



SERVICE AND OPERATING MANUAL

Model SB2-A

Type 3



I M2 c/b T5
II 2GD b T5



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 PUMP OPERATION

This ball check valve pump is powered by compressed air and is a 1:1 pressure ratio design. The pump is alternately pressurize through the inner side of one diaphragm chamber, while simultaneously exhausting the other inner chamber. Air pressure causes the diaphragms, (which are connected by a common rod,) to move endwise. Air pressure is applied over the entire surface of the diaphragm, while liquid is discharged from the opposite side. The diaphragm operates under a balanced condition during the discharge stroke, and the unit can be operated at discharge heads over 200 feet (61 meters) of water head.

The diaphragms are connected by a common rod, secured by plates to the center of the diaphragms. One diaphragm performs the discharge stroke, while the other is pulled to perform the suction stroke in the opposite chamber.

For maximum diaphragm life, keep the pump as close to the liquid being pumped as possible. Positive suction head in excess of 10 feet of liquid (3.048 meters) may require a back pressure regulating device. This will maximize diaphragm life.

Alternate pressuring and exhausting of the diaphragm chamber is performed by means of an externally mounted, pilot operated, four-way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet air pressure is applied to one diaphragm chamber and the other diaphragm chamber exhausts air. When the spool shifts to the opposite end of the valve body, the porting of chambers is reversed. The air distribution valve spool is moved by an internal pilot valve which alternately pressurizes one side of the air distribution valve spool, while exhausting the other side. The pilot valve is shifted at each end of the diaphragm stroke by the diaphragm plate coming in contact with the end of the pilot spool. This pushes the pilot valve into position for shifting of the air distribution valve.

The chambers are manifolded together with a suction and discharge check valve for each chamber which maintains flow in one direction through the pump.

INSTALLATION & START-UP

Locate the pump as close to the product being pumped as possible. Keep suction line length and number of fittings to a minimum. Do not reduce line size.

For installations of rigid piping, short flexible sections of hose should be installed between pump and piping. This reduces vibration and strain to the piping system. A Warren Rupp Tranquilizer® surge suppressor is recommended to further reduce pulsation in flow.

This pump was tested at the factory prior to shipment and is ready for operation. It is self-priming from a dry start for suction lifts of 20 feet (6.096 meters) or less. For suction lifts exceeding 20 feet of liquid, fill the chambers with liquid prior to priming.

AIR SUPPLY

Air supply pressures cannot exceed 125 psi (8.61 bar). Connect the pump air inlet to an air supply of sufficient capacity and pressure required for desired performance. When the air line is solid piping, use a short length of flexible hose [not less than 3/4" (19mm) in diameter] between pump and piping to eliminate strain to pipes.

▲ WARNING ▲

HAZARD WARNING — POSSIBLE EXPLOSION HAZARD can result if 1,1,1-Trichloroethane, Methylene Chloride or other Halogenated Hydrocarbon solvents are used in pressurized fluid systems having Aluminum or Galvanized wetted parts. Death, serious bodily injury and/or property damage could result. Consult with the factory if you have questions concerning Halogenated Hydrocarbon solvents.

▲ IMPORTANT ▲

Read these instructions completely, before installation and start-up. 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.

▲ 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. (See page 6)

▲ BEFORE OPERATION ▲

Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Retorque loose fasteners to prevent leakage. Follow recommended torques stated in the card attached to the new pump.

AIR INLET & PRIMING

For start-up, open an air valve approximately 1/2" to 3/4" turn. After the unit primes, an air valve can be opened to increase flow as desired. If opening the valve increases cycling rate, but does not increase flow rate, cavitation has occurred, and the valve should be closed slightly.

For the most efficient use of compressed air and the longest diaphragm life, throttle the air inlet to the lowest cycling rate that does not reduce flow.

AIR EXHAUST

If a diaphragm fails, the pumped liquid or fumes can enter the air end of the pump, and be exhausted into the atmosphere. When pumping hazardous or toxic materials, pipe the exhaust to an appropriate area for safe disposition.

