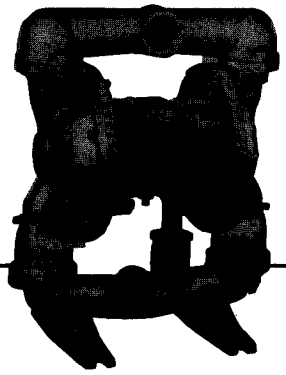
WARREN RUPP HOUDAILLE
ONE OF THE HOUDAILLE PUMP GROUP

Model EB2-A

SandPIPER®

Operating Instructions, Service Manual and Repair Parts List



Operating and Service Instructions

⚠ 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.

Principle of Operation:

The SandPIPER pump is powered by compressed air which alternately pressurizes the inner sides of the two diaphragm chambers while simultaneously exhausting the opposite inner chambers causing the diaphragms, which are connected by a shaft, to move endwise. Since air pressure is applied over the entire surface of the diaphragm which is forcing liquid to be discharged by its other side, the diaphragm is operating under a balanced condition during the discharge stroke. This allows the unit to be operated at discharge heads over 200 feet (61 meters) of water head.

Alternate pressurizing and exhausting of the diaphragm chamber is performed by 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 and the other diaphragm chamber is connected to the exhaust. When the spool is removed 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 means of an internal pilot valve which alternately pressurizes the ends of the air distribution valve spool while simultaneously exhausting the other ends. The pilot valve is positively shifted at each end of the diaphragm stroke by the diaphragm plate's coming in contact with the end of the pilot valve spool and pushing it into position for shifting of the air distribution valve. The chambers are manifolded together with a suction and discharge check valve for each chamber to maintain flow in one direction through the pump.

INSTALLATION PROCEDURES:

Position the pump as close as possible to the source of the liquid to be pumped. Avoid long or undersize suction lines and use the minimum number of fittings.

For permanent installation involving rigid piping, install short flexible sections of hose between the pump and piping. This reduces strains and permits easier removal of the pump for service when required. **At time of installation, inspect all external gasketed fasteners for looseness caused by gasket creep. Tighten loose fittings securely to prevent leakage.**

AIR SUPPLY:

Do not connect the unit to an 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 an air supply of rigid piping, mount a section of flexible line to the pump to eliminate piping strain. In permanent installations, an air line filter is recommended. **The weight of the air supply line and of the filter must be supported by some means other than the air valve cap. Failure to provide support may result in damage to the pump.**

LUBRICATION:

A small amount of lightweight oil (SAE 10 wt., maximum) poured into the air inlet daily is recommended to lubricate the air distribution valve. An air line filter and lubricator is recommended on permanent installations. The lubricator should be set at a rate of one drop of oil for every 20 SCFM (Standard Cubic Feet per Minute) (9.44 lit./sec.) of air being used. When using EPDM elastomers, use no oil in the system or chemical attack may occur. Consult factory for oil recommendation.

OPERATION:

Your SandPIPER pump has been tested prior to shipment and is ready for use as received. It is completely self-priming and no initial filling with fluid is required.

If the unit is to be totally submerged, the air exhaust must be piped above liquid level to prevent the liquid and foreign material from entering the air distribution valve mechanism.

Open the inlet air valve at least one turn to allow sufficient cycling rate for the pump to prime (30 to 60 cycles per minute). After pumping starts, adjust the inlet air valve for the desired pumping capacity. When further opening of the inlet air valve increases cycling rate without increasing the flow rate, the pump is being starved of liquid due to suction limitations. Further opening of the air inlet valve will waste compressed air. Set the inlet air valve for lowest cycling rate that does not decrease flow rate for most efficient operation.

FREEZING OR ICING OF EXHAUST:

Icing of the air exhaust can occur under certain conditions of temperature and humidity on compressed air power equipment. When pump performance suffers because of icing, a non-sticky anti-freeze lubricant such as KILFROST, in an air line lubricator, will solve the problem. Icing is more likely to occur 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. (See **OPERATION,** above.) Piping used for the exhaust should not be smaller than 1" pipe size. Reduced pipe size can restrict the exhausted air and reduce pump performance.

