MODEL 108

SPECIFICATIONS

PERFORMANCE

DISCHARGE VOLUME.....100 GPH / 378 LPH

PUMP HEAD PRESSURE..... 400 PSI / 28 BAR

TEMPERATURE RISE ..... 250°F - 240/480 VOLT

HEAT INPUT .....49 KW @230 VAC or 460 VAC

TEMPERATURE LIMIT ..... UP TO 200°F / 93°C

GENERAL

MINIMUM INLET WATER PRESSURE.....10 PSI / 0.68 BAR

WEIGHT (DRY) ..... 375 LBS / 170 KG

HOSE, MODULE TO HEATERS Y01-00040

NOZZLE, IMPACT .....(#53 ORIFICE) P/N J05-00253

BELT - MOTOR TO PUMP..... P/N R02-00429

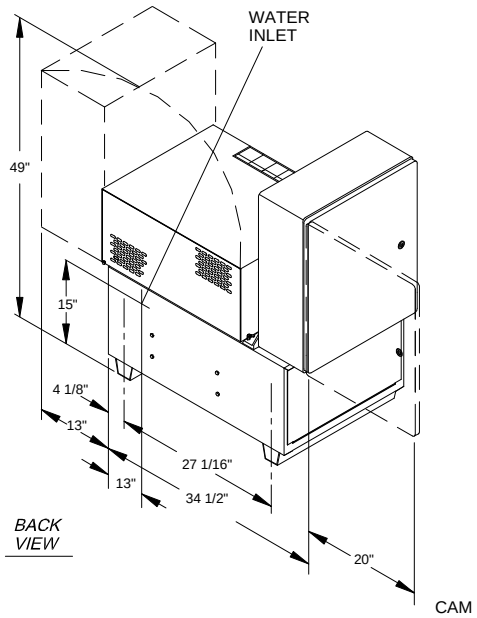
HOSE, DISCHARGE.....3/8" X 50' P/N K02-03150-1C

WAND & TRIGGER GUN 42"..... P/N 122-00700A

MANIFOLD BACK PRESSURE NEW .....

.....0 PSI @ 3.0 GPM / 0.34 BAR @ 11.4 LPM

MANIFOLD REQUIRES DESCALING WITH 1/16" COATING ON HEATER SHEATH



PUMP & UNLAODER

PUMP .....P/N N07-00098

PUMP PULLEY.....R03-00656

PUMP PULLEY BUSHING.....R04-00001

PUMP TYPE.....GENERAL CERMAIC PLUNGER, OIL BATH

PUMP MOTOR

MOTOR HORSEPOWER..... 3/4 HP / 0.56 KW

MOTOR SPEED…….....3450 RPM

MOTOR VOLTAGE.....208V / 230V / 460V 60HZ 3PH

MOTOR PART NUMBER..... F02-00092

MOTOR PULLEY..... P/N R03-00130

ELECTRICAL

MACHINE VOLTAGE..... 460V 60HZ 3PH

POWER REQUIREMENTS.....

.....240V 3PH - 155 AMPS / 460V 3PH - 77 AMPS

CAM SWITCH ..... P/N F04-00741A

CONTACTOR, MAGNETIC 24AMP…..... P/N FC5-A2070

CONTACTOR, MAGNETIC 93AMP…..... P/N F05-00160

RELAY, OVERLOAD ..... P/N FC5-A0024

TEMP CONTROL, ADJUSTABLE ..... P/N F04-00821-08

RELAY, TIME DELAY ..... P/N FA5-00052

SWITCH, PRESSURE..... P/N F04-00781

WATER HEATER

IMMERSION HEATER, STAINLESS STEEL ..... P/N F07-00025

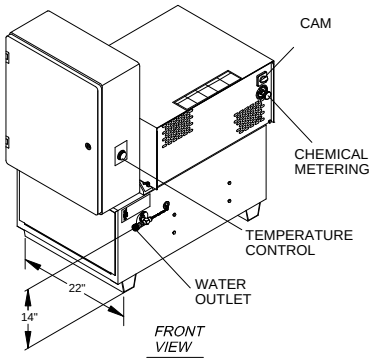
IMMERSION HEATER WATTAGE ..... P/N 10KW

IMMERSION HEATER DIMENSION ..... 1 1/4 X 25"

