

MAGNUM 610RC PUMP

Operation / Maintenance Manual

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1 FORWARD

THIS MANUAL CONTAINS INSTRUCTIONS FOR THE INSTALLATION, OPERATION AND MAINTENANCE OF THE TREBOR PUMP. If you have any questions concerning the information contained in this manual, contact your local Trebor pump distributor or contact Trebor direct at 800-669-1303 in the U.S., 801-561-0303 outside the U.S., or by email at treborservice@idexcorp.com.

All Trebor pumps are designed to give a long and trouble-free service life. The life of the pump and satisfactory operation are enhanced by correct application, installation, regular inspection and routine maintenance. Misuse or improper installation, operation or maintenance of pumps may result in pump damage.

This manual must be read and understood prior to installation and maintenance. All installation, operation and maintenance works must be carried out by qualified personnel in strict accordance with this manual and must comply with all local, state and national safety codes. Trebor shall not be liable for injury, damage or delays caused by a failure to observe the instructions contained in this manual.

You are advised to read the warranty that was supplied with your pump. Warranty is valid only when genuine Trebor parts are used.

PUMP RECORDS

- Pump Model: _____
- Pump Serial Number: _____
- Date: _____

Maintain pump records whenever possible. This will provide ready access to information for ordering spare parts and evaluating the performance of the pump. Information to be included in these records: Fluid being pumped; Cycle rate; Service conditions, including frequency of operation; Maintenance records, including parts usage.

DECLARATION OF CONFORMITY



We herewith declare that the pumps described in this Installation, Operation and Maintenance Manual comply with the following provisions:

- Machinery Directive (98/37/EC)
- Applied harmonized standards: EN809, EN292, EN1050
- ATEX Directive (94/9/EC): Group I, Category M2; Group II, Category 2GD; T6; non-electrical equipment; gas and dust

Method of compliance: prEN 13463-5 (Constructional Safety)
Technical File reference no.: 968/Ex-Ab501/04

Manufacturer:

Trebor International
A Unit of IDEX Corporation
8100 South 1300 West
West Jordan, UT 84088, USA

Importer in Country of Use:

Signature: _____

2 SAFETY INFORMATION

2.1 GENERAL SAFETY GUIDELINES

This manual gives instructions about pump installation, operation and maintenance. It must be read and understood by the personnel responsible for these duties prior to assembly and start-up. This manual must be kept available at the installation site at all times.

2.1.a Safety Symbols

Safety instructions in this manual are marked by:



This **caution** symbol indicates a risk to personal safety, the pump, the nearby equipment or the environment if instructions and recommended precautions are not followed.

2.1.b Operating Personnel

The personnel responsible for operation, maintenance, inspection and assembly must be adequately qualified.

The responsibilities of the operating personnel must be defined by the plant operator. If the staff does not have the necessary knowledge, they must be trained and instructed.

2.1.c In the Event of Non-Compliance

If operating personnel do not comply with the safety instructions contained herein, they may place themselves, the pump or the environment at risk, which may result in a loss of any right to claim damages.

2.1.d Safety at Work

The following safety apparel should be available and worn, where appropriate:

- Chemical resistant gloves when handling parts that have been in contact with chemistry.
- Safety glasses with side shields for eye protection, especially when working around chemicals.
- Other personal protective equipment as required by local regulations to protect against all hazards.

3 WARRANTY

MAGNUM 610RC PUMP

TREBOR International, Inc. warrants to the purchaser of new equipment manufactured by TREBOR to be free from defects in material and workmanship when used for its intended purpose under normal operating conditions, and maintained according to the Operation/Maintenance Manual.

TREBOR's obligation under this warranty is limited to repairing or replacing, at TREBOR's option and at the TREBOR factory, any part or parts thereof which shall, within 1 year after delivery thereof to the original purchaser, be demonstrated to TREBOR's satisfaction to have been defective. This warranty is transferable. The warranty period is based on the original ship date from the factory. All warranty related freight costs shall be borne by the customer.

Excessive wear to pump components caused by pumping abrasive solutions or chemicals, as well as damage caused by ingesting foreign objects shall not be covered by this warranty.

This warranty shall not apply to any equipment which, in the judgment of TREBOR, shall have been repaired or altered outside TREBOR's factory in any way, so as to affect its performance or reliability; subjected to misuse, negligence or accident; or used other than in accordance with TREBOR's printed instructions.

There are no terms, conditions or warranties, expressed, implied or statutory, of merchantability, fitness, capacity, or otherwise, of the goods ordered, other than, or different from, the warranty set forth above. This warranty takes precedence over any other warranty, expressed or implied.

TREBOR neither assumes, nor authorizes any other party to assume for it, any liability in connection with said equipment except as set forth above.

