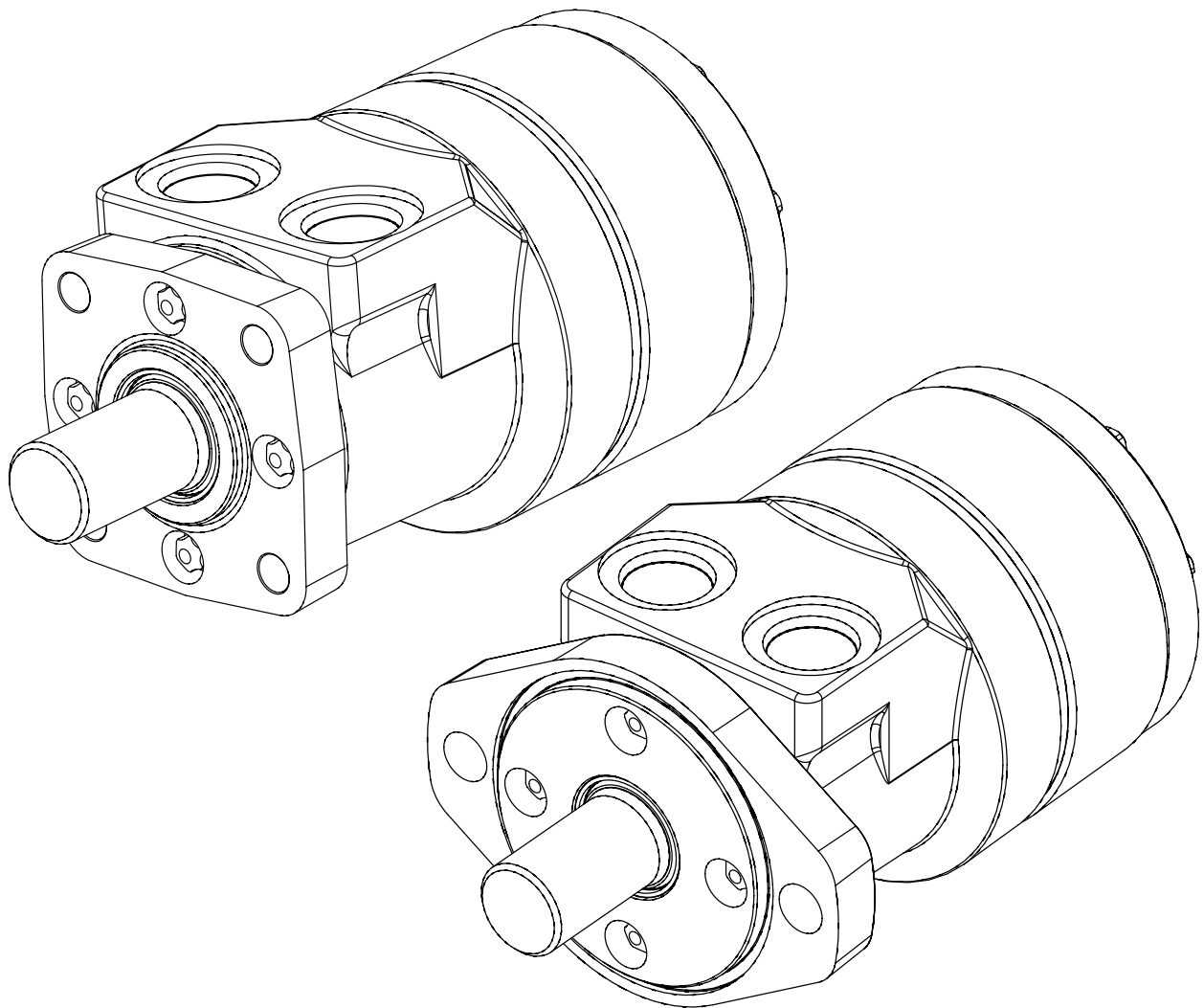


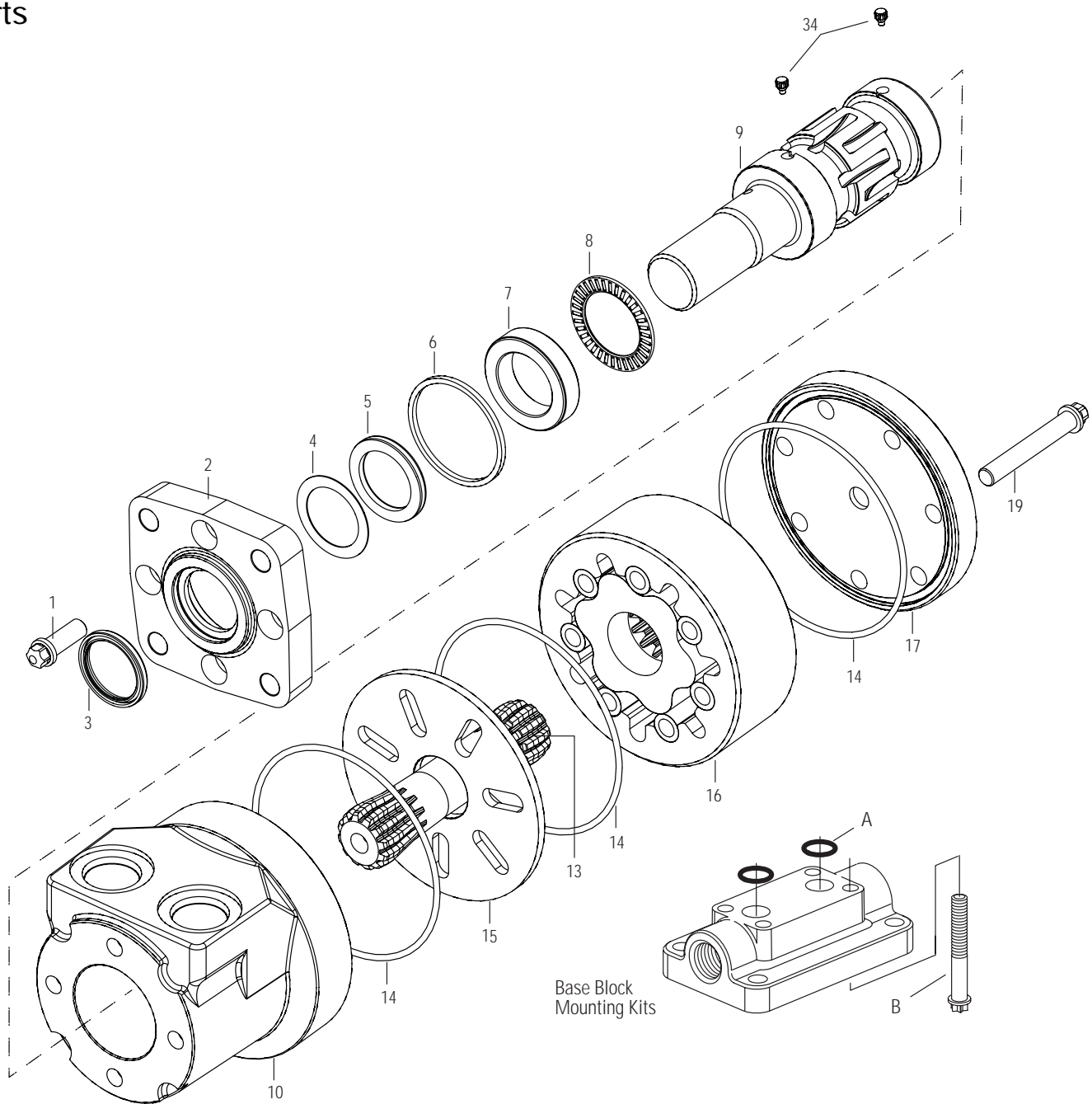
**S-Series General Purpose Motors**

Parts and Repair Manual

-012



# Parts



## -012 Design Code

DISPLACEMENT	REF. NO. 13 DRIVE	LENGTH	REF. NO. 16 GEROLER*	WIDTH	REF. NO. 19 (6 PT. DRIVE) SCREW CAP	LENGTH
cm <sup>3</sup> /r [in <sup>3</sup> /r]		mm [in.]		mm[in.]		mm[in.]
59 [3.6]	4993244-001	77,7 [3.06]	4999415-001	7,6 [0.30]	16294-150	38,1 [1.50]
74 [4.5]	4993244-002	80,0 [3.15]	4999415-002	9,9 [0.39]	16294-162	41,1 [1.62]
97 [5.9]	4993244-003	83,1 [3.27]	4999415-003	11,9 [0.47]	16294-169	42,9 [1.69]
120 [7.3]	4993244-004	85,9 [3.38]	4999415-004	15,9 [0.61]	16294-183	46,5 [1.83]
146 [8.9]	4993244-005	88,9 [3.50]	4999415-005	18,5 [0.73]	16294-195	49,5 [1.95]
159 [9.7]	4993244-006	91,7 [3.61]	4999415-006	21,3 [0.84]	16294-205	52,1 [2.05]
185 [11.3]	4993244-007	94,5 [3.72]	4999415-007	24,1 [0.95]	16294-212	53,8 [2.12]
231 [14.1]	4993244-008	99,3 [3.91]	4999415-008	29,0 [1.14]	16294-238	60,5 [2.38]
293 [17.9]	4993244-009	109,2 [4.30]	4999415-009	38,6 [1.52]	16294-275	69,8 [2.75]
370 [22.6]	4993244-010	118,6 [4.67]	4999415-010	48,0 [1.89]	16294-312	79,2 [3.12]

# Parts List

REF NO.	PART NO.	QUANTITY	DESCRIPTION
1	16292-088	4	Screw, Cap (6 Point (E10) Drive 5/16-24 x 7/8)
2	22000-001	1	Flange Mounting (2 Bolt) AA
	22000-002	1	Flange Mounting (4 Bolt) 3/8-16 UNC AB
	22000-006		Flange Mounting (4 Bolt) M10 x 1,5 AE
	22000-004		Flange Mounting (2 Bolt SAE B) AH
	22000-005		Flange Mounting (4 Bolt Magneto) AK
3	9121-002	1	Seal, Exclusion
4	220002-000	1	Washer, Backup
5	9057-014	1	Seal, Pressure
6	9091-001	1	Seal
7	7462-000	1	Race, Thrust Bearing
8	7537-000	1	Bearing, Thrust Needle
9	201616-001	1	Shaft, Output (1" Dia. Straight with Woodruff Key Slot)
	201616-002		Shaft, Output (SAE 6B Splined)
