

# SERVICE AND OPERATING MANUAL

**SANDPIPER**  
A WARREN RUPP PUMP BRAND



## Model ST1½-A Type 4 Model ST40-A Type 4

### PLEASE NOTE!

The photos shown in this manual are for general instruction only. Your specific model may not be shown. Always refer to the parts list and exploded view drawing for your specific model when installing, disassembling or servicing your pump.

### PRINCIPLE OF OPERATION

All Warren Rupp SANDPIPER pumps, including this Containment Duty SANDPIPER pump, operate on the same basic principle. They are designed to be powered by compressed air only which alternately pressurizes the inner side of one diaphragm chamber while simultaneously exhausting the other inner chamber. The diaphragms are connected by a common rod; when the inner side of one diaphragm chamber is pressurized, moving the diaphragm outward on a discharge stroke, the opposite diaphragm is pulled inward on a suction stroke.

Alternate pressurizing and exhausting of the diaphragm chamber is accomplished with an externally mounted pilot operated, four way, spool type, air distribution valve. When the spool is at one end of the valve body, inlet air pressure is connected to one diaphragm chamber while the other diaphragm chamber is exhausting. When the spool is moved to the opposite end of the valve body, the porting of chambers is reversed. The air distribution valve spool is moved from one end position to the other in the valve body by an internal pilot valve which alternately pressurizes one end of the air distribution valve spool while simultaneously exhausting the other. The pilot valve is positively shifted at each end of the diaphragm stroke by the diaphragm plate contacting the end of the pilot valve spool. This pushes it into position to shift the air distribution valve.

In all SANDPIPER pumps, this reciprocating diaphragm movement creates an alternating suction and discharge action in the outer diaphragm chamber and the pumped material. A manifold with a suction and discharge check valve for each chamber serves as a common inlet and outlet for the pump.

This Containment Duty SANDPIPER unit differs from other SANDPIPER units only in that it utilizes four (4) diaphragms instead of two (2). Two rod-connected diaphragms are the driver diaphragms. The other two (outermost) diaphragms are the actual pumping diaphragms. Each driver diaphragm (of neoprene or other elastomer), and the pumping diaphragm (of PTFE), are separated by a chamber filled with liquid which transmits the reciprocating motion of the driver diaphragm to the pumping diaphragm. The PTFE pumping diaphragms, in turn, create the alternating suction and discharge action in the outer diaphragm chambers, and are the only diaphragms in contact with liquid being pumped.

### INSTALLATION PROCEDURES

**CAUTION:** This pump should not be applied in pumping applications where the driver liquid coming in contact with the pumped liquid would create a hazardous condition. This contact will occur if a PTFE pumping diaphragm fails since this diaphragm normally separates the two liquids. Also note that care must be taken to guard against the operation of this unit if it has been subjected to freezing temperatures. If the driver liquid freezes, possible diaphragm failure may result.

Locate pump as close to product to be pumped as is practical to keep length of suction line and number of fittings to a minimum. **DO NOT REDUCE SUCTION LINE SIZE** except for very low flow rates or where higher velocities are required to keep pumped material in suspension in the carrying liquid.

This unit is completely self-priming from a dry start up to a static suction lift of 10 feet (3.05 meters). For priming at suction lifts in excess of 10 feet (3.05 meters), fill the pumping chambers with liquid prior to operation. **POSITIVE SUCTION HEAD IN EXCESS OF 10 FEET (3.05 METERS) OF LIQUID SHOULD ALSO BE AVOIDED FOR BEST DIAPHRAGM SERVICE LIFE.**



#### IMPORTANT

*Read these safety warnings and instructions in this manual completely, before installation and start-up of the pump. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.*



#### CAUTION

*Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Re-torque loose fasteners to prevent leakage. Follow recommended torques stated in this manual.*



#### WARNING

*Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. The discharge line may be pressurized and must be bled of its pressure.*



#### WARNING

*In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. The air exhaust must be piped to an appropriate area for safe disposition.*



#### WARNING

*Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.*

For installations involving the use of rigid piping, short flexible sections of hose are recommended between the pump and piping. This will reduce piping strains and vibration.

## FILLING THE DRIVER CHAMBERS WITH LIQUID

THE DRIVER CHAMBERS WILL BE FILLED WITH DISTILLED WATER AT THE FACTORY. IF THE INNER CHAMBER IS CAST IRON, THE UNIT IS FILLED WITH ETHYLENE GLYCOL.

If you prefer to substitute another liquid, to prevent system contamination consult the factory first to determine compatibility of the substitute with pump construction.

Follow the steps listed below to replace the liquid in the pump after disassembly or liquid loss:

1. Disconnect air supply from pump before starting any work. Remove the fill and drain plugs (¼ NPT) (.0635 cm) from the driver chambers. After the chambers are completely drained of all liquid, replace the drain plugs and tighten them securely. **NOTE:** Use thread sealant on plug threads.

2. Remove the two large (1 NPT) (2.54 cm) pipe plugs (one on each side) located in the rear of the innermost air chambers.

3. Determine which side of the pump is on the discharge stroke and which side is on the suction stroke by checking the positions of the diaphragm assemblies. The cast inner diaphragm plate closest to the pump intermediate housing, or centerline, is the chamber in the suction stroke position. The opposite chamber, with cast inner diaphragm plate away from unit centerline, is in the discharge stroke position. **NOTE:** The diaphragm assemblies (cast inner diaphragm plates) are visible through the two tapped holes in the inner chambers from which the two large pipe plugs were removed.

