

# OPERATOR'S MANUAL

# 6661HX-XXX-C

INCLUDING: OPERATION, INSTALLATION & MAINTENANCE

RELEASED: 12-18-06  
REVISED: 5-20-10  
(REV. 04)



## 1" DIAPHRAGM PUMP CSA CERTIFIED, 1:1 RATIO, METALLIC INTENDED FOR USE WITH SWEET NATURAL GAS



**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

Refer to Model Description Chart to match the pump material options.

637118-C for gas section repair (see page 6).

637119-C9-C for fluid section repair (see page 4).

### PUMP DATA

**Models** ..... see Model Description Chart for "-XXX"

**Pump Type** ..... Gas Operated Double Diaphragm

**Material** ..... see Model Description Chart

**Weight** ..... 19 lbs (8.62 kgs)

**Maximum Gas Inlet Pressure** ..... 120 p.s.i.g. (8.3 bar)

**Maximum Material Inlet Pressure** ... 10 p.s.i.g. (0.69 bar)

**Maximum Outlet Pressure** ..... 120 p.s.i.g. (8.3 bar)

**Maximum Flow Rate (flooded inlet)** ... 35 g.p.m. (133 l.p.m.)

**Displacement / Cycle @ 100 p.s.i.g.** . 0.156 gal. (0.59 lit.)

**Maximum Particle Size** ..... 1/8" dia. (3.2 mm)

**Maximum Temperature Limits** ... 32° to 125° F (0° to 52° C)

**Dimensional Data** ..... see page 8

**Noise Level @ 70 p.s.i., 60 c.p.m.** ..... 64.5 db(A)①

① The pump sound pressure levels published here have been updated to an Equivalent Continuous Sound Level ( $L_{Aeq}$ ) to meet the intent of ANSI S1.13-1971, CAGI-PNEUROPS 5.1 using four microphone locations.

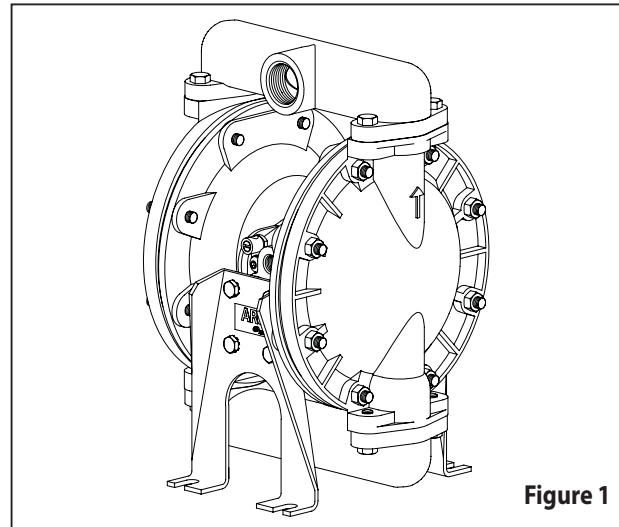


Figure 1

### MODEL DESCRIPTION CHART

6661 H 0 - 1 C 9 - C	
<b>Center Section Material, Fluid Connection</b> H - Aluminum, 1 - 11-1/2 N.P.T.F. - 1	
<b>Fluid Cap / Manifold Material, Hardware</b> 0 - Aluminum, Carbon Steel	
<b>Seat Material</b> 1 - Aluminum	
<b>Ball Material</b> C - Hytrel®	
<b>Diaphragm Material</b> 9 - Hytrel	
<b>Fluid Section Service Kit Selection</b>	6661H0 - 1 <del>X</del> <del>X</del> - C 637119 - <del>X</del> <del>X</del> - C
EXAMPLE: Model #6661H0-1C9-C Fluid Section Service Kit # 637119-C9-C	Ball — Diaphragm

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# ARO

**IR** Ingersoll Rand  
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## OPERATING AND SAFETY PRECAUTIONS

READ, UNDERSTAND AND FOLLOW THIS INFORMATION TO AVOID INJURY AND PROPERTY DAMAGE.



EXCESSIVE GAS PRESSURE  
STATIC SPARK



HAZARDOUS MATERIALS  
HAZARDOUS PRESSURE

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

- Do not exceed the maximum inlet gas 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** STATIC SPARK. Can cause explosion resulting in severe injury or death. Ground pump and pumping system.