IMMERSION HEATER VOLTAGE ..... 265 VAC 60 HZ 1 PH

SENSOR, PROBE ..... P/N F04-00821-09

HOSE, JUMPER ..... P/N K02-04220A2



MACHINE RECORD

SERIAL NUMBER	DATE OF PURCHASE	PLACE OF PURCHASE

MONTH / DAY / YEAR	OPERATING HOURS	MAINTENANCE PERFORMED

NOTES

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. 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.

7. Do not operate the machine if any mechanical failure is noted or suspected.
8. 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.

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

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

11. If a water leak is found, **DO NOT OPERATE THE MACHINE**. Shut off the motor and repair.

12. Follow instructions on how to stop the machine and bleed pressures quickly. Be thoroughly familiar with the controls.

13. 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.

14. All installations must conform to all applicable local codes. Contact your electrician, plumber, utility company or seller for details.

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 operate machine with wet hands.

3. Keep power cords and connections (connectors) out of water.

4. All wiring and electrical connections should comply with the National Electrical Code (NEC) and with local codes and practices.

5. Fuses or circuit breakers should be compatible with machine requirements. (See ELECTRICAL section of **MODEL SPECIFICATIONS** for power requirements.)

6. High voltage may be present within this machine. Servicing should only be performed by properly trained personnel.

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.

2. **LOCAL CODES**: Installation and servicing must only be performed by qualified personnel and must conform to local codes and the ordinances.

3. **QUALIFIED PERSONNEL:** All installation and servicing must only be performed by qualified personnel and must conform to the local codes.
4. **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.
5. **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: To reduce the risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.

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. **ELECTRICITY**: Electricity must be shut off when installing or servicing

WATER INSTALLATION

1. **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**
2. **WATER TEMPERATURE VARIATION:** The temperature of discharged water is dependant on the incoming water temperature. Some minor adjustment to the temperature control may be required if the incoming water is significantly different than 50 degrees Fahrenheit.
3. **WATER CONDITIONS**: Local water conditions affect the manifold, heaters, 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.
4. **FREEZING:** This machine must be protected from freezing according to STORAGE section of **MACHINE MAINTENANCE**.

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 the machine has been exposed to sub-freezing temperatures, it must be thoroughly warmed to above freezing before operating. Failure to warm the 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.
- **OIL LEVEL**: Check the oil level in the water pump.
- **BELT** (if so equipped): Make sure the belt tension and condition is as specified in **MACHINE MAINTENANCE**.
- **CHEMICAL 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.
- **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 heating elements.
- **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. Select temperature (if so equipped).
2. 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 and heating elements 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 3 minutes, water pump damage may occur.
3. Turn the switch to the burner position.
4. 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.
5. **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.
6. 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. Shut off electrical supply.
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.

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.

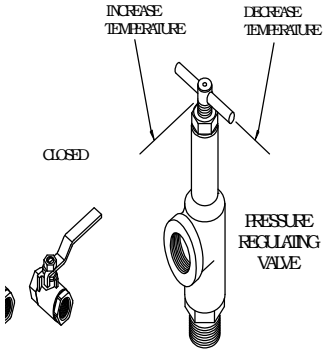
START-UP

1. Install the open gun assembly.
2. Open the ball valve on coil inlet assembly.
3. Set the temperature control to a MAXIMUM of 300°F .
4. Turn the switch to the burner position.

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.

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. Shut off electrical supply.
5. If freezing conditions may exist, refer to STORAGE in **MACHINE MAINTENANCE**.
6. Close the ball valve on the coil inlet assembly.



