



Parts & Repair Information



Series 2 Hydrostatic Pumps

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Introduction

This Manual provides service information for Eaton Heavy Series 2 Variable Displacement Pumps, Models 33, 39, 46, 54 and 64. Step by step instructions for complete disassembly, inspection and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Most repairs require the removal of the pump from the vehicle.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnect the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth: lint in a hydraulic system will cause damage.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly like Vaseline before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.

After all repairs are complete it is essential to verify the accuracy of pump repairs on an authorized test stand.

Required Tools for Disassembly/Reassembly

- 1/4 in. Hex Key
- 5/16 in. Hex Key
- 9/16 in. Hex Key
- 5/8 in. Hex Key
- 12 mm Hex Key
- 5/16 in. Socket or End Wrench
- 1/2 in. Socket or End Wrench
- 9/16 in. Socket or End Wrench
- 11/16 in. End Wrench
- 3/4 in. Socket or End Wrench
- 1 in. Socket or End Wrench
- 1 1/4 in. Socket or End Wrench
- Breaker Bar or Ratchet Wrench
- Torque Wrench (200 Max. Capacity)
- Adjustable Pliers
- Screwdrivers (Small & Large)
- Internal Retaining Pliers (str. .047 Tips)
- Internal Retainer Pliers (Str. Tips)
- Dial Indicator with Magnetic Base
- Depth Micrometer with Extensions
- Parallel Bars (2)
- Slide Hammer
- Split Blade Bearing Puller
- Seal Bullet (Special)
- Low Clearance Bearing Puller (Special)
- Hammer (Steel and Plastic)
- Small Machinist Ruler
- Small Flashlight
- Light Petroleum Jelly
- Suitable Solvents and Cleaners
- Low Clearance Bearing Puller (Special)

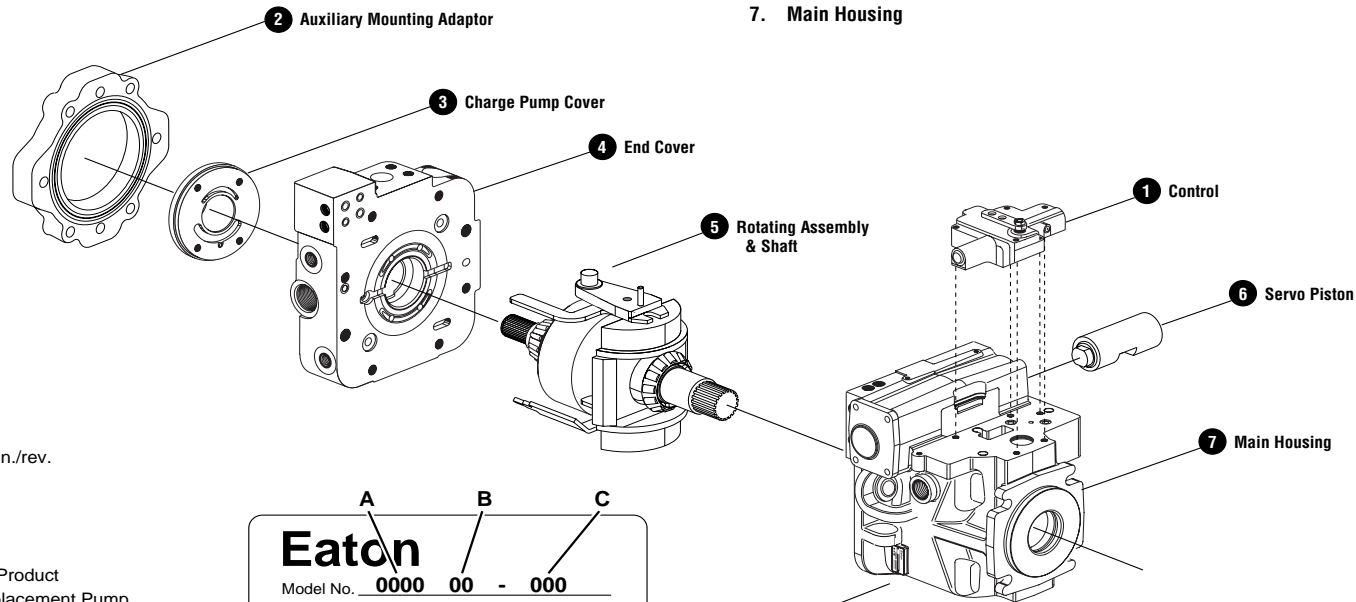
Special Tools are shown on pages 55-57

Major Assemblies -- Series 2 Variable Displacement Pump

Caution: Before attempting to disassemble pump refer to the detailed disassembly instructions starting on Page 28

Order of Major disassembly is:

1. Control (as applicable)
2. Auxiliary Mounting Adaptor (if applicable)
3. Charge Pump Cover
4. End Cover
5. Rotating Group & Shaft
6. Servo Piston
7. Main Housing



ID Tag

A Displacement cu. in./rev.