- Use the pump ground lug provided. Connect to a 12 ga. (minimum) wire (kit is included) to a good earth ground source.
- Sparks can ignite flammable material and vapors.
- The pump must be electrically grounded using the grounding conductor provided. Improper grounding can cause improper and dangerous operation.
- Secure pump, connections and all contact points to avoid vibration and generation of contact or static spark.
- Consult local building codes and electrical codes for specific grounding requirements.
- After grounding, periodically verify continuity of electrical path to ground. Test with an ohmmeter from each component (e.g., hoses, pump, clamps, container, spray gun, etc.) to ground to insure continuity. Ohmmeter should show 0.1 ohms or less.
- Submerge the outlet hose end, dispensing valve or device in the material being dispensed if possible. (Avoid free streaming of material being dispensed.)
- Use hoses incorporating a static wire.
- Use proper ventilation.
- Keep inflammables away from heat, open flames and sparks.
- Keep containers closed when not in use.

**⚠ WARNING** Pump exhaust may contain contaminants. Can cause severe injury. Pipe exhaust away from work area and personnel.

- The gas outlet of the pump must be vented to a safe location in accordance with local codes or, in the absence of local codes, an industry or nationally recognized code having jurisdiction over the specific installation.
- Use a grounded 3/8" minimum i.d. hose between the pump and the muffler.

**⚠ WARNING** HAZARDOUS PRESSURE. Can result in serious injury or property damage. Do not service or clean pump, hoses or dispensing valve while the system is pressurized.

- Disconnect gas supply line and relieve pressure from the system by opening dispensing valve or device and / or carefully and slowly loosening and removing outlet hose or piping from pump.

**⚠ WARNING** HAZARDOUS MATERIALS. Can cause serious injury or property damage. Do not attempt to return a pump to the factory or service center that contains hazardous material. Safe handling practices must comply with local and national laws and safety code

requirements.

- Obtain Material Safety Data Sheets on all materials from the supplier for proper handling instructions.

**⚠ WARNING** EXPLOSION HAZARD. Models containing aluminum wetted parts cannot be used with 1,1,1-trichloroethane, methylene chloride or other halogenated hydrocarbon solvents which may react and explode.

- Check pump motor section, fluid caps, manifolds and all wetted parts to assure compatibility before using with solvents of this type.

**⚠ CAUTION** Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with temperature and concentration of the chemical(s) within the substances being pumped, flushed or circulated. For specific fluid compatibility, consult the chemical manufacturer.

**⚠ CAUTION** Maximum temperatures are based on mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperature. Consult the chemical manufacturer for chemical compatibility and temperature limits. Refer to PUMP DATA on page 1 of this manual.

**⚠ CAUTION** Be certain all operators of this equipment have been trained for safe working practices, understand it's limitations, and wear safety goggles / equipment when required.

**⚠ CAUTION** Do not use the pump for the structural support of the piping system. Be certain the system components are properly supported to prevent stress on the pump parts.

- Suction and discharge connections should be flexible connections (such as hose), not rigid piped, and should be compatible with the substance being pumped.

**⚠ CAUTION** Prevent unnecessary damage to the pump. Do not allow pump to operate when out of material for long periods of time.

- Disconnect gas line from pump when system sits idle for long periods of time.

**⚠ CAUTION** Use only genuine ARO® replacement parts to assure compatible pressure rating and longest service life.

**NOTICE** Install the pump in the vertical position. The pump may not prime properly if the balls do not check by gravity upon start-up.

**NOTICE** Re-torque all fasteners before operation. Creep of housing and gasket materials may cause fasteners to loosen. Re-torque all fasteners to insure against fluid or gas leakage.

**NOTICE** Replacement warning labels are available upon request: "Static Spark" pn \ 93616-1, Diaphragm Rupture" pn \ 93122.

**⚠ WARNING** = Hazards or unsafe practices which could result in severe personal injury, death or substantial property damage.

**⚠ CAUTION** = Hazards or unsafe practices which could result in minor personal injury, product or property damage.

**NOTICE** = Important installation, operation or maintenance information.

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## GENERAL DESCRIPTION

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The ARO natural gas powered diaphragm pump offers high volume delivery even at low gas pressure. Natural gas powered diaphragm pumps move fluids such as crude oil, salt water, drilling mud, lubrication oils, glycol, caustic liquids and acids. ARO pumps feature stall resistant design, modular gas motor / fluid sections.

Gas operated double diaphragm pumps utilize a pressure differential in the gas chambers to alternately create suction and a positive fluid pressure in the fluid chambers, ball checks insure a positive flow of fluid.

Pump cycling will begin as gas pressure is applied and it will continue to pump and keep up with the demand. It will build and maintain line pressure and will stop cycling once maximum line pressure is reached (dispensing device closed) and will resume pumping as needed.