4 INSTALLATION

4.1 UNPACKING

After unpacking, the pump should be checked for any damage that may have occurred during shipment. Damage should be reported to the carrier immediately.

The following items should be included within the shipping container:

<u>Qty</u>	<u>Item</u>	<u>Description</u>
1	610RC	Magnum 610RC Pump
1	M610RC	Operation/Maintenance Manual
1	C0135	Check Muffler Assembly
1	C0145	Conductive Connector Group

4.2 TIE BOLT TORQUE

The tie bolts on the pump are tightened before leaving the factory. However, relaxation may occur due to handling, material creep, or other unforeseen events. Trebor recommends that all eight tie bolts be re-tightened upon pump install. The following procedure should be used.

1. Remove black tie bolt caps (Item 5 in 6.4 Parts Illustration) from both sides of all 8 tie bolts.
2. Apply 42 in-lbs. of torque to each slave side bolt while holding the master side bolt stationary. A star-pattern is advised.
 - a. The master side is the left side of the pump if you are looking at the fluid ports.
3. Replace tie bolt caps.

4.3 UTILITIES / HOOK-UP

The pump is mounted using four 1/4" bolts. It is recommended that the pump be mounted not more than 15° from level to maintain its self-priming ability and pumping efficiency.

Air Inlet: 1/4" NPTF (Ø3/8" [8mm] supply tube minimum).

Air Supply: 20-60 PSIG (.14 – .41 MPa) clean dry air or nitrogen. (See Performance Charts, Section 5.1, for air consumption.)

Fluid Ports: IN/OUT: 3/4" NPT; IMPORTANT SUCTION ("IN") LINE REQUIREMENTS: (for maximum flow)

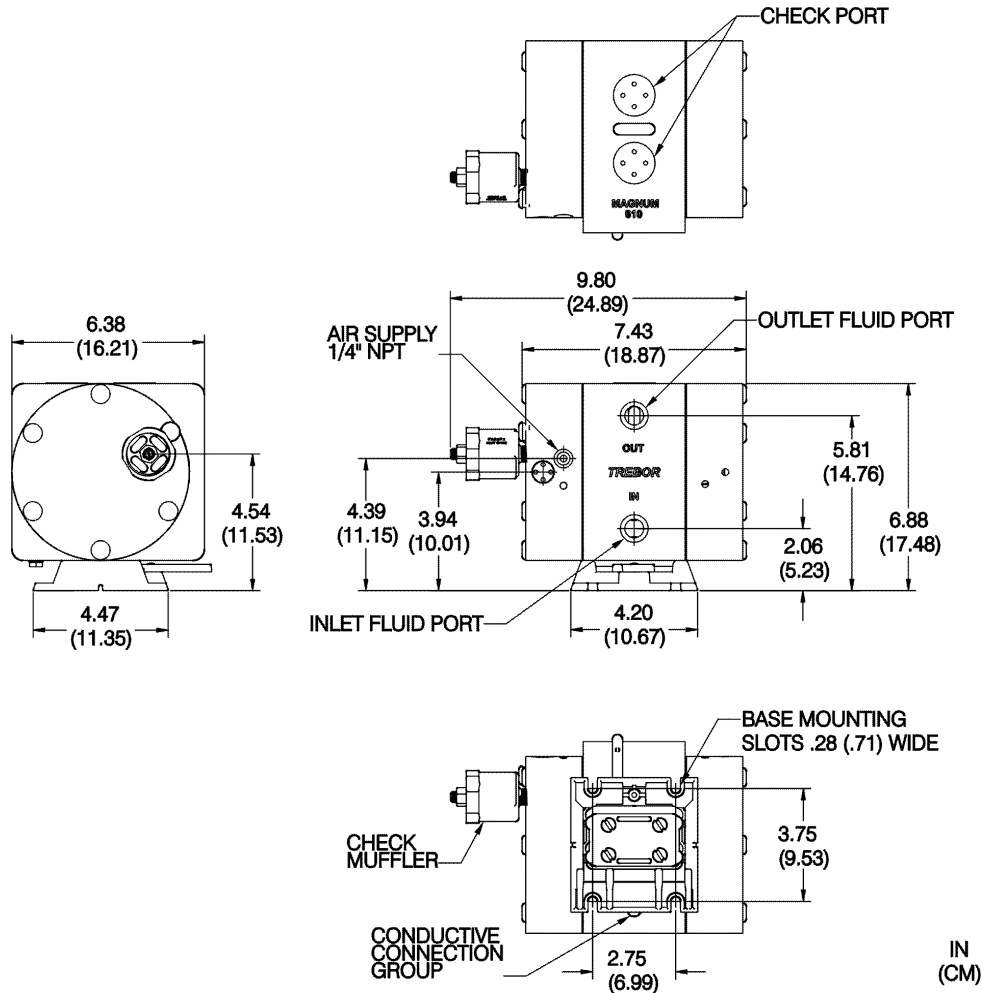
1. Maximize supply line diameter. Minimum 3/4" tubing or 1/2" pipe recommended.
2. Minimize supply line length.
3. Minimize supply line restrictions; valves, fittings, etc.

