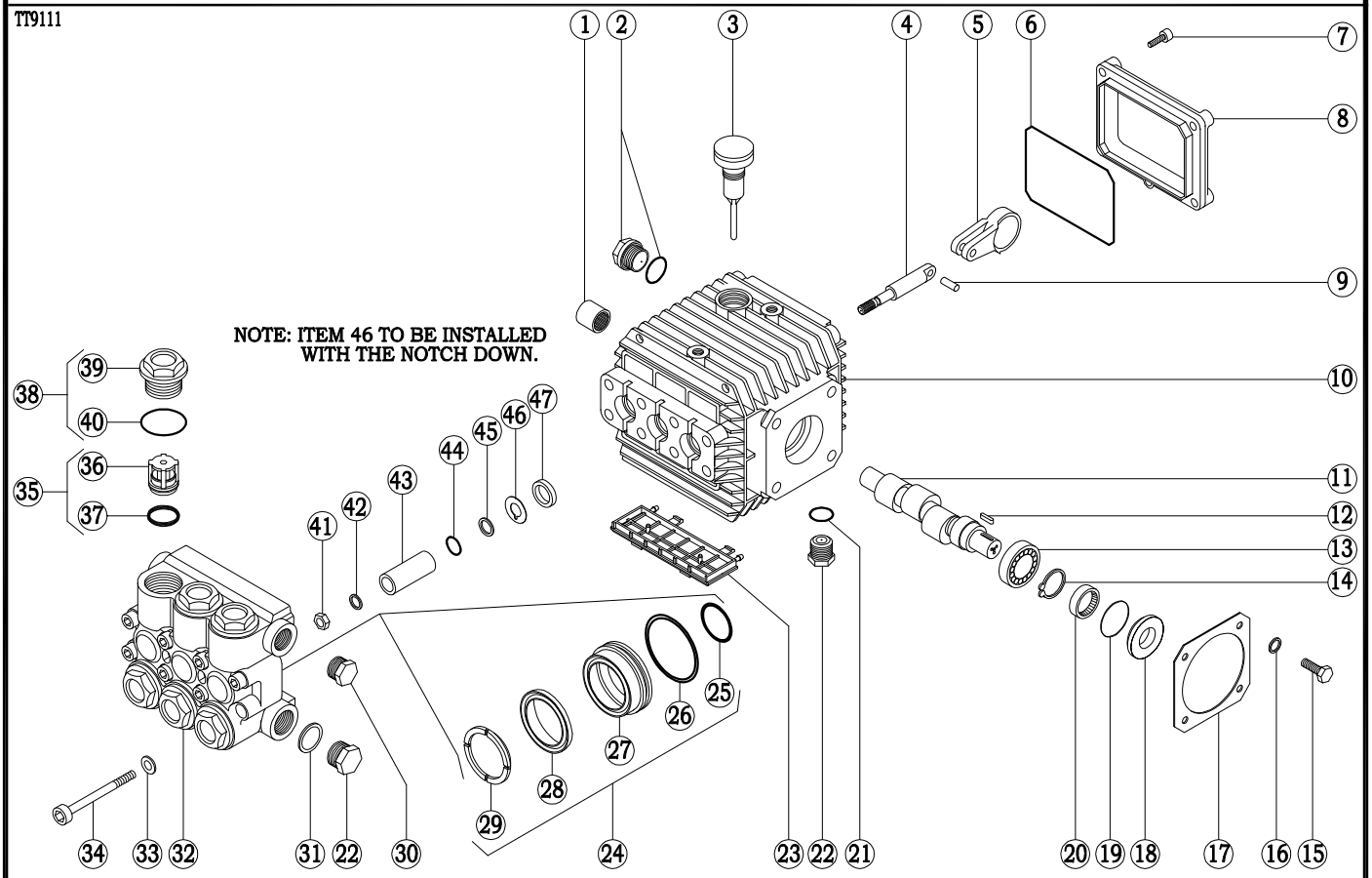
PART NO.	DESCRIPTION	ITEM	QTY
N07-99001	VALVE ASSEMBLIES		
	ASS'Y, CHECK VALVE	36	6
	O-RING	37	6
N07-99139	RETAINER & O-RINGS		
	O-RING	25	3
	O-RING	26	3
	RETAINER, PACKING	27	3

PART NO.	DESCRIPTION	ITEM	QTY
N07-99141	PLUNGER PACKING		
	O-RING	25	3
	O-RING	26	3
	PACKING, V	28	3
	ADAPTER, MALE	29	3
N07-99084	PLUGS & O-RINGS		
	PLUG	39	6
	O-RING	40	6

PART NO.	DESCRIPTION	ITEM	QTY
N07-99140	PLUNGER PACKING W/RETAINER		
NOTE: ORDER THREE FOR COMPLETE PUMP.	O-RING	25	1
	O-RING	26	1
	RETAINER, PACKING	27	1
	PACKING, V	28	1
	ADAPTER, MALE	29	1
N07-99083	OIL SEALS		
	OIL SEAL	47	3

BREAKDOWN, PUMP - N07-00031

EXPLODED VIEW

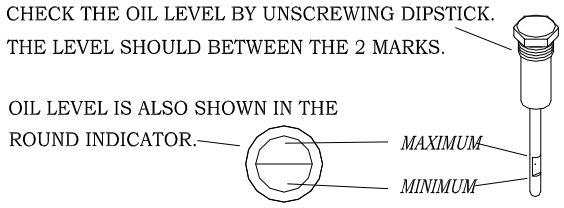


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	N07-12055	BEARING, NEEDLE	24	N07-99140	KIT, PLUNGER PACKING
2	N07-20029	INDICATOR, OIL LEVEL	25	N07-31016	O-RING
3	N07-20024	DIPSTICK, OIL	26	N07-12016	O-RING
4	N07-12038	CROSSHEAD	27	N07-31015	RETAINER, PACKING
5	N07-12034	ROD, CONNECTING	28	N07-31012	PACKING, V
6	N07-43025	O-RING	29	N07-31014	ADAPTER, MALE
7	N07-80052	SCREW, CAP	30	N07-20030	PLUG
8	N07-12026	COVER, CRANKCASE	31	N07-20051	WASHER, FLAT
9	N07-12032	PIN, CROSSHEAD	32	N07-31001B	HEAD, BRASS
10	N07-17023	CRANKCASE	33	N07-20036	WASHER, FLAT - SERRATED
11	N07-12031	CRANKSHAFT	34	N07-12002	SCREW, CAP
12	N07-20033	KEY	35	N07-99001	KIT, VALVE ASSEMBLY
13	N07-20022	BEARING, BALL	36	N07-20054	ASSEMBLY, VALVE
14	N07-12053	RING, SNAP	37	N07-20004	O-RING
15	N07-20018	SCREW, CAP	38	N07-99084	KIT, PLUGS & O-RINGS
16	N07-20036	WASHER, FLAT	39	N07-12010	PLUG
17	N07-20019	RETAINER, BEARING	40	N07-20009	O-RING
18	N07-20044	SPACER	41	N07-12056	NUT, HEX
19	N07-20021	O-RING	42	N07-12042	WASHER, FLAT - COPPER
20	N07-20045	SEAL, OIL	43	N07-31040	PLUNGER - 18MM
21	C07-01409	O-RING	44	J06-20209	O-RING
22	N07-20049	PLUG	45	F04-76509	RING, ANTI-EXTRUSION
23	N07-17060	COVER	46	N07-12039	WASHER, FLINGER - COPPER
			47	N07-99083	KIT, OIL SEAL

GENERAL PUMP MAINTENANCE

OIL LEVEL



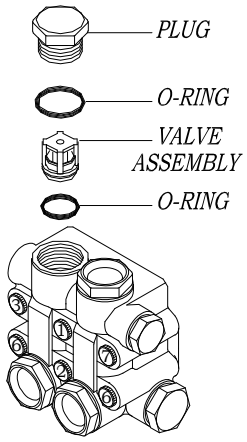
TOOL KITS

PACKING EXTRACTION KIT - P/N Z09-00028

COMPLETE TOOL KIT - P/N Z09-00021

VALVE SERVICE

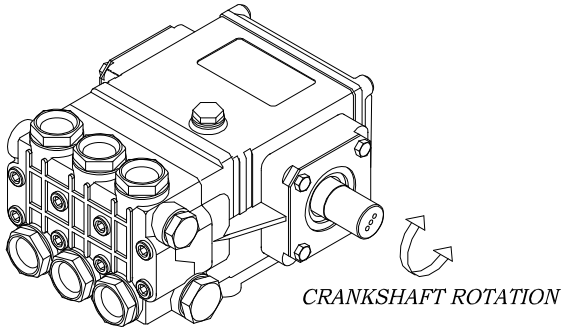
1. Remove the plugs holding the valve assemblies.
2. Remove and discard o-rings from the plugs. Clean plugs with solvent or soap and water. Allow to dry.
3. Using a needle nose pliers, fingers, or hook shaped tool, remove the valve assemblies from the head. Remove and discard the o-rings from the valve assemblies and/or head. Examine each valve assembly and discard damaged parts. Refer to the "**PUMP BREAKDOWN"** for part numbers of any replacement items.
4. Clean any accumulated debris from the valve cavities and flush with water.
5. Wash the valve assemblies in clean water and rinse. While still wet, test each valve assembly by sucking on the valve seat. A properly sealing valve will allow a good vacuum to be developed and maintained, while a malfunctioning valve will not. Good valve assemblies should be set aside for installation in step 7.



6. Malfunctioning valve assemblies must be replaced.
7. Lubricate a new o-ring with the pump crankcase oil and install into valve cavity in the head. Install a good valve assembly into the cavity as illustrated.
8. Lubricate a new o-ring with pump crankcase oil and place on a plug cleaned in step 2 above.
9. Install a plug into the pump head. Tighten plug by hand.
10. Torque the plug to the value indicated in the "TORQUE" section of the pump specifications.
11. Repeat steps 7 through 11 for remaining valve assemblies.

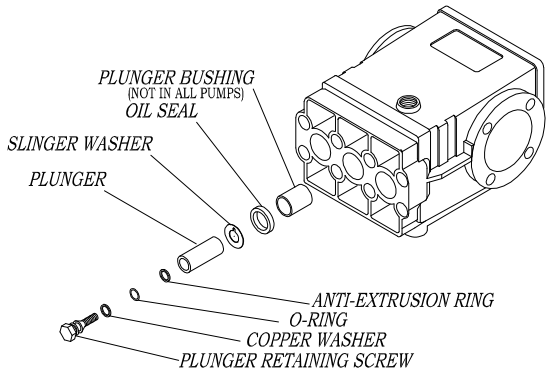
HEAD REMOVAL

1. Remove the cap screws holding the pump head to the crankcase. A metric tool is required for this step. Be careful not to lose the washer on each cap screw.
2. Remove the head by rotating the crankshaft and tapping the head away from the crankcase with a soft mallet. Keep rear surface of the head parallel to the front surface of the crankcase to prevent binding on the plungers.
3. Once the head is removed, protect the plungers from damage.



PLUNGER SERVICE

1. Remove pump head per "HEAD REMOVAL".
2. Remove any packings and retainers left on the plungers by pulling them straight off.
3. Examine each plunger, looking for a smooth surface free of any scoring, cracks, or pitting. Any defective plungers should be removed per "PLUNGER REMOVAL".
4. Discard and replace any defective plungers.
5. Reinstall the plunger per "PLUNGER INSTALLATION".
6. Reinstall head per "HEAD INSTALLATION".



PLUNGER REMOVAL

NOTE: When the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.

1. Remove the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.
2. Remove the plunger retaining screw by turning counterclockwise. Remove and replace copper washer.
3. Remove and discard o-ring and anti-extrusion ring from retainer screw.
4. Remove the plunger from the cross head and examine it for cracks, scoring, or pitting.
5. Remove and discard copper flinger washer, clean with solvent and allow to dry.

PLUNGER INSTALLATION

1. Install the copper flinger washer onto the cross head.
2. Slide the plunger onto the crosshead.
3. Lubricate an o-ring with crankcase oil and install into the groove on the plunger screw. Install the anti-extrusion ring into the groove next to the o-ring. Note: The o-ring should be nearest the screw head and the anti-extrusion ring nearest the threads.
4. Apply a drop of thread sealant to the threads of the retainer screw.
5. Thread the plunger retainer screw into the cross head making sure the copper flat washer is installed onto the screw.
6. Torque the plunger retainer screw to the value indicated in the torque section of the pump specifications.

PACKING SERVICE

1. Remove the head per "PUMP HEAD REMOVAL".
2. Remove any packings and female adapters left on the plungers by pulling them straight off. Insert proper packing extractor onto the extractor hammer. Insert packing extractor and tool through the packings and adapters remaining in the head. Tighten the hammer and remove the remaining items in the head. Remove packings and o-rings from adapters. Discard the o-rings and packings.
3. Clean the packing canities in the head and rinse with clean water.
4. Clean exposed plungers. Clean male and female adapters with soap and water and allow to dry.
5. Examine male and female adapters, discard worn items. Trial fit the female adapters into the head

checking for binding or damage. Discard and replace damaged items.

6. Lubricate packing cavities in the head and all packings and adapters with pump crankcase oil.

7. Lay head on the bench with packing cavities up. Install one male adapter in each cavity with the flat side down.

8. Install one v-packing into each cavity with the lips pointing down. A packing insertion too of the appropriate size is recommended for this operation.

9. Install the restop ring with the lips pointing down.

10. Install a front female adapter into each cavity with the flat side up. Make certain the adapter goes all way down into the cavity.

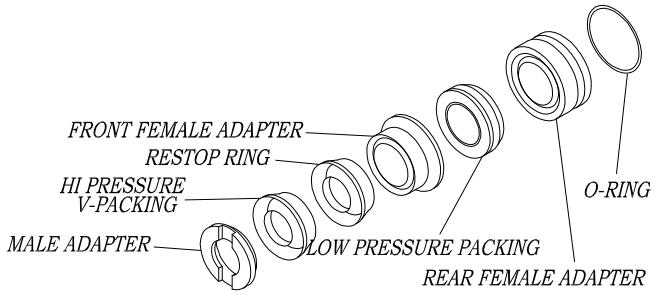
11. Install the low pressure packing with the flat side down.

12. Install the rear female adapter into each cavity with the lips pointing down.

13. Lubricate o-rings with pump crankcase oil and install one into the groove of each adapter.

14. Install one adapter and o-ring into each cavity with the flat side up. Each adapter and o-ring assembly should push into the head to approximately 1/16 inch of being flush with the surface of the head. Only hand pressure should be required to perform this operation. This step is ***VERY IMPORTANT.*** If the rear female adapter does not fit almost flush, something is not properly positioned. If a proper fit is obtained, proceed to step 16. If a proper fit is not obtained, remove the female adapters from the offending cavity and reinstall items per steps 8 through 15.

15. Install head per "HEAD INSTALLATION".



HEAD INSTALLATION

1. Prepare pump head per instructions in "PACKING SERVICE".

2. Rotate the plungers so the outer plungers are projecting the same distance from the crankcase.

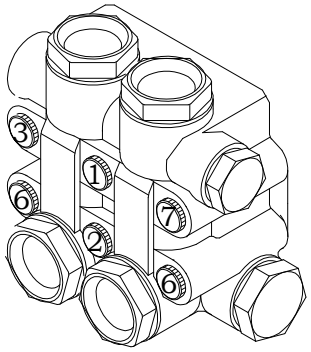
3. Lubricate the exposed plungers with crankcase oil.

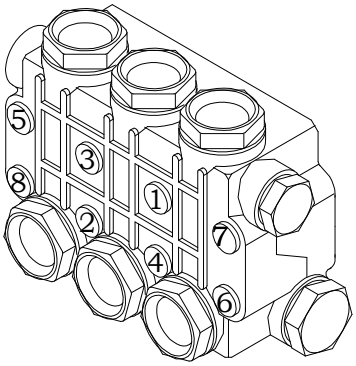
4. Start the head onto the plungers and using a soft mallet, tap the head evenly until it comes in contact with the crankcase.

5. Start the cap screws through the head and into the crankcase. Do not forget the lock washer on each screw.

6. Tighten all cap screws by hand.

7. Torque the cap screws to the value indicated in the "TORQUE" section of **PUMP SPECIFICATIONS**. Torque the cap screws in the order listed below.





PUMP MAINTENANCE RECORD

OIL CHANGE

MONTH / DAY / YEAR	OPERATING HOURS	OIL BRAND & TYPE

PUMP SERVICE

MONTH / DAY / YEAR	OPERATING HOURS	TYPE OF MAINTENANCE

PUMP TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
1. Oil leaking in the area of water pump crankshaft.	A. Worn crankshaft seal. B. Bad bearing. C. Grooved shaft. D. Failure of retainer o-ring	A. Remove and replace. B. Remove and replace. C. Remove and replace. D. Remove and replace.
2. Excessive play on crankshaft.	A. Defective bearings. B. Excess shims.	A. See "Worn bearing". B. Set up crankshaft.
3. Loud knocking in pump.	A. Loose conecting rod screws. B. Worn connecting rod. C. Worn bearings. D. Loose plunger bushing screw.	A. Tighten connecting rod screws per **PUMP SPECIFICATIONS**. B. Replace connecting rod per **PUMP MAINTENANCE.** C. Replace bearings per **PUMP MAINTENANCE**. D. Tighten plunger screw per **PUMP SPECIFICATOINS.**
4. Oil leaking at the rear portion of the pump.	A. Damaged or improperly installed oil gauge window gasket. B. Damaged or improperly installed rear cover. C. Oil gauge loosed. D. Rear cover screws loose. E. Pump overfilled with oil, displaced through crankcase breather hole in oil cap/dipstick.	A. Replace gasket or o-ring. B. Replace gasket or o-ring. C. Tighten oil gauge. D. Tighten rear screws. to torque values in **PUMP SPECIFCATIONS. S** E. Drain oil: refill to recommended oil level as stated in OIL LEVEL in **PUMP MAINTENANCE**.
5. Water in crankcase	A. May be caused by humid air condensing into water inside the crankcase. B. Worn or damaged plunger screw o-ring.	A. Maintain or step up lubrication schedule. B. Remove and replace. See PLUNGER SERVICE in **PUMP MAINTENANCE.**
6. Worn bearing	A. Excessive belt tension. B. Oil contamination.	A. See BELT TENSION in **MACHINE MAINTENANCE**. B. Check oil type and change intervals per **PUMP SPECIFICATIONS.**
7. Short bearing life	A. Excessive belt tension. B. Misalignment between pump and motor. C. Oil has not been changed on regular basis.	A. See BELT TENSION in **MACHINE MAINTENANCE**. B. Re-align pump and motor. C. Check oil type and change intervals per **PUMP SPECIFICATIONS.**
8. Short seal life	A. Damaged plunger bushing. B. Worn connecting rod. C. Excess pressure beyond the pump's maximum rating. D. High water temperature.	A. Replace punger bushing. B. Peplace connecting rod. C. Match pressure stated in **PUMP SPECIFICATIONS**. D. Lower water tempersture stated in **PUMP SPECIFCATIONS**.

PUMP TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
9. Dirty or worn check valves.	A. Normal wear. B. Debris	A. Remove and replace. B. Check for lack of water inlet screens.
10. Presence of metal particles during oil change.	A. Failure of internal component. B. New pump.	A. Remove and disassemble to find probable cause. B. New pumps have machine fillings and debris and should be drained and refilled per **PUMP SPECIFICATIONS**.
11. Water leakage from under head.	A. Worn packing. B. Cracked/scored plunger. C. Failure of plunger retainer o-ring.	A. Install new packing. B. Remove and replace plunger. C. Remove and replace plunger retainer o-ring.
12. Loud knocking noise in pump	A. Pulley loose on crankshaft. B. Defective bearing. C. Worn connecting rod. D. Worn crankshaft. E. Worn crosshead.	A. Check key and tighten set screw. B. Remove and replace bearing. C. Remove and replace connecting rod. D. Remove and replace crankshaft. E. Remove and replace crosshead.
13. Frequent or premature failure of the packing	A. Scored, damaged, or worn plunger. B. Overpressure to inlet manifold. C. Abrasive material in the fluid being pumped. D. Excessive pressure and or temperature of fluid being pumped. E. Over pressure of pumps. F. Running pump dry.	A. Remove and replace plungers. B. Reduce inlet pressure. C. Install proper filtration on pump inlet pumping. D. Check pressures and fluid inlet temperature; be sure they are within specified range. E. Reduce pressure. F. Do not run pump without water.
14. Low Pressure	A. Dirty or worn check valves. B. Worn packing. C. Belt slipping. D. Improperly sized spray tip or nozzle. E. Inlet filter screen is clogged. F. Pitted valves.	A. Clean/Replace check valves. B. Remove and replace packing. C. See BELT TENSION in **MACHINE MAINTENANCE.** D. See **MACHINE SPECIFICATIONS** for specified spray tip or nozzle. E. Clean inlet filter screen. F. See VALVE SERVICE in **PUMP MAINTENANCE.**
15. Erratic pressure: pump runs rough	A. Dirty or worn check valves. B. Foreign particles in valve assemblies. C. High inlet water temperature	A. Clean/Replace check valves. A. Clean/Replace check valves. C. See temperature in **PUMP SPECIFICATIONS**.
16. Excessive vibration	A. Dirty or worn check valves	A. See "Dirty or worn check valves"
17. Scored plungers	A. Abrasive material in fluid being pumped.	A. Install proper filtration on pump inlet plumbing
18. Pitted plungers	A. Cavitation	A. Decrease inlet water temperature and/or increase inlet water pressure.
19. Cavitation	A. High inlet fluid temperatureLow inlet pressure.	A. Lower inlet fluid temperature.Raise inlet fluid pressure.

VALVE, METERING - P/N C03-00307

OPERATION

HANDLE

Turning Chemical flow handle clockwise will shut off chemical flow.

FLOW ADJUSTING SCREW

Turning the flow adjusting screw clockwise lowers the chemical flow. Turning the screw counterclockwise lowers the flow.

SPECIFICATIONS

Maximum Pressure.....4000 PSI / 276 BAR
Maximum Flow .....12 GPM / 45 LPM
Minimum Flow .....1.0 GPM / 3.8 LPM
MAXIMUM TEMPERATURE .....200F° / 93°C
WEIGHT.....0.75 LBS. / 0.33 KG
INLET.....1/4 FNPT
OUTLET .....1/4 FNPT
O-RINGS.....VITON
VALVE HOUSING MATERIAL.....BRASS

MAINTENANCE

VALVE STEM REMOVAL -

1. Using screw driver remove cap (item 1A).
2. Holding handle and using socket remove nut (item 1B) and lock washer (item 1C) found inside handle.
3. Remove mounting nut (item 1E).
4. Holding valve housing (item 7), turn the valve retainer (item 2) counter clockwise be careful not to lose o-ring off bottom of retainer.
5. Holding the valve retainer (item 2) turn stem (item 4) counterclockwise until it comes out of the bottom of the retainer.

