

WARRANTY

The Manufacturer warrants this product to be free from significant deviations from published specifications. If repair or adjustment is necessary within the warranty period, the problem will be corrected at no charge if it is not due to misuse or abuse on your part as determined by the Manufacturer. Repair costs outside the warranty period, or those resulting from product misuse or abuse, may be invoiced to you.

The warranty period for this product is noted on the Warranty Card.

PRODUCT RETURN

To limit charges and delays, contact the seller or Manufacturer for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product, please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

TECHNICAL ASSISTANCE

If you have any questions about the use of this product, contact the Manufacturer or authorized seller.

OPERATING MANUAL

PTFE DIAPHRAGM PUMP

MODEL NO. 07090-42



All wetted surfaces are of PTFE. This heavy-duty, drive-operated pump is built to deliver virtually any corrosive chemical without harm to its components. Or, the purest fluids can be delivered without risking contamination from the pump. The 07090-42 PTFE Diaphragm Pump handles intermediate size flows (up to 800 mL/min) of a wide range of concentrations and viscosities. It can also pump fluids through filters and other restrictions, and can pressurize containers.

Flexibility? The PTFE DIAPHRAGM PUMP can be teamed-up with your existing MASTERFLEX® L/S® variable speed drive (10:1) range.

WARNING: THIS PUMP IS CAPABLE OF DEVELOPING PRESSURES IN EXCESS OF THE MAXIMUM RATED 100 PSIG INTERMITTENT DUTY. APPROPRIATE PRECAUTIONS SUCH AS A PRESSURE RELIEF VALVE MUST BE INSTALLED TO PROTECT THE PUMP AND ANCILLARY CONNECTIONS FROM ACCIDENTAL OVER-PRESSURIZATION.



Barnant Company
28W092 Commercial Avenue
Barrington, Illinois U.S.A. 60010-2392

(847) 381-7050
(847) 381-7053 (Fax)
800-637-3739
www.barnant.com

e-mail: barnant@barnant.com

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SAFETY PRECAUTIONS



WARNING: PRODUCT USE LIMITATION

This product is not designed for, nor intended for use in patient connected applications; including, but not limited to medical and dental use, and accordingly has not been submitted for FDA approval.

WARNING: CHECK VALVES are intended for use on this pump only. Do not use separately from the pump as forward flow at higher flow rates will suddenly restrict, causing a rapid increase in backpressure with resultant hose and connection bursting.



INTRODUCTION

The instructions in this manual are task-oriented for easy reference. You can go directly to a particular section and quickly find the answers to your questions. The step-by-step installation and operating instructions are easy to follow.

Also for easy reference, the component designations used in the illustrations are CAPITALIZED in the text.

SPECIFICATIONS

PTFE Diaphragm Pump

Model:	07090-42
Flow Rate*:	80 to 800 mL/min
Flow Rate vs. Speed Conformity Variation:	Better than 10% (typical)
Metering Pressure Range:	3 to 50 psig
Max. Rated Pressure:	50 psig (Continuous) 75 psig (Intermittent)
Metering Accuracy:	Better than 2% dispensed volume
Min. Lift:	2 ft (dry) 16 ft (wet)
Pump Head Dead Volume:	16 mL
Overall Dimensions:	6 in H x 7 in L x 3 in W
Max. Rated Speed:	400 rpm (Continuous) 600 rpm (Intermittent)
Min. Rated Speed:	40 rpm
Operating Fluid: Temperature Range:	150° F (Continuous) 230° F (Intermittent)
Liquid Viscosity Range:	1 to 500 centipoise
Motor hp at max. pressure and speed:	1/20 hp
Pump Torque at 0 psig:	2.8 lb-in (AVG) 4.9 lb-in (Peak)
Pump Torque at Max. Pressure:	5.2 lb-in (AVG) 9.6 lb-in (Peak)

*Performance at 0 psig, 400 rpm, 70°F ambient.

