

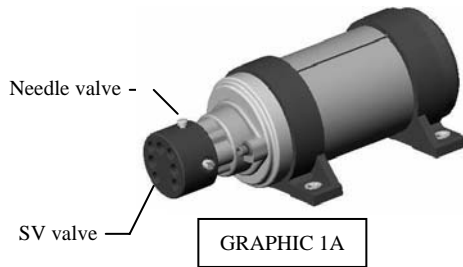


## LIP OIL SEAL REPLACEMENT - REVERSING PUMP

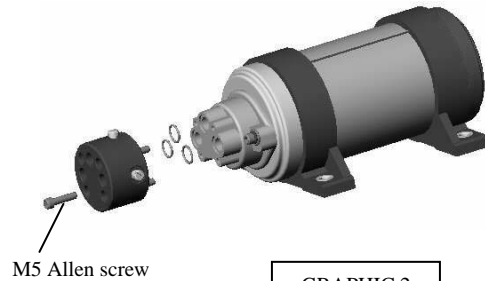
### A. Pumpset Disassembly:

#### 1. Remove Pumpset from Vessel:

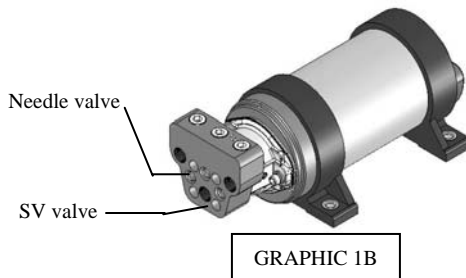
- a. If the pumpset is fitted with a Shut Off Valve Assembly as per graphic 1, the steering system can be easily kept in useful service by firmly closing the 3 needle valves (located radially around the manifold or on the face of the manifold on the front of the pump body), which isolate the pumpset from the steering system. Once isolated, the pumpset can be removed by splitting the joint between the pump body and the Shut Off Valve Assembly and disconnecting the electrical power supply cables to the motor. 4 x M5 Allen Screws connect the pump body and the Shut Off Valve Assembly, see graphic 2.



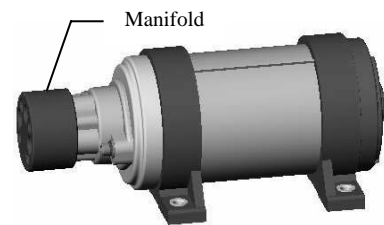
GRAPHIC 1A



GRAPHIC 2



GRAPHIC 1B

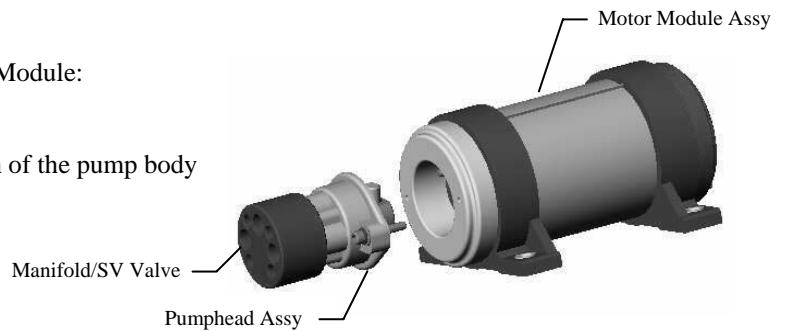


GRAPHIC 3

- b. If the pumpset is fitted with a Straight Thru Manifold in place of a Shut Off Valve Assembly as per graphic 3, then OTHER means must be devised to enable the steering system to be kept in useful service. The 3 hydraulic connections at the front of the manifold must be disconnected along with the electrical power supply cables to the motor.

#### 2. Remove Pumphead Assembly from Motor Module:

- a. Note the flow scale setting or the position of the pump body relative to the slotted hole on the right side looking from the front. This relationship determines the flow rate of the pump and should be restored when re-assembling the pumphead.



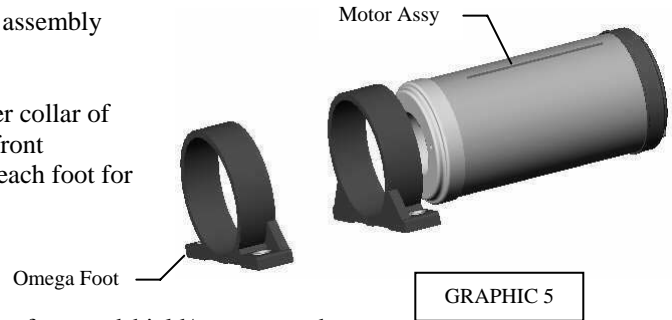
GRAPHIC 4A

## LIP OIL SEAL REPLACEMENT - REVERSING PUMP Continued

- b. Remove the 2 x M5 Allen Screws that connect the pumphead body to the motor module front endshield, and then remove the pumphead, rotor & piston assembly. Note that a Straight Thru Manifold or a Shut Off Valve Assy may remain connected to the pumphead body for this procedure.

