ALEMITE

SERVICE INSTRUCTIONS

Diaphragm Pump

8301

DESCRIPTION

The Model 8301 Air-Powered Diaphragm Pump is used to transfer corrosive chemicals. The wetted parts are polypropylene and the diaphragms are Santoprene to resist damage from caustics, plating liquids, brine water and other corrosive chemicals. A silencer enclosed in the body reduces the noise. The pump delivers a maximum capacity of fourteen gallons per minute.

The pump has the following outstanding features:

1. Leak-Free Flange Connections
2. Side-Outlet Port Design
3. Non-Leak Manifold
4. Corrosion-Resistant Air Motor
5. Abrasion-Resistant Housing
6. Air-Valve Reset Button
7. Air Valve Requires No Lubrication

SPECIFICATIONS

Pump Ratio: 1:1

Air Connections:
- Inlet: ..... 1/4" NPT (f)
- Outlet: ..... 3/8" NPT (f)

Material Connections:
- Inlet: ..... 1/2" NPT (f)
- Outlet: ..... 1/2" NPT (f)

Discharge Volume per Cycle ..... 0.025 Gal.
Maximum Size Solid: ..... 1/32"
Air-Supply Pressure: ..... 20-100 PSI
Temperature Range: ..... 32-140° F.
Net Weight: ..... 7.7 lbs.

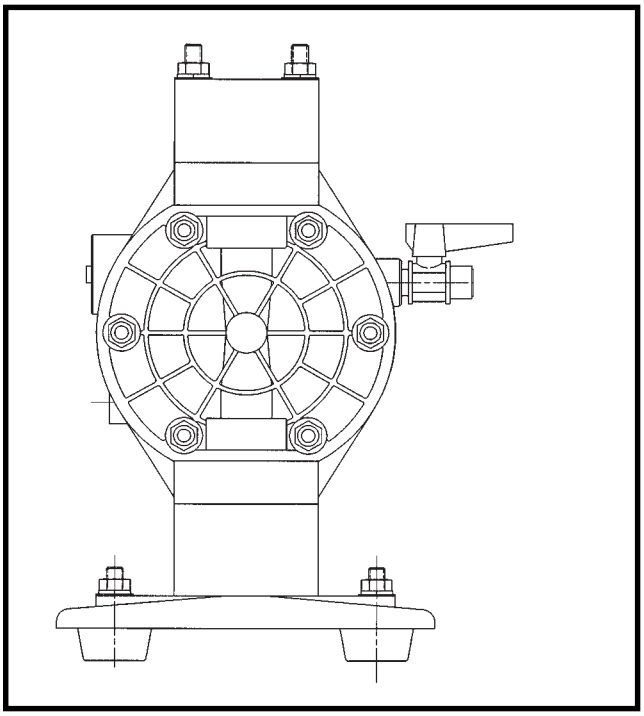

Figure 1: *Model 8301 Diaphragm Pump*

GENERAL SAFETY REQUIREMENTS

IMPORTANT: Read all instruction sheets and any other explanatory information before beginning any installation, operation or maintenance.

1. Check all hoses and lines for weak or damaged condition and make sure that all connections are secure.

NOTE: Worn or damaged parts threaten person and property. Replace all such parts.

2. Do not use pump with any liquids not compatible with the materials of the pump components.

3. Never exceed the maximum pressure rating of any component in the system.

4. Never point the dispensing device at anyone. Accidental discharge can cause serious injury.

5. Shut off the air pressure and relieve all material pressures before attempting to service any part.

6. Check for leaks before starting any pumping operation. If any leaks or other abnormalities are found, do not operate the pump.

7. Wear safety glasses at all times when operating the pump.

8. Wear a face shield and proper body protection when working with hazardous chemicals.

9. When pumping Class 1 Hazardous (flammable) liquids, use pump outdoors or in an OSHA approved location.

10. When pump is used with flammable or Class 1 materials, the following procedures must be strictly applied:

A. A special “static hose” must be used which has a provision for conducting static electrical charges.

B. Hose must be properly grounded with a grounding conductor.

C. Pump and entire system must be properly grounded, in accordance with local and national codes.

WARNING: Unless proper grounding is followed, static discharge can cause a fire or an explosion.

INSTALLATION

There are many possible configurations in which the pump can be connected. Specific installations will depend on the fluid being pumped and the application.

NOTE: For best results, it is recommended that an air filter/moisture separator (such as the Alemite 5604-2) and an air-pressure regulator (such as the Alemite 7604-B) be used in the air line.

WARNING: The pump must be grounded to prevent any sparks when pumping flammable or volatile liquids.

NOTE: The inlet and outlet manifolds are reversible to facilitate connecting the hoses from either direction.