	201616-007		Shaft, Output (1" Dia. Straight with .315 Dia. Crosshole)
	201616-008		Shaft, Output (1" Dia. Straight with .406 Dia. Crosshole)
	201616-024		Shaft, Output (25mm Dia. Straight)
	201616-016		Shaft, Output (7/8" Dia. SAE B 13T Splined)
	201616-017		Shaft, Output (7/8" Dia. Straight SAE B Straight)
	201616-018		Shaft, Output (1" Dia. Tapered)
	14193-000		Key, Woodruff (1" Dia. Straight Shaft)
	14193-000		Key, Woodruff (for Tapered Shaft)
	14391-004		Key, Woodruff (for 7/8" Dia. Shaft)
	14462-006		Key, Woodruff (for 25mm Dia. Shaft)
	14381-000		Nut (for Tapered Shaft)
10	4993789-001	1	Housing, 7/8-14 O-ring Ports AA
	4993789-002		Housing, 1/2 NPTF Ports AB
	4993789-003		Housing, Manifold Ports (5/16-18 UNC) AC
	4993789-007		Housing, Manifold Ports (M8 x 1.5) AD
	4993789-006		Housing, (G 1/2 (BSP)) AF
13	*	1	Drive
14	4993784-001	3	Seal
15	4993682-001	1	Plate, Spacer
16	*	1	Geroler
17	4997139-001	1	Cap, End (No Port)
	4997139-002	1	Cap, End (with Drain Port 7/16-20 O-ring)
	4997139-003	1	Cap, End (with Drain Port G 1/4 (BSP))
19	*	7	Screw, Cap (6 Point (E10) Drive 5/16-24)
20	9072-003	1	Plug/O-ring (7/16-20 Drain Port)
	250003-904	1	O-ring for 7/16-20 Drain Port Plug
	9170-002	1	Plug/Packing ring (G 1/4 (BSP) Drain Port)
21	9900101-000		Seal kit (Buna N) - Contains Poppet
	9900100-000		Seal Kit (Viton) - Contains Poppet
34	201971-001	2	Poppet
Mounting Kit	123-1007		Base Blocking Mounting Kit (1/2 NPTF Ports (Manifold Mount Motors Only))
Mounting Kit	123-1008		Base Blocking Mounting Kit (7/8-14 O-ring Ports (Manifold Mount Motors Only))
X A	15058-000		Seal, O-ring (2)
B	267512-019		Screw, Cap (5/16-18 Thread (4))
	14774-003		Screw, Cap (M8 x 1.5 Thread (4))

\* See table on page 2 for part number

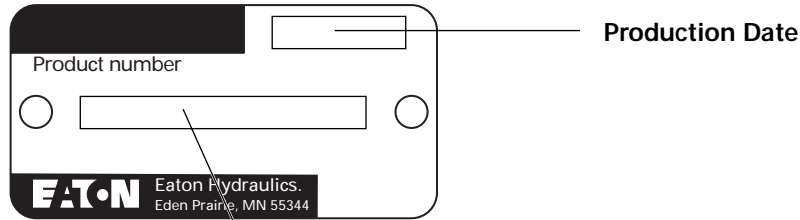
# How To Order Replacement Parts

Each order must include the following:

