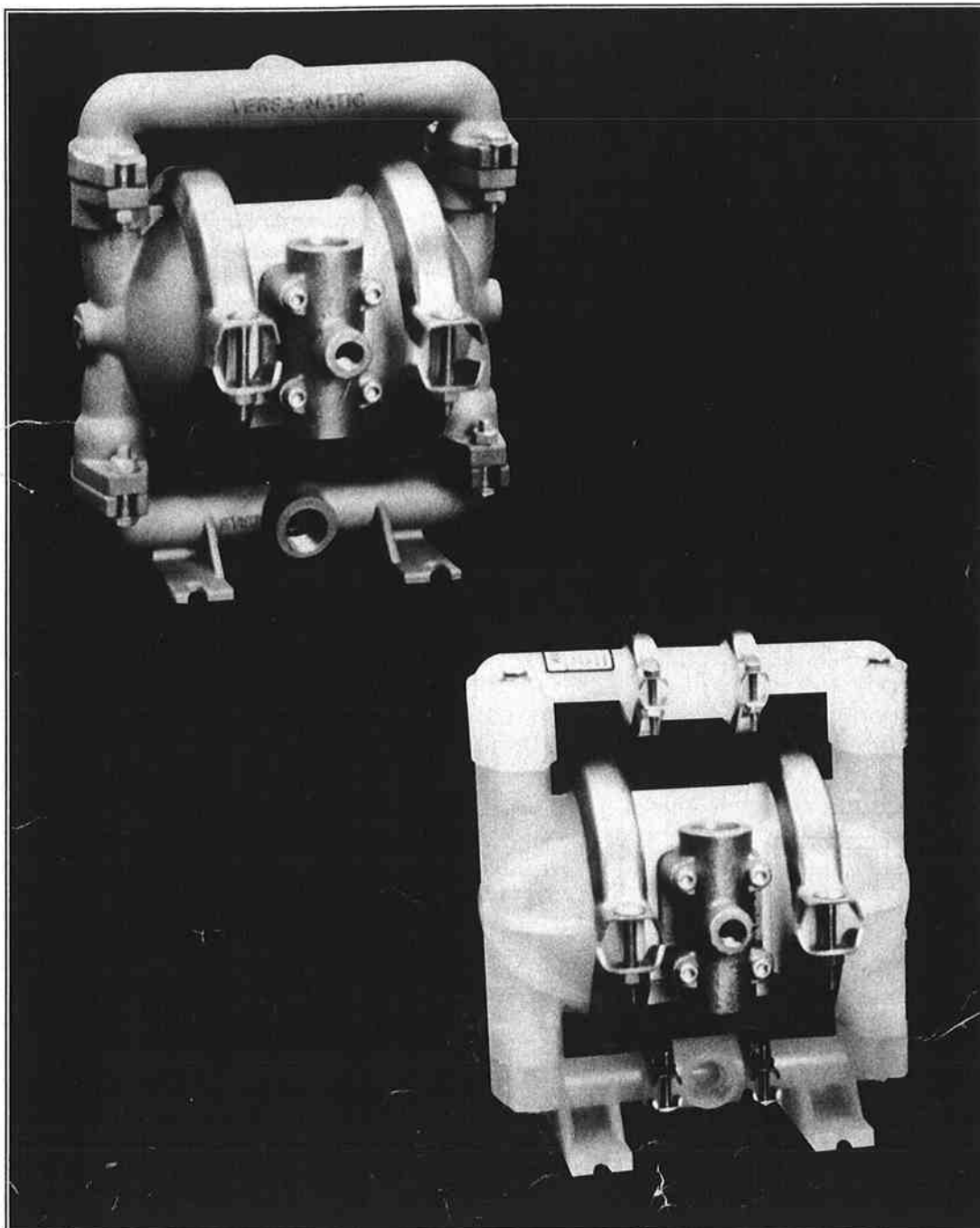


PUMPTM

VERSA-MATIC® PUMP

Operating Instructions



- Models**
- V5P**
 - V5K**
 - V5T**
 - V5S**
 - V5H**
 - V5**

Specifications and Performance

Volumes indicated on chart were determined by actually pumping water into calibrated tanks.

Versa-Matic Model V5

Flow Rate Adjustable To0-14 gpm
(53 lpm)

Port Size

Inlet0.50" Female NPT (BSP)

Discharge0.50" Female NPT (BSP)

Air Inlet0.25" NPT

Air Exhaust0.375" NPT

Suction Lift15' (4.57m) Dry/
25' (7.62m) Wet

Teflon8' (2.44m) Dry/
10' (3.04m) Wet

Max. Particle Size

(Diameter)0.062" (1.58mm)

Shipping Weights

Aluminum15 lbs (6.8 kg)

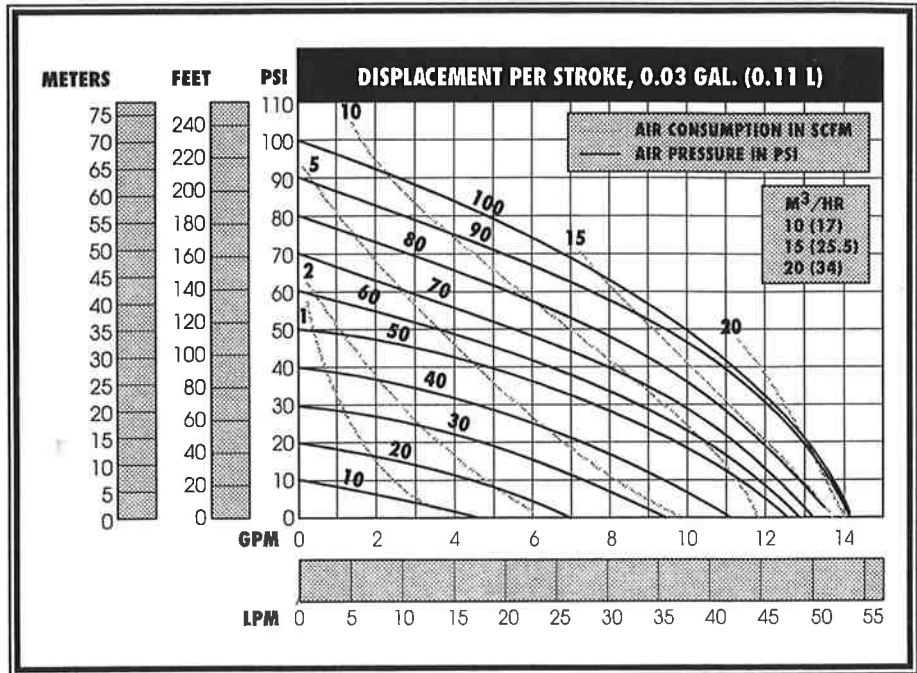
Hastelloy C V5H18 lbs (8.17 kg)

Kynar V5K10 lbs (4.54 kg)

Polypropylene V5P10 lbs (4.54 kg)

Stainless V5S18 lbs (8.17 kg)