Grounding: Use the supplied Conductive Connector Group to attach the pump to an appropriate facility ground. The pump attachment is located behind the mounting base (see Figure 4-1) and is tapped for this group. It is advised to ensure your pump is properly installed. This can be done by measuring the resistance to ground which should be less than 1,000,000 ohms from either pump head.



CAUTION: If pipe work is not properly installed, it may pose a risk to personnel, equipment or environment, when operating in areas with explosion hazard.

ATTENTION: All Local codes must be followed during installation and operation of this pump.



MTD0528

Figure 4-1

Recommended Maximum Operating Levels: 60 PSIG (.41 MPa) air supply, 110°C fluid temperature

ATTENTION: The pump should be operated with clean dry air (CDA) or nitrogen. Particulate, water and oils in the air supply can damage the pump.

NOTE: Although extensive efforts are made to deliver pumps to our customers completely dry, new pumps may contain residual moisture from their final DI water test.

4.4 CHECK MUFFLER OPERATION

4.4.a Purpose

- Permits pump to operate reliably in systems with a discharge fluid “dead head” condition (discharge port closed while pump air supply remains on), or in systems that have the pump located at an elevation below the liquid supply level.

4.4.b Adjustment

- The Check Muffler is preset at the factory to a setting that makes the pump cycle at a slow constant rate with the fluid discharge port closed, and the pump air supply at 45 PSIG. This setting also allows the pump to operate with approximately 4 ft. (1 meter) of H₂O positive fluid supply pressure. “Deadheading” at other air supply pressure or with more positive fluid supply pressure (fluid source above pump) may require user adjustment. The adjustment should control the pump to a slow, steady cycle rate with no erratic cycling, “machine gunning”, evident.

NOTE: If pump application does not require operation in either of these conditions, loosen check muffler adjustment screw by turning counter-clockwise for minimum restriction. Note: Pump capacity is reduced as check muffler adjustment is increased in the clockwise direction.

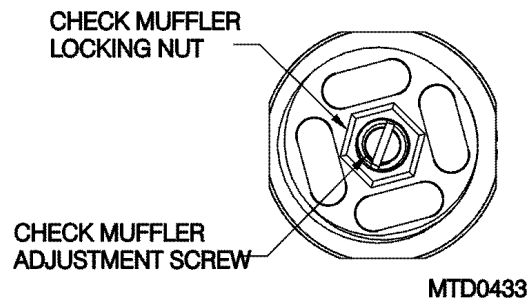


Figure 4-2

- Loosen locking nut.
- Turn adjustment screw clockwise (CW) to increase backpressure.
- Turn adjustment screw counter-clockwise (CCW) to decrease backpressure.
- Tighten locking nut when done to maintain adjustment.

5 START-UP

- Pump air supply pressure should be regulated.
- Open the fluid suction (IN) line valve, if necessary.
- Open the fluid discharge (OUT) line valve, if necessary.
- Start with air regulator at low pressure setting. Increase or decrease pressure to attain desired flow, up to 60 PSIG (.41 MPa) at the pump.
- Table 1: Consumption / Efficiency can be used to determine approximate air consumption.
- Refer to Troubleshooting, Section 0, if pump fails to start.

ATTENTION: Prolonged periods of dry running will damage critical internal pump parts.

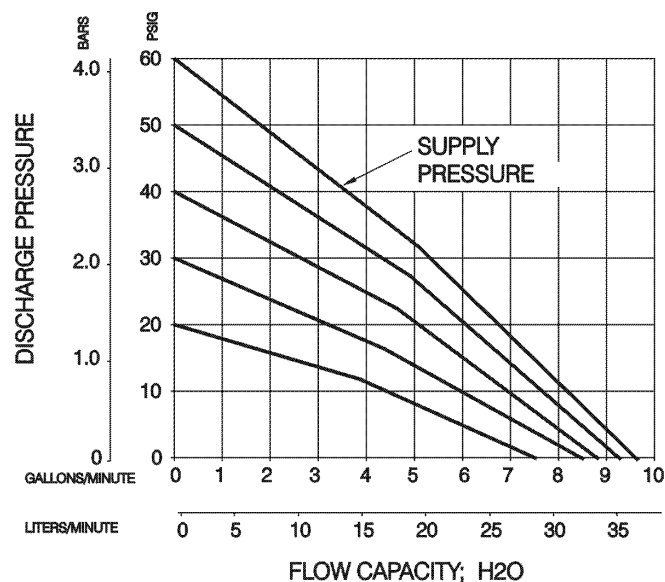
5.1 PERFORMANCE CHARTS

Pumping capacity is a function of air supply pressure and volume, suction head, suction line restrictions, discharge head, discharge line restriction, and fluid specific gravity and viscosity.