⚠ CAUTION: If a diaphragm fails the pumped product or fumes can enter the air side of the pump. This side is exhausted through the exhaust port (muffler).

When the product is a hazardous or toxic material, the exhaust should be piped to an appropriate area for safe disposition.

When the product source is at a higher level than the pump (flooded suction), the exhaust should be piped to a higher level than the product to prevent spills caused by siphoning.

MAINTENANCE AFTER USE:

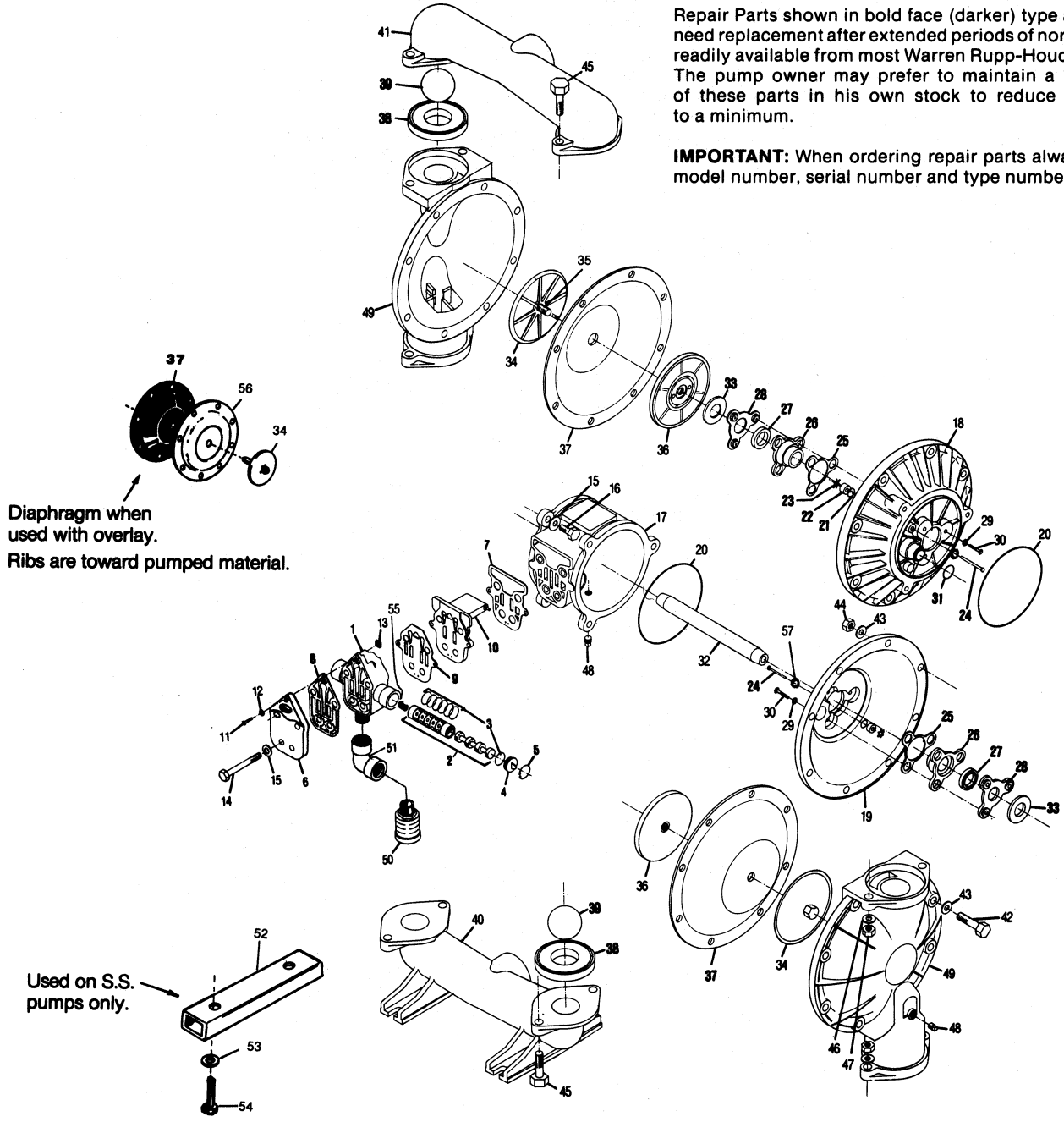
⚠ CAUTION: Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. The discharge line may be pressurized and must be bled of its pressure. When the pump is used for toxic or aggressive fluids, it should be flushed clean prior to disassembly.

