

OPERATOR'S MANUAL

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE
 INCLUDE MANUAL: S-632 GENERAL INFORMATION MANUAL (PN 97999-624)

650132-X
650133-X
650137-X

2" AIR MOTOR
2:1 RATIO
6" STROKE

2" DIFFERENTIAL
TRANSFER PUMP

RELEASED: 8-3-71
 REVISED: 12-10-02
 (REV. T)



**READ THIS MANUAL CAREFULLY BEFORE INSTALLING,
 OPERATING OR SERVICING THIS EQUIPMENT.**

It is the responsibility of the employer to place this information in the hands of the operator. Keep for future reference.

SERVICE KITS

- Use only genuine ARO® replacement parts to assure compatible pressure rating and longest service life.
- 66098 for repair of 60702 air motor section.
- 637044 for repair of lower pump end (Teflon upper and lower).
- 637045 for repair of lower pump end (UHMW-PE upper and lower).
- 637355 for repair of lower pump end (UHMW-PE upper / Teflon lower).

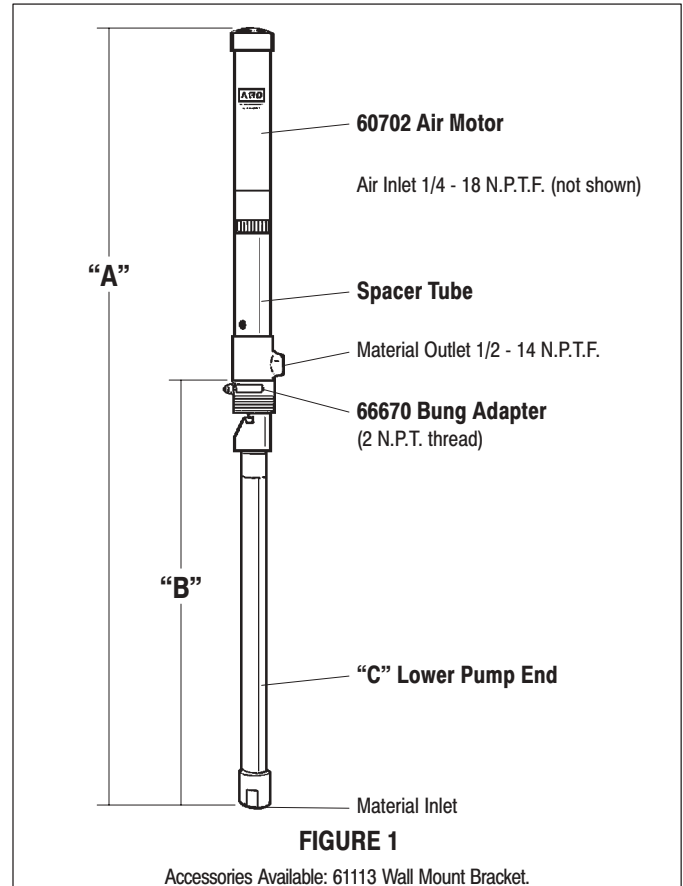
SPECIFICATIONS

Model Series	65013X-X
Type	Air Operated, Transfer Pump
Ratio	2:1
Air Motor	60702
Air Motor Repair Kit	66098
Motor Diameter	2" (5.08 cm)
Stroke (Double Acting)	6" (15.24 cm)
Air Inlet (female)	1/4 - 18 N.P.T.F.
Lower Pump End Series	
650132-X	66283-X
650133-X	66281-X
650137-1	66601-10
Material Outlet (female)	1/2 - 14 N.P.T.F.
Material Inlet	
650132-X	1 - 11-1/2 N.P.T.F. (female)
650133-X and 650137-1	immersed
Pump Drum Size / Capacity	
650132-X	Wall mount
650133-X and 650137-1	55 gallon
Dimensional Data	see chart

PERFORMANCE

Air Inlet Pressure Range	0 - 150 p.s.i. (0 - 10.3 bar)
Fluid Pressure Range	0 - 300 p.s.i. (0 - 20.7 bar)
Maximum Rec'd Cycles / Minute ..	120
Displacement In³ Per Cycle	8.0
Volume / Cycle	4.4 oz. (131 ml)
Cycles Per Gallon	28.8
Flow @ 120 Cycles / Minute	4.2 gallons (15.8 liters)
Noise Level @ 90 p.s.i. - 40 c.p.m. ..	81 db(A)①

① The pump sound pressure level has been updated to an Equivalent Continuous Sound Level (L_{Aeq}) to meet the intent of ANSI S1.13-1971, CAGI-PNEUROP S5.1 using four microphone locations.