4. Fill the driver chamber on the suction side of the pump with 1.20 liters or 40 to 41 fluid oz. by volume accuracy to 1 oz. (28.41 ml) with the driver liquid chosen for use. The driver liquid chambers must be filled with the correct amount of the driver liquid as too little or too much liquid can cause premature diaphragm failure and erratic pumping.

5. After filling, the liquid will not come all the way to the top of the filling hole. Use a screwdriver or similar tool to apply leverage on the inner diaphragm plate (diaphragm assembly) forcing the driver diaphragm on the side you have just filled partially through its discharge stroke until the liquid level in the chamber you are filling comes to the top of the fill hole. This displaces any air in the chamber. **CAUTION:** Do not pry on or damage the elastomer diaphragm while performing this step of the filling instructions.

6. Re-plug the fill hole and tighten securely. **NOTE:** Use thread sealant on plug threads and tighten only until snug.

7. Using a screwdriver or similar tool apply leverage on the inner diaphragm plate (diaphragm assembly), on the side just filled, forcing the pump to “shift” or reverse diaphragm positions.

8. Follow steps (4) thru (6) to fill the opposite driver chamber.

9. Re-install the two large pipe plugs in the rear of the pump inner air chambers.

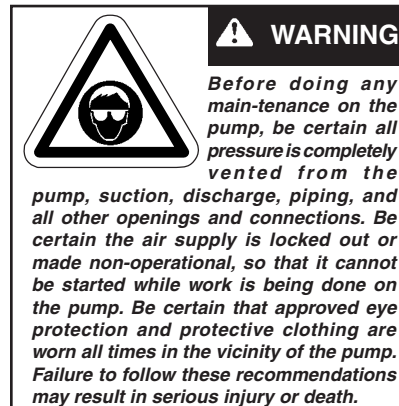
**NOTE:** Use thread sealant on plug threads.

## Revised Filling Procedure:

### For pumps with air valve 031-098-000

Insert the safety clip (210-008-330, item 61) on one side of the main air valve body and cycle the pump at 5 to 10 psi. As you face the pump, the side with the pin should be the first driver fluid reservoir to be filled. The driver diaphragm will be on a suction stroke. Pour the correct amount of liquid into the reservoir. The fluid level will not come completely to the top. Loosely install the pipe plug, with pipe dope, PTFE tape or o-ring (depending on pump model) placed on the threads. Release all air pressure to the pump and remove the safety clip. The diaphragm will relax and will come to center. Watch the loose pipe plug closely as air escapes and the driver fluid level rises. Insert the safety clip on the opposite side and add a small amount of air pressure. When you see liquid weeping out between the loose pipe plug and fill hole, tighten the pipe plug. Repeat the procedure for the unfilled chamber.

If you have a problem getting the driver fluid to come to the top, a blunt instrument can be inserted into the chamber port of the pump and pressure can manually be applied to the pumping diaphragm to cause the liquid to come to the top. **Do this carefully.** A needle valve for precision stroking control is recommended at the air inlet for this procedure. Please be aware that air left in the chambers will result in faulty operation of the pump and will cause premature pumping diaphragm failure.



ST1½-A volume for non-overlay = 1200ml / 40.6 fl. oz.

Use pipe dope on pipe plugs. Cast iron fluid chambers typically filled with normal antifreeze.

## CHAMBER PORTING

This unit is equipped with ball check valves and is furnished with side chamber porting as standard. This arrangement is suitable for most pumping applications. A conversion kit of elbows is available for optional top or bottom porting when required. Top porting is recommended for operation at extremely low flow rates and high discharge pressures, to eliminate accumulated air or vapor from the pumping chamber.

## AIR SUPPLY

DO NOT CONNECT unit to air supply in excess of 125 PSI (8.61 Bars). Install a shutoff valve in the air supply line to permit removal of the unit for servicing. When connecting the unit to an air supply of rigid piping, use a section of flexible line to the pump to eliminate piping strain.

## OPERATION

This pump has been tested prior to shipment and is ready for use as received.

Make certain that the capacity at which the pump is operating is not limited by the suction conditions involved (see installation procedures). Keep in mind that the diaphragms will move at a rate proportional to inlet air flow. If the cycling rate is allowed to exceed the rate that liquid can enter the chamber that is on the suction stroke the liquid is simply pulled apart (cavitation) and the pump's displacement is reduced. For the most efficient use of compressed air and longest diaphragm service life, always throttle the air inlet to the lowest cycling rate that does not decrease the flow rate.

Start the unit by opening the air inlet valve approximately ½ to ¾ turn. After the unit starts pumping the air inlet valve can be opened to increase the pumping capacity as desired. When further opening of the valve increases the cycling rate without an increase in capacity, cavitation exists; and the valve should be closed slightly.

## FREEZING OR ICING OF EXHAUST

Icing of air exhaust can occur under certain conditions of temperature and humidity on all compressed air powered equipment. When performance loss due to icing is experienced, use of an air dryer should eliminate this condition. Icing will be more prevalent at high discharge pressures.

## AIR EXHAUST

SANDPIPER pumps can be submerged if the materials of construction are compatible with the liquid and the exhaust is piped above the liquid level. Piping used for the exhaust should not be smaller than 1" (2.54 cm) pipe size. Reduced pipe size can restrict the exhausted air and cause reduced pump performance.

