



Price Pump® Co.



INSTALLATION, OPERATING AND MAINTENANCE MANUAL

POLYPROPYLENE AIR OPERATED
DIAPHRAGM PUMPS

MODEL 1/2 AOD-P

ALL ELASTOMERS

PLEASE FILL IN DATA
FROM YOUR PUMP
NAMEPLATE

Pump Model _____

Spec. No. _____

Serial No. _____

Seal No. _____

Price Pump® Company

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RETAIN MANUAL
FOR REFERENCE

47393-9/94
IN-AOD-3

Congratulations

You are now the owner of a Price® Pump Co. Air Operated Diaphragm Pump. This pump was carefully inspected and subjected to final performance tests before releasing for shipment. In order to achieve maximum performance and reliability, please follow the simple instructions in this manual.

RECOMMENDED PRECAUTIONS

1. For satisfactory operation and safety, maximum inlet air pressure must not exceed 125 psi (8.79 kg/sq cm).
2. No modifications, additions or deletions should be made to the pump without prior approval of the factory.
3. Drain casing completely and flush with water before servicing pump handling volatile or harmful liquids.

READ CAREFULLY THE CAUTION BELOW

CAUTION:

The performance of Price® pump is based upon clear, cold, fresh water with suction conditions as shown on the performance curves. If used to pump other liquids, pump performance may differ from rated performance based on the different specific gravity, temperature, viscosity, etc. of the liquid being pumped. A standard pump, however, may not be safe for pumping all types of liquids, such as toxic, volatile or chemical liquids, or liquids under extreme temperatures or pressures.

Please consult Price® Pump catalogs as well as local codes and general references to determine the appropriate pumps for your particular application. Since it is impossible for us to anticipate every application of a Price® pump, if you plan to use the pump for a non-water application, consult Price® Pump beforehand to determine whether such application may be proper or safe under the circumstances. Failure to do so could result in property damage or personal harm.

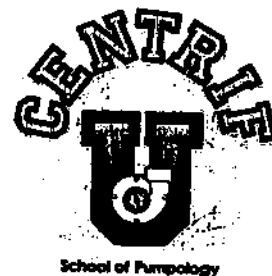


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OPERATING INSTRUCTIONS

POLYPROPYLENE AIR OPERATED DIAPHRAGM PUMPS

1/2 AOD-P

ALL ELASTOMERS

INSTALLATION

Bolt pump to a mounting pad using appropriately sized diameter bolts. Rubber vibration insulators should be used between the pump mounting feet and mounting pad to reduce pump vibrations and stresses. In permanent installations the pump should not be directly attached to rigid piping, but instead should be connected through flexible hoses or equivalent on both the suction and discharge. This should be done to reduce pipe stresses and vibrations which are characteristic of the reciprocating nature of the pump. A surge suppressor may be required on the discharge line of the pump if further reduction in vibration or a reduction of pulsation in the discharge flow is desired.

If the pump is used in a submerged application a line or hose should be attached to the pump air exhaust to prevent liquid from entering the air valve when the pump is shutdown or operating at low discharge heads. **CARE MUST BE EXERCISED WHEN SUBMERGING THE PUMP IN CORROSIVE PUMPING MEDIA.**

Suction and discharge pipe size should be at least equal to the inlet pipe diameter or larger. Larger, if highly viscous liquid is to be pumped or long lengths of pipe are used. When using suction hoses use the non-collapsing reinforced type, since this pump is capable of producing high vacuum at the suction inlet.

SOLIDS-HANDLING CAPABILITY

Price® Pump Air Operated Diaphragm Pumps will pass the following spherical solid sizes:

Model	Size
1/2 AOD-P	1/8" Dia. (3.1 mm)

If the possibility exists that larger sized solids may be suspended or carried along by the pumping media, install a strainer on the suction line with smaller sized holes than the allowable solid size. This will prevent the larger solids from entering the pump and interfering with operation of the pump ball valves.

AIR SUPPLY

The inlet to the air valve is a female 1/4" NPT. The air supply line should be sized accordingly so that there is no restriction less than inlet pipe size.

NOTE: Longer air lines require larger diameters to reduce the air system pressure loss and make available required pressure and flow at the pump air inlet. It is

safe to use up to **110 psig (7.73 kg/sq cm)** for pumping requirements.

WARNING: DO NOT EXCEED 125 PSIG (8.79 KG/SQ CM) AIR SUPPLY PRESSURE AS COMPONENT DAMAGE OR PERSONAL INJURY MAY RESULT.

PUMP CONTROL

The pump operating conditions, flow (GPM) and discharge head (PSIG) can be controlled in the following manner:

1. Throttling the pump discharge by means of a valve on the discharge line. When the pump discharge pressure equals the air supply pressure, the pump will stop. This will not harm the pump, however, **do not exceed 125 psig (8.6 kg/sq cm) air supply pressure.** The pump may be in this mode indefinitely. By opening the discharge valve the pump will resume pumping.
2. The air pressure supply can be limited to the pump. Price® Pump recommends the installation of a Price® Pump air filter/pressure regulator for all AOD applications. A globe or gate valve can be used before the regulator for on or off control. Failure to use an air pressure regulator will cause the pump air inlet pressure and thus discharge pressure to climb to maximum air system pressure when the pump is stopped.