1. Product Number
2. Production Date
3. Part Name
4. Part Number
5. Quantity of Parts

For more detailed information, please contact

Eaton Hydraulics  
14615 Lone Oak Road  
Eden Prairie, MN 55344



## Product Number

**103 0000 012**

Product Line Identification Number

Product Identification Number

Engineering Change Code

## -012 Product Numbers - S Series

MOUNTING	SHAFT	PORTS	DISPLACEMENT CM <sup>3</sup> /R [IN <sup>3</sup> /R]									PRODUCT NUMBER 103-XXXX-012
			59 [3.6]	74 [4.5]	97 [5.9]	120 [7.3]	146 [8.9]	159 [9.7]	185 [11.3]	231 [14.1]	293 [17.9]	
<b>2 Bolt Flange</b>	1 in. Straight w/Woodruff Key	7/8-14 O-ring	-1537	-1034	-1035	-1538	-1539	-1036	-1037	-1038	-1039	-1040
		1/2 NPTF	-1540	-1026	-1027	-1541	-1542	-1028	-1029	-1030	-1031	-1032
		Manifold*	-1543	-1042	-1043	-1544	-1545	-1044	-1045	-1046	-1047	-1048
	1 in. SAE 6B Splined	7/8-14 O-ring	-1552	-1082	-1083	-1553	-1554	-1084	-1085	-1086	-1087	-1088
		1/2 NPTF	-1555	-1074	-1075	-1556	-1557	-1076	-1077	-1078	-1079	-1080
		Manifold*	-1558	-1090	-1091	-1559	-1560	-1092	-1093	-1094	-1095	-1096
<b>4 Bolt Flange</b>	1 in. Straight w/Woodruff Key	7/8-14 O-ring	-1570	-1010	-1011	-1571	-1572	-1012	-1013	-1014	-1015	-1016
		1/2 NPTF	-1573	-1002	-1003	-1574	-1575	-1004	-1005	-1006	-1007	-1008
		Manifold*	-1576	-1018	-1019	-1577	-1578	-1020	-1021	-1022	-1023	-1024
	1 in. SAE 6B Splined	7/8-14 O-ring	-1579	-1058	-1059	-1580	-1581	-1060	-1061	-1062	-1063	-1064
		1/2 NPTF	-1582	-1050	-1051	-1583	-1584	-1052	-1053	-1054	-1055	-1056
		Manifold*	-1585	-1066	-1067	-1586	-1587	-1068	-1069	-1070	-1071	-1072

\*5/16-18 Threaded Mounting Hole

# Tools Required

## Tools Required for BOTH Disassembly and Reassembly

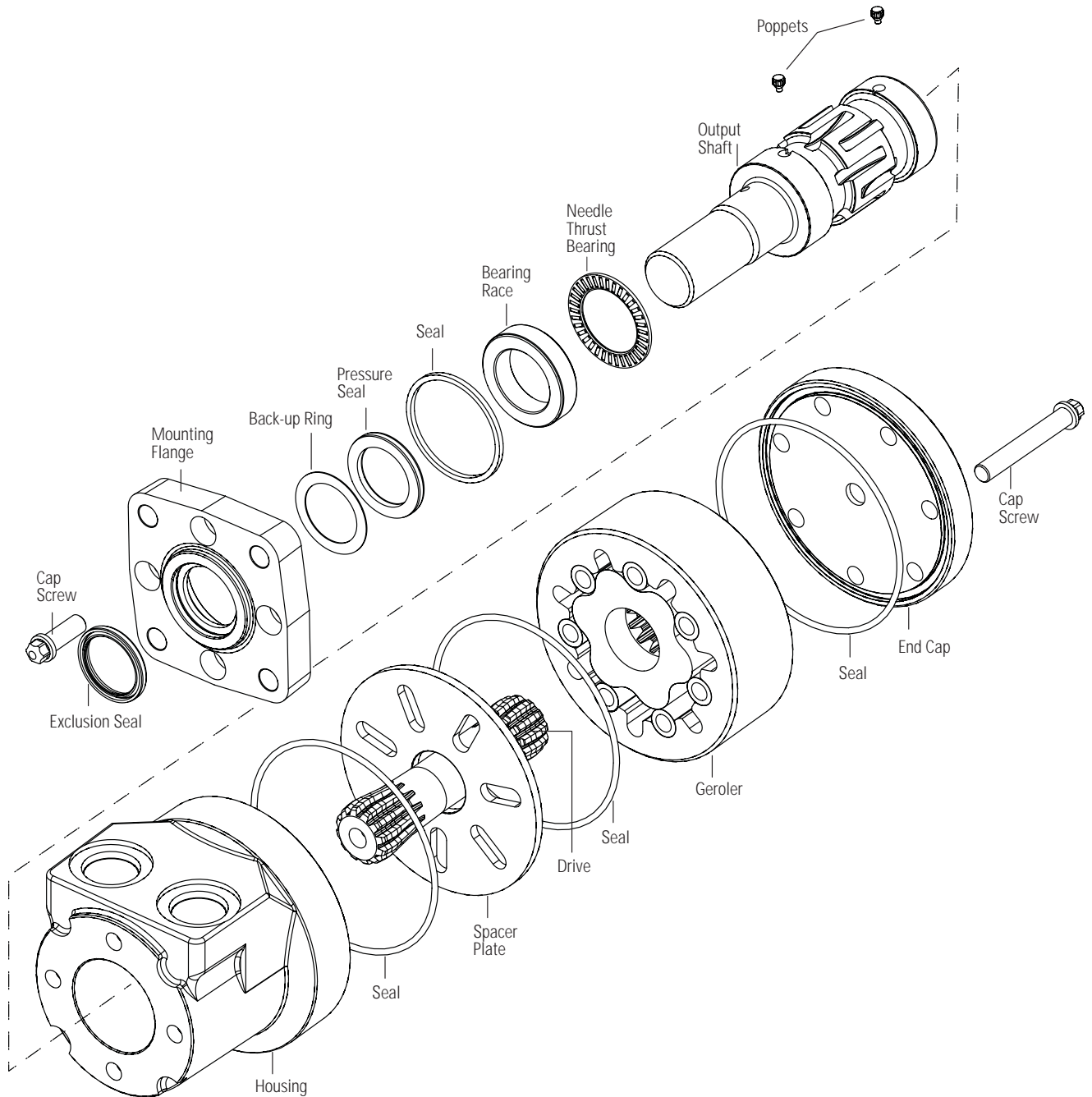
- Torque wrench (34Nm [300 lb-in] capacity)
- 300-400mm [12-16 inch] breaker bar

- 5/16-12 point socket no. 5422 (Heavy Duty—56Nm [500 lb-in] capacity)
- Small screwdriver (150-200 x 6mm [6-8 x .25 inch] flat blade), see page 8 for tooling information.
- 3/16 inch [5mm] hex key

- Shaft pressure seal installation tool P/N 600523\*
  - Seal sleeve or bullet P/N 600304 (1 inch dia. shaft), P/N 600466\*
- \* Tools available—*by special order* through our service department.

The following tool is not necessary for disassembly but may be extremely helpful:

- Small propane torch



# Disassembly

Cleanliness is extremely important when repairing motors.