VALVE STEM INSTALLATION -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 13 ft/lbs.

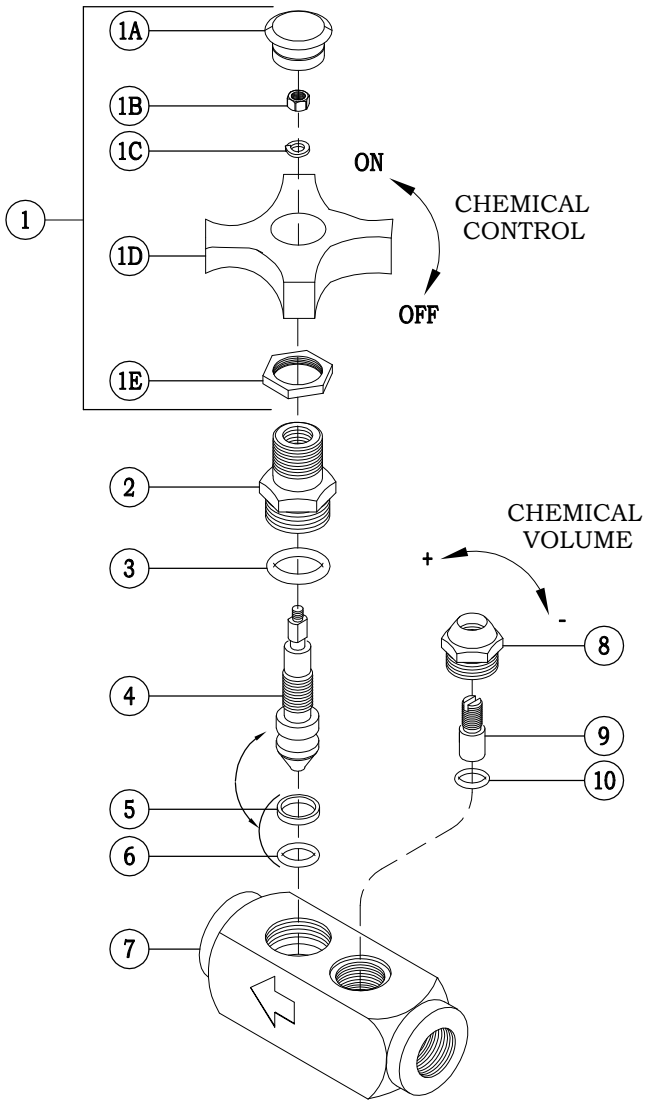
REMOVE FLOW ADJUSTING SCREW -

1. Remove the adjusting screw retainer (item 8) turning couter-clockwise.
2. Hold the retainer (item 8), using a screw driver turn the adjusting screw (item 9) clockwise until it comes out of the bottom.
3. Inspect screw for any nicks or scratches and replace as necessary.
4. Remove and replace o-ring (item 10).

REINSTALL FLOW ADJUSTING SCREW -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 30 ft/lbs

EXPLODED VIEW

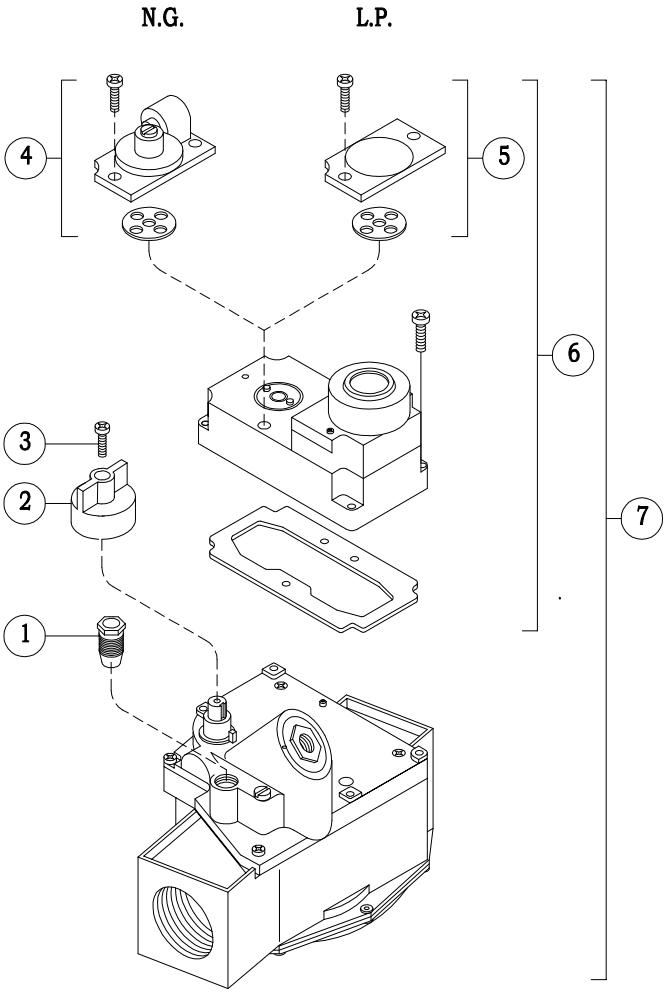


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	C07-00307-01	KIT, HANDLE
1A	----------	CAP, PLASTIC
1B	----------	NUT, HEX
1C	----------	WASHER, LOCK
1D	----------	HANDLE, ADJUSTMENT
1E	----------	NUT, HEX
2	----------	RETAINER, VALVE STEM
3	----------	O-RING - VITON 1/16CS X 3/16ID
4	----------	STEM, VALVE - SHUT-OFF
5	----------	RING, ANTI-EXTRUSOIN
6	----------	O-RING - VITON 3/32CS X 1/4ID
7	----------	HOUSING, VALVE
8	----------	RETAINER, ADJUSTING SCREW
9	----------	SCREW, ADJUSTING - FLOW
10	----------	O-RING - VITON 1/16CS X 1/8ID
	D01-00060	DECAL, METERING VALVE

BREAKDOWN, GAS VALVE & PILOT COUPLE

EXPLODED VIEW



VALVE, REGULATED GAS (N.G.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
4	S03-00425	KIT, REGULATOR (N.G.)
6	S03-00427	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00422	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00413	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00420	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00419	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00408	VALVE, GAS (24 VAC) (1 X 1)
	S03-00411	VALVE, GAS (115 VAC) (1 X 1)
	S03-00409	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 4, & 6

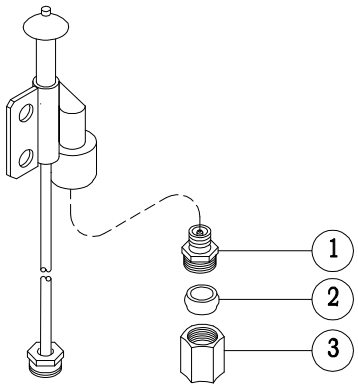
VALVE, NON-REGULATED GAS (L.P.)

PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	S03-00531	NUT, THREADED SLEEVE
2	S03-41801	KNOB, VALVE
3	H04-13802	SCREW, MACHINE
5	S03-00421	KIT, NON-REGULATED (L.P.)
6	S03-00423-A	KIT, ACTUATOR (24 VAC) (BLACK)
	S03-00426	KIT, ACTUATOR (115 VAC) (BROWN)
	S03-00423-B	KIT, ACTUATOR (230 VAC) (GREEN)
7	S03-00416	VALVE, GAS (24 VAC) (3/4 X 1)
	S03-00417	VALVE,GAS (115 VAC) (3/4 X 1)
	S03-00418	VALVE, GAS (230 VAC) (3/4 X 1)
	S03-00412	VALVE, GAS (24 VAC) (1 X 1)
	S03-00414	VALVE, GAS (115 VAC) (1 X 1)
	S03-00415	VALVE, GAS (230 VAC) (1 X 1)

*NOTE: ITEM 7 INCLUDES ITEMS 1, 2, 3, 5, & 6

EXPLODED VIEW



PILOT COUPLE P/N S03-00282 (N.G.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-2	ORIFICE, PILOT - 0.020 (N.G.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

PILOT COUPLE P/N S03-00281 (L.P.)

ITEM	PART NO.	DESCRIPTION
1	S03-00280-1	ORIFICE, PILOT - 0.014 (L.P.)
2	C05-00110	SLEEVE, COMPRESSION
3	C05-00120	NUT, COMPRESSION

GAS VALVE SERVICING

LIQUID PROPANE & NATURAL GAS VALVE

IMPORTANT SAFETY INSTRUCTIONS

FUEL SAFETY

⚠ **DANGER:** To avoid possible injury, fire, or explosion, please read and follow these instructions.

N.G. (Natural) gas is lighter than air and will generally rise through the venting and escape harmlessly.

L.P. (Propane) gas is **heavier** than air and like water, will flow to the **lowest level**. Before lighting the pilot burner, sniff at the **lowest level**. **If you smell gas**, follow these rules:

1. Get all the people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric switches or light switches on or off in the area. **DO NOT** use an electric fan to remove gas from the area.
3. Shut off the gas supply from the outside of the building.
4. Telephone (from another location) Gas Company and Fire Departments. Ask instructions. **DO NOT** go back into the building..

1. **QUALIFIED PERSONNEL AND LOCAL CODES:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes and with the Natural Fuel Gas Code (ANSI Z223.1/NFPA No. 54).
2. **GAS AND ELECTRICITY**: Gas and electricity must be shut off when installing or servicing. Turn back on to test or operate.
3. **FIRE HAZARD:** Keep combustible materials away from gas machines. DO NOT allow lint or dust collect in the burner area.
4. **N.G. AND L.P.:** Caution must be taken to ensure no raw gas is present in the surrounding area before attempting to put the machine into operation, or when relighting pilot.
5. **GAS SUPPLY:** Do not connect the machine to supply piping before testing gas supply pressure. Excessive pressure may cause damage to gas control valve. This machine must have a fuel supply as specified in the FUEL section of the **MODEL SPECIFICATIONS**

SAVE THESE SAFETY INSTRUCTIONS

GENERAL INFORMATION

1. **LEAK TEST:** All gas connections should be tested for leaks per the LEAK TEST instructions.
2. **CONVERTING N.G. to L.P.:** The regulator and vent tube must be removed, a plate installed in it's place, a regulator added to the incoming supply line, and main burner and pilot orifice changed.
3. **CONVERTING L.P. to N.G.:** A regulator must be installed on the gas valve, a vent tube added, and main burner and pilot orifice changed.
4. **L.P. FIRED MACHINES:** As weather gets colder, the rate of liquid being vaporized into gas in the fuel storage tank will decrease. The storage tank(s) must be sized sufficiently large enough to ensure an adequate supply of vaporized fuel at all anticipated outdoor temperatures. Your L.P. supplier can recommend the correct tank(s) knowing the piping layout and the BTU demand found in **MODEL SPECIFICATIONS**.
5. **FUEL OUTAGE:** If your L.P. tank runs out of fuel or if the natural gas supply is interrupted, turn off the gas at the machine. After L.P. tank is filled, or the natural gas is restored, relight pilot per LIGHTING PILOT instructions.
6. **WATER EXPOSURE:** If your gas control valve has been exposed to water in any way, do not attempt to use it. It must be replaced. Do not attempt to repair the gas control valve.

LEAK TEST

1. Use soapy water or leak detecting solution (never a match or open flames) when checking for leaks.
2. Apply the water or solution over the connections and observe carefully to see if bubbles expand, indicating a leak is present. A large leak can blow the solution away before the bubbles have a chance to form.
3. To correct leak, try tightening first. If leak continues, take the connection apart and inspect the threads. Replace defective items.
4. If step 3 doesn't correct the problem, look for sand holes in the pipe or fittings. If found replace the complete device.

LIGHTING PILOT

1. Turn on the line valve.
2. Set the temperature control (if so equipped) to the lowest setting.
3. Turn on the gas control valve knob to "Pilot" position.
4. Depress and hold knob down while lighting pilot. Allow pilot to burn 1/2 minute before releasing valve knob. If pilot does not remain lit, repeat the operation allowing a longer period before releasing. If pilot still does not remain lit or does not light, the pilotcouple may be defective and needs to be replaced. (if pilot adjustment is necessary see "PILOT FLAME ADJUSTMENT".
5. Turn knob to "ON" position.
6. Set temperature control (if so equipped) to the desired temperature position. **NOTE: Do Not** use knob on gas control valve to adjust gas flow. Turn to full "ON". **Do Not** adjust gas input between "PILOT" and "ON" positions of the knob.

PILOT FLAME ADJUSTMENT

1. Remove machine screw located next Remove machine screw located next to the pilot connection. Be careful not to lose the gasket.
2. Turn the recessed screw clockwise to reduce the pilot flame and counter-clockwise to increase the pilot flame.
3. With gasket in place, replace machine screw securely over adjustment screw.

RELIGHTING PILOT

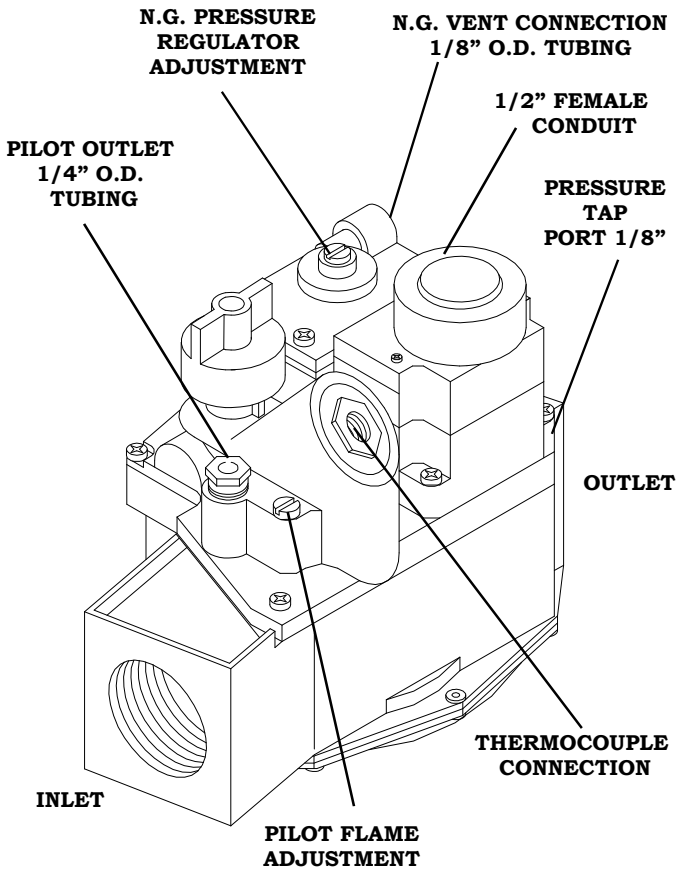
1. Partially depress and turn gas control valve knob to "Off" position.
2. Wait at least 5 minutes to allow gas to escape the burner compartment.
3. See **LIGHTING PILOT** section above.

PRESSURE REGULATOR ADJUSTMENT

NOTE: Pressure regulator is normally preset at factory. However, field adjustment may be accomplished as follows:

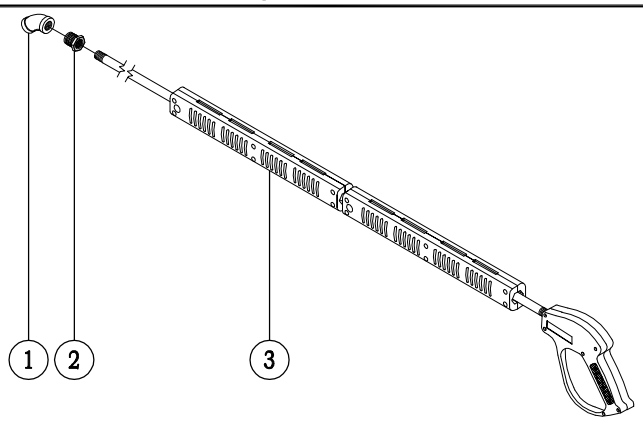
1. Monometer or attachment may be accomplished at pressure tap port.
2. Remove plug on top of regulator.
3. Rotate the adjustment screw "clockwise" to increase or "counterclockwise" to decrease pressure. See **MODEL SPECIFICATIONS** for proper pressure setting.
4. Replace plug securely.

NOTE: This regulator is normally used with a Natural Gas machine, L.P. Gas fired machine requires a regulator on the incoming supply line.



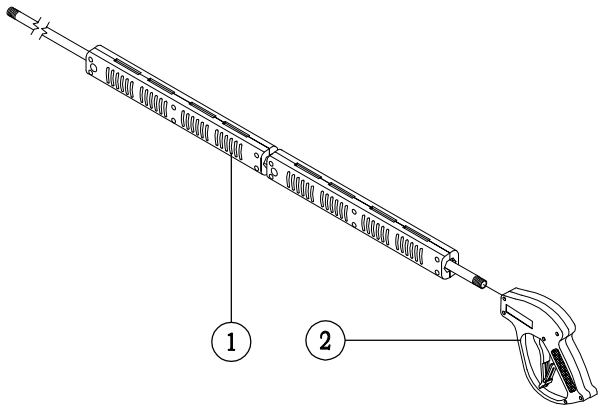
ASS'Y, OPEN GUN & WAND

EV - P/N 122-00700A



P/N 122-00700A PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E08-00008-2	ELBOW, PIPE	3	J06-00102B	ASS'Y, WAND & OPEN GUN
2	E04-00003-2	BUSHING, PIPE			

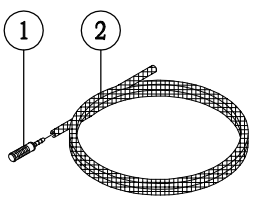


P/N 122-00700A PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	J06-00104E	ASSEMBLY, WAND	2	J06-00101	GUN, OPEN

ASSEMBLY, CHEMICAL LINE

EV - P/N 4120-00902P

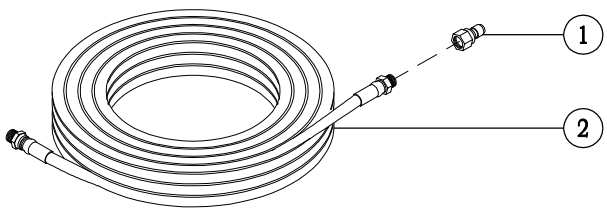


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	C04-00131	SCREEN, CHEMICAL
2	Z01-08413-2	HOSE, POLY BRAID - 84"

ASSEMBLY, HOSE & COUPLER

EV - P/N 241-00710



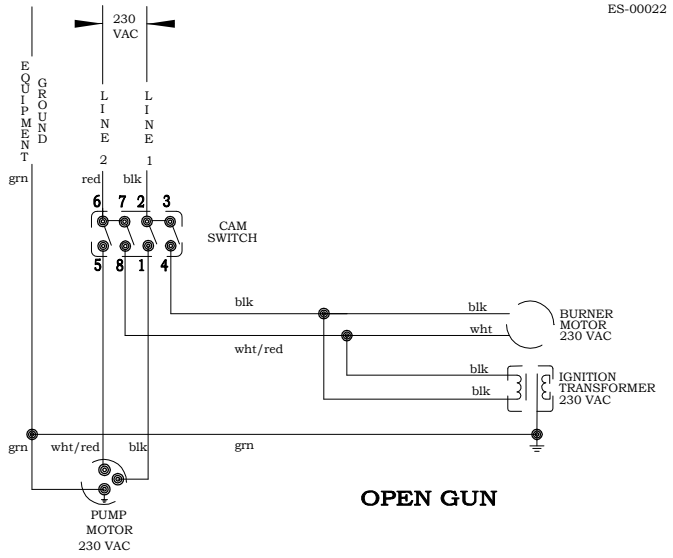
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	W04-31231-B	NIPPLE, COUPLER
2	K02-03150-1C	ASSEMBLY, HOSE