IMPORTANT: It is essential that the **inlet** end of the CHECK VALVE be installed in the INLET PORT of the REAGENT HEAD. Similarly, the **outlet** end must be installed in the OUTLET PORT.

See Fig. 6 for the correct orientation. The ball seats in the end shown. When assembled, you can **see** the ball through the outlet end of the CHECK VALVE. The pump will not operate unless the CHECK VALVES are properly installed.

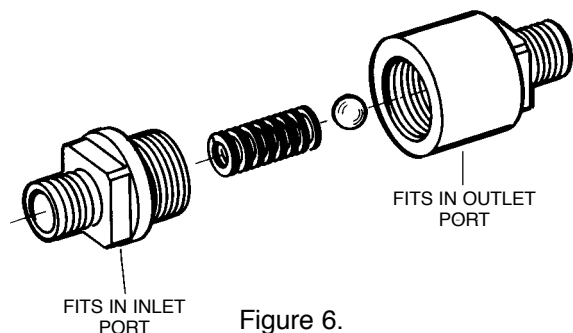


Figure 6.

- To seal, use PTFE tape on threads.

CAUTION: Hand-tighten only. Over-tightening can damage the PTFE parts.



- Test the new CHECK VALVE performance by pumping some fluid under operating conditions.

(4) How to Replace Reagent Head

- For replacement of the REAGENT HEAD (Part No. D-2027), see preceding instructions for DIAPHRAGM replacement.

ACCESSORIES

Description	Part No.
Female Pipe Adapter with 1/4 NPT(F). Use with 3/8 in OD tubing	06376-14
PFA Tubing, 3/8 in OD x 1/4 in ID. Pack of 25 ft (7.6 m)	06375-05
External Check Valve	07090-45
Service Kit. Contains PTFE diaphragm, two PTFE check valve assemblies, two drive-tang boots, installation GAGE/wrench, instructions.	07090-43

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OPERATING DATA

The Pump delivers fluids at accurately metered flow rates ranging from 80 to 800 mL/min (400 rpm). Intermittent operation up to 1200 mL/min (600 rpm) is permissible. The unit may be run dry—loss of fluid will not harm the Pump. (See Specifications section for complete details.)

Flow/Pressure Performance

The following graph summarizes pump performance at various speeds, flows, pressures and viscosities. The DIAPHRAGM can work continuously against back pressures up to 50 psig (intermittently up to 75 psig) while providing a wet suction lift of 16 feet of water or more. (Drylift, 24 inches or more.)

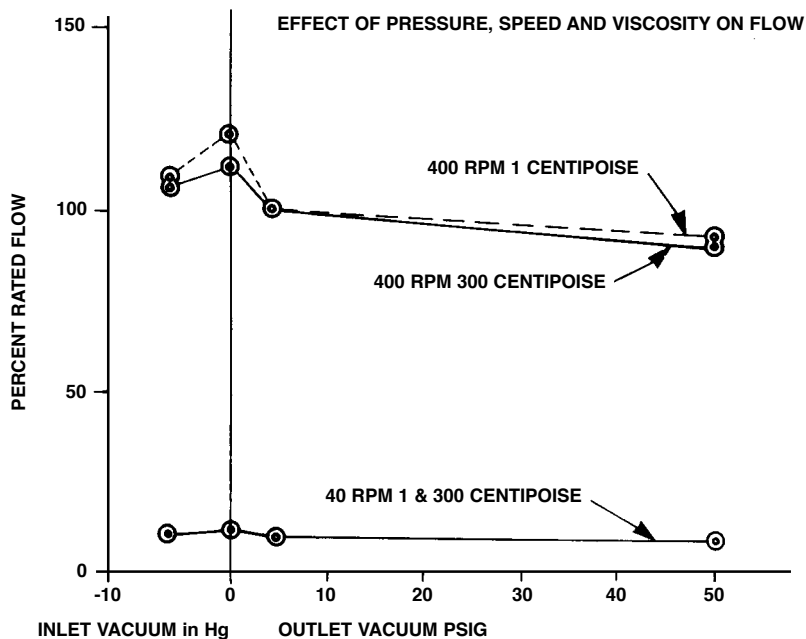


Figure 1.