When the pump is used for materials that tend to settle out or transform from liquid to solid form, care must be taken after each use or during idle time to remove them and flush the pump as required to prevent damage.

In freezing temperatures the pump must be completely drained when idle. This model must be tilted to allow the liquid from the chambers to run out of the discharge port.

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-Houdaille 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.



SERVICE INSTRUCTIONS: TROUBLE SHOOTING

1. Pump will not cycle

A. Check to make sure the unit has enough pressure to operate and that the air inlet valve is open.

B. Check the discharge line to insure that the discharge line is neither closed nor blocked.

C. If the spool in the air distribution valve is not shifting, check the main spool. It must slide freely.

D. Excessive air leakage in the pump can prevent cycling. This condition will be evident. Air leakage into the discharge line indicates a ruptured diaphragm. Air leakage from the exhaust port indicates leakage in the air distribution valve. See further service instructions.

E. Blockage in the liquid chamber can impede movement of diaphragm.

2. Pump cycles but will not pump

A. Suction side of pump pulling in air. Check the suction line for air leaks and be sure that the end of the suction line is submerged. Check flange bolting. Check valve flanges and manifold to chamber flange joints.

B. Make certain the suction line or strainer is not plugged. Restriction at the suction is indicated by a high vacuum reading when a vacuum gauge is installed in the suction line.

C. Check valves may not be seating properly. To check, remove the suction line and cover the suction port with your hand. If the unit does not pull a good suction (vacuum), the check valves should be inspected for proper seating.