SCHEMATICS, ELECTRICAL - OIL FIRED

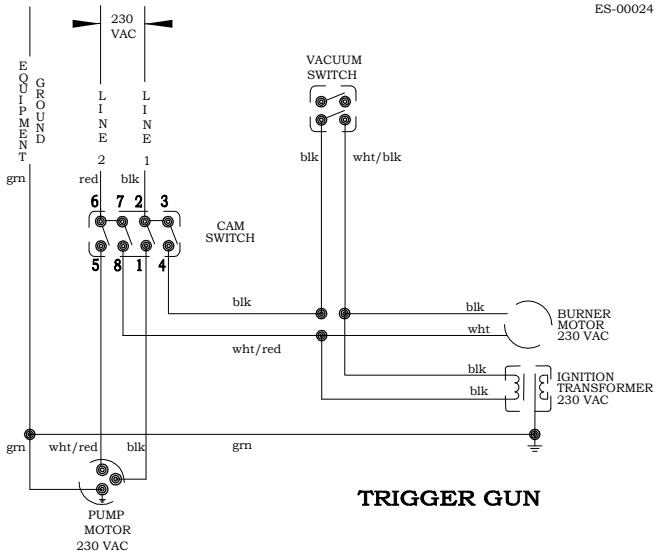
230 VAC 1 PHASE 60 HERTZ

ES-00022



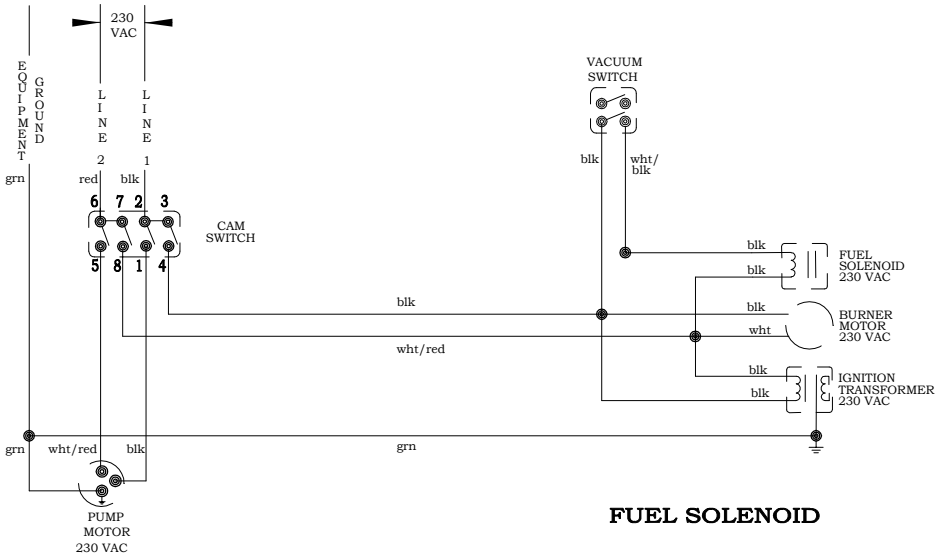
OPEN GUN

ES-00024



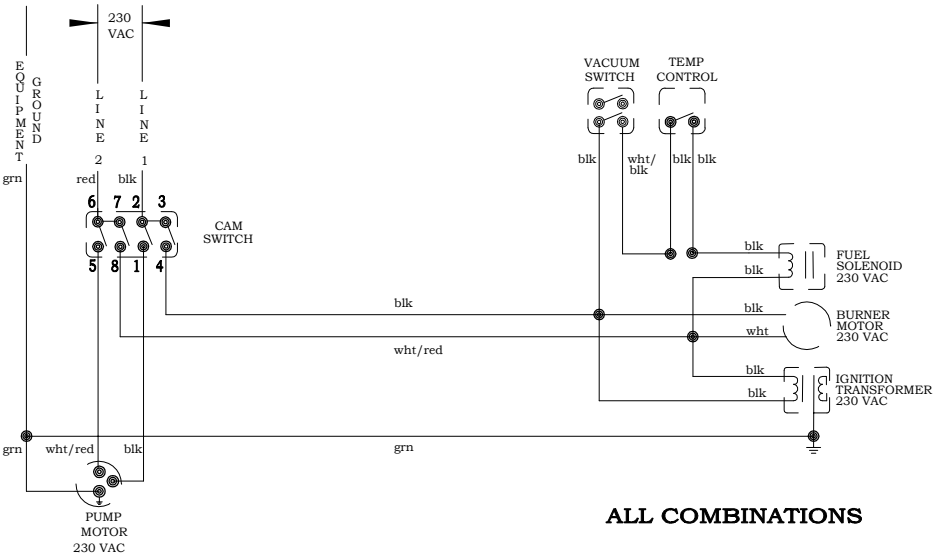
TRIGGER GUN

ES-00025



FUEL SOLENOID

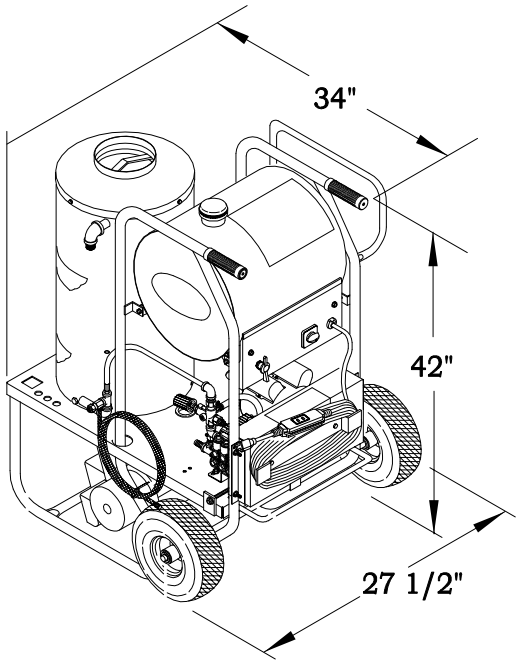
ES-00027



ALL COMBINATIONS

MODEL 122 SPECIFICATIONS

DIMENSIONS



ALL DIMENSIONS ARE IN
IN INCHES UNLESS OTHERWISE
NOTED. 1 INCH = 25.4 MM

PERFORMANCE

DISCHARGE VOLUME.....2.0 GPM / 7.5 LPM
PUMP HEAD PRESSURE.....350 PSI / 24 BAR
TEMPERATURE RISE.....225°F @ 132 GPM / 125°C @ 500 LPM
TEMPERATURE LIMIT.....UP TO 300 DEGREES
COMBUSTION SMOKE/BACHARACH SCALE.....#1 OR #2 SMOKE
CARBON MONOXIDE ALLOWED.....0.01%
DRAFT/STACK INSTALLATION.....0.2" - 0.04" WC READING
HEAT INPUT.....385,000 BTU/HR / 1,558,000 KCAL/HR

GENERAL

MINIMUM WATER INLET PRESSURE.....40 PSI / 0.68 BAR
STACK SIZE.....8" DIA / 203.2MM DIA
NOZZLE, IMPACT.....(#45 ORIFICE) P/N J05-00345
HOSE, HIGH PRESSURE.....3/8" X 50' P/N K02-03150-1C
COIL SIZE.....1/2"ID X 126' SCHEDULE 40 - P/N 2122-00207
WEIGHT (DRY).....400 LBS / 182 KG
FUEL TANK CAPACITY.....8 GAL / 30 L
WAND & TRIGGER GUN..... P/N 120-00700A
BELT.....(A24 SUPER II) P/N R02-00424-II
COIL BACK PRESSURE (NEW).....5 PSI @ 2.0 GPM / 0.34 BAR @ 7.5 LPM
COIL BACK PRESSURE REQUIRING DESCALING.....50 PSI @ 2.0 GPM / 3.40 BAR @ 7.5 LPM

PUMP

PUMP .....(TT941) P/N N07-00026
PULLEY.....(AK49H) P/N R03-00649
PULLEY BUSHING.....(H X 24MM) P/N R04-00001

PUMP MOTOR

HORSEPOWER..... 3/4 HP / 0.56 KW
SPEED.....1725 RPM
PULLEY.....(AK46 X H) P/N R03-00646-1
VOLTAGE 115V 60HZ 1PH
PART NUMBER.....F02-00042
PULLEY BUSHING.....(H X 5/8) P/N R04-00002

ELECTRICAL

VOLTAGE..... 115 VAC, 60 HZ, 1 PH
TEMPERATURE CONTROL.....P/N F04-00818
CURRENT.....15 AMP
CAM SWITCH.....F04-00741A

BURNER

BURNER.....V00-17391
SPEED.....3450 RPM
FUEL NOZZLE.....(2.50 90 DEGREE A) P/N V2.50 90DA
FUEL CONSUMPTION.....2.74 GPH / 10.4 LPHR
FUEL PRESSURE .....120 PSI / 8 BAR
MOTOR - 1/5HP.....P/N V00-20554
VOLTAGE.....115V 1PH 60HZ
FUEL PUMP .....(DANFOSS) V-100714-001
TYPE.....PRESSURE ATOMIZING
FUEL TYPE.....KEROSENE, #1 OR #2 DIESEL

OPERATION TABLE OF CONTENTS

OIL FIRED ELECTRIC DRIVEN CLEANER

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ALL CLEANERS ARE CAREFULLY INSPECTED AND CARTONED TO PROTECT AGAINST SHIPPING DAMAGE. IF THERE IS DAMAGE OR MISSING PARTS, THE TRANSPORTATION COMPANY AGENT SHOULD MAKE A NOTATION TO THAT EFFECT ON THE BILL. REFER TO THE PARTS LIST IN THIS MANUAL AND ADVISE WHAT PARTS ARE MISSING OR DAMAGED. IF AVAILABLE, GIVE THE INVOICE NUMBER ON ALL ORDER BILLS. THIS PROCEDURE WILL ENABLE NEEDED PARTS TO BE SHIPPED QUICKLY.

READ ALL Installation, Operation, and Maintenance instructions before operating the machine

NOTE: Refer to CLEANER MODEL for **SERIAL NUMBER** location

NOTE: Dimensions are in inches unless otherwise noted

IMPORTANT SAFETY INSTRUCTIONS

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

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

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

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

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

GENERAL SAFETY

1. Before operating this machine, read and observe all safety, unpacking, and operating instructions. Failure to comply with these instructions could create a hazardous situation.
2. The operator of this equipment should not operate this equipment when fatigued or under influence of alcohol or drugs.
3. The operator of this equipment should be thoroughly familiar with its operation and trained in the job to be accomplished.
4. The operator of this equipment should wear protective face shields and other protective clothing as required for safe operation.
5. Keep all protective covers and shields in place. Operating this machine with moving parts could allow operator or bystander serious injury or even death.
6. Do not operate the machine if any mechanical failure is noted or suspected.Keep all shields in place.
7. Do not leave this machine unattended when it is operating.
8. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.
9. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the motor and repair.
10. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.
11. When starting a job, survey the area for possible hazards and correct before proceeding.
12. If chemicals are used in conjunction with this equipment, read and follow the product label directions.
13. During normal operation of this machine, hot discharges and surfaces may be produced.
14. Do not start the burner unless a full flow of water is coming from the gun. Air leaks or insufficient water to the machine, or an open chemical valve means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

15. Do not start the machine unless the gun assembly is firmly gripped by the machine operator. Failure to do this could result in injury from a flying hose and gun assembly.

WARNING: RISK OF INJECTION OR SEVERE INJURY. KEEP CLEAR OF NOZZLE. DO NOT DIRECT DISCHARGE STREAM AT PERSONS. THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS.

AVERTISSEMENT: RISQUE D'INJECTION ET DE BLESSURES GRAVES. SE TENIR À L'ÉCART DU JET. NE PAS DIRIGER LE JET DE SOTIE VERS D'AUTRES PERSONNES CONFIER L'UTILISATION LE JET DE SOTIE VERS D'AUTRES PERSONNES. CONFIER L'UTILISATION DE CE MATÉRIEL À UN

16. Always point the gun assembly in a safe direction and do not direct spray on the cleaner or personnel in the area.
17. Always shut down machine before refueling.

WARNING: OPEN FLAME. Do not operate this machine in an area with combustible materials. A suitable fire extinguisher should be available in operating area.

18. Do not overfill the fuel tank. If any spillage occurs, clean up immediately and/or neutralize the spill before attempting to operate the machine.

MECHANICAL SAFETY

1. All guards, shields, and covers must be replaced after adjustments are made to prevent accidental contact with hazardous parts.
2. Drive belts must be inspected and tightened periodically to operate at optimum levels.
3. Inspect machine for damaged or worn components and repair or replace to avoid potential hazards. Do not operate the machine if any mechanical failure is noted or suspected.
4. Always use the correct size spray tip found in the GENERAL section of the **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.

ELECTRICAL SAFETY

1. This machine must be electrically grounded. Failure to have the machine grounded may result in the operator being electrically shocked and even death.
2. Do not plug–in or un–plug machine with wet hands.
3. Keep power cords and connections (connectors) out of water.
4. If an extension cord must be used to operate this machine, it should be as short as possible. The extension cord must be properly sized and fitted with a grounding type plug and receptacle.
5. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.
6. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)
7. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

FUEL SAFETY

WARNING: DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR OIL CONTAINING GASOLINE OR SOLVENTS.

AVERTISSEMENT: NE PAS UTILISER D'ESSENCE DE PRODUITS DE VIDANGE NI D'HUILE CONTENANT DE L'ESSENCE OU DES SOLVANTS

1. Use only fuel #1 or #2 diesel. The use of incorrect fuel may result in fire or explosion and severe injury to the operator.
2. Do not refuel machine while it is running or hot. Allow it to cool sufficiently to prevent ignition of any spilled fuel. Clean up any spilled fuel before resuming operation.

3. Fuel burning equipment must have proper ventilation for cooling, combustion air, and exhausting of combustion products.
4. Stacking, where required, must be installed in accordance with all local codes. A draft diverter must be installed on a machine connected to an exhaust stack to prevent improper operation.
5. Where stacking is not required, provide adequate ventilations to prevent any possible accumulation of hazardous fumes.
6. Personnel trained in and familiar with the type of equipment being serviced should only perform adjustments to fuel burning equipment.

SAVE THESE SAFETY INSTRUCTIONS

INSTALLATION

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

   All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices. Use the chart on the next page for your cord selection

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

WARNING: ELECTRICAL SHOCK HAZARD

3. **EXTENSION CORD**: The use of an extension cord that has undersize wire compared to the amp draw of your machine will adversely limit the starting load carrying abilities of the motor and machines performance. Use only 3-wire extension cords that have 3-prong plugs and 3-pole cord connectors that accept the plug from the product. Use only extension cords that are intended for outdoor use. These extension cords are identified by a marking "Acceptable for use with outdoor appliances; store indoors while not in use." Use only extension cords having an electrical rating not less than the rating of the product. Do not use damaged extension cords. Use an extension cord in good repair free of frays or cracks in the outer covering. Do not abuse extension cord and do not yank on any cord to disconnect. Keep cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting the product from the extension cord.

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

COPPER WIRE SIZE MINIMUM AWG	MACHINE AMP DRAW* 3 CONDUCTOR WIRES	MACHINE AMP DRAW* 2 CONDUCTOR WIRES
16	10	13
15	--	--
14	15	18
12	20	25
10	25	30
8	35	40
6	45	55
4	60	70
2	80	95

CHART FIGURES ARE BASED ON NOT MORE THAN 100 FOOT

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

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

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

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

⚠ WARNING: CARBON MONOXIDE HAZARD

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

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

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

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

8. **FREEZING:** This machine must be protected from freezing according to STORAGE section of **MACHINE MAINTENANCE**.

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

10. **CHEMICALS:** Mix chemicals per the chemical manufacturers printed directions. Follow all mixing, handling, application, and disposal instructions. Wear gloves, boots, goggles, and protective clothing appropriate for the chemical being used

VENTING

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

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

1. **DRAFT DIVERTERS**: (STACKED CLEANERS)

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

THIS MACHINE IS NOT TO BE CONNECTED TO A TYPE B GAS VENT. NE PAS RACCORDER CET APPAREIL À UN TUYAU D'ÉVACUATION DE GAZ DU TYPE B.

   A. A draft diverter must be used on all cleaners that are stacked. This includes any chimney even if not expelled to the outside.
   B. Use a draft diverter of the inverted funnel or bell type that meets all codes for capacity and materials. Mount the draft diverter directly to the stacking flange on the machine
   C. The draft diverter's function is to insure that the barometric pressures are as close to the same as possible at the air inlet and outlet to the coil and will not be changed by either up drafts or down drafts.

D. Installation of a draft diverter **WILL NOT PREVENT THE COIL FROM FREEZING**. In areas where freezing temperatures are common, some type of down draft prevention must be used. Check local codes for acceptable methods for the prevention of down drafts.

2. **VENTING INSTALLATION INFORMATION**:

A. Never Reduce the Stack size. The diverter and stacking should be the same size as the stack opening on the machine.B.

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

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

D. A Rain Cap U.L. approved should be installed on the stack

OPERATING INSTRUCTIONS

PRE START-UP

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

A. Check the tension of the belt (if so equipped) per instructions in **MACHINE MAINTENANCE**.

B. Flush the machine per instructions in **MACHINE MAINTENANCE**.

C. Install float tank drain plug (if so equipped).

D. Open float tank ball valve (if so equipped).

2. **CAUTION:** Always use pipe or hose suitable to carry live steam. The pipe or hose should be large enough ID as not to restrict the flow.

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

4. Read and observe all items in "CLEANER INSTALLATION".

START-UP

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

WARNING: ELECTRIC SHOCK HAZARD

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

3. **OIL LEVEL**: Check the oil level in the water pump.

4. **BELT**: Make sure belt tension and condition is as specified in MACHINE MAINTENANCE.

5. **STACK COVER**: Remove the stack cover (if so equipped).

6. **FUEL FILTER**: Inspect fuel filter for evidence of water contaminants.

7. **FUEL**: Make sure the fuel lines are open (**CAUTION:** Closed valves will DAMAGE the fuel pump and void warranty). Use #1 or #2 diesel**.**

8. **FUEL QUANTITY**: Make sure the fuel supply is sufficient to complete the job. See the GENERAL section of **MODEL SPECIFICATIONS** for the fuel tank capacity.

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

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

11. **FLOAT TANK:** Check the float tank to assure it is full and the float valve shuts off securely.

12. Check the position of the ball valve (if so equipped) on outlet line of the float tank assuring that it is in the open position.

13. Turn the switch to the burner position.

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

14. Select temperature (if so equipped).

15. With the gun assembly in hand (on trigger gun models hold the trigger gun valve in open position) and with a good flow of water turn switch to the pump position.

    CAUTION: A good flow of water must be flowing from the end of a gun within 30 seconds, before proceeding. Lack of water can cause water pump damage.

    CAUTION: DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.

    CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 5 minutes, water pump damage may occur.

14. Turn the switch to the pump position.

15. Do not start the burner unless a full flow of water is coming from the steam trap. Air leaks or insufficient water to the machine means less than full flow of water through the coil. This could cause hose failure and burns to the operator.

16. **TO CLEAN**:

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

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

17. **TO APPLY CHEMICAL**:

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

    Mix chemicals per label instructions. Use necessary safety precautions.

    A. Insert chemical screen into chemical container

    B. Adjust metering valve (if so equipped).

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

TO RINSE:

A. Close chemical metering valve (if so equipped). NOTE: It is advisable to dip the chemical screen in a container of clean water and open the valve 1 minute to clean the valve of any remaining residue.

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

C. Start from the top, working downward using long, overlapping strokes

SHUT-DOWN

1. Turn the switch from the burner position to the pump position.

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

3. Turn off the water supply.

4. Disconnect from electrical supply.

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

6. Replace stack cover (if so equipped).

COMBINATION OPTION

INSTRUCTIONS

WARNING: This machine should be operated only by personnel instructed in and familiar with its operation. The discharge produced is 300°F / 150°C and can cause **SERIOUS BODILY INJURY** to you and anyone coming in contact with it.

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

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

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

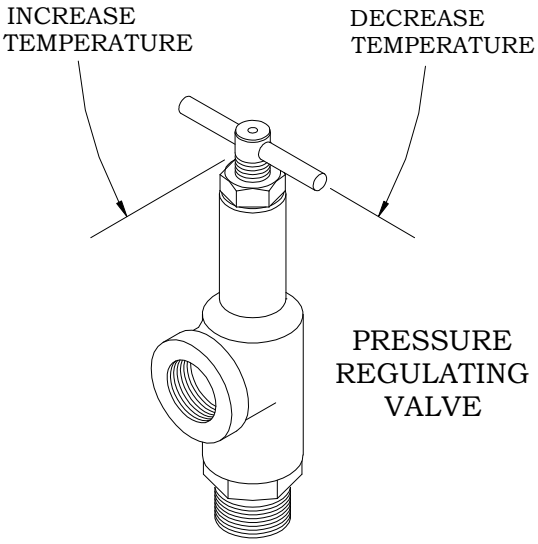
The water temperature is relative to the season variation and should be taken in consideration when operating steam.

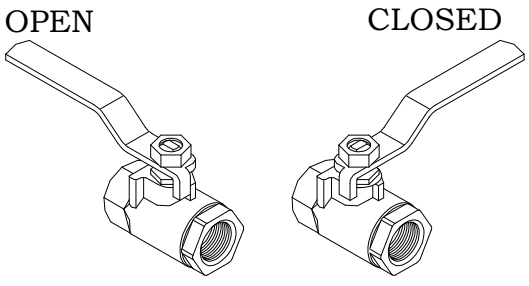
1. Install the open gun assembly.
2. Open the ball valve on coil inlet assembly.
3. Set the temperature control to 300°F MAXIMUM.
4. For startup see “START UP” section on the previous page.

WARNING: RISK OF INJECTION OR SEVERE INJURY. KEEP CLEAR OF NOZZLE. DO NOT DIRECT DISCHARGE STREAM AT PERSONS. THIS EQUIPMENT IS TO BE USED ONLY BY TRAINED OPERATORS.

AVERTISSEMENT: RISQUE D’INJECTION ET DE BLESSURES GRAVES. SE TENIR À L’ÉCART DU JET. NE PAS DIRIGER LE JET DE SOTIE VERS D’AUTRES PERSONNES CONFIER L’UTILISATION LE JET DE SOTIE VERS D’AUTRES PERSONNES. CONFIER L’UTILISATION DE CE MATÉRIEL À UN OPÉRATEUR QUALIFIÉ.

5. Regulate the temperature indicated on the thermometer to 300°F by turning the regulating valve on the coil inlet assembly clockwise to DECREASE the temperature and counter clockwise to INCREASE the temperature.
6. For shut down follow “SHUT DOWN” previously shown on this page.
7. Close the ball valve on the coil inlet assembly.





MACHINE MAINTENANCE

MOTOR DRIVEN OIL FIRED CLEANERS	DAILY	EACH HR FIRST 8 HRS	AFTER FIRST 50 HRS	EVERY 50 HRS	EVERY 100 HRS	EVERY 500 HRS	YEARLY
OIL BATH WATER PUMP: **Oil Level** – check and add as needed per PUMP SERVICE insert. **Oil Change –** drain and refill per PUMP SERVICE insert. **CAUTION:** Used oil must be disposed into an environment safe container and brought to an oil recycling center. **Oil Contamination –** Milky color indicates water	● ●		●			●	
HOSES: **Blistering, Loose** Covering **Abrasion** of cover exposing reinforcement. **Cuts** exposing reinforcement	● ● ●						
BELTS: **Cracks or fraying** **Belt Tension -** For correct belt tension, see MACHINE MAINTENANCE insert.	● ●						
FILTER – WATER: **Check water inlet** hose screen for debris **Check float tank** screen for debris	 ●	●		●			
SPRAY TIP: **Check Tip** for debris.	●						
FUEL: Adequate fuel supply.	●						
FILTER—FUEL: **If contaminants** are present see FUEL FILTER insert. **Remove and Replace** fuel filter per FUEL FILTER insert.	● ●						
SCREEN—FUEL: **Check fuel pump screen** for debris see OIL BURNER MAINTENANCE insert.					●		
BURNER NOZZLE: **Replace Nozzle** as specified in BURNER section of MODEL SPECIFICATIONS or BURNER ASSEMBLY insert.							●
GUARDS AND SHIELDS: Check that all guards and shields are in place and secure.							●
PUMP MOTOR WITH GREASE FITTINGS: Remove drain plug. Use 1 or 2 full strokes of shell "DOLIUM RB", Chevron "SR1 No. 2" or Texaco "PREMIUM RB:. Operate for 20 minutes and replace drain plug.	●						

MACHINE MAINTENANCE

FLUSHING

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

   CAUTION: A good flow of water must be flowing from the end of a gun within 30 seconds, before proceeding. Lack of water can cause water pump damage.

   CAUTION: DO NOT RUN PUMP WITHOUT WATER, AS THIS WILL CAUSE DAMAGE TO THE PUMP AND VOID WARRANTY.

   CAUTION: On a machine equipped with a trigger gun valve, if the trigger gun valve remains in the closed position for more than 5 minutes, water pump damage may occur.
8. When clean water flows from the gun, turn switch to the OFF position.
9. Disconnect the water supply.
10. Dissconnect the electrical supply.
11. If freezing conditions may exist, refer to "STORAGE" section.

