

SERIES 'S', 'E' AND 'M' ELECTRONIC METERING PUMPS

OPERATION AND
SERVICE GUIDE
O-960
MAY 1991

Installation Operation Maintenance Instruction

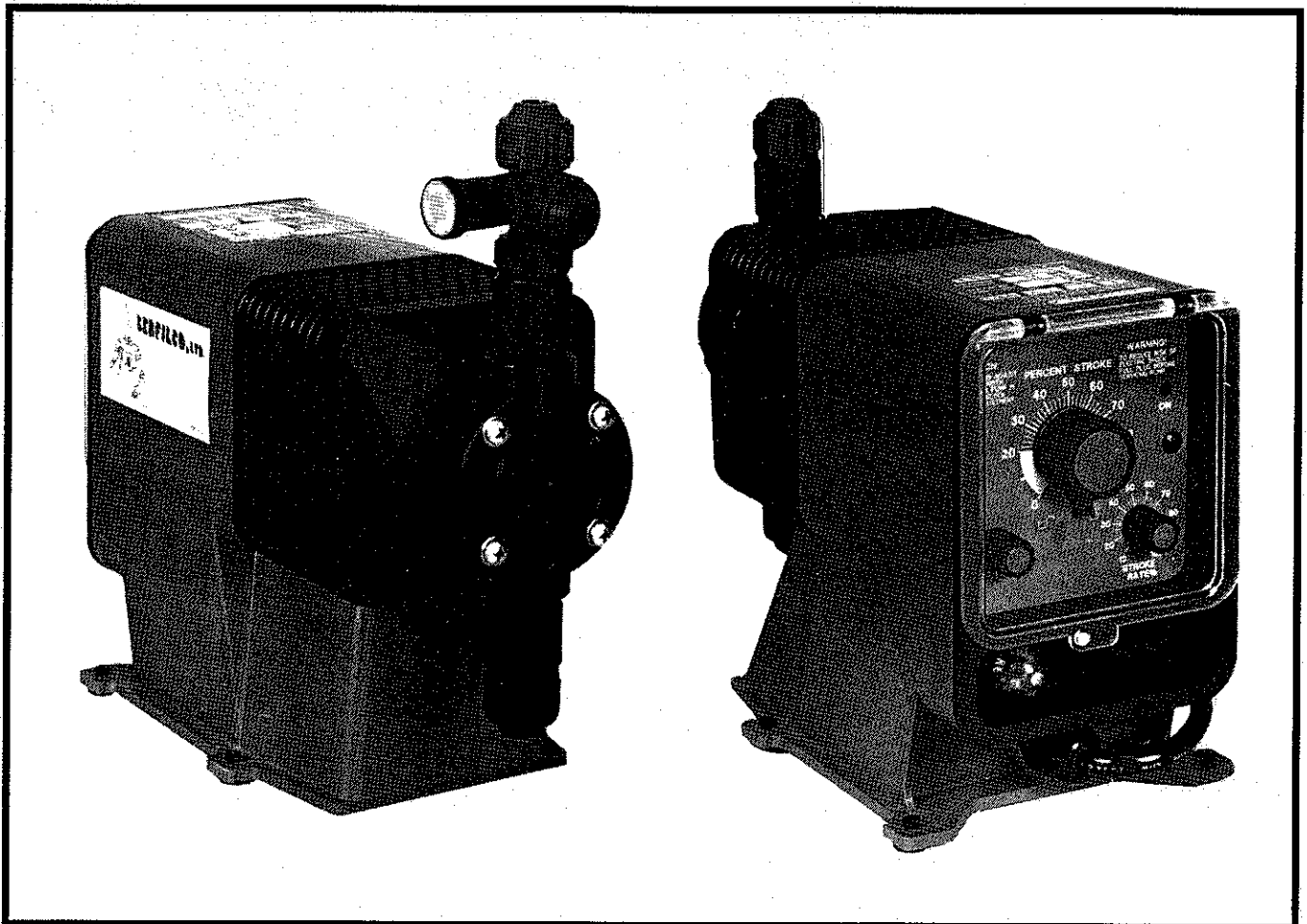


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INTRODUCTION

These installation, operation and maintenance instructions cover your electronic metering pump. Refer to the pump nameplate to determine the actual model.

o PRINCIPLE OF OPERATION

Diaphragm metering pumps are used to accurately meter chemicals or fluids. This is achieved by an electromagnetic drive mechanism (solenoid) which is connected to a diaphragm. When the solenoid is pulsed by the control circuit, it displaces the diaphragm which, through the use of check valves, moves the fluid out the discharge under pressure. When the solenoid is deenergized it returns the diaphragm and pulls more fluid into the pumphead and the cycle repeats.

The pump stroke rate is controlled by the internal circuit and is changed by turning the rate knob. The mechanical stroke length of the pump is controlled by the stroke length knob.

o MATERIALS OF CONSTRUCTION

The wetted materials (those parts that contact the solution being pumped) available for construction are polypropylene, PVC, SAN, Hypalon, Viton, EPDM, Teflon, 316 Stainless Steel, Ceramic and Alloy C. These materials are very resistant to most chemicals. However, there are some chemicals, such as strong acids or organic solvents, which cause deterioration of some elastomer and plastic parts, such as diaphragm, valve seat, or head. Consult Chemical Resistance Guide or Supplier for information on chemical compatibility.

Various manufacturers of plastics, elastomers and pumping equipment publish guidelines that aid in the selection of wetted materials for pumping commercially available chemicals and chemical compounds. Two factors must always be considered when using an elastomer or plastic part to pump chemicals. They are:

1. The temperature of service: Higher temperatures increase the effect of chemicals on wetted materials. The increase varies with the material and the chemical being used. A material quite stable at room temperature might be affected at higher temperatures.
2. Material choice: Materials with similar properties will vary greatly in performance with certain chemicals.

o MANUFACTURER'S PRODUCT WARRANTY

The manufacturer warrants its equipment of its manufacture to be free of defects in material or workmanship. Liability under this policy extends for one (1) year from the date of delivery from our factory or authorized distributor. The manufacturer's liability is limited to repair or replacement of any device or part which is returned, prepaid, to the factory within one (1) year of delivery to the original purchaser, and which is proven defective upon examination. This warranty does not include installation or repair cost and in no event shall the manufacturer's liability exceed its selling price of such part.

The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. Replaceable elastomeric parts are expendable and are not covered by any warranty either expressed or implied. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through use of its products.

The above warranty is in lieu of any other warranty, either expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to make any warranty other than the above.

UNPACKING THE PUMP

Check all equipment for completeness against the order and for any evidence of shipping damage. Shortages or damages should be reported immediately to the carrier and to the seller of the equipment.

The carton should contain:

- Metering Pump
- Clear Flexible Suction Tubing
- Stiff White Discharge Tubing
- Footvalve/Strainer Assy.
- Anti-siphon/backpressure Injection Valve Assy.
- One Instruction Book that you are now reading
- Rubber Pads

Make sure that all items have been removed from the shipping carton before it is discarded.