This pump can be submerged if materials of construction are compatible with the liquid. The air exhaust must be piped above the liquid level. Piping used for the air exhaust must not be smaller than 1" (2.54 cm). Reducing the pipe size will restrict air flow and reduce pump performance. When the product source is at a higher level than the pump (flooded suction), pipe the exhaust higher than the product source to prevent siphoning spills.

Freezing or icing-up of the air exhaust can occur under certain temperature and humidity conditions. Use of an air dryer unit should eliminate most icing problems.

BETWEEN USES

When used for materials that tend to settle out or transform to solid form, the pump should be completely flushed after each use, to prevent damage. Product remaining in the pump between uses could dry out or settle out. This could cause problems with valves and diaphragms at re-start. In freezing temperatures, the pump must be drained between uses in all cases.

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 five hex nuts and one capscrew for each set of check valves (i.e., suction & discharge), providing access to the two ball valves and their valve seats. New ball valves are 3⁵/₈" (9.21 cm) in diameter and will require replacement when worn to approximately 3³/₈" (8.57 cm) diameter.

DIAPHRAGM SERVICING

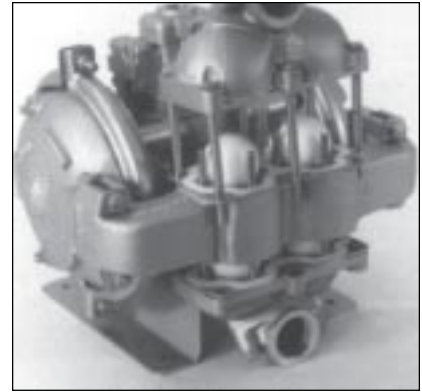
Need for inspection or service of diaphragm is usually indicated when unit pumps from one chamber only and air is discharged out pump discharge port or when liquid being pumped is discharged through air exhaust port.

To service diaphragms remove two capscrews which secure the chamber to the manifold assembly, and twelve hex nuts that secure the chamber to the main pump assembly. To remove diaphragms, loosen diaphragm assembly by turning it out of the diaphragm rod using a 1¹/₈" (2.857 cm) socket or wrench. Removal of opposite outer chamber will permit removal of second diaphragm assembly and diaphragm rod as a unit.

To remove the diaphragm from the diaphragm assembly, hold the diaphragm rod in a clamping device, making sure to protect the rod surface of shaft so as not to scratch or mar it in any way. With a wrench turn the diaphragm assembly out of the diaphragm rod. To disassemble the components, turn a 5/16-18 UNC capscrew by hand into the tapped hole in the inner diaphragm plate. This will keep the plate from turning while the capscrew is removed. To remove the capscrew, place the assembly in a vise so the two protruding ends of screws are loose in the vise jaws (approximately 7/8" apart). Turn the center screw loose from the back plate and the assembly will come apart.

REASSEMBLY

All procedures for reassembling the pump are the reverse of the disassembly instructions with further instructions as shown:



Check valves.



Torquing the diaphragm.

▲ CAUTION ▲

In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. If pumping a product which is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe disposition.

▲ CAUTION ▲

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. When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly.

The diaphragm assemblies are to be installed with the natural bulge outward or toward the head of the center screw. Make sure both plates are installed with outer radii against the diaphragm. After all components are in position in a vise and hand tight, set a torque wrench for 40 ft. pounds (54.23 Newton meters) using a 1¹/₈" (2.857 cm) socket. After each diaphragm sub assembly has been completed, thread one assembly into the diaphragm rod. Make sure the 5/16-18 UNC capscrew has been removed from the inner plate and the diaphragm rod bumper is in place on the diaphragm rod.