When the product being pumped is at a level above the pump (flooded suction), the exhaust should be piped to a higher level than the product in order to prevent spillage caused by siphoning.

## MAINTENANCE AFTER USE

When this pump is used to handle materials that settle out or transform from a liquid to a solid form, care must be taken after each use and during idle periods to remove or flush these materials from the pump as required. Failure to do this could result in possible premature diaphragm failure.

To drain liquid from the pump, turn the unit over on the manifold side. This position puts the chamber ports down and will allow the check balls to fall away from the seats allowing complete draining of the unit. This procedure is important to ensure complete draining in freezing weather. **NOTE:** See note concerning operation of unit in freezing conditions in "Installation Procedures".

On permanent installations the pump chambers can be drained by removing the drain plug in each outer chamber.

## MAINTENANCE NOTE

A preventative maintenance procedure should be established to check the PTFE pumping diaphragms for wear. Even though this part was proven to be good for millions of cycles, the service life will vary with each application depending on the abrasive nature of the liquid being pumped.

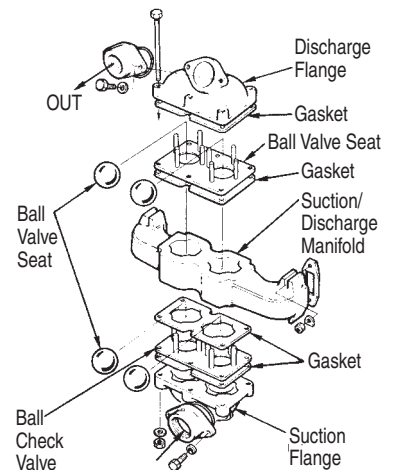


Fig. 1 Check Valve Servicing

The choice of the PTFE unit indicates that the material being handled is not compatible with the standard materials of construction (Neoprene and aluminum). If a pumping diaphragm (PTFE) were to fail, the unit would continue pumping via the driver diaphragm. The elastomeric driver diaphragm would then be exposed to the liquid and failure of this diaphragm due to attack would be the end result. At this point additional damage can occur to the air valving portion of the pump and other internal parts and castings.

## CHECK VALVE SERVICING

For best priming and most efficient pumping performance, it is important to maintain check valves and valve seats in good condition for proper sealing. Need for inspection or service of ball valves is usually indicated by poor priming, unstable cycling, reduced performance, or pump cycles but will not pump.

Inspection and service of check valves requires the removal of six bolts which provides access to all four ball valves and both, suction and discharge, valve seats. New ball check valves are 2¼" (5.715 cm) diameter and will require replacement when worn to approximately 2" (5.08 cm) diameter.

## DIAPHRAGM SERVICING

### DRIVER DIAPHRAGMS

Drain the driver liquid from the driver chamber on the side to be serviced. This is accomplished by removing the drain plug in the bottom of the driver chamber. Remove the four (4) flange nuts that secure the manifold assembly to the pump chambers. Remove the manifold assembly from the pump. Remove the eight (8) hex nuts that secure the inner pumping diaphragm chamber assembly to the driver inner diaphragm chamber and remove the assembly by pulling axially off the studs. This will permit a quick inspection of the PTFE pumping diaphragm as well as the driver diaphragm. It is not required that the pumping diaphragm chambers be separated to get to the driver diaphragms.

To remove the driver diaphragm, loosen the diaphragm assembly by turning it out of the shaft using a ¾" (.9525 cm) Allen wrench. Once the assembly has turned, it can be turned out by hand by use of the diaphragm. Removal of the opposite pumping chamber assembly will allow removal of the second driver diaphragm assembly and the shaft as a unit. The interior components consisting of the shaft seals and sleeve bearing are now accessible for inspection or service as required.

To disassemble the driver diaphragm assemblies, clamp the inner diaphragm plate around the outer diameter in a vise to hold it while you turn the center screw loose from the back plate and the assembly will come apart.

To remove the shaft from a diaphragm assembly, hold the shaft in a clamping device making sure to protect the shaft surface so as not to scratch or mar it in any way. Then the diaphragm assembly will turn loose using an Allen wrench ¾" (.9525 cm) on the center screw.

All procedures for reassembling the diaphragms are just in reverse of previous instructions for disassembly. The diaphragms are to be installed with their natural bulge outward or toward the outer diaphragm plate. Make sure that the inner diaphragm plate is installed with the flat face against the diaphragm.

After all the components are in position in a vise and hand tightened, tighten with a wrench to approximately 45 Ft./Lbs. (61.01 Newton meters) torque reading. After each driver diaphragm assembly has been made thread one assembly into the shaft. Install this subassembly into the pump and secure it by placing the pumping chamber assembly over it and secure it in place with the eight (8) hex nuts. This will hold the diaphragm assembly in place while the opposite side is installed. Make sure the last diaphragm assembly is torqued into the shaft at 30 Ft./Lbs. (40.67 Newton meters). This final torquing will lock the diaphragm assemblies together. Place the remaining pumping chamber assembly on the open end and secure it by tightening the nuts gradually and evenly.

### PUMPING DIAPHRAGMS

It is recommended that the above procedure be followed to the point of removing the pumping chamber assembly from the unit. Remove the hex nuts and capscrews that secure the assembly together and lift off the outer chamber from the assembly. This exposes the PTFE pumping diaphragm and allows access to the o-ring seal behind it.