0033 = 3.3
0039 = 3.9
0046 = 4.6
0054 = 5.4
0064 = 6.4

B Identifies Type of Product

22 = Variable Displacement Pump

C Identifies Specific Unit Configuration

D Month of Manufacture

E Year of Manufacture

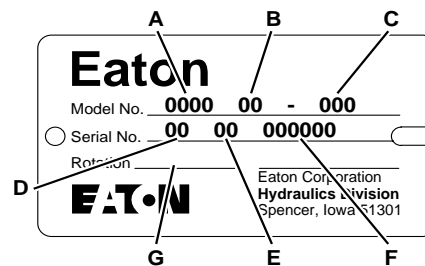
F Specific Serial Number of Unit

G Identifies Direction of Input Shaft Rotation

Observed from Shaft End of Unit

CW = Clockwise

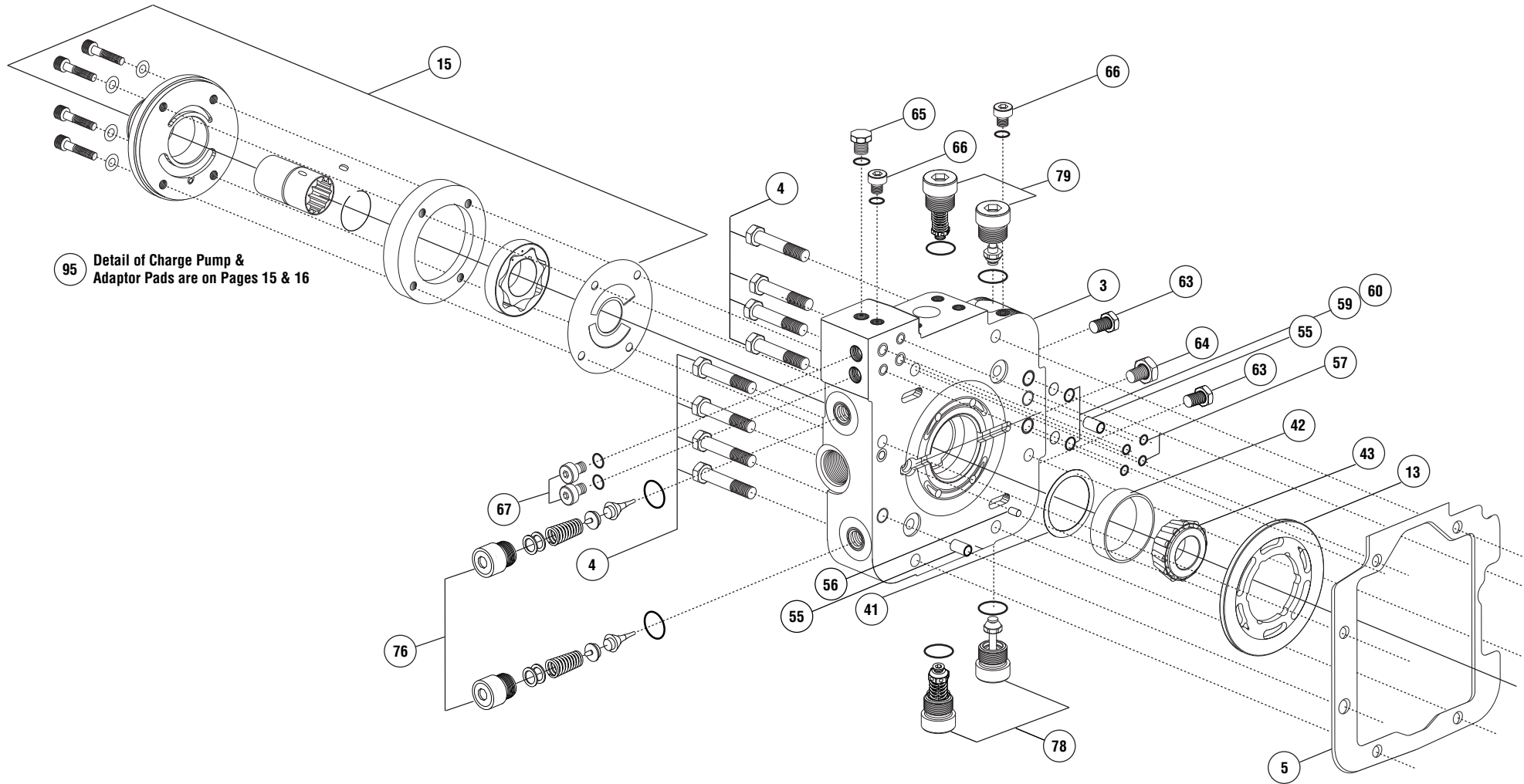
CCW = Counterclockwise