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## GAS AND LUBE REQUIREMENTS

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

- A filter capable of filtering out particles larger than 50 microns should be used on the gas supply. There is no lubrication required other than the "O" ring lubricant which is applied during assembly or repair.
- If lubricated gas is present, make sure that it is compatible with the "O" rings and seals in the gas motor section of the pump.

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## OPERATING INSTRUCTIONS

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- Always flush the pump with a solvent compatible with the material being pumped if the material being pumped is subject to "setting up" when not in use for a period of time.
- Disconnect the gas supply from the pump if it is to be inactive for a few hours.
- The outlet material volume is governed not only by the gas supply, but also by the material supply available at the inlet. The material supply tubing should not be too small or restrictive. Be sure not to use hose which might collapse.
- When the diaphragm pump is used in a forced-feed (flooded inlet) situation, it is recommended that a "check valve" be installed at the gas inlet.
- Secure the diaphragm pump legs to a suitable surface to insure against damage by vibration.

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## MAINTENANCE

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- Certain ARO "Smart Parts" are indicated which should be available for fast repair and reduction of down time.
- Provide a clean work surface to protect sensitive internal moving parts from contamination from dirt and foreign matter during service disassembly and reassembly.
- Keep good records of service activity and include the pump in preventive maintenance program.
- Service kits are available to service two separate diaphragm pump functions: 1. GAS SECTION, 2. FLUID SECTION. The Fluid Section is divided further to match typical active Material Options.
- Before disassembling, empty captured material in the outlet manifold by turning the pump upside down to drain material from the pump.

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## FLUID SECTION DISASSEMBLY

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1. Remove top manifold(s).
2. Remove (22) balls, (19) "O" rings and (21) seats.
3. Remove (15) fluid caps.
4. Remove (14) screws, (6) washers, (7) diaphragms and (5) washers.
5. Remove (3) "O" rings. NOTE: Do not scratch or mar the surface of (1) diaphragm rod.

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## FLUID SECTION REASSEMBLY

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- Reassemble in reverse order.
- Clean and inspect all parts. Replace worn or damaged parts with new parts as required.
- Lubricate (1) diaphragm rod and (2) "O" ring with Key-Lube grease.
- Use ARO pn 98930-T bullet (installation tool) to aid in installation of (2) "O" ring on (1) diaphragm rod.
- Be certain (7) diaphragms align properly with (15) fluid caps before making final torque adjustments on bolt and nuts to avoid twisting the diaphragm.
- Re-check torque settings after pump has been re-started and run a while.

## PARTS LIST / 6661HX-XXX-C FLUID SECTION

★ 637119-C9-C fluid section service kits include: Balls (item 22), diaphragms (item 7) plus items 2, 3, 19 and 93706-1 Key-Lube grease (page 6).

### PARTS LIST

Item	Description (size)	Qty	Part No.	[Mtl]	Item	Description (size)	Qty	Part No.	[Mtl]
□ 1	Rod	(1)	98724-1	[C]	16	Manifold	(2)	92001	[A]
★ 2	"O" Ring (3/32" x 3/4" o.d.)	(1)	Y330-113	[B]	★ 19	"O" Ring (3/32" x 1-9/16" o.d.)	(4)	Y327-126	[V]
★ 3	"O" Ring (1/16" x 5/8" o.d.)	(4)	Y328-14	[T]	21	Seat	(4)	92008-1	[A]
5	Washer - Air side (3-5/8" o.d.)	(2)	93441-2	[C]	★ 22	Ball (1" diameter)	(4)	90532-C	[H]
□ 6	Washer - Fluid side	(2)	93441-2	[C]	26	Bolt (5/16" - 18 x 1")	(8)	Y6-55-C	[C]
★ 7	Diaphragm	(2)	90533-9	[H]	29	Nut (5/16" - 18)	(16)	Y12-5-C	[C]
9	Washer (0.505" i.d.)	(2)	93189-1	[SS]	43	Ground Lug (see page 7)	(1)	93004	[Co]
14	Screw (1/2" - 20 x 1")	(2)	Y5-85-T	[SS]	57	Ground Kit Assembly (not shown)	(1)	66885-1	---
15	Fluid Cap	(2)	94945	[A]					

□ "Smart Parts", keep these items on hand in addition to the service kit for fast repair and reduction of down time.

#### MATERIAL CODE

[A] = Aluminum  
 [B] = Nitrile  
 [C] = Carbon Steel  
 [Co] = Copper  
 [H] = Hytrel  
 [SS] = Stainless Steel  
 [T] = PTFE  
 [V] = Viton®

**PARTS LIST / 6661HX-XXX-C FLUID SECTION**

FOR THE GAS MOTOR SECTION, SEE PAGES 6 & 7.