Note the uniform performance at widely varying viscosities. Liquids with viscosities up to 500 centipoise can also be metered accurately at up to 400 rpm. When pumping very viscous liquids, slight flow rate shifts can be expected (as compared with water).

- Using a screwdriver in the slot in the DIAPHRAGM SHAFT and the 7/16 in wrench on the LOCKING NUT, lock the DIAPHRAGM in place.
- Recheck to verify that the DIAPHRAGM is at its furthest excursion and that it just touches the GAGE. If necessary repeat the above adjustment procedure until the DIAPHRAGM just touches the GAGE when it is at its furthest excursion.
- Replace SPACING RING segments.
- Realign holes in the DIAPHRAGM with holes in the pump housing by turning the slot in the DIAPHRAGM SHAFT (with a screwdriver) at back of pump.
- Attach the REAGENT HEAD to the PUMP BODY.
- Replace the BACKING PLATE.
- Tighten the 4 PHILLIPS SCREWS (with washers) **uniformly**. Make sure all 4 screws are seated under light torque before tightening them to specifications (25 pound-inch).

CAUTION: If screws are not tightened correctly, the unit will leak between head and diaphragm. Before placing in service, test the pump with inert fluid under operating pressure.



(3) How to Replace Check Valves

The CHECK VALVES can be serviced or replaced individually or in pairs without disassembly of Pump Head.

WARNINGS: First purge the Pump to flush out any hazardous fluid.



CHECK VALVES are intended for use on this pump only. Do not use separately from the pump as forward flow at higher flow rates will suddenly restrict, causing a rapid increase in backpressure with resultant hose and connection bursting.

- Unscrew CHECK VALVE from head. Place the wrench (3/4 in) across the flats adjacent to the threads to be unscrewed. If placed on the flats farthest from the threads, the valve body halves may become loose.

Install new CHECK VALVES. Place the wrench (3/4 in) across the flats adjacent to the threads to be tightened into the Pump. If placed on the flats farthest from the threads, the Pump halves could become overstressed and leak under pressure.

- ❑ Disconnect Pump Head from Drive by removing 4 SOCKET HEAD-SCREWS. (See Fig. 2.)
- ❑ Disconnect BACKING PLATE from Pump Head by removing 4 PHILLIPS SCREWS with washers. (See Fig. 4.)
- ❑ With the DIAPHRAGM now loose, remove the SPACING RING segments. (See Fig. 4.)
- ❑ Remove the REAGENT HEAD (with CHECK VALVES still attached).

NOTE: If a damaged REAGENT HEAD (Part No. D-2072) must be replaced, also order the complete Service Kit (Part No. 07090-43).

- ❑ To remove the worn DIAPHRAGM, hold a screwdriver in the slot of the DIAPHRAGM shaft (at back of Pump—see Fig. 2) while simultaneously loosening the LOCKING NUT adjacent to the DIAPHRAGM. Use a 7/16 in open end wrench.

NOTE: A GAGE furnished with the service kit has such a wrench at one end—see Fig. 5.

- ❑ Replace the old DIAPHRAGM with the new one.
- ❑ To obtain maximum durability from the new DIAPHRAGM, and to prevent it from striking the REAGENT HEAD or the PUMP BODY, adjust its **height** correctly by using the GAGE provided. First, while holding the GAGE against the PUMP BODY, rotate the INPUT SHAFT (TANG) until the DIAPHRAGM is extended its maximum distance from the PUMP BODY.
- ❑ Screw the DIAPHRAGM into or out of the DIAPHRAGM SHAFT as necessary until the letter “B” on the DIAPHRAGM just touches the GAGE.