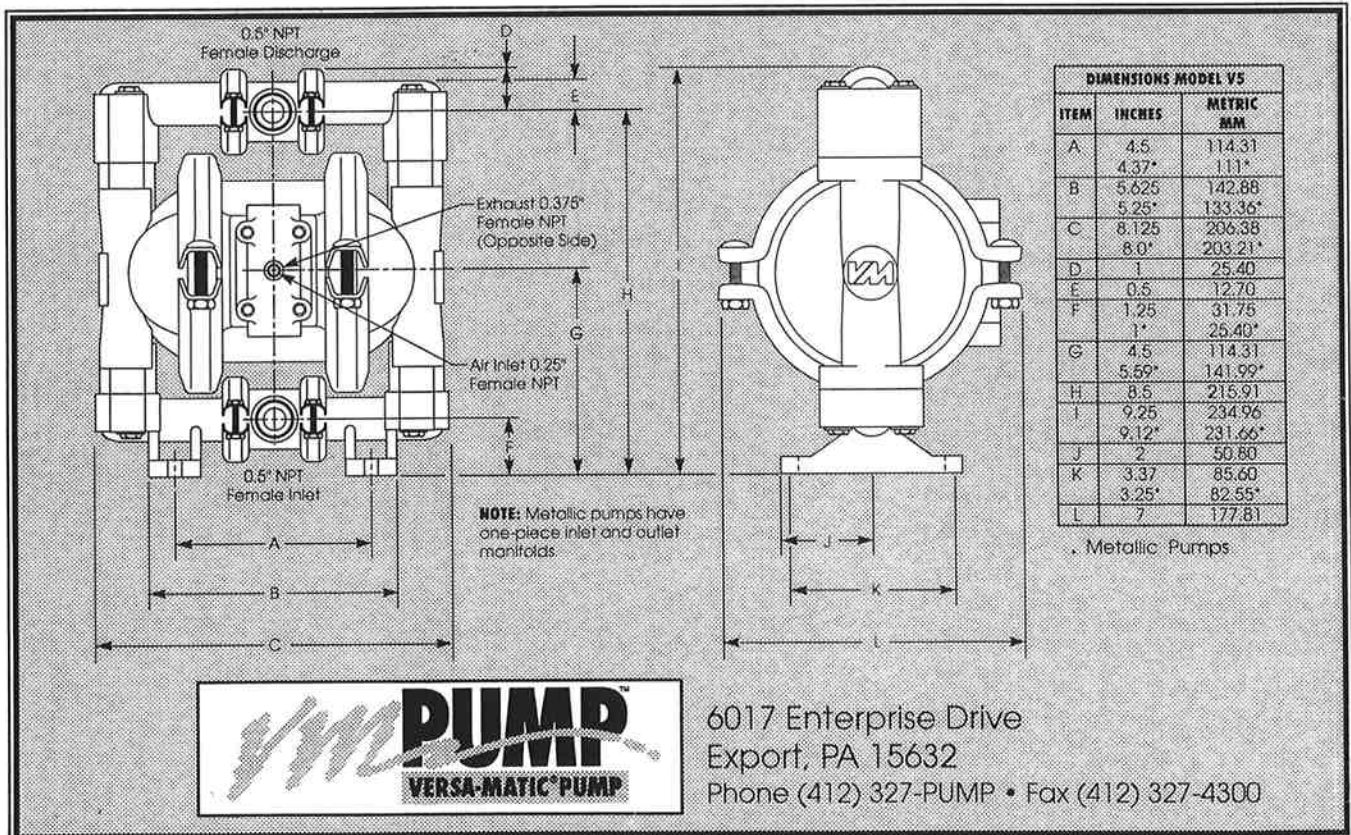
Teflon V5T12 lbs (5.45 kg)



Caution: Do not exceed 100 psig (6.8 bars) air supply pressure.

Note: For V5 pumps fitted with Tef-Matic™ diaphragms, reduce water discharge figures by 20%. Suction lift is reduced to 8' dry (2.44m) and 10' (3.04m) wet.

Teflon® and Delrin® are registered trademarks of E.I. DuPont. Kynar® is a registered trademark of Penwalt Corp. Gortex® is a registered trademark of W.L. Gore.



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Consult factory for certified drawings.

Revised 8/96

Installation and Operation of Versa-Matic Pumps

Installation

The standard model V5 pump comes with a footed base for easy mounting in permanent installations. If the pump is to be permanently submerged, a hose should be attached to the pump AIR exhaust with the exhaust piped above the liquid level to prevent the liquid from entering the pump and a strainer used on the inlet side of pump.

CAUTION: Polypropylene, kynar and teflon models may have standard delrin, polypropylene and stainless steel non-wetted parts. Therefore, chemical compatibility of the non-wetted parts should be checked before submerging the pump in corrosive liquids.

In permanent installations, the pump should be attached to plant piping using a flexible coupling on both the intake and discharge connections to reduce pipe vibration due to the reciprocating nature of the pump. To further reduce vibration, a surge suppressor next to the pump discharge may be used.

The pump has a 1/2-inch discharge and a 1/2-inch intake opening. The PVM, KVM and TVM models have female NPT threaded openings in both the inlet and discharge manifolds.

Suction pipe size should be at least 1/2 inch in diameter or even larger if highly viscous material is to be pumped. If suction hose is used, it must be of a non-collapsible, reinforced type as the V5 is capable of pulling a high vacuum. Discharge piping should be of at least 1/2 inch. It is critical, especially on the suction side of the pump, that all fittings and connections are air tight or a reduction or loss of pump suction capability will result.

THE V5 PUMP WILL PASS 1/16-inch DIAMETER SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

The inlet to the air valve is 1/4-inch female NPT. The compressed air line to the pump should be at least 1/4-inch. The air line should be large enough to supply the volume of air necessary to achieve; the desired pumping rate (see V5 pump performance curve). Use air pressure **up to** 100 psig depending upon pumping requirements.

CAUTION: Do not exceed 100 psig air supply pressure.

To control the pump discharge rate:

1. Limit the volume and/or pressure of the air supply to the pump (preferred method). A gate valve or needle valve installed at the air inlet to the pump is suggested for this purpose.
2. When the need to control the pump from a remote location exists, throttle the pump discharge by installing a valve in the discharge line of the pump. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stall out; no by-pass or pressure relief valve is needed and the pump will not be damaged.

CAUTION: DO NOT EXCEED 100 PSIG AIR SUPPLY PRESSURE.

Operating Instructions

A. The model V5 does not come equipped with a built-in lubricator and it does require an air line lubricator and filter. No alterations should be made to the pump; simply fill the air line lubricator and adjust the oil flow to a very low rate. In cold weather operation or conditions of high discharge pressure, ice may form in the air valve from moisture in the air line and eventually stop the pump. If this occurs, an ethylene-glycol type antifreeze and 10-weight non-detergent oil mixture, or a de-icer with lubricating qualities such as Tannergas can be substituted for 10-weight non-detergent oil.

B. Make sure the air line to pump is free from dirt or other foreign matter. An air line filter is required to filter out any particles that may interfere with the air valve operation.

C. Turn on the air supply to pump.

CAUTION: Be sure that the air line pressure to the pump never exceeds 100 psig. If so, a pressure regulator should be installed and set at a maximum of 100 psig.

D. Pumping volume (gpm) can be set by counting the number of strokes per minute. The V5 pumps approximately .03 gallons per stroke. A stroke is 1/2 cycle or one air exhaust.