Work in a clean area. Before disconnecting the lines, clean port area of motor. Remove key when used. Check shaft and key slot, remove burrs, nicks or sharp edges and polish around the key slot. Before starting disassembly, drain oil from motor, then plug ports and thoroughly clean exterior of motor.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly. Follow the clamping procedures explained throughout the manual.

1. Place motor in vise, clamp across edge of flange with output shaft down. When clamping, use protective device on vise, such as soft jaws, pieces of hard rubber or wood, see Fig. 1.
2. Some motors may have a case drain plug in the end cap. If external case drain is not used, it is not necessary to replace the seal unless leakage occurs.
3. Remove end cap, see figure 2.
4. Remove seal from end cap.
5. Remove Geroler—retain rollers in the outer Geroler ring, see Fig. 3.
6. Remove seal from spacer plate, see Fig. 3.

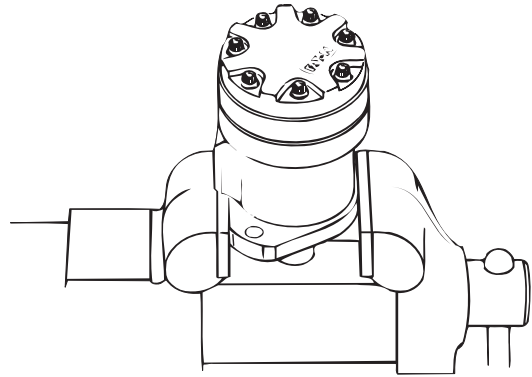


Figure 1

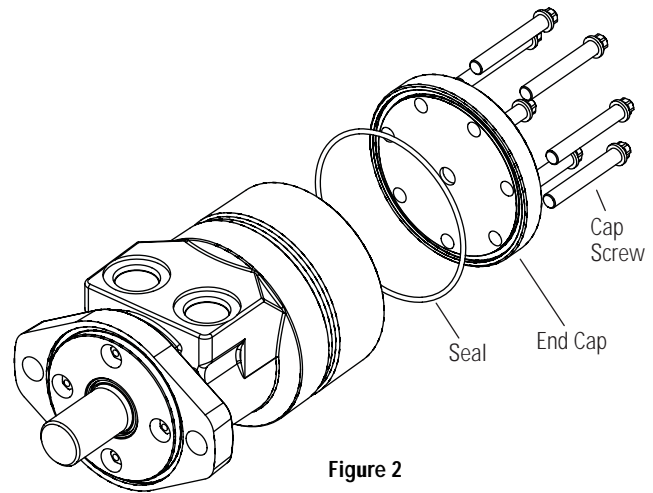


Figure 2

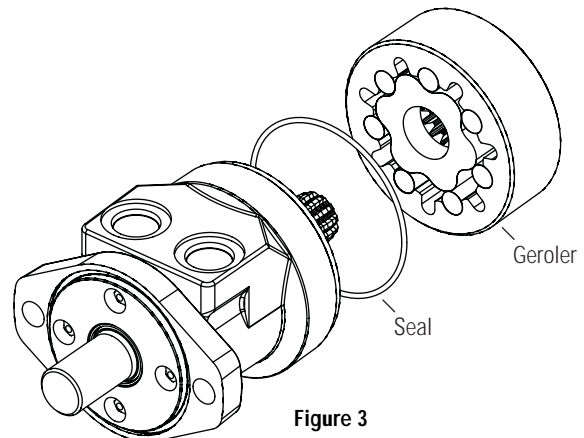


Figure 3

# Disassembly (continued)

7. Remove spacer plate.
8. Remove drive, see Fig. 4.
9. Remove seal from housing.
10. Reposition motor in vise. Clamp across ports as shown in Fig. 5, not on side of housing. Do not over tighten jaws. Excessive clamping force may distort housing.
11. Remove the 4 cap screws from the mounting flange. These motors are assembled using Loctite on the screws to hold them in place.

The screws will require approximately 34-45Nm [300-400 lb-in] of torque to break loose and approximately 11 Nm [100 lb-in] torque to remove after they are broken loose. Do not use an impact wrench on Loctited screws, this may result in rounded heads or broken sockets.

**Note:** If higher torque than given above is required to break the screws loose, apply heat according to the following instructions. When heated the Loctite partially melts and the torque required to remove the screw is greatly reduced. Follow the instructions carefully, and be careful not to overheat and cause damage to the motor. Use a small flame propane torch to heat a small area of the housing, where the screw enters, see Fig. 6. Apply torque to the screw with a socket wrench gradually as heat is applied for 8 to 10 seconds. As soon as the screw breaks loose, remove heat from the housing and continue turning the screw until it is completely removed.

12. Remove motor from vise. Place on clean flat surface. Carefully lift flange from housing with a twisting motion.

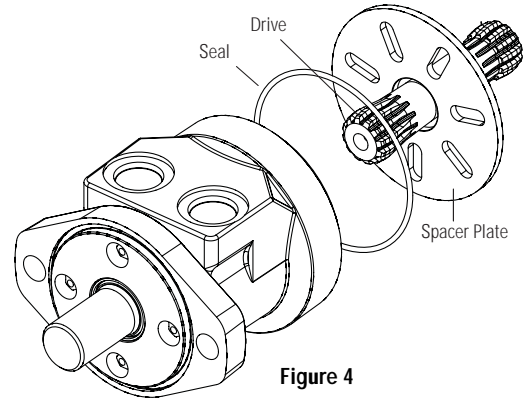
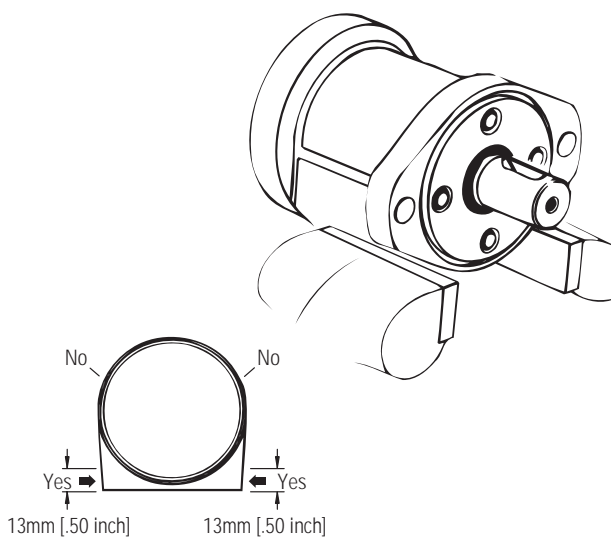


Figure 4



Clamp across ports not across housing. Excessive clamping pressure causes distortion.