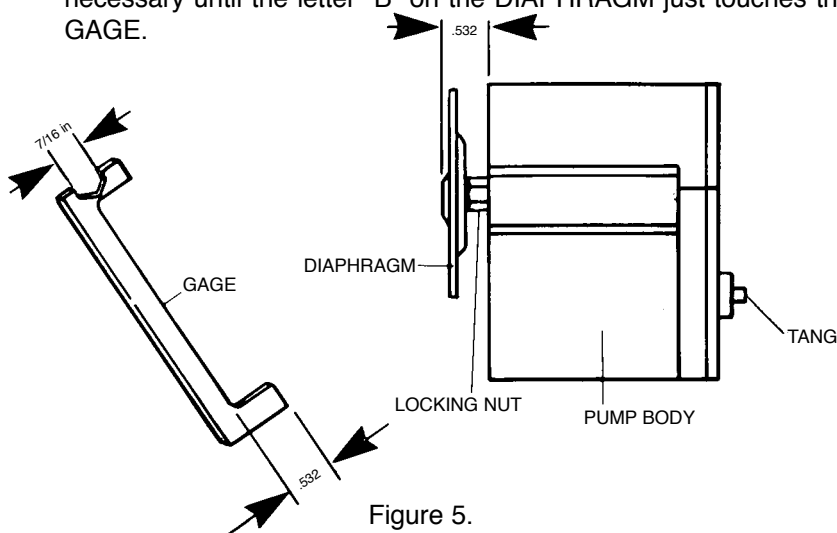


Figure 5.

Chemical Resistance of PTFE

PTFE has the highest chemical resistance classification (Excellent) for virtually all chemicals—even at high temperatures. For details about resistance and physical properties for specific chemicals consult your dealer.

WARNING: Extended pumping with halogen compounds, including perchloric acid, chloroethanol dichlorobenzines, methyl ethyl ketones, is not recommended and may cause a hazardous condition.



Metering/Dispensing Accuracy

The 07090-42 Pump delivers fluid with repeatable accuracy of better than 2% volume variation. Best accuracy is achieved under conditions of constant pressure at a preset speed with a fully flooded pump suction. A back pressure of at least 3 psig assures quick seating of CHECK VALVES and improves accuracy. For best repeatability, the Pump should be operated with **no** suction lift.

PUMP CONSTRUCTION

A rugged cast aluminum housing encloses the unique drive mechanism, composed of a double convoluted short-stroke PTFE DIAPHRAGM which flexes in response to a nutating bearing linked to a spring-loaded spool.

The PTFE REAGENT HEAD has INLET/OUTLET PORTS for the CHECK VALVES, each composed of a PTFE spring-loaded PTFE ball on a PTFE seat. Body halves will withstand pressures up to 75 psig intermittently.

WARNING: Use a pressure relief valve to prevent higher pressures.



The OUTLET PORT is positioned perpendicular to the DIAPHRAGM axis to avoid air entrapment, which can affect metering accuracy and cause reagent contamination. Minimum dead volume improves dispensing accuracy and reduces the amount of liquid trapped in pump.

The gas-purging Pump Head design permits self-priming to a minimum of 24 in of water suction dry lift. Primed wet suction lift is a minimum of 16 feet of water useful for liquid transfer applications. There's no need for a separate transfer pump when drawing liquids from the bottom of large tanks.

How Drive Mechanism Works

The drive mechanism is composed of a nutating bearing with a fixed offset drive coupled to a motor shaft. The bearing rolls against a beveled metal spool to provide a very efficient and balanced short-stroke drive mechanism. The double convoluted diaphragm (with molded-in stud) flexes with

each rotation of the nutating bearing, thus pumping fluid at a precise drive rate. This linear stroking motion imposes very low stress on the DIAPHRAGM.

NOTE: This drive mechanism never requires lubrication or cleaning.