Minimum Air Supply Pressure

This air valve incorporates a stall-free design and will begin operating with air inlet pressures as low as 5 psig.

OPERATING INSTRUCTIONS

The pump air valve is of an oilless design; that is, no lubrication is required or recommended. A clean, dry air supply should be provided for optimum air valve operation and life. In cold weather operation, or under conditions of high pump discharge pressure and relatively high humidity, air valve freezing may occur as a result of moisture in the compressed air being released. If this occurs, anti-freeze of the ethylene glycol type, may be used in a measuring dispenser, such as an air line lubricator at the pump air inlet. The resulting mist will keep the air valve free of ice build-up.

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OPERATING INSTRUCTIONS

1. In cases where there are several air-operated diaphragm pumps being used simultaneously and freezing of the air valve occurs frequently due to excessive moisture in the compressed air system, it may be advantageous to install a desiccant type compressed air dryer in the air system to purge the air supply of unwanted moisture.

For permanent installations, an air filter and water/oil separator should be used. This is always good practice, since it insures maximum life of the air valve moving parts and seals by keeping them clean of dirt and oil residue.

Excessive oil and water in the inlet air supply will cause a varnish-like substance to form on the self-lubricated valve spool. This will eventually lead to valve spool "sticking" and result in erratic spool operation. Should this occur, the spool and housing bore may be cleaned with a commercial safety solvent.

2. When starting the pump, make sure all valving on the suction and discharge lines are open. The pump will not prime with the valves closed. Pump cavitation will occur if the suction line is restricted with foreign matter - use a suction strainer with hole size less than allowable solid size for model in question.
3. When pumping highly viscous materials, it is advisable to check the pump flow rate vs. the pump stroke rate.

AVG. GALLONS PER STROKE*

PUMP MODEL	Standard Elastomers	Teflon
1/2" AOD-P	.016 (.06l)	.014 (.05l)

*Actual test data with flooded suction and specific gravity of 1.0.

- One pump stroke is equal to one exhaust blast. The pump should not pump faster than the material is capable of being drawn into the pump. If this occurs, cavitation will occur and damage to the pump could result in time.
4. To determine maximum pumping speed, increase air supply while pump discharge increases. When discharge flow no longer increases, throttle back air until pump discharge flow starts to fall off. This point is the optimum pumping speed achievable by either one of the two methods previously mentioned under the PUMP CONTROL section of this manual.
 5. The pump air exhaust port should be kept free of blockage. A 3/8" (9.5 mm) sized hose may be piled up to the exhaust port and directed away. The pump should never be operated submerged without installing a line from the exhaust port to a point above the liquid surface. The required exhaust line should be kept as short as possible or pump performance could be affected. If long lengths of exhaust line are

necessary, increase the internal diameter of the exhaust line to minimize pressure drop and pump performance loss. If the exhaust sound level becomes too objectionable, use the air muffler provided.

NOTE: Installing an air exhaust muffler on a submerged pump will not prevent the liquid in which the pump is submerged, from entering the air valve.

CAUTION: If a diaphragm failure occurs, the pumping media may be blown out the exhaust port. This could be hazardous if the pumping media is toxic or aggressive. It is advisable to add a line to the exhaust port and direct it safely away when pumping toxic or aggressive media.

6. Drain pump and flush after use when pumping material which can pack, settle out of liquid suspension, or solidify in time. A packed pump can cause damage to the diaphragm clamping plates and pump shaft when started after a period of interrupted use. The pump may be inverted and drained through the discharge port and flushed through the suction port.

OPERATING TEMPERATURE

The pump should not be used to pump liquids above 150°F (65°C). Degradation of the pump elastomers will occur when the temperature of the pumping media rises above 150°F (65°C). For operating temperatures above 150°F (65°C) consult factory.

TROUBLESHOOTING

1. **Pump will run but will not pump.**
 - a. check suction line for leaks
 - b. tighten bolts on suction manifold of pumps
 - c. material too viscous to pump at high rate of flow - slow down pump by reducing air supply to pump
 - d. suction manifold & pump chambers misaligned - disassemble & realign.
 - e. suction or discharge balls jammed open with foreign object - disassemble pump & examine.
- NOTE:** Optimum priming speed for these pumps is obtained when air inlet pressure is maintained between 15-20 psl, (1.0-1.4 kg. sq cm) with open pump discharge.
2. **Air bubbles in pump discharge**
 - a. check suction line & clamps for leaks
 - b. cracked or ruptured diaphragm