For Detailed Model Code Listings refer to Pages 58-59

NOTE: This is a typical Series 2 configuration
your model may differ slightly from this view
depending on features installed.

Exploded View Drawing – Series 2 Variable Displacement Pump



95 Detail of Charge Pump & Adaptor Pads are on Pages 15 & 16

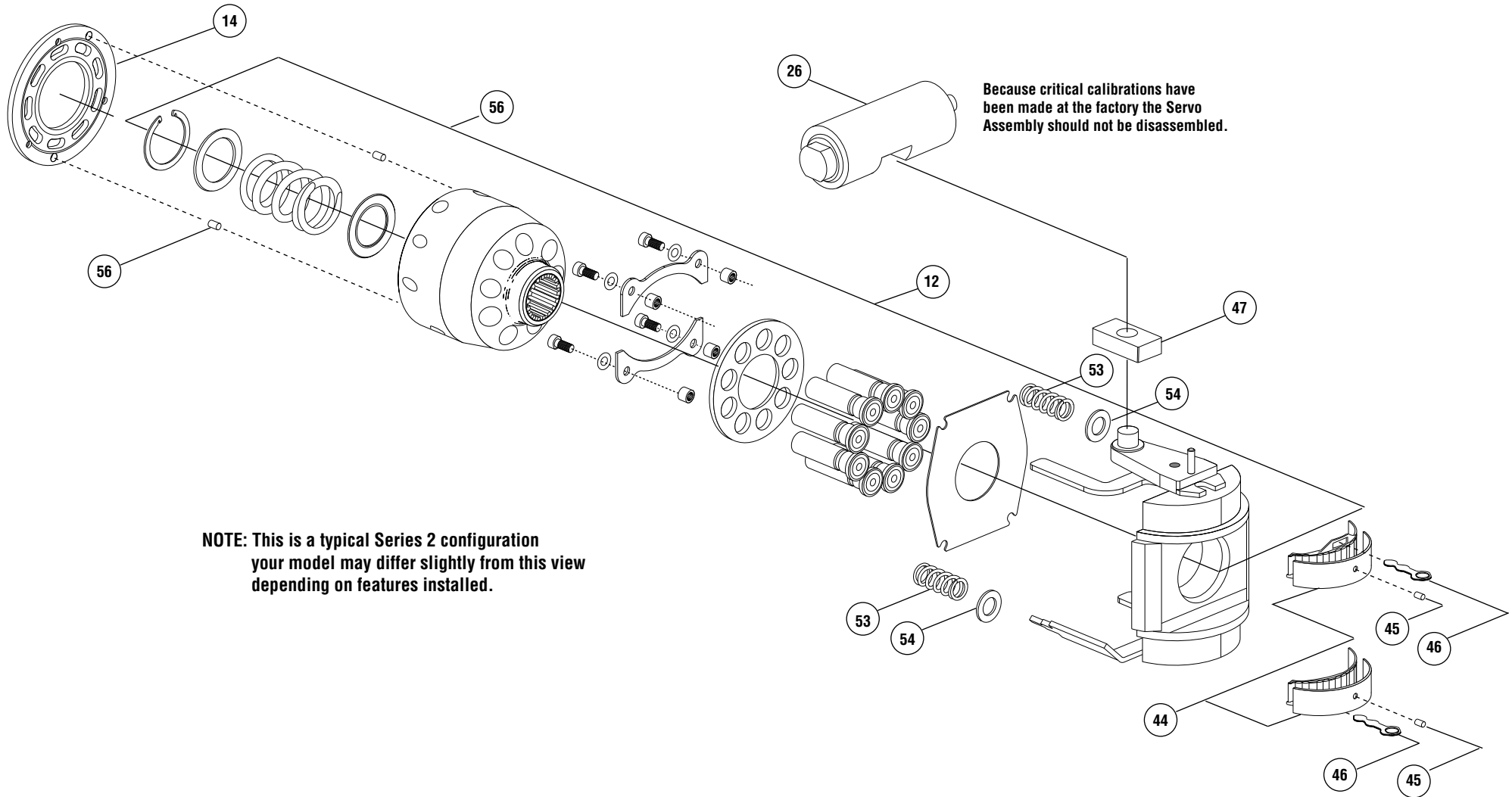
NOTE: This is a typical Series 2 configuration your model may differ slightly from this view depending on features installed.