Install this sub assembly into the pump and secure by installing the outer chamber in place and tightening the capscrews. This will hold the assembly in place while the opposite side is installed. Install the second diaphragm assembly into the diaphragm rod checking to see that the diaphragm rod bumper is in place. Tighten to 30 ft. lbs. (40.67 Newton meters) torque before installing the outer chamber in place. If the holes in the diaphragm flange do not align with the holes in the inner chamber flange, turn the diaphragm assembly in the direction of tightening to align the holes so that the capscrews can be inserted. This final torquing of the last diaphragm assembly will lock the two diaphragm assemblies together. Secure the last outer chamber by tightening down the securing nuts gradually and evenly. This tightening procedure should be done on both sides.

When reinstalling check valves, take care that the seat gaskets are aligned properly before securing porting flange in place.

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

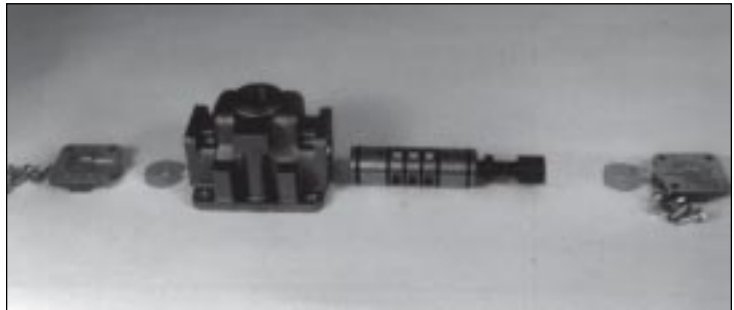
Please refer to the exploded view drawing and parts list in the Service Manual supplied with your pump. If you need replacement or additional copies, contact your local Warren Rupp Distributor, or the Warren Rupp factory Literature Department at the number shown below. To receive the correct manual,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

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.

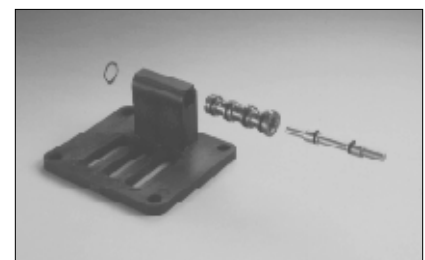
With the valve body assembly off the pump, access to the sleeve and spool set is made by removing four hex head capscrews (each end) on the end caps of the valve body assembly. With the end caps removed, slide the spool back and forth in the sleeve. The spool is closely sized to the sleeve and must move 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.

▲ DANGER ▲

Before doing any maintenance on the pump, be certain all pressure is completely vented from the pump, suction, discharge, piping, and all other openings and connections. Be certain the air supply is locked out or made nonoperational, so that it cannot be started while work is being done on the pump. Be certain that approved eye protection and protective clothing are worn at all times in the vicinity of the pump. Failure to follow these recommendations may result in serious injury or death.



Air valve body.



Pilot valve.

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

The pilot valve assembly is accessed by removing the main air distribution valve body from the pump and lifting the pilot valve body out of the intermediate housing.

Most problems with the pilot valve can be corrected by replacing the o-rings. Always grease the spool prior to inserting it into the sleeve. If the sleeve is removed from the body, reinsertion must be at the chamfered side. Grease the o-rings to slide the sleeve into the valve body. Securely insert the retaining ring around the sleeve. When reinserting the pilot valve, push both plungers (located inside the intermediate bracket) out of the path of the pilot valve spool ends to avoid damage.

PILOT VALVE ACTUATOR

Bushings for the pilot valve actuators are threaded into the intermediate bracket from the outside. The plunger may be removed for inspection or replacement. First remove the air distribution valve body and the pilot valve body from the pump. The plungers can be located by looking into the intermediate. It may be necessary to use a fine piece of wire to pull them out. The bushing can be turned out through the inner chamber by removing the outer chamber assembly. Replace the bushings if pins have bent.

TROUBLESHOOTING

PROBLEM: Pump cycles but will not pump. (Note: higher suction lifts require faster cycling speed for priming.)

POSSIBLE CAUSES:

- A. Air leak in suction line.
- B. Excessive suction lift.
- C. Check valve not closing.
- D. Leakage at joint of suction manifold or elbow flange.
- E. Suction line plugged.
- F. Diaphragm ruptured.