When the pump is used for moving thick materials, check stroke rate to determine that pump is not operating at a faster rate than the material is capable of flowing, or cavitation will occur. If pump is operating at a speed too fast for available flow, reduce the volume of air to the pump until stroke rate approximates discharge volume.

E. If the material being pumped will pack or solidify, always flush the pump after use. The pump can be turned upside down and most of the liquid will drain out.

F. For pumps fitted with teflon diaphragms, limit the suction inlet pressure to a maximum of 10 psig. Limit vacuum to 16 inches mercury.

NOTE: The temperature range of Teflon diaphragms is +40°F to +200°F.

CAUTION: Wear safety glasses. When diaphragm failure occurs, material being pumped may be forced out from air exhaust.

TROUBLE SHOOTING

The pump will not run – or runs slowly

1. Examine the air inlet for dirt.
2. Check for a sticking air valve and flush it with solvent.
3. Check for a worn out air valve. If piston face in air valve is shiny instead of dull, air valve is probably worn beyond working tolerances and must be rebuilt by Versa-matic or replaced.
4. Examine the center bushing O-rings. If they are excessively worn they will not seal, and air will simply flow through pump and out of the air exhaust. Use only Versa-Matic O-rings - they are manufactured to Versa-Matic specifications.

The pump runs, but little or no material flows

1. Check for pump cavitation, slow the pump speed down to match the thickness of the material being pumped.
2. Look for sticking ball checks. If the material being pumped is not compatible with the pump, the elastomers may swell. Replace the ball checks and seats with proper elastomers.
3. Make sure all the suction connections are air tight.

The pump air valve is frozen

Check for excessive moisture in the compressed air. Either install a dryer for the compressed air or use an antifreeze such as Tannergas or Killfrost instead of 10-weight non-detergent oil.

Air bubbles in pump discharge

1. Look for a ruptured diaphragm.
2. Check the tightness of all intake fittings.
3. Check the tightness of the piston plates to the shaft.

Material comes out of the air exhaust

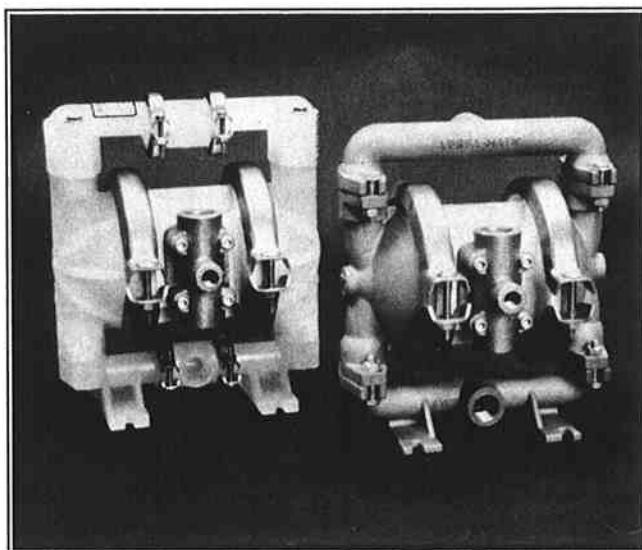
1. Inspect the diaphragm for rupture.
2. Check the tightness of the piston plates to the shaft.

Disassembly & Reassembly Instructions

CAUTION: Before beginning maintenance or repair, disconnect the compressed air line to the pump and allow the air pressure to escape from the pump. Disconnect all intake, discharge, and air lines. To drain the pump, turn it upside down and empty any fluid into a suitable container. Use safety goggles and gloves if there is corrosive or toxic liquids present.

The V5 has a 1/2" inlet and 1/2" outlet and is designed for flow up to 14 GPM. Its Air Distribution System is based upon design simplicity and proven efficiency. The Versa-Matic model V5 is available in polypropylene, PVDF and PFA models for highly corrosive applications.

NOTE: Before beginning disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly.

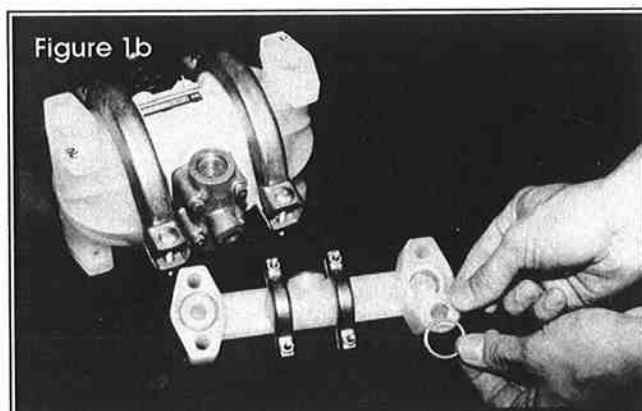
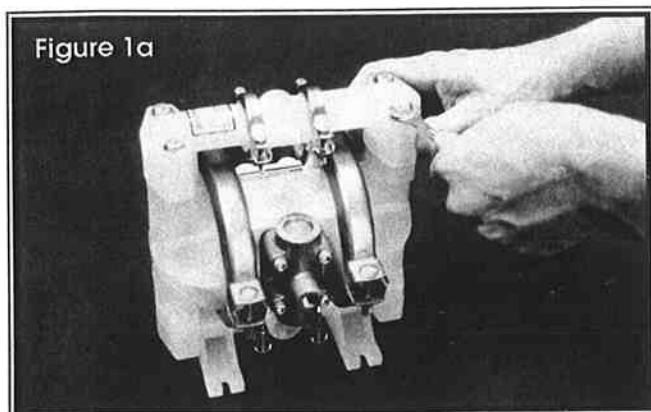


Disassembly

Step 1

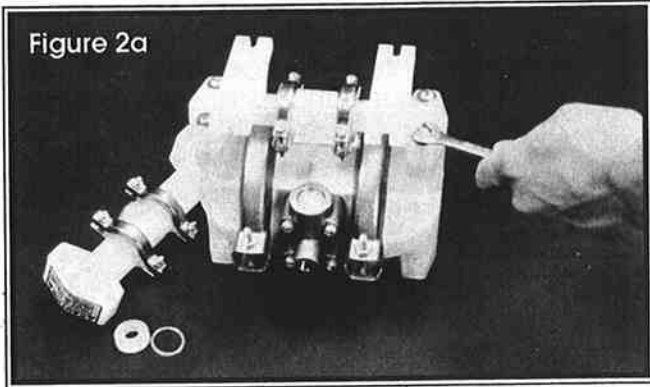
NOTE: The model used for these instructions includes thermo plastic diaphragms, balls, and seats. Models with Teflon diaphragms, balls and seats are the same except where noted. Start by removing the four bolts that fasten the discharge manifold to the main body of the pump.

(Figures 1a & 1b) The discharge valve ball seats and O-rings are now available for inspection. If the seats and balls are scratched or worn by chemical attack they should be replaced or poor vacuum will result.