MODEL	"A" (mm)	"B" (mm)	"C"
650132-C	41-1/2" (1054.1)	22-3/8" (568.3)	66283
650132-2C	41-1/2" (1054.1)	22-3/8" (568.3)	66283-3
650133	52-7/8" (1343.0)	33-3/4" (857.3)	66281
650133-1	52-7/8" (1343.0)	33-3/4" (857.3)	66281-1
650133-4	52-7/8" (1343.0)	33-3/4" (857.3)	66281
650133-5	52-7/8" (1343.0)	33-3/4" (857.3)	66281-3
650137-1	53" (1346.2)	33-7/8" (860.4)	66601-10



OPERATING AND SAFETY PRECAUTIONS

- Refer to General Information sheet for additional safety precautions and important information.

⚠ WARNING EXCESSIVE AIR PRESSURE. Can cause personal injury, pump damage or property damage.

- Do not exceed the maximum inlet air pressure as stated on the pump model plate.
- Be sure material hoses and other components are able to withstand fluid pressures developed by this pump. Check all hoses for damage or wear. Be certain dispensing device is clean and in proper working condition.

⚠ WARNING HAZARDOUS PRESSURE. Do not exceed maximum inlet air pressure of 150 p.s.i. (10.3 bar). Operating pump at higher pressure may cause pump damage and / or personal injury and / or property damage.

- **COMPONENT RUPTURE.** This pump is capable of producing high material pressure as stated on pump model plate. Be sure material hoses and other components are able to withstand

fluid pressures developed by this pump.

⚠ WARNING STATIC SPARK. Can cause explosion resulting in severe injury or death. Ground pump and pumping system.

- Sparks can ignite flammable material and vapors.
- The pumping system and object being sprayed must be grounded when it is pumping, flushing, recirculating or spraying flammable materials such as paints, solvents, lacquers, etc. or used in a location where surrounding atmosphere is conducive to spontaneous combustion. Ground the dispensing valve or device, containers, hoses and any object to which material is being pumped.
- Use the pump grounding lug provided on metallic pumps for connection of a ground wire to a good earth ground source. Use Aro Part No. 66885-1 Ground Kit or a suitable ground wire (12 ga. min.).
- Use hoses incorporating a static wire.

TROUBLE SHOOTING

Pump continually cycles.

- Check for empty material supply. Disconnect the air (from the pump), replenish material supply.
- Check to see if the connecting rod has disassembled from the mating rod. See assembly of lower pump end (figure 4).
- The ball may be wedged or sticking open in the foot valve body. NOTE: Replace the ball or the foot valve if either are damaged.
- Check for worn or damaged (32 or 46) upper packing.

Material on one stroke only (fast downstroke).

- The ball in the foot valve may not be checking or sealing properly. Remove the ball from foot valve and inspect. If the ball or foot valve is damaged, replace with new parts. If the ball or foot valve is not damaged, thoroughly clean both parts and reassemble (see lower pump end instructions).

Material on one stroke only (fast upstroke).

- Check for worn or damaged (37) lower material piston. Replace piston (see lower pump end instructions). See figure 7.

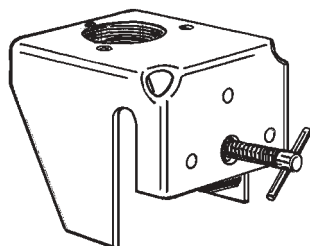
Material leakage out the top of the pump body.

- Check for worn or damaged (32 or 46) upper packing. See lower pump end instructions and replace the upper packing.
- Remove (41) ball from the (42 or 43) foot valve body. Thoroughly clean and replace (see figure 7).