Model Number		33	39	46	54	64
Displacement	cm ³ /rev	54,4	63,7	75,4	89,2	105,5
	in ³ /rev	3.32	3.89	4.59	5.44	6.44

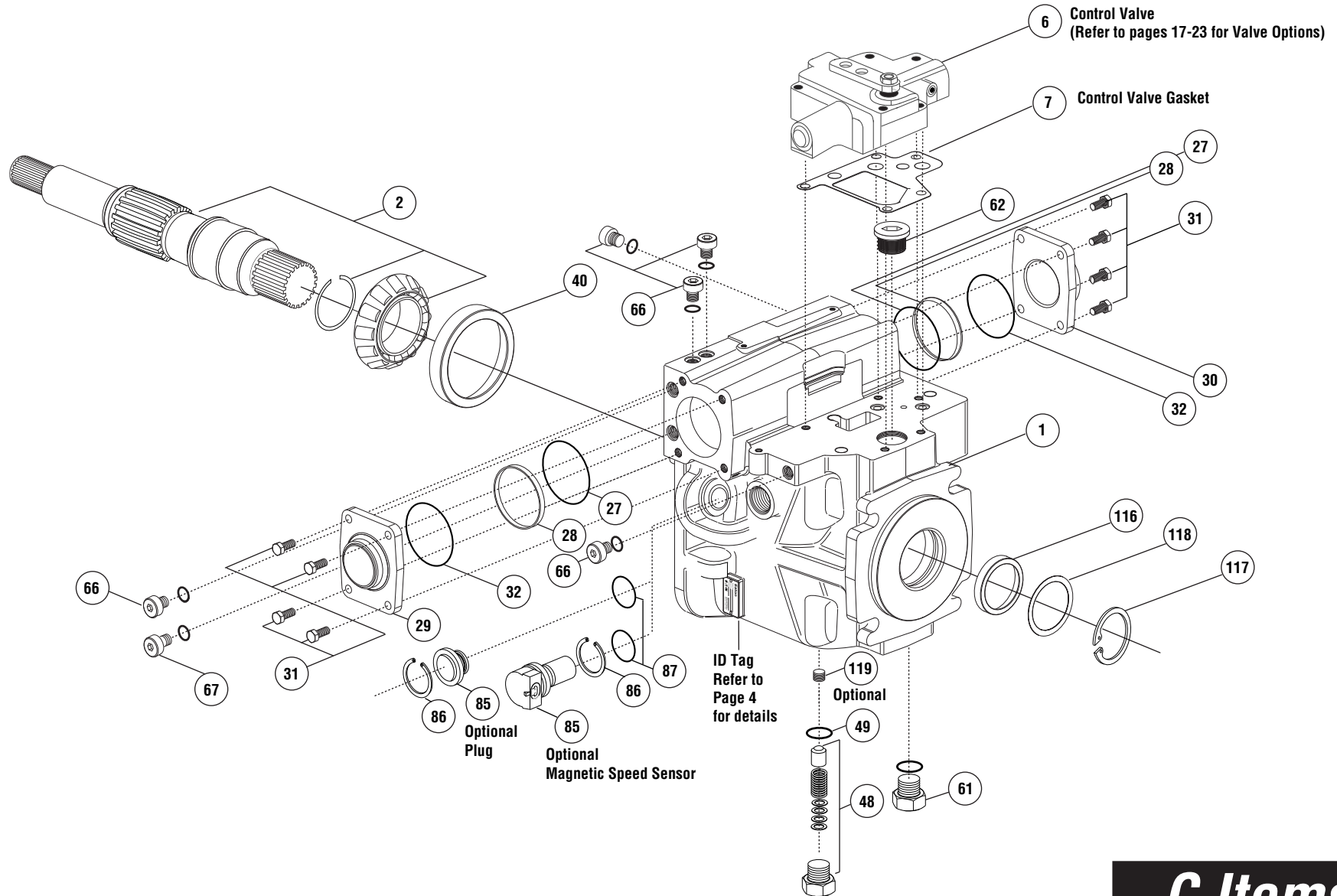


Exploded View Drawing – Series 2 Variable Displacement Pump

B Items



Exploded View Drawing – Series 2 Variable Displacement Pump



C Items

Parts List – Series 2 Variable Displacement Pump

Item	Part No.	Qty.	Description
1 C	◆	1	Main Housing (see parts list on page 11)
2 C	◆	1	Drive Shaft Sub-Assembly (see parts list on page 12)
3 A	◆	1	End Cover (see parts list on page 16)
4 A	103090-325	8	Hex Bolt HD 3/8-16 Gr8 (54,4 - 63,7 - 75,4 cm ³ /rev)
	103091-325	8	Hex Bolt HD 7/16-16 Gr8 (89,2 - 105,5 cm ³ /rev)
5 A	◇	1	End Cover Gasket (54,4 -63,7 - 75,4 cm ³ /rev)
5 A	◇	1	End Cover Gasket (89,2 - 105,5 cm ³ /rev)
6 C	◆	1	Control Valve (see Control Valves on pages 17 through 24)
7 C	◆	1	Control Valve Gasket (see Control Valves on pages 17 through 24)
12 B	◆	1	Rotating Kit Assembly (see Assembly Parts List on page 13)
13 A	◆	1	Propel Valve Plate (see Assembly Parts List on page 12)
14 B	◆	1	Bearing Plate (see Assembly Parts List on page 12)
15 A	◇	1	Eccentric Ring (see Charge Pump Assembly Parts List on page 14-15)
15 A	◇	1	Gerotor Assembly (see Charge Pump Assembly Parts List on page 14-15)
15 A	◇	1	Valve Plate, High Torque Charge Pump (see Charge Pump List on page 14-15)
15 A	◇	1	Charge Pump Cover (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	4	Sealing Washer (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	4	Cap Screw 5/16-18 Soc HD 1-1/2" (see Charge Pump Parts List on page 14-15)
	◇	4	Cap Screw 5/16-18 Soc HD 1-3/4"(see Charge Pump Parts List on page 14-15)
	◇	4	Cap Screw 5/16-18 Soc HD 2" (see Charge Pump Parts List on page 14-15)