PRECAUTIONS FOR OPERATION

Each Electronic Metering Pump has been tested to meet prescribed specifications and safety standards. Proper care in handling, installation and operation will help in ensuring a trouble free installation.

Please read all these cautionary notes prior to installation and start-up of your metering pump.

1. **Important: Pump must be installed and used with supplied anti-siphon/back pressure/injection valve unless discharge backpressure is always above 25 PSI. Failure to do so could result in excessive pump output flow. If backpressure is always present, remove the spring in the injector fitting to achieve full pump pressure capabilities.**
2. Handle the pump with care. Dropping or heavy impact causes not only external damage to the pump, but also to electrical parts inside.
3. Install the pump in a place where the ambient temperature does not exceed 40°C (104°F) and relative humidity below 90%. The pump is spray resistant and should be installed accordingly. Do not operate immersed. To avoid high internal pump temperatures, do not operate in direct sunlight.
4. Install the pump in a place convenient for its future maintenance and inspection, then fix it to prevent vibration. Rubber pads are provided for table top operation.

5. Protective caps must be removed prior to installing tubing onto valve assemblies. Use tubing of specified size. Connect the tubing to the suction side securely to prevent the entrance of outside air. Make sure that there is no liquid leakage on the discharge side.
6. Be careful to check that the voltage of the installation matches the voltage indicated on the pump nameplate. Each pump is equipped with a three prong plug. Whether plugging into a receptacle or wiring into a system, always be sure the pump is grounded. If receptacle is utilized, to disconnect, do not pull wire but grip the plug with fingers and pull out. Do not use the receptacle in common with heavy electrical equipment which generates surge voltage. It can cause the failure of the electronic circuit inside the pump.
7. Tampering with electrical devices can be potentially hazardous. Always place chemicals and pump installation well out of the reach of children and others.
8. Never repair or move the metering pump while operating. Always disconnect electrical power. For safety, use protective gloves and face protection.
9. An air bleed valve is standard for all models with tubing connections. Air purges should be performed when the pump chamber contains no fluid at the time of start-up. As a safety measure, connect the return tubing to the air bleed valve and bypass fluid back to storage tank or a suitable drain.
10. Chemicals used may be dangerous and should be used carefully and according to warnings on the label. Follow the directions given with each type of chemical. Do not assume chemicals are the same because they look alike. Always store chemicals in a safe location away from children and others. We cannot be responsible for the misuse of chemicals being fed by the pump. Always have the material safety data sheet (MSDS) available for any fluid being pumped.
11. Always wear protective clothing (protective gloves and safety glasses) when working on or near chemical metering pumps.
12. All pumps are pretested with water before shipment. Remove head and dry thoroughly if you are pumping a material that will react with water, (i.e. sulfuric acid). Valve seats, ball checks, gaskets, and diaphragm should also be dried. Before placing pump into service, extreme care should be taken to follow this procedure.
13. Valve cartridges have arrows stamped on them to indicate fluid flow direction.
14. When metering hazardous material DO NOT use plastic tubing, strictly use proper rigid pipe. Consult supplier for special adaptors or valve assemblies.
15. Pump is NOT to be used to handle or meter flammable liquids or materials.
16. Standard white discharge tubing is not recommended for installations exposed to direct sunlight. Consult supplier for special black tubing.
17. Factory will not be held responsible for improper installation of pump, or plumbing. All cautions are to be read thoroughly prior to hook-up and plumbing. For all installations a professional plumber should be consulted. Always adhere to local plumbing codes and requirements.
18. When using pump with pressurized systems, make sure the pressure of the system does not exceed the maximum pressure rating on the pump nameplate. Be sure to de-pressurize system prior to hook-up or disconnecting the metering pump.
19. Electronic power modules are equipped with automatic reset thermal overload devices and may reset unexpectedly.

INSTALLATION, PIPING AND WIRING

The metering pump should be located in an area that allows convenient connections to both the chemical storage tank and the point of injection. Even though the pump has a corrosion resistant housing and efficient cooling ribs, avoid continuous temperatures in excess of 40°C (104°F). To do otherwise will result in damage to the pump.

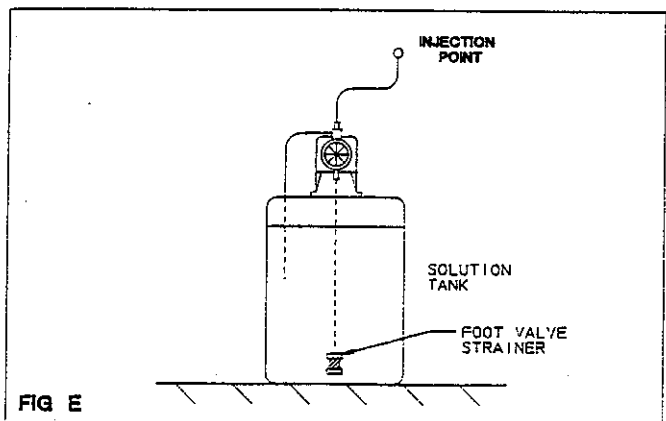
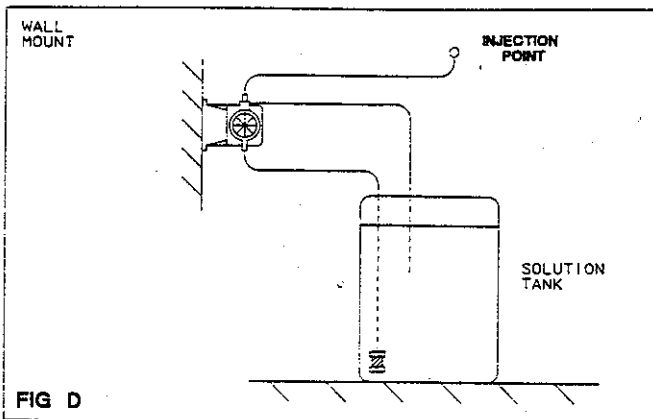
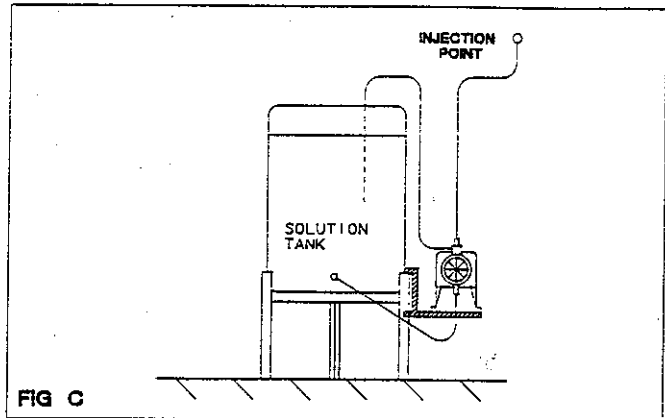
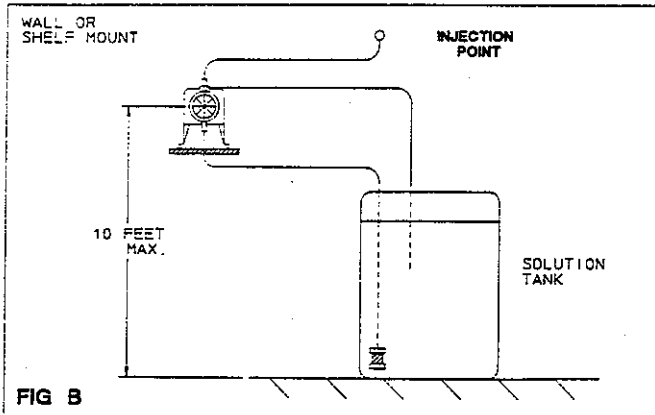
MOUNTING

Typical mounting arrangements are shown in Figures B to E.