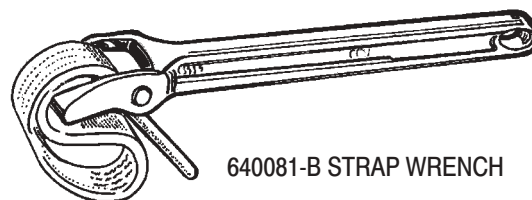
Air leakage out of the exhaust holes. (See Air Motor Instructions)

- Check to see if the (9) valve plate is loose or has disassembled from the (11) spacer.
- Check for worn or damaged (10) piston.
- Check for worn or damaged (19) "O" ring.
- Check for worn or warped (9) valve plate.
- Worn or damaged (14) "O" ring. Replace (14) "O" ring.

OPTIONAL ACCESSORIES



61113 BRACKET



640081-B STRAP WRENCH

FIGURE 2

GENERAL DESCRIPTION

The Aro 2" differential 2:1 ratio transfer pumps have been designed for the application and transfer of a wide range of corrosive and non-corrosive materials. These pumps may be directly mounted in the 2" bung of a standard drum or when using a 61113 mounting bracket, the pump can be mounted on the wall or in an open head drum.

AIR MOTOR

The 2" pump uses a differential, double acting style of air motor.

SPACER SECTION

The air motor is connected to the lower pump end by a spacer tube, this protects the air motor section from possible contamination due to normal wear and eventual leakage of material past the upper material piston seals.

$\frac{\text{PUMP RATIO} \times \text{INLET PRESSURE TO PUMP MOTOR}}{\text{MAXIMUM PUMP FLUID PRESSURE}}$

Pump ratio is an expression of the relationship between the pump motor area and the lower pump end area. **EXAMPLE:** When 150 p.s.i. (10.3 bar) inlet pressure is supplied to the motor of a 5:1 ratio pump it will develop a maximum of 750 p.s.i. (52 bar) fluid pressure (at no flow) - as the fluid control is opened, the flow rate will increase as the motor cycle rate increases to keep up with the demand.

LOWER PUMP SECTION

Models covered by this manual have either threaded or un-threaded material inlets.

AIR AND LUBE REQUIREMENTS

- Do not operate pump continuously at speeds in excess of 75 cycles per minute.
- Excessive air pressure will shorten the life of the pump.
- Use an air regulator to control operating pressure and cycle rate.
- Filtered and oiled air will allow the pump to operate more efficiently and yield a longer life to operating parts and mechanisms.
- It is recommended that an oiler be installed in the airline as close as possible to the pump. This increases the service life of the pump by reducing wear of the air motor's internal parts.
- **DAILY: Fill air line lubricator with a good grade of S.A.E. NO. 90 W non-detergent gear oil, adjust to 1 to 2 drops per minute.**
- Lack of or an excessive amount of lubrication will affect the performance and life of this pump. Use the recommended lubricants.

INSTALLATION

FLUSH PUMP

1. Connect fluid hose to pump outlet and be sure all fittings are tight.
 2. Turn air regulator knob counter-clockwise until it turns freely.
 3. Pump has been tested in oil and a small amount remains for protection against rusting. Immerse lower pump end in compatible solvent.
 4. Connect air hose coupler to connector on FRL.
 5. Turn air regulator knob clockwise until air motor starts operating.
 6. Flush pump with oil.
 7. Disconnect air supply from air motor.
- **CAUTION:** Solvent used for flushing may not be compatible with material being pumped. If this is the case, flush again with a compatible solvent.
 - If pump does not function properly, disconnect air and relieve all pressure. Refer to Trouble Shooting.

OPERATING INSTRUCTIONS

1. Turn air regulator knob clockwise until air motor starts to cycle.
 2. Allow pump to cycle slowly until it is primed and all air is purged from the fluid hose or dispensing valve.
 3. Turn off dispensing valve and allow pump to stall-check all fittings for leakage.
 4. Change air regulator setting until desired pressure and flow is obtained.
 5. Inspect airline filter, open petcock to flush moisture or residue from bowl.
- If pump is to be inoperative for more than a few hours at a time, disconnect air supply and relieve all pressure from the system.

MAINTENANCE

The basic pump consists of two major components: 1. Air Motor, 2. Lower Pump. The air motor is removable and is to be serviced separately. Refer to air motor manual for service and parts. Disassembly should be done on a clean work bench.