The re-assembly is just in reverse of the above as follows: Install the o-ring seal in the groove provided on the inner chamber. Replace the PTFE diaphragm and place the outer chamber on the assembly making sure that the chambers inlet-outlet port centerline is perpendicular to the centerline formed by the fill and drain plugs in the inner chamber. Replace all fasteners that secure the assembly together and torque them at 33 Ft./Lbs.

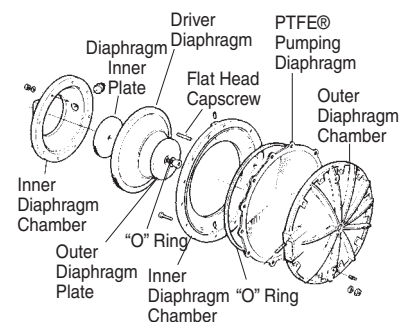


Fig. 2 Diaphragm Servicing

(44.74 Newton meters) alternating from one side to the other in the process. Do not overtighten these bolts due to the nature of PTFE to cold flow.

Reinstall the pumping chamber assembly on the pump as it was removed and fill with the driver liquid as called out in this text. After complete re-assembly the unit should be tested prior to installation on the job simply to make sure the capscrews and hex nuts are torqued down properly to ensure no leakage around the PTFE diaphragm surfaces.

## **A NOTE ABOUT AIR VALVE LUBRICATION**

The SANDPIPER pump's pilot valve and main air valve assemblies are designed to operate WITHOUT lubrication. This is the preferred mode of operation. There may be instances of personal preference, or poor quality air supplies when lubrication of the compressed air supply is required. The pump air system will operate with properly lubricated compressed air supplies. Proper lubrication of the compressed air supply would entail the use of an air line lubricator (available from Warren Rupp) set to deliver one drop of 10 wt., non-detergent oil for every 20 SCFM of air the pump consumed at its point of operation. Consult the pump's published Performance Curve to determine this.

It is important to remember to inspect the sleeve and spool set routinely. It should move back and forth freely. This is most important when the air supply is lubricated. If a lubricator is used, oil accumulation will, over time, collect any debris from the compressed air. This can prevent the pump from operating properly.

Water in the compressed air supply can create problems such as icing or freezing of the exhaust air causing the pump to cycle erratically, or stop operating. This can be addressed by using a point of use air dryer to supplement a plant's air drying equipment. This device will remove excess water from the compressed air supply and alleviate the icing or freezing problem.

## **ESADS: EXTERNALLY SERVICEABLE AIR DISTRIBUTION SYSTEM**

Please refer to the exploded view drawing and parts list in the Service Manual supplied with your pump. If you need replacement or additional copies, contact your local Warren Rupp Distributor, or the Warren Rupp factory Literature Department at the number shown below. To receive the correct manual, you must specify the MODEL and TYPE information found on the name plate of the pump.

## **MODELS WITH 1" SUCTION/DISCHARGE OR LARGER, AND METAL CENTER SECTIONS**

The main air valve sleeve and spool set is located in the valve body mounted on the pump with four hex head capscrews. The valve body assembly is removed from the pump by removing these four hex head capscrews.

With the valve body assembly off the pump, access to the sleeve and spool set is made by removing four hex head capscrews (each end) on the end caps of the valve body assembly. With the end caps removed, slide the spool back and forth in the sleeve. The spool is closely sized to the sleeve and must move freely to allow for proper pump operation. An accumulation of oil, dirt or other contaminants from the pump's air supply, or from a failed diaphragm, may prevent the spool from moving freely. This can cause the spool to stick in a position that prevents the pump from operating. If this is the case, the sleeve and spool set should be removed from the valve body for cleaning and further inspection.

Remove the spool from the sleeve. Using an arbor press or bench vise (with an improvised mandrel), press the sleeve from the valve body. Take care not to damage the sleeve. At this point, inspect the o-rings on the sleeve for nicks, tears or abrasions. Damage of this sort could happen during assembly or servicing. A sheared or cut o-ring can allow the pump's compressed air supply to leak or bypass within the air valve assembly, causing the pump to leak compressed air from the pump air exhaust or not cycle properly. This is most noticeable at pump dead head or high discharge pressure conditions. Replace any of these o-rings as required or set up a routine, preventive maintenance schedule to do so on a regular basis. This practice should include cleaning the spool and sleeve components with a safety solvent or equivalent, inspecting for signs of wear or damage, and replacing worn components.

To re-install the sleeve and spool set, lightly lubricate the o-rings on the sleeve with an o-ring assembly lubricant or lightweight oil (such as 10 wt. air line lubricant). Press the set into the valve body easily, without shearing the o-rings. Re-install one end cap, gasket and bumper on the valve body. Using the arbor press or bench vise that was used in disassembly, press the sleeve back into the valve body. You may have to clean the surfaces of the valve body where the end caps mount. Material may remain from the old gasket. Old material not cleaned from this area may cause air leakage after reassembly. Take care that the bumper stays in place allowing the sleeve to press in all the way. Re-install the spool, the opposite end cap, gasket and bumper on the valve body. After inspecting and cleaning the gasket surfaces on the valve body and intermediate, re-install the valve body on the pump using new gaskets. Tighten the four hex head capscrews evenly and in an alternating cross pattern.