1. Connect a suction hose from the supply container to the pump fluid inlet.

2. Connect a discharge hose to the pump fluid outlet.

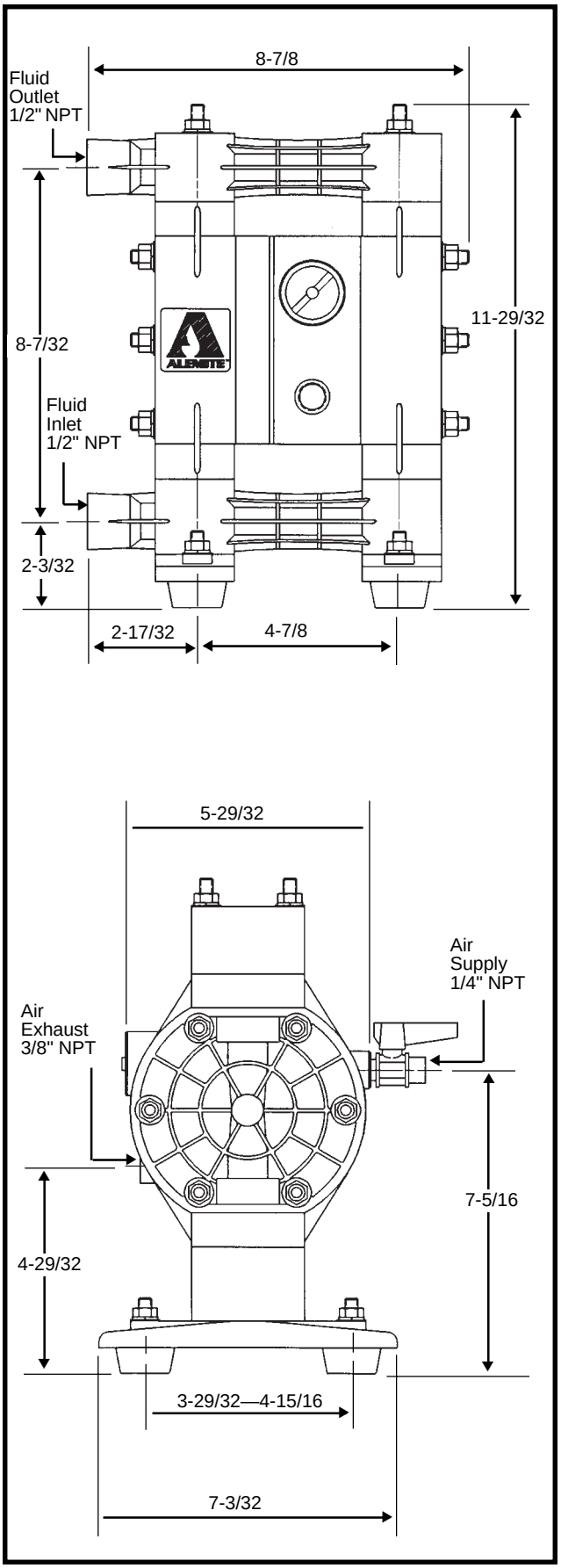

Figure 2: *Dimensions & Locations*

NOTE: Use a flexible hose between the pump and any piping to eliminate any vibration in the piping.

3. Connect a hose from the air supply to the inlet air port.

NOTE: Make sure that the air-control valve on the diaphragm pump is closed before connecting to the air supply.

CAUTION: Maximum air pressure is 100 PSI. Do not exceed this rating.

NOTE: Due to the plastic construction of the pump, it is recommended that for all hardware connections, standard torque values should be used. Pipe-thread sealant should be used on all plumbing connections. Over torquing of any component can lead to distortion of plastic.

OPERATION

WARNING: Wear safety glasses at all times when operating the pump. Always wear a face shield and proper body protection when working with hazardous chemicals.

NOTE: Check for leaks before starting any pumping operation. If any leaks or other abnormalities are found, do not operate the pump.

1. The positive-displacement pump is self priming. To initially prime the pump, using either the control valve on the pump or the air-regulator valve, bring the air pressure up slowly.

NOTE: Due to the fact that air and air mixed with material (which may be a corrosive chemical) can discharge quite violently during this procedure, direct the discharge outlet back to the source at this time. If a reel is used, bring the reel outlet back to the source. If the reel is too far away for the hose to reach, bleed the air into a separate container until the pump and hose are primed.

NOTE: If starting difficulty is encountered, press the reset button which is located at the air valve.

2. When the pump and hose are fully primed, the pump is ready for operation.

NOTE: If the pump is operated faster than the allowable flow rate, it can cause cavitation. This will reduce the rate flow of the fluid and also reduces the life of the diaphragm.

3. To obtain the maximum discharge rate, start the pump by opening the ball valve gradually while watching the discharging fluid until the flow rate begins to diminish. Then close the valve slightly to get the maximum discharge rate.