- Periodically flush entire pump system with a solvent that is compatible with the material being pumped.
- Refer to disassembly procedures of air motor for correct breakdown.
- Before reassembling, lubricate parts where required. When reassembling "O" rings or parts adjacent to "O" rings, care must be exercised to prevent damage to "O" rings and "O" ring groove surfaces.
- **SERVICING.** Disconnect air lines and carefully bleed the pressure off the system before servicing or cleaning pump, or removing fluid hose or gun.

PUMP SERVICE PROCEDURES

PUMP DISASSEMBLY

Refer to Figure 3.

NOTE: All threads are right hand.

CAUTION: Do not clamp the pump tightly.

1. Thread a 1/2" nipple into the material outlet.
2. Place the 2" differential pump assembly in a vise as shown. Rotate the pump assembly so that the 1/2" nipple is resting against the vise.

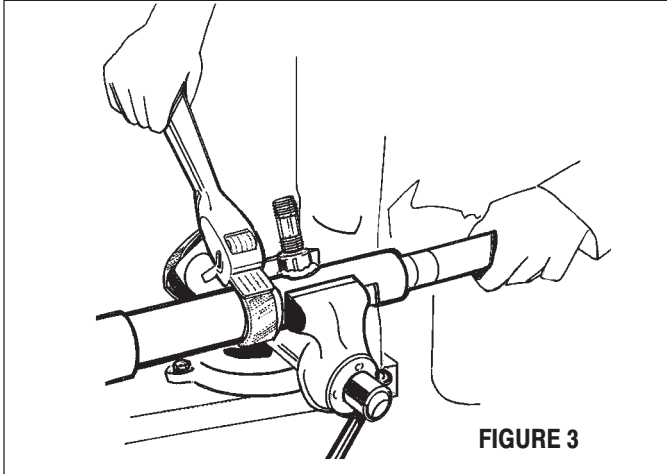


FIGURE 3

3. Unthread the air motor from the material outlet body by using a strap wrench on the air motor separating tube.
4. Push the connecting rod, in the lower pump assembly, to one side and pull down until the air motor separates from the lower pump assembly.
5. The pump is now in two assemblies: air motor and lower pump assembly.

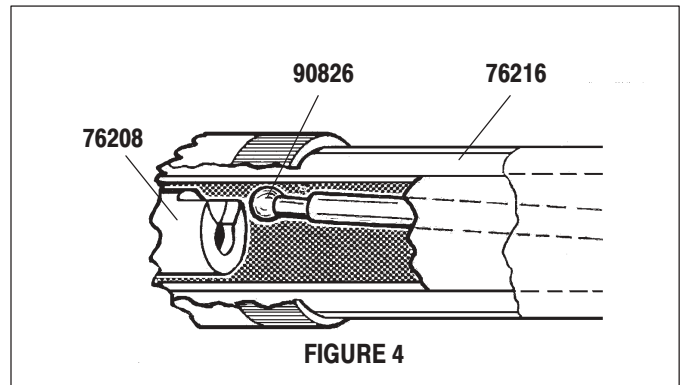


FIGURE 4

PUMP REASSEMBLY

Refer to Figure 3.

1. Place the 2" air motor in a vise with the needle valve or pipe nipple resting against the jaws of the vise, as shown.
2. Insert the 90826 tip of the lower assembly into the 76216 separating tube of the air motor.
3. Insert the 90826 tip of the lower pump assembly through the outside edge of the slot in the 76208 plunger tip, center the 90826 tip in the 76208 plunger tip and pull out until the 90826 tip is retained.
4. Thread the air motor into the material outlet body and tighten by using a strap wrench on the air motor 76216 separating tube.

2" AIR MOTOR SERVICE PROCEDURES

2" AIR MOTOR DISASSEMBLY

Refer to Figure 5.

1. Place the air motor in the vise with a needle valve or a 1/4" pipe nipple resting against the jaws of the vise, as shown.