INSTALLATION PROCEDURES

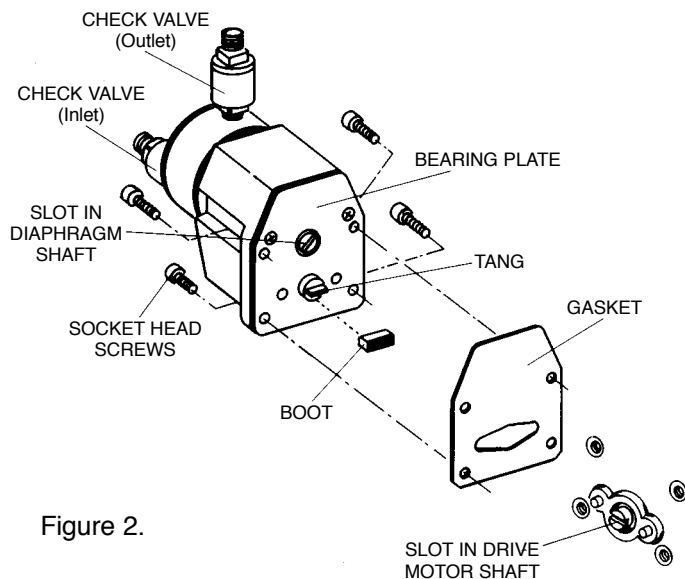


Figure 2.

(1) Mount the Pump On Drive

If your Pump is not already installed on a Drive, follow this procedure:

- Install the plastic BOOT over the TANG at the end of the pump shaft (Fig. 2). This BOOT should be inspected and replaced when worn or at 1500 hour intervals.

CAUTION: Not using the BOOT will damage the Pump.



NOTE: The BOOT with closed ends (A-3480) will fit most drives. Use of the BOOT with open ends (A-3514) may be required on some drives. Both BOOTS are supplied with the pump.



Figure 3.

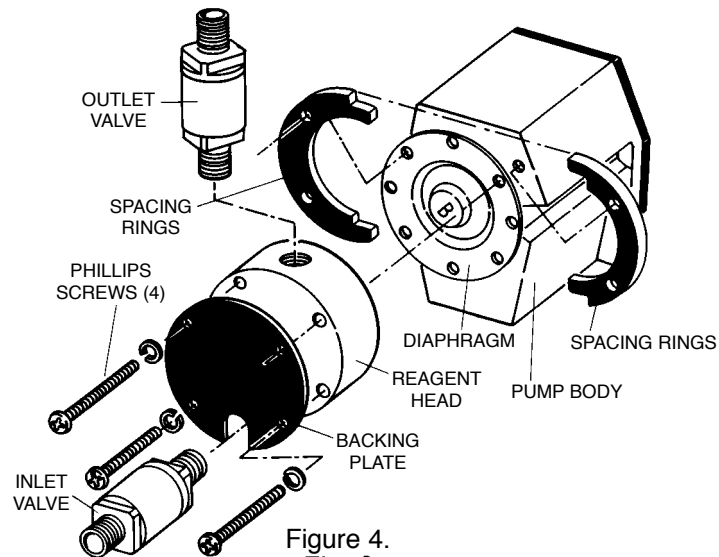


Figure 4.
Fig. 3

- Remove the SPACING RING segments.
- Remove the REAGENT HEAD, with CHECK VALVES still attached.
- Clean the surfaces with water or suitable chemicals, depending upon the fluid previously pumped.
- Unscrew the CHECK VALVES. Place the wrench across the flats adjacent to the threads to be unscrewed. If placed on the flats farthest from the threads, the valve body halves may become loose. Clean the valves. When the valves are reassembled, do not use more than 7 inch-pounds of torque. Excessive torque may overstress the threads holding the pump halves together, causing leakage when under pressure. To install the valve into the pump, place the wrench across the flats adjacent to the threads to be screwed into the pump.