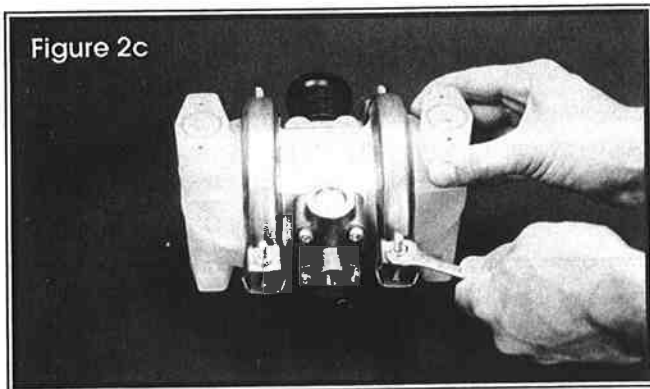


Step 2

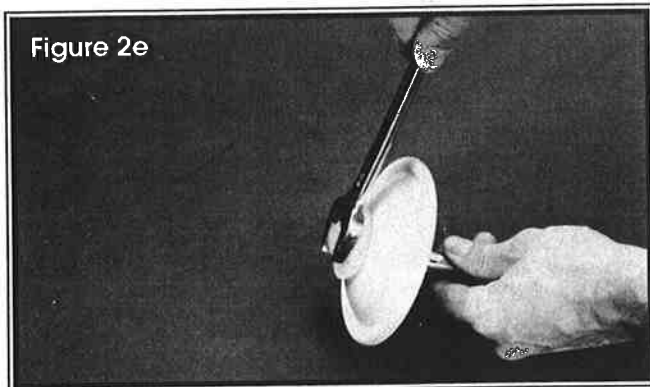
Turn the pump over and remove the four bolts that secure the inlet manifold to the main body of the pump. Remove the inlet manifold and inspect the inlet balls and seats replace if needed. (Figure 2a) If teflon O-rings are used they may need replaced as teflon has no memory and



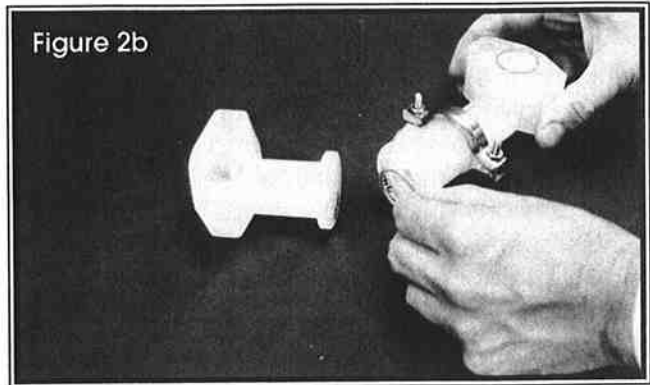
Next, remove the 4 bolts that secure the large clamps. The two water chambers can now be removed exposing the diaphragms. (Figure 2c)



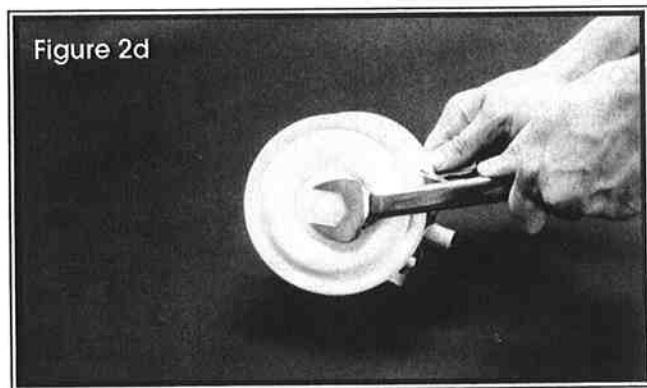
Only one piston will loosen. Remove the remaining shaft and diaphragm from the center section. It is recommended that a vise with wood blocks be used to hold the shaft while removing the piston and diaphragm (Figure 2e).



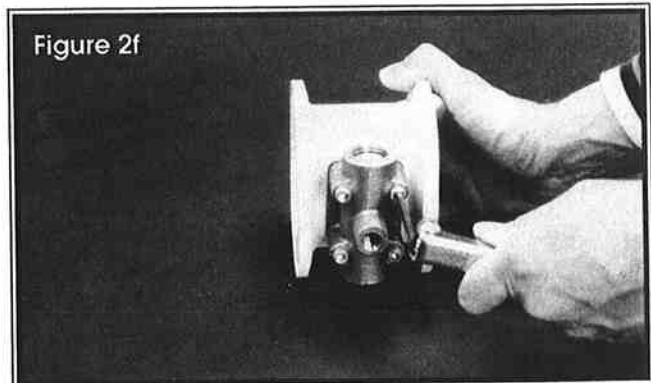
will not reseal. Normally the inlet or discharge manifolds should not be disassembled. However, if this is necessary the small bands should be completely removed and the unit reassembled. Care should be taken to align both elbows on the same plane. (Figure 2b)



Use two adjustable wrenches to loosen the outer diaphragm plates from the pump shaft. (Figure 2d)



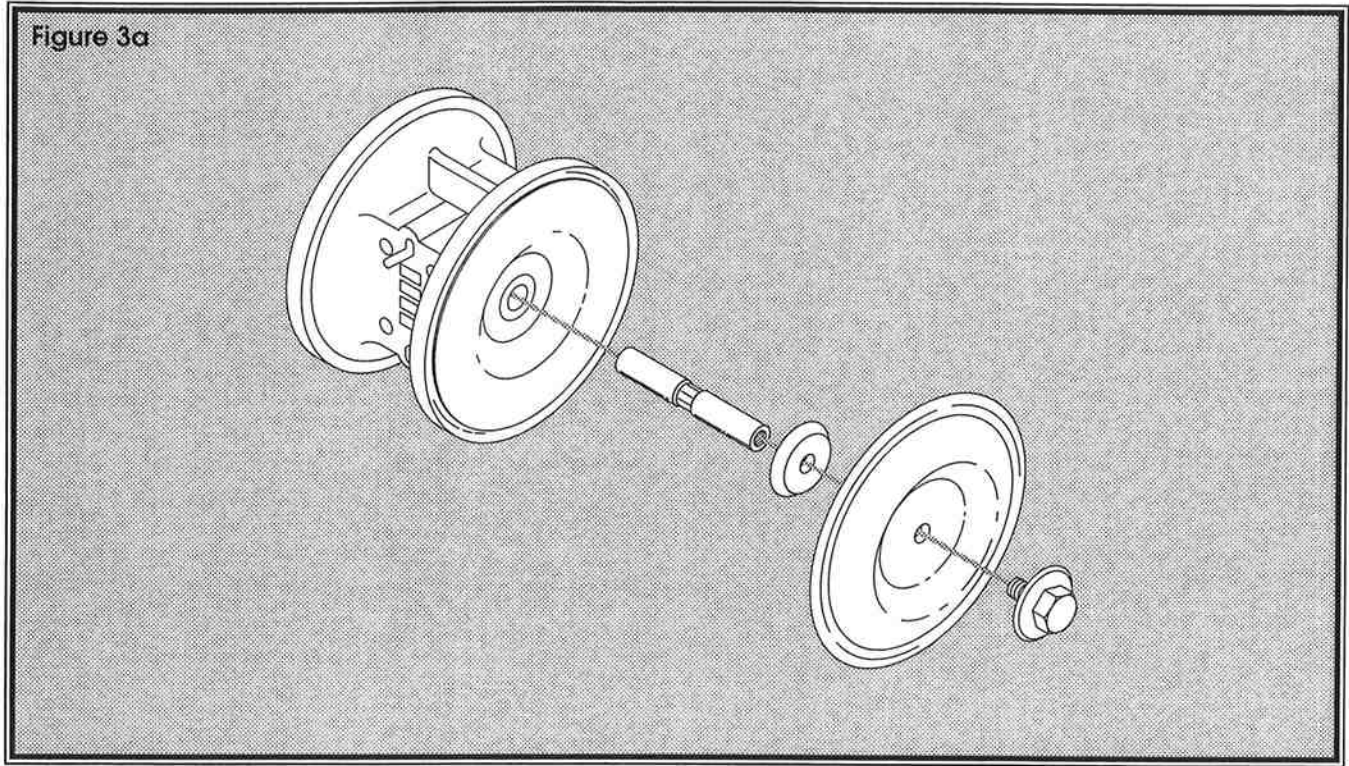
Inspect the shaft for nicks, scratches or excessive wear and replace if necessary. Remove the 4 allen head bolts that fasten the air valve to the center section (Figure 2f) Refer to page 8 for service of the air valve.



