

# OPERATOR'S MANUAL

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

613109-XX

613110-XX

613111-XX

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(REV. C) IPP/PSE

2" AIR MOTOR  
1:1 RATIO

## STAINLESS STEEL PUMP

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

### SERVICE KITS

#### SERVICE KITS

- 66098 Service Kit for Air Motor Repair
- 637001 Service Kit for Lower Pump Repair
- 637026 Service Kit for Lower Pump Repair
- 637027 Service Kit for Lower Pump Repair

### OPERATING PRECAUTIONS

#### MODEL NO. | MAX. WORKING PRESSURE @ AIR INLET PRESSURE

- 613109-XX
- 613110-XX 150 P.S.I. (10 bar) at 150 P.S.I. (10 bar)
- 613111-XX
- Use ARO replacement parts to assure compatible pressure rating.
- Heed All Warnings.
- Do not operate pump continuously at speed in excess of 75 cycles per minute.
- Disconnect air line from pump air motor when system sits idle for long periods of time.
- SERVICING:** Before servicing or cleaning pump, or removing fluid hose or gun from a unit that has been used, be sure to disconnect airline.

Materials and solvents being pumped must be compatible with the parts of this pump. This pump is made of: 316 Stainless Steel, Teflon, and Buna "N".

- WARNING: PREVENT STATIC SPARKING:** If static sparking occurs, fire or explosion could result. Pump, dispensing valve and containers must be grounded when handling inflammable fluids such as petroleum products, paints, lacquers and wherever discharge of static electricity is a hazard.
- Check continuity (a good static wire connection) with an ohmmeter. Place one probe on one hose fitting and the other probe on the other hose fitting. Continuity or proper grounding through hose is good when a reading is obtained on the ohmmeter.
- When pumping, flushing or recirculating volatile solvents, the area must be adequately ventilated.
- Keep solvents away from heat, sparks and open flames. Keep containers closed when not in use.

### AIR SUPPLY REQUIREMENTS

- Excessive air pressure will shorten the life of the pump. Do not operate pump above recommended maximum air pressure. For maximum operating efficiency, the following air supply specifications should be maintained to this pump:
  - AIR PRESSURE — Refer to operating precautions, above.
  - AIR FILTRATION — 50 micron
  - LUBRICATED AIR SUPPLY
  - AIR INLET SIZE — 1/4" N.P.T.
- Failure to observe warnings may cause personal injury and/or damage to the pump. If necessary, an air regulator should be installed to maintain the desired pressure when pump is in operation.

- Filtered and oiled air will allow the pump to operate more efficiently and yield a longer life to operating parts and mechanisms.
- Aro recommends Model 128221-300 (1/4") FRL to maintain a proper air supply.

### OPERATING PROCEDURES

The ratio of the pump (for example 613109-XX 1:1) is an expression of the relationship between the effective air motor area and the effective lower pump area. When 150 PSI (10 bar) of air pressure is supplied to the air motor, the lower pump end will develop the maximum working pressure (150 PSI) as shown in the chart under OPERATING PRECAUTIONS. The flow rate increases as the air motor cycle rate increases to keep up with the demand.

#### To Prime System:

- \_\_\_ Install gun or dispensing device to material hose outlet.
- \_\_\_ Immerse fluid inlet or suction hose into material to be pumped.
- \_\_\_ Regulate air pressure from 30 to 50 P.S.I.
- \_\_\_ Connect air supply and allow pump to cycle until it pressurizes system and stalls.
- \_\_\_ Slowly open dispensing device and allow pump to operate until material primes throughout the system.

If pump does not stop or material does not flow from dispensing valve, refer to Troubleshooting Section of this manual.

- \_\_\_ Adjust air regulator to desired operating air pressure.

**CAUTION:** Do not allow pump to operate when out of material.

### DAILY MAINTENANCE

- Lack of or an excessive amount of lubrication will affect the performance and life of this pump. Use only recommended lubricants.
- DAILY** — Fill air line lubricator reservoir with SAE NO. 90W non-detergent gear oil.
- 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

- This manual covers the basic pump unit. The air motor is completely separate from the lower pump end. This helps to keep the air motor from being contaminated by the material being pumped.
- Periodically flush entire pump system with a solvent that is compatible with the material being pumped.
- Disassembly should be done on a clean work bench with clean cloths to keep parts clean.
- If replacements parts are necessary, consult drawing for parts identification.
- Before assembling, lubricate parts where required. When assembling "O" rings or parts adjacent to "O" rings care must be exercised to prevent damage to "O" rings and "O" ring groove surfaces.