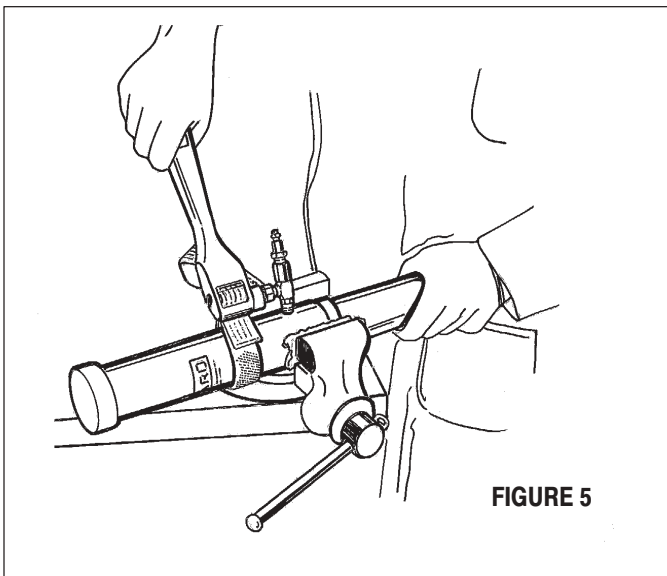


FIGURE 5

NOTE: All threads are right hand.

2. Place a strap wrench around the (1) cap and remove the cap. NOTE: If the (6) cylinder comes off with (1) cap, place the cap in a vise and use a strap wrench around the cylinder and unscrew from cap. NOTE: Do not squeeze or use pipe wrench on (6).
3. Place a strap wrench around the (6) cylinder and unscrew and remove the cylinder.
4. Pull the (7) assembly and (15) plunger out of the (18) body and lay aside.
5. Remove the (17) spring and (16) "O" ring from the (18) body.
6. Place the (18) body in the vise and loosen the (21) lock ring with a strap wrench.
7. Place a strap wrench around the (22) separating tube and unthread.
8. Remove the (20) washer and (19) "O" ring from the (18) body.
9. Clamp the flats of the (7) piston and spacer assembly in the vise. Remove the plunger tip from the (7) spacer and piston assembly. NOTE: Do not remove the (13) plunger tip from the (15) plunger, unless replacing parts.
10. Remove the (12) gasket from the (13) plunger tip. NOTE: Do not mar or damage o.d. of (15) plunger.
11. Remove the three (8) screws from the spacer and piston assembly.
12. Remove the (9) valve plate and (11) valve spacer.