Air Supply Pressure (PSIG)	Discharge Fluid Pressure (PSIG)	Air Used (SCFM)	Cycles Per Minute	Displacement IN ³ Per Cycle
20	0	3.9	170	10.4
20	10	2.8	105	9.3
30	0	5.6	190	10.5
30	15	4.0	120	9.4
40	0	7.0	198	10.5
40	20	5.4	125	9.6
50	0	8.4	205	10.5
50	25	7.2	130	9.7
60	0	10.2	208	10.6
60	30	8.4	128	9.4

Table 1: Consumption / Efficiency

NOTE: Specification to be used to size regulators and control valves.



MTD0317

Figure 5-1: Pressure & Capacity Chart

6 MAINTENANCE

Trebor pump maintenance can be divided into two categories: air system maintenance and fluid system maintenance. The purpose of air system maintenance is to prevent air system failures such as stalling or erratic cycling. The purpose of fluid system maintenance is to maintain suction lift and maximum fluid capabilities.

PUMP REBUILD SERVICE

Trebor provides a factory rebuild service for customers using Trebor products. Trebor will rebuild any standard pump (exclusive of options). Please contact Trebor's Sales Department for current rebuild pricing. The fixed rebuild price includes a factory rebuild and parts equivalent to the standard rebuild kit. Each factory rebuild comes with a new one-year warranty. Repairs requiring more extensive part replacements will be quoted prior to proceeding with the pump rebuild. If the pump has exceeded its useful life and cannot be rebuilt, the customer may elect to purchase a new Trebor pump. If the customer chooses not to rebuild or replace the pump, a \$150.00 evaluation charge will be required.

All returned pumps are to be shipped freight prepaid with a valid purchase order for the cost of rebuild service. Please contact Trebor prior to returning your pump to obtain an RMA Number and Pump Return Data Sheet to ensure proper safety precautions. Each pump will be evaluated and repaired within 5 working days of the receipt of pump at Trebor facility.



CAUTION: Be aware that the pump will contain residual liquid when it is removed from service. Please follow the instructions in the Pump Return Data Sheet for proper decontamination before returning the pump to Trebor.

6.1 PREVENTIVE MAINTENANCE SCHEDULE

The following maintenance schedule is recommended to optimize pump performance and minimize failures. Tie bolt torque should be checked prior to installation and every twelve months thereafter.

Adhering to the recommended preventative maintenance schedule along with periodic inspection of the pump will ensure continued efficient operation and overall reliable pump performance.

MAGNUM 610RC PUMP

Replacement			Inspection				Component / Comments
6 Month	1 Year	2 Year	3 Month	6 Month	1 Year	2 Year	
	X						Shuttle Spool System
					X		Tie Bolt Retorque
		X					Check Balls and O-Rings
	X						Check Balls and O-Rings (High Suction Applications)
		X					Shaft Seal and Shaft
	X						Shaft Seal and Shaft (High Suction Applications)
		X					Diaphragms and Main Seals
	X						Diaphragms and Main Seals (H ₂)
X							Diaphragms and Main Seals (ACT 935 & TMAH)

Recommended tie bolt torque is 42 in-lbs.

6.2 RECOMMENDED SPARE PARTS

KR610RC-00-A Spares Rebuild Kit, which includes:

<u>Part No</u>	<u>Qty</u>	<u>Description</u>		
KD610-03-A	1	Diaphragm Kit		
		Includes:	(2) 98003600	O-Ring
			(2) C0100	Diaphragm Set
KM610RC-00-A	1	Maintenance Kit		
		Includes:	(1) 11001210	Shuttle Assembly
			(1) 11001230	Detent Assembly
11001015	1	Protective Cap Set		
11001220	2	Pilot Valve		
1610B0022	1	Shaft		
98001415	4	Check Ball		
98001976	2	Shaft Seal		
98002331	2	O-Ring		
98002332	2	O-Ring		
98002334	4	O-Ring, PTFE		
AM084	2	Check Cap Seal		
C0135	1	Check Muffler		