STORAGE

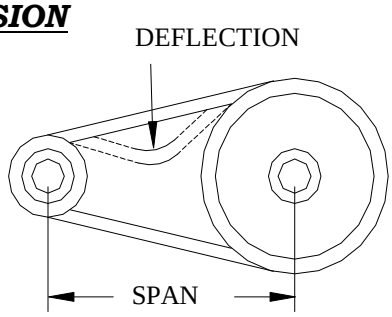
1. Rinse the chemical line by inserting the screen into a container of clear water and open the metering valve 1 minute to clean it of any remaining residue. Be sure the chemical metering valve is closed when finished.
2. Check the position of the ball valve (if so equipped) on the outlet of the float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

SPRAY TIP MAINTENANCE

1. Remove the spray tip from the gun assembly.
2. Blow out debris with compressed air from the outside in. Any debris remaining in the inlet side of the nozzle should be cleaned out. If lime or chemical scale is present in the inlet side, the nozzle may be soaked in descaling solution or replaced. If the tip is worn, replace with one specified in the GENERAL section of **MODEL SPECIFICATIONS** or **MODEL EXPLODED VIEW**.

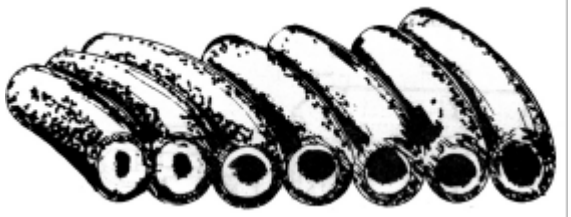
3. Before replacing spray tip flush the machine per "FLUSHING".
4. Reinstall Spray tip to gun assembly.

BELT TENSION



1. Deflection for each inch of span between pulley centers with a 6-pound force applied in the middle of the span. EXAMPLE: A 6-pound force applied at the middle of an 8 inch span should produce a deflection of 8/64 inch or 1/8 inch.
2. Belts can be tightened or loosened by loosening the nuts holding the pump assembly to the motor mount. Then tighten or loosen the j-bolt on the motor mount. Retighten the pump assembly after the desired tension is reached.

COIL BACK PRESSURE CHECK



Above is a cross section view showing the progressive liming of coils.

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

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

COIL BACK PRESSURE CHECK INSTRUCTIONS

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

DISCHARGE VOLUME GPM	BACK PRESSURE REQUIRING DESCALING
2-3 GPM	50 PSI
3-4 GPM	75 PSI
4-5 GPM	100 PSI
6 GPM	150 PSI
8-10 GPM	175 PSI

USE A 1000 PSI PRESSURE GAUGE

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

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

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

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

For Descaling Instructions request Z08-00493.

ACCESSORIES

PART NO. DESCRIPTION

Y02-00001 ..... 0-1000 PSI (69 BAR) Pressure Gauge

Z01-00070-1.....3/8" x 100 Yards Thread Tape

NOTE: All Gauges are Glycerin Filled ¼ NPT

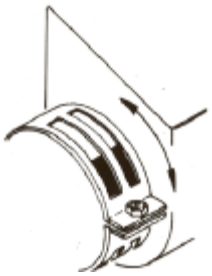
PUMP TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
1. Oil leaking in the area of water pump crankshaft.	A. Worn crankshaft seal. B. Bad bearing. C. Grooved shaft. D. Failure of retainer o-ring	A. Remove and replace. B. Remove and replace. C. Remove and replace. D. Remove and replace.
2. Excessive play on crankshaft.	A. Defective bearings. B. Excess shims.	A. See "Worn bearing". B. Set up crankshaft.
3. Loud knocking in pump.	A. Loose conecting rod screws. B. Worn connecting rod. C. Worn bearings. D. Loose plunger bushing screw.	A. Tighten connecting rod screws per **PUMP SPECIFICATIONS**. B. Replace connecting rod per **PUMP MAINTENANCE.** C. Replace bearings per **PUMP MAINTENANCE**. D. Tighten plunger screw per **PUMP SPECIFICATOINS.**
4. Oil leaking at the rear portion of the pump.	A. Damaged or improperly installed oil gauge window gasket. B. Damaged or improperly installed rear cover. C. Oil gauge loosed. D. Rear cover screws loose. E. Pump overfilled with oil, displaced through crankcase breather hole in oil cap/dipstick.	A. Replace gasket or o-ring. B. Replace gasket or o-ring. C. Tighten oil gauge. D. Tighten rear screws. to torque values in **PUMP SPECIFCATIONS. S** E. Drain oil: refill to recommended oil level as stated in OIL LEVEL in **PUMP MAINTENANCE**.
5. Water in crankcase	A. May be caused by humid air condensing into water inside the crankcase. B. Worn or damaged plunger screw o-ring.	A. Maintain or step up lubrication schedule. B. Remove and replace. See PLUNGER SERVICE in **PUMP MAINTENANCE.**
6. Worn bearing	A. Excessive belt tension. B. Oil contamination.	A. See BELT TENSION in **MACHINE MAINTENANCE**. B. Check oil type and change intervals per **PUMP SPECIFICATIONS.**
7. Short bearing life	A. Excessive belt tension. B. Misalignment between pump and motor. C. Oil has not been changed on regular basis.	A. See BELT TENSION in **MACHINE MAINTENANCE**. B. Re-align pump and motor. C. Check oil type and change intervals per **PUMP SPECIFICATIONS.**
8. Short seal life	A. Damaged plunger bushing. B. Worn connecting rod. C. Excess pressure beyond the pump's maximum rating. D. High water temperature.	A. Replace punger bushing. B. Peplace connecting rod. C. Match pressure stated in **PUMP SPECIFICATIONS**. D. Lower water tempersture stated in **PUMP SPECIFCATIONS**.

PUMP TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
9. Dirty or worn check valves.	A. Normal wear. B. Debris	A. Remove and replace. B. Check for lack of water inlet screens.
10. Presence of metal particles during oil change.	A. Failure of internal component. B. New pump.	A. Remove and disassemble to find probable cause. B. New pumps have machine fillings and debris and should be drained and refilled per **PUMP SPECIFICATIONS**.
11. Water leakage from under head.	A. Worn packing. B. Cracked/scored plunger. C. Failure of plunger retainer o-ring.	A. Install new packing. B. Remove and replace plunger. C. Remove and replace plunger retainer o-ring.
12. Loud knocking noise in pump	A. Pulley loose on crankshaft. B. Defective bearing. C. Worn connecting rod. D. Worn crankshaft. E. Worn crosshead.	A. Check key and tighten set screw. B. Remove and replace bearing. C. Remove and replace connecting rod. D. Remove and replace crankshaft. E. Remove and replace crosshead.
13. Frequent or premature failure of the packing	A. Scored, damaged, or worn plunger. B. Overpressure to inlet manifold. C. Abrasive material in the fluid being pumped. D. Excessive pressure and or temperature of fluid being pumped. E. Over pressure of pumps. F. Running pump dry.	A. Remove and replace plungers. B. Reduce inlet pressure. C. Install proper filtration on pump inlet pumping. D. Check pressures and fluid inlet temperature; be sure they are within specified range. E. Reduce pressure. F. Do not run pump without water.
14. Low Pressure	A. Dirty or worn check valves. B. Worn packing. C. Belt slipping. D. Improperly sized spray tip or nozzle. E. Inlet filter screen is clogged. F. Pitted valves.	A. Clean/Replace check valves. B. Remove and replace packing. C. See BELT TENSION in **MACHINE MAINTENANCE.** D. See **MACHINE SPECIFICATIONS** for specified spray tip or nozzle. E. Clean inlet filter screen. F. See VALVE SERVICE in **PUMP MAINTENANCE.**
15. Erratic pressure: pump runs rough	A. Dirty or worn check valves. B. Foreign particles in valve assemblies. C. High inlet water temperature	A. Clean/Replace check valves. A. Clean/Replace check valves. C. See temperature in **PUMP SPECIFICATIONS**.
16. Excessive vibration	A. Dirty or worn check valves	A. See "Dirty or worn check valves"
17. Scored plungers	A. Abrasive material in fluid being pumped.	A. Install proper filtration on pump inlet plumbing
18. Pitted plungers	A. Cavitation	A. Decrease inlet water temperature and/or increase inlet water pressure.
19. Cavitation	A. High inlet fluid temperatureLow inlet pressure.	A. Lower inlet fluid temperature.Raise inlet fluid pressure.

AIR BAND ADJUSTMENT

NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

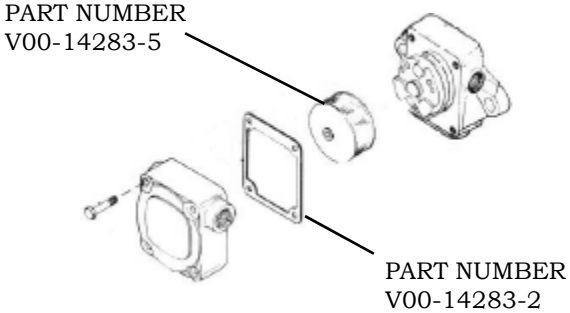
1. Loosen the cap screw retaining the air bands.
2. Move the air bands as indicated below with the machine in operation. NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.
3. Tighten the cap screw retaining the air bands.



FUEL PUMP FILTER

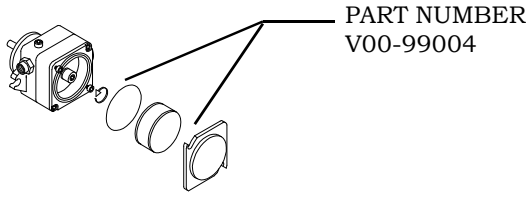
SUNDSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



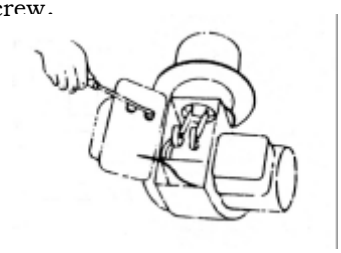
DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



TRANSFORMER TEST

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 inches and 3/4 inches, if it doesn't jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
11. Close transformer, reposition retainer clip and tighten screw.



BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.
3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle. NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ACCESSORIES

Z01-00095 – Fuel Nozzle Changing Wrench
Z01-00092 – Fuel Pump Wrench (Sundstrand)
Z01-00093 – Solenoid Wrench (ASCO)

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place. **CAUTION:** Do not over tighten, as this will cause the electrode insulator to fail.

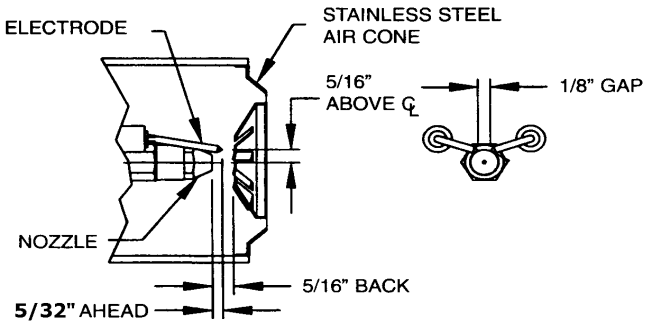


FIGURE 1

CLEANER TROUBLESHOOTING

ELECTRIC MOTOR DRIVEN OIL FIRED CLEANERS

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Poor Cleaning Action.	A. Hard water. B. Low Pressure. C. Little or no chemical being drawn. D. Improper chemical. E. Improper chemical mixture. F. Low Discharge Pressure.	A. Connect machine to water softener. B. See "Low operating pressure" C. See "Machine will not draw chemical". D. Obtain proper chemical. E. Mix chemicals per the label. Follow all mixing, handling, application, and disposal instructions. F. See "Low operating pressure"
2. Machine will not draw chemical.	A. No chemical solution. B. Metering valve not open. C. Chemical line strainer clogged.Air leak in chemical line. D. Metering valve clogged. E. Restrictor orifice too large or missing.	A. Replenish supply. B. Turn metering valve knob to open. C. Remove screen and clean. D. Tighten all fittings and hoses for the chemical line. E. Disassemble and clean. Install proper size orifice.
3. Low operating pressure	A. Insufficient water supply. B. Incoming water hose too small. C. Water supply hose too long. D. Belt slippage. E. Worn Belt. F. Spray tip worn or wrong size. G. Dirty or worn check valves in water pump. H. Water supply hose kinked. I. Inlet filter screen clogged. J. Motor runs slow. K. Air leak in inlet plumbing. L. Defective water pump. M. Leaking discharge hose. N. Chemical metering valve open and sucking air. O. Defective unloader valve. P. Inlet ball valve not fully open (if so equipped) Q. Restricted coil	A. The water supply must meet or exceed the maximum discharge volume specified in the PERFORMANCE section, and minimum water inlet pressure specified in the GENERAL section of the **MODEL SPECIFCATIONS** section. B. Use larger water supply hose. C. Use shorter water supply hose. D. Tighten belt per instructions in **MACHINE MAINTENANCE** insert. E. Replace belt per **CLEANER EXPLODED VIEW.** F. Replace with spray tip specified in the GENERAL section of **MODEL SPECIFICATIONS**. G. See **PUMP TROUBLESHOOTING**. H. Straighten hose. I. Clean water filter screen or hose inlet screen. J. See "Pump engine starts slow or overheats and stops". K. Tighten all fittings. L. See **PUMP TROUBLESHOOTING**. M. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Disconnect the power and replace hose. N. Resupply chemical, place soap screen in water, or shut off metering valve. O. Repair or replace unloader valve. P. Open inlet ball valve completely. (Handle parallel w/valve body). Q. See COIL BACK PRESSURE CHECK on **MACHINE MAINTENANCE.**

CLEANER TROUBLESHOOTING (CONT.)

ELECTRIC MOTOR DRIVEN OIL FIRED CLEANERS

TROUBLE	POSSIBLE CAUSE	REMEDY
4. Excessive, unusual noise.	A. Defective Pump. B. Defective motor. C. Pulleys rubbing. D. Misalignment of pump & motor	A. See **PUMP TROUBLESHOOTING**. B.Call service technician or take engine to Repair/Warranty station. C. Adjust shields or pulley(s). D. Realign pump and engine.
5. .Belts slipping.	A. Belts too loose. B. Excessive Back Pressure. C. Defective Water Pump.	A. Tighten belt per instructions on **MACHINE MAINTENANCE**. B. See "Excessive Back Pressure" below. C. See **PUMP SERVICE**.
6. Excessive Back Pressure	A. Spray tip built up with lime. B. Water pump turning too fast. C. Coil built up with lime. D. Relief valve defective.	A. Remove and clean, or replace spray tip with tip specified in the *GENERAL* section of **MODEL SPECIFICATIONS**. Flush machine per *FLUSHING* in **MACHINE MAINTENANCE** B. See **MODEL SPECIFICATIONS**. C. Delime coil. D. Remove and replace.
7. Excessive vibration.	A. Defective Belt. B. Defective Pump. C. Defective accumulator	A. Remove and replace using belt specified in **CLEANER EXPLODED VIEW** or the *GENERAL* section of **MODEL SPECIFICATIONS**. B. See **PUMP TROUBLESHOOTING.** C. Recharge/Replace.
8. Pump motor will not start (motor does not hum)	A. No Power. B. Defective motor starter or ON/OFF switch. C. Defective motor.	A. Use a different outlet,check fuses in main disconnect switch. Replace fuse if blown. B. Call service technician. C. Call service technician, or take motor to Repair/Warranty station.
9. Pump motor will not start (motor hums)	A. Pump frozen. B. Defective motor. C. Defective water pump. D. Excessive back pressure	A. Machine must be thoroughly warmed to above freezing. B. Call service technician or take motor to Repair/Warranty station. C. See **PUMP SERVICE**. D. See "Excessive Back Pressure" above.
10. Pump motor starts slow or overheats and stops.	A. Low voltage B. Excessive back pressure C. Defective motor	A. See "Low voltage" below. B. See "Excessive Back Pressure" above. C. Call service technician, or take motor to Repair/Warranty station.
11. Pump motor stops and will not start.	A. Motor starter "kicked out" (if so equipped) or thermal overload tripped. B. Excessive back pressure. C. Defective motor.	A. Turn motor starter off to reset, then turn on, or push thermal overload reset button on motor. B. See "Excessive Back Pressure". above. C. Call service technician, or take motor to Repair/Warranty station.
12. Low voltage	A. Incoming voltage incorrect. B. Not large enough extension cord. C. Too long extension cord	A. Have a qualified technician check the motor terminal voltage. Correct voltage is in **MODEL SPECIFICATIONS**. B. Use an extension cord with amperes or watts rating as high or higher than that of the **MODEL SPECIFICATIONS**. C. Shorten extension cord.
13. Machine shocks operator	A. Machine improperly grounded. B. Outlet not grounded	A. **STOP!** Operating machine. Call service technician. B. Have properly wired outlet installed.

OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See "ADJUSTING ELECTRODE ASSEMBLY" in **BURNER MAINTENANCE SECTION**.
	B. Electrode insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per "TRANSFORMER TEST" in **BURNER MAINTENANCE SECTION.**
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty primary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See "Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See "Low fuel pressure".
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	0. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel	P. See "No fuel."
2. No fuel	A.Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See "Low fuel pressure".
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle	G. Remove and replace (Do not clean).
3. Low fuel pressure	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump	H. Remove and replace.

OIL BURNER TROUBLESHOOTING		
TROUBLE	***POSSIBLE CAUSE***	***REMEDY***
4. Pulsating pressure	A. Partially clogged fuel pump strainer or filter. B. Air leaking around fuel pump cover.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section. B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit smokes	A. Improper fuel. B. Air to burner insufficient. C. Fuel nozzle interior loose. D. Water in fuel. E. Gun out of alignment.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Replace nozzle. D. Inspect fuel filter for water presence. E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage. B. Fuel too viscous. C. Fuel pump defective. D. Motor defective.	A. Voltage must match those specified in the BURNER section of **MACHINE SPECIFICATIONS** section. B. Operate in warmer conditions or with fuel adapted to cold weather conditions. C. Check that fuel pump turns freely. D. Call service technician or take motor to repair/warranty station.
7. Delayed ignition (rumbling, noisy starts)	A. Dirty or damaged electrodes. B. Air adjustment open too far. C. Poor fuel spray pattern. D. Incorrect electrode setting. E. Weak transformer	A. Clean or replace. B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section. C. Remove and replace with fuel nozzle specified in **BURNER ASSEMBLY**. D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE** section. E. See TRANSFORMER CHECK on **OIL BURNER MAINTENANCE** section
8. Burner does not electrically come on	A. Burner motor reset button tripped. B. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the "reset button" if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion. B. Reset if necessary.

OIL FIRED WATER HEATER TROUBLESHOOTING

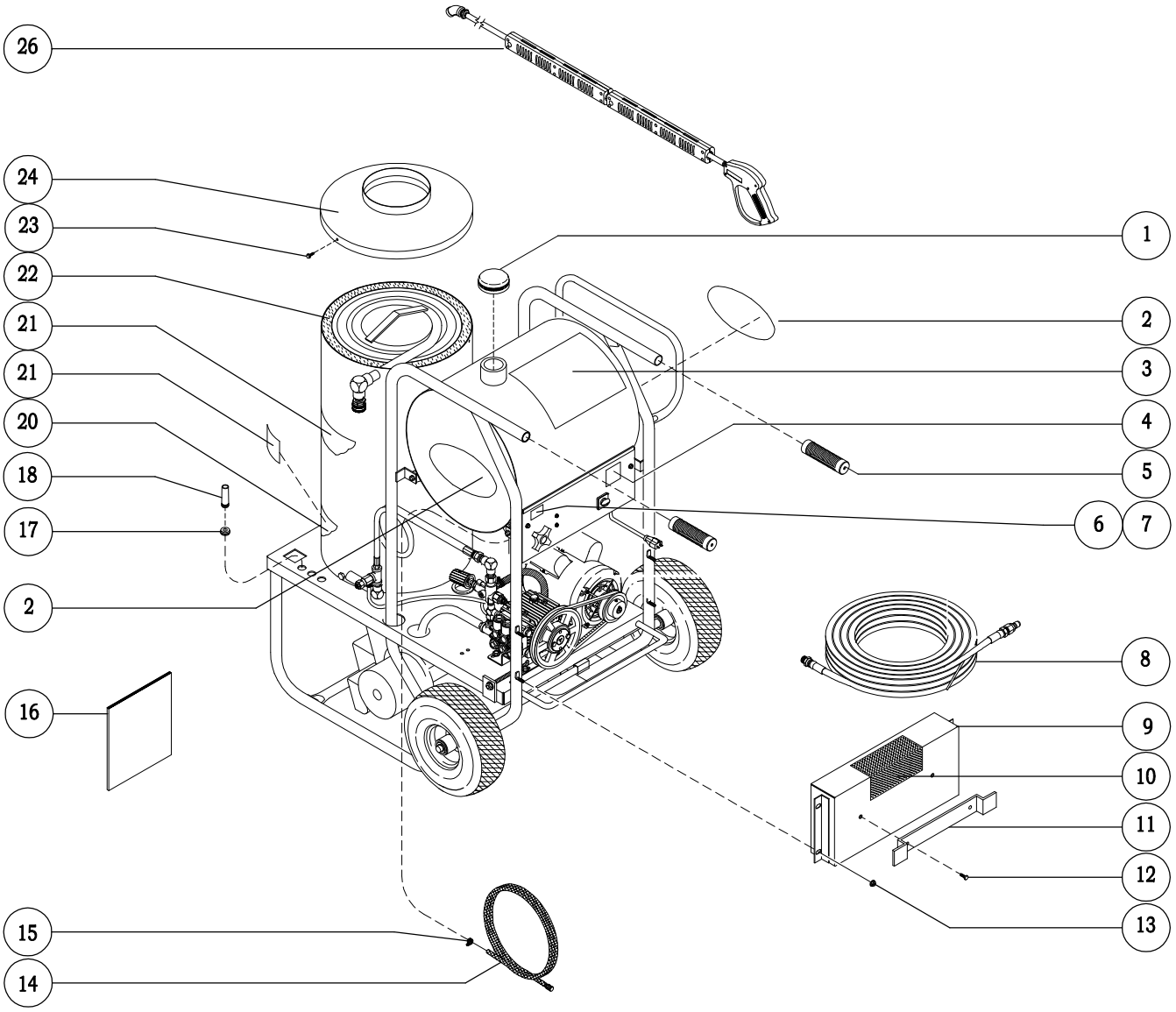
TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Machine will not rise to operating temperature	A. Low fuel pressure. B. Water in fuel piping. C. Fuel filter clogged. D. Poor combustion. E. Improper fuel supply. F. Temperature control inoperative (if equipped).	A. See BURNER on **MODEL SPECIFICATIONS** for specified pressure. B. Drain fuel tank and remove and replace filter per **FUEL FILTER INSERT**. C. Remove and replace fuel filter element per **FUEL FILTER INSERT**. D. See "Poor combustion". E. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**. F. See **TEMPERATURE CONTROL INSERT**.
2. Machine overheats	A. Insufficient water. B. Temperature control inoperative. C. Improper fuel supply	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. See **TEMPERATURE CONTROL INSERT**. C. Use fuel specified in "BURNER" section of the **MODEL SPECIFICATIONS**.
3. Dry steam (very little moisture, very hot steam)	A. Insufficient water. B. Improper fuel supply. C. Improper fuel pressure.	A. See Low Operating Pressure on **MACHINE TROUBLESHOOTING INSERT**. B. Use fuel specified **in BURNER section of the MACHINE SPECIFICATIONS.** C. See BURNER on MODEL **SPECIFICATIONS** for specified pressure.
4. Machine smokes (sweet smelling exhaust)	A. Improper fuel supply. B. Insufficient combustion air. C. Leaking fuel system. D. Clogged or improper burner nozzle. E. Loose burner nozzle.	A. Use fuel specified in BURNER section of **MODEL SPECIFICATIONS**. B. See AIR BAND ADJUSTMENT on **OIL BURNER MAINTENANCE INSERT**. C. Correct leakage problem. D. Remove (DO NOT CLEAN) and replace nozzle per **BURNER ASSEMBLY INSERT**. E. See **BURNER MAINTENANCE INSERT**.
5. Machine fumes (exhaust burns eyes)	A. Too much combustion air. B. Improper fuel pressure.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL on **MODEL SPECIFICATIONS** for specified pressure.
6. Excessive oil dripping from laydown coil condensate.	A. Loose nozzle. B. Fuel pressure too high. C. Burner nozzle defective. D. Incorrect burner nozzle.	A. See **BURNER TROUBLESHOOTING INSERT.** B. See FUEL PRESSURE ADJUSTMENT section on **BURNER MAINTENANCE INSERT.** C. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT**. D. Remove and replace with appropriate nozzle found on the **BURNER ASSEMBLY OR BREAKDOWN INSERT.**
7. Poor combustion.	A. Low fuel pressure. B. Improper fuel supply. C. Insufficient combustion air.	A. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** B. See Low Fuel Pressure on **BURNER TROUBLESHOOTING INSERT.** C. See AIR BAND ADJUSTMENT section on **OIL BURNER MAINTENANCE**.