3. Remove rubber Omega mounting feet from motor assembly (Optional):

- a. Using a screwdriver or pry bar, stretch the rubber collar of the mounting foot (2 pieces) over the lip of the front endshield of the motor. Note the orientation of each foot for correct reassembly. See Graphic 5.



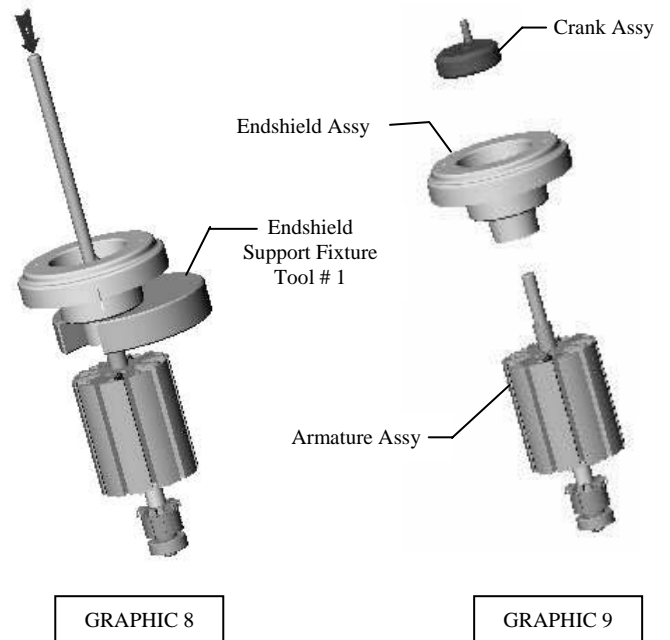
4. Remove motor rear endshield and stator from motor front endshield/armature sub-assembly :

- a. Using a 4 mm AF wrench or Philip head screwdriver, remove 2 x M5 draw bolts from motor rear endshield. See Graphic 6.
- b. There are magnetic forces holding the motor stator body in position, this can be overcome by hand force. Pull the stator body away from the motor front endshield and remove. See Graphic 7.



5. Remove motor front endshield sub-assy and crank assy from motor armature :

- a. Using a standard bench mounted # 1 or # 2 size press, the endshield support fixture (custom tool # 1) and the pusher shaft (custom tool # 4), configured as shown in Graphic 8. Press the crank assembly off the motor armature shaft.
- b. Remove the crank assembly and the endshield assembly from the motor armature assembly. See Graphic 9.

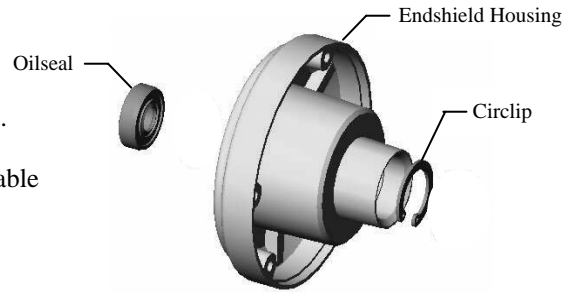


## LIP OIL SEAL REPLACEMENT - REVERSING PUMP Continued

### B. Front Motor Endshield Disassembly:

#### 1. Remove Circlip and Oil Seal :

- a. Using internal circlip pliers, remove circlip. See Graphic 11.
- b. Using standard bench mounted # 1 or # 2 size press and suitable mandrel. Press the oil seal out of the endshield housing.



GRAPHIC 11

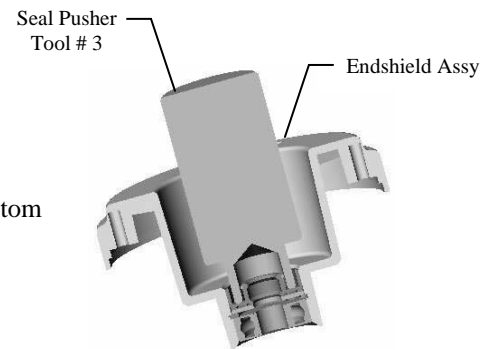
### C. Front Motor Endshield Re-Assembly:

#### 1. Install Circlip :

- a. Using internal circlip pliers, install circlip. See Graphic 11.