MACHINE MAINTENANCE

ELECTRIC DRIVEN ELECTRIC FIRED CLEANERS

FLUSHING

1. Turn on electrical supply.
2. Connect machine to a pressurized water supply (if not already done so) 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. Remove spray tip from gun assembly.
6. With gun assembly in hand, turn on the pump switch. 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.
7. When clean water flows from gun, turn off the switch.
8. Reinstall spray tip.
9. With gun assembly in hand, turn on the switch.
10. When clean water flows from gun, turn off the pump switch.
11. If freezing conditions may exist, refer to "STORAGE" section.
12. Turn off and disconnect the water supply.
13. Turn off electrical supply.

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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. 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
5. Fill a 2-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.
6. Pour the antifreeze solution slowly into the float tank assembly, with the discharge gun assembly in hand, turn on the switch. Hold the trigger gun valve in open position.
7. Turn off the switch just prior to running out of antifreeze mixture.
8. Shut off electrical supply.
9. Disconnect gun and hose.
10. Place machine in a dry place protected from weather conditions.

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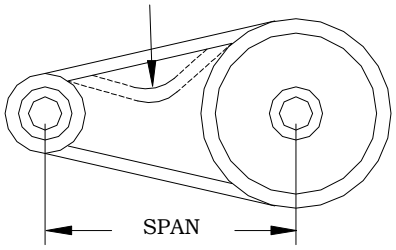
SPRAY TIP MAINTENANCE

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 the **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

DEFLECTION



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.

HEATER MANIFOLD BACK PRESSURE CHECK

A regular maintenance schedule for the descaling of your heating manifold is essential to insure its longevity.

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

MANIFOLD

CHECK INSTRUCTIONS

1. Remove discharge hose from machine.
2. Inspect inside of hose for build-up of any material. If 1/16" build-up of material exists descaling should be performed.

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 machine.

MACHINE MAINTENANCE

ELECTRIC DRIVEN ELECTRIC FIRED	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. **HEATING MANIFOLD:**							
Lime deposit inspection.	●						
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 mnifolds and water pumps. See STORAGE in the **MACHINE MAINTENANCE** section for cold weather instructions.	●						

CLEANER TROUBLESHOOTING

ELECTRIC HEATED HOT WATER CLEANERS

TROUBLE	*POSSIBLE CAUSE*	*REMEDY*
1. Heater does not activate	A. Insufficient water flow. B. Water temperature too high. C. Pressure switches inoperable	A. Check for sufficient water flow. B. Check water temperature to make sure it is not above 150°F limit. C. Check for switch operation across terminals, adjust or replace.
2. 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"
3. Machine will not draw chemical.	A. No chemical solution. B. Metering valve not open. C. Chemical line strainer clogged. D. Air leak in chemical line. E. Metering valve clogged.	A. Replenish supply. B. Turn metering valve knob to open. C. Remove screen and clean. D. Tighten all fittings and hoses. E. Disassemble and clean.
4. 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	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 MACHINE SPECIFCATION section. B. Use larger water supply hose. C. Use shorter water supply hose. D. Tighten belt per instructions on MACHINE MAINTENANCE insert. E. Replace belt per MACHINE EXPLODED VIEW. F. Replace with proper size spray tip; see MACHINE SPECIFICATION for proper size. G. See PUMP TROUBLESHOOTING. H. Straighten hose. I. Clean water filter or hose inlet screen. J. See "Pump motor 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.