OPERATING INSTRUCTIONS

3. **Intermittent pump operation and/or ice blowing from exhaust port**
 - a. remove obstruction from suction line
 - b. valve freeze-up – install de-icer on air inlet line or suitable air dryer in compressed air line.
 - c. sticky air valve – remove spool & clean with safety solvent.
4. **Pump stops pumping.**
 - a. increase air supply pressure – DO NOT exceed **125 psig (8.79 kg/cm²)** under any circumstances and check for obstruction in suction or discharge line.
 - b. spool sticking – remove spool & clean with safety solvent – install suitable filter on air inlet if dirt or contaminants persist.
 - c. air valve ice-up – excess moisture on the muffler is an indication that significant water is present in the air supply. Depending on the degree of severity, an in line water separator or air dryer is recommended.
5. **Severe pump vibration with intermittent flow.**
 - a. ruptured diaphragm – disassemble pump, replace diaphragm and clean air valve if necessary.
 - b. mechanical failure – disassemble pump and inspect for bent shaft, etc.
6. **Pumping media coming from exhaust port.**
 - a. ruptured diaphragm – disassemble pump, replace diaphragm – clean air valve if necessary.
7. **Varying pump discharge per stroke.**
 - a. remove suction manifold and check for obstructions.
 - b. worn or leaky ball valves & seats – disassemble pump and replace worn parts.
8. **Slowing up of pumping action.**
 - a. clogged air exhaust muffler – replace.
 - b. ice build up in air valve – install de-icer on air inlet line.

PUMP DISASSEMBLY INSTRUCTIONS

Prior to disassembly of any AOD pump included herein; follow the "caution" below.

CAUTION: Do not attempt to perform any maintenance or repair on the air operated diaphragm pumps until the compressed air line to the pump and pump discharge line has been shut off, bled down, and disconnected. In addition, when pumps are being used to pump toxic or aggressive media, the pumps should be flushed clean prior to disassembly.

DISASSEMBLY INSTRUCTIONS FOR MODELS 1/2 AOD-P

(refer to Fig. 1, page 8)

1. Start disassembly by standing pump upright on its mounting feet. Remove discharge manifold (23) by removing the four 1/4" - 20x4" cap screws (52), flatwashers (53), and hex nuts (54).
2. Remove "O" rings (47), ball cages (57), ball checks (29), ball seats (28). Carefully check these parts for wear and replace worn items during reassembly.
NOTE: If pump is Teflon fitted, it is recommended that "O" rings (47) be replaced.
3. Remove and discard gaskets (58) and replace with new ones during reassembly.
4. Invert pump so that it is resting on the tops of the pump chambers (1). Remove suction manifold (24) and mounting feet (55) by removing four 1/4" - 20x4 1/2" cap screws (56) and associated washers and hex nuts.
5. Remove "O" rings (59), ball seats (28), ball checks (29), and ball cages (57). Inspect for wear and replace if necessary.
NOTE: It is recommended that Teflon "O" rings (59) be replaced.
6. Remove pump chambers (1) by removing the 5/16" x 1 1/4" cap screws (30), flatwashers (31), and hex nut (32). If pump is Teflon fitted, remove Teflon tape (51) from pump chamber (1).
CAUTION: Before removing pump chambers, note the word "TOP" engraved in the top portion of the pump chamber and its relationship to the air valve assembly. Mark an index line across the pump chamber flange and air chamber flanged portion of the air valve. This will aid in finding the right alignment during reassembly.
7. Place hex portion of outer clamp plate (4) in table vise. Loosen opposing clamp plate (4) with wrench.
8. Remove assembly from vise and completely remove loose clamp plate. Remove diaphragm (6), spacer gasket (60), inner clamp plate (7), and bumper (8) from shaft. Check diaphragm and bumper for wear and replace if necessary.
9. Remove shaft and remaining diaphragm from pump by sliding through shaft bore. Put free end of shaft in vise between two blocks of wood or soft metal jaws, and remove outer clamp plate, diaphragm, inner clamp plate, bumper, and spacer gasket.
10. The wetted end of your pump is now completely disassembled. Refer to air valve disassembly on page 8.

OPERATING INSTRUCTIONS

REASSEMBLY INSTRUCTIONS FOR MODEL 1/2 AOD-P

(refer to Fig. 1, page 8)

1. Place pump shaft (16) in vise with soft metal jaws or wooden blocks between the vise jaws. Slip bumper (8) over one end of shaft. Assemble diaphragm (6) to pump shaft using inner clamp plate (7) and outer clamp plate (4). Use **Loctite #242** on clamp plate screw threads. Convexed side of diaphragm should face outward, away from valve housing. Tighten outer clamp plate to a torque of **150 in-lbs (17 n-m)**.
2. Remove shaft from vise and slip spacer gasket (60) over other end of shaft. Insert shaft and diaphragm assembly thru bore in valve housing and check for free movement of shaft. It should not bind. Bottom out diaphragm and gasket against valve housing flange. Align holes in diaphragm, gasket and flange.
3. Invert assembly and place hex portion of outer clamp plate in table vise. Place new bumper (8) on shaft end and gasket (60) on face of valve housing flange. Install inner clamp plate, diaphragm, and outer clamp plate onto shaft. Use **Loctite # 242** on outer clamp plate threads. **DO NOT TIGHTEN CLAMP PLATE AT THIS TIME.**
4. Use a rubber lubricant (such as P-80) and apply liberally between plastic outer clamp plate and diaphragm. Carefully align all holes in diaphragm, gasket, and valve housing flange on both sides of assembled unit. Tighten the second outer clamp plate (4) to **150 in-lbs (17n-m)**. Recheck to make sure that all holes are still aligned.
5. If pump is Teflon fitted, install new Teflon tape (51) onto pump chamber (1). Teflon tape should cover raised rib on pump chamber without encroaching on bolt holes. Put pump chamber (1) in place, making sure that the index lines marked in item 6 of Disassembly Instructions are aligned and that the word "TOP" on the pump chamber is aligned with the tip of the air valve assembly. Install 5/16" x 1 1/4" cap screws (30) and flat washers (31) thru pump chamber flange and valve housing flange. Install flat washers (31) and 5/16" hex nuts (32). Torque cap screws to **50-70 in lbs (5.6-8.0 n-m)**.
6. Remove assembly from vise and repeat procedures in item 5 above for remaining pump chamber.
7. To assemble ball checks, suction manifold, and mounting feet, proceed as follows. Set assembled unit on table top with the pump chamber openings labeled with the word "TOP", down on table. Insert ball cages (57) into pump chamber openings that face up. Continue with ball valves (29), ball seats (28), and "O" rings (59). Invert suction manifold (24) with the threaded inlet facing in desired direction and place on top of pump chambers. Place mount-