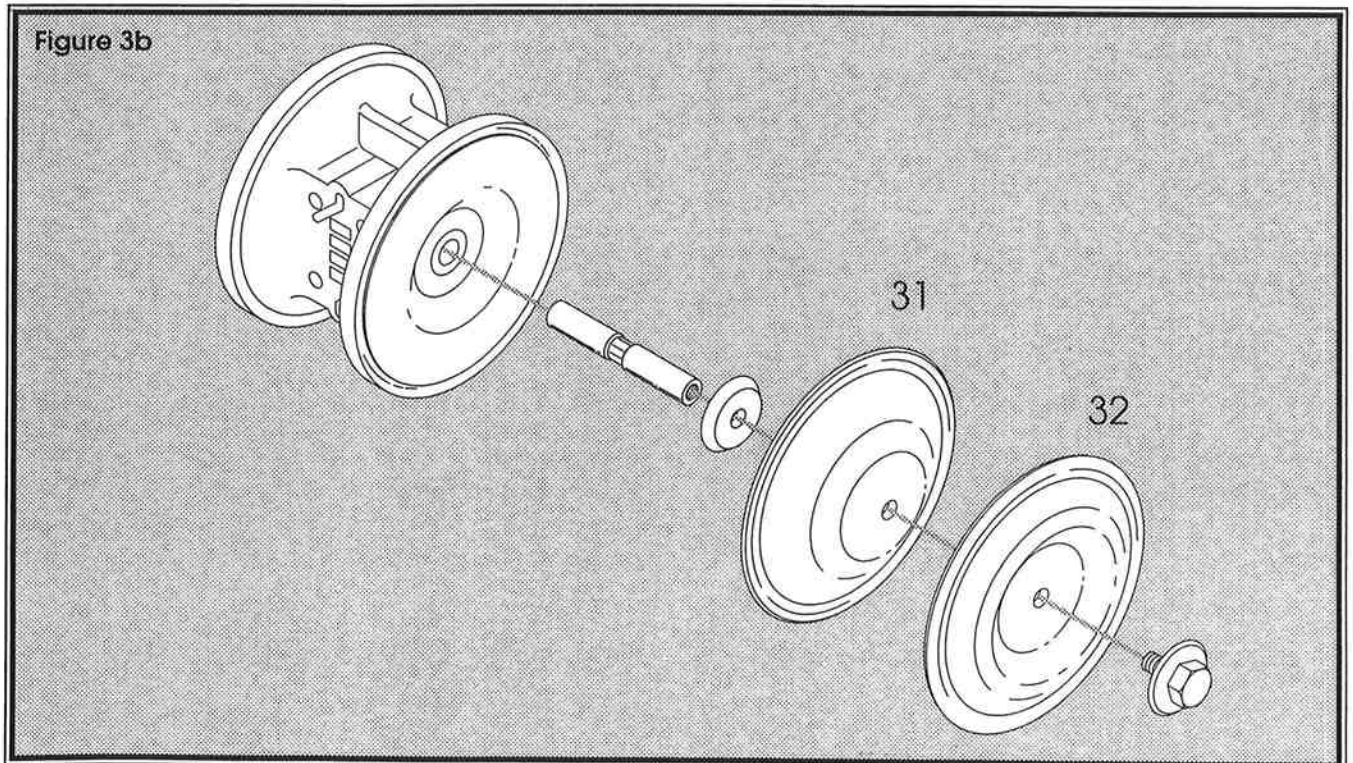
Assembly

Step 1

XL TPE diaphragms exploded view



Teflon diaphragms exploded view



Step 2

Before assembly, remove the O-rings from the center bushing and flush the center section to remove grit and contaminants. Inspect the shaft for nicks, scratches, bending or excessive wear and replace if necessary. Install new O-rings whenever servicing the center section. Be sure to lubricate the shaft with 10-weight non-detergent oil so that it will slide past the O-rings. Next, install the diaphragm and inner and outer piston on the shaft and insert shaft through center bushing (Figures 4a and 4b). Turn the center section over and install diaphragm and pistons on the other side of the shaft. Use two adjustable wrenches to tighten the outer pistons simultaneously (Figure 4c). Next install the water chambers (take note of the alignment marks) and the large clamps (Figure 4d). Teflon fitted pumps use expanded gasket material and this should be replaced before installing water chambers. (Figure 4e)