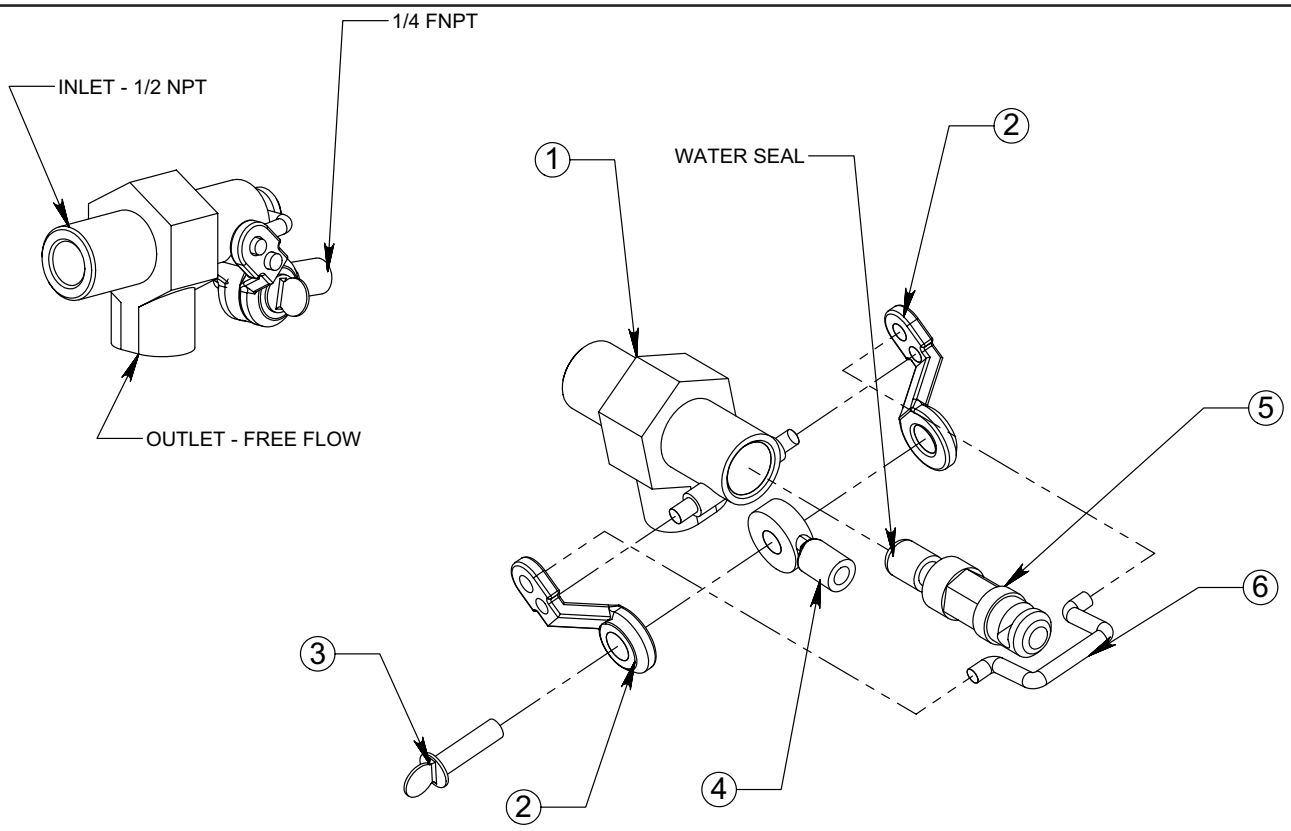
CLEANER TROUBLESHOOTING (CONT.)

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

VALVE, FLOAT
P/N C03-00636

SPECIFICATIONS

- MAXIMUM FLOW . . . . . 14 GPM / 53 LPM / 35 PSI
- MATERIAL - HOUSING . . . . . BRASS
- MATERIAL - WATER SEAL . . . . . BUNA - N
- MATERIAL - PLUNGER . . . . . FLUTED CELCON
- WEIGHT . . . . . 0.82 LBS. / 0.37 GM
- INLET . . . . . 1/2 MIP

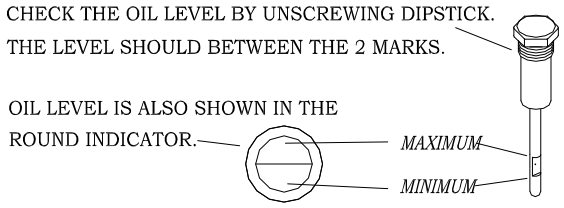


PART LISTS

ITEM	PART NUMBER	PART DESCRIPTION	QTY.
1	BODY	HOUSING, VALVE	1
2	ANGLE	ARM, PLUNGER	2
3	BOLT	SCREW, WING	1
4	Part14	ARM, BALL	1
5	PLUNGER	PLUNGER	1
6	U PEICE	LINK,PLUNGER	1