## **PILOT VALVE**

This assembly is reached by removing the air distribution valve body from the pump and lifting the pilot valve body out of the intermediate housing. Follow the instruction above for the air distribution valve when servicing the pilot valve.

When reinserting an externally serviceable pilot valve, push both plungers out of the path of the pilot valve so that they and the pilot valve are not damaged.

**Service Note:** If a problem arises with the pilot valve, it is usually corrected by replacing only o-rings. Always grease the spool prior to inserting into the sleeve. If the sleeve is removed from the body, reinsertion must be from the same side it was removed from, the chambered side. Again, grease the o-rings so that it slides into the body. Make sure the retaining ring has securely been inserted around the sleeve.

**Service Note:** When re-installing pilot valve (Item 6), make sure that plunger pins (Item 5) are both pushed as far as possible in, toward the diaphragms. Large head as close to casting as possible; otherwise, these items may be damaged.

## **PILOT VALVE ACTUATOR**

The bushings for the pilot valve actuators are threaded into the intermediate bracket from the outside. The plunger may be removed for inspection or replacement from the inside by removing the air distribution valve body and the pilot valve body from the pump. The plungers should be visible through the intermediate from the top. Depending on their position, you may find it necessary to use a fine piece of wire to pull them out. Under rare circumstances, it may be necessary to replace the o-ring seal.

To replace the o-ring, the bushing can be turned out through the inner chamber by removing the outer chamber assembly to reach the bushing.

## **IMPORTANT**

This pump is pressurized internally with air pressure during operation—always make certain all bolting is in good condition and that all of correct bolting is reinstalled during assembly.

## **WARRANTY**

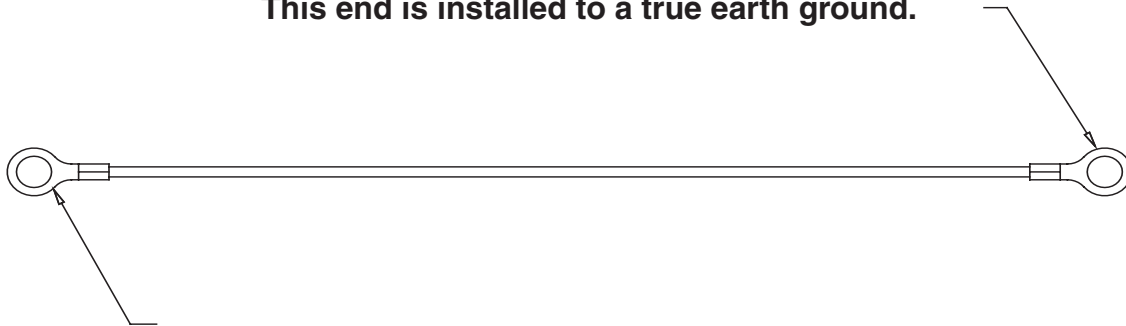
This unit is guaranteed for a period of five years against defective material and workmanship.

# Grounding The Pump

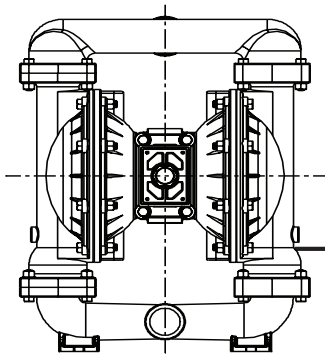
**⚠ WARNING ⚠**

*Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.*

This end is installed to a true earth ground.



This end is fastened to the pump hardware.



This 8 foot long (244 centimeters) Ground Strap, part number 920-025-000 can be ordered as a service item.

To reduce the risk of static electrical sparking, this pump must be grounded. Check the local electrical code for detailed grounding instruction and the type of equipment required, or in the absence of local codes, an industry or nationally recognized code having jurisdiction over specific installations.