Figure 4c

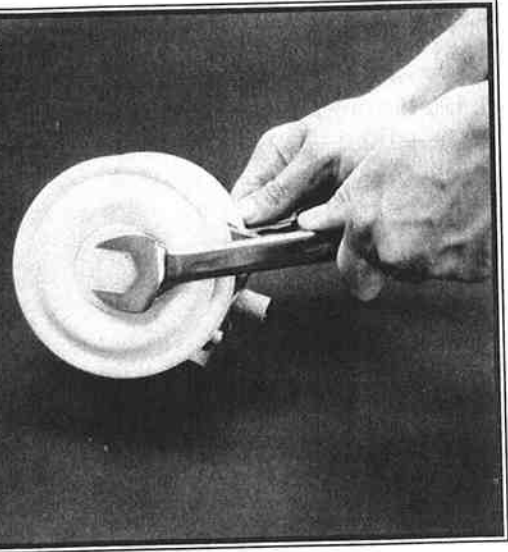


Figure 4d

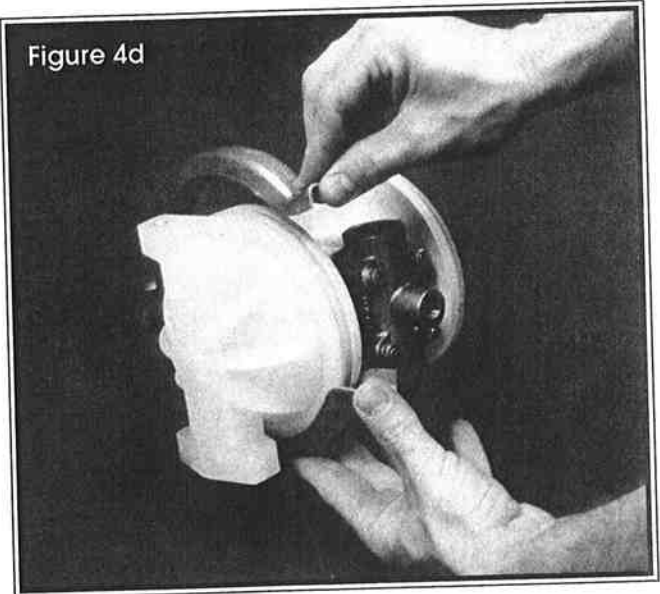


Figure 4e



Figure 4a

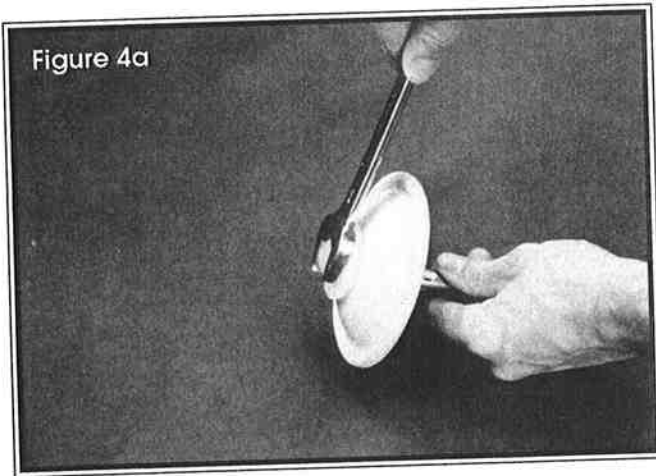
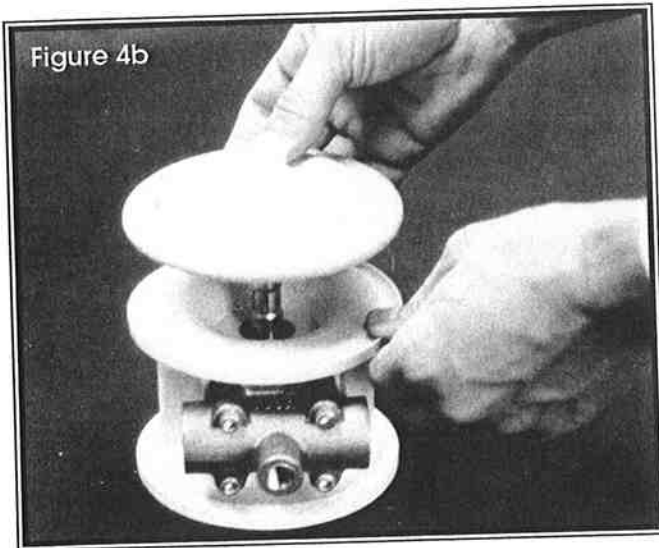


Figure 4b



Install the valve balls, seats and new O-rings in the bottom of each water chamber (Figure 4f). Install inlet manifold assembly on main body of pump align bolt holes and tighten (do not overtighten bolts! 40 in. lbs is adequate). (Figure 4g)

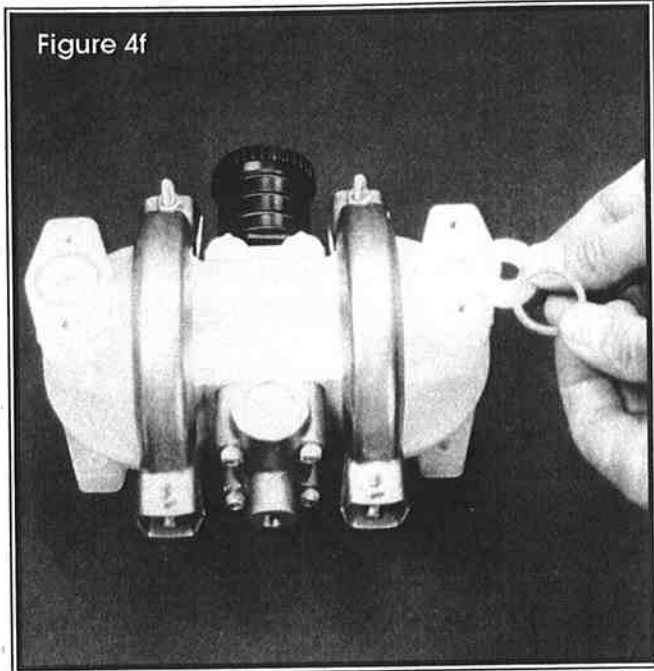


Figure 4f

CAUTION: To prevent leakage, both of the flange surfaces of the top and bottom manifolds (Figure 4h) must be aligned so that they are level and in the same planes.

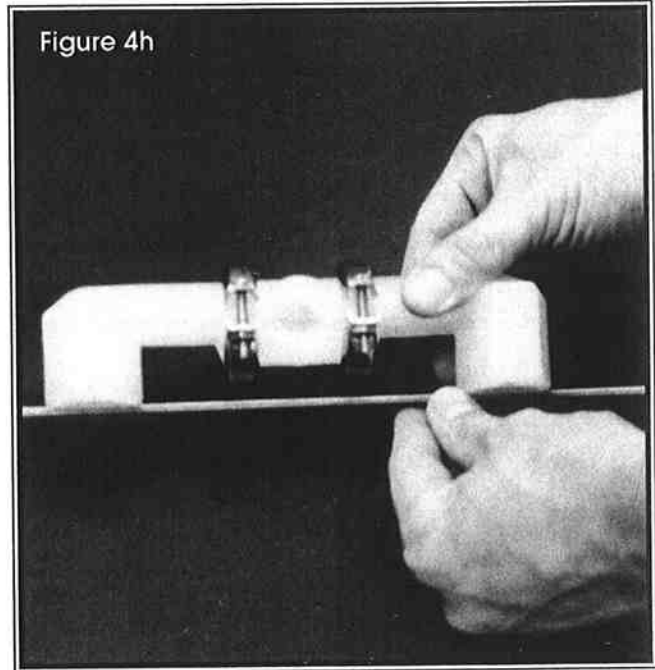


Figure 4h

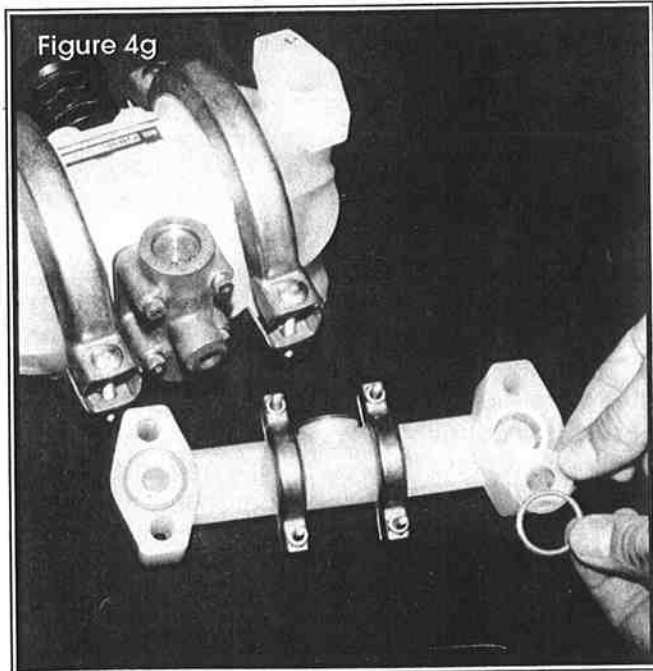


Figure 4g

Install the valve seats, O-rings and balls in the top manifold assembly (Note: beveled side of seat must always face the valve ball).