SERVICE

Trouble-Shooting:

For the most common of problems, a trouble-shooting chart is provided as a guide to most of the corrective remedies. (See Table 1.)

MAINTENANCE

INLET CHECK VALVES:
(Figures 3 and 6)

Disassembly:

NOTE: To remove the inlet check valves, the pump must be turned over.

1. Remove the four nuts (4), lockwashers (3) and flatwashers (2) that hold the two bases (40) and the outlet manifold (13) to the two end castings (21).

2. Remove the two bases and the inlet manifold.

NOTE: There are two inlet cavities in the pump. This procedure is written for one but is identical for the other.

3. Remove the top “O” ring (16) from the inlet cavity.

4. Remove the valve seat (23) from the inlet cavity.

5. Remove the valve cage (15) with the check-valve disk from the inlet cavity.

6. Remove the check-valve disk (14) from the valve cage.

7. Remove the bottom “O” ring (16) from the inlet cavity.

8. Clean and inspect all parts. Replace any parts that are worn or show any signs of disintegration due to the corrosive effects of some of the fluids.

Reassembly:

NOTE: The reassembly procedure is written for one inlet valve but is identical for the other.

1. Reinsert the bottom “O” ring (16) in the inlet cavity. Make sure that it is properly seated.

2. Insert the check-valve disk (14) into the valve cage (15).

3. Insert the valve cage with the check-valve disk in the inlet cavity.

4. Reinsert the valve seat (23) into the inlet cavity. Make sure that it is pressed down completely.

NOTE: When the valve seat is properly seated, it will be about flush with the top of the inlet cavity.

5. Replace the top “O” ring (16) in the inlet cavity.

6. Replace the inlet manifold (13) and the two bases on the studs.

7. Replace the four nuts (4), lockwashers (3) and flatwashers (2) that hold the outlet manifold and the bases to the two end castings (21).

8. Tighten the nuts until firm. Do not over tighten.

OUTLET CHECK VALVES:
(Figures 3 and 6)

Disassembly:

1. Remove the four nuts (4), lockwashers (3) and flatwashers (2) that hold the outlet manifold (13) to the two end castings (21).

2. Remove the outlet manifold (13).

NOTE: There are two outlet cavities in the pump. This procedure is written for one but is identical for the other.

3. Remove the top “O” ring (16) from the outlet cavity.

4. Remove the valve cage (15) from the outlet cavity.

5. Remove the check-valve disk (14) from the valve cage.

6. Remove the valve seat (23) from the outlet cavity.

7. Remove the bottom “O” ring (16) from the outlet cavity.

8. Clean and inspect all parts. Replace any parts that are worn or show any signs of disintegration due to the corrosive effects of some of the fluids.

Reassembly:

NOTE: The reassembly procedure is written for one outlet valve but is identical for the other.