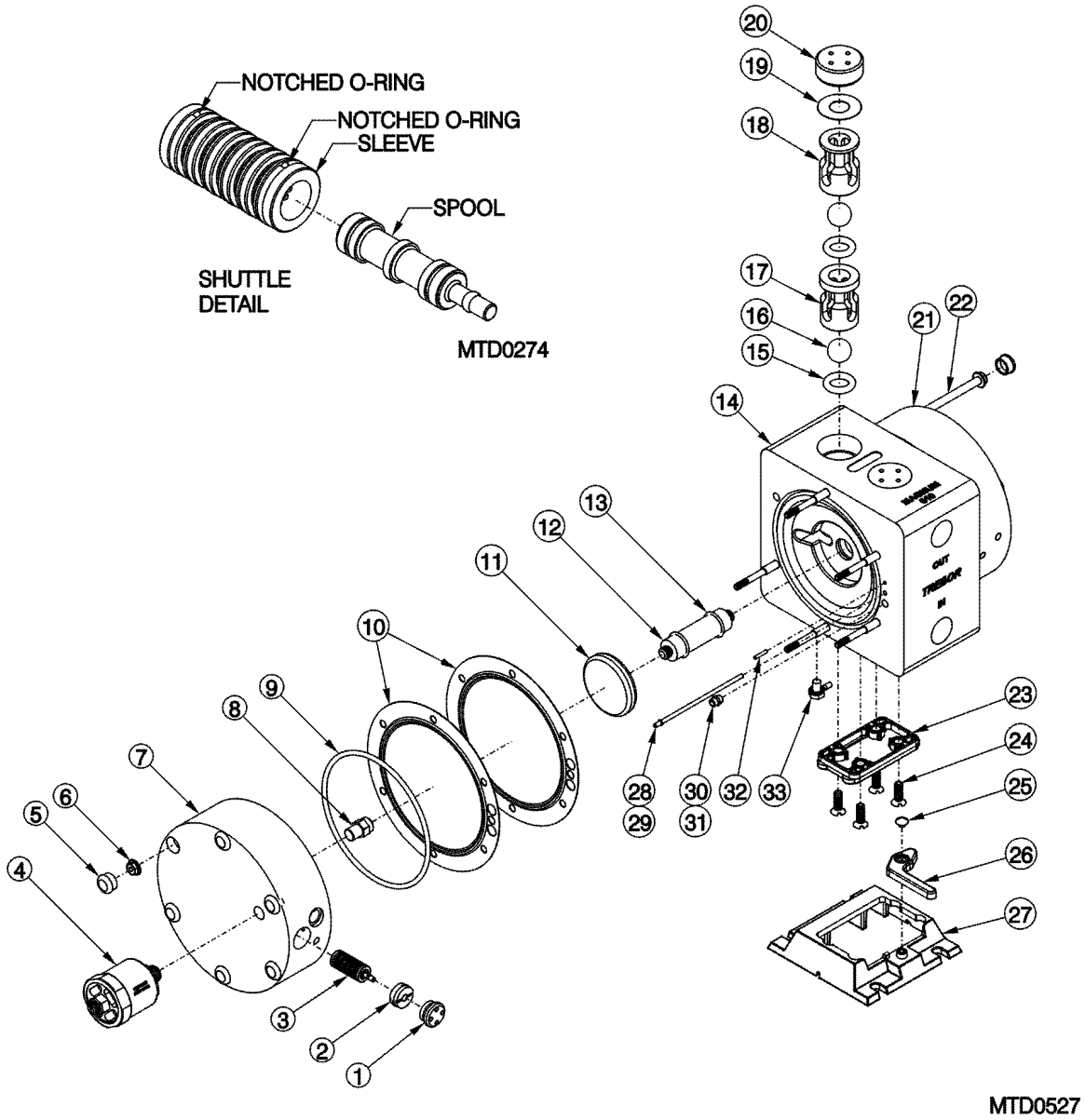
6.3 TOOLS

The following tool kit is recommended as standard service equipment.

KT610RC-00-A Tool Kit, which includes:

<u>Part No</u>	<u>Qty</u>	<u>Description</u>
98001225	2	3/8" Nut Driver
98001226	1	1/2" Nut Driver
98001230	1	5/32" Allen Wrench
98002327	1	Tool Case
98003225	1	3/8" Socket
98003305	1	Drive Handle
T000B0014	1	Check Sleeve Removal Tool
T000B0020	1	Check Sleeve Insertion Tool
T0123	1	Shuttle Sleeve Tool
T0146	1	3/4" Pin Tool
T0148	1	1/2" Pin Tool
T16002104	1	Shaft Bullet