Figure 5

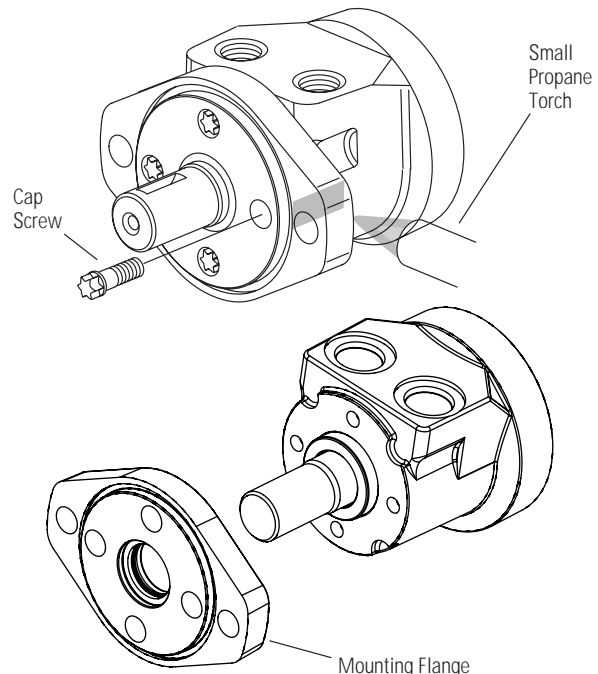
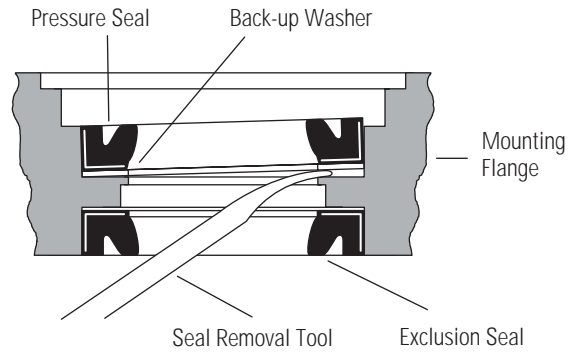


Figure 6

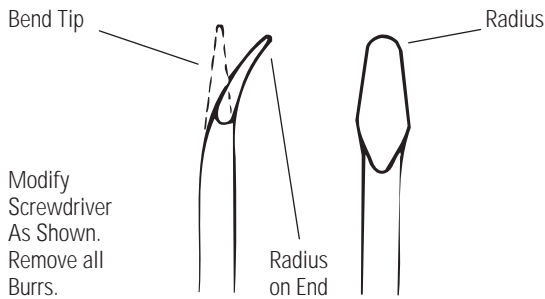
# Disassembly (continued)

13. The exclusion seal, pressure seal and oil seal will come off with the flange. Use a seal remover tool, like the one shown in Fig. 7, to remove the dust seal and pressure seal, as shown in Fig. 8 and 9. Work nose of tool between pressure seal and flange. Pry seal part-way. Remove tool and repeat at a point 180° away. Push seal completely out of cavity, see Fig. 9.

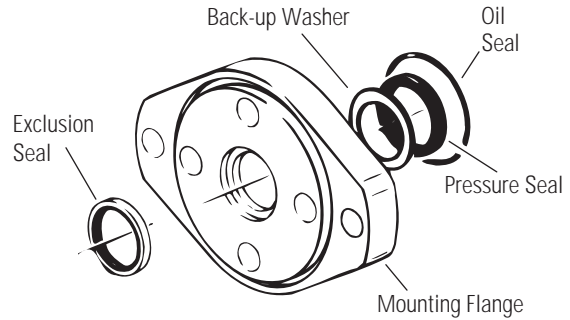
14. Remove output shaft from housing, see Fig. 10
15. Remove bearing race and needle thrust bearing from shaft.



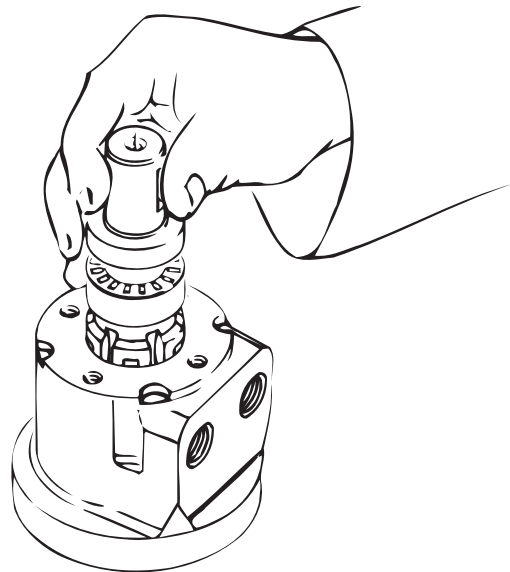
**Figure 8**



**Figure 7**



**Figure 9**



**Figure 10**



# Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage or damage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe parts with cloth or paper towel, lint or other matter can get into the hydraulic system and cause damage. Check around the key slot and chamfered area of the shaft for burrs, nicks or sharp edges that can damage the seals when reassembling. Remove nicks or burrs with a hard smooth stone (such as an Arkansas stone). Do not try to file or grind motor parts.

**Note:** Lubricate all seals with petroleum jelly such as Vaseline. Use new seals when reassembling the motor. **Do not stretch seals before installing.** Refer to parts list on page 3 for proper seal kit number.

**Important: Cleanliness is extremely important in the successful application of Loctite. Use the following procedures to properly clean all parts.**

A. Wash the housing with non-petroleum base solvent to remove oil, grease and debris. Petroleum base solvents may leave residue detrimental to successful Loctite curing. Pay particular attention to 4 tapped holes on the flange end.