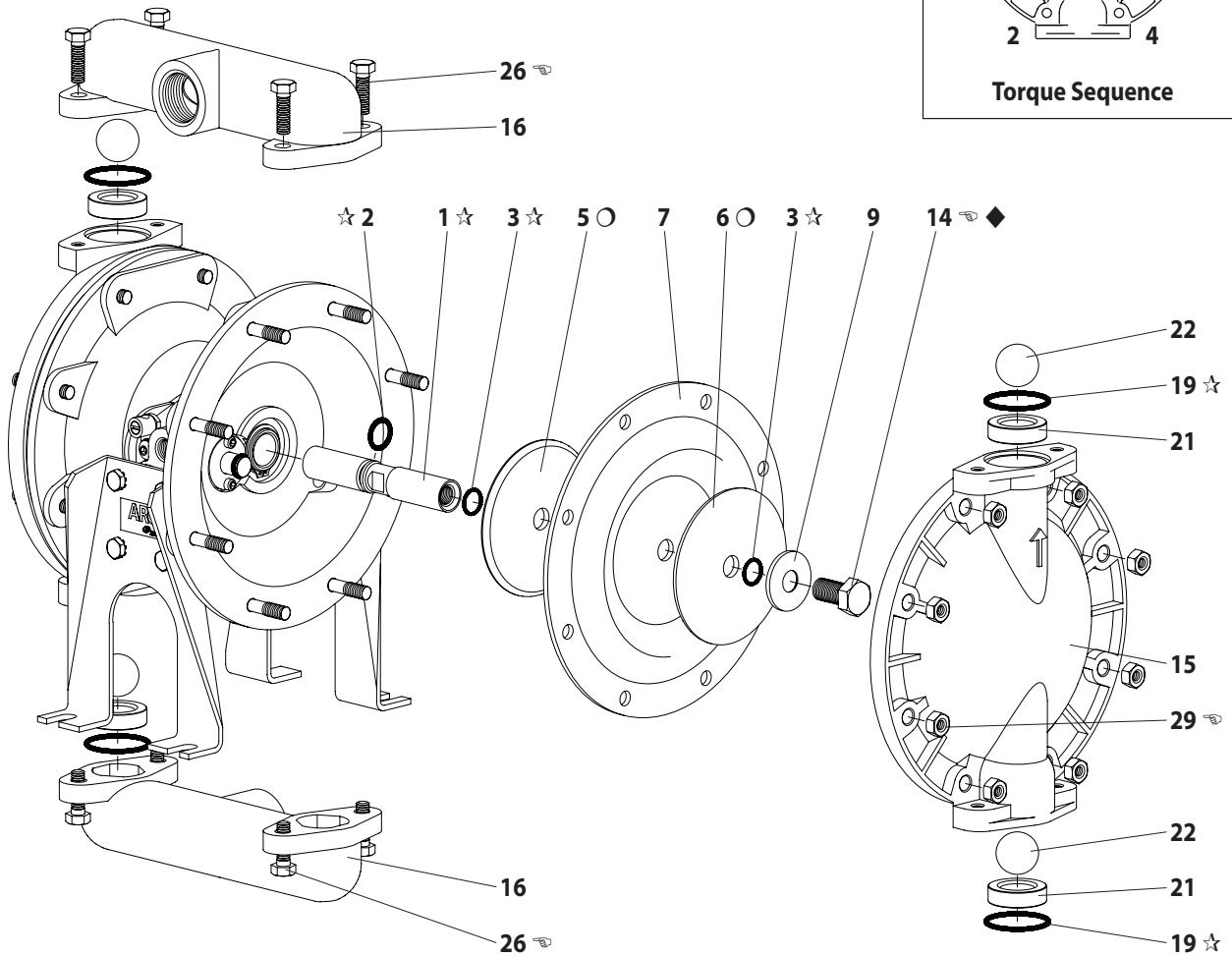
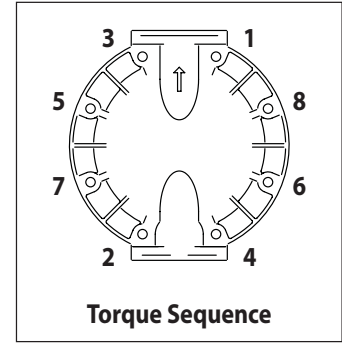
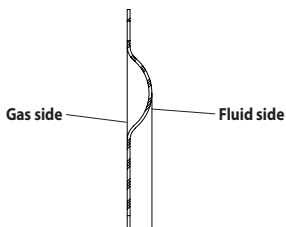


Figure 2



Cross section view of diaphragm.