MODEL 613109-XX  
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## ACCESSORIES

MODEL NO.	LOWER PUMP	PARTS KIT (Consists of:)
	See Figure 5	See Figure 1
613109	61480-1	61139 (A,B1,C & D)
613109-1	61480-2	61139 (A,B1,C & D)
613109-2	61480-1	61139 (A,B1,C & D)
613109-3	61480-3	—————
613109-11	61480-1	61927 (A,B2,C,D,E,F & G)
613109-12	61480-2	61926 (B2,E,F,G,H,J,K & L)
613109-31	61480-3	61925 (E,F,G,H,J,K & L)
613110	61477-1	61139 (A,B1,C & D)
613110-1	61477-2	61139 (A,B1,C & D)
613110-2	61477-3	—————
613111	61478-1	61139 (A,B1,C & D)
613111-1	61478-2	61139 (A,B1,C & D)
613111-2	61478-3	—————

**THESE MODELS ARE CANCELLED**

REF.	DESCRIPTION	PART NO.
A	Clamp	76315
B1	Tube	92249-26
B2	Tube	92249-34
C	Clamp	61204-1
D	Screw	61835
E	Valve	92818
F	Connector	23902-210
G	Coupler	23102-200
H	Material Hose	622553-05
J	Air Hose	622201-03
K	Bushing	Y45-9-C
L	Union	75366

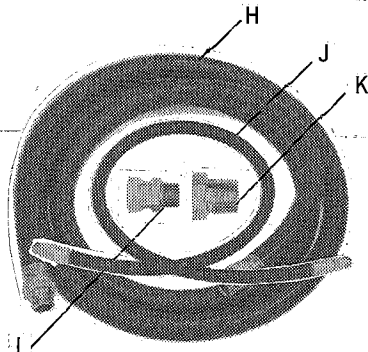
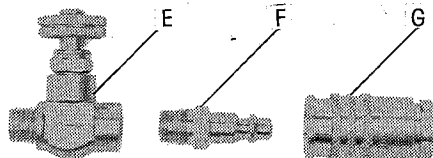
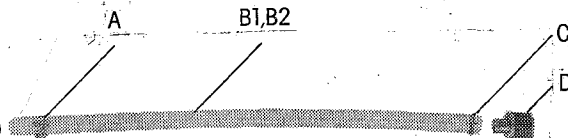


FIGURE 1

## SPACER ASSEMBLY

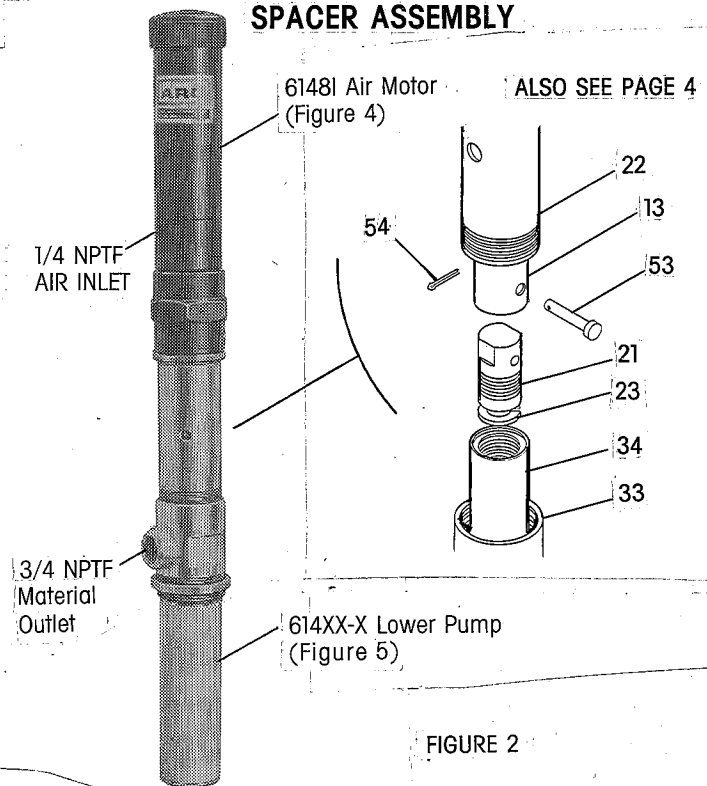


FIGURE 2

## DISASSEMBLY OF AIR MOTOR FROM THE LOWER PUMP END

NOTE: All threads are right hand.