60702 2" AIR MOTOR PARTS LIST

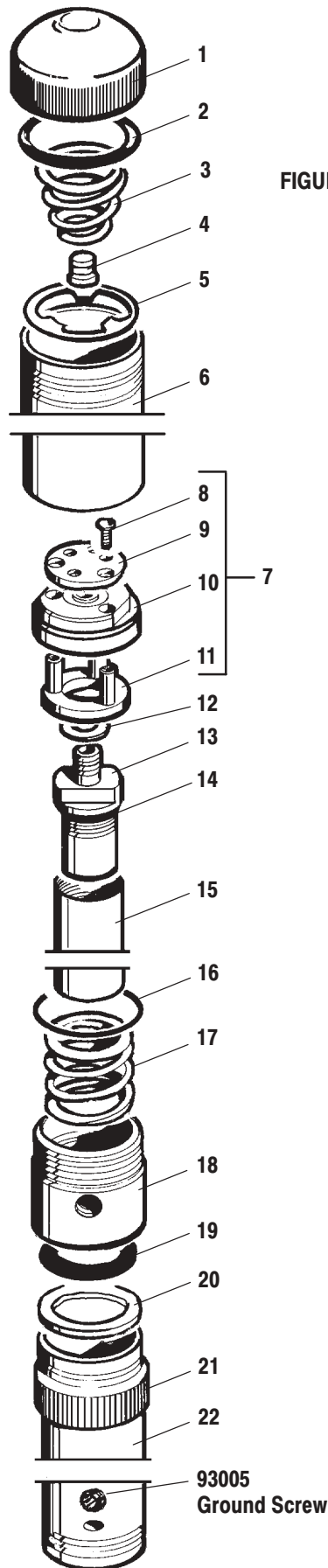


FIGURE 6

ITEM	DESCRIPTION	QTY	PART NO.
✓	SERVICE KIT PARTS		66098
1	Cap	1	76073-2
✓ 2	"O" Ring (3/32" x 2-5/16" o.d.)	1	Y325-138
3	Spring	1	77208
4	Button	1	90638
5	Washer	1	77290
6	Cylinder	1	76074-2
✓ 7	Spacer & Piston Assembly	1	61088
8	Screw (#4 - 40 x 3/8")	3	Y222-54-C
9	Valve Plate	1	76090
10	Piston Assembly	1	60656
11	Valve Spacer	1	76856
✓ 12	Gasket	1	F21-53
13	Plunger Tip	1	76208
14	"O" Ring (1/8" x 1-1/4" o.d.)	1	Y325-214
15	Plunger	1	76215
✓ 16	"O" Ring (3/32" x 2-1/16" o.d.)	1	Y325-134
17	Spring	1	76070
18	Pump Body	1	76077-2
✓ 19	"O" Ring (.275" x 1.837" o.d.)	1	77803
20	Washer	1	76075
21	Lock Ring	1	76100
22	Separating Tube	1	76216

2" AIR MOTOR REASSEMBLY

Refer to Figure 6.

1. Insert the (11) valve spacer through the bottom of the (10) piston assembly.
 2. Place the (9) valve plate on top of the piston assembly (side with three protrusions) to face (10) piston and align the three holes with the three posts of the (11) spacer.
 3. Fasten the valve plate down with the three (8) screws (this is the (7) spacer and piston assembly). Lay aside.
 4. Thoroughly grease the (19) "O" ring and place into the (18) body.
 5. Place the (20) washer in the (18) body.
 6. Screw the (22) separating tube securely to the (18) body.
 7. Tighten the (21) lock ring.
 8. Grease the (16) "O" ring and place over the threads of the (18) body.
 9. Place the (17) spring into the (18) body.
 10. Place the (15) plunger with (13) plunger tip through the (22) spacer tube and through the (18) body.
- NOTE: To prevent damage to (19) "O" ring, apply light film of grease on (15 and 13) assembly.
11. Place the (12) gasket over the threads of (13) plunger tip.
 12. Screw the (7) spacer and piston assembly onto the (13) plunger tip and tighten with wrenches, using flats provided.
 13. Thoroughly grease the inside of the (6) cylinder and insert it over the (7) spacer and piston assembly.
 14. Thread the (6) cylinder on the (18) body.
 15. Screw the (1) cap, with (2) ring, (3) spring, (4) button and (5) washer, in place on the (6) cylinder and tighten with a strap wrench.

LOWER PUMP SERVICE PROCEDURES

LOWER PUMP DISASSEMBLY

Refer to Figure 7.

NOTE: All threads are right hand.

CAUTION: Do not place wrench any other place other than the knurled part of the (33) suction tube.

1. Clamp the lower pump assembly in the vise, clamping on solid part of (26) pump body. NOTE: Do not clamp directly on outlet hole.
2. Place a pipe wrench or strap wrench on the knurled part of the (33) suction tube and remove the suction tubes.
3. Grasp the (34) lower piston rod and remove the rod and piston assembly by pulling straight out.
4. Place a pipe wrench or strap wrench on the knurled part of the (28) inner suction tube and remove.
5. Remove (25) tube and bushing assembly, using a strap wrench.
6. Clamp the (42 or 43) foot valve on flats in vise.
7. Place a pipe wrench on the knurled portion of (33) suction tube.
8. Remove (33 and 35) suction tubes from (42 or 43) foot valve.
9. Remove (42 or 43) foot valve from vise.
10. Remove (40) ball stop and (41) ball.
11. Clamp the (34) lower piston rod in the vise on flats.
12. Remove (29) cotter pin and (27) upper piston rod, remove by turning counter-clockwise.
13. Remove (30) nut, releasing
 - a. (31) washer, (32) seal and (31) washer or
 - b. (44) spring washer, (45) female washer, four (46) "V" packings and (47) male washer.
14. Remove the (39) nut, (38) washer and (37) piston.

LOWER PUMP END REASSEMBLY

Refer to Figure 7.

CAUTION: Apply Loctite Nickel anti-seize compound to all stainless steel threads unless the service manual calls for Loctite 271 threadlocker.