ing feet in position and secure to manifold using the four 1/4" x 4 1/2" long cap screws (56) flatwashers and hex nuts. Tighten screws to **80-90 in-lbs (9-10 n-m)**.

8. Invert pump so that it is resting on the mounting feet. Install new gaskets (58), ball seats (28), ball valves (29), ball cages (57) and "O" rings (47). Place discharge manifold (23) on top and secure to pump chambers using the four 1/4"x4" long cap screws, flatwashers and hex nuts. Tighten screws to **80-90 in-lbs (9-10 n-m)**.
9. Your pump is now ready to be placed back in service.

AIR VALVE DISASSEMBLY INSTRUCTIONS, 1/2 AOD-P,

(refer to Fig. 2, page 9)

1. Remove spool housing end caps (36), gaskets (37) and cap screws (35) from spool housing (68).
2. Remove spool (39) and examine spool and piston rings (45) for wear. Replace piston ring seals and spool if deeply scratched, chipped, or worn. New spools will be interchangeable with old. If bore in spool housing (68) is corroded, excessively pitted, or deeply scratched, replace spool housing.
3. Remove muffler (44) from exhaust cap (63), and check inside for dirt and debris. If muffler is clogged it will affect pump performance. Replace if necessary.
4. Remove spool housing (68), gaskets (65) and (64), and exhaust cap (63) by removing the four socket head cap screws (66), flatwashers (62), and hex nuts (61). Check gaskets for any degradation and replace if required.
5. Remove retaining rings (75) and lip seal type gaskets (76) from both ends of valve housing (78). Replace these items during reassembly. If Oilite bronze sleeve bushings (43) in valve housing shaft bore appear to be worn they can be removed by carefully pressing both out from one side. Replace if worn.
6. Remove outer retaining rings (72) using special pliers. Pry out seals (73) with a small flat bladed screwdriver, being careful not to damage the bore. Remove inner retaining rings (72) using special pliers. Remove the pilot spool (82) from the air valve by pulling out at one end.
7. Remove the piston ring assemblies (83) from each end of the pilot spool.
8. Your air valve assembly is now completely disassembled and ready for reassembly.

OPERATING INSTRUCTIONS

AIR VALVE REASSEMBLY INSTRUCTIONS FOR MODEL 1/2 AOD-P

(refer to Fig. 2, page 9)