- Place the Lower Pump End in a vise on the Flats of the Body.
- Loosen the lock nut on the spacer tube.
- Unthread and pull the Air Motor away from The Lower Pump End until the cotter pin and pin are exposed.
- Remove the cotter pin and pin.
- The air motor and lower pump end are now disconnected.

## ASSEMBLY OF AIR MOTOR TO LOWER PUMP END

- Place the lower pump in a vise on the flats of body.
- Slip the plunger, of the air motor over the end of the adapter and align the pin holes of the plunger with the pin holes of the adapter.
- Insert the pin through the pin holes of the plunger and adapter.
- Replace the cotter pin and secure.
- Clean the threads of the spacer tube and apply Teflon tape. Then screw the adapter onto the spacer tube.
- Tighten the lock nut. The air motor is now assembled to the lower pump, remove from vise.

## TROUBLESHOOTING

Malfunctions beyond the scope of this manual should be brought to the attention of your ARO Representative or Distributor.

Problem	Cause	Remedy
Pump fails to operate	—Inadequate air supply	—Increase air pressure to pump
Material on one stroke only (Fast Down-stroke)	—(48) ball does not seat properly on foot valve.	—Remove ball from Foot Valve. Clean and inspect Ball and Foot Valve. If either is damaged, replace.
Material on one stroke only (Fast Upstroke)	—Worn (40) "U" cup or (41) "O" ring	—If either is damaged, replace.
Material Leakage from Solvent-Cup	—Worn (26) or (27) packings	—Replace packings
	—Scored (34) Plunger	—Replace (34) Plunger

## DISASSEMBLY 2" AIR MOTOR

Refer to Figure 4

Place the air motor in the vise as shown in Fig. 3.

NOTE: All threads are right hand.

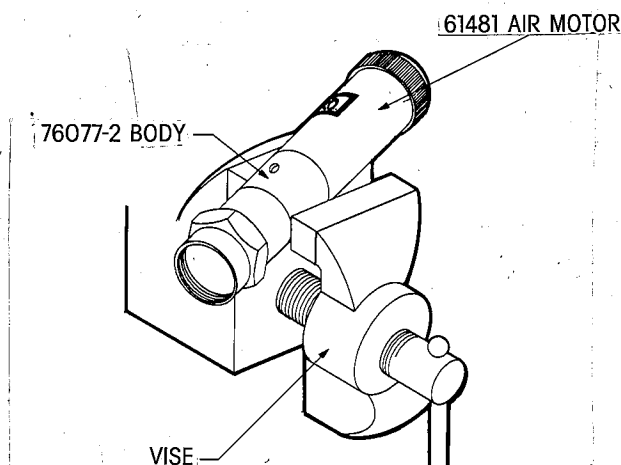


FIGURE 3

Place a strap wrench around the (1) cap, 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.

Do not squeeze or use pipe wrench on (6).

- Place a strap wrench around the (6) cylinder, unscrew and remove the cylinder.
- Pull the (7) ass'y. and (13) plunger out of the (16) body, and lay aside.
- Remove the (15) spring from the (16) body.
- Remove the (14) "O" ring from the (16) body.
- Remove the (18) washer and one (17) "O" Ring from the (16) body.
- Clamp the flats of the (7) piston and spacer ass'y in the vise. Remove plunger tip from the (7) piston and spacer ass'y.
- Remove the (12) gasket from the (13) plunger.

Do not mar or damage O.D. of (13) plunger.

- Remove the three (8) screws from the spacer and piston ass'y.
- Remove the (9) valve plate.
- Remove the (11) valve spacer.