1. Reinsert the bottom “O” ring (16) in the outlet cavity. Make sure that it is properly seated.

2. Reinsert the valve seat (23) in the outlet cavity. Make sure that it is pressed down completely.

3. Set the check-valve disk (14) into the center of the valve seat (23).

4. Insert the valve cage (15) in the outlet cavity over the check-valve disk.

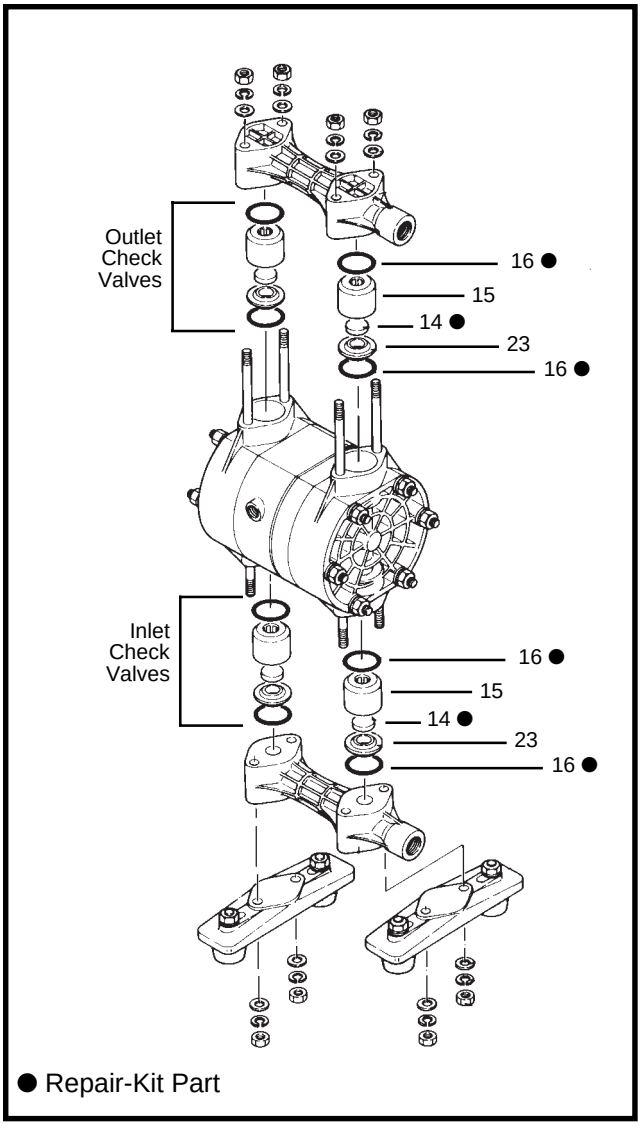

Figure 3: *Inlet & Outlet Check Valves*

NOTE: When the valve cage is properly seated, it will be about flush with the top of the outlet cavity.

5. Replace the top “O” ring (16) in the outlet cavity.

6. Replace the outlet manifold (13) and replace the four nuts (4), lockwashers (3) and flatwashers (2) that hold the outlet manifold to the two end castings (21).

7. Tighten the nuts until firm. Do not over tighten.

COMPLETE PUMP:
(Figure 6)

NOTE: It is not necessary to remove the air-control valve when completely disassembling the pump.

Disassembly:

1. Remove the outlet manifold and the outlet check-valve assemblies as described in the disassembly procedure in the Outlet Check Valve Section.

2. Remove the two bases, the inlet manifold and the inlet check-valve assemblies as described in the disassembly procedure in the Inlet Check Valves Section.

3. Remove the six tie rods (1) from the pump assembly.

4. Slide off each end casting (21) from the center body.

NOTE: Do not let the studs get bent.

5. Hold one diaphragm retaining nut (20) with a wrench and unscrew the other one.

6. Pull the diaphragm (46) off the center rod (24).

NOTE: The center disk (22) may be stuck to the diaphragm.

7. Pull the center disk from the diaphragm.

8. Pull the diaphragm cushion (18) from the center rod (24).

9. Remove the “O“ ring (5) from the body.

10. Repeat steps 6 through 9 for the other side of the pump.

11. Remove body B (27) from body A (25).

12. Remove the bushing (8) from body B (27) and remove the “O” ring (7) from the bushing.

13. Remove the “O” ring (6) from inside the center hole in body B.

14. Remove the center rod (24) from body A and remove the spacer (9) from the center rod.

15. Remove the gasket (26) from body A (25).

16. Remove the bushing (8) from body A (25) and remove the “O” ring (7) from the bushing.

17. Remove the “O” ring (6) from inside the center hole in body A (25).

18. Lift out the two springs (10) and the two pilot guides (11) with the pilot valves (12) attached.

19. Remove the two screens (38) and silencer (39) from body A (25).

20. Clean and inspect all parts. Replace the silencer if it cannot be cleaned. If any kits are used, use all parts in the kit. Replace any other parts that are worn or show signs of disintegration due to the corrosive effects of some of the fluids.

NOTE: This procedure does not include the disassembly of the air-valve as described in the Air-Valve Section, as these parts do not have to be removed in order to disassemble the rest of the pump. If the air-valve needs to be serviced, see that section of the service sheet.

Reassembly:

1. Install the two screens (38) and the silencer (39) into body A (25).

2. Reinsert the two springs (10) and the two pilot guides (11) with the pilot valves (12) attached into the holes in body A (25).

3. Replace the gasket (26) on body A (25).

NOTE: Be sure to turn the gasket so that the dimples are facing down and are into the air-valve slots. Align the gasket on the two metal pins on body A (25).

NOTE: Before reinstalling the two bushings each with the two “O” rings (6 & 7), apply a little general-purpose grease to the “O” rings.

4. Insert one “O” ring (6) into the center hole in body A (25).

5. Insert one “O” ring (7) into one bushing (8) and attach that bushing to the spacer (9).

6. Push bushing and spacer into the center hole in body A. Press it firmly enough to seat ther “O” rings.

7. Insert the center rod (24) through the spacer (9) and bushing (8).

8. Insert the other “O” ring (6) into the center hole in body B (27).

9. Insert the second “O” ring (7) into the second bushing (8).

10. Insert this bushing into center hole in body B.

11. Place body B (27) over the center rod (24).

NOTE: Be sure to align the air slot and the hole for the tip of the valve guide.

12. Place “O” ring (5) into the slotted circle on body B.

NOTE: Make sure that the “O” ring is properly seated.