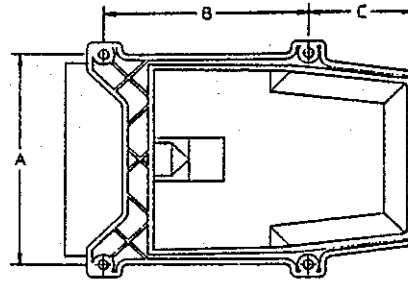
Important: Injection point must be higher than the top of the solution supply tank to prohibit gravity feeding, unless anti-siphon/backpressure/injector valve is used.

1. For wall or shelf mounting, refer to Figure E. Connect suction tubing to suction valve of chemical pump. Suction valve is the lower valve. Tubing should be long enough so that the footvalve/strainer assembly hangs about 2-3 inches above the bottom of chemical tank. To keep chemical from being contaminated, the tank should have a cover.
2. Flooded suction mounting (installing the pump at the base of the chemical storage tank, Figure C) is the most trouble free type of installation and is recommended for very low output requirements. Since the suction tubing is filled with chemical, priming is accomplished quickly and the chance of losing prime is reduced.

To mount pump, drill 4 holes of 1/4" diameter in the shelf as shown in the dimension drawing (Figure F). Attach pump securely using four #10 bolts and nuts.



3. The pump can be mounted to a wall as shown in Figure D. Drill and attach with #10 wood or metal screw per the dimension drawing shown in Figure F. Prior to attaching, turn the pump head 90° so that suction and discharge connections are in a vertical direction. The suction valve must always be below the discharge valve. This can be easily accomplished by removing the four screws and adaptor that attach the pump head to the housing, turning the head and adaptor 90° so the arrows on the valves will be pointing upwards when the pump is mounted to the wall. Rebolt the pump head and adaptor securely to the housing. To prevent damage to pump head -- do not overtighten head bolts.



SERIES E PLUS

HOUSING SIZE	DIMENSIONS		
	A	B	C
MEDIUM	4.36	4.81	2.19
LARGE	4.36	6.12	2.19

Figure F

4. The pump can be mounted on top of a solution tank as shown in Figure E. Install chemical pump on the cover. Insert suction tubing through the center hole and cut tubing so foot valve/strainer hangs about 2-3 inches above the bottom of the tank. Mount the chemical pump rigidly by drilling four 1/4" holes and using four #10 screws and nuts.

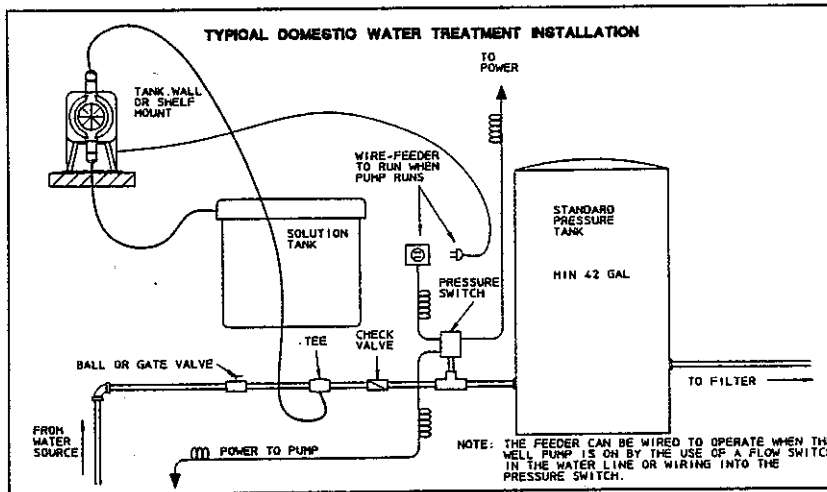


FIG G1

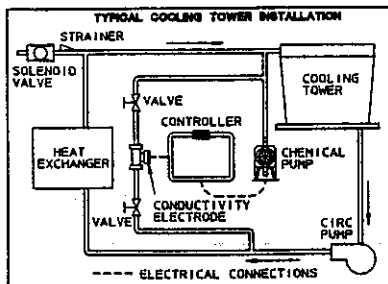


FIG G2

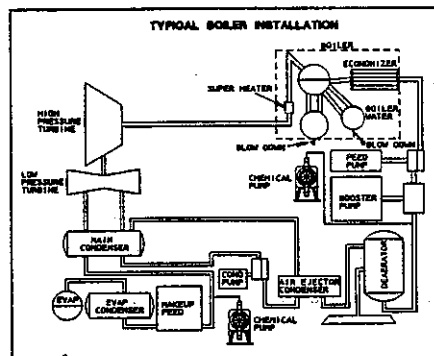
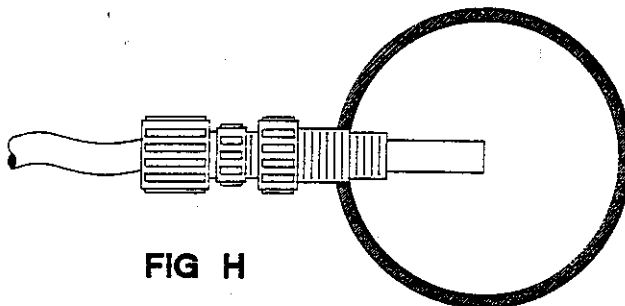