**TORQUE REQUIREMENTS**

NOTE: DO NOT OVERTIGHTEN FASTENERS.

- (14) Bolt, 25 - 30 ft. lbs (33.9 - 40.7 Nm).
- (26) Bolt, 120 - 140 in. lbs (13.6 - 15.8 Nm).
- (29) Nut, 120 - 140 in. lbs (13.6 - 15.8 Nm).

**LUBRICATION / SEALANTS**

- ◆ Apply Loctite® 271™ to threads.
- ☆ Apply Key-Lube grease (93706-1) to all "O" rings, "U" cups and mating parts.

○ NOTICE: Radius edge of parts (5 and 6) is against diaphragm.

## PARTS LIST / 6661HX-XXX-C GAS MOTOR SECTION

✓ Indicates parts included in 637118-C gas section repair kit.

### GAS MOTOR PARTS LIST

Item	Description (size)	(Qty)	Part No.	[Mtl]
101	Motor Body	(1)	94743	[A]
✓ 102	"O" Ring (1/16" x 1" o.d.)	(2)	Y325-20	[B]
□ 103	Sleeve	(1)	94527	[D]
✓ 104	Retaining Ring (0.925 i.d.)	(2)	Y145-25	[C]
105	Screw (1/4" - 20 x 5/8")	(8)	93860	[C]
107	Leg	(2)	92003	[C]
✓ 108	Gasket (with notch)	(1)	92878	[B/Ny]
□ 109	Piston	(1)	92011	[D]
✓ 110	"U" Cup (3/16" x 1-3/8" o.d.)	(1)	Y186-51	[B]
□ 111	Spool	(1)	92005	[A]
□ 112	Washer (1.557" o.d.)	(5)	92877	[Z]
✓ 113	"O" Ring (1/8" x 1-1/4" o.d.)	(5)	Y325-214	[B]
✓ 114	"O" Ring (3/32" x 1-9/16" o.d.)	(6)	Y325-126	[B]
□ 115	Spacer	(4)	92876	[Z]
□ 116	Spacer	(1)	92006	[Z]

Item	Description (size)	(Qty)	Part No.	[Mtl]
✓ 117	Gasket	(1)	92004	[B/Ny]
118	Pilot Rod	(1)	93309-1	[C]
✓ 119	"O" Ring (1/8" x 3/4" o.d.)	(4)	93075	[U]
120	Spacer	(3)	115959	[Z]
121	Sleeve Bushing	(2)	98723-1	[Bz]
✓ 122	"O" Ring (3/32" x 9/16" o.d.)	(2)	94820	[U]
✓ 123	Screw (#8 - 32 x 3/8")	(4)	Y154-41	[C]
124	Stud (5/16" - 18 x 1-3/4")	(16)	92866	[C]
128	Pipe Plug (1/8" - 27 N.P.T. x 1/4")	(1)	Y227-2-L	[C]
133	Lockwasher (1/4")	(1)	Y14-416-T	[SS]
197	Button Head Screw (1/4" - 20 x 1/4")	(2)	94987	[SS]
198	Button Head Screw (1/4" - 20 x 3/8")	(1)	94987-1	[SS]
✓	Key-Lube "O" Ring Lubricant	(1)	93706-1	
	Key-Lube, 10 Pack		637175	

□ "Smart Parts", keep these items on hand in addition to the service kit for fast repair and reduction of down time.

#### MATERIAL CODE

[A] = Aluminum	[C] = Carbon Steel	[SS] = Stainless Steel
[B] = Nitrile	[D] = Acetal	[U] = Polyurethane
[Bz] = Bronze	[Ny] = Nylon	[Z] = Zinc

### GAS MOTOR SECTION SERVICE

Service is divided into two parts - 1. Pilot Valve, 2. Major Valve.

#### GENERAL SERVICE NOTES:

- Gas Motor Section service is continued from Fluid Section repair.
- Inspect and replace old parts with new parts as necessary. Look for deep scratches on metallic surfaces, and nicks or cuts in "O" rings.
- Take precautions to prevent cutting "O" rings upon installation.
- Lubricate "O" rings with Key-Lube grease.
- Do not over-tighten fasteners. Refer to torque specification block on view.
- Re-torque fasteners following restart.