15 A	◇	1	Charge Pump Drive Shaft (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	1	Key (see Charge Pump Kit Assembly Parts List on page 14-15)
	◇	1	Key (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	1	Retaining Ring (see Charge Pump Kit Assembly Parts List on page 14-15)
	◇	1	Retaining Ring (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	1	O-Ring (see Charge Pump Kit Assembly Parts List on page 14-15)
	◇	1	O-Ring (see Charge Pump Kit Assembly Parts List on page 14-15)
15 A	◇	1	Charge Shaft Bushing (pressed inside Charge Pump Cover)
	◇	1	Charge Shaft Bushing (pressed inside Charge Pump Cover)
15 A	◇	1	Valve Plate, High Torque Charge Pump
28 C	108300	2	Ring Seal (54,4 - 63,7 - 75,4 cm ³ /rev) (see gasket kit 990710-000 page 27)
26 B	◆	1	Servo Piston Sub-Assembly (see Sub-Assembly Parts List on page 11)
27 C	◇	2	O-Ring (see kit 990710-000 page 27)
28 C	108300	2	Ring Seal (54,4 - 63,7 - 75,4 cm ³ /rev) (see gasket kit 990710-000 page 27)
	108915	2	Ring Seal (89,2 - 105,5 cm ³ /rev) (see gasket kit 990710-000 page 27)
29 C	108145	1	Servo Piston Cover (54,4 - 63,7 - 75,4 cm ³ /rev)
	108372	1	Servo Piston Cover (89,2 - 105,5 cm ³ /rev)
30 C	109331	1	Servo Piston Cover (54,4 - 63,7 - 75,4 cm ³ /rev)
	108371	1	Servo Piston Cover (89,2 - 105,5 cm ³ /rev)
31 C	95862-088	8	Hex Bolt HD 5/16-18 Gr 5 (54,4 - 63,7 - 75,4 cm ³ /rev)
	95912-088	8	Screw, Cap Soc HD 5/16-18 Gr 8 (89,2 - 105,5 cm ³ /rev)
32 C	◇	2	O-Ring (54,4 - 63,7 - 75,3 cm ³ /rev) (see gasket kit 990710-000 page 27)
40 C	103232	1	Bearing Cup (54,4 - 63,7 - 75,4 cm ³ /rev)
	103807	1	Bearing Cup (89,2 - 105,5 cm ³ /rev)

Legend ◆ Refer to specific item assembly parts list.