FIG G3

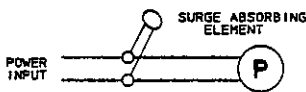
PIPING

1. Use provided tubing of specified size for connection. Connect tubing securely to prevent leakage of chemical and the entrance of air. Since plastic nuts are used for fittings, they should not be tightened excessively i.e. hand tighten only.
2. If the air bleed valve assembly is being used, a return line (tubing) should be securely connected and routed back to the storage tank. **To avoid possible injury from chemicals do not attempt to prime using a bleed valve without installing a return line.**
3. When pump is shelf mounted or top mounted on tank, suction lift should not exceed 10 feet.
4. To maintain metering accuracy, an anti-siphon/backpressure/injection valve is provided. The injection valve must be installed in the discharge line. Best practice is to install the injection valve at the point of chemical injection.
5. If the discharge tubing is going to be exposed to direct sunlight, black tubing should be used instead of the standard white translucent tubing supplied with each pump. To obtain, contact supplier.
6. To prevent clogging or check valve malfunction always install a strainer assembly to the end of the suction tubing (Figure E). This footvalve/strainer assembly should always be installed 2 to 3 inches above the bottom of the chemical tank. This will help prevent clogging the strainer with any solids that may settle on the tank bottom. The chemical tank and footvalve/strainer should be cleaned regularly, to ensure continuous troublefree operation. If the chemical being pumped regularly precipitates out of solution or does not dissolve easily or completely (e.g. calcium hydroxide), a mixer should be used in the chemical tank. These are readily available in many motor configurations and mountings. To obtain, contact supplier.
7. A flooded suction (tank liquid level always at a higher elevation than the pump) is recommended when pumping sodium hypochlorite (NaOCl) and hydrazine solution (N_2H_2) etc. which are liable to produce air bubbles. Maintaining a low liquid temperature will also help eliminate this problem.
8. Pipe corrosion can result if dilution at the injection point does not occur rapidly. This problem is easily prevented by observing this simple rule: install injection fitting so that the end is in the center of the flow stream of the line being treated. Trim injector tip as required. See Figure H. Note: Extended injection assemblies are available for large water lines. Consult your supplier for more information.

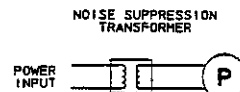


WIRING

1. The metering pump should be wired to an electrical source which conforms to those on the pump nameplate.
2. After checking the power voltage, wiring should be made in accordance with local electrical coding. (Applying higher voltage than the pump is rated for, will damage the internal circuit.)
3. Connect the power cord to a properly grounded three prong outlet. Do not defeat the purpose of grounding by either cutting off the ground prong or not connecting the ground wire.
4. In the electronic circuit of the control unit, measures for surge voltage are made by means of surge absorbing elements and high voltage semiconductors. Nevertheless, excessive surge voltage may cause failure in some areas. Therefore, the receptacle should not be used in common with heavy electrical equipment which generates high voltage. If this is unavoidable, however, measures should be taken by (a) the installation of a surge absorbing element (varister of min. surge resistance 2000A) to the power supply connection of the pump, or (b) the installation of a noise suppression transformer.



(a)



(b)

5. Signal input to the external pulse signal input terminals ([EXT],[STOP]) must be no-voltage signals from relay-contacts, etc. and the input of other signals is prohibited. (in the case of relay contacts, 100 ohms or below at ON and 1M ohms or above at OFF.) The pulse duration of the input signal must be 10ms or over and the frequency of the input signal must not exceed 125 times/min. Signal cord is provided with the pump.

WELL PUMP SYSTEM INSTALLATION

1. Ensure that the metering pump voltage matches the voltage of the well pump. Typical well pump electrical circuits are shown in Figure I. All electric wiring should be installed in accordance to local electrical codes by a licensed electrician.
2. Install the anti-siphon/backpressure/injection valve on the discharge side of the metering pump into a tee which is installed into the water line going to the pressure tank. Typical installations are found in figures G1, G2 and G3. **Be sure to install the injection assembly in a vertical position on the bottom side of the water line (Figure J).**

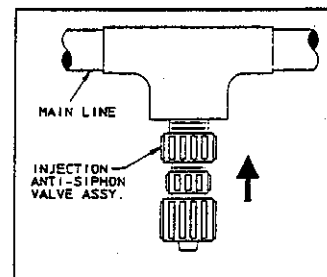


FIG J

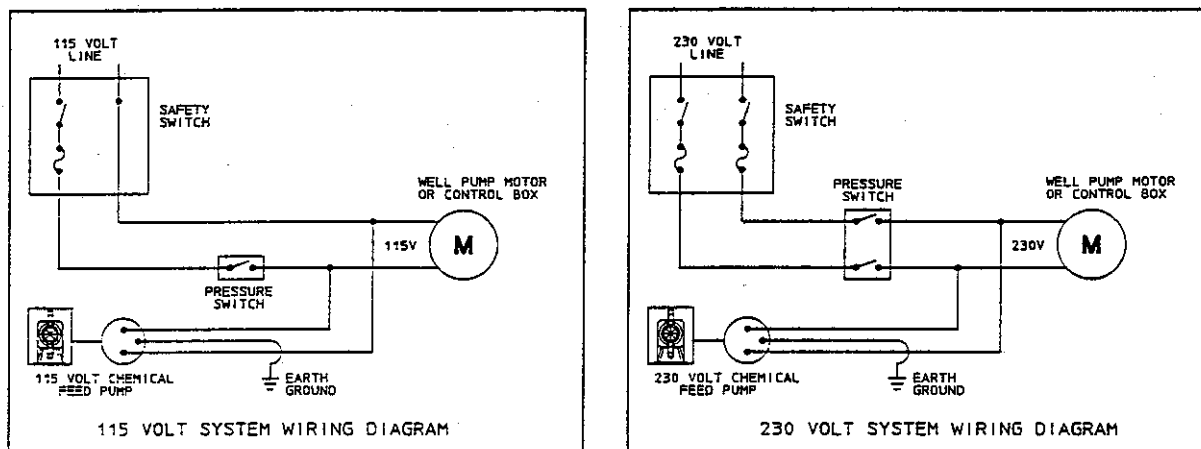


FIG 1

START UP AND OPERATION

POWER

All metering pumps are available in 115 volts at 50/60 Hertz, single phase. Optionally 230 volts at 50/60 Hertz, single phase can be provided. **Prior to start-up always check to insure that the pump voltage/frequency/phase matches that of the power supply.**

PRIMING

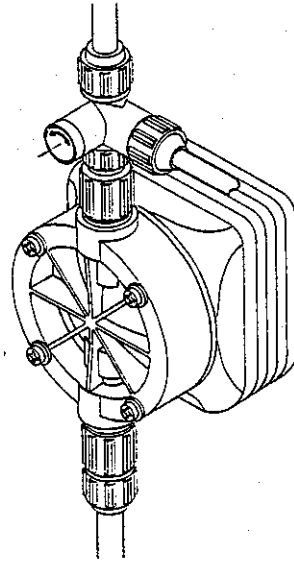
Caution: When working on or around a chemical metering pump installation, protective clothing and gloves and safety glasses should be worn at all times.

All pumps are tested with water. If the chemical to be pumped reacts when mixed with water (e.g. sulfuric acid) the pump head should be removed and dried thoroughly along with the diaphragm and valve seats.

1. Plug the pump into an appropriate outlet. Turn the power on switch to either "ON" or "MANUAL" depending on the control option the pump is equipped with. The green LED will light up and flash off each time the pump strokes.
2. Adjust the stroke rate knob to the 100% setting mark (for more information see "Capacity Control").
3. Adjust the stroke length knob to the 100% setting mark (for more information see "Capacity Control").
4. If the discharge line is connected directly to a pressurized system it should be temporarily disconnected during priming of the pump. This operation is greatly simplified if the pump is equipped with the available air bleed valve which allows for easy bypass of pump discharge fluid. All air must be purged from the pumphead before the pump will pump against pressure.