## ASSEMBLY OF AIR MOTOR

Refer to Figure 4

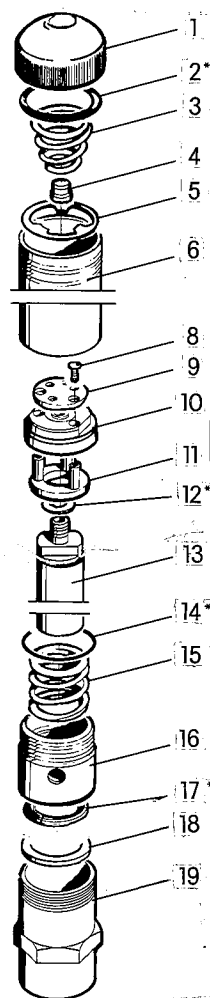
- Insert the (11) valve spacer through the bottom of the (10) piston ass'y. (see Figure 4).
- Place the (9) valve plate on top of the piston ass'y. (side with 3 protrusions) to face (10) piston and align the three holes with the three posts of the (11) spacer.
- Fasten the valve plate down with the three (8) screws. (This is the (7) spacer & piston ass'y.) Lay aside.
- Thoroughly grease the two (19) packings and place them into the (16) body, with the lips upward, being careful not to damage the packings.
- Place the (18) washer in the (16) body.
- Grease the (14) "O" ring and place over the threads of the (16) body.
- Place the (15) spring into the (16) body.
- Place the (13) plunger through the (6) spacer tube and through the (16) body.

To prevent damage to one (17) "O" Ring apply light film of grease on (13) ass'y.

- Place the (12) gasket over the threads of (13) plunger.
- Screw the (7) spacer and piston ass'y onto the (13) plunger and tighten with wrenches, using flats provided.

- Thoroughly grease the inside of the (6) cylinder and insert it over the (7) spacer and piston ass'y.
- Thread the (6) cylinder on the (16) body.
- 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.

## 61481 PARTS LIST



REF.	PART NO. (QTY)	DESCRIPTION
1	76073-2	CAP
2	Y325-138	"O" RING
3	77208	SPRING
4	90638	BUTTON
5	77290	WASHER
6	77526	CYLINDER
7	61088	SPACER & PISTON
8	Y222-54-C (3)	SCREW
9	76090	VALVE PLATE
10	60656	PISTON ASS'Y
11	76856	VALVE SPACER
12	F21-53	GASKET
13	61159	PLUNGER
14	Y325-134	"O" RING
15	76070	SPRING
16	76077-2	PUMP BODY
17	77803	"O" Ring
18	76075	WASHER
19	77527	ADAPTER

\* PARTS SO MARKED  
ARE INCLUDED IN  
66098 SERVICE KIT

FIGURE 4

## DISASSEMBLY OF LOWER PUMP END

NOTE: All threads are right hand.

- Clamp the lower pump ass'y in a vise on the (33) pump body, with the material outlet up.
- Place a pipe or strap wrench around the (37) suction tube and hold securely. Place a wrench on the flats of the (50), (51), or (52) foot valve body and remove foot valve body.
- Remove the (45) dowel pin and ball from the (50), (51), or (52) foot valve body.
- Remove the (46) snap ring and the (47) "O" ring from the (50), (51), or (52) foot valve body.
- Unthread the (37) suction tube from the (33) pump body, using a strap wrench.
- Pull the (34) plunger out of the (33) pump body from the same end the suction tube was just removed from.
- Remove the (35) "O" Ring from the (33) pump body.
- Unthread the (22) spacer tube from the (33) pump body.
- Place a wooden dowel or hammer handle in the (22) spacer tube and lightly tap the (24) washer, the four (18) packings, and the (28) male washer.
- Remove the (29) spring, the two (31) gaskets and the (32) washer from the (33) pump body.
- Remove the (40) rod from the (34) plunger using an open end of adjustable wrench.
- Remove the (44) nut.
- With a spanner wrench remove the (43) Retaining Nut.
- Remove the (40) cup.

# ASSEMBLY OF LOWER PUMP END

NOTE: Use Loctite Nickel anti-seizing compound on all stainless steel threads. Use WETSOL "PLUS" to lubricate packings when assembling.