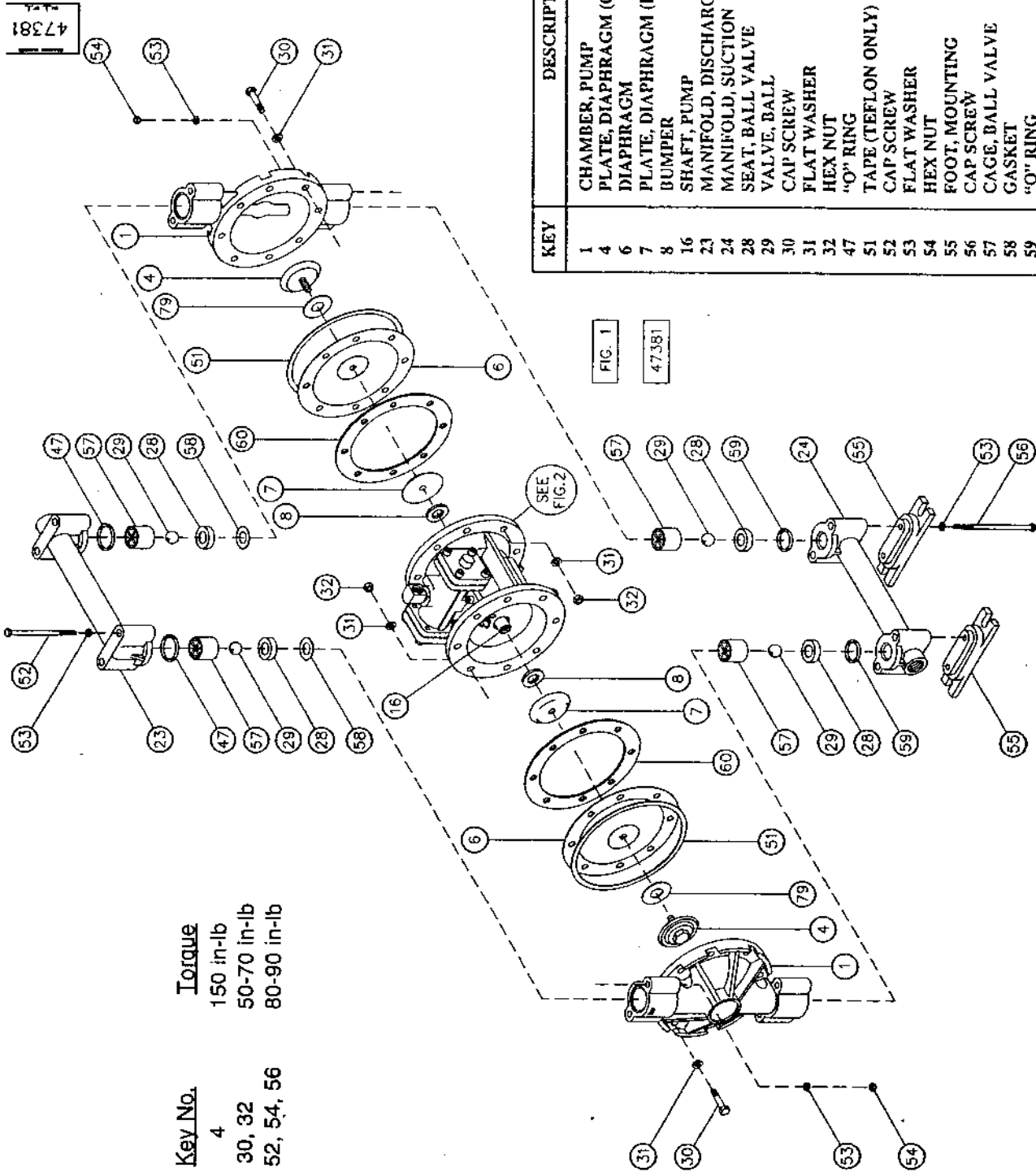
CAUTION: Care must be taken at this stage to ensure cleanliness. A dirty valve will stick and work improperly. Keep area free of dirt, oil, and metal chips.

1. Clean all parts with clean safety solvents and inspect for wear prior to reassembly.
2. Press in shaft bushings (43), making sure they are properly aligned with the bore in the valve housing. Press in 3/16" beyond the flush position. This will allow room for the gaskets (76) and retaining rings (75). Install new gaskets and retaining rings.
3. Install new piston ring assemblies (83) on pilot spool (82). Push pilot spool with piston rings into bore of air valve, installing from side of air valve which has chamber on bore. Install inner retaining rings (72), seals (73), and outer retaining rings (72). The lips on seals (73) must face outward towards pump chambers.
4. Inspect spool (39) for scratches, scoring, chips, and wear. If severe grooving or marking is evident, replace spool. To ensure maximum performance the spool should not be excessively worn, although the pump will still run satisfactorily.
5. Remove piston ring seals and expander rings (46) from spool. Replace with new.

NOTE: Upon reassembly of piston ring seals (45) and expander rings (46) the opening in the expander ring and the split in the piston ring should be assembled 180° apart. Also, upon reassembling the spool to the spool housing bore, rotate piston ring seals in their grooves until the split in the seal is at the valve housing 3 or 9 o'clock position. This prevents the split from covering valve housing ports during reassembly. This also eliminates the tendency to hang up on a port. Do not install main spool in the centered position or pump will not start.

6. Install new spool housing cap gaskets (37) with existing end caps (36) and 1/4"-20 Allen head screws (35) at both ends of spool housing.
7. Reinspect air valve/spool housing gasket (65). If any damage is evident replace with new. Position exhaust cap (63), gasket (64) and (65), and spool housing assembly onto valve housing and secure with four 1/4-20x4" Allen head screws (66), washers (62), and hex nuts (61). **Torque to 50 in-lbs (5.7 n-m)**
8. Check muffler (44) to make sure that it is clean and free of debris. If it cannot be cleaned, replace with new. Install in exhaust cap.
9. Your air valve assembly is now completely refurbished and ready for further pump assembly.

47381



KEY	DESCRIPTION
1	CHAMBER, PUMP
4	PLATE, DIAPHRAGM (OUTER)
6	DIAPHRAGM
7	PLATE, DIAPHRAGM (INNER)
8	BUMPER
16	SHAFT, PUMP
23	MANIFOLD, DISCHARGE
24	MANIFOLD, SUCTION
28	SEAT, BALL VALVE
29	VALVE, BALL
30	CAP SCREW
31	FLAT WASHER
32	HEX NUT
47	"O" RING
51	TAPE (TEFLON ONLY)
52	CAP SCREW
53	FLAT WASHER
54	HEX NUT
55	FOOT, MOUNTING
56	CAP SCREW
57	CAGE, BALL VALVE
58	GASKET
59	"O" RING
60	GASKET, SPACER
79	GASKET