Air Bleed Operation:

- A) While pump is running, turn adjustment screw counterclockwise.
- B) Run with valve open until a solid stream of fluid comes out of the bypass tubing (1/4 x 3/8 supplied with valve), no air bubbles.
- C) Close air bleed valve by turning adjustment screw clockwise.



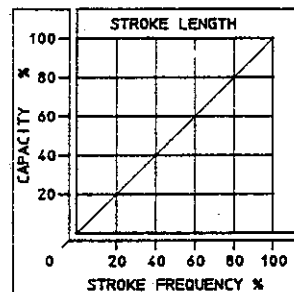
5. Chemical should reach the pumphead after a few minutes of operation. If not, remove the discharge fitting and moisten the discharge valve area (ball check and valve seats) with a few drops of chemical being fed to the metering pump. For safety, always use protective clothing and gloves, wear safety glasses and use a proper container to hold the chemical.
6. If the pump continues to refuse to prime, refer to Troubleshooting Section of these instructions.
7. Once the pump has been primed and is pumping the chemical through the head, turn off the power, reconnect the discharge tubing (if it had been removed) and immediately clean any spilled chemical that is on the pump housing or head.
8. Turn the power on once more and adjust the pump flow to the desired rate (see "Capacity Control").
9. Always check the calibration of the pump after start-up. It's best to let the pump run for an hour or two to stabilize before checking calibration.

CAPACITY CONTROL

Capacity can be controlled by means of the stroke length adjusting knob or stroke frequency adjusting knob.

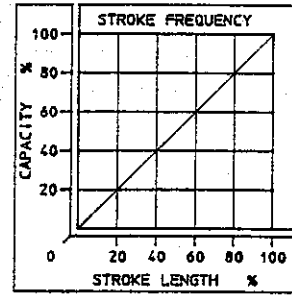
(1) Stroke Frequency Adjustment:

- o Stroke frequency can be controlled from 10 to 100% (12 to 125 spm) by means of the electronic circuit.
- o Stroke frequency can be set by means of the stroke frequency adjusting knob even while the pump is in operation.



(2) Stroke Length Adjustment:

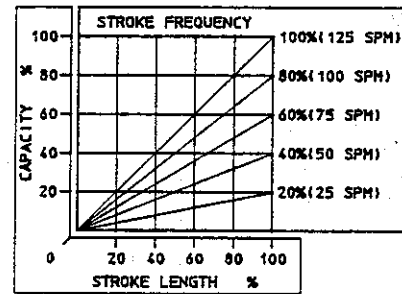
- o Stroke length can be controlled within 0 to 100% of the diaphragm displacement. (It should be controlled within 10 to 100% for practical use.)
- o Stroke length can be set by means of the stroke length adjusting knob while the pump is in operation. **Do not turn the knob while the pump is stopped.**



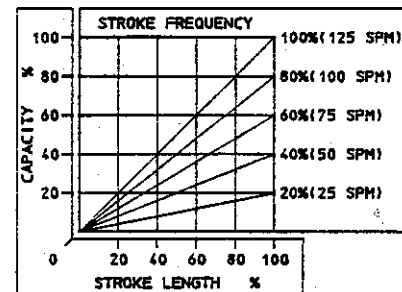
(3) Controlling Procedure:

Proper set points for stroke length and stroke frequency should be determined after consideration of the pump and characteristics of the fluid. The following procedure is recommended from the viewpoint of pump performance. **Note: The closer the stroke length is to 100%, the better the pump performance will be.**

- A) Set the stroke length to 100% then adjust the stroke frequency for coarse capacity control.
- B) Measure the capacity.
- C) When the measured capacity is less than the required value, increase the stroke frequency and measure the capacity again.
- D) Then, adjust the stroke length for fine capacity control.
- E) Finally, measure the capacity and make sure that the required value is obtained.



<u>Example</u>	Desired Flow	=	15 GPD
	Selected Model	=	LPD4
	Set Stroke Length	=	100%
	Set Stroke Rate	=	100%
	Output Capacity	=	21 GPD
	Adjust Stroke Rate to 80%		
	Output Capacity	=	$0.80 \times 21 = 16.8 \text{ GPD}^*$
	Stroke Length Setting	=	$\frac{15}{16.8} \times 100 = 90\% \text{ approx.}$



Thus to obtain the desired flow, stroke length is set at 90% and stroke rate is set at 80% i.e. output capacity = $0.90 \times 0.80 \times 21 = 15 \text{ GPD}^*$

* Check these values by measurement.

OPERATION BY EXTERNAL INPUT SIGNALS:

The pump can be controlled by three types of input signals. The input socket connections are located at the bottom of the control panel face and the signal cords are provided with the pump.

STOP FUNCTION:

Operation of the pump can be stopped by an external signal input. When the external signal is input to the terminal marked [STOP] which is provided at the bottom of the control panel, the lamp 'STOP' (red) lights up and operation of the pump is stopped. The stop function overrides both manual settings and external input signals at other terminals.

- o Input signals should be no-voltage signals from relay contacts, etc. and input of the signals should be prohibited. (In case of relay contacts, electric resistance must be 100 ohms or below at ON and 1M ohm or above at OFF).

The stop function is commonly used in conjunction with a tank float switch. The float switch contacts are normally open but when the tank level falls past a certain point the contacts close and the pump stops.

EXTERNAL PACING FUNCTION:

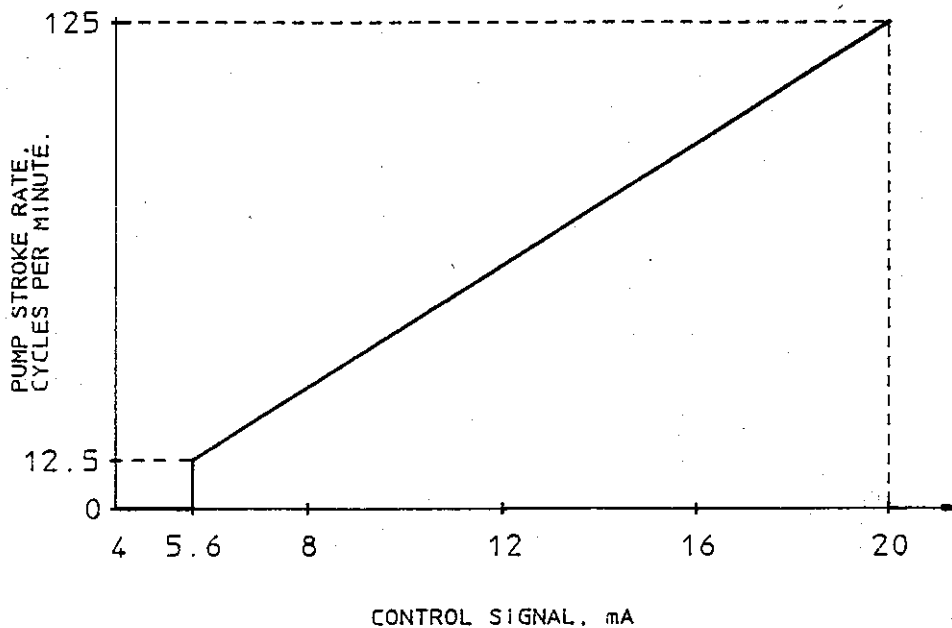
The pumps stroke rate can be controlled by an external input signal. When the input signal line is connected and the EXTERNAL/OFF/MANUAL switch is in the external position and a contact signal is input to the terminal marked [EXTERNAL] the pump makes one discharge stroke.