# SERVICE AND OPERATING MANUAL

## Model ST1 1/2-A Type 4

## Model ST40-A Type 4

SPILL PREVENTION

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
1	070-006-170	Bearing, Sleeve	2
2	114-002-156	Bracket, Intermediate	1
	114-002-010	Bracket, Intermediate	1
3	<b>720-004-360</b>	<b>Seal, U-Cup</b>	<b>2</b>
4	<b>135-008-000</b>	<b>Bushing, Threaded (with O-Ring)</b>	<b>2</b>
5	<b>620-004-114</b>	<b>Plunger, Actuator</b>	<b>2</b>
6	<b>095-073-000</b>	<b>Pilot Valve Body Ass'y.<sup>1</sup></b>	<b>1</b>
6-A	095-070-551	Pilot Valve Body	1
6-B	755-025-000	Sleeve (with O-Ring)	1
6-C	560-033-360	O-Ring (Sleeve)	4
6-D	775-026-000	Spool (with O-Ring)	1
6-E	560-023-360	O-Ring (Spool)	2
6-F	675-037-080	Retaining Ring	1
7	360-041-379	Gasket, Valve Body	1
8	560-001-360	O-Ring (Sold with Item 4)	2
9	530-036-000	Muffler, Exhaust	1
10	095-043-156	Body, Valve	1
	095-043-010	Body, Valve	1
11	<b>132-014-358</b>	<b>Bumper, Valve Spool</b>	<b>2</b>
12	<b>165-066-010</b>	<b>End Cap Assembly</b>	<b>2</b>
13	<b>360-048-425</b>	<b>Gasket, Valve Body</b>	<b>1</b>
14	<b>360-010-425</b>	<b>Gasket, End Cap</b>	<b>2</b>
15	<b>560-020-360</b>	<b>O-Ring</b>	<b>6</b>
16	<b>031-066-000</b>	<b>Sleeve &amp; Spool Set</b>	<b>1</b>
17	170-032-115	Capscrew, Hex Hd., 1/4-20 Size	8
18	170-045-115	Capscrew, Hex Hd., 5/16-18 Size	4
19	<b>132-002-360</b>	<b>Bumper, Diaphragm Plate</b>	<b>2</b>
20	<b>560-022-360</b>	<b>O-Ring</b>	<b>2</b>
21	<b>685-007-120</b>	<b>Rod, Diaphragm</b>	<b>1</b>
22	196-029-156	Chamber, Inner Diaphragm	2
	196-029-015	Chamber, Inner Diaphragm	2
23-1	115-062-080	Bracket, Foot, Left Hand	2
23-2	115-062-080	Bracket, Foot, Right Hand	2
24	612-052-157	Plate, Inner Diaphragm	2
	612-052-010	Plate, Inner Diaphragm	2
25	612-096-110	Plate, Outer Diaphragm	2
26	170-024-115	Capscrew, Hex Hd., 7/16-14 Size	8
27	900-006-115	Washer, Lock 7/16 Size	48
28	618-007-115	Plug, Pipe 1 NPT Size	2
29	286-005-365	Diaphragm	2
	286-005-364	Diaphragm	2
	286-005-363	Diaphragm	2
30	902-003-000	Stat-O Seal	2
31	196-028-156	Chamber, Driver	2
	196-028-010	Chamber, Driver	2
32	807-033-115	Stud 7/16-14 Size	16
34	545-007-115	Nut, Hex 7/16-14 Size	40
35	170-058-115	Capscrew, Hex Hd. 7/16-14 Size	4
36	170-060-115	Capscrew, Hex Hd. 7/16-14 Size	20
37	618-003-110	Plug, Pipe 1/4 NPT Size	4
38	560-043-360	O-Ring	2
	560-043-363	O-Ring	2
	560-043-364	O-Ring	2
39	807-017-115	Stud 7/16-14 Size	4
40	170-006-330	Capscrew, Hex Hd., 3/8-16 Size	4

Repair Parts shown in **bold face (darker) type** are more likely to need replacement after extended periods of normal use. They are readily available from most Warren Rupp distributors. The pump owner may prefer to maintain a limited inventory of these parts in his own stock to reduce repair downtime to a minimum.

**IMPORTANT:** When ordering repair parts always furnish pump model number, serial number and type number.

### MATERIAL CODES The Last 3 Digits of Part Number

- 000...Assembly, sub-assembly; and some purchased items
- 010...Cast Iron
- 015...Ductile Iron
- 025...Music Wire
- 080...Carbon Steel, AISI B-1112
- 100...Alloy 20
- 110...Alloy Type 316 Stainless Steel
- 111...Electropolished Stainless Steel
- 112...Alloy "C"
- 114...303 Stainless Steel
- 115...302/304 Stainless Steel
- 120...416 Stainless Steel (Wrought Martensitic)
- 148...Hardcoat Anodized Aluminum
- 150...6061-T6 Aluminum
- 151...6063-T6 Aluminum
- 154...Almag 35 Aluminum
- 155 or 156...356-T6 Aluminum
- 157...Die Cast Aluminum Alloy #380
- 159...Anodized Aluminum
- 162...Brass, Yellow, Screw Machine Stock
- 170...Bronze, Bearing Type, Oil Impregnated
- 180...Copper Alloy
- 330...Plated Steel
- 331...Chrome Plated Steel
- 332...Electroless Nickel Plated
- 335...Galvanized Steel
- 356...Injection Molded Hytrel
- 357...Rupplon (Urethane Rubber)
- 360...Buna-N Rubber. Color coded: RED
- 363...Viton (Fluorel). Color coded: YELLOW
- 364...E.P.D.M. Rubber. Color coded: BLUE
- 365...Neoprene Rubber. Color coded: GREEN
- 366...Food Grade Nitrile. Color coded: WHITE
- 375...Fluorinated Nitrile
- 379...Conductive Nitrile
- 384...Conductive Neoprene
- 405...Cellulose Fibre
- 408...Cork and Neoprene
- 425...Compressed Fibre
- 440...Vegetable Fibre
- 500...Delrin 500
- 501...Delrin 570
- 520...Injection Molded PVDF, Natural Color, Food Grade/USDA Acceptable
- 540...Nylon "Foodgrade"
- 550...Polyethylene
- 551...Polypropylene
- 555...PVC
- 580...Ryton
- 600...PTFE (virgin material) Tetrafluoroethylene (TFE)
- 603...Blue Gylon
- 604...PTFE, Diaphragm
- 608...Conductive PTFE
- 610...PTFE Encapsulated Silicon
- 611...PTFE Encapsulated Viton
- 632...Neoprene Rupplon
- 633...Viton/PTFE
- 634...EPDM/PTFE
- 635... Neoprene/PTFE
- 636...White Nitrile/PTFE
- 637...Viton

DDelrin, Viton and Hytrel are registered tradenames of E.I. DuPont.  
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Nylatron is a registered tradename of Polymer Corp.  
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Ryton is a registered tradename of Phillips Chemical Co.