WARNING: Never try to clean the PUMP BODY drive mechanism. Especially don't drop it into a solvent. And, repeat, do not autoclave the unit—this might compromise its internal lubricating qualities and lead to pump failure.



- Reassemble all components and connect Pump to the Drive unit.

(2) How to Replace Diaphragm

There's minimum pump downtime when a damaged or contaminated DIAPHRAGM must be replaced.

WARNING: Before disassembly, purge the pump. Be sure any hazardous fluid previously pumped is completely flushed out.



Troubleshooting Solutions (cont.):

Symptom	Possible Cause	Solution
V REDUCTION IN FLOW RATE: 1 - Gradually	Diaphragm fatigue	Replace Diaphragm & Check Valves
	2 - Erratically	
	(a) Dirt in system affecting valves	Clean system Install inlet filter—May require new Check Valves
	(b) Backpressure changes	Check system plumbing

SERVICE PROCEDURES

The 07090-42 Diaphragm Pump is built for long, hard use, handling the most corrosive fluids. But if wear problems occur, the DIAPHRAGM, CHECK VALVES and REAGENT HEAD can be quickly replaced to extend product life and/or restore flow capacity.

A **Service Kit** (Part No. 07090-43), ordered separately, contains:

- 1 DIAPHRAGM (including a GAGE/Wrench to aid in installation)
- 2 CHECK VALVES
- 2 Plastic BOOTS for TANG (if ordered separately, use Part No. A-3480 for closed end or Part No. A-3514 for open ends).

Following are the most common service procedures:

(1) How to Clean the Pump Head

CAUTION: DO NOT AUTOCLAVE. The use of conventional autoclave cleaning procedures is **not** recommended. Consult with your Dealer if you have special cleaning requirements.



The 07090-42 Pump is easily cleaned because it's so simple to disassemble the Pump Head after each use.

WARNING: Before disassembly, purge the pump with a suitable fluid. Be sure any hazardous material previously pumped is completely flushed out.



- Disconnect the Pump Head from Drive. Remove 4 SOCKET HEADSCREWS. (See Fig. 2.)
- Disassemble the Pump Head, (but don't remove the DIAPHRAGM). First, disconnect the BACKING PLATE by removing 4 PHILLIPS SCREWS and washers. (See Fig. 4.)

- Connect the Pump to Drive by aligning the TANG on Pump Head (including installed BOOT) with the SLOT in the motor Drive shaft.
NOTE: It may be easier to turn the shaft on the Drive unit to align with the Pump Head TANG (using a screwdriver).
- With the two shafts now connected, fasten the Pump securely to the Drive unit with the 4 (8-32 x 3/4) SOCKET HEADSCREWS furnished, using the long hex key provided.

(2) Attach Tubing Fittings

Select PTFE fittings (with internal 1/4 NPT thread) required for the expected backpressure conditions. (Consult your dealer for assistance.)

- Before attaching tubing fittings to valves, wrap 1 1/2 or 2 1/2 turns of the 4 mil thick PTFE tape around the 1/4 NPT threads on CHECK VALVES. This should provide a tight seal.

CAUTION: Don't allow any tape to protrude beyond the end of threads. Particles could get into CHECK VALVES and disrupt performance.



- DO NOT OVER-TIGHTEN PTFE THREADS AND CONNECTIONS.** PTFE has the property of "cold-flowing" when stressed. If over-tightened, PTFE threads will continue to become loose!

CAUTION: It is important to tighten two PTFE parts using the proper wrenches located as close to the joint as practical.



- Attach tubing fittings to the CHECK VALVES. Place a wrench across the outer flats (adjacent to the threads) and hold stationary to prevent rotation of valve halves (i.e., valve assembly) relative to each other. Never allow an already joined part to rotate further than previous joint, when fastening to it.

CAUTION: PTFE threads may strip or PTFE parts may break if valve body halves rotate relative to each other or if the valve rotates relative to the head. This will also cause seal failure of the CHECK VALVE.