- o When the 'ON' signal pulse is input, the pump operates one stroke and the fluid is discharged. In addition, the pump can be operated continuously at a rate of 0 to 125 strokes/min. by repeated input of 'ON' and 'OFF' signals.
- o After receiving an input signal, the pump generates the necessary power pulse to actuate the solenoid. The external signal input is debounced by the pump circuit. The pump will not stroke in response to a spurious or erratic input signal that follows at a rate greater than 125 spm. If the external signal rate exceeds 125 spm, the pump will stroke at half the external signal rate to prevent overdosing and to protect the pump from overheating.
- o Input signals should be no-voltage signals from relay contacts, etc. and the input of other signals is prohibited. (In the case of relay contacts, electric resistance must be 100 ohms or below at ON and 1M ohms or above at OFF).
- o Cycle rate of the input signal should not exceed 125 times/min.

4-20 mA DC INPUT FUNCTION:

The pumps stroke rate can also be controlled by a 4-20 mA DC signal applied to the terminal marked [4-20 mA].

- o For the 4-20 input to have any effect on the pump output rate, the AUTO/OFF/MANUAL switch must be in the AUTO position.
- o The 4-20 mA input signal affects the pumps output as per the graph below:



- o The signal cord polarity is:
 Black = Common
 White = Positive
- o Signal input impedance is 124 ohms.

MAINTENANCE

CAUTION: Before performing any maintenance or repairs on chemical metering pumps, be sure to disconnect all electrical connections and insure that all pressure valves are shut off and pressure in the pump and lines has been bled off.

Always wear protective clothing, gloves and safety glasses when performing any maintenance or repairs on chemical metering pumps.

ROUTINE MAINTENANCE

1. Routinely check the physical operating condition of the pump. Look for the presence of any abnormal noise, excessive vibration, low flow and pressure output or high temperatures [when running constantly at maximum stroke rate, the pump housing temperature can be up to 160°F (70°C)].
2. For optimum performance, valve seats and balls should be changed every 4-6 months. Depending on the application, more frequent changes may be required. Actual operating experience is the best guide in this situation. Repeated short-term deterioration of valve seats and balls usually indicates a need to review the suitability of wetted materials selected for the application. Contact the supplier for guidance.
3. Check for leaks around fittings or as a result of deteriorating tubing e.g. when standard white translucent discharge tubing is exposed to direct sunlight. Take appropriate action to correct leak by tightening fittings or replacing components.

4. Keep the pump free of dirt/debris as this provides insulation and can lead to excessive pump temperatures.
5. If the pump has been out of service for a month or longer, clean the pump head/valve assemblies by pumping fresh water for approximately 30 minutes. If the pump does not operate normally after this "purging run", disassemble valve assemblies, inspect, clean or replace as appropriate.

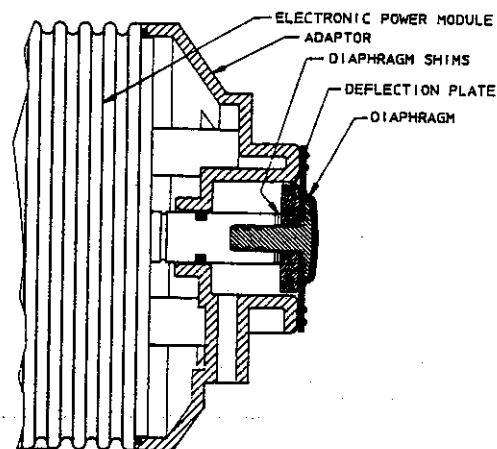
DISASSEMBLY AND ASSEMBLY DIAPHRAGM REMOVAL

1. Flush pumphead and valve assemblies out by running pump on water or other suitable neutralizing solution. Wash outside of pump down if chemical has dripped on pump.
2. Set stroke length of pump to 0% and unplug pump.
3. Disconnect tubing or piping from the pump. Remove the four pumphead screws and then remove the pumphead assembly.
4. Remove the diaphragm by grasping it at the outer edges and turning it counterclockwise until it unscrews from the electronic power module (EPM). Don't lose the deflection plate or diaphragm shims which are behind the diaphragm. Note shim quantity can be from 0 to 3.
5. Inspect diaphragm if it is intended to be used again. Look for indications of the Teflon face being overstretched, (localized white areas) or the elastomer on the back of the diaphragm being worn. Excessive amounts of either condition require diaphragm replacement.

DIAPHRAGM REPLACEMENT

Refer to drawings in the back of the manual.

1. When replacing the diaphragm, it's always a good idea to replace the valve cartridges and other wear parts. A kit is available from your supplier with all parts necessary to completely rebuild your pumps wetend. All your supplier needs to know is the "KOPkit No." on your pump's nameplate to supply this kit.
2. Set pump stroke length to 0% and unplug the pump.
3. If you kept the shims from the original diaphragm or know the original quantity you can avoid Step #4 for shimming the diaphragm and go to Step #5.
4. Slide the diaphragm deflection plate onto the back of the diaphragm stud, radius side towards the diaphragm. Next slide three shims onto the diaphragm threaded stud and screw the diaphragm into the EPM unit. Refer to sketch. Turn diaphragm clockwise until it stops turning. If there is a gap between the adaptor and diaphragm, repeat the procedure removing one shim each time until the diaphragm just touches the adaptor or is slightly recessed.



5. Apply grease to areas of the diaphragm that contact the deflection plate or radius on the adaptor.
6. Screw the diaphragm into the EPM units shaft with the deflection plate and appropriate number of shims in between.
7. Adjust stroke length to 50%. It is easier to do this if you temporarily turn the pump on. Place the pumphead onto the adaptor with valve flow arrows pointing up and install and tighten pumphead screws. Tighten screws until pumphead pulls up against adaptor.
8. Adjust stroke length back to 100% for easier priming and place pump back into service.