D. Static suction lift may be too high. Priming can be improved by elevating the suction and discharge lines

EB2-A REPAIR PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	RQD.
1	095-051-551	Body, Spool Valve	1
2	**031-032-000**	**Sleeve & Spool Set**	**1**
3	**560-058-360**	**O-Ring**	**8**
4	165-038-356	Cap, End	2
5	**675-043-115**	**Ring, Retaining**	**2**
6	165-037-551	Cap, Valve Body	1
7	**360-056-425**	**Gasket**	**1**
8	**360-058-425**	**Gasket**	**1**
9	**360-059-425**	**Gasket**	**1**
10	**095-054-000**	**Assy., Pilot Valve**	**1**
11	170-063-330	Capscrew, Hex Hd.	1
12	901-035-330	Washer, Flat	1
13	542-001-330	Nut, Square	1
14	170-026-330	Capscrew, Hex Hd.	4
15	901-005-330	Washer, Flat	10
16	170-018-330	Capscrew, Hex Hd.	6
17	114-008-551	Brk't., Intermediate	1
18	196-048-551	Chamber, Inner	1
19	196-049-551	Chamber, Inner	1
20	**560-062-360**	**O-Ring**	**2**
21	**560-001-360**	**O-Ring**	**2**
22	**135-013-162**	**Bushing**	**2**
23	**675-042-115**	**Ring, Retainer**	**2**
24	**620-004-114**	**Plunger, Actuator**	**2**
25	**360-055-425**	**Gasket, Brg.**	**2**
26	**070-026-501**	**Bearing, Sleeve**	**2**
27	**720-004-360**	**Seal, U-Cup**	**2**
28	**670-029-551**	**Retainer, Bearing**	**2**
29	901-001-330	Washer, Flat	6
30	710-009-330	Screw, Selftapping	6
31	**675-041-360**	**Ring, Sealing**	**2**
32	685-007-120	Rod, Diaphragm	1
33	**132-020-358**	**Bumper**	**2**
34	612-039-156	Plate, Outer Diaphragm Assy.	2
	612-097-110	Plate, Outer Diaphragm Assy.	2
35	807-026-330	Stud	2
36	612-082-151	Plate, Inner Diaphragm	2
37	**286-007-365**	**Diaphragm**	**2**
	286-007-363	Diaphragm	2
	286-007-360	Diaphragm	2
	286-007-364	Diaphragm	2
38	**722-040-365**	**Seat, Valve**	**4**
	722-040-363	Seat, Valve	4
	722-040-360	Seat, Valve	4
	722-040-364	Seat, Valve	4
	722-040-600	Seat, Valve	4
39	**050-017-365**	**Ball, Check Valve**	**4**
	050-017-360	Ball, Check Valve	4
	050-017-364	Ball, Check Valve	4
	050-018-600	Ball, Check Valve	4
40	518-032-156	Manifold, Suction	1
	518-032-110	Manifold, Suction	1
41	518-033-156	Manifold, Discharge	1
	518-033-110	Manifold, Discharge	1
42	170-081-330	Capscrew, Hex Hd.	16
43	901-022-330	Washer, Flat	32
44	545-007-330	Nut, Hex	16
45	170-066-330	Capscrew, Hex Hd.	8
46	900-003-330	Washer, Lock	8
47	545-008-330	Nut, Hex	8
48	618-003-330	Pipe Plug	3
49	196-047-157	Chamber, Outer	2
	196-047-110	Chamber, Outer	2
50	530-008-000	Muffler, Exhaust	1
51	312-044-555	45° Elbow	1
52	326-003-080	Foot, Mounting	2
53	901-022-330	Washer, Flat	4
54	170-024-330	Capscrew, Hex Hd.	4
55	780-027-025	Spring	1
56	286-020-604	Overlay Diaphragm	2
57	132-022-360	Bumper	2
	Not Shown:		
	535-015-000	Name Plate	1
	710-010-115	Drive Screw	4
	031-031-000	Valve Body Assy. (Consists of items 1, 2, 3, 4, 5)	1

MATERIAL CODES

The Material Code Is The Last 3 Digits Of The Part Number

000...Assembly, sub-assembly; and some purchased items
010...Cast Iron
015...Ductile Iron
080...Carbon Steel, AISI B-1112
110...316 Stainless Steel
112...Hastelloy-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
356...Rupplon II
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...F.D.A. Nitrile. Color coded: WHITE
375...Fluorinated Nitrile
405...Cellulose Fibre
408...Cork and Neoprene
425...Compressed Asbestos
440...Vegetable Fibre
500...Delrin 500
501...Delrin 570
520...Injection Molded Kynar, Natural Color, FDA/USDA Acceptable
540...Nylon
550...Polyethylene
551...Polypropylene
555...PVC (Polyvinyl Chloride)
580...Ryton
600...Teflon (virgin material) Tetrafluoroethylene (TFE)
603...Blue Gylon
604...TuffRUPP
611...Teflon Encapsulated Viton

Delrin, Teflon, and Viton are registered tradenames of E.I. DuPont.
Gylon is a registered tradename of Garlock, Inc.
Hastelloy-C is a registered tradename of Cabot Corporation.
Kynar is a registered tradename of Pennwalt Corporation.
Rupplon, SandPIPER and TuffRUPP are registered tradenames of Warren Rupp-Houdaille, Inc.
Ryton is a registered tradename of Phillips Chemical Company.

higher than the check valves and pouring liquid into the unit through the suction inlet. When priming at high suction lifts or with long suction lines operate the pump at maximum cycle rate.