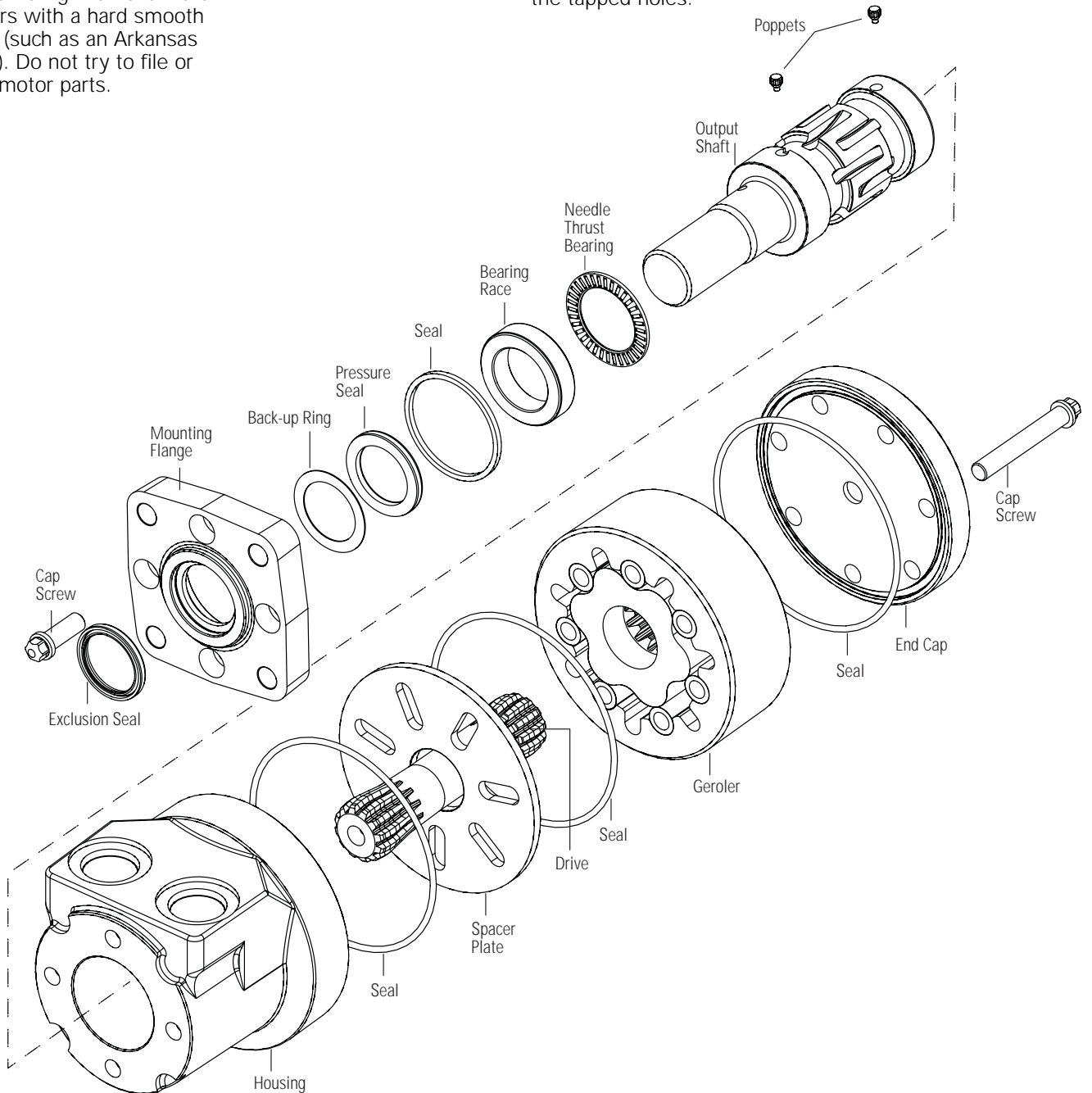
**Note: Fully cured Loctite resists most solvents, oils, gasoline, kerosene, and is not affected by cleaning operations.**

B. Blow dry with compressed air. Clean and dry the tapped holes.

**Note: It is not necessary to remove the cured Loctite that is securely bonded in the tapped holes; however any loose particles of cured Loctite should be removed.**

C. Wire brush the screw threads to remove loose particle of cured Loctite and other debris. Discard any screws that have damaged threads or a corroded, damaged, or rounded head.

D. Wash the screws with non-petroleum base solvent. Blow dry with compressed air.



# Reassembly (continued)

17. Install poppets in the shaft. A dab of petroleum jelly may be used to ensure poppets are retained for subsequent assembly steps.
18. Lubricate output shaft with clean hydraulic oil, then install shaft in housing.

**Important: Do not permit oil to get into the 4 tapped holes.**

19. Install needle thrust bearing then bearing race on shaft. Pull shaft partially out of housing, push all three parts in housing together. The bearing race must rotate freely when in position.
20. Clean mounting flange of all loose metallic chips, particles, dirt or other contamination, including oil. During cleaning, visually check seal seat in mounting flange for scratches or other marks that might damage the pressure seal. Check for cracks in flange that might cause leakage, see Fig. 12.

**Important: If a pressure seal installation tool is not available, temporarily install flange without seals. Then install 2 cap screws to secure flange to housing. After you complete reassembly of the Geroler end of the motor, install seals in flange and apply Loctite (see steps 37 thru 42 on page 13).**

**Note:** If you have a pressure seal installation tool, continue reassembly, starting with step 21.

21. Lubricate I.D. of seal tube and O.D. of shaft pressure seal with a light film of clean petroleum jelly.

Align small I.D. end of seal tube with seal seat in mounting flange. Install back-up ring and pressure seal in tube—lips of seal face up—see above. Then insert seal driver in tube to firmly push (by hand with rotating action) seal in seal seat.

**Important: After installing seal in flange, examine seal condition. If cut, damaged, or improperly installed, you must replace it before continuing reassembly.**

22. Install exclusion seal in flange, see Fig. 15. Press the dust seal into place carefully. To eliminate damage to rubber portion or distortion of metal container use a tool (flat-round face 35-41mm[1.37 to 1.62 inch] diameter) which provides proper guiding and positioning.
23. Install 1.94 inch [50mm] I.D. seal in flange.

**Caution: Do not use excessive amount of Loctite.**

24. Apply 3 or 4 drops of Loctite adhesive (Loctite no. 601 sealant) at top of threads in each of 4 holes in housing, see Fig. 14. Do not allow parts with Loctite applied to surface to contact any metal parts other than their proper assembly. Wipe off excess Loctite from housing face, using a non-petroleum base solvent. Do not apply Loctite to threads more than 15 minutes before installing screws. If housing stands for more than 15 minutes, repeat application. No additional cleaning or removal of previous Loctite is necessary.