PROBLEM: Pump will not cycle. (Note: Always disconnect air supply to relieve air pressure before disassembling any portion of pump.)

▲ IMPORTANT ▲

Before pump operation, all external gasketed fasteners must be inspected for looseness caused by gasket creep after leaving the factory. Retorque loose fasteners to insure against leakage. Follow recommended torques where called out. (A card is attached to each new pump stating this fact.)

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

POSSIBLE CAUSES:

- A. Discharge hose or line plugged, or discharge head requirement greater than air supply pressure. (Disconnect discharge line to check.)
- B. Spool in air distribution valve not shifting. (Remove end cap and check spool — must slide freely.)
- C. Diaphragm ruptured. (Air will escape out discharge line in this case.)
- D. Blockage in diaphragm chamber preventing movement. (Shut off air supply and reopen after pressure is relieved.)
- E. Plugged or dirty exhaust muffler.

PROBLEM: Uneven discharge flow. (Indicates one chamber not operating properly.)

POSSIBLE CAUSES:

- A. Check valve not sealing properly in one chamber.
- B. Diaphragm failure in one chamber.
- C. Air leak at suction manifold joint or elbow flange one side.
- D. Plugged or dirty muffler.

For additional information, see the Warren Rupp Troubleshooting Guide.

WARRANTY:

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

**RECOMMENDED WARREN RUPP ACCESSORIES
TO MAXIMIZE PUMP PERFORMANCE:**

- **Tranquilizer® Surge Suppressor:** For nearly pulse-free flow.
- **Warren Rupp Filter/Regulator:** For modular installation and service convenience.
- **Warren Rupp Speed Control:** For manual or programmable process control. Manual adjustment or 4-20mA reception.

*For more detailed information on these accessories,
contact your local Warren Rupp Factory-Authorized Distributor,
or Warren Rupp corporate headquarters.*

Available Service Kits

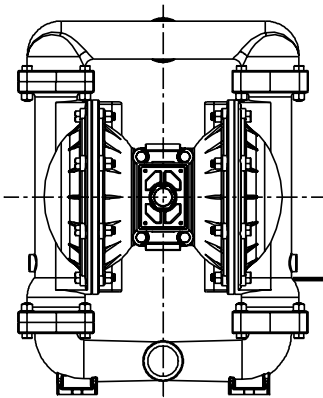
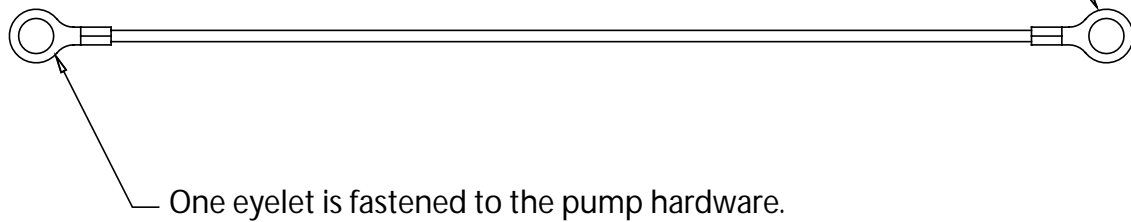
Part No.	Description
476-100-000	Air End Kit Seals, O Rings, Gaskets, Sleeve and Spool Set, Pilot Valve Assembly
476-043-354	Santoprene Diaphragms and Check Balls, Fibre Gaskets, Nitrite O Rings
476-043-360	Buna Diaphragms, Check Balls and O Rings, Fibre Gaskets
476-043-364	EPDM Diaphragms and Check Balls, Fibre Gaskets, Nitrite O Rings
476-043-365	Neoprene Diaphragms and Check Balls, Fibre Gaskets, Nitrite O Rings
476-043-633	Viton Diaphragms, PTFE Check Balls, Gaskets and O Rings
476-043-635	PTFE Overlay Diaphragms, Check Balls, Gaskets and O Rings, Neoprene Backup Diaphragm
476-043-636	Food Grade Nitrite Diaphragms, PTFE Check Balls, Gaskets and O Rings

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.