1. Clamp the (34) lower piston rod on flats in vise, put the (36) washer and (37) piston in place as shown (lips up).
2. Put the (38) washer and (39) nut in place.
3.
 - a. Assemble (31) washer, (32) seal (lips down) and (31) washer to (34) lower piston rod or
 - b. Assemble (47) male washer, four (46) "V" packings (lips down), (45) female washer (lips down) and (44) spring washer to (34) lower piston rod.
4. Assemble (30) nut to (34) lower piston rod and tighten.
5. Thread the (27) upper piston rod into (34) lower piston rod until the cotter pin holes line up.
6. Insert (29) cotter pin and bend legs apart (flatten legs and head). **CAUTION: Be sure to flatten cotter pin, as shown in cross section (see figure 7), to prevent damage to packings.**
7. Clamp on (26) pump body.
8. Thoroughly grease the inside of the (28) inner suction tube and thread securely into the (26) pump body.
9. Thoroughly grease the (32, 37 and 46) packings, insert the (27) upper piston rod through the (28) inner suction tube and (26) pump body, (24) tip end first.
10. Thoroughly grease the inside of the (33 and 35) suction tubes.
11. Place the (33 and 35) suction tubes over the (37) piston and thread into the (26) pump body.
12. Place the (41) ball into the (42 or 43) foot valve. Insert the (40) ball stop into the (42 or 43) foot valve.
13. Thread the (42 or 43) foot valve into the (33 or 35) suction tube.
14. Tighten the lower pump section by placing a bar in the bottom slot in the (43) foot valve or a wrench on the flats of (42) foot valve.
15. Place the (25) tube and bushing assembly over the (24) tip and thread into the (26) pump body.

LOWER PUMP END PARTS LIST

ITEM	DESCRIPTION (Size in inches)	QTY	PART NO.	[MTL]	ITEM	DESCRIPTION (Size in inches)	QTY	PART NO.	[MTL]
24	Connecting Rod Tip	(1)	90826	[C]	▲ 37	Piston (66281, 66283, 66601-10)	(1)	91484	[T]
25	Tube and Bushing Assembly	(1)	66280	[SS]	●	(66281-1, 66281-3, 66283-3)	(1)	91523	[UH]
26	Pump Body	(1)	91821	[SS]	38	Washer	(1)	91489	[SS]
27	Upper Piston Rod	(1)	91812	[SS]	39	Nut (3/8" - 24)	(1)	Y115-14	[SS]
28	Inner Suction Tube	(1)	91814	[SS]	40	Ball Stop	(1)	90825	[SS]
▲ 29	Cotter Pin (3/32" o.d. x 3/4" long)	(1)	Y15-32-S	[SS]	41	Ball (.8125" dia.)	(1)	90815	[SS]
30	Nut (5/16" - 18)	(1)	Y108-5-S	[SS]	42	Foot Valve Body (66283-X)	(1)	90932	[SS]
31	Washer	(2)	91487	[SS]	43	Foot Valve Body (66281-X, 66601-10)	(1)	90823	[SS]
32	Seal (models 66281, 66283, 66601-10)	(1)	93848-2	[T/SS]	▲ 44	Spring Washer (66281-3, 66283-3)	(1)	96033	[SH]
●	(models 66281-1)	(1)	93848-1	[UH/SS]	▲ 45	Female Washer (66281-3, 66283-3)	(1)	95331	[SS]
33	Suction Tube (66281-X)	(1)	91817	[SS]	▲ 46	"V" Packing (66281-3, 66283-3)	(4)	95330-4	[UH]
	(66283-X)	(1)	91820-2	[SS]	▲ 47	Male Washer (66281-3, 66283-3)	(1)	95332	[SS]
	(66601-10)	(1)	92443-2	[SS]	48	"O" Ring (66601-10 only)	(1)	91189	[T]
34	Lower Piston Rod (66281-X, 66601-10)	(1)	91811	[SS]	▣	Items included in service kit		637044	
	(66283-X)	(1)	91819-2	[SS]	●	Items included in service kit		637045	
35	Suction Tube (66601-10 only)	(1)	92442	[SH]	▲	Items included in service kit		637355	
36	Washer	(1)	91816	[SS]					