- Tighten your female threaded fitting onto the valve using 60 oz-in (hand-tighten) of torque.

CAUTION: Exceeding rated torque may strip PTFE threads or break PTFE parts.



(3) Replacement of Valves

If a valve is to be **replaced** use a thin 1/2 in open end wrench on the valve flats closest to the pump to remove the old valve and to install the new one. Be sure to wrap 2 layers of PTFE tape on the pipe thread.

(4) Attach Tubing

The INLET and OUTLET VALVES on Pump Head are appropriately labeled.

- Attach tubing to the inlet and outlet CHECK VALVE fittings.
- Apply a clamp to secure tubing at each fitting.

WARNINGS:



CHECK VALVES are intended for use on this pump only. Do not use separately from the pump as forward flow at higher flow rates will suddenly restrict, causing a rapid increase in backpressure with resultant hose and connection bursting.

THIS PUMP IS CAPABLE OF DEVELOPING PRESSURES IN EXCESS OF THE MAXIMUM RATED 100 PSIG INTERMITTENT DUTY. APPROPRIATE PRECAUTIONS SUCH AS A PRESSURE RELIEF VALVE MUST BE INSTALLED TO PROTECT THE PUMP AND ANCILLARY CONNECTIONS FROM ACCIDENTAL OVER-PRESSURIZATION.

(5) Install Filter

Suspended particles in the fluid might cause CHECK VALVE leakage, resulting in metering inaccuracies. Install a Filter at the pump inlet, if required.

(6) Adjust Drive Speed

Adjust the variable speed Drive until the required flow rate is achieved. (Refer to instructions provided with Drive.) Typically, flow will be about 200 mL/min per 100 rpm.

7) Calibrate the Pump (if required)

If best precision is required, each metering session should begin with a flow calibration procedure. Do this in accordance with anticipated conditions of speed, temperature and pressure operation.

Allow the pump to run continuously for 5 minutes. This will ensure that any air drawn into pump during priming has passed through the DIAPHRAGM HEAD. This warmup period also allows the valves to properly seal. Also, it stabilizes operating temperatures for the drive motor and controls. During the first hour of pump/drive operation, minor warmup considerations may affect metering accuracy.

TROUBLESHOOTING GUIDE

Symptom	Possible Cause	Solution
I CLACKING NOISE	Tang BOOT worn out	Replace BOOT
II FLUID DRIPPING FROM:		
1 - Bottom of Housing	Ruptured diaphragm	Replace Diaphragm & Check Valves
2 - Check Valves	(a) Loose fittings	Remove, retape, install, hand-tighten
	(b) Loose Check Valve	Remove, retape, install, hand-tighten
	(c) Check Valve seal failure	Replace valves
	(d) Excessive back-pressure	Check/reduce backpressure
3 - Reagent Head	(a) Loose screws	Tighten screws
	(b) Head damage	Replace Head Check Diaphragm for possible replacement
III BUBBLES IN DISCHARGE LINE	(a) Fitting leaking	Remove, clean and tape fittings, reinstall, torque until tight
	(b) Dissolved gases; volatilize fluids	Increase backpressure on pump to stop outgassing or cavitation of fluid.
IV FLUID IS NOT BEING PUMPED	(a) Drive not operating	Remove pump & check drive. Consult drive manual.
	(b) Dirt in Check Valves, or plumbing problems, or failed Diaphragm, or failed Drive mechanism	Operate pump at speeds above 40 rpm. Fill pump with water and check for inlet suction. Proper suction indicates a plumbing problem. No suction indicates a pump problem: Check for fluid dripping from housing—which indicates a Diaphragm failure. If no dripping, remove Check Valves, operate pump, look into ports to see if Diaphragm is flexing. If flexing , replace Check Valves. If not flexing , the Drive Mechanism has failed—consult Dealer.