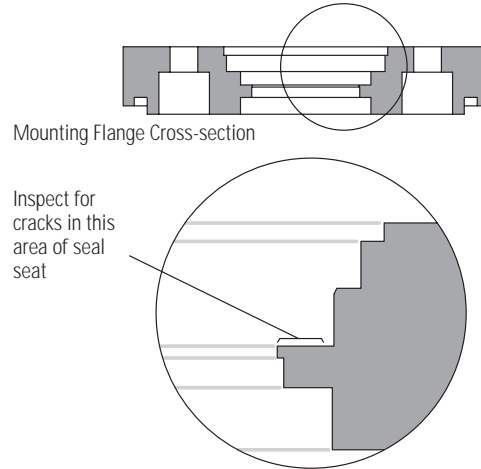


Figure 12

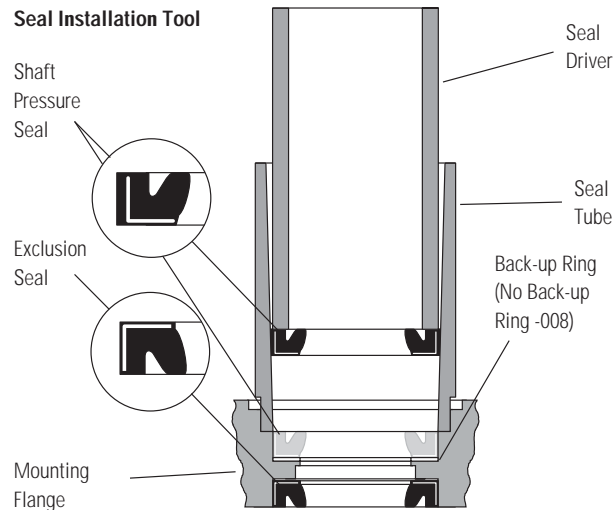


Figure 13

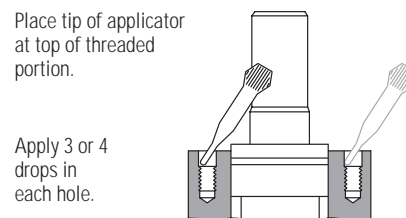


Figure 14

# Reassembly (continued)

25. Before installing the flange and seal assembly over the shaft, place a protective sleeve or bullet over the shaft. Lubricate space between dust seal and pressure seal, as well as lips of both seals (see Fig. 15). Install flange. Rotate flange slowly while pushing down over shaft. Be careful not to invert or damage the seals.
26. Clamp motor in vise as shown in Fig. 5, install dry screws and alternately torque immediately to 28Nm [250 lb-in]. If you use primer, allow to cure for 10-15 minutes, without primer, allow 6 hours before subjecting motor to high torque reversals. On all other applications you can run the motor immediately. If you use new bolts, make sure they are the correct length, 22mm [.875 inch] under head length, see parts list for correct part number. Longer screws will not permit proper seal between the flange and housing. Install key in key slot of shaft.

## Geroler End

27. Clamp housing in a vise, Geroler end up. See Step 1 for correct clamping procedure.

**Important: To aid installation of seals, apply light coating of clean petroleum jelly, such as Vaseline, to seals before installing.**

**Important: Do not stretch seals before installing.**

28. Pour approximately 35 cc of clean hydraulic oil in output shaft cavity.
29. Install seal in housing seal groove. Avoid twisting seal.
30. Install drive, observe proper timing procedure (Fig. 18).
31. Place spacer plate carefully on the housing, align bolt holes.
32. Install seal in spacer plate seal groove, see Fig. 17. Avoid twisting seal.
33. Carefully place Geroler on the spacer plate, see Fig. 17. Observe proper timing procedure, see Fig. 18.

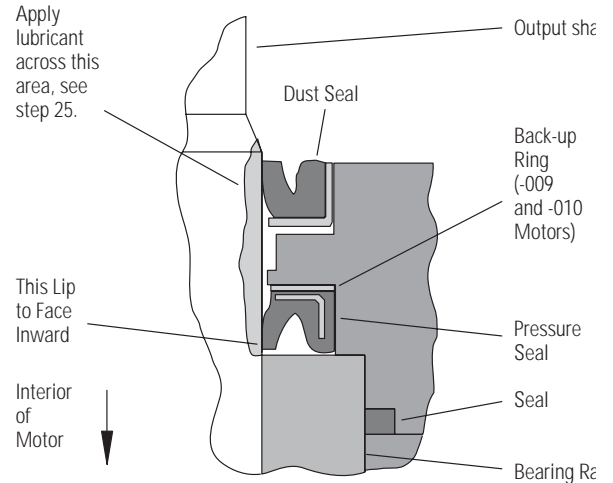


Figure 15

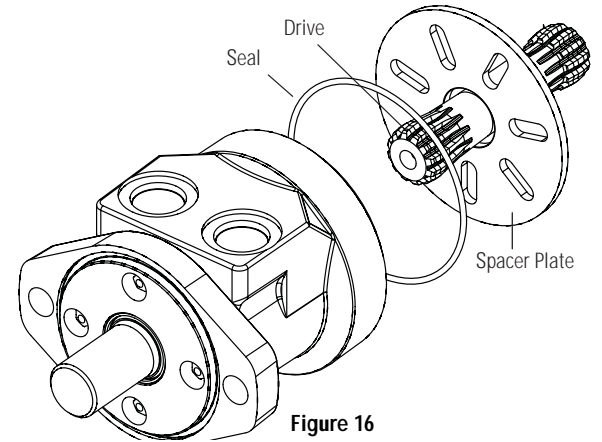


Figure 16

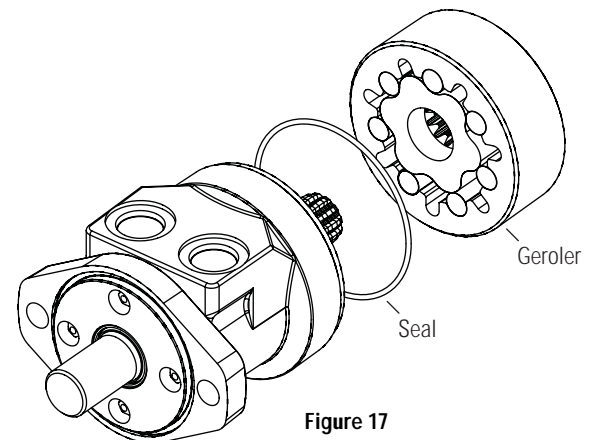


Figure 17

# Reassembly (continued)

## Timing Procedure

- A. Align shaft timing dot with any bolt hole.
- B. Install drive. For the 59 and 74 cm<sup>3</sup>/r [3.6 and 4.5 in<sup>3</sup>/r] displacements on the -012 motors, install the wide end of the drive in the output shaft. Install either end of the drive in the output shaft for the -012 motor displacements ranging from 97 to 370 cm<sup>3</sup>/r [5.9 to 22.6 in<sup>3</sup>/r].
- C. Install spacer plate. Remember which bolt hole was aligned with the shaft timing dot. Install seal in spacer plate seal groove. Avoid twisting seal.
- D. Place Geroler on spacer plate, positioning any star point over the bolt hole aligned with the timing dot.
- E. Rotate Geroler to line up bolt holes. Be careful not to disengage star from drive or disturb Geroler seal. Reverse rotation is obtained by positioning any star valley, rather than any star point, over the aligned bolt hole.