MODEL 122 – PARTS LISTS - TABLE OF CONTENTS

EXPLODED VIEWS & COMPONENT BREAKDOWNS

CLEANER MODEL 122

P/N 2162-20020

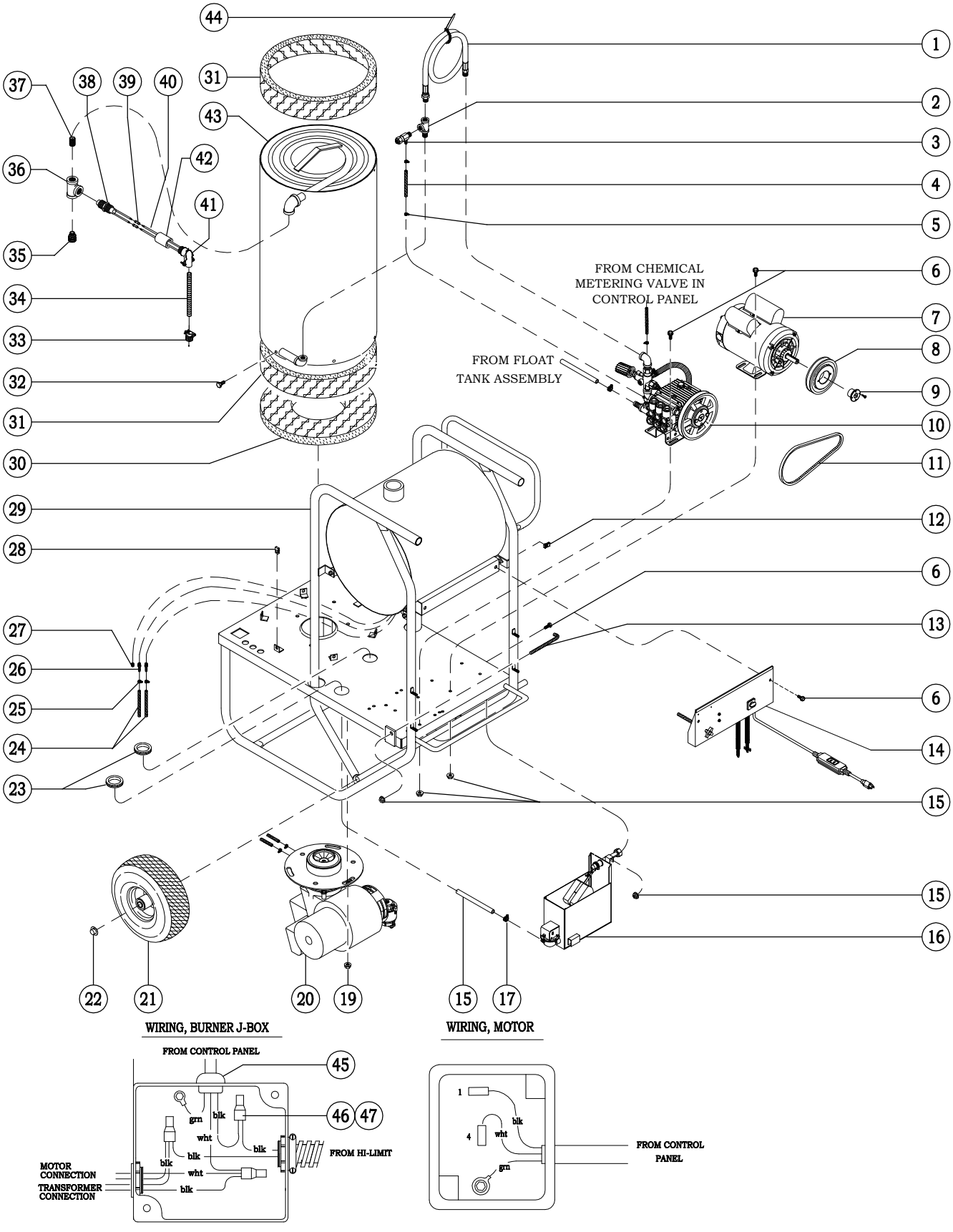


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Z01-00084	CAP, FILLER	*14	4120-00902P	ASSEMBLY, CHEMICAL LINE
2	D01-00531	DECAL, OVAL	15	W02-00033	CLAMP, HOSE
3	D01-10450	DECAL, DANGER-WARNING	16	Z08-01272	MANUAL, OWNERS
4	D01-00092B	DECAL - MADE IN AMERICA	17	F04-00451	GROMMET, RUBBER
5	Z01-00018	GRIP, HANDLE	18	J05-00345	NOZZLE, IMPACT
6	H09-12500	RIVET, POP	19	D01-00515	DECAL, WING W/O OVAL
7	----------	DECAL, SERIAL NUMBER	20	D01-10242A	DECAL, MODEL - 122
*8	241-00710	HOSE, COILED	21	D01-00516	DECAL, WING - W/ALKOTA OVAL
9	2122-00150	SHIELD, PULLEY - SPECIFY COLOR	*22	122-00600	ASSEMBLY, CLEANER
10	Z06-04200	TAPE, NONSKID	23	H04-19011	SCREW, SELF TAP
11	AB18-01801PB	HANGER, CORD - SPECIFY COLOR	24	2122-00210	ASSEMBLY, COIL TOP
12	H04-25000	SCREW, CAP	*25	122-00700A	ASSEMBLY, GUN & WAND
13	H06-25003	NUT, LOCK	*For Breakdown See Z08-01274 (22), Z08-02631 (8, 14, 25)		

ASSEMBLY, CLEANER - MODEL 122

EXPLODED VIEW



ASSEMBLY, CLEANER - P/N 122-00600

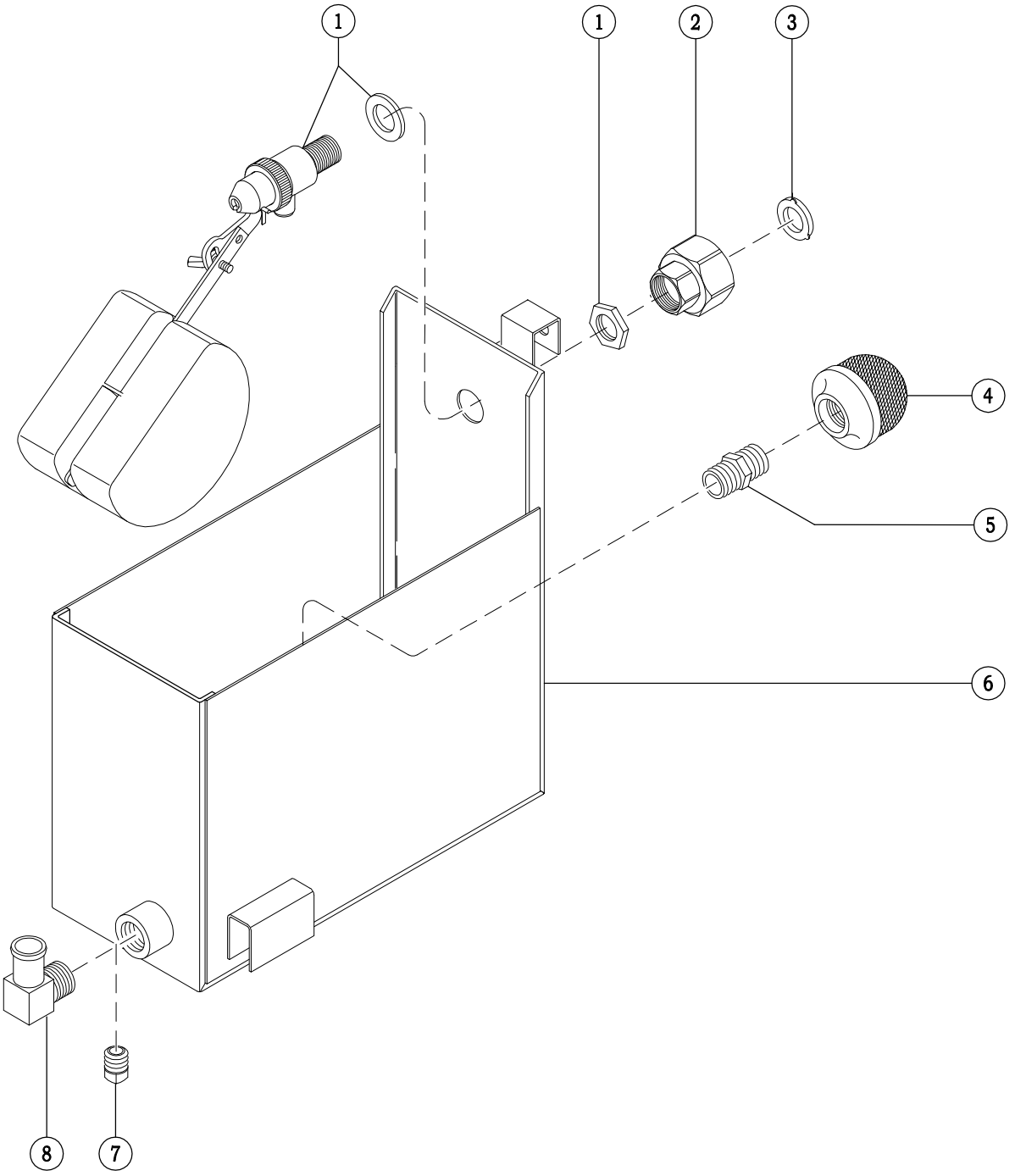
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	Y01-00040	ASS'Y, HOSE	25	W02-00033-P	CLAMP, HOSE
2	E10-00021-58	TEE, STREET	26	C03-00131	VALVE, BALL
3	C03-00501	VALVE, RELIEF	27	E09-00004-2	PLUG, PIPE
4	K31-01600	HOSE, WATER	28	H06-25011	NUT, TINNERMAN
5	W02-00033	CLAMP, HOSE	29	3852-00130	WELDMENT, FRAME
6	H04-31306	SCREW, CAP	30	90-00119	INSULATION - 1" X 14"DIA
7	F02-00042	MOTOR, ELECTRIC	31	Z01-05043	INSULATION - 2 1/2" X 43 1/2"
8	R03-00646-1	PULLEY, V	32	H04-25002	SCREW, CAP
9	R04-00002	BUSHING, PULLEY	33	F04-00310	CONNECTOR, CONDUIT
*10	122-00500	ASS'Y, PUMP	34	F05-05310	CONDUIT, ELECTRICAL
11	R02-00424-II	BELT, V	35	W04-34155-A	COUPLER, FEMALE
12	H06-25006	CLIP, TINNERMAN	36	E10-00005-5	TEE, PIPE
13	H03-31302	BOLT, J	37	E15-00010-58	NIPPLE, PIPE
*14	3112-00302	ASS'Y, CONTROL PANEL	38	F04-00837	THERMOSTAT, PROBE
15	H06-31300	NUT, HEX	39	F04-00617	TERMINAL, SPLICE
*16	2122-00121A	ASS'Y, FLOAT TANK	40	F14-05210	WIRE, ELECTRICAL
17	W02-00031	CLAMP, HOSE	41	F04-00312	CONNECTOR, CONDUIT - 90
18	K60-01600	HOSE, WATER	42	E06-00008-2	COUPLING, PIPE
19	H06-37500	NUT, HEX	43	2122-00207	COIL - W/WRAPPER
*20	122-00400	ASS'Y, BURNER	44	F02-00025	TIE, CABLE
21	G02-00008	WHEEL, RIM & TIRE	45	F04-00411	CONNECTOR, STRAIN RELIEF
22	H06-62500	NUT, PAL	46	F04-00615	TERMINAL, SPLICE
23	F04-00453	GROMMET, RUBBER	47	F04-00616	INSULATOR, SPLICE
24	Z01-03213-2	HOSE, POLYBRAID			

*For Breakdown See Z08-01278 (10), Z08-03286 (14), Z08-03412 (16), Z08-01277 (20)

ASSEMBLY, FLOAT TANK

EXPLODED VIEW - P/N 2122-00121A



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00631	VALVE, FLOAT	5	120-10506	ASS'Y, RESTRICTOR - 1/4 ORF
2	C05-00274	ADAPTER, GARDEN HOSE	6	2122-04120	TANK, FLOAT
3	C05-00271	WASHER, HOSE	7	E09-00002-P	PLUG, PIPE
4	C04-00120	SCREEN, FILTRATION	8	W02-10057-8	BARB, HOSE

BREAKDOWN, FLOAT VALVE

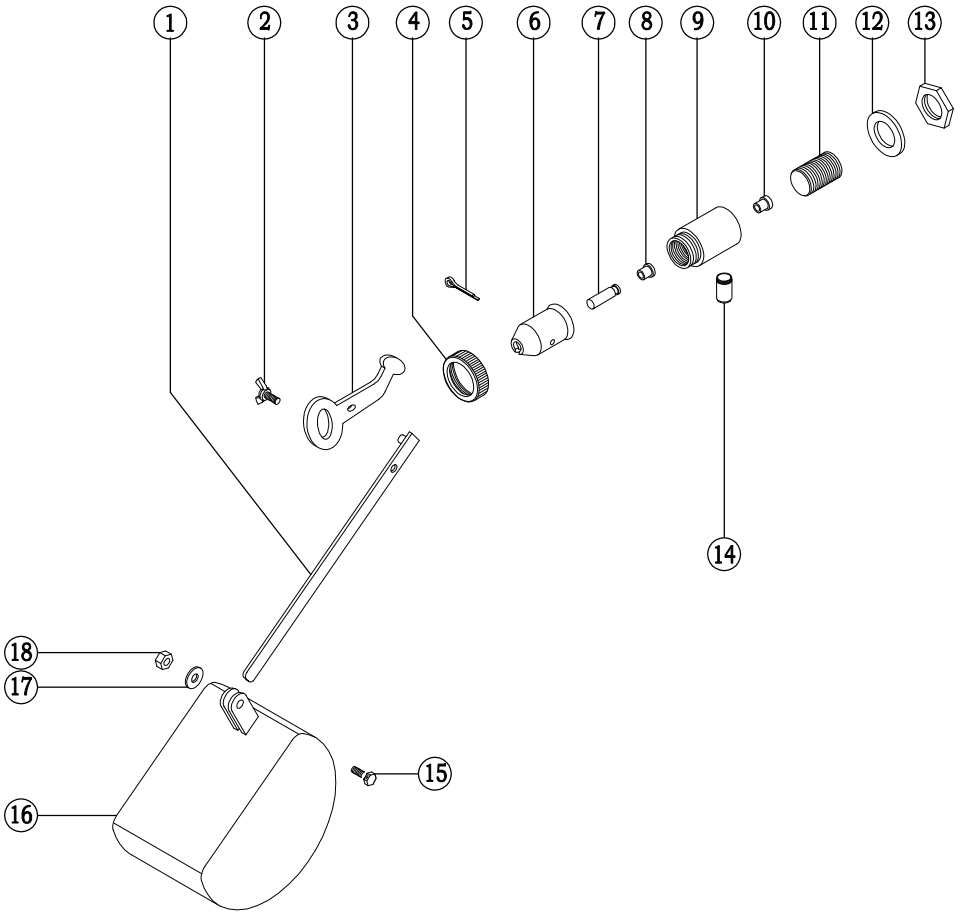
P/N C03-00631

SPECIFICATIONS

MAXIMUM VOLUME.....7 GPM / 26 LPM
MAXIMUM PRESSURE.....140 PSI / 10 BAR
MAXIMUM TEMPERATURE.....140°F / 60°C
PORT SIZE - INLET.....3/8 NPT

DIMENSIONS.....11.4 X 4.1 X 2.8 IN. / 290 X 104 X 71 MM
WEIGHT.....0.6 LB / 0.3 KG
MATERIAL.....BRASS, PLASTIC, BUNA-N

EXPLODED VIEW

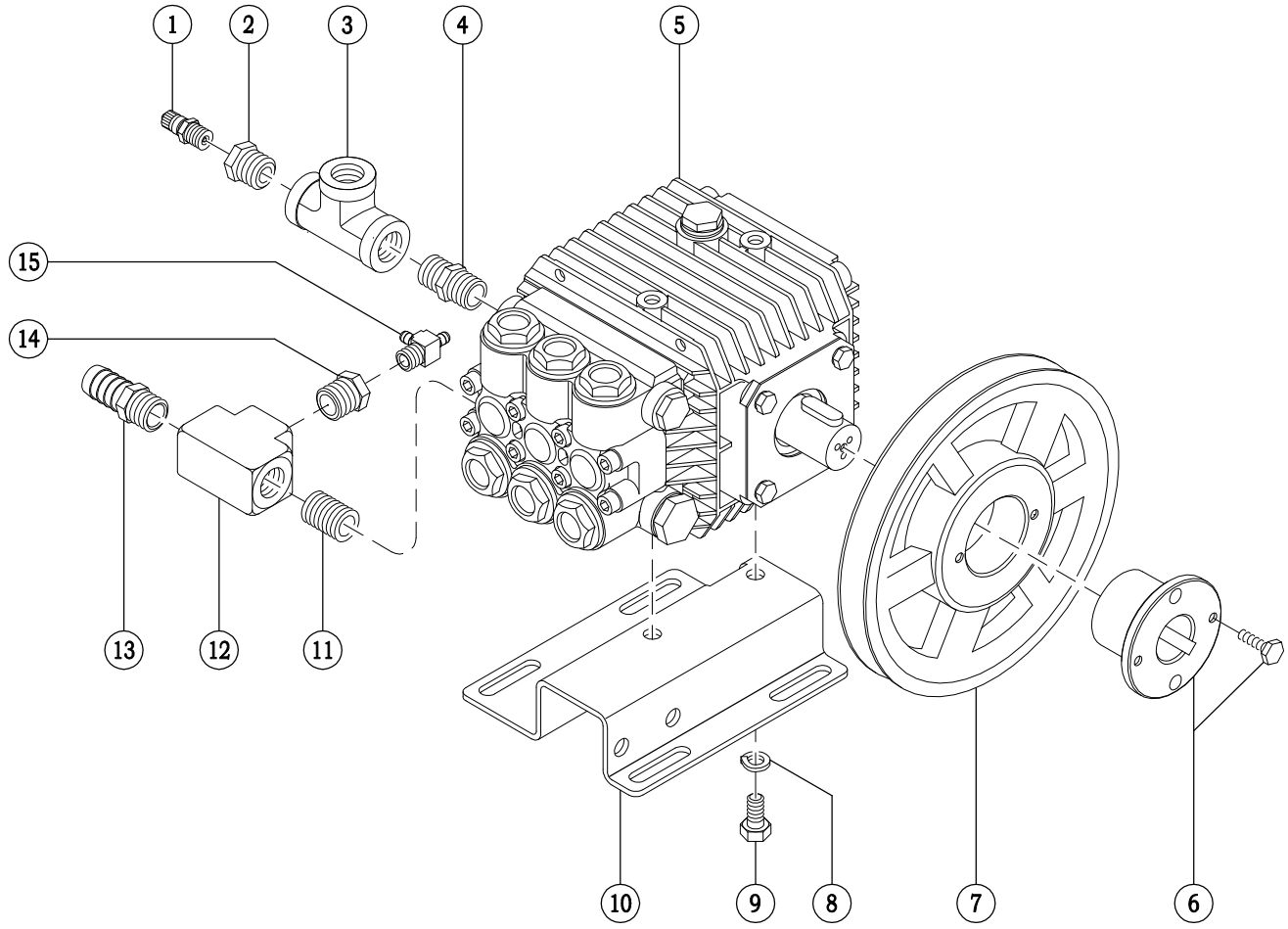


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00631-11	ARM, FLOAT	10	C03-00631-04	SEAT, VALVE
2	C03-00635-10	SCREW, WING	11	C03-00631-03	NIPPLE, BRASS
3	C03-00631-16	LEVER	12	C03-00631-02	WASHER, FLAT - RUBBER
4	C03-00631-09	NUT, RETAINER	13	C03-00631-01	NUT, HEX
5	C03-00631-17	KEY, COTTER	14	C03-00631-18	NIPPLE, TOE
6	C03-00631-08	GUIDE, PISTON ROD	15	C03-00631-10	SCREW, CAP
7	C03-00631-07	ROD, PISTON	16	C03-00628	FLOAT, PLASTIC
8	C03-00631-06	PISTON	17	H05-19000	WASHER, FLAT
9	C03-00631-05	HOUSING, VALVE	18	C03-00631-14	NUT, HEX