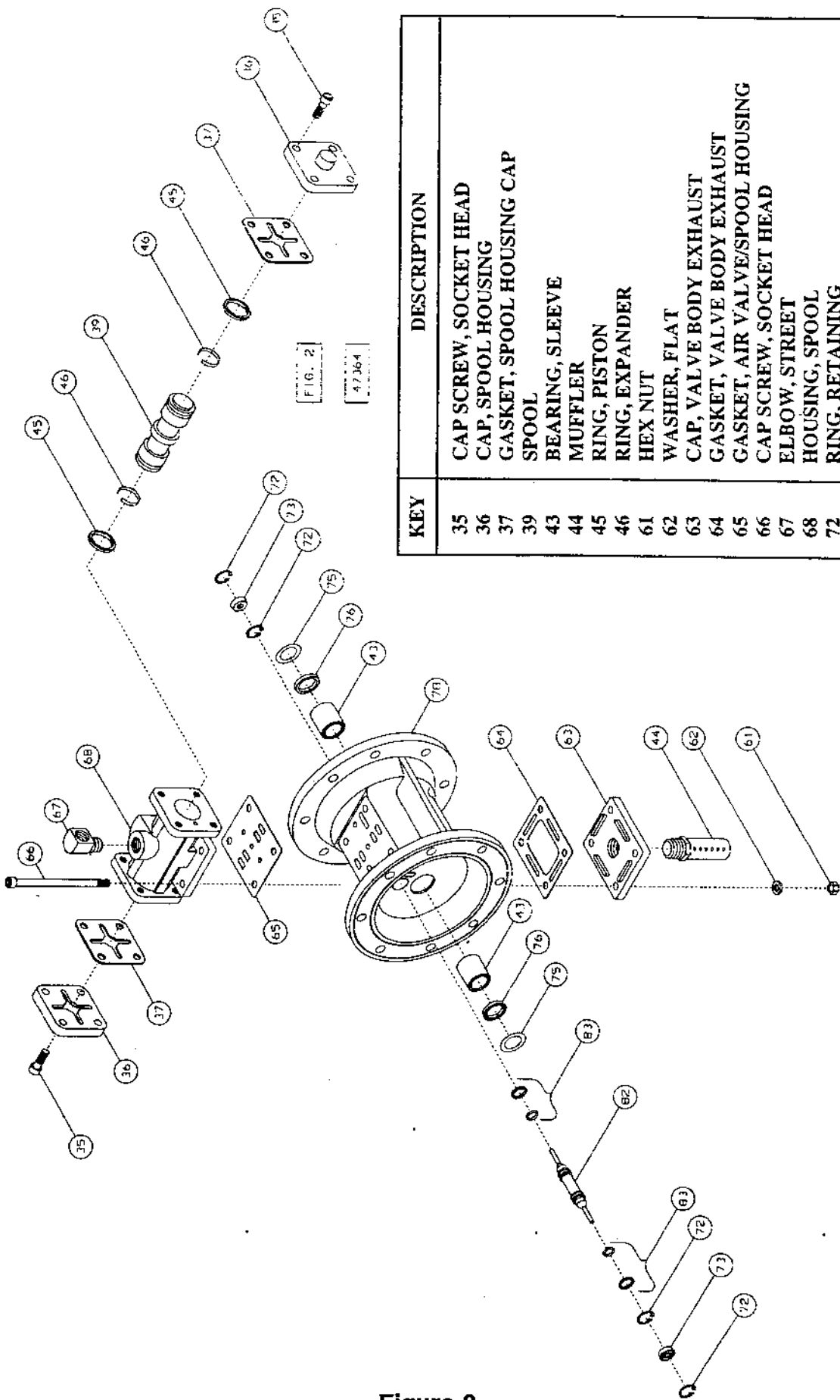
FIG. 1

47381

Key No.
4
30, 32
52, 54, 56

Torque
150 in-lb
50-70 in-lb
80-90 in-lb

Figure 1



KEY	DESCRIPTION
35	CAP SCREW, SOCKET HEAD
36	CAP, SPOOL HOUSING
37	GASKET, SPOOL HOUSING CAP
39	SPOOL
43	BEARING, SLEEVE
44	MUFFLER
45	RING, PISTON
46	RING, EXPANDER
61	HEX NUT
62	WASHER, FLAT
63	CAP, VALVE BODY EXHAUST
64	GASKET, VALVE BODY EXHAUST
65	GASKET, AIR VALVE/SPOOL HOUSING
66	CAP SCREW, SOCKET HEAD
67	ELBOW, STREET
68	HOUSING, SPOOL
72	RING, RETAINING
73	SEAL
75	RING, RETAINING
76	SEAL
78	HOUSING, AIR VALVE
82	SPOOL TWIN
83	PISTON RING ASSY