#### 2. Install (NEW) Oil Seal

- a. Using standard bench mounted # 1 or # 2 size press and Seal Pusher (custom Tool # 3). Press new oil seal into endshield housing. See Graphic 12.

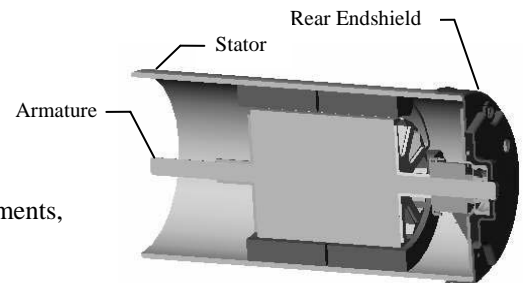


GRAPHIC 12

### D. Pumpset Re-Assembly:

#### 1. Assemble Motor Armature and Motor Stator.

- a. Note that commutator end of armature should be at end of stator which has notch on outer body.
- b. Magnetic forces will interfere with the initial alignment requirements, but will dissipate close to final assembly position.



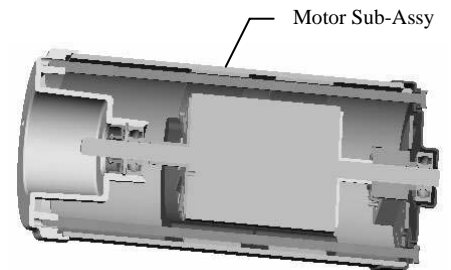
GRAPHIC 13

#### 2. Assemble Motor Rear Endshield and Motor Armature/ Stator Sub-Assembly.

- a. Note ORIENTATION of motor rear end shield in relationship to motor stator body, this is important to ensure that the polarity of the permanent magnets in the stator are in PHASE with the brushes. Both parts are notched and these notches MUST closely align at assembly.

#### 3. Assemble Motor Front Endshield, Motor Armature/ Stator Sub-Assembly and Motor Draw Bolts.

- a. Note ORIENTATION of 2 x M5 draw bolts in relationship to mating threaded holes in front end shield. See Graphic 14.



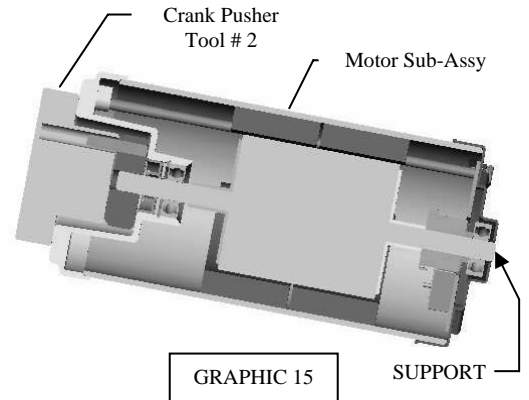
GRAPHIC 14

## LIP OIL SEAL REPLACEMENT - REVERSING PUMP Continued

- b. There may be a snug fit between the motor front endshield and the motor stator body. Use a soft blunt instrument to lightly tap the outer edge of the endshield to ensure that a good engagement is achieved.
- c. Insert the 2 x M5 draw bolts + flat washers and lock washers thru the holes in the motor rear end shield. Note that due to magnetic forces, these bolts may be drawn away from alignment with the threaded holes in the front endshield. The threaded holes have a generous chamfered lead in to assist in this procedure. See Graphic 14.

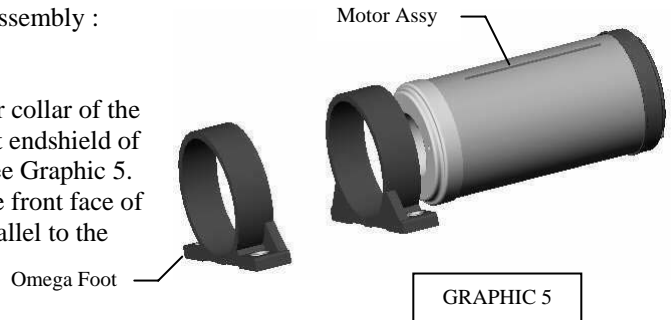
### 4. Assemble Crank Assembly to Motor Sub-Assembly.

- a. Using standard bench mounted # 1 or # 2 size press and Crank Pusher (custom Tool # 2). Press crank assembly onto motor armature shaft.
- b. Note that the relationship between the front face of the motor endshield and the front face of the crank is **IMPORTANT**. It is controlled by the Crank Pusher (Custom Tool # 2). See Graphic # 15.
- c. **ENSURE** that the rear endshield end of the armature shaft is directly supported during this crank pressing operation.