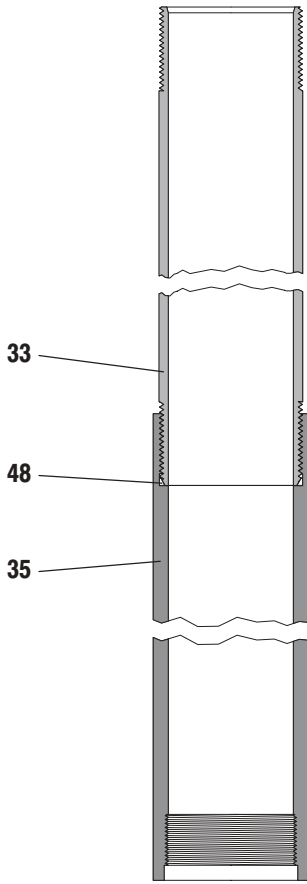
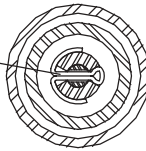
LOWER PUMP END PARTS LIST

☆ Use Loctite #271 threadlocker on these threads.

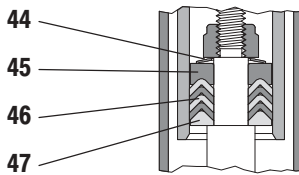
⌘ Use Teflon tape and Nickel anti-seize on these threads.

MATERIAL CODE	
[C]	= Carbon Steel
[SH]	= Hard S'Steel
[SS]	= Stainless Steel
[T]	= Teflon
[UH]	= UHMW-PE

Cotter Pin needs to be installed as shown. Flatten the head and legs.



66601-10 ONLY



6628X-3 ONLY

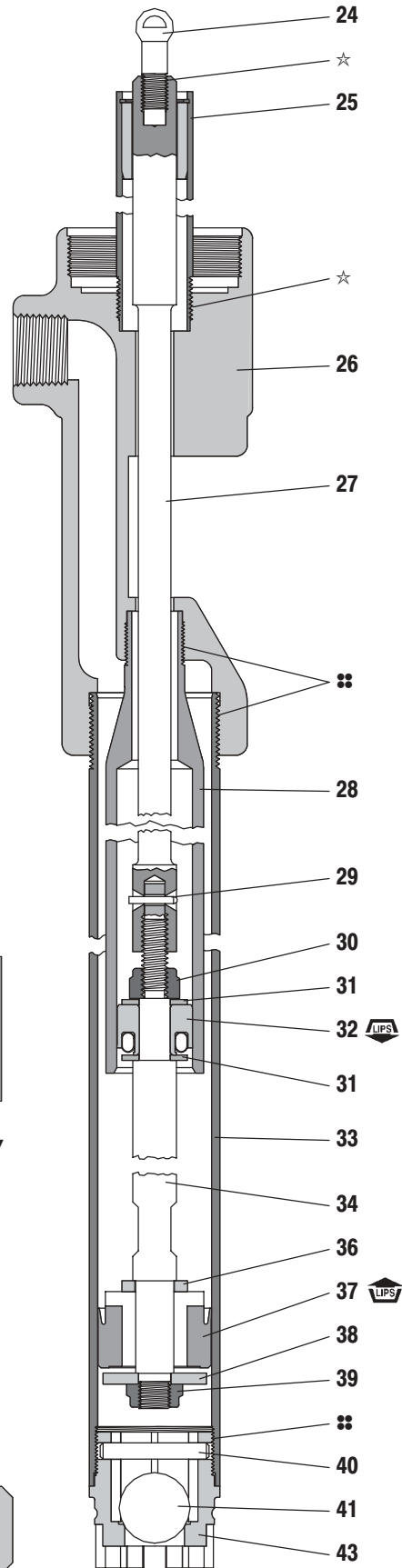
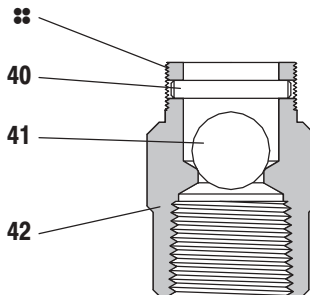


FIGURE 7