ASSEMBLY, PUMP - P/N 122-00500

EXPLODED VIEW

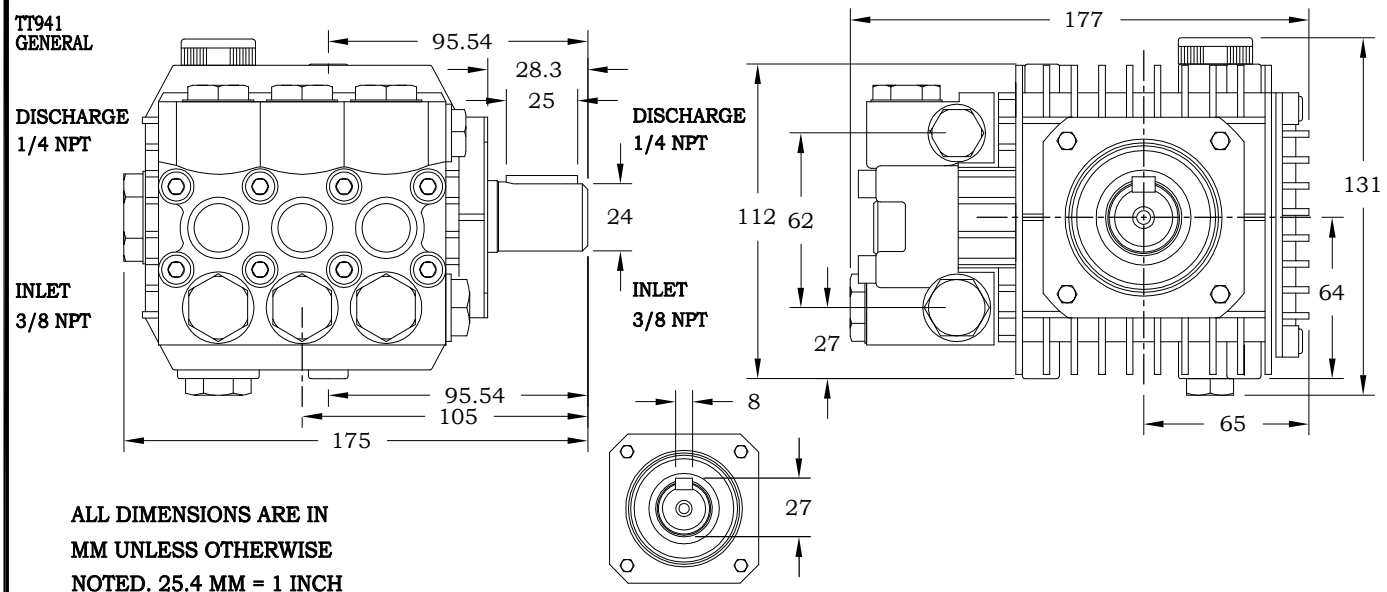


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	C03-00810	VALVE, AIR	9	N07-20048	SCREW, CAP
2	E04-00002-58	BUSHING, PIPE	10	N07-31046	MOUNT, PUMP
3	E10-00003-5	TEE, PIPE	11	E14-00016-48	NIPPLE, CLOSE
4	E14-R0010-58	NIPPLE, PIPE	12	E11-00013-4	TEE, PIPE
5	N07-00026	PUMP, WATER	13	W02-10022-8	BARB, HOSE
6	R04-00001	BUSHING, PUMP	14	E04-00016-48	BUSHING, PIPE
7	R03-00649	PULLEY, V	15	W02-10016-8	BARB, HOSE
8	H05-31304	WASHER, LOCK			

PUMP, WATER - P/N N07-00026

DIMENSIONS



ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED. 25.4 MM = 1 INCH

PERFORMANCE

DISCHARGE VOLUME.....3.43GPM / 13.0 LPM

PUMP HEAD PRESSURE.....1500 PSI / 103.0 BAR

GENERAL

CRANKSHAFT ROTATION.....CLOCKWISE AND COUNTER CLOCKWISE

MAXIMUM SPEED.....2800 RPM

MAXIMUM PUMPED FLUID TEMPERATURE.....165°F / 74°C

INLET PRESSURE.....-9 IN HG @ 75°F TO 116 PSI / -0.3 BAR @ 24°C TO 8 BAR

WEIGHT (WET).....11.2 LBS / 5.1 KG

LUBRICATION

OIL CHANGE INTERVAL .....AFTER FIRST 50 HOURS THEN AFTER 500 HOURS

OIL TYPE.....SAE 20 OR SAE 30 (NON-DERTERGENT)

CRANKCASE CAPACITY.....11.2 FL OZ / 0.33 LT

TORQUE

VALVE PLUG.....33 FT LBS / 4.6 KG M

MOUNT TO CRANKCASE.....16 FT LBS / 2.2 KG M

*PLUNGER NUT TO CROSSHEAD.....10 FT LBS / 1.0 KG M

REAR CRANKCASE COVER TO CRANKCASE.....7.0 FT LBS / 1.0 KG M

HEAD TO CRANKCASE.....8.8 FT LBS / 1.2 KG M

*__NOTE:__ When plunger nut is removed, install a new copper washer and flinger washer to ensure proper fit and seal of ceramic plunger. If same copper washers are reused cracking or a poor seal may result.

REPAIR PARTS PACKAGES

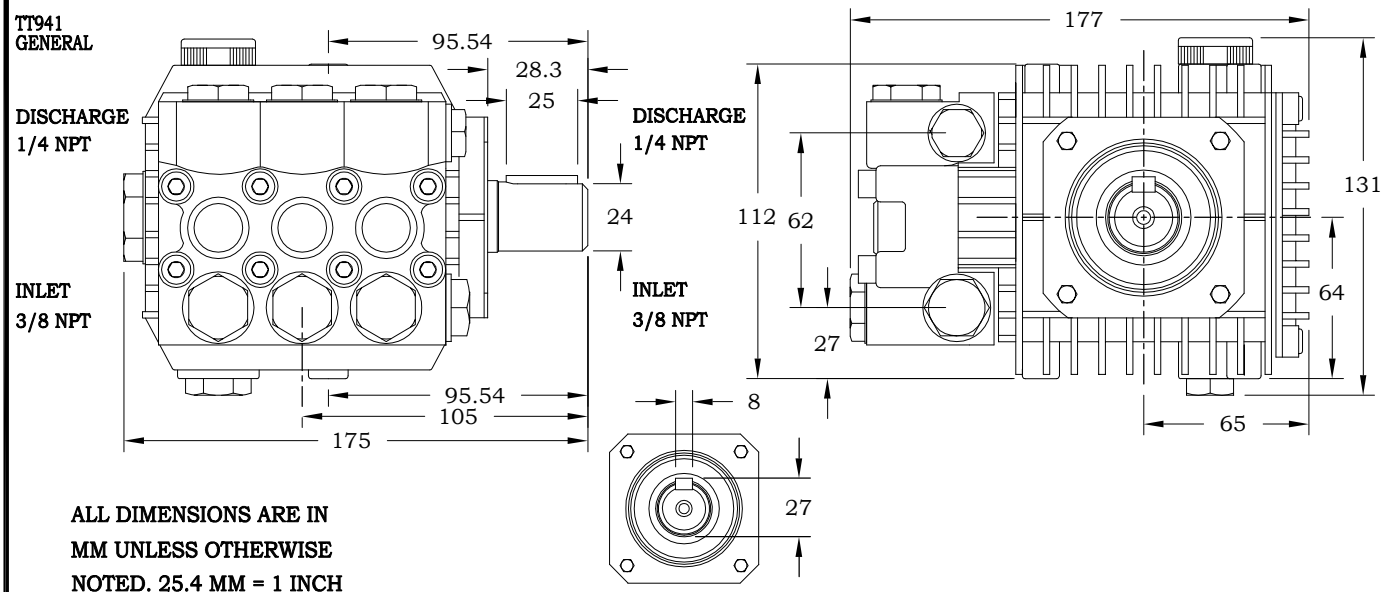
PART NO.	DESCRIPTION	ITEM	QTY
N07-99001	VALVE ASSEMBLIES		
	ASS'Y, CHECK VALVE	36	6
	O-RING	37	6
N07-99086	RETAINER & O-RINGS		
	O-RING	25	3
	O-RING	26	3
	RETAINER, PACKING	27	3

PART NO.	DESCRIPTION	ITEM	QTY
N07-99097	PLUNGER PACKING		
	O-RING	25	3
	O-RING	26	3
	PACKING, V	28	3
	ADAPTER, MALE	29	3
N07-99084	PLUGS & O-RINGS		
	PLUG	39	6
	O-RING	40	6

PART NO.	DESCRIPTION	ITEM	QTY
N07-99096	PLUNGER PACKING W/RETAINER		
NOTE: ORDER THREE FOR COMPLETE PUMP.	O-RING	25	1
	O-RING	26	1
	RETAINER, PACKING	27	1
	PACKING, V	28	1
	ADAPTER, MALE	29	1
N07-99083	OIL SEALS		
	OIL SEAL	47	3

PUMP, WATER - P/N N07-00026

DIMENSIONS



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INLET PRESSURE.....-9 IN HG @ 75°F TO 116 PSI / -0.3 BAR @ 24°C TO 8 BAR

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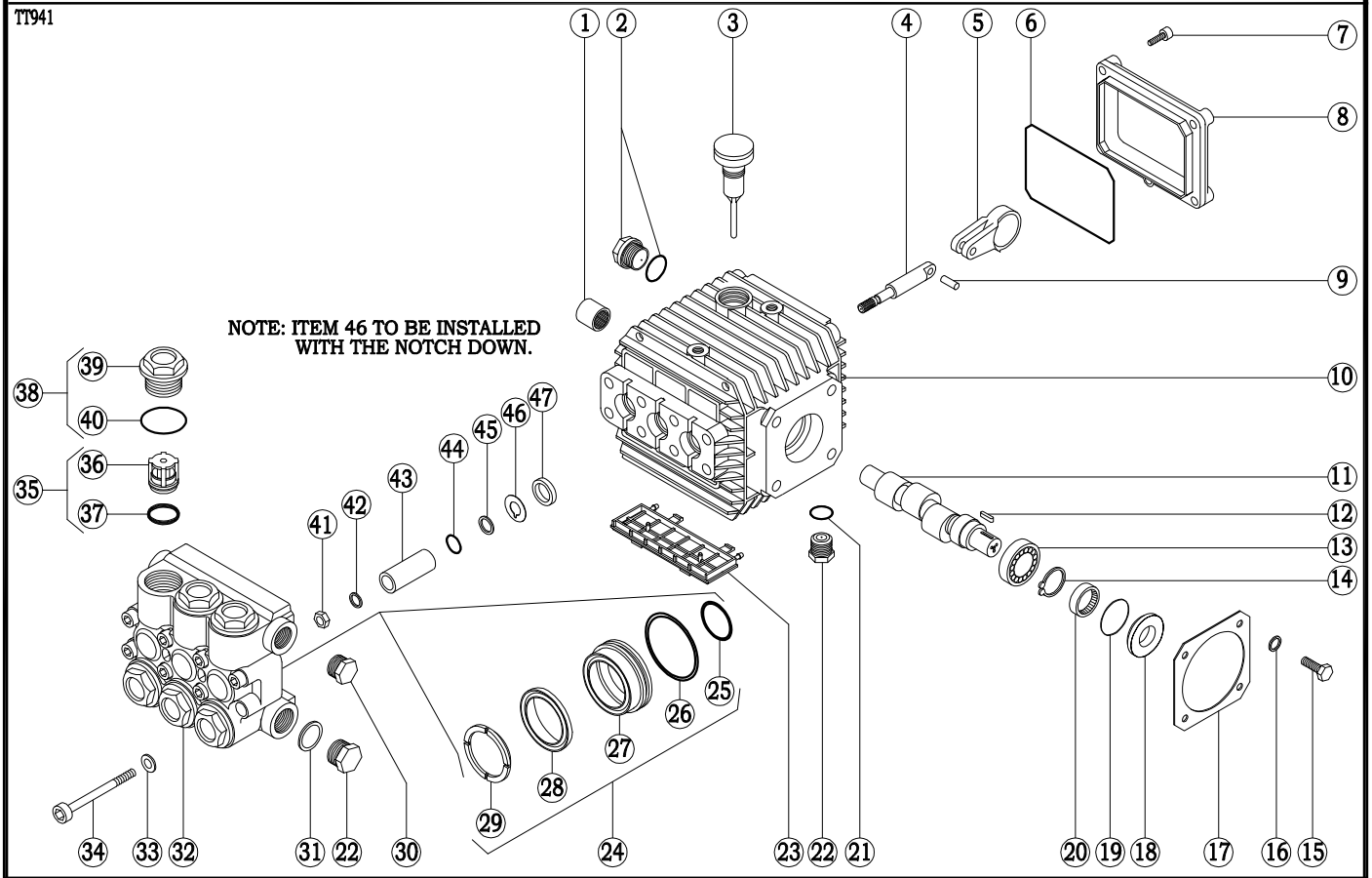
	RETAINER, PACKING	27	3

PART NO.	DESCRIPTION	ITEM	QTY
N07-99097	PLUNGER PACKING		
	O-RING	25	3
	O-RING	26	3
	PACKING, V	28	3
	ADAPTER, MALE	29	3
N07-99084	PLUGS & O-RINGS		
	PLUG	39	6
	O-RING	40	6

PART NO.	DESCRIPTION	ITEM	QTY
N07-99096	PLUNGER PACKING W/RETAINER		
NOTE: ORDER THREE FOR COMPLETE PUMP.	O-RING	25	1
	O-RING	26	1
	RETAINER, PACKING	27	1
	PACKING, V	28	1
	ADAPTER, MALE	29	1
N07-99083	OIL SEALS		
	OIL SEAL	47	3

BREAKDOWN, PUMP - N07-00026

EXPLODED VIEW

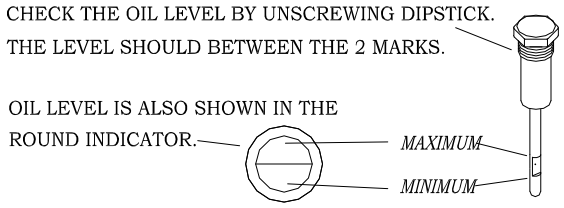


PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	N07-12055	BEARING, NEEDLE	24	N07-99096	KIT, PLUNGER PACKING
2	N07-20029	INDICATOR, OIL LEVEL	25	N07-31016	O-RING
3	N07-20024	DIPSTICK, OIL	26	N07-12016	O-RING
4	N07-12038	CROSSHEAD	27	N07-12015	RETAINER, PACKING
5	N07-12034	ROD, CONNECTING	28	N07-15012	PACKING, V
6	N07-43025	O-RING	29	N07-12014	ADAPTER, MALE
7	N07-80052	SCREW, CAP	30	N07-20030	PLUG
8	N07-12026	COVER, CRANKCASE	31	N07-20051	WASHER, FLAT
9	N07-12032	PIN, CROSSHEAD	32	N07-12001-B	HEAD, BRASS
10	N07-17023	CRANKCASE	33	N07-20036	WASHER, FLAT - SERRATED
11	N07-12031	CRANKSHAFT	34	N07-12002	SCREW, CAP
12	N07-20033	KEY	35	N07-99001	KIT, VALVE ASSEMBLY
13	N07-20022	BEARING, BALL	36	N07-20054	ASSEMBLY, VALVE
14	N07-12053	RING, SNAP	37	N07-20004	O-RING
15	N07-20018	SCREW, CAP	38	N07-99084	KIT, PLUGS & O-RINGS
16	N07-20036	WASHER, FLAT	39	N07-12010	PLUG
17	N07-20019	RETAINER, BEARING	40	N07-20009	O-RING
18	N07-20044	SPACER	41	N07-12056	NUT, HEX
19	N07-20021	O-RING	42	N07-12042	WASHER, FLAT - COPPER
20	N07-20045	SEAL, OIL	43	N07-12040	PLUNGER - 15MM
21	C07-01409	O-RING	44	J06-20209	O-RING
22	N07-20049	PLUG	45	F04-76509	RING, ANTI-EXTRUSION
23	N07-17060	COVER	46	N07-12039	WASHER, FLINGER - COPPER
			47	N07-99083	KIT, OIL SEAL

GENERAL PUMP MAINTENANCE

OIL LEVEL



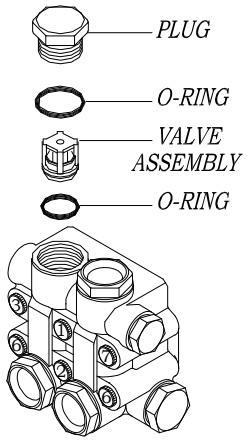
TOOL KITS

PACKING EXTRACTION KIT - P/N Z09-00028

COMPLETE TOOL KIT - P/N Z09-00021

PLUNGER INSTALLATION

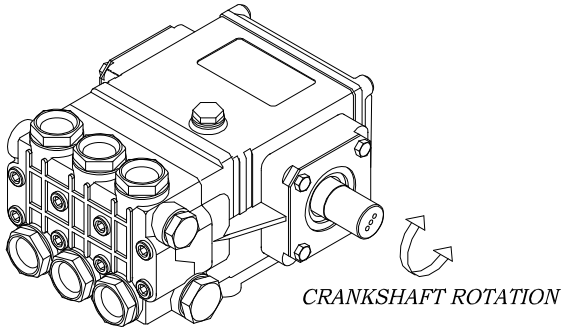
1. Remove the plugs holding the valve assemblies.
2. Remove and discard o-rings from the plugs. Clean plugs with solvent or soap and water. Allow to dry.
3. Using a needle nose pliers, fingers, or hook shaped tool, remove the valve assemblies from the head. Remove and discard the o-rings from the valve assemblies and/or head. Examine each valve assembly and discard damaged parts. Refer to the "**PUMP BREAKDOWN"** for part numbers of any replacement items.
4. Clean any accumulated debris from the valve cavities and flush with water.
5. Wash the valve assemblies in clean water and rinse. While still wet, test each valve assembly by sucking on the valve seat. A properly sealing valve will allow a good vacuum to be developed and maintained, while a malfunctioning valve will not. Good valve assemblies should be set aside for installation in step 7.



6. Malfunctioning valve assemblies must be replaced.
7. Lubricate a new o-ring with the pump crankcase oil and install into valve cavity in the head. Install a good valve assembly into the cavity as illustrated.
8. Lubricate a new o-ring with pump crankcase oil and place on a plug cleaned in step 2 above.
9. Install a plug into the pump head. Tighten plug by hand.
10. Torque the plug to the value indicated in the "TORQUE" section of the pump specifications.
11. Repeat steps 7 through 11 for remaining valve assemblies.

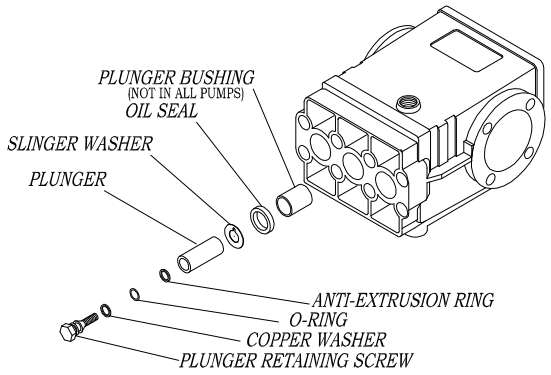
HEAD REMOVAL

1. Remove the cap screws holding the pump head to the crankcase. A metric tool is required for this step. Be careful not to lose the washer on each cap screw.
2. Remove the head by rotating the crankshaft and tapping the head away from the crankcase with a soft mallet. Keep rear surface of the head parallel to the front surface of the crankcase to prevent binding on the plungers.
3. Once the head is removed, protect the plungers from damage.



PLUNGER SERVICE

1. Remove pump head per "HEAD REMOVAL".
2. Remove any packings and retainers left on the plungers by pulling them straight off.
3. Examine each plunger, looking for a smooth surface free of any scoring, cracks, or pitting. Any defective plungers should be removed per "PLUNGER REMOVAL".
4. Discard and replace any defective plungers.
5. Reinstall the plunger per "PLUNGER INSTALLATION".
6. Reinstall head per "HEAD INSTALLATION".



PLUNGER REMOVAL

NOTE: When the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.

1. Remove the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.
2. Remove the plunger retaining screw by turning counterclockwise. Remove and replace copper washer.
3. Remove and discard o-ring and anti-extrusion ring from retainer screw.
4. Remove the plunger from the cross head and examine it for cracks, scoring, or pitting.
5. Remove and discard copper flinger washer, clean with solvent and allow to dry.

PLUNGER INSTALLATION

1. Install the copper flinger washer onto the cross head.
2. Slide the plunger onto the crosshead.
3. Lubricate an o-ring with crankcase oil and install into the groove on the plunger screw. Install the anti-extrusion ring into the groove next to the o-ring. Note: The o-ring should be nearest the screw head and the anti-extrusion ring nearest the threads.
4. Apply a drop of thread sealant to the threads of the retainer screw.
5. Thread the plunger retainer screw into the cross head making sure the copper flat washer is installed onto the screw.
6. Torque the plunger retainer screw to the value indicated in the torque section of the pump specifications.

PACKING SERVICE

1. Remove the head per "PUMP HEAD REMOVAL".
2. Remove any packings and female adapters left on the plungers by pulling them straight off. Insert proper packing extractor onto the extractor hammer. Insert packing extractor and tool through the packings and adapters remaining in the head. Tighten the hammer and remove the remaining items in the head. Remove packings and o-rings from adapters. Discard the o-rings and packings.
3. Clean the packing canities in the head and rinse with clean water.
4. Clean exposed plungers. Clean male and female adapters with soap and water and allow to dry.
5. Examine male and female adapters, discard worn items. Trial fit the female adapters into the head

checking for binding or damage. Discard and replace damaged items.

6. Lubricate packing cavities in the head and all packings and adapters with pump crankcase oil.

7. Lay head on the bench with packing cavities up. Install one male adapter in each cavity with the flat side down.

8. Install one v-packing into each cavity with the lips pointing down. A packing insertion too of the appropriate size is recommended for this operation.

9. Install the restop ring with the lips pointing down.

10. Install a front female adapter into each cavity with the flat side up. Make certain the adapter goes all way down into the cavity.