6.4 PARTS ILLUSTRATION



6.5 PARTS LIST

ILL NO	PART NO	QTY	DESCRIPTION	PM YEAR #	MATERIAL
1	1100C0026	1	Shuttle Plug		PP
2	11001230	1	Detent	1 & 2	Acetal, SS
3	11001210	1	Shuttle Assembly	1 & 2	SS410, Buna
4	C0135	1	Check Muffler Assembly	2	PP, NPRN
5	98001109	12	Tie Bolt Cap	2	PU
6	98002338	6	Nut, Flanged		SS18-8
7	C0142	1	Master Head		PP
8	11001220	2	Pilot Valve		Brass, SS, NBR
9	98003600	2	Main Seal	2	Viton
10	C0100	2	Diaphragm Set	2	PFA
11	C0095	2	Push Plate		PTFE
12	1610B0022	1	Shaft	2	PFA
13	98001976	2	Shaft Seal	2	PTFE
14	C0141	1	Body		PTFE
15	98002334	4	O-Ring, PTFE Check Valve	2	PTFE
16	98001415	4	Check Ball	2	PTFE
17	1610B0007	2	Suction Sleeve		PTFE
18	1610B0008	2	Discharge Sleeve		PTFE
19	AM084	2	Seal, Check Bore Cap	2	PTFE
20	C0144	2	Check Bore Cap		PTFE
21	C0143	1	Slave Head		PP
22	1610B0010	6	Tie Bolt Assembly		SS416, PFA
23	AM022	1	Mounting Base		PP
24	98003207	4	Mounting Screw		PP
25	98003071	1	Locking Lever Screw		PP
26	AM023	1	Locking Lever		PP
27	C0102	1	Quick Release Base		PP
28	1610A0013	1	Pilot Transfer Tube		PFA
29	98002331	2	O-Ring, Transfer Tube	2	Viton
30	1110A0022	2	Main Transfer Tube		PFA
31	98002332	2	O-Ring, Transfer Tube	2	Viton
32	98003599	2	Conductive Pin		SS
33	C0145	1	Conductive Connector Group		SS

6.6 CLEAN-UP

The pump fluid cavities may be flushed clean by cycling with the suction (IN) and discharge (OUT) lines connected to a DI water flushing or rinsing tank. Flushing using an external pressure source without allowing the pump to cycle will result in incomplete removal of potentially dangerous chemicals.

6.7 DISASSEMBLY

During the life of the pump it will be necessary to perform certain preventative maintenance procedures to ensure its continued high performance operation. This section and the next (6.8 Assembly) are provided for the user's convenience in disassembly and re-assembly procedures.



CAUTION: Pump assembly and disassembly must be performed by authorized and qualified personnel who have fully read this manual. If not, the pump could be damaged and people and the environment placed at risk when operating this pump in explosive hazard areas.

- Thoroughly clean / flush the pump using DI water (Refer to Section 6.6 Clean Up).
- Unlock pump from quick release base by pulling out locking lever on front of base. Then slide pump forward until it stops. Lift pump off base.
- Remove check muffler assembly.
- Remove tie bolt caps from both heads.
- Remove flanged nuts from the tie bolt assemblies. (Master Head side.) Using both 3/8" nut drivers. Leave tie bolts in place.
- Lay the pump on the slave head side.

- Remove the master head.
- Remove the main seal and diaphragms.
- Remove the main transfer tube and seal.
- Remove the pilot transfer tube seal.
- Remove the body assembly.
- Remove the pilot transfer tube and seal and the second main transfer tube and seal.
- Remove the slave side set of diaphragms and main seal.
- Remove tie bolts.

NOTE: All parts, when disassembled, should be thoroughly washed and be free from chemical residue for handling purposes.

6.7.a Body Disassembly

- Remove check bore caps and seals.
- Remove sleeves, check balls and O-rings.
- Unthread one push plate from the shaft.
- Remove remaining push plate and shaft from body.
- Unthread push plate from shaft.
- Remove shaft seals from the shaft bore, taking care not to damage the shaft bore or shaft seal grooves.

6.7.b Head Disassembly

- Remove the shuttle cap from the master head.
- Remove the detent and shuttle spool. See Section 6.4 for shuttle detail. (A small blast of air into the air inlet port will normally cause the detent and shuttle spool to pop out.)
- Remove the shuttle sleeve from the shuttle bore.
- Remove the pilot valves from the master and slave heads, with 1/2" nut driver.