GENERAL PUMP MAINTENANCE

OIL LEVEL



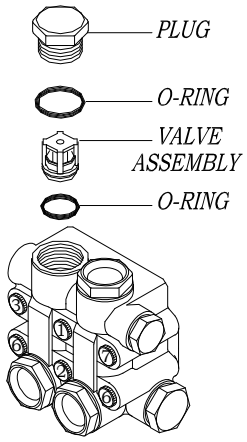
TOOL KITS

PACKING EXTRACTION KIT - P/N Z09-00028

COMPLETE TOOL KIT - P/N Z09-00021

VALVE SERVICE

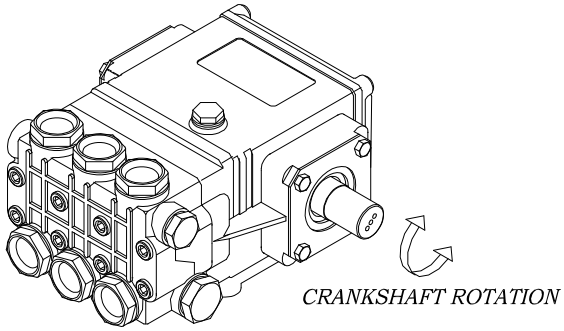
1. Remove the plugs holding the valve assemblies.
2. Remove and discard o-rings from the plugs. Clean plugs with solvent or soap and water. Allow to dry.
3. Using a needle nose pliers, fingers, or hook shaped tool, remove the valve assemblies from the head. Remove and discard the o-rings from the valve 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.

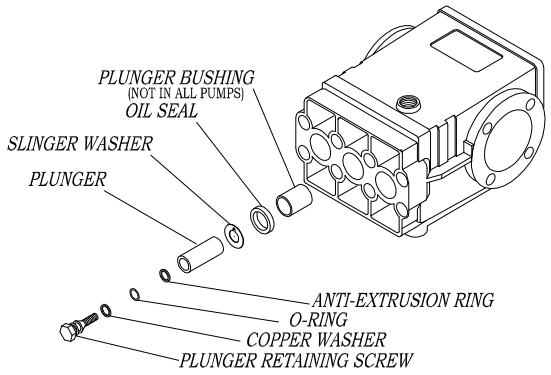
HEAD REMOVAL

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.

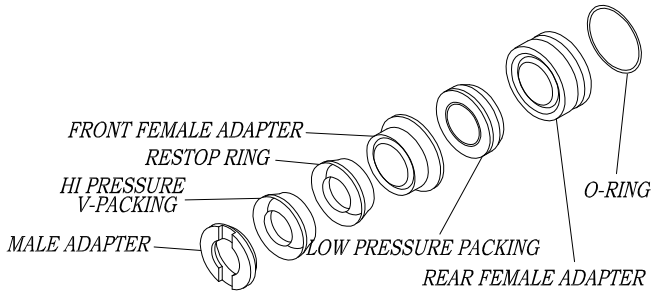
11. Install the low pressure packing with the flat side down.

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.

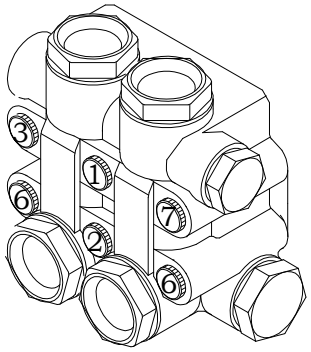
3. Lubricate the exposed plungers with crankcase oil.

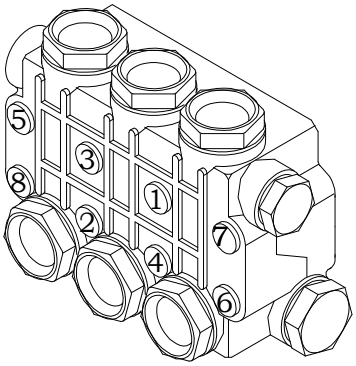
4. Start the head onto the plungers and using a soft mallet, tap the head evenly until it comes in contact with the crankcase.