Item
61, 66

Torque
50 in-lb

Figure 2

AOD® PUMP WARNINGS

- A Static charge buildup could occur in a plastic pump or an electrically insulated metal pump.
- Any contaminants in the air supply will be exhausted out the muffler to the atmosphere.
- All piping connections to the pump should be flexible.
- The chemical compatibility of the pump materials of construction with the fluids being pumped must be checked before use.
- AOD® pumps are not to be used for sanitary food applications.
- Submerged AOD® pumps should have their exhaust pipes away from the liquid level. A submerged pump may leak some air from gasketed joints. Do not submerge pumps in corrosive media.
- A pump which has stopped due to air valve icing will restart by itself when ice melts.
- Use only original factory replacement parts.
- Before start-up re-torque all external fasteners to the torque values listed in the I&O manual supplied with the pump.
- Pump temperature limits must be observed: Polypro pump - 150 deg F max. (65 deg. C)
Metal pump - 180 deg F max. (82 deg. C)
- Do not exceed 125 psi (8.79 bar) air inlet pressure as component damage or personal injury may result.
- AOD® pumps must only be operated by oil free, clean, dry compressed air.
- Shut off, bleed down and disconnect the compressed air supply before doing any maintenance or repair to the pump.
- The pump should be flushed before disassembly. The pump should be inverted (outlet at bottom) to drain properly.
- A diaphragm failure could:
 - a. cause the system to which the pump is connected to be pressurized up the the compressed air supply pressure and mix air with the fluid being pumped.
 - b. Cause the fluid being pumped to be sprayed out through the exhaust muffler.
- AOD® pumps are not suitable for use with 1,1,1-trichloroethane, methylene chloride or other materials containing halogenated hydrocarbons. Aluminum wetted parts can react with these solvents and explode. Consult solvent suppliers for compatibility with aluminum before installation.
- For 1-1/2", 2" and 3" AOD® pumps- CAUTION – unit weight may exceed 65lbs. (30 kg).

AOD® sound level at a distance of 1 meter with an air inlet pressure of 35 psig.

Pump size Inches	Pump Material	Sound Pressure Level		Sound Power Level db (A)
		RMS db (A)	Peak db (C)	
1/2	Polypro	87	104	97
1	Polypro	89	105	99
1	Metal	95	110	105
1-1/2	Metal	90	109	100
2	Metal	98	108	108
	Metal	97	108	103



GENERAL TERMS OF SALE FOR PRODUCTS

Effective: January 1, 1999

1. GENERAL

A. Seller's price is based on these sales terms and conditions. This contract shall represent the final, complete and exclusive statement of the agreement between the parties and may not be modified, supplemented, explained or waived by parol evidence, any Terms and Conditions contained in Buyer's purchase order or request for quotation, any course of dealings between the parties, Seller's performance or delivery, or in any other way. The Terms and Conditions of this contract may only be modified or waived in a written document signed by an Officer of Seller. These terms are intended to cover all activity of Seller and Buyer hereunder, including sales and use of products, parts and work and all related matters (references to products include parts and references to work include construction, installation and start-up). Any reference by Seller to Buyer's specifications and similar requirements are only to describe the products and work covered hereby and no warranties or other terms therein shall have any force of effect. Any information provided by Seller, including but not limited to suggestions as to specific equipment does not imply any guarantee of specific suitability and/or material compatibility in a particular application since many factors outside the control of Seller may affect the suitability of products in a particular application. Catalogs, circulars and similar pamphlets of the Seller are issued for general information purposes only and shall not be deemed to modify the provisions hereof.

B. The agreement formed hereby and the language herein shall be construed and enforced under the Uniform Commercial Code as in effect in the State of California on the date hereof.

2. TAXES

Any sales, use or other similar type taxes imposed on this sale or on this transaction are not included in the price. Such taxes shall be billed separately to the Buyer. Seller will accept a valid exemption certificate from the Buyer if applicable; however, if an exemption certificate previously accepted is not recognized by the governmental taxing authority involved and the Seller is required to pay the tax covered by such exemption certificate. Buyer agrees to promptly reimburse Seller for the taxes paid.

3. PERFORMANCE, INSPECTION AND ACCEPTANCE

A. Unless Seller specifically assumes installation, construction or start-up responsibility, all products shall be finally inspected and accepted within thirty (30) days after arrival at point of delivery. Products not covered by the foregoing and all work shall be finally inspected and accepted with thirty (30) days after completion of the applicable work by Seller. All claims whatsoever by Buyer (including claims for shortages) excepting only those provided for under the WARRANTY AND LIMITATION OF LIABILITY and PATENTS Clauses hereof must be asserted in writing by Buyer within said thirty (30) day period or they are waived. If this contract involves partial performance, all such claims must be asserted within said thirty- (30) day period for each partial performance. There shall be no revocation of acceptance. Rejection may be only for defects substantial in impairing the value of products or work and Buyer's remedy for lesser defects shall be those provided for under the WARRANTY AND LIMITATION OF LIABILITY Clause.

B. Seller shall not be responsible for non-performance or for delays in performance occasioned by any causes beyond Seller's reasonable control, including, but not limited to, labor difficulties, delays of vendors or carriers, fires, governmental actions, or shortages of material, components, labor, or manufacturing facilities. Any delays so occasioned shall affect a corresponding extension of Seller's performance dates, which are, in any event, understood to be approximate. In no event shall Buyer be entitled to incidental or consequential damages for late performance or for a failure to perform. Seller reserves the right to make partial shipments and to ship products, parts or work which may be completed prior to the scheduled performance date.