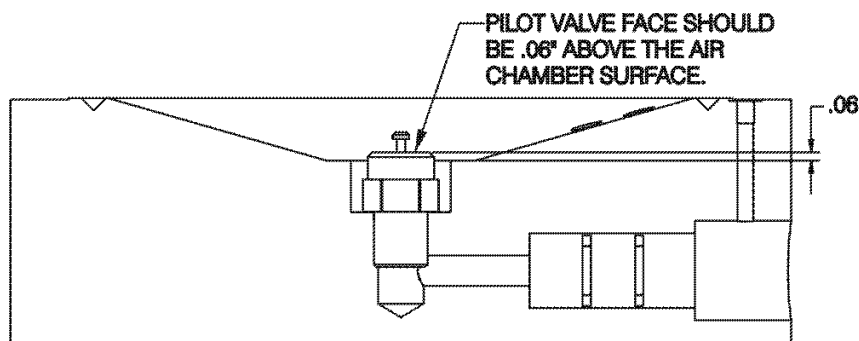
NOTE: The shuttle spool, sleeve and the exterior of the detent may be cleaned with isopropyl alcohol. Do not disassemble or remove lubricant from detent. If lubricant is lost, it is necessary to replace the detent to avoid damage to the shuttle spool.

6.8 ASSEMBLY

6.8.a Head Assemblies

Pilot Valve (Both Heads)

- Install the pilot valves with 2 wraps of TFE thread tape in each head.



MTD0320

Figure 6-1

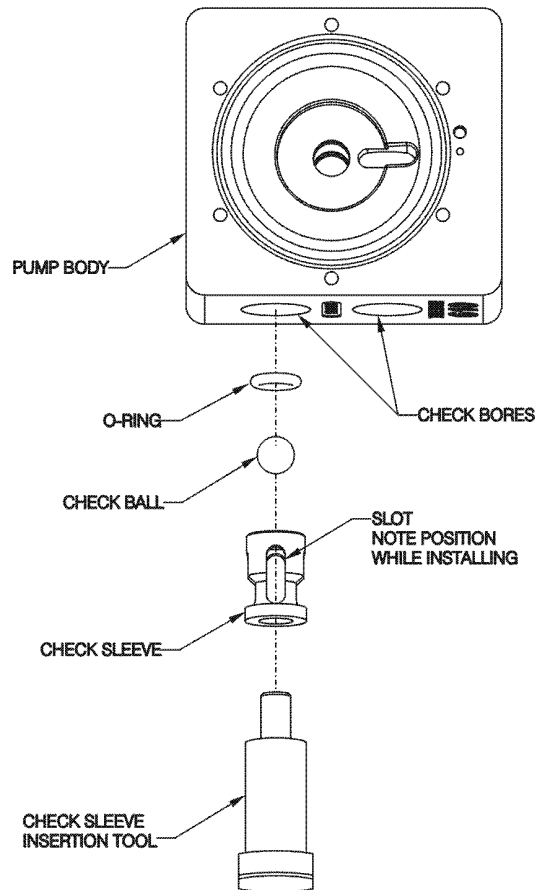
Shuttle Assembly (Master Head)

NOTE: Ensure that the shuttle spool moves freely inside the shuttle sleeve prior to installation.

- Check the shuttle assembly making sure it has notched O-rings on each end. (See Section 6.4 for shuttle detail.)
- Insert shuttle sleeve into the shuttle bore.
- Insert shuttle spool.
- Insert detent.
- Install shuttle cap with 2 wraps of TFE tape.

6.8.b Body Assembly

NOTE: Body must be upside down with check port extending over a table edge so that parts remain assembled during insertion of sleeves. (See Figure 6-2.)



MTD0321

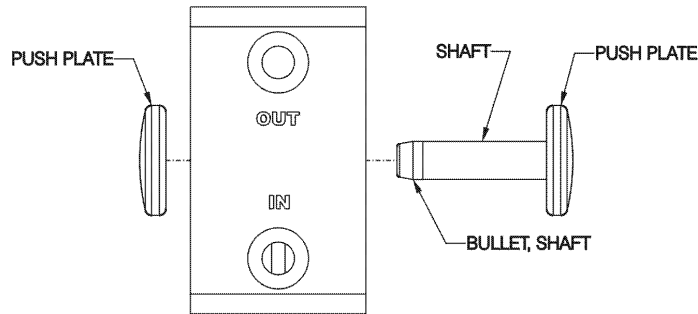
Figure 6-2

- Insert suction sleeve, check ball and O-ring carefully into check bore.

NOTE: The suction sleeves have a shoulder diameter larger than their body diameter.

- Repeat insertion process with the discharge sleeve, check ball and O-ring.
- Repeat process for second check bore.
- Place seals and tighten check bore caps into check bores.
- Install shaft seals into shaft bore grooves.

- Thread shaft into push plate, gently snug.
- Insert shaft through shaft bore using shaft bullet as shown (This prevents damage to the PTFE shaft seals).