<sup>1</sup> Available only in kit form. Order Kit 031-055-000 which also includes items 5, 7, 13 and 60.



ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.	Repair Parts shown in <b>bold face (darker) type</b> are more likely to need replacement after extended periods of normal use. They are readily available from most Warren Rupp distributors. The pump owner may prefer to maintain a limited inventory of these parts in his own stock to reduce repair downtime to a minimum.
42	545-005-330	Nut, Hex 3/8-16 Size	4	<b>IMPORTANT:</b> When ordering repair parts always furnish pump model number, serial number and type number.
43	905-001-330	Washer Taper	4	
44	545-007-115	Nut, Hex 7/16-14 Size	4	
47	900-005-330	Washer, Lock 3/8 Size	4	
48	612-007-150	Plate, Base	1	
	612-007-080	Plate, Base	1	
<b>50</b>	<b>360-022-600</b>	<b>Gasket, Manifold/Chamber</b>	<b>2</b>	
51	196-027-110	Chamber, Outer Diaphragm	2	
	196-027-112	Chamber, Outer Diaphragm	2	
	196-027-156	Chamber, Outer Diaphragm	2	
	196-027-010	Chamber, Outer Diaphragm	2	
<b>52</b>	<b>286-017-604</b>	<b>Diaphragm</b>	<b>2</b>	
53	618-003-112	Plug, Pipe 1/4 NPT Size	4	
	618-003-110	Plug, Pipe 1/4 NPT Size	4	
<b>54-1</b>	<b>050-010-600</b>	<b>Ball, Check Valve</b>	<b>4</b>	
54-2	170-035-115	Capscrew (SS and Alloy C) 7/16-14 size	4	
	170-023-115	Capscrew (Aluminum, Cl, HC) 7/16-14 size	4	
54-3	170-040-115	Capscrew, Hex Hd., 3/8-16 size	6	
54-4	334-006-110	Flange, Discharge	1	
	334-006-112	Flange, Discharge	1	
	334-006-156	Flange, Discharge	1	
	334-006-010	Flange, Discharge	1	
54-5	334-007-110	Flange, Suction	1	
	334-007-112	Flange, Suction	1	
	334-007-156	Flange, Suction	1	
	334-007-010	Flange, Suction	1	
54-6	334-008-110	Flange, Threaded (NPT)	2	
	334-008-112	Flange, Threaded (NPT)	2	
	334-008-156	Flange, Threaded (NPT)	2	
	334-008-010	Flange, Threaded (NPT)	2	
	334-008-110E	Flange, Threaded (BSP)	2	
	334-008-112E	Flange, Threaded (BSP)	2	
	334-008-156E	Flange, Threaded (BSP)	2	
	334-008-010E	Flange, Threaded (BSP)	2	
<b>54-7</b>	<b>360-017-608</b>	<b>Gasket, Manifold to seat</b>	<b>4</b>	
54-8	518-003-110	Manifold, Suction-Discharge	1	
	518-003-112	Manifold, Suction-Discharge	1	
	518-003-156	Manifold, Suction-Discharge	1	
	518-003-010	Manifold, Suction-Discharge	1	
54-9	545-005-115	Nut, Hex 3/8-16 Size	6	
<b>54-10</b>	<b>560-028-610</b>	<b>O-Ring</b>	<b>2</b>	
<b>54-11</b>	722-010-110	Check Ball Valve Seat w/Retainer (Suction)	1	
	722-010-112	Check Ball Valve Seat w/Retainer (Suction)	1	
54-12	900-005-115	Washer, Lock 3/8 Size	6	
<b>54-14</b>	722-031-110	Check Ball Valve Seat w/Retainer (Discharge)	1	
	722-031-112	Check Ball Valve Seat w/Retainer (Discharge)	1	
<b>57</b>	<b>560-070-610</b>	<b>O-Ring</b>	<b>2</b>	
58	171-002-110	Capscrew, Flat Hd. Socket	2	
59	618-003-110	Plug, Pipe	2	
<b>60</b>	<b>132-022-360</b>	<b>Bumper</b>	<b>2</b>	
61	210-008-330	Clip, Safety	1	
62	560-023-360	O-Ring, Endcap	2	
63	920-025-000	Ground Strap	1	
Not Shown:				
	242-001-000	Fill Bottle	1	
	031-098-156	Main Air Valve Assy.	1	
	031-098-311	(Inc. Items 10, 11, 12, 14, 15, 16,17)	1	

Repair Parts shown in **bold face (darker) type** are more likely to need replacement after extended periods of normal use. They are readily available from most Warren Rupp distributors. The pump owner may prefer to maintain a limited inventory of these parts in his own stock to reduce repair downtime to a minimum.