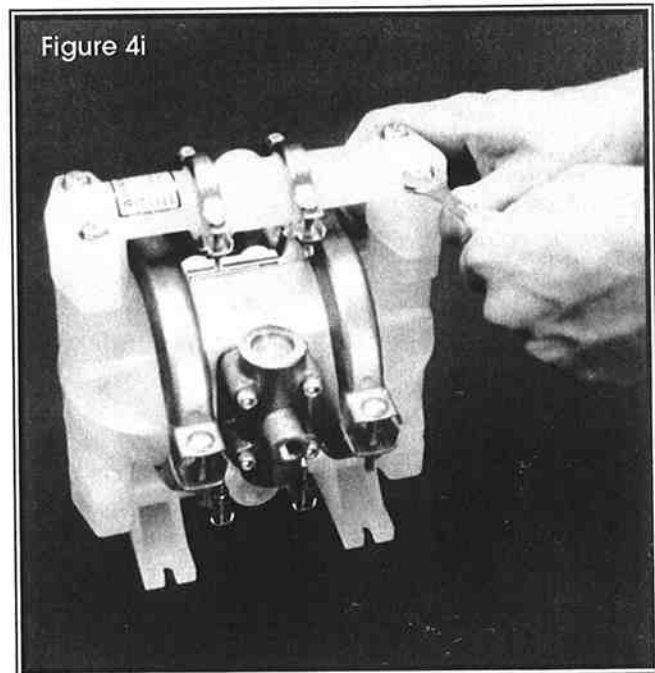


Figure 4i

Place the discharge manifold assembly on top of water chambers. Align holes and fasten with four bolts to complete pump assembly. (Figure 4i)

Air Valve & Center Section Disassembly & Reassembly Instructions

The air valve assembly consists of both the air valve body and piston and the center section. The unique design of the air valve relies only on differential pressure to effect the diaphragm shift. It is reliable and simple to maintain. The bushing in the center block, along with the diaphragm shaft cause the air valve to shift. The following procedure will ensure that the air valve will provide trouble-free service.

Air Valve Body & Piston Assembly/Disassembly

The air valve body and piston (V100A), can be disconnected from the pump by removing the four socket head cap screws (V100AS), which attach it to the center section. The piston should move freely and the ports on the face of the air valve body should align with the ports in the air valve piston. The piston should also appear to be dull, dark gray in color. If the piston appears to be a shiny aluminum color, the air valve is probably worn beyond working tolerances and should be either replaced or rebuilt.

If the piston does not move freely in the air valve, the entire air valve should be immersed in a cleaning solution.

NOTE: Do not force the piston by inserting a metal object.

This soaking should remove any accumulation of sludge and grit which is preventing the air valve piston from moving freely. If the air valve piston does not move freely after the above cleaning, the air valve should be disassembled as follows: remove the snap ring from the top end of the air valve cylinder and apply an air jet to the small hole on the opposite end of the air valve face (Figure 5c).

CAUTION: The air valve end cap may come out with considerable force. To insure safe removal of piston, muffle loose end of air valve with cloth to reduce piston ejecting at a high rate of force.

Inspect the piston and cylinder bore for nicks and scoring. Small nicks can usually be dressed out and the piston returned to service. Inspect the cylinder end cap. Make sure that the guide pin is straight and smooth or the piston will not move freely in the cylinder. New O-rings (V160U) should be installed on the end cap, assuring that proper alignment of the piston and cylinder ports is maintained. Reinstall air valve to center block of pump (Figure 5d).

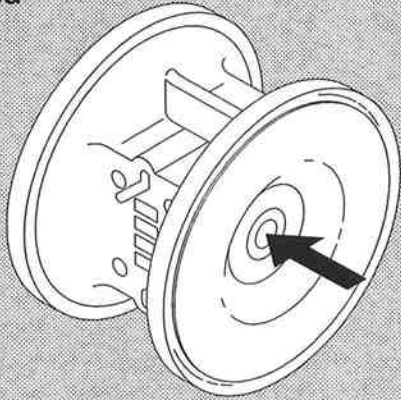
O-Ring Replacement

When the O-rings become worn or flat, they no longer provide a secure seal and must be replaced. The most common method of removal is to use an O-ring pick (available at most industrial supplies) or an ice pick if the proper tool is not available.

Center Section Assembly (V192)

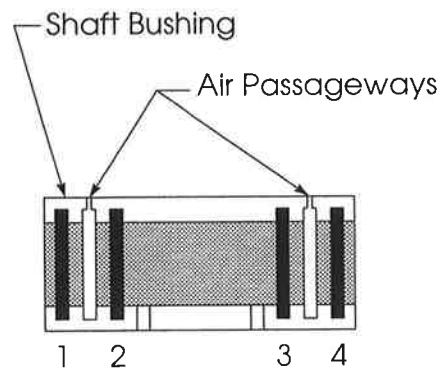
The pump's center block (V192) consists of a molded housing with a bronze bushing. The bushing has nine grooves cut on the inside diameter. There are four O-rings that fit in these grooves (Figure 5b). Since these O-rings form a part of the shifting function of the pump, it is necessary that they be located in the proper grooves. The bronze bushing is not removable. When bushing wear becomes excessive, a new section must be purchased.

Figure 5a



(See cross-sectional view - Figure 5b)

Figure 5b



Insert O-rings into these grooves

Figure 5c

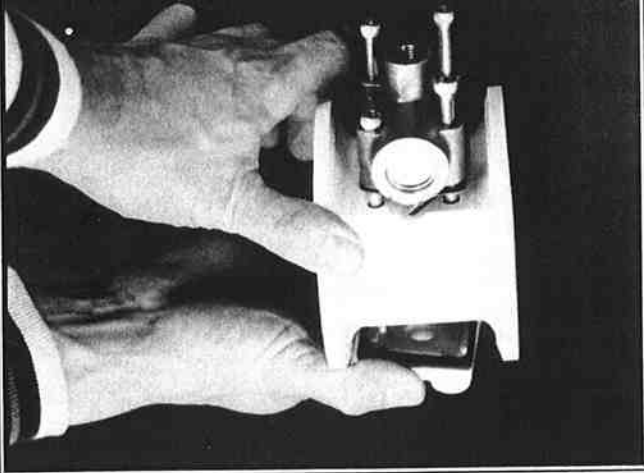


Figure 5d

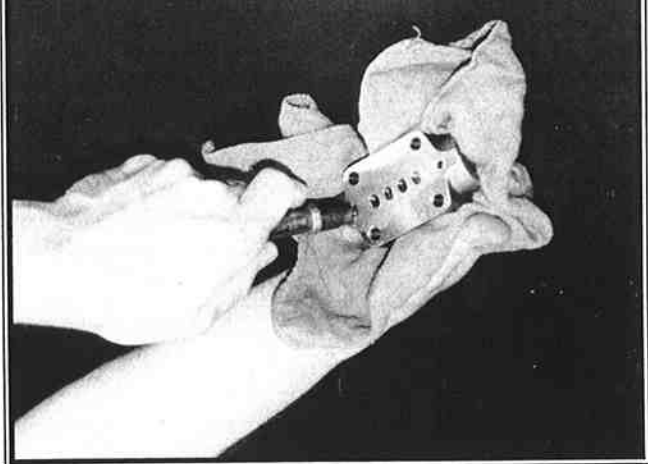
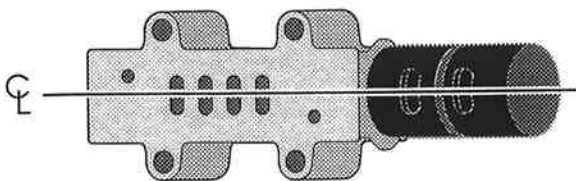