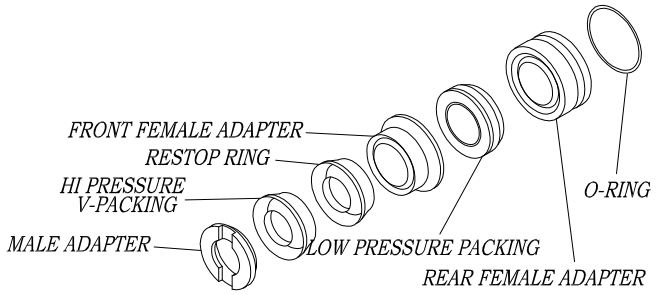
11. Install the low pressure packing with the flat side down.

12. Install the rear female adapter into each cavity with the lips pointing down.

13. Lubricate o-rings with pump crankcase oil and install one into the groove of each adapter.

14. Install one adapter and o-ring into each cavity with the flat side up. Each adapter and o-ring assembly should push into the head to approximately 1/16 inch of being flush with the surface of the head. Only hand pressure should be required to perform this operation. This step is ***VERY IMPORTANT.*** If the rear female adapter does not fit almost flush, something is not properly positioned. If a proper fit is obtained, proceed to step 16. If a proper fit is not obtained, remove the female adapters from the offending cavity and reinstall items per steps 8 through 15.

15. Install head per "HEAD INSTALLATION".



HEAD INSTALLATION

1. Prepare pump head per instructions in "PACKING SERVICE".

2. Rotate the plungers so the outer plungers are projecting the same distance from the crankcase.

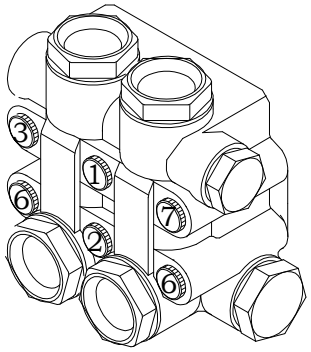
3. Lubricate the exposed plungers with crankcase oil.

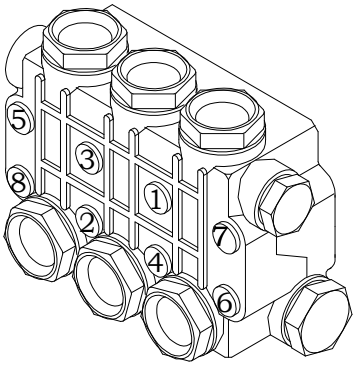
4. Start the head onto the plungers and using a soft mallet, tap the head evenly until it comes in contact with the crankcase.

5. Start the cap screws through the head and into the crankcase. Do not forget the lock washer on each screw.

6. Tighten all cap screws by hand.

7. Torque the cap screws to the value indicated in the "TORQUE" section of **PUMP SPECIFICATIONS**. Torque the cap screws in the order listed below.





PUMP MAINTENANCE RECORD

OIL CHANGE

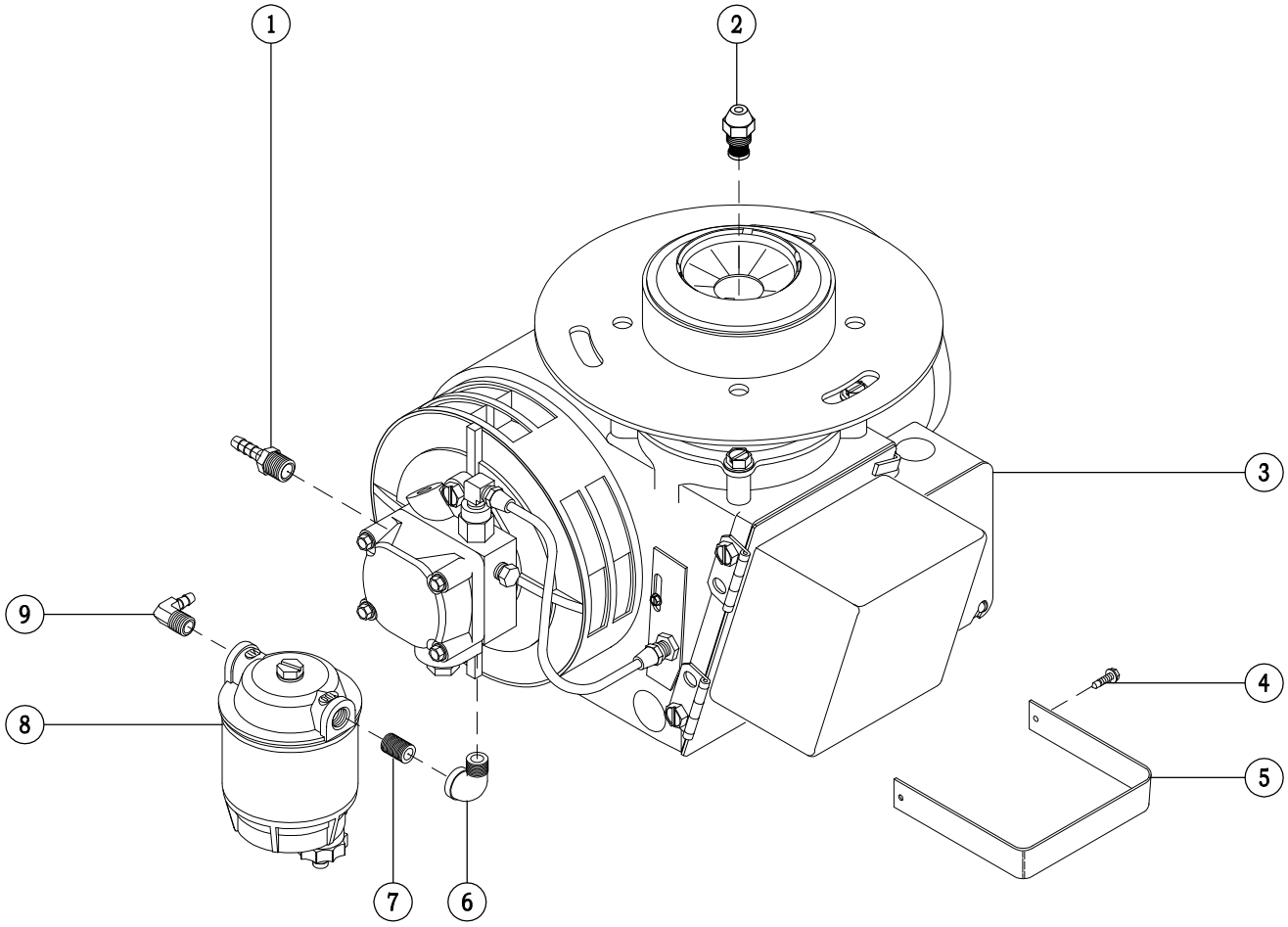
MONTH / DAY / YEAR	OPERATING HOURS	OIL BRAND & TYPE

PUMP SERVICE

MONTH / DAY / YEAR	OPERATING HOURS	TYPE OF MAINTENANCE

ASSEMBLY, BURNER - P/N 122-00400

EXPLODED VIEW



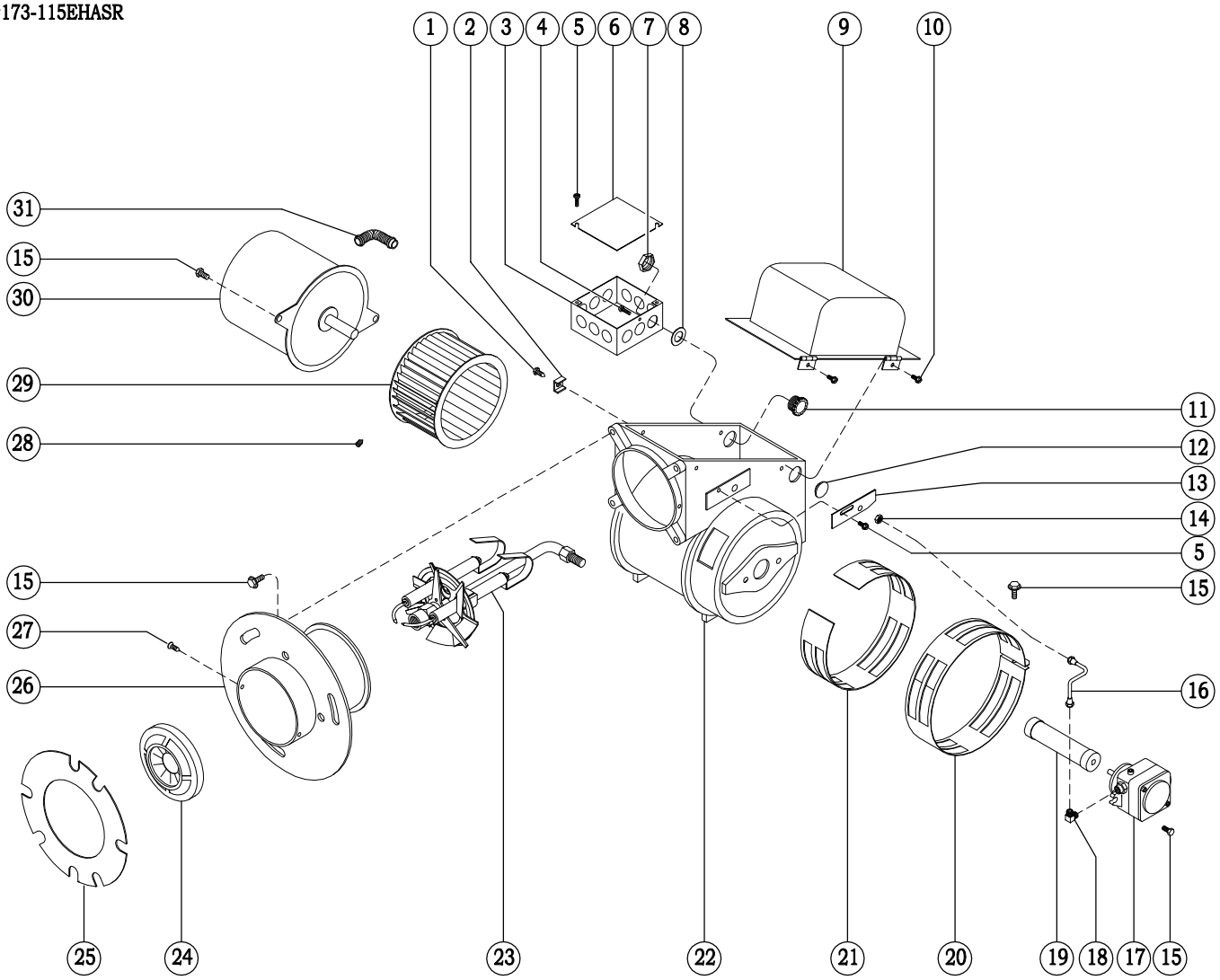
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	W02-10019-8	BARB, HOSE	6	E08-00006-2	ELBOW, PIPE
2	V2.50 90DA	NOZZLE, BURNER	7	E13-00010-2	NIPPLE, PIPE
3	V00-17391	BURNER, OIL	8	V04-00308	FILTER, FUEL
4	H04-19011	SCREW, SELF TAP	9	W02-10031-8	BARB, HOSE
5	AS16-01204PB	BRACKET, TRANSFORMER			

BREAKDOWN, OIL BURNER 115V 60HZ - W/O SOLENOID

P/N V00-17391 - EXPLODED VIEW

#173-115EHASR



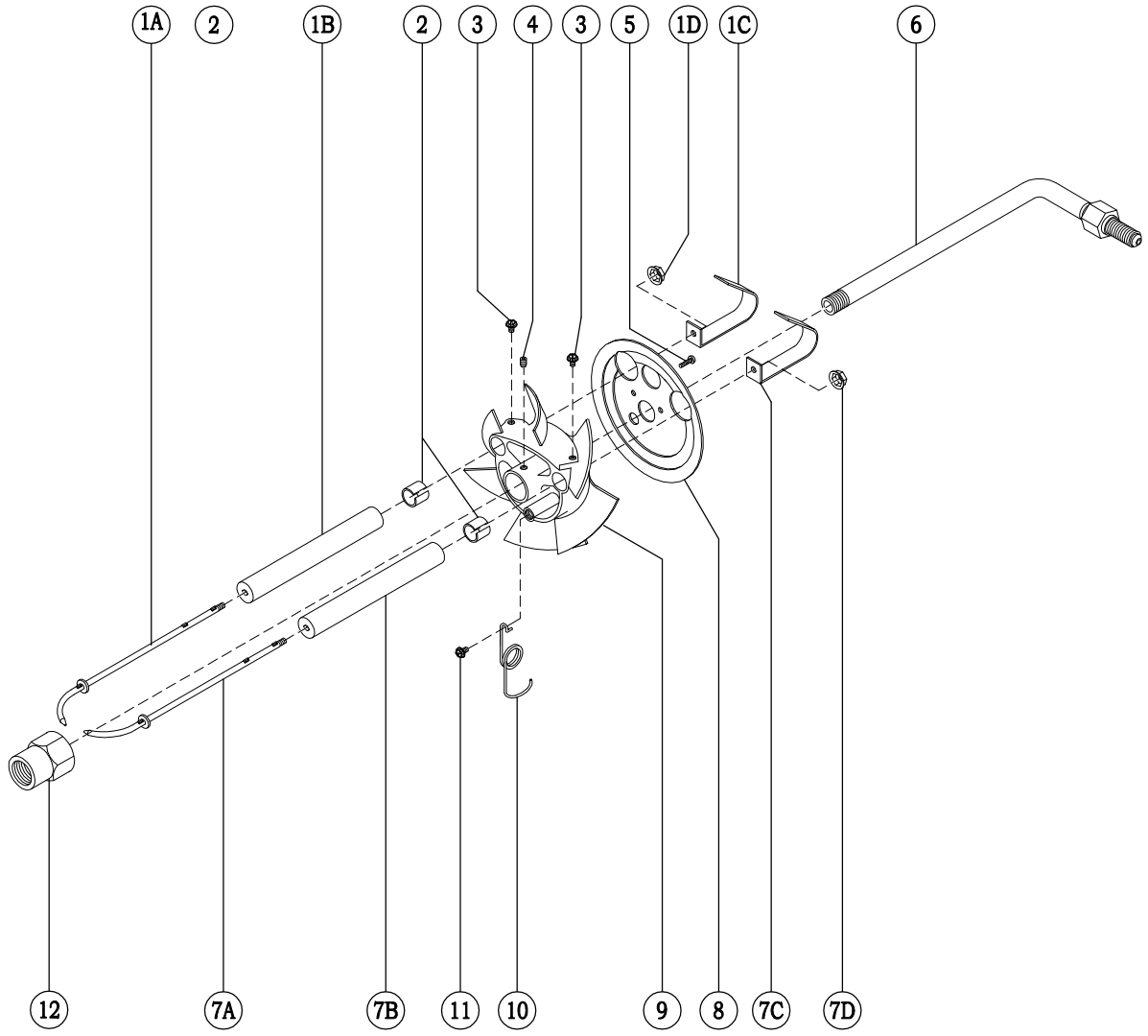
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-13360	SCREW, THREAD CUTTING	17	V-100714-001	PUMP, FUEL - DANFOSS
2	V00-13038	CLIP, HOLD DOWN	18	V00-13494-1	ELBOW, FLARE
3	F04-00517	BOX, JUNCTION	19	V00-13279	COUPLING, SHAFT
4	H04-19000	SCREW, THREAD CUTTING	20	V00-02668	BAND, AIR - OUTER
5	H04-16401	SCREW,MACHINE	21	V00-02669	BAND, AIR - INNER
6	F04-00512	COVER, JUNCTION BOX	22	V00-04725	HOUSING, FAN
7	F04-00315	NUT, HEX	23	V00-30540-07	ASSEMBLY, BURNER GUN
8	H05-87500	WASHER, FLAT	24	V00-14159	CONE, AIR - #3A
9	V00-21659	TRANSFORMER, IGNITION - 115V	25	V00-12484	GASKET, FLANGE
10	V00-13045	SCREW, THREAD CUTTING	26	4120-00440	WELDMENT, AIR TUBE
11	F04-00316	NIPPLE, CHASE	27	V00-12699	SCREW, THREAD CUTTING
12	F04-00500	BLANK, SNAP	28	H04-31302	SCREW, SET
13	V00-13392	COVER, SLOT	29	V00-21854	FAN W/ITEM 28
14	V00-14296	NUT, HEX	30	V00-20554	MOTOR, ELECTRIC - 115V 60HZ
15	H04-31310	SCREW, CAP	31	V00-13121	STRAIN RELIEF, CORD
16	V00-14452-1	ASSEMBLY, OIL LINE			

ASSEMBLY, BURNER GUN - P/N V00-30540-07

EXPLODED VIEW

30540-003



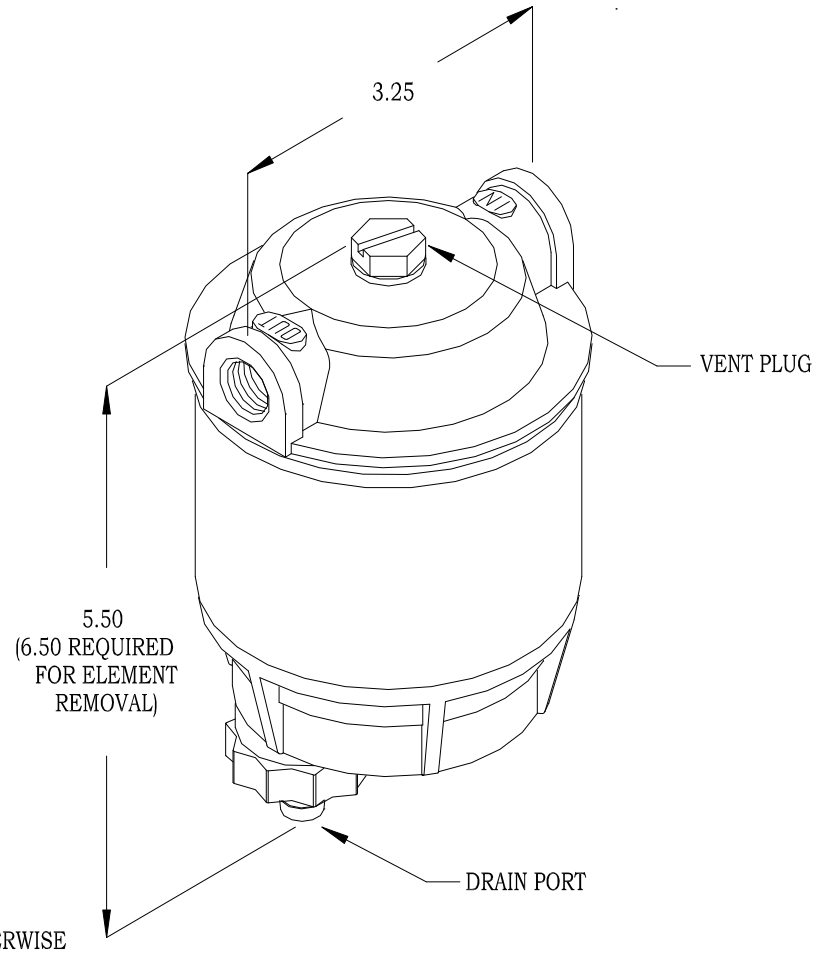
PARTS LIST

ITEM		DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	V00-147332RH	ASSEMBLY, ELECTRODE - RH	7	V00-147342LH	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-12945	BAR, BUSS - CURVED	7C	V00-12945	BAR, BUSS - CURVED
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13408	PLATE, BAFFLE - 3"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	H04-16400	SCREW, THREAD CUTTING
6	----------	ASSEMBLY, OIL PIPE	12	V00-12362	ADAPTER, NOZZLE

*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY

FILTER, FUEL - P/N V04-00308

DIMENSIONS



ALL DIMENSSIONS ARE
IM INCHES UNLESS OTHERWISE
NOTED. 25.4 MM = 1 INCH

SPECIFICATIONS

MAXIMUM FLOW.....15 GPH / 57 LPM
MAXIMUM FILTRATION.....2 MICRONS
MAXIMUM TEMPERATURE.....212° / 100°
WEIGHT.....1 LB / 340 GM
INLET AND OUTLET PORT SIZE.....1/4 NPT

TROUBLESHOOTING

1. FUEL BOWL LEAKING.	A. DETERIORATED GASKET. B. HOUSING CRACKED C. BOWL RIM CRACKED, NICKED, OR SCRACHTED D. GASKET MISSING E. LOOSE FUEL BOWL	A. REMOVE AND REPLACE GASKET B. REMOVE AND REPLACE HOUSING C. REMOVE AND REPLACE BOWL D. REPLACE GASKET E. TIGHTEN FUEL BOWL ONTO FILTER
2. AIR LEAKING INTO SYSTEM (INDICATED BY AIR BUBBLES IN BOWL DURING OPERATION)	A. LOOSE VALVE ASSEMBLY B. CRACKED COMPONENT C. LOOSE FILTER BOWL	A. TIGHTEN VALVE ASSEMBLY NUT SLIGHTY B. INSPECT FILTER BOWL, FILTER HOUSING, AND GASKET C. TIGHTEN FUEL BOWL ONTO FILTER

FILTER, FUEL - P/N V04-00308

MAINTENANCE PROCEDURES

1. *PRIMING THE MACHINE*

Spin-off the element, fill with clean fuel and coat the square gasket (3) with fuel. Reinstall the element and tighten 1/4 to 1/3 turns after the gasket contacts the upper housing. Start the machine and check that there are no leaks.

2. *DRAINING WATER*

Check the collection bowl daily. Drain off water contaminants by opening the head vent and then the drain. If more than 1/8 cup of fluid is drained, follow the priming instructions, other wise, close the vent and drain. Start machine and allow air to purge from fuel system prior to operating equipment.

3. *ELEMENT REPLACEMENT FREQUENCY*

Frequency of element replacement is determined by contamination level in the fuel. Replace the element upon power loss of engine (if so equipped) or every 500 hours whichever comes first.

NOTE: Foul smelling diesel fuel is an indication of micro biological contamination. A change in fuel source is recommended. Always carry a spare elements as one tank full of contaminated fuel will plug fuel filter elements prematurely.

4. *ELEMENT REPLACEMENT PROCEDURE*

1. Shut off the fuel tank valves.
2. Unscrew the amber bowl from the fuel filter.
3. Unscrew and discard the filter from the upper housing.
4. Follow procedures listed under "PRIMING".
5. Turn on fuel tank valves.