**IMPORTANT:** When ordering repair parts always furnish pump model number, serial number and type number.

**MATERIAL CODES**  
**The Last 3 Digits of Part Number**

- 000...Assembly, sub-assembly; and some purchased items
- 010...Cast Iron
- 015...Ductile Iron
- 025...Music Wire
- 080...Carbon Steel, AISI B-1112
- 100...Alloy 20
- 110...Alloy Type 316 Stainless Steel
- 111...Electropolished Stainless Steel
- 112...Alloy "C"
- 114...303 Stainless Steel
- 115...302/304 Stainless Steel
- 120...416 Stainless Steel (Wrought Martensitic)
- 148...Hardcoat Anodized Aluminum
- 150...6061-T6 Aluminum
- 151...6063-T6 Aluminum
- 154...Almag 35 Aluminum
- 155 or 156...356-T6 Aluminum
- 157...Die Cast Aluminum Alloy #380
- 159...Anodized Aluminum
- 162...Brass, Yellow, Screw Machine Stock
- 170...Bronze, Bearing Type, Oil Impregnated
- 180...Copper Alloy
- 330...Plated Steel
- 331...Chrome Plated Steel
- 332...Electroless Nickel Plated
- 335...Galvanized Steel
- 356...Injection Molded Hytrel
- 357...Rupplon (Urethane Rubber)
- 360...Buna-N Rubber. Color coded: RED
- 363...Viton (Fluorel). Color coded: YELLOW
- 364...E.P.D.M. Rubber. Color coded: BLUE
- 365...Neoprene Rubber. Color coded: GREEN
- 366...Food Grade Nitrile. Color coded: WHITE
- 375...Fluorinated Nitrile
- 405...Cellulose Fibre
- 408...Cork and Neoprene
- 425...Compressed Fibre
- 440...Vegetable Fibre
- 500...Delrin 500
- 501...Delrin 570
- 520...Injection Molded PVDF, Natural Color, Food Grade/USDA Acceptable
- 540...Nylon "Foodgrade"
- 550...Polyethylene
- 551...Polypropylene
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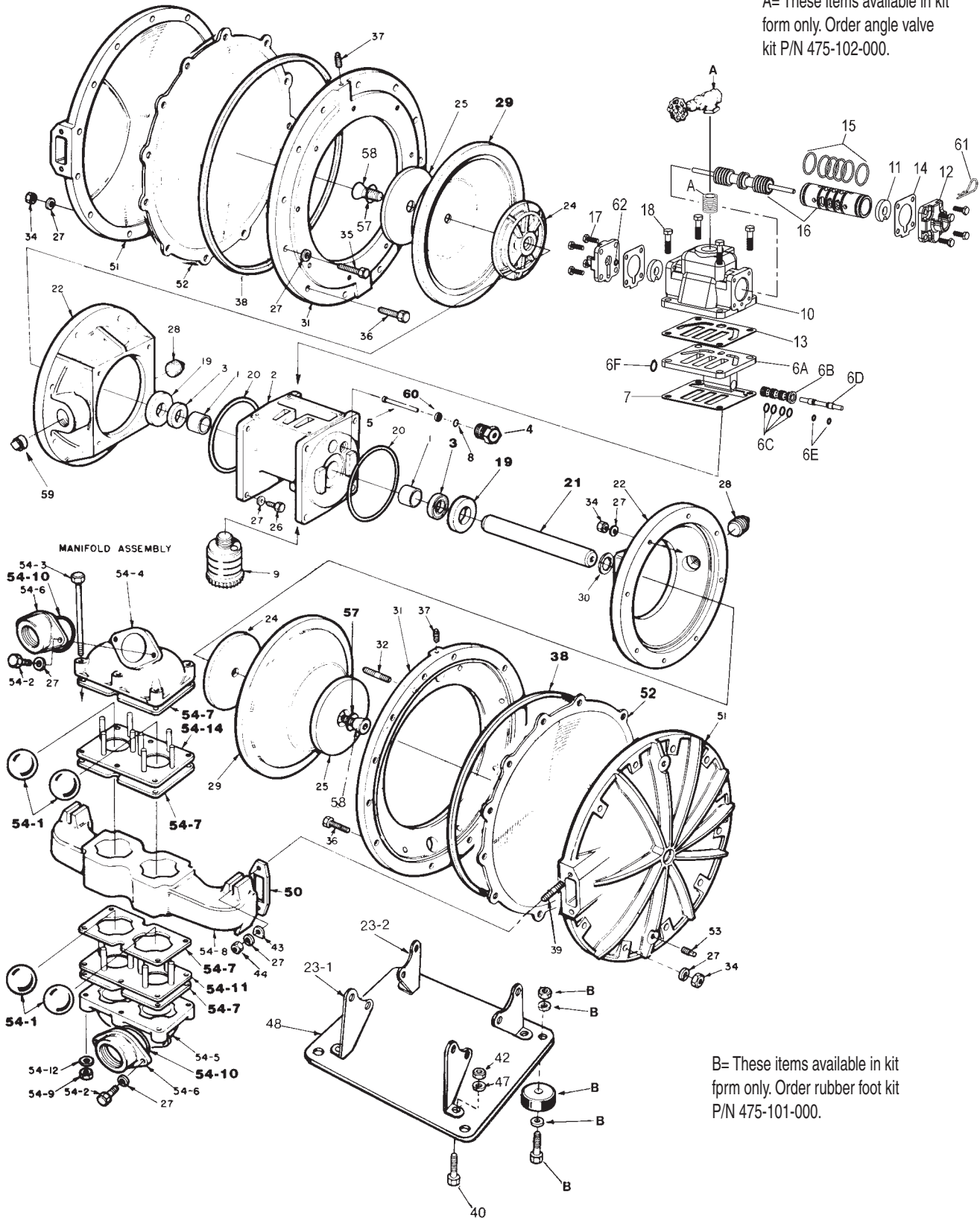
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A= These items available in kit form only. Order angle valve kit P/N 475-102-000.



B= These items available in kit form only. Order rubber foot kit P/N 475-101-000.