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

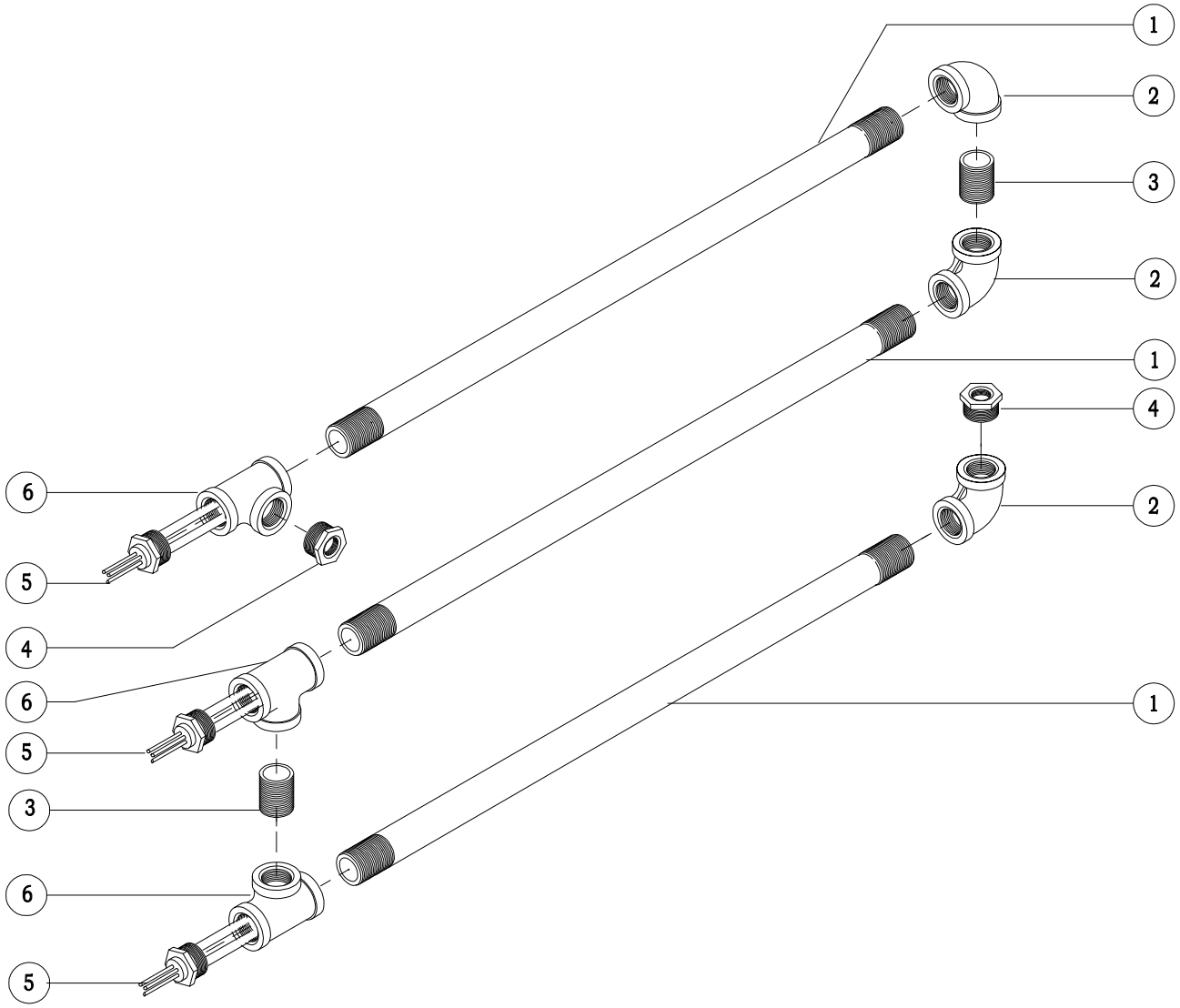
MONTH / DAY / YEAR	OPERATING HOURS	TYPE OF MAINTENANCE

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.