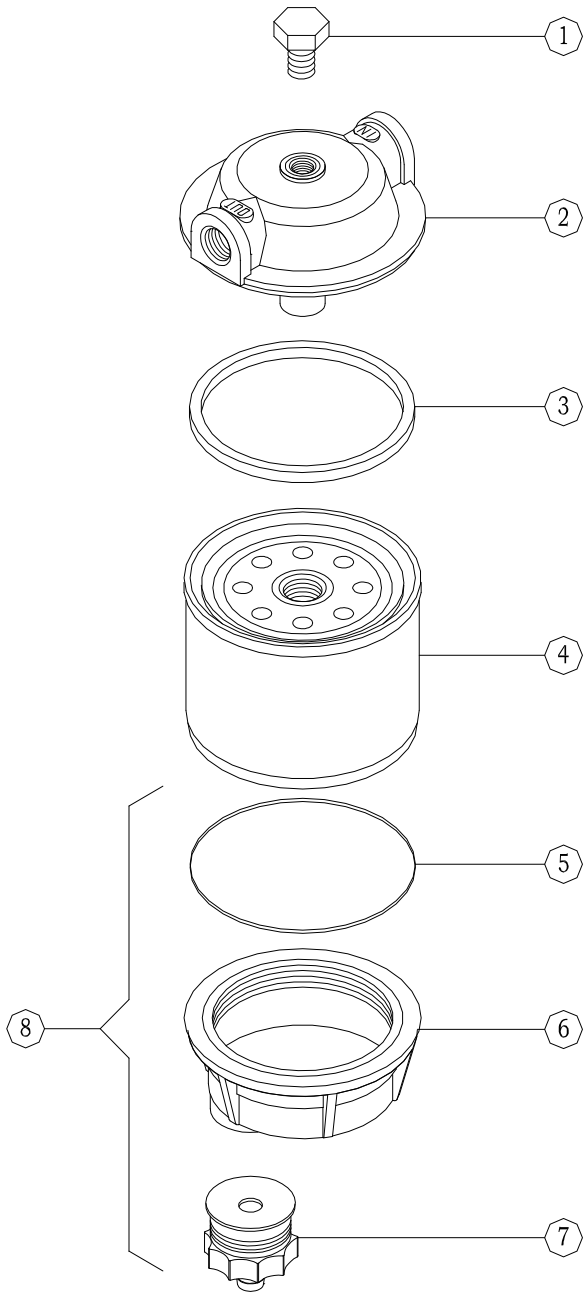
CAUTION: Valves left off with fuel pump running can cause damage to the fuel pump!

MAINTENANCE SCHEDULE

	WEEKLY	100 HRS
GASKETS: A. Inspect for deterioration or tearing. B. Remove and Replace.	◎	◎
BOWLS: Inspect rim of bowl to insure it is free of nicks, cracks, or scratches.	◎	
FILTER ELEMENT: A. Inspect for damage or deterioration. B. Remove and Replace . (500 Hours)	◎	
FUEL BOWL: If contaminants are found, check more frequently.	◎	

NOTE: Intervals stated are for normal operating conditions. The intervals suggested may be shortened or lengthened as determined by existing conditions.

EXPLODED VIEW

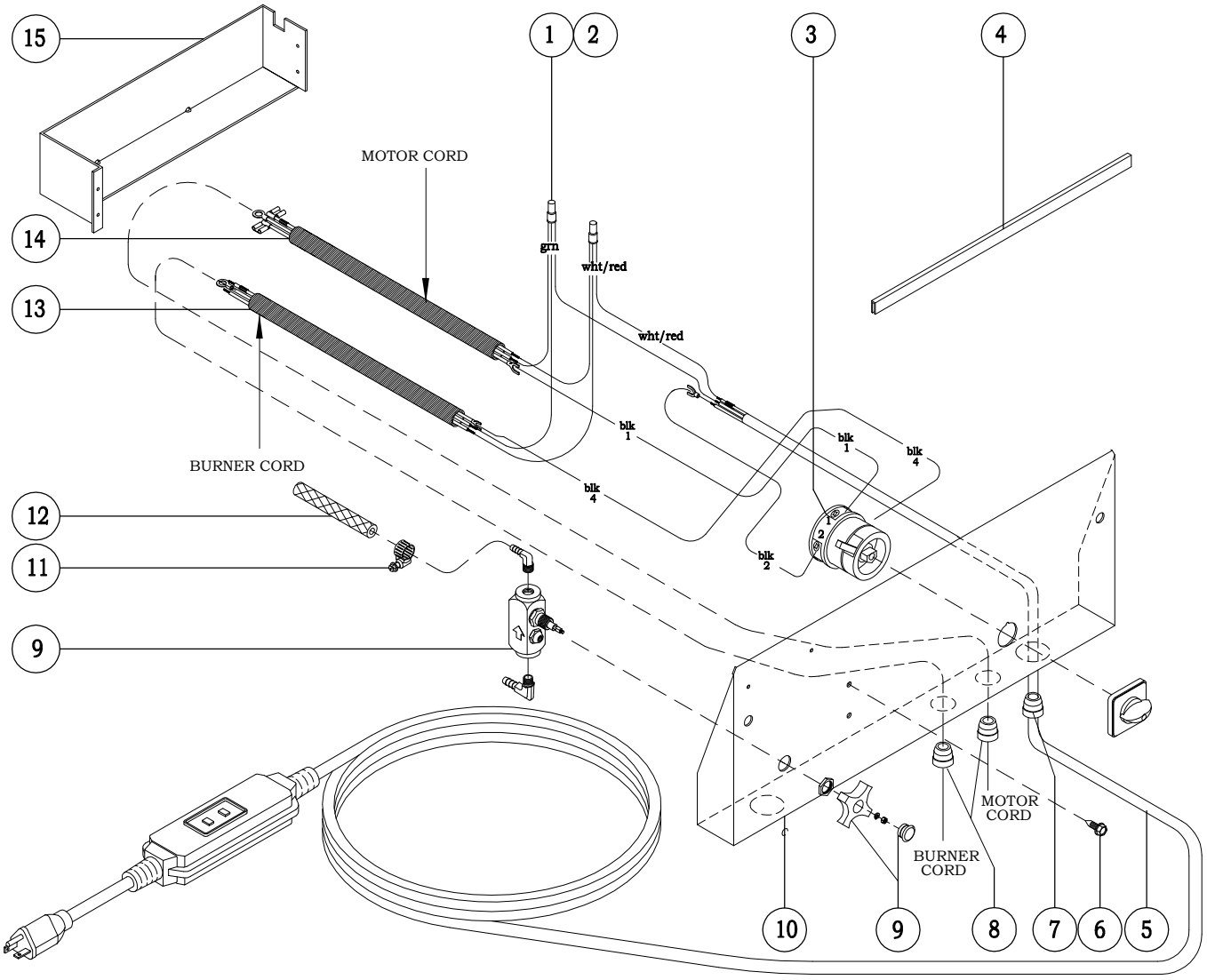


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	V04-00308-04	ASSEMBLY, VENT
2	V04-00308-02	HOUSING, UPPER
3	V04-00308-03	GASKET, SQUARE
4	V04-00308-01	ELEMENT, FILTER
5	V04-00308-05	O-RING
6	V04-00308-06	BOWL, AMBER - 3"
7	V04-00308-07	ASSEMBLY, DRAIN
8	V04-00308-K	KIT, REPLACEMENT BOWL

ASSEMBLY, CONTROL PANEL - 115V 1PH 60HZ 20 AMP

EXPLODED VIEW - P/N 3112B-00302



PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	F04-00615	TERMINAL, SPLICE	10	AS1691827NPB	PANEL, CONTROL-SPECIFY COLOR
2	F04-00616	INSULATOR, SPLICE	11	W02-00033	CLAMP, HOSE
3	F04-00741A	SWITCH, CAM	12	Z01-01613-2	HOSE, POLYBRAID
4	Z01-14123	EDGING - 14 3/4	13	2142-00342	ASSEMBLY, CORD
5	2142-00344	ASSEMBLY, CORD	13A	Z06-01100	TAPE, VINYL - RED
5A	Z06-01100	TAPE, VINYL - RED	13B	F04-04041	CORD, ELECTRICAL
5B	F04-00604	TERMINAL, FORK	13C	F04-00610	TERMINAL, FORK
5C	F04-00177	CORDSET	13D	F04-00612	TERMINAL, RING
6	H04-16404	SCREW, SELF TAP	14	2142-00343	ASSEMBLY, CORD
7	F04-00413	BUSHING, STRAIN RELIEF	14A	Z06-01100	TAPE, VINYL - RED
8	F04-00411	BUSHING, STRAIN RELIEF	14B	F04-02471	CORD, ELECTRICAL - 24"
9	10301-00520	ASS'Y, METERING VALVE	14C	F04-00610	TERMINAL, FORK
*9A	C03-00307	VALVE, METERING	14D	F04-00612	TERMINAL, RING
9B	W02-10031-8	BARB, HOSE	14E	F04-00611	TERMINAL, QUICK DISCONNET
9C	D01-00060	DECAL, METERING	15	AS1801329NPB	COVER, PANEL-SPECIFY COLOR

*For Breakdown See Z08-04056

VALVE, METERING - P/N C03-00307

OPERATION

HANDLE

Turning Chemical flow handle clockwise will shut off chemical flow.

FLOW ADJUSTING SCREW

Turning the flow adjusting screw clockwise lowers the chemical flow. Turning the screw counterclockwise lowers the flow.

SPECIFICATIONS

Maximum Pressure.....4000 PSI / 276 BAR
Maximum Flow .....12 GPM / 45 LPM
Minimum Flow .....1.0 GPM / 3.8 LPM
MAXIMUM TEMPERATURE .....200F° / 93°C
WEIGHT.....0.75 LBS. / 0.33 KG
INLET.....1/4 FNPT
OUTLET .....1/4 FNPT
O-RINGS.....VITON
VALVE HOUSING MATERIAL.....BRASS

MAINTENANCE

VALVE STEM REMOVAL -

1. Using screw driver remove cap (item 1A).
2. Holding handle and using socket remove nut (item 1B) and lock washer (item 1C) found inside handle.
3. Remove mounting nut (item 1E).
4. Holding valve housing (item 7), turn the valve retainer (item 2) counter clockwise be careful not to lose o-ring off bottom of retainer.
5. Holding the valve retainer (item 2) turn stem (item 4) counterclockwise until it comes out of the bottom of the retainer.

VALVE STEM INSTALLATION -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 13 ft/lbs.

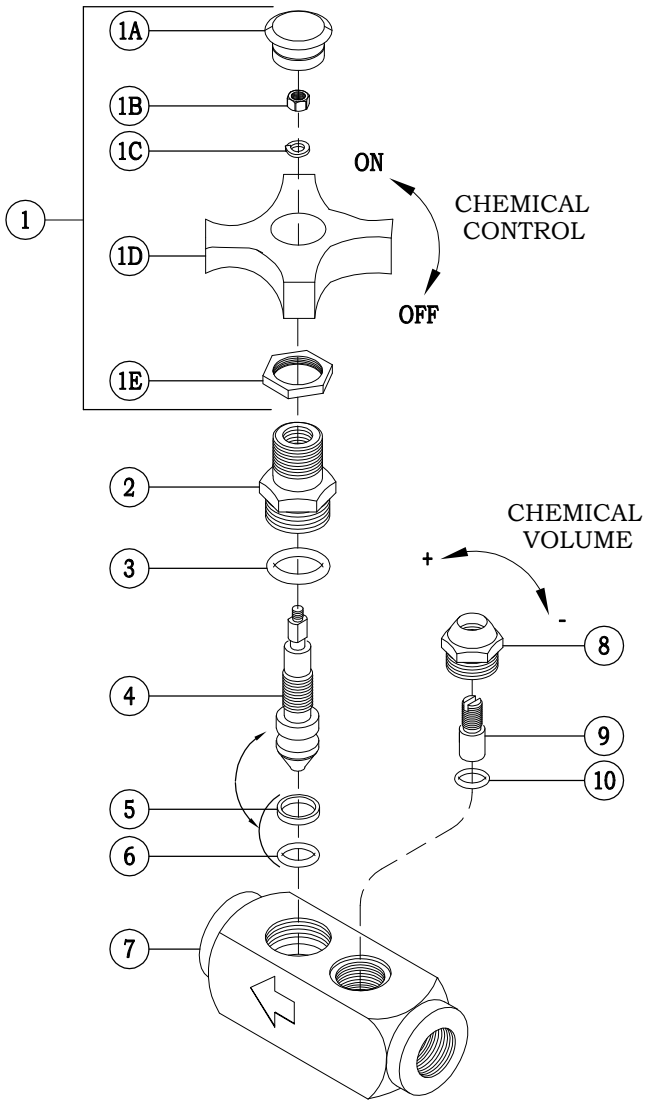
REMOVE FLOW ADJUSTING SCREW -

1. Remove the adjusting screw retainer (item 8) turning couter-clockwise.
2. Hold the retainer (item 8), using a screw driver turn the adjusting screw (item 9) clockwise until it comes out of the bottom.
3. Inspect screw for any nicks or scratches and replace as necessary.
4. Remove and replace o-ring (item 10).

REINSTALL FLOW ADJUSTING SCREW -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 30 ft/lbs

EXPLODED VIEW

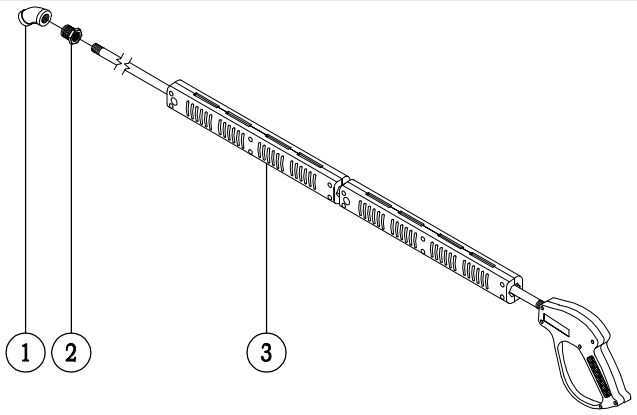


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	C07-00307-01	KIT, HANDLE
1A	----------	CAP, PLASTIC
1B	----------	NUT, HEX
1C	----------	WASHER, LOCK
1D	----------	HANDLE, ADJUSTMENT
1E	----------	NUT, HEX
2	----------	RETAINER, VALVE STEM
3	----------	O-RING - VITON 1/16CS X 3/16ID
4	----------	STEM, VALVE - SHUT-OFF
5	----------	RING, ANTI-EXTRUSOIN
6	----------	O-RING - VITON 3/32CS X 1/4ID
7	----------	HOUSING, VALVE
8	----------	RETAINER, ADJUSTING SCREW
9	----------	SCREW, ADJUSTING - FLOW
10	----------	O-RING - VITON 1/16CS X 1/8ID
	D01-00060	DECAL, METERING VALVE

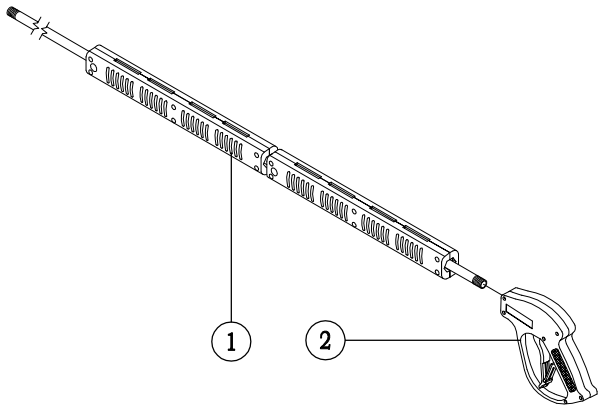
ASS'Y, OPEN GUN & WAND

EV - P/N 122-00700A



P/N 122-00700A PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E08-00008-2	ELBOW, PIPE	3	J06-00102B	ASS'Y, WAND & OPEN GUN
2	E04-00003-2	BUSHING, PIPE			

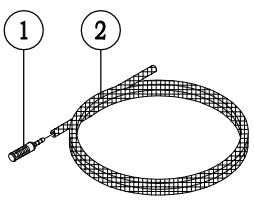


P/N 122-00700A PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	J06-00104E	ASSEMBLY, WAND	2	J06-00101	GUN, OPEN

ASSEMBLY, CHEMICAL LINE

EV - P/N 4120-00902P

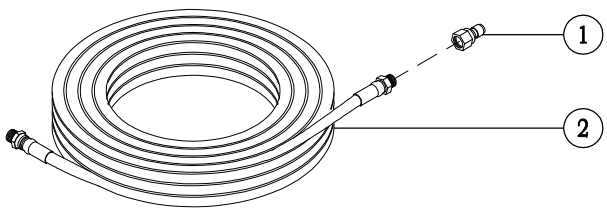


PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	C04-00131	SCREEN, CHEMICAL
2	Z01-08413-2	HOSE, POLY BRAID - 84"

ASSEMBLY, HOSE & COUPLER

EV - P/N 241-00710



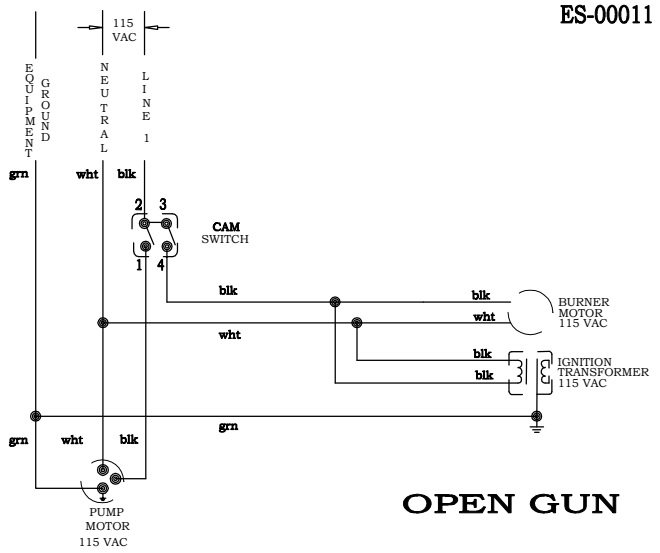
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	W04-31231-B	NIPPLE, COUPLER
2	K02-03150-1C	ASSEMBLY, HOSE

SCHEMATICS, ELECTRICAL - OIL FIRED

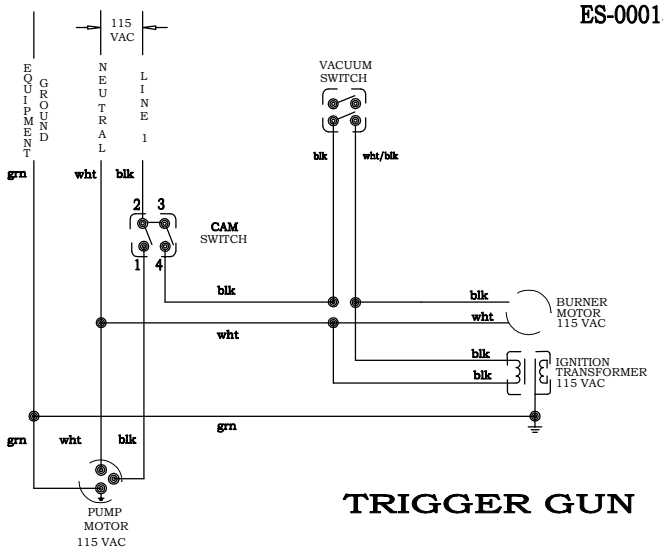
115 VAC 1 PHASE 60 HERTZ

ES-00011



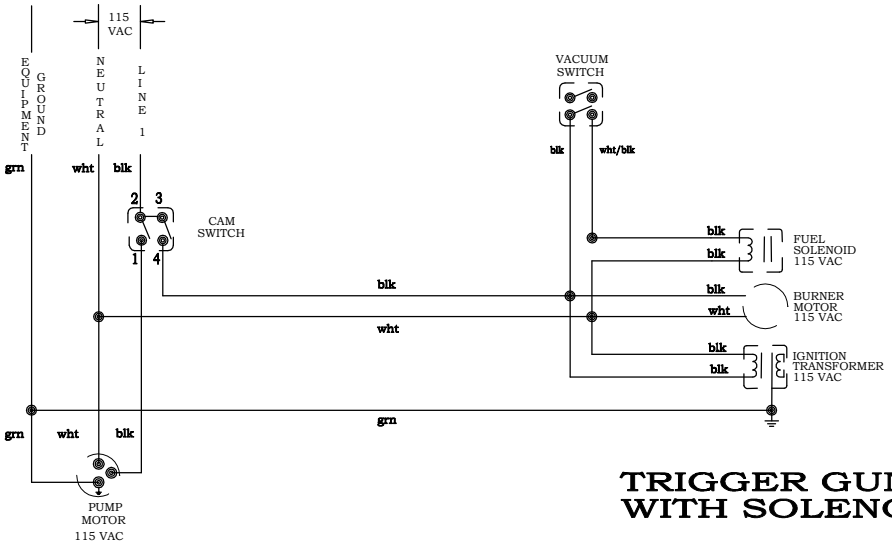
OPEN GUN

ES-00015



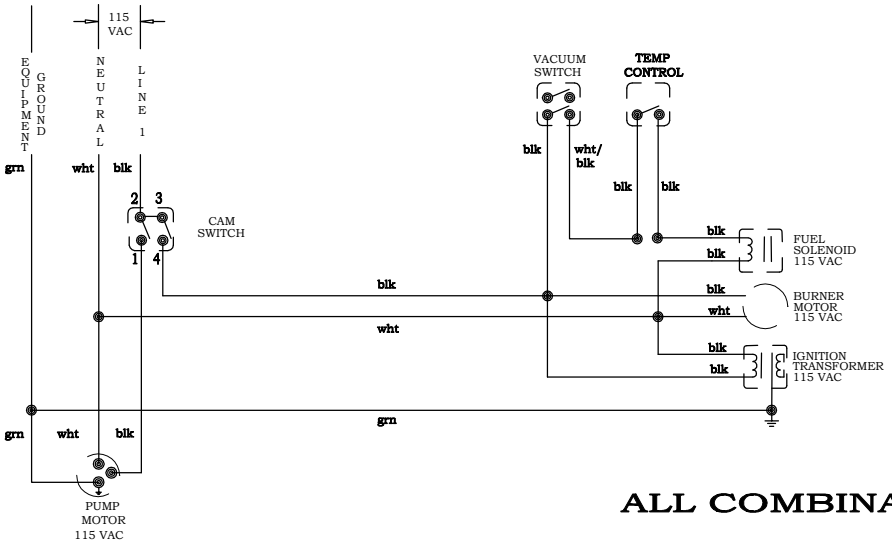
TRIGGER GUN

ES-00016



TRIGGER GUN WITH SOLENOID

ES-00018



ALL COMBINATIONS