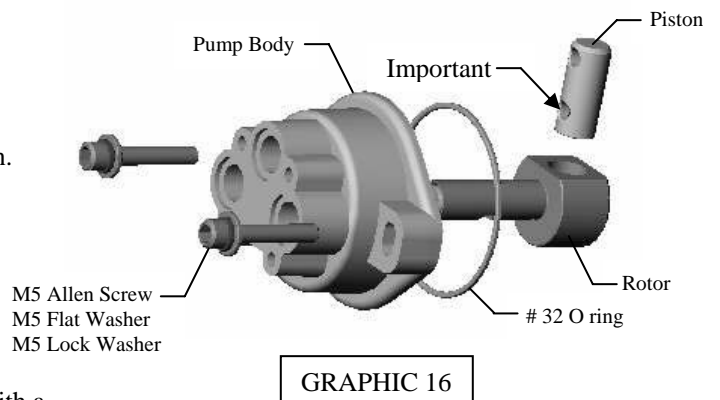
### 5. Assemble rubber Omega mounting feet to motor assembly :

- a. Using a screwdriver or prybar, stretch the rubber collar of the mounting foot (2 pieces) over the lip of the front endshield of the motor. Note the orientation of each foot. See Graphic 5. A centerline between the 2 threaded holes on the front face of the front endshield should be approximately parallel to the mounting surface of the Omega feet.



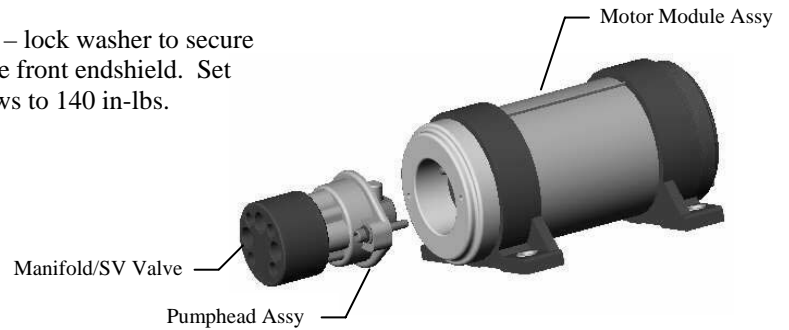
### 6. Assemble Pumphead Assembly to Motor Module:

- a. Ensure that the piston is in the correct orientation. This is crucial for operation of the pump. See "Important" note on Graphic 16.
- b. Ensure that the #32 O ring is securely engaged in the groove on the pump body.
- c. Ensure that all parts are free from dust or dirt particles and that all internal parts are covered with a coating of hydraulic oil.



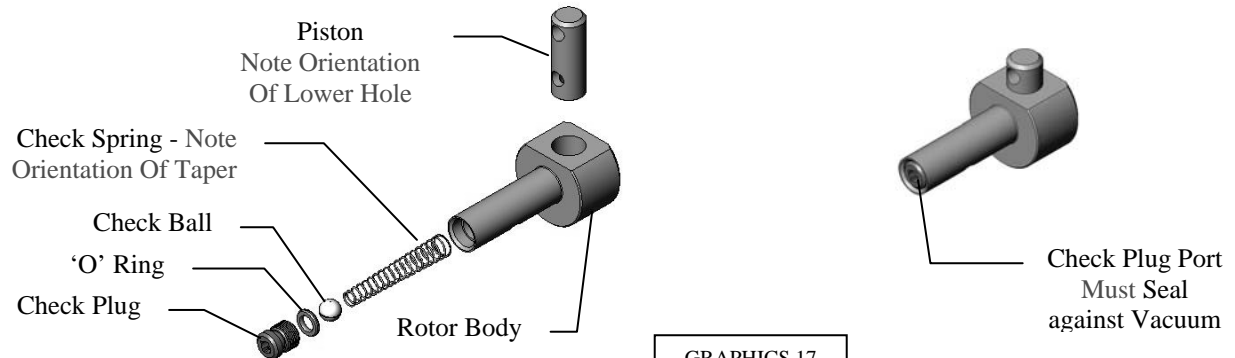
## LIP OIL SEAL REPLACEMENT - REVERSING PUMP Continued

- d. Offer the Pumphead Assemble to the Motor Module, ensure that the drive pin on the drive crank located inside the cavity of the front endshield engages with the upper hole on the piston.
- e. Install 2 x M5 allen screw – flat washer – lock washer to secure the joint between the pump body and the front endshield. Set flow rate on scale and torque allen screws to 140 in-lbs.



GRAPHIC 4A

### E. Rotor Sub-Assembly:



GRAPHICS 17