C. In the event that Seller has agreed to mount motors, turbines, gears, or other products which are not manufactured by Seller and which are not an integral part of Seller's manufactured product, and a delay in the delivery of such products to Seller occurs that will cause a delay in Seller's performance date, Seller reserves the right to ship its product upon completion of manufacture and to refund an equitable portion of the amount originally included in the purchase price for mounting without incurring liability for non-performance.

D. Seller reserves to itself the right to change its specifications, drawings and standards if such changes will not impair the performance of its products, and parts, and further that such products, and parts, will meet any of Buyer's specifications and other specific product requirements which are a part of this agreement.

E. The manufacture and inspection of products and parts shall be to Seller's Engineering and Quality Assurance standards plus such other inspections, tests or documentation as are specifically agreed to by Seller. Requirements for any additional inspection, tests, documentation, or Buyer witness of manufacture, test, and/or inspection shall be subject to additional charges.

4. TITLE AND RISK OF LOSS

Title and risk of loss shall pass to buyer upon delivery of products at the designated Ex Works place (Incoterms 1990) unless otherwise agreed by the parties.

5. EROSION AND CORROSION

It is specifically understood that products and parts sold hereunder are not warranted for operation with erosive or corrosive fluids. No product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action of any fluid and Buyer shall have no claim whatsoever against Seller therefore.

6. WARRANTY AND LIMITATION OF LIABILITY.

A. Seller warrants only that its product and parts, when shipped, will be free from defects in materials and workmanship. With respect to products and parts not manufactured by Seller, Seller's only obligation shall be to assign to Buyer, to the extent possible, whatever warranty Seller requires from the manufacturer. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery and, in any event, within one (1) year after initial start-up or eighteen (18) months after shipment, whichever first occurs, and all claims for defective work must be made in writing immediately upon discovery and in any event, within one (1) year of completion thereof by Seller.

Defective items must be held for Seller's inspection and returned to the original f.o.b. point upon request.

THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING WITHOUT LIMITATION, THE IMPLIED, WARRANTIES OF MERCHANTABILITY AND FITNESS.

B. ANY PRODUCT (S) SOLD HEREUNDER WHICH IS NOT MANUFACTURED BY SELLER IS NOT WARRANTED BY SELLER and shall be covered only by the express warranty, if any, of the manufacturer thereof.

C. Upon Buyer's submission of a claim as provided above and its substantiation, Seller shall at its option either (i) repair or replace its product, part or work at the original place of delivery, or (ii) refund an equitable portion of the purchase price.

D. THE FOREGOING IS SELLER'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY AND, EXCEPT FOR GROSS NEGLIGENCE, WILLFUL MISCONDUCT, AND REMEDIES PERMITTED UNDER THE PERFORMANCE, INSPECTION AND ACCEPTANCE AND THE PATENTS CLAUSES HEREOF, THE FOREGOING IS BUYER EXCLUSIVE REMEDY AGAINST SELLER FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHER THEORIES. BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, NOR FOR DAMAGES FOR LOSS OF USE, LOST PROFITS OR REVENUE, INTEREST, LOST GOODWILL, WORK OR PRODUCTION STOPPAGE, IMPAIRMENT OF OTHER GOODS, INCREASED EXPENSES OF OPERATION, OR THE COST OF PURCHASING REPLACEMENT POWER OR OTHER SERVICES BECAUSE OF SERVICE INTERRUPTIONS. FURTHERMORE, IN NO EVENT SHALL SELLER'S TOTAL LIABILITY FOR DAMAGES OF BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS OR PARTS MANUFACTURED BY SELLER AND UPON WHICH SUCH LIABILITY IS BASED. ANY ACTION ARISING HEREUNDER RELATED HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE CAUSE OF ACTION ACCRUES OR IT SHALL BE BARRED.

7. PURCHASER'S REPRESENTATIONS & WARRANTIES

Purchaser represents and warrants that the products(s) covered by this contract shall not be used in or in connection with a nuclear facility or application. The parties agree that this representation and warranty is material and is being relied on by seller. This provision may be modified in a separate writing signed by an officer of PPC.

8. PATENTS

Seller agrees to assume the defense of any suit for infringement of any patents brought against Buyer to the extent of such suit charges infringement of an apparatus or product claim by Seller's product in and of itself, provided (i) said product is built entirely to Seller's design, (ii) Buyer notifies Seller in writing of the filing of such suit within ten (10) days after the service of process thereof, and (iii) Seller is given complete control of the defense of such suit, including the right to defend, settle and make changes in the product for the purpose of avoiding infringement of any process or method claims, unless infringement of such claims is the result of following specific instruction furnished by Seller.

9. EXTENT OF SUPPLY

Only products as listed in Seller's proposal are included in this agreement. It must not be assumed that Seller has included anything beyond same.

10. MANUFACTURING SOURCES

To maintain delivery schedules, Seller reserves the right to have all or any part of the Buyer's order manufactured at any of Seller's or its licensee's plants on a world-wide basis.

11. TERMS OF PAYMENT

Net 30 days from date of invoice.