One eyelet is installed to a true earth ground.
(Requires a maximum 5/16 or 8mm maximum diameter bolt)



This 8 foot long (244 centimeters) Ground Strap, partnumber 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.



ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
1	114-002-010	Bracket Assembly, Intermediate	1
1	114-002-156	Bracket Assembly, Intermediate	1
2	070-006-170	Bearing, Sleeve	2
3	720-004-360	Seal, U-Cup	2
4	135-008-000	Bushing Assembly, Threaded	2
5	560-001-360	O-Ring	2
6	620-004-114	Plunger, Actuator	2
7	095-073-000	Pilot Valve Body Assy.¹	1
	095-115-000	Pilot Valve Body Assy. (CI Only)	1
7-A	095-070-551	Pilot Valve Body	1
7-B	755-025-000	Sleeve (w/O-Ring)	1
7-C	560-033-360	O-Ring (Sleeve)	4
7-D	775-026-000	Spool (w/O-Ring)	1
7-E	560-023-360	O-Ring (Spool)	2
7-F	675-037-080	Retaining Ring	1
8	360-041-379	Gasket, Valve Body	1
9	530-036-000	Muffler, Exhaust	1
10	031-012-000	Sleeve & Spool Set	1
11	095-043-010	Body, Valve	1
	095-043-156	Body, Valve	1
12	132-014-358	Bumper, Valve Spool	2
13	165-011-010	Cap, End	2
	165-011-157	Cap, End	2
14	360-010-425	Gasket, End Cap	2
15	560-020-360	O-Ring	6
16	170-032-330	Capscrew, Hex Head	8
17	170-045-330	Capscrew, Hex Head	4
18	360-048-425	Gasket, Valve Body	1
19	132-002-360	Bumper, Diaphragm	2
20	560-022-360	O-Ring	2
21	685-007-120	Rod, Diaphragm	1
22	612-047-330	Plate, Diaphragm — Inner	2
25	170-060-330	Capscrew, Hex Head	16
26	170-024-330	Capscrew, Hex Head	4
27	170-058-330	Capscrew, Hex Head	4
28	170-030-330	Capscrew, Hex Head	8
29	807-038-330	Stud	4
30	807-039-330	Stud	12
31	900-005-330	Washer, Lock	4
32	900-003-330	Washer, Lock	20
33	900-006-330	Washer, Lock	12
34	545-007-330	Nut, Hex	12
35	545-008-330	Nut, Hex	12
36	545-005-330	Nut, Hex	4
37	196-001-010	Chamber, Inner	2
	196-001-157	Chamber, Inner	2
38	115-053-080	Bracket, Foot Mounting	2
39	560-047-360	O-Ring	2
	560-060-611	O-Ring	2
40	685-032-080	Rod, Connector	1
41	722-035-110	Seat Assembly, Ball Check Valve <i>(for use with PTFE balls only)</i>	2
	722-035-112	Seat Assembly, Ball Check Valve <i>(for use with PTFE balls only)</i>	2
	722-097-110	Seat Assembly	
	722-097-112	Seat Assembly	
42	286-007-360	Diaphragm	2

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
110...	Alloy Type 316 Stainless Steel
112...	Alloy "C"
114...	303 Stainless Steel
115...	301/302/304 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
354...	Injection Molded #203-40 Santoprene— Duro 40D +/-5. Color coded: RED
356...	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
550...	Polyethylene
551...	Polypropylene
555...	PVC (Polyvinyl Chloride)
580...	Ryton
600...	Virgin PTFE
603...	Blue Gylon
604...	Virgin PTFE — Diaphragm
608...	Conductive PTFE
610...	Encapsulated Silicon
611...	Virgin PTFE Encapsulated Viton

Delrin, Virgin PTFE, Hytrel, and Viton are registered tradenames of E.I. DuPont.