ASSEMBLY, MANIFOLD - HEATER P/N 4208-00460

EXPLODED VIEW



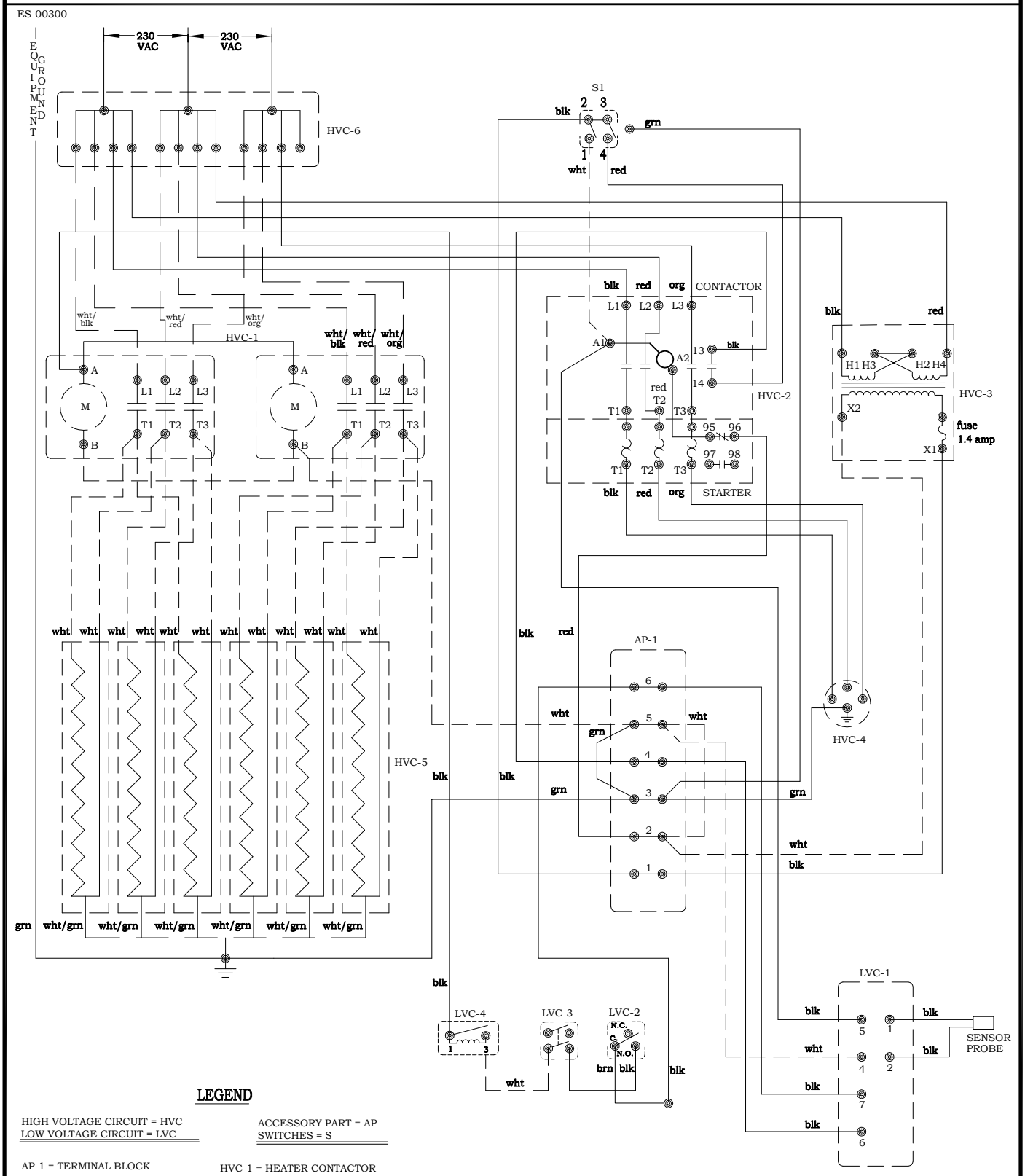
PARTS LIST

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
1	E18-00230-1	NIPPLE, PIPE	4	E04-00015	BUSHING, PIPE
2	E08-00021-1	ELBOW, PIPE	5	F07-00025	HEATER, IMMERSION - 265V
3	E18-00010-1	NIPPLE, PIPE	6	E10-00010-1	TEE, PIPE