Figure 5e



V5P, V5K, V5T Engineered Plastic Pump Assembly Drawing and Parts List (8/96)

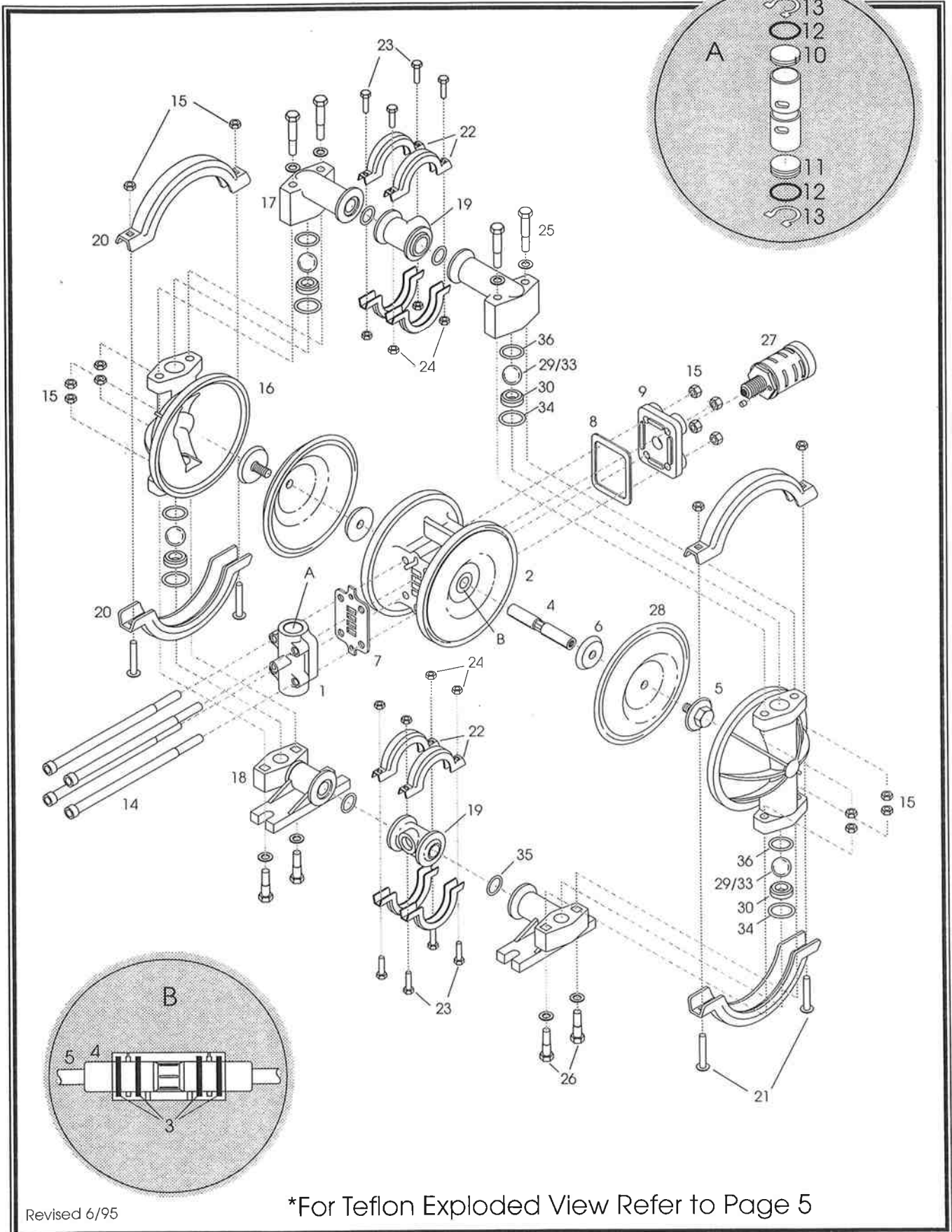
Item	Description	Qty.	Pump Model Number		
			V5P	V5K	V5T
1	Air Valve Body & Piston	1		V100A	
2	Center Section Assembly*	1		V192	
3	Center Block O-Ring	4		V192J	
4	Shaft	1		V101A	
5	Outer Piston	2	PV199B	KV199B	TV199B
6	Inner Piston	2		V199C	
7	Air Valve Gasket	1		V100B	
8	Muffler Plate Gasket	1		V192MG	
9	Muffler Plate	1		V192M	
10	End Cap w/Guide	1		V100R	
11	End Cap w/o Guide	1		V100S	
12	End Cap O-Ring	2		V100U	
13	End Cap Snap Ring	2		SV190T	
14	Air Valve Cap Screw	4		V101AS-1	
15	Hex Nut SS	16		SV169C	
16	Water Chamber	2	PV195	KV195	TV195
17	Discharge Manifold Elbow	2	PV196	KV196	TV196
18	Inlet Manifold Elbow	2	PV197	KV197	TV197
19	Manifold "T" Section	2	PV198	KV198	TV198
20	Large Clamp Band SS	2		V194	
21	Carriage Bolt	4		V194B	
22	Small Clamp Band SS	4		V198	
23	Hex Head Cap Screw	8		V198B	
24	Hex Nut	8		V198C	
25	Top Manifold Bolt and Washer	4		SV196B-1	
26	Bottom Manifold Bolt and Washer	4		SV197B-1	
27	Air Exhaust Muffler	1		VTM-3	
28	Diaphragm***	2		V193	
29	Valve Ball***	4		V111	
30	Valve Seat	4	V110P	V110K	V110TF
31	Back-Up Diaphragm**	2		V193TB	
32	Teflon Diaphragm**	2		V193TF	
33	Teflon Valve Ball	4		V111TF	
34	Valve Seat O-Ring	8	V110TES	V110TES	V110TEV
35	Manifold O-Ring	4	V198TES	V198TES	V198TEV
36	Valve Seat O-Ring (Hard Teflon)	4		V110HT	
	Teflon Gasket Kit (Not Shown)	1		V193TFG Kit	

* Includes molded in bronze bushings and O-Rings

** See Page 5, Figure 3B.

*** Available in five different elastomers

NOTE: TES = Teflon Encapsulated Silicone O-Rings
TEV = Teflon Encapsulated Viton O-Rings



Revised 6/95

*For Teflon Exploded View Refer to Page 5