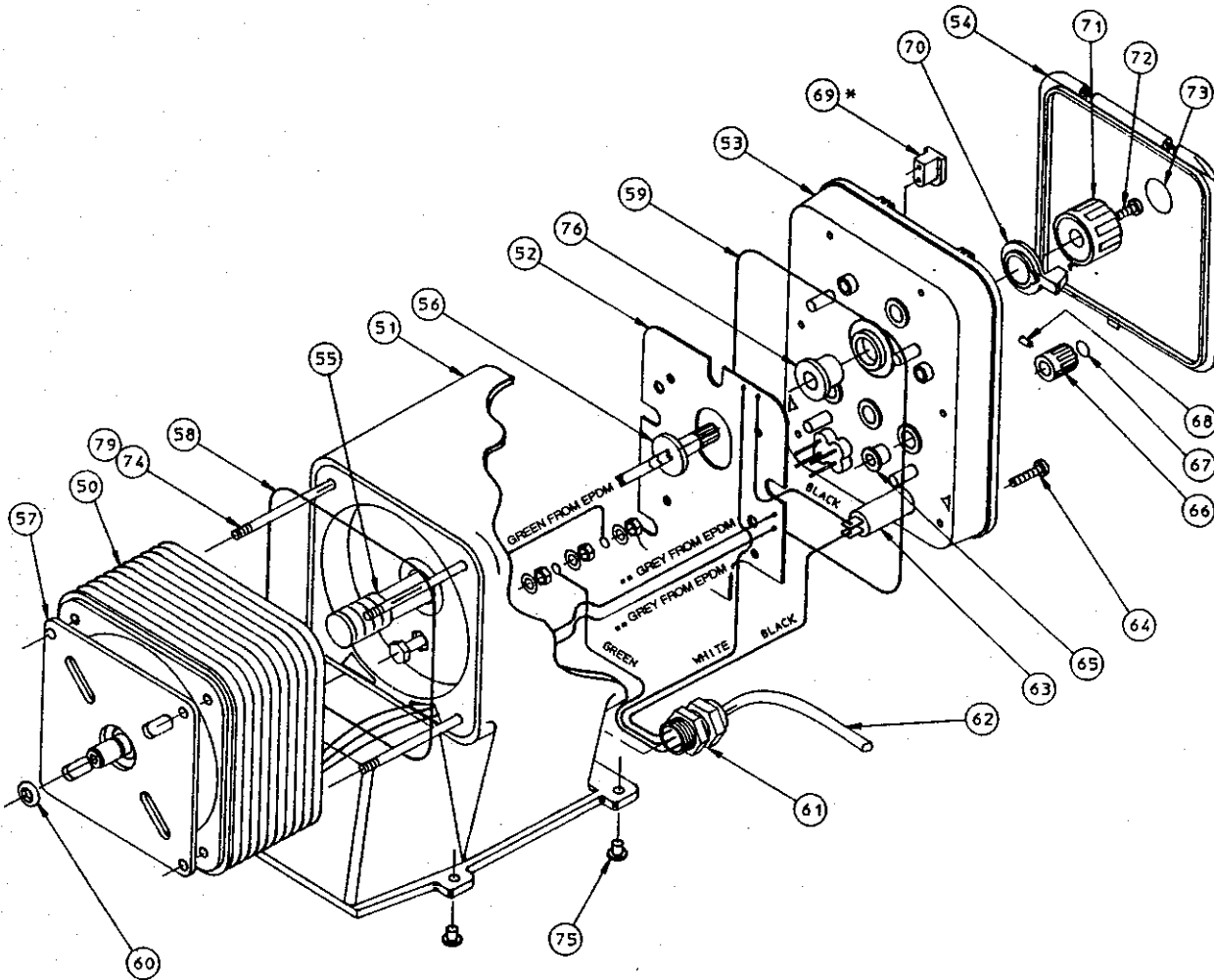
VALVE REPLACEMENT

1. Flush pump to clean any chemical from pumphead.
2. Unplug pump and disconnect any tubing or piping.
3. Unscrew valve cartridges and discard. Also remove O-Rings down inside pumphead.
4. Using new O-Rings, install new valve cartridges with arrows pointing in the fluid flow direction. Hand tighten only, do not use wrenches or pliers. This is especially important when the pumphead is SAN material.
5. Reconnect tubing or piping and reinstall the pump.

TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
LOSS OF CHEMICAL RESIDUAL	<ol style="list-style-type: none"> 1. Pump setting too low 2. Scale at injection point 3. Solution container allowed to run dry 	<ol style="list-style-type: none"> 1. Adjust to higher setting (pump must be operating during the stroke length adjustment). 2. Clean injection parts with 8% muriatic acid or undiluted vinegar. (Also, see Maintenance Section). 3. Refill the tank with solution and prime. (See Start Up and Operation Section).
TOO MUCH CHEMICAL	<ol style="list-style-type: none"> 1. Pump setting too high 2. Chemical in solution tank too rich 3. Siphoning of chemical into well or main line 	<ol style="list-style-type: none"> 1. Lower pump setting (pump must be operating to adjust stroke length knob). 2. Dilute chemical solution. NOTE: For chemical that reacts with water, it may be necessary to purchase a more dilute grade of chemical direct from chemical supplier. 3. Test for suction or vacuum at the injection point. If suction exists, install an anti-siphon valve.
LEAKAGE AT TUBING CONNECTION	<ol style="list-style-type: none"> 1. Worn tube ends 2. Chemical attack 	<ol style="list-style-type: none"> 1. Cut off end of tubing (about 1") and then replace as before. 2. Consult your seller for alternate material.
FAILURE TO PUMP	<ol style="list-style-type: none"> 1. Leak in suction side of pump 2. Valve seats not sealing 3. Low setting on pump 4. Low solution level 5. Diaphragm ruptured 6. Pump head cracked or broken 7. Pump head contains air or chlorine gas 	<ol style="list-style-type: none"> 1. Examine suction tubing. If worn at the end, cut approximately an inch off and replace. 2. Clean valve seats if dirty or replace with alternate material if deterioration is noted. 3. When pumping against pressure, the dials should be set above 20% capacity for a reliable feed rate. 4. Solution must be above foot valve. 5. Replace diaphragm as shown in the "Maintenance Section." Check for pressure above rated maximum at the injection point. NOTE: Chemical incompatibility with diaphragm material can cause diaphragm rupture and leakage around the pump head. 6. Replace pump head as shown in "Maintenance Section." Make sure fittings are hand tight only. Using pliers and wrench can crack pump head. Also, chemical incompatibility can cause cracking and subsequent leakage. 7. After turning off all pressure lines, disconnect discharge tubing and install bleed valve assembly.

PROBLEM	PROBABLE CAUSE	REMEDY
FAILURE TO PUMP (Cont.)	8. Breakdown or disconnection of wiring 9. Voltage drop 10. Malfunction of electronic control board	8. Connect wiring properly. Check fuse or circuit breaker. 9. Take measures after investigation of cause. 10. Contact supplier.
PUMP LOSES PRIME	1. Dirty check valve 2. Ball checks not seating or not sealing properly 3. Solution container allowed to run dry	1. Remove and replace or clean off any scale or sediment. 2. Check seat and ball checks for chips, clean gently. If deformity or deterioration is noted, replace part with proper material. Resulting crystals can hold check valves open, therefore the valves must be disassembled and cleaned. Be sure to replace all parts as shown in the Parts Diagram (at the end of the manual). 3. Refill container with proper chemical.
FITTING LEAKAGE	1. Loose fittings 2. Broken or twisted gasket 3. Chemical attack	1. All fittings can be hand tightened to prevent leakage. Clean off chemicals which have spilled on pump. 2. Check gaskets and replace if broken or damaged. 3. Consult your pump supplier for alternate material.
PUMP WILL NOT PRIME	1. Too much pressure at discharge 2. Check valves not sealing 3. Output dials not set at maximum 4. Suction lift height too much. 5. Pump equipped with spring loaded high viscosity valves	1. Turn off all pressure valves, loosen outlet tubing connection at discharge point. Remove discharge valve cartridge. Dampen ball check and valve seats with a few drops of solution. Set pump dials to maximum rate. When pump is primed, reconnect all tubing connections. 2. Disassemble, loosen, clean, and check for deterioration or swelling. Reassemble and wet the valve assembly, then prime. See Start-Up and Operating Section. 3. Always prime pump with output dials set at maximum rated capacity. 4. Decrease suction lift or pull vacuum on pump discharge until pump is primed. 5. Loosen discharge valve to aid in priming. Take necessary safety precautions or apply vacuum to pump discharge.