3. Low performance

A. Capacity is reduced as the discharge pressure increases, as indicated on the performance curve. Performance capability varies with available inlet air supply. Check air pressure at the pump inlet when the pump is operating to make certain that adequate air supply is maintained.

B. Check vacuum at the pump suction. Capacity is reduced as vacuum increases. Reduced flow rate due to starved suction will be evident when cycle rate can be varied without change in capacity. This condition will be more prevalent when pumping viscous liquids. When pumping thick, heavy materials the suction line must be kept as large in diameter and as short as possible, to keep suction loss minimal.

C. Low flow rate and slow cycling rate indicate restricted flow through the discharge line. Low flow rate and fast cycling rate indicate restriction in the suction line or air leakage into suction.

D. Unstable cycling indicates improper check valve seating on one chamber. This condition is confirmed when unstable cycling repeats consistently on alternate exhausts. Cycling that is not consistently unstable may indicate partial exhaust restriction due to freezing and thawing of exhaust air. Use of an anti-freeze lubricant in an air line lubricator should solve this problem.

CHECK VALVE SERVICING:

Need for inspection or service is usually indicated by poor priming, unstable cycling, reduced performance or the pump's cycling but not pumping.

DIAPHRAGM SERVICING:

Remove the eight bolts (four each side) securing the manifold assemblies to the outer chambers. Remove the eight bolts securing the outer chamber to the inner chamber. Remove the diaphragm assembly (outer plate, diaphragm, inner plate) by turning the assembly counterclockwise using a 1" (2.54 cm) wrench on the outer plate lugs. To disassemble the diaphragm assemblies, screw into the inner plates two threaded pins, place the pins in a vise and turn the outer plate counterclockwise using the 1" wrench. The interior components consisting of shaft seals, sleeve bearings and bearing retainers are now accessible for service.

Procedures for reassembling the diaphragms are the reverse of the above. The diaphragms must be installed with their natural bulge to the outside, toward the outer diaphragm plate. Install the inner plate with the flat face against the diaphragm.

After all components are in position in a vise and hand tight, tighten with a wrench to approximately 35 ft. lbs. (4.838 kilograms/meters) torque. After both diaphragm assemblies have been assembled, thread one assembly into the shaft (hold the shaft near the middle in a vise with soft jaws, to protect the finish). Install this sub assembly into the pump and secure by placing the outer chamber on the end with the diaphragm. This holds the assembly in place while the opposite side is installed. Torque the last diaphragm assembly to 25 ft. lbs. (3.456 kilograms/meters). This final torquing will lock the diaphragm assemblies together. Place the remaining outer chamber on the open end and loosely tighten the bolts. Replace the manifold assemblies to square the flanges before final tightening of the remaining bolts. Alternating for progressive tightening, torque the eight capscrews to 200 in./lbs. (2.304 kilograms/meter).

AIR DISTRIBUTION VALVE SERVICING:

The spool and sleeve are rust and corrosion resistant brass and hardened stainless steel. The spool is closely sized to the sleeve and should slide freely. Accumulation of dirt and oils may prevent the pump from cycling. Remove the valve body from the center pump housing, remove the end caps, and push the spool out of the sleeve. Wash the parts in cleaning solvent or kerosene, and check the spool and sleeve for possible roughness, nicks, or scratches. Use a fine stone or crocus cloth to carefully remove any irregular marks on the surfaces. When the spool slides freely on the sleeve, coat the parts with light oil and reassemble. The four capscrews inserted through the valve body cap to hold the air valve to the intermediate section should be torqued to 150 in./lbs. (1.728 kilograms/meter).

PILOT VALVE SERVICING:

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.

PILOT VALVE ACTUATOR SERVICING:

The bushings for the pilot valve actuators are pressed 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 as you look into 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 become necessary to replace the o-ring seal. The bushing can be pushed through the inner chamber by removing the outer chamber assembly to reach the bushing.

WARRANTY: This unit is guaranteed for a period of one year against defective material and workmanship.