- Clean the threads of the (39) rod with solvent, place the (40) cup onto the rod as shown in Figure 5.
- Apply Loctite to the threads of (39) rod extending out below the (40) cup.
- With spanner wrench (ARO part number 38237) thread the (43) retaining nut onto the (39) rod.
- Thread the (44) nut onto (39) rod and tighten.
- Place one of the (31) gaskets into the (33) pump body.
- Place the (32) washer into the (33) pump body.
- Place one of the (31) washers or (32) washer into the (33) pump body. clamp in vise.
- Apply Loctite Nickel Anti-Seize to the threads on the (22) spacer tube.
- Put the (24) female washer, the (26) four packings, the (28) male washer, and the (29) spring into the (22) spacer tube
- Thread the (22) spacer tube into the (33) pump body and tighten.
- Thoroughly grease the outside diameter of the (34) plunger with (21) adapter last, insert it into the (22) spacer tube.
- Clean threads of the (39) rod and the mating tapped hole (34) plunger with solvent.
- Place the (38) lock washer over the threads of the (39) rod and apply Loctite to the threads.
- Using flats provided thread the (39) rod into the (34) plunger and tighten.
- Place (35) "O" Ring into the (33) pump body.
- Push the (34) plunger thru the (33) pump body assembly.
- CAUTION: Do not damage packings.
- Push the (34) plunger assembly up until the (21) adapter is exposed out of the (22) spacer tube.
- Thoroughly grease the inside of, and apply Teflon tape or Parker Ferrulube to the external threads of the (37) suction tube, carefully force the external threaded end of (37) suction tube over the (40) cup. CAUTION: Do not damage the lips of the (40) cup.
- Thread the (37) suction tube into the (33) pump body.
- Thoroughly grease and install the (47) "O" Ring on the (50), (51), (52) foot valve body as shown in Figure 5.
- Place the (46) snap ring on the (50), (51) or (52) foot valve body
- Place the (48) ball in the (50), (51), or (52) foot valve body.
- Apply Loctite Nickel Anti-Seize to the threads of the (50), (51), or (52) foot valve body and thread into (37) suction tube and tighten.

## LOWER PUMP END

FIGURE 5

20	Locknut	90606
21	Adapter	77525
22	Spacer Tube	76048
23	Lockwasher	Y14-816-T
24	Female Washer	
	Models 61477-1,-2,-3 61478-1,-2,-3	77327 □ ‡
25	Washer	
	Models 61480-1,-2,-3	77398 *
26	Packing (4 Req'd.)	□ ‡
	Models 61477-1,-2,-3 61478-1,-2,-3	90578-3
27	Packing	
	Models 61480-1,-2,-3	77744 *
28	Male Washer	
	Models 61477-1,-2,-3	77326 □
	Models 61478-1,-2,-3	91349 ‡
29	Spring	
	Models 61477-1,-2,-3 61478-1,-2,-3	90602
30	Gasket	
	Models 61477-1,-2,-3 61480-1,-2,-3	76748 * □
31	Washer (2 Req'd.)	
	Models 61478-1,-2,-3	90603 ‡
32	Washer	
	Models 61478-1,-2,-3	90611
33	Pump Body	65793-2
34	Plunger	90615
35	"O" Ring (Models 61477-1,-2,-3 61478-1,-2,-3)	90607 □ ‡
	(Models 61480-1,-2,-3)	77361 *

36	Locknut	76248
37	Tube	90621
38	Lockwasher	Y14-816-T
39	Extension Rod	76045
40	Cup (Models 61477-1,-2,-3 61478-1,-2,-3)	76044 □ ‡
41	"O" Ring	
	Models 61480-1,-2,-3	Y325-325 *
42	Piston	
	Models 61480-1,-2,-3	77265 *
43	Retaining Nut	76046
44	Nut	Y11-7-T
45	Pin	90620
46	Snap Ring	90616
	"O" Ring	90617 * □ ‡
48	Ball (Models 61477-1,-2, 61478-1,-2 61480-1,-2)	76905
	(Models 61477-3, 61478-3, 61480-3)	90949
49	"O" Ring	
	Models 61480-1,-2	77297 *
50	Foot Valve	
	Models 61477-2, 61478-2, 61480-2	77324
51	Foot Valve	
	Models 61477-1, 61478-1, 61480-1	76932
52	Foot Valve	
	Models 61477-3, 61478-3, 61480-3	90619
53	Pin	76990
54	Cotter Pin	Y15-21-S

\* Parts marked are included in 637001 kit

□ Parts marked are included in 637026 kit

‡ Parts marked are included in 637027 kit