13. Place the diaphragm cushion (18) on the center rod (24) next to body B (27).

14. Place the center disk (22) against the diaphragm (17) and place both on the center rod (24).

15. Replace the diaphragm retaining nut (20) on the center rod (24).

16. Repeat steps 12 through 15 for body A (25).

17. Hold one diaphragm retaining nut with a wrench and turn the other one. Do not overtighten.

18. Insert the six tie rods (1) through one of the end castings (21).

19. Place the body assembly on the end casting.

20. Place the other end casting on the body assembly.

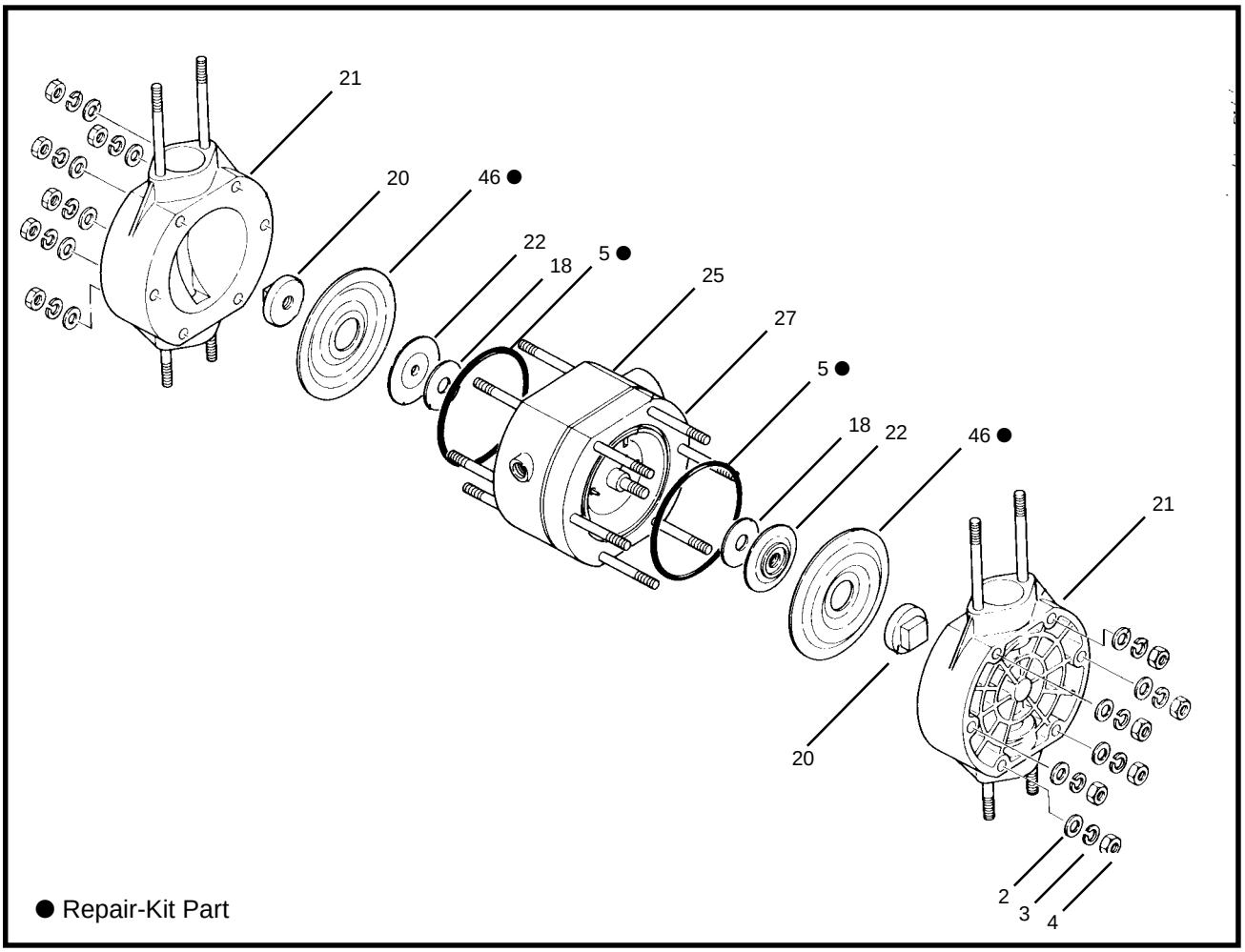

Figure 4: *Components of Diaphragm Portion of Pump with Manifolds Removed*

NOTE: The two end castings each have an arrow on them. Make sure that the arrow points toward the fluid outlet. The arrows will point up when the pump is completely reassembled and sitting on its two bases.

21. Reattach the six flatwashers, the six lockwashers and the six nuts on the six tie rods. Tighten each tie rod by holding the nut at one end of the tie rod and turning the other one.

22. Tighten the nuts on the six tie rods alternately in a criss-cross pattern so that the pump goes together properly. Do not overtighten.