Gylon is a registered tradename of Garlock, Inc.

Warren Rupp, Rupplon, and SandPIPER are registered tradenames of Warren Rupp, Inc.

Ryton is a registered tradename of Phillips Chemical Company.

Loctite is a registered tradename of Loctite Corporation.

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
	286-007-364	Diaphragm	2
	286-007-365	Diaphragm	2
	286-007-363	Diaphragm	2
	286-007-366	Diaphragm	2
	286-007-356	Diaphragm	2
	286-007-354	Diaphragm	2
43	196-035-010	Chamber, Diaphragm — Outer	2
	196-035-110	Chamber, Diaphragm — Outer	2
	196-035-112	Chamber, Diaphragm — Outer	2
44	612-039-010	Plate Assembly, Diaphragm	2
	612-097-110	Plate Assembly, Diaphragm	2
	612-097-112	Plate Assembly, Diaphragm	2
45	312-033-010	Elbow, Manifold	2
	312-033-110	Elbow, Manifold	2
	312-033-112	Elbow, Manifold	2
46	334-025-010	Flange, Threaded	2
	334-025-110	Flange, Threaded	2
	334-025-112	Flange, Threaded	2
47	334-026-010	Flange, Porting — Suction	1
	334-026-110	Flange, Porting — Suction	1
	334-026-112	Flange, Porting — Suction	1
48	334-027-010	Flange, Porting — Discharge	1
	334-027-110	Flange, Porting — Discharge	1
	334-027-112	Flange, Porting — Discharge	1
49	518-027-010	Manifold	1
	518-027-110	Manifold	1
	518-027-112	Manifold	1
50	360-049-425	Gasket, Flange	2
	360-049-603	Gasket, Flange	2
51	360-050-379	Gasket, Manifold	4
	360-050-384	Gasket, Manifold	4
	360-050-608	Gasket, Manifold	4
52	618-003-110	Pipe Plug	4
	618-003-112	Plug, Pipe	4
	618-003-330	Plug, Pipe (Cast Iron wetted end)	4
53	675-013-360	Ring, Sealing	2
	675-013-365	Ring, Sealing	2
	675-013-363	Ring, Sealing	2
	675-013-364	Ring, Sealing	2
	675-013-600	Ring, Sealing	2
54	050-017-360	Ball, Check Valve	4
	050-017-364	Ball, Check Valve	4
	050-017-354	Ball, Check Valve	4
	050-017-365	Ball, Check Valve	4
	050-018-600	Ball, Check Valve	4
55	115-057-080	Bracket, Foot Mtg.	2
56	900-004-330	Washer, Lock	2
57	545-004-330	Nut, Hex	2
58	286-020-604	Diaphragm	2
59	901-025-115	Washer	2
61	132-022-360	Bumper	2
62	618-003-330	Pipe Plug (air end)	2

NOT SHOWN:

031-019-010	(CI Center)	(1)
031-019-156	(Alum. Center)	(1)
	Includes items 10, 11, 12, 13, 14, 15, 16	

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
- 110... Alloy Type 316 Stainless Steel
- 112... Alloy "C"
- 114... 303 Stainless Steel
- 115... 301/302/304 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
- 354... Injection Molded #203-40 Santoprene—Duro 40D + /-5. Color coded: RED
- 356... 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
- 550... Polyethylene
- 551... Polypropylene
- 555... PVC (Polyvinyl Chloride)
- 580... Ryton
- 600... Virgin PTFE
- 603... Blue Gylon
- 604... Virgin PTFE—Diaphragm
- 610... Encapsulated Silicon
- 611... Virgin PTFE Encapsulated Viton