### PILOT VALVE DISASSEMBLY

1. Remove (104) retaining ring.
2. Remove (123) screws and (122) "O" rings.
3. Remove (118) piston rod, (121) sleeve bushing, (119) "O" rings and (120) spacers from the (101) motor body.
4. Remove (103) sleeve and (102) "O" rings.

### PILOT VALVE REASSEMBLY

1. Replace two (102) "O" rings, if worn or damaged, and reinstall (103) sleeve.
2. Install one of the (121) sleeve bushings, (119) "O" rings, (120) spacers and the remaining (121) bushing.
3. Carefully push (118) pilot rod into bushing etc. and retain on each end with the two (122) "O" rings. Retain with (123) screws.
4. Replace (104) retaining rings.

### MAJOR VALVE DISASSEMBLY

1. Remove (107) legs and (108 and 117) gaskets.
2. On the side opposite the air inlet, push on the inner diameter of (111) spool. This will force the (109) piston out. Continue pushing the (111) spool and remove. Check for scratches and gouges.
3. Reach into the gas section (exhaust side) and remove (116) spacer, (115) spacers, (113) "O" rings, (114) "O" rings, (112) washers, etc. Check for damaged "O" rings.

### MAJOR VALVE REASSEMBLY

1. Replace (112) washer, (114) "O" ring and (113) "O" ring onto (115) spacer and insert etc. **NOTE: Be careful to orient spacer legs away from blocking internal ports.**
2. Lubricate and carefully insert (111) spool.
3. Install (117) gasket and (107) leg.
4. Lubricate and install (110) packing cup and insert (109) piston into (air inlet side) cavity, the (110) packing cup lips should point outward.
5. Install (108) gasket and replace (107) leg.



# PARTS LIST / 6661HX-XXX-C GAS MOTOR SECTION

**IMPORTANT**  
BE CERTAIN TO ORIENT (115) SPACER LEGS  
AWAY FROM BLOCKING INTERNAL PORTS  
WHEN REASSEMBLING GAS SECTION.