NOTE: When the tie rods are tight, there will still be small gaps between the body assembly and the two end castings.

23. Reinstall the inlet and outlet check valves and manifolds as described in the reassembly procedure in the Inlet and Outlet Check Valves Sections.

AIR-VALVE:
(Figure 6)

NOTE: To ease in reassembly, lay the body of the pump on its side so that the air-valve plug is facing up.

CAUTION: The ball valve must be removed if the pump is placed in this manner.

NOTE: Two special tools are furnished with the pump. They are used when removing the air valve. These are the air-valve plug tool for removal of the air valve plug and the air-valve sleeve extraction tool for the removal of the air-valve sleeve.

Disassembly:

1. Remove the air-valve plug (37) from the body of the pump.

NOTE: Use the air-valve plug tool to ease the removal of this plug.

2. Remove “O” ring (34) from this plug.

3. Remove the push rod (36) from the air-valve plug.

4. Remove “O” ring (35) from the push rod.

5. Pull out the spool assembly, consisting of the spool (32) with the five seal rings (43), one air-valve cushion (29) and the detent assembly (33). Remove the five seal rings from the spool.

6. Remove the sleeve (31) with the six “O” rings (44) by using the air-valve sleeve extraction tool.

7. Remove the six “O” rings from the sleeve.

8. Remove the second air-valve cushion (29).

9. Clean and inspect all parts. If any kits are used, use all parts that are supplied in the kit. Replace any other parts that are worn.

Reassembly:

1. Place the first air-valve cushion (29) into the air cavity with the flat side down. Make sure that it is not cocked.

2. Place the six “O” rings (44) on the sleeve (31).

3. Insert the air-valve sleeve wih the six “O” rings into the air cavity.

NOTE: To ease the process, apply a little general-purpose grease to the “O” rings on the sleeve.

4. Place the five seal rings (43) on the spool (32).

5. Place the second air-valve cushion (29) and the detent assembly (33) on the end rod of the spool (32) and screw nut on the end rod.