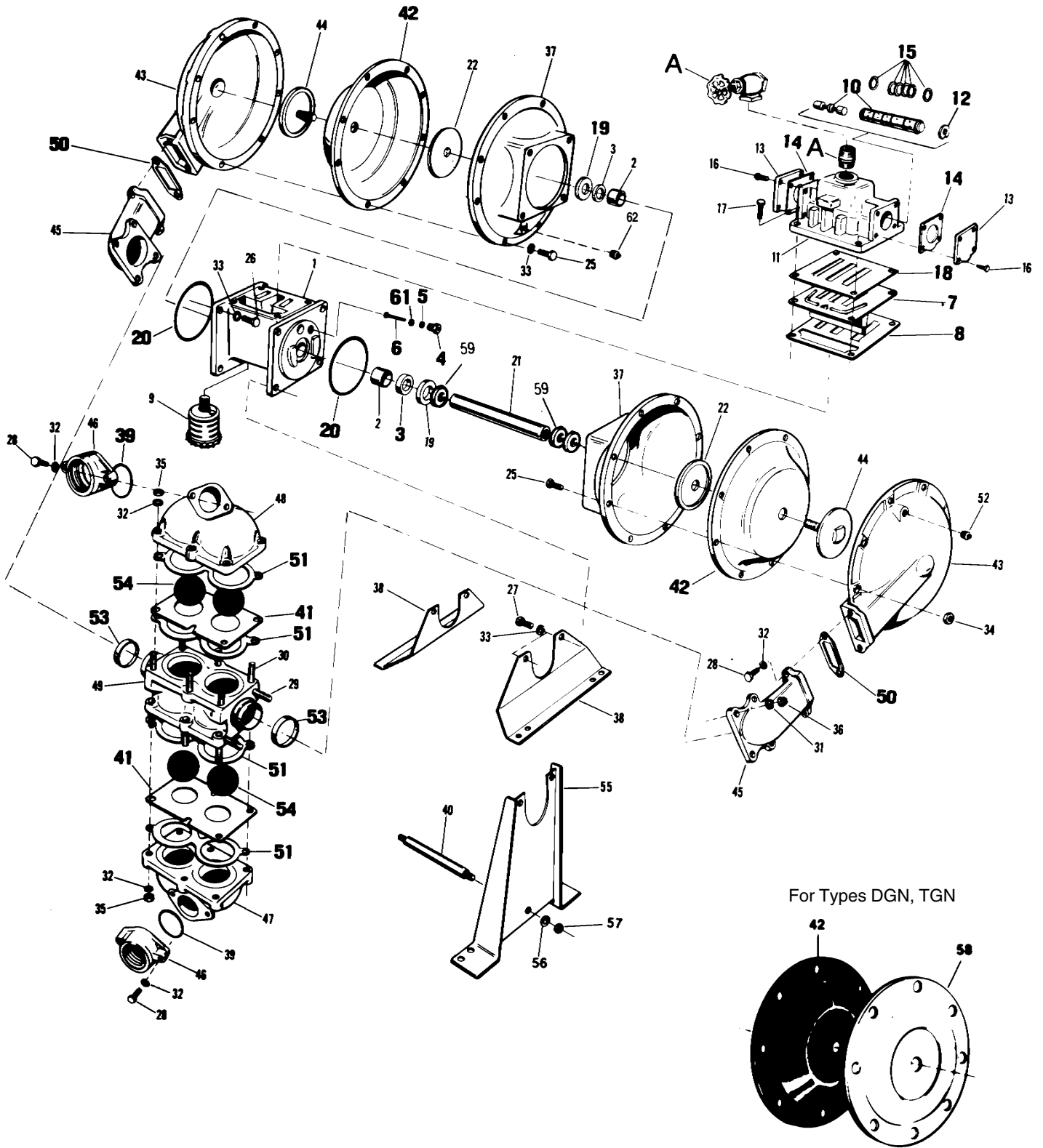
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Available in kit form. Order P/N 031-055-000, which also includes items 6, 8, 18, 61.

****BOTTOM PORTING** is recommended for pumping material containing solids which could settle out in the pumping chambers.

****TOP PORTING** is recommended if there is a possibility of entrapped air vapors inhibiting the pumping action.

A = These Items Available in Kit Form Only.
 Order Angle Valve Kit P/N 475-102-000.



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