MTD0322

Figure 6-3

6.8.c Final Assembly

- Remove bullet and thread on remaining push plate, gently snug.
- Insert tie bolt assemblies through slave head and lay flat with tie bolts sticking up.
- Place main seal O-ring into the main seal groove in slave head.
- Install a diaphragm set, removing all air from between diaphragms, onto the tie bolts noting the relative orientation of the formed main seal groove in the diaphragms with respect to conforming to the main seal. Also note air transfer port hole alignment.
- Place one main transfer tube with seal into respective port.
- Place pilot transfer tube and one seal into slave head.
- Install one conductive pin in the slave head.



CAUTION: If conductive pin is not properly installed, it may pose a risk to personnel, equipment or environment, when operating in areas with explosion hazard.

- Carefully place and press the body assembly onto the tie bolts, transfer tubes, seals, and slave head.
- Install the remaining diaphragm set onto the tie bolts and body, again noting formed main seal groove and transfer port seals (O-rings).
- Install seal onto protruding pilot transfer tube.
- Place the master side main seal O-ring into the formed groove in the diaphragms as closely as possible to ensure engagement into the main seal groove in the master head.
- Install one conductive pin in the master head.



CAUTION: If conductive pin is not properly installed, it may pose a risk to personnel, equipment or environment, when operating in areas with explosion hazard.

- Place remaining main transfer tube and seal into body.
- Install the master head onto the bolts taking care not to jar or move any of the mating components.
- Install flange nuts onto tie bolts; tighten to 42 in-lbs. torque.
- Install tie bolt caps and check muffler assembly.
- Install pump onto base and slide back. Use locking lever to secure.
- Resistance between heads must be less than 1,000,000 ohms.



CAUTION: A good validation of correct pump assembly is to check the resistance between both pump heads to ground. Failure to assemble properly may pose a risk to personnel, equipment or environment, when operating in areas with explosion hazard.

7 TROUBLESHOOTING

Pump Will Not Start, Fails to Operate

Cause:

- Insufficient air pressure.
- Insufficient air volume.
- Dirty or damaged shuttle valve.
- New diaphragm installed; not stretched enough to allow contact with pilot valves.
- Both diaphragms expanded into contact with pilot valves due to excess fluid supply line pressure.
- Fluid discharge line blocked. Downstream valve closed, filter plugged or other obstruction (dead head).
- Shuttle valve spool may be centered.

Solution:

- Must be 10-15 PSIG greater than fluid discharge line pressure.
- See Performance Charts (Section 5.1) for requirements.
- Clean shuttle spool/detent and sleeve until free movement is assured; or replace (see 6.8.a).
Use clean dry air or nitrogen.
- Increase air pressure up to 60 psig until pump starts. Decrease for proper flow if necessary.
- Adjust check muffler assembly (see 4.4).
- Remove obstruction. Refer to Section 4.4 for further information on "Dead Head" condition.
- Turn off air supply. Disconnect supply tube at pump fitting to bleed internal pressure. Reconnect and turn on air. Remove shuttle cap and push the spool to end of travel. Replace cap, start pump.

Bubbles in Fluid Discharge

Cause:

- Leaking fluid inlet fitting.
- Leaking main seal.
- Ruptured (perforated) diaphragm. This is easily detected by large amounts of air in the discharge fluid during pump operation.

Solution:

- Tighten, or remove and wrap with PTFE thread tape prior to tightening.
Replace seals (adapter port option only).
- Tighten tie bolt nuts to 42 in-lbs. Replace diaphragms if damaged.
- Replace Diaphragms.

Fluid Leaks

Cause:

- Tie bolt torque not enough to effect seal.
- Damaged main seal.
- Check bore cap.
- Ruptured diaphragm(s) can result in fluid leaks through air exhaust port and shuttle valve.

Solution:

- Tighten all nuts to 42 in-lbs.
- Replace. Check for irregularities in diaphragm groove on pump body. Inspect for proper chemical compatibility.
- Tighten, or remove and replace seal.
- Replace diaphragms, and any parts that may have been damaged by fluid exposure.

Erratic Cycling

Cause:

- Leaking shuttle cap.
- Fluid supply line restricted (cavitation).
- Fluid supply line pressure.
- Pilot valve not seating.
- Pilot valve transfer O-rings leaking.
- Check ball(s) not seating.

Solution:

- Tighten; or remove and wrap with PTFE thread tape prior to tightening.
- Reduce fluid restriction.
Reduce distance, height of suction head.
Increase diameter of suction supply line (reduces restriction).
- Adjust check muffler assembly.
- Check pilot valve function and seal.
Additional PTFE thread tape on pilot valve threads.
- Check diaphragm hole alignment. Replace O-ring seals.
- Replace check balls and O-ring seats.