6. Insert this assembled unit into the air cavity.

7. Place “O” ring (35)on to the push rod.

8. Insert the push rod (36) with “O” rings (35) into the air-valve plug (37).

9. Place “O ring (34) on the plug.

10. Replace the air-valve plug (37) into the air cavity. Tighten with the air-valve plug tool.

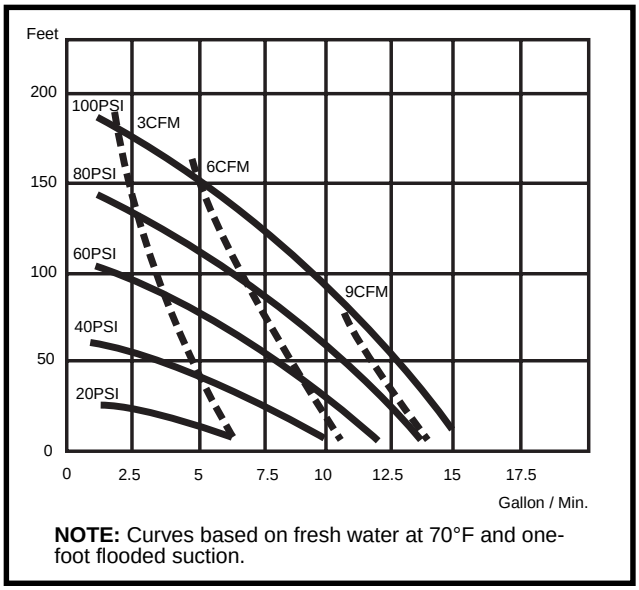

Figure 5: *Performance Curves for Diaphragm Pump*

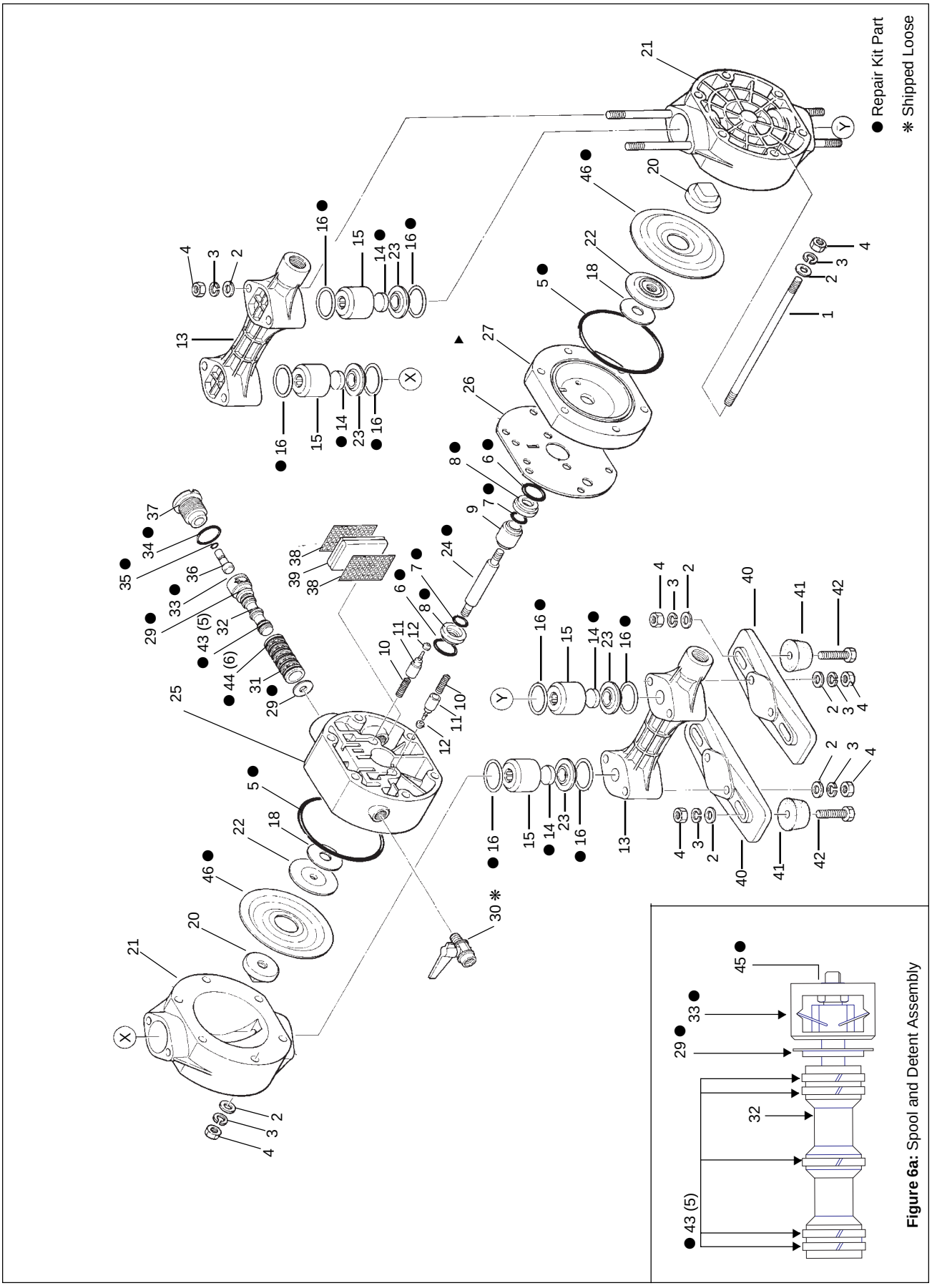

Figure 6a: Spool and Detent Assembly

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Little or no flow	1. Insufficient air supply. 2. Closed valve or clogged line. 3. Piping too small. 4. Spool valve stopped in neutral position. 5. Damaged spool valve. 6. Clogged diaphragm chamber. 7. Relief valve not adjusted properly. 8. Damaged diaphragm. 9. Incorrectly positioned and plumbed. 10. Clogged muffler.	1. Check air supply. 2. Open valve or remove restriction. 3. Increase piping size; should be at least one size larger than pump port. 4. Push Reset Button for manual start. 5. Repair or replace valve. 6. Clean diaphragm chamber. 7. Adjust or clean. 8. Replace diaphragm. 9. Position pump with discharge at top and suction at bottom. Pump must be mounted horizontally. 10. Clean or replace muffler.
Pulsating flow	1. Some pulsating flow is normal. 2. Clogged check valve. 3. Damaged check valve disk. 4. Damaged check valve seat. 5. Air leak in suction line. 6. Clogged discharge line. 7. Clogged diaphragm chamber.	1. None required. 2. Clean or replace. 3. Replace disk. 4. Replace seat. 5. Repair or replace. 6. Clean line. 7. Clean diaphragm chamber.
Unbalanced pumping	1. Damaged diaphragm. 2. Damaged check valve disk. 3. Damaged check valve seat. 4. Damaged spool and detent.	1. Replace diaphragm. 2. Replace disk. 3. Replace seat. 4. Replace spool and detent.
Air exhaust from discharge	1. Damaged diaphragm. 2. Air leak in suction line.	1. Replace diaphragm. 2. Repair or replace.
Liquid returns from inlet	1. Damaged check valve disk. 2. Damaged check valve seat. 3. Viscosity of liquid too high. 4. Pump speed too fast.	1. Replace disk. 2. Replace seat. 3. Reduce pump speed. 4. Reduce pump speed.
Pump does not stop when discharge is closed	1. Clogged check valve. 2. Damaged check valve disk. 3. Damaged check valve seat. 4. Air leak in suction line.	1. Clean or replace valve. 2. Replace disk. 3. Replace seat. 4. Repair or replace.
Abnormal sound in exhaust	Clogged diaphragm chamber.	Clean diaphragm chamber.