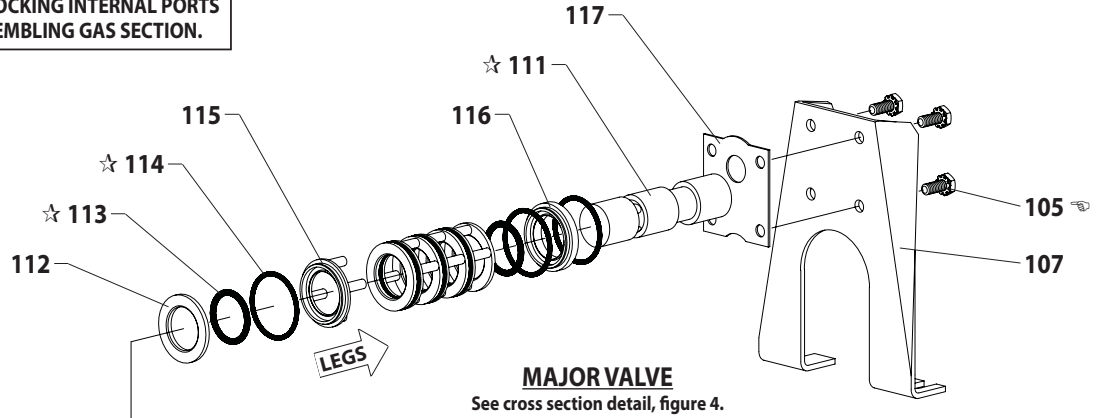
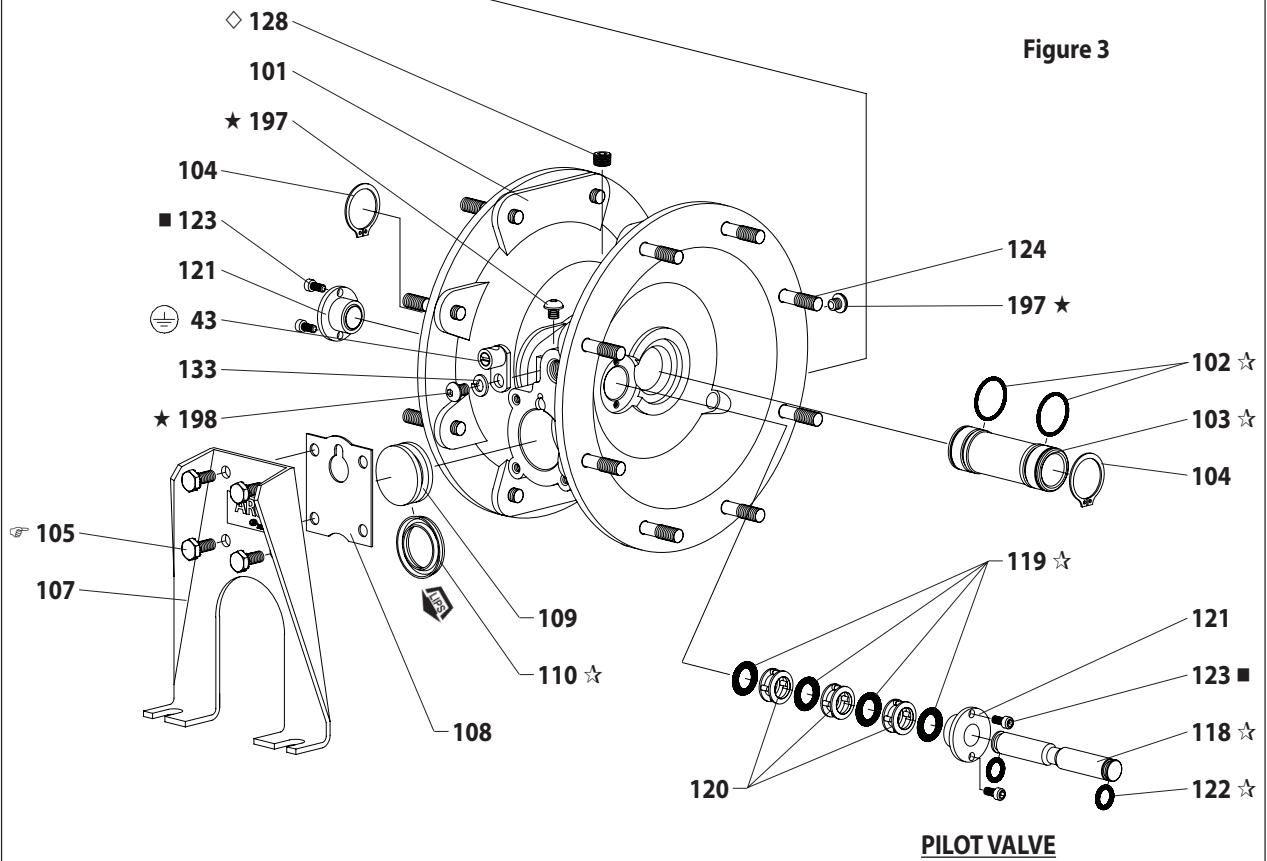
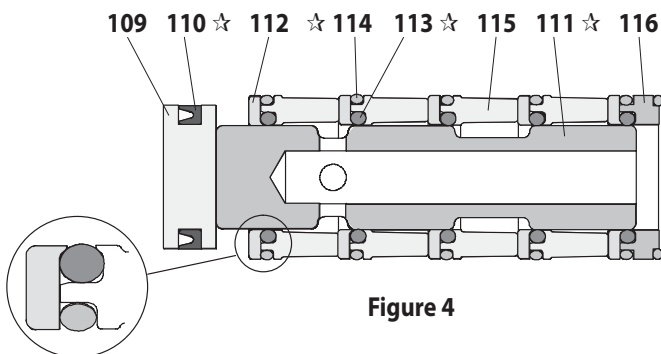


Figure 3



## MAJOR VALVE CROSS SECTION DETAIL



**TORQUE REQUIREMENTS**  
NOTE: DO NOT OVERTIGHTEN FASTENERS.  
(105) Torque to 40 - 50 in. lbs (4.5 - 5.6 Nm).

### LUBRICATION / SEALANTS

- ☆ Apply Key-Lube grease to all "O" rings, "U" cups and mating parts.
- Apply Loctite 262™ to threads.
- ◇ Apply Loctite 572™ to threads.
- ★ Apply Loctite 577™ to threads.

## TROUBLE SHOOTING

### Product discharged from exhaust outlet.

- Check for diaphragm rupture.
- Check tightness of (14) diaphragm screw.