ELECTRICAL SCHEMATIC

ELECTRIC FIRED - 230 VAC 3 PHASE 60 HERTZ
WITH: 265 VAC 1 PHASE 60 HERTZ IMMERSION HEATERS

ES-00300



LEGEND

HIGH VOLTAGE CIRCUIT = HVC
LOW VOLTAGE CIRCUIT = LVC

ACCESSORY PART = AP
SWITCHES = S

AP-1 = TERMINAL BLOCK

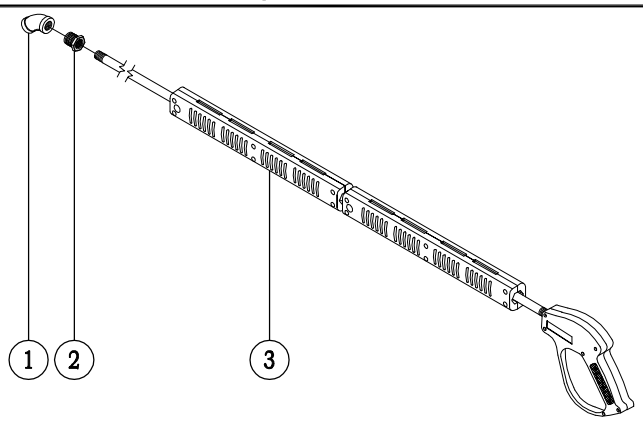
S-1 = CAM SWITCH

LVC-1 = TEMPERATURE CONTROL
LVC-2 = PRESSURE SWITCH
LVC-3 = VACUUM SWITCH
LVC-4 = TIME DELAY RELAY

HVC-1 = HEATER CONTACTOR
HVC-2 = MOTOR STARTER W/OVERLOAD
HVC-3 = STEP DOWN TRANSFORMER
HVC-4 = PUMP MOTOR 460 VAC
HVC-5 = IMMERSION HEATERS 10,000W - 265 VOLT
HVC-6 = POWER DIST. BLOCK

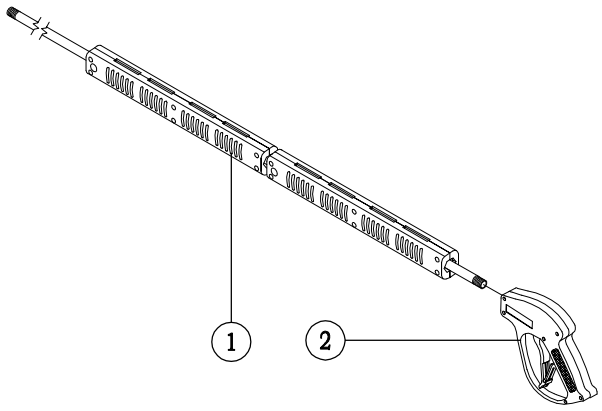
ASS'Y, OPEN GUN & WAND

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			

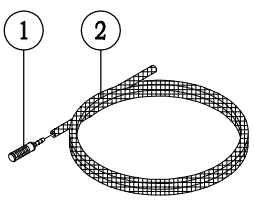


P/N 122-00700A PARTS LIST

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

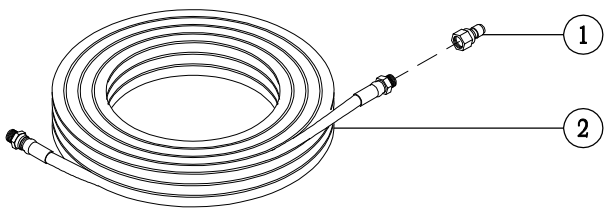


PARTS LIST

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