Table 1: *Trouble-Shooting Chart*

Minor Repair Kits

393630-75 Check Valves and Diaphragm Kit

Item No.	Part No.	Description	Qty.
5	393630-5	"O" Ring	2
14	393630-14	Check Valve Disk	4
16	393630-16	"O" Ring	8
46	393630-46	Diaphragm (Santoprene))	2

393630-76 Center Rod Replacement Kit

Item No.	Part No.	Description	Qty.
5	393630-5	"O" Ring	2
6	393630-6	"O" Ring	2
7	393630-7	"O" Ring	2
8	393630-8	Bushing	2
24	393630-24	Center Rod	1
	393590	Teflon Grease	1

393630-77 Air-Valve Seal Kit

Item No.	Part No.	Description	Qty.
29	393630-29	Air-Valve Cushion	2
34	393630-34	"O" Ring (Buna N)	1
35	393630-35	"O" Ring (Buna N)	1
43	393630-43	Seal Ring	5
44	393630-44	"O" Ring	6
45	393630-45	Nut	1

393630-78 Detent Assembly Kit

Item No.	Part No.	Description	Qty.
33	393630-33	Detent Assembly	1
45	393630-45	Nut	1

PARTS LIST – Model 8301 Diaphragm Pump (Figure 6)

	Item No.	Part No.	Description	Qty.
✚	1	393630-1	Tie Rod (Stainless Steel)	6
✚	2	393630-2	Washer (Stainless Steel)	24
✚	3	393630-3	Spring Washer (Stainless Steel)	24
✚	4	393630-4	Nut (Stainless Steel)	24
●	5	393630-5	“O” Ring, 3-23/32" I.D. x 1/8" Thick (Buna N)	2
✚ ●	6	393630-6	“O” Ring, 27/32" I.D. x 9/64" Thick (Buna N)	2
✚ ●	7	393630-7	“O” Ring, 17/32" I.D. x 3/32" Thick (Buna N)	2
✚ ●	8	393630-8	Bushing	2
	9	393630-9	Spacer	1
	10	393630-10	Spring	2
✚	11	393630-11	Pilot Guide	2
	12	393630-12	Pilot Valve (Buna N)	2
	13	393630-13	Manifold (Polypropylene)	2
✚ ●	14	393630-14	Check Valve Disk	4
	15	393630-15	Valve Cage (Polypropylene)	4
●	16	393630-16	“O” Ring, 1-5/32" I.D. x 9/64" Thick (Buna-N)	8
✚	18	393630-18	Diaphragm Cushion	2
✚	20	393630-20	Outer Disk	2
	21	393630-21	End Casting	2
✚	22	393630-22	Inner Disk	2
	23	393630-23	Valve Seat (Polypropylene)	4
✚ ●	24	393630-24	Center Rod (Stainless Steel)	1
✚	25	393630-25	Body A	1
	26	393630-26	Gasket (TPFE)	1
✚	27	393630-27	Body B	1
✚ ●	29	393630-29	Air-Valve Cushion	2
	30	393630-30	Ball Valve	1
✚	31	393630-31	Air-Valve Sleeve	1
✚	32	393630-32	Spool	1
✚ ●	33	393630-33	Detent Assembly	1
✚ ●	34	393630-34	“O” Ring, 31/32" I.D. x 9/64" Thick (Buna N)	1
✚ ●	35	393630-35	“O” Ring, 3/16" I.D. x 1/16" Thick (Buna N)	1
✚	36	393630-36	Reset Button	1
✚	37	393630-37	Air-Valve Plug	1
	38	393630-38	Screen	2
✚	39	393630-39	Silencer	1
	40	393630-40	Base (Polypropylene)	2
	41	393630-41	Rubber Foot	4
✚	42	393630-42	Bolt	4
●	43	393630-43	Seal Ring	5
✚ ●	44	393630-44	“O” Ring, 25/32" I.D. x 1/16" Thick (Buna N)	6
✚ ●	45	393630-45	Nut	1
✚ ●	46	393630-46	Diaphragm (Santoprene)	2

● Repair-Kit Part
✚ Not available as a separate purchased part

NOTE: The parts listed in this instruction sheet are for reference identification in the instructions and illustrations. Some of them are not available as separate parts and these are noted in the parts list. Refer to the current parts price list and bulletins before ordering parts, and always give the part number, quantity, description and model where used when ordering parts. Parts availability and prices are subject to change without notice.

PARTS CHANGES SINCE LAST PRINTING

Deleted Air Coupler