### Gas bubbles in product discharge.

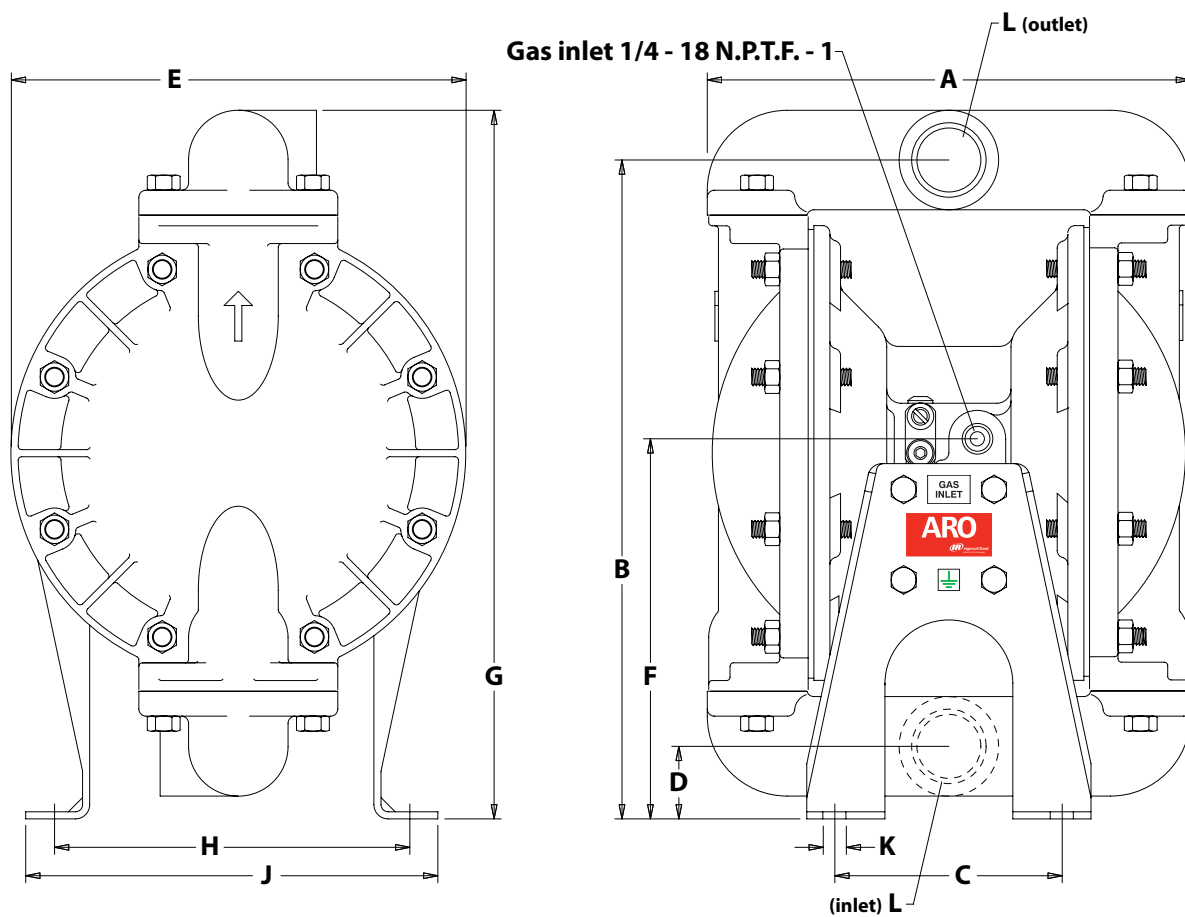
- Check connections of suction plumbing.
- Check "O" rings between intake manifold and fluid caps.
- Check tightness of (14) diaphragm screw.

### Low output volume, erratic flow or no flow.

- Check gas supply.
- Check for plugged outlet hose.
- Check for kinked (restrictive) outlet material hose.
- Check for kinked (restrictive) or collapsed inlet material hose.
- Check for pump cavitation - suction pipe should be sized at least as large as the inlet thread diameter of the pump for proper flow if high viscosity fluids are being pumped. Suction hose must be a non-collapsing type, capable of pulling a high vacuum.
- Check all joints on the intake manifolds and suction connections. These must be gas tight.
- Inspect the pump for solid objects lodged in the diaphragm chamber or the seat area.

## DIMENSIONAL DATA

Dimensions shown are for reference only, they are displayed in inches and millimeters (mm).



### DIMENSIONS

A - 8-1/2" (215.9 mm)	E - 8" (203.2 mm)	H - 6-1/4" (158.8 mm)
B - 11-9/16" (293.7 mm)	F - 6-1/2" (165.1 mm)	J - 7-5/16" (185.7 mm)
C - 4" (101.6 mm)	G - 12-1/2" (317.5 mm)	K - 7/16" (11.1 mm)
D - 1-1/4" (31.8 mm)		

Pump Model  
6661H0-1C9-C

"L" Material Inlet / Outlet  
1 - 1-1/2 N.P.T.F. - 1

**Figure 5**



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