ITEM	DESCRIPTION	QTY.	PART NO.
50	Electronic power module EPDM	1	51-0050
51	Housing	1	51-0051
52	Electronic control board	1	51-0052
53	Control panel	1	51-0053
54	Dust cover	1	51-0054
55	Female adjustment shaft	1	51-0055
56	Male adjustment shaft	1	51-0056
57	EPDM retaining plate	1	51-0057
58	EPDM housing "O"-ring	1	51-0058
59	Control panel "O"-ring	1	51-0059
60	Secondary seal	1	51-0060
61	Strain relief	1	51-0061
62	Power cord	1	51-0062
63	Overload device	1	51-0063
64	Control panel screw	5-6	51-0064

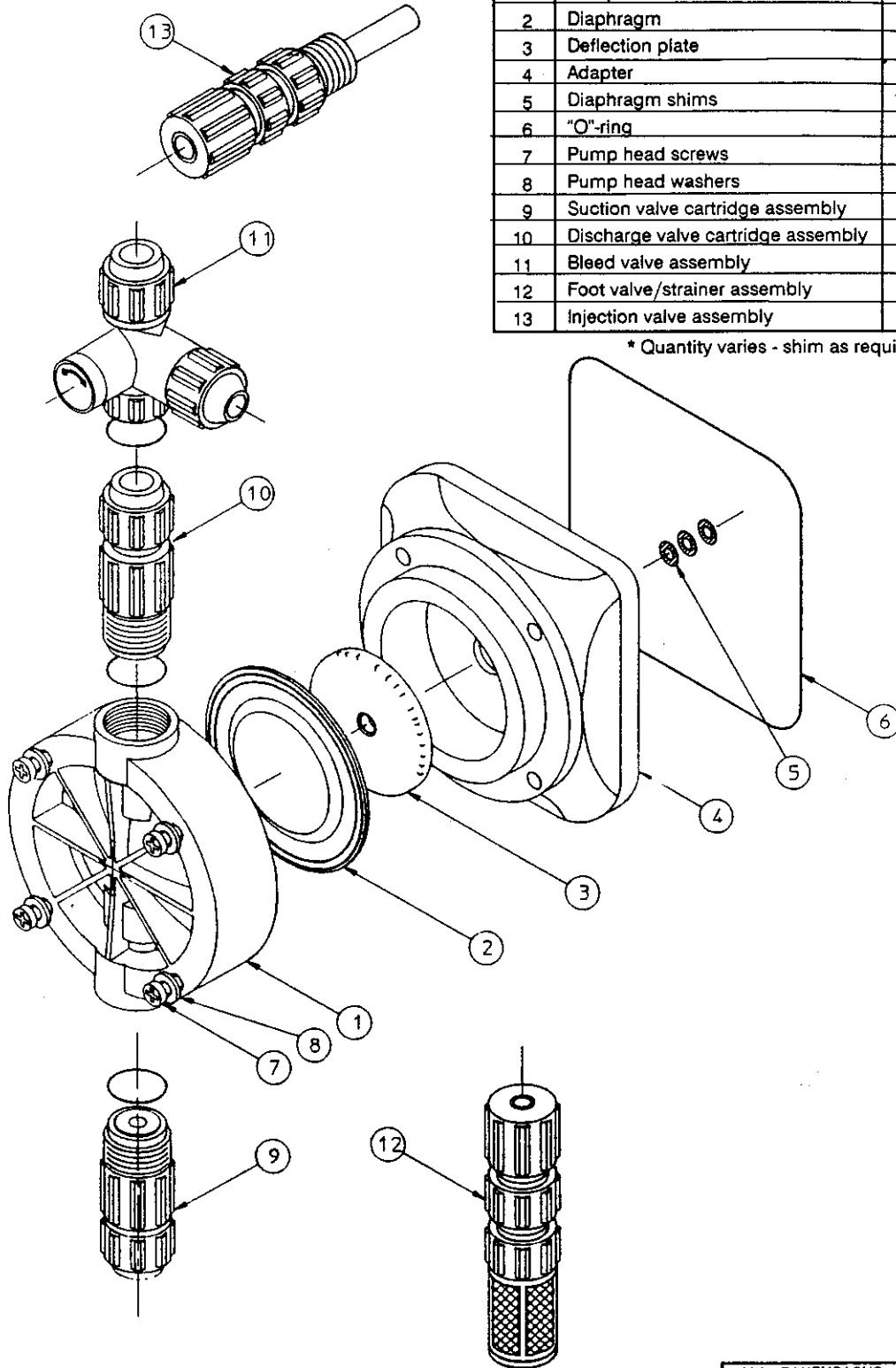
ITEM	DESCRIPTION	QTY.	PART NO.
65	Grommet, stroke rate/switch	1-2	51-0065
66	Knob, stroke rate/switch	1-2	51-0066
67	Knob, sticker	1-2	51-0067
68	Knob set screw	1-2	51-0068
*69	Pin plug	2	*51-0069
70	Locking tab	1	51-0070
71	Knob, stroke length	1	51-0071
72	Knob mounting screw	1	51-0072
73	Knob sticker	1	51-0073
74	EPDM mounting screw	4	51-0074
75	Foot pad	4	51-0075
76	Grommet, stroke length	1	51-0076
77	Panel label (not shown)	1	51-0077
79	EPDM mounting washer	4	51-0079

*Pin Plug used on external pacing, stop and 4-20Ma, stop options.

NOTE: 1. Terminal locations on the circuit board vary depending on the control option.
115 volt EPDM units have grey leads. 230 volt EPDM units have red colored lead wires.

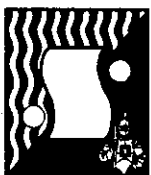
ITEM	DESCRIPTION	QTY	PART NO.
1	Pump head	1	51-0001
2	Diaphragm	1	51-0002
3	Deflection plate	1	51-0003
4	Adapter	1	51-0004
5	Diaphragm shims	*1-3	51-0005
6	"O"-ring	1	51-0006
7	Pump head screws	4	51-0007
8	Pump head washers	4	51-0008
9	Suction valve cartridge assembly	1	51-0009
10	Discharge valve cartridge assembly	1	51-0010
11	Bleed valve assembly	1	51-0011
12	Foot valve/strainer assembly	1	51-0012
13	Injection valve assembly	1	51-0013

* Quantity varies - shim as required.



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