34. Install seal in end cap seal groove. Avoid twisting seal.
35. Install end cap, see Figure 20.

### Standard Rotation

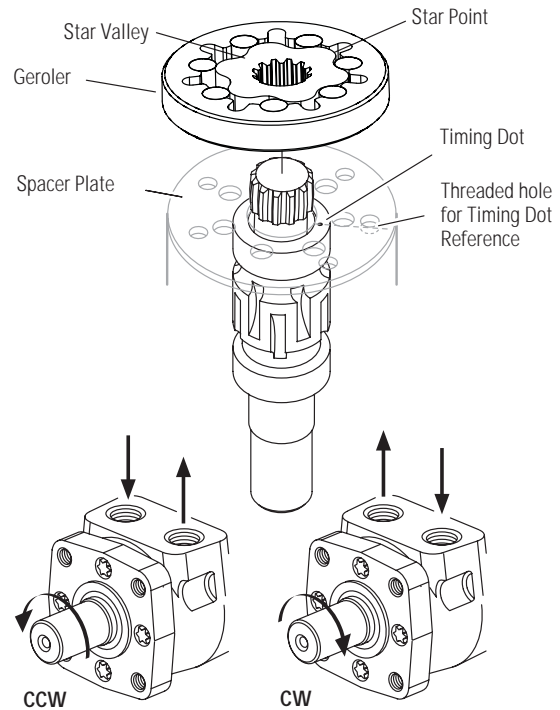


Figure 18

### Reverse Rotation

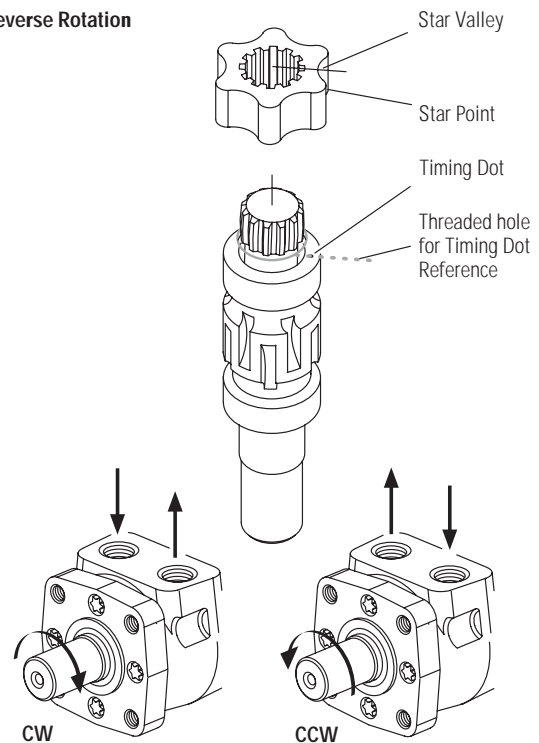


Figure 19

# Reassembly (continued)

36. Install cap screws in end cap.

Pretighten all screws to 2-5 Nm [15-40 lb-in]. Make sure Geroler section seals are properly seated before torquing screws. Then torque screws to 34Nm [300 lb-in] in sequence, as shown in Fig. 21.

**Note:** Steps 37 through 42 cover mounting flange seal installation without using a seal installation tool.

37. Clamp motor in vise with output shaft up, see Fig. 23. Remove cap screws and flange.

38. Prepare seal seat of flange, see step 20.

39. Lubricate exclusion seal O.D. Install dust seal in flange. Make sure seal is flush with flange, see step 22.

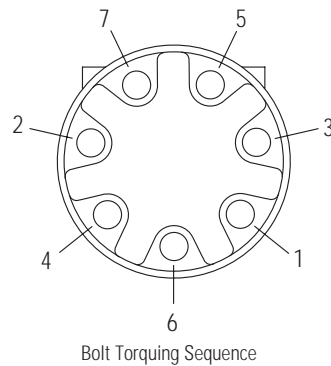
40. Install pressure seal flush against bearing race, see Fig. 22. Lightly lubricate pressure seal O.D.

41. Place a seal sleeve or bullet over shaft. Twist flange down shaft until flush against pressure seal. The pressure seal must enter into seat evenly and gradually. Install 4 cap screws. Gradually and evenly finger tighten cap screws (crisscross pattern). Then use a hand socket wrench to lightly snug tighten screws until flange is flush against housing. Do not tighten screws more than one full rotation at a time (crisscross pattern).

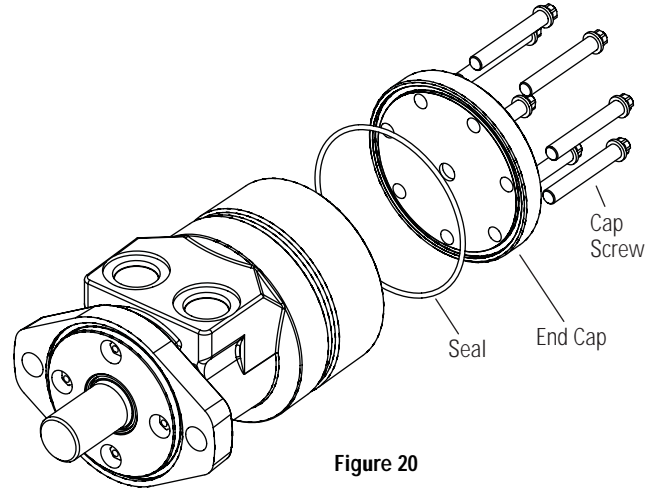
42. Use a hand torque wrench to gradually and evenly tighten cap screws (crisscross pattern) until they reach 28Nm[250 lb-in]. See important information below.

**Important: Do not use air socket wrench on cap screws for this type of seal installation.**

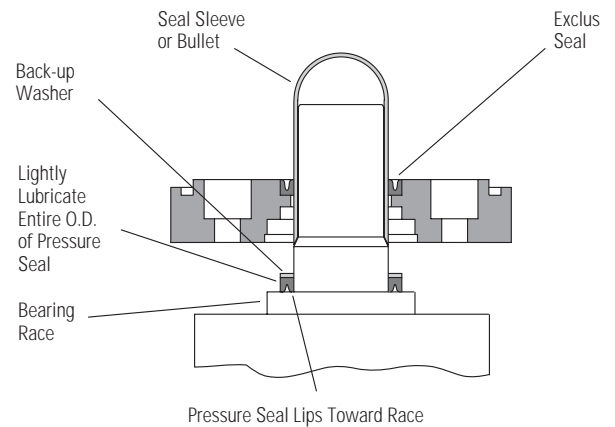
**Important: Proper pressure seal installation is important. You must remove cap screws and flange to examine seal condition. If you have cut or damaged the pressure seal, you must replace it with a new one. If seal is in good condition continue flange reassembly—starting with procedure step 24, page 10.**



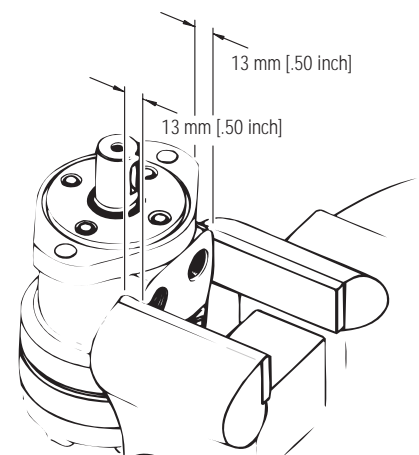
**Figure 21**



**Figure 20**



**Figure 22**



**Figure 23**

Eaton  
14615 Lone Oak Road  
Eden Prairie, MN 55344  
USA  
Tel: 952 937-9800  
Fax: 952 974-7722  
[www.hydraulics.eaton.com](http://www.hydraulics.eaton.com)

Eaton  
20 Rosamond Road  
Footscray  
Victoria 3011  
Australia  
Tel: (61) 3 9319 8222  
Fax: (61) 3 9318 5714

Eaton  
Dr.-Reckeweg-Str. 1  
D-76532 Baden-Baden  
Germany  
Tel: (49) 7221 682-0  
Fax: (49) 7221 682-788



**Char-Lynn**

© 2006 Eaton Corporation  
All Rights Reserved  
Printed in USA  
Document No. C-MOOV-TS001-E  
Supersedes 6-125 and 7-116  
May 2006