◇ Parts included in Kit. (Refer to specific Parts Kit list.)

Parts List – Series 2 Variable Displacement Pump

Item	Part No.	Qty.	Description
41 A	◇	A/R	Bearing Shim (54,4 - 63,7 - 75,4 cm ³ /rev) (see Shim kit 990715-000 page 26)
◇		A/R	Bearing Shim (89,2 - 105,5 cm ³ /rev) (see Shim kit 990388-000 page 26)
42A43A	108295-000	1	Bearing Cup/ Bearing Cone S/A (54,4 - 63,7 - 75,4 cm ³ /rev)
42A43A	990386-000	1	Bearing Cup/ Bearing Cone S/A (89,2 - 105,5 cm ³ /rev)
44 B	◆	2	Swash Bearing (54,4 - 63,7 - 75,4 cm ³ /rev) (see assembly parts list on page 11)
	◆	2	Swash Bearing (89,2 - 105,5 cm ³ /rev) (see assembly parts list on page 11)
45 B	108331	2	Race Pin
46 B	108823	2	Clocking Link (54,4 - 63,7 - 75,4 cm ³ /rev)
	108973	2	Clocking Link (89,2 - 105,5 cm ³ /rev)
47 B	108152	1	Slide Block (54,4 - 63,7 - 75,4 cm ³ /rev)
	108349	1	Slide Block (89,2 - 105,5 cm ³ /rev)
48 C	◇	1	Low Pressure Relief Valve Plug (see LPRV Kit 9900713-000 page 26)
49 C	◇	1	O-Ring (see gasket kit 990710-000 page 27)
53 B	108214	2	Hold Down Spring
54 B	16048-480	2	Hold Down Washer
55 A	107582	2	Hollow Dowel (54,4 - 63,7 - 75,4 cm ³ /rev)
	108369	2	Hollow Dowel (89,2 - 105,5 cm ³ /rev)
56 A/B	98202	3	Dowel
57 A	◇	4	Static Face Seal (see gasket kit 990710-000 page 27)
59 A	◇	2	O-Ring (located between end cover and housing see page 27)
60 A	◇	2	Back-up Ring (located between end cover and housing see page 27)
61 C	25083-01	1	O-Ring Plug
62 C	107887	1	O-Ring Plug Soc HD
63 A	25706-006	2	O-Ring Plug
64 A	25090-010	1	O-Ring Plug
65 A	25090-004	3	O-Ring Plug
66 A/C	25083-004	12	O-Ring Plug (not all positions shown in views)
67 A/C	25083-002	3	O-Ring Plug (used with IPOR if option is installed)
68	96559	1	Shipping Strap (54,4 - 63,7 - 75,4 cm ³ /rev) (not shown in view)
69	101822	1	Shipping Strap (89,2 - 105,5 cm ³ /rev) (not shown in view)
76 A	108840-xxx	2	Relief Valve, POR (Optional) xxx = last 3 digits indicate pressure setting i.e. -300 = 3000 psi
78 A	109183-xxx	1	Relief Valve and or Check Valve (B Port) xxx = last 3 digits indicate pressure setting i.e. -450 = 4500 psi
79 A	109183-xxx	1	Relief Valve and or Check Valve (A Port) xxx = last 3 digits indicate pressure setting i.e. -650 = 6500 psi
80	◆	1	Control Valve Orifice
81	◆	1	Control Valve Orifice
82	◆	1	Control Valve Supply Orifice,
83	95653-012	2	Soc Pipe Plug .125-27 NPTF (inside charge pump inlet port)
84	95653-006	2	Soc Pipe Plug .062-27 NPTF(inside charge pump inlet port)
85 C	◇	1	Magnetic Speed Sensor (see Speed Sensor Kit page 21)
	108307	1	Plug (Optional)
86 C	16160-125	1	Retaining Ring (Optional)

Legend ◆ Refer to specific item assembly parts list. A/R – As Required
◇ Parts included in Kit. (Refer to specific Parts Kit list.)

Parts List – Series 2 Variable Displacement Pump

Item	Part No.	Qty.	Description
87 C	◇	1	O-Ring (see gasket kit 990710-000 page 27)
95 A	◇	1	Charge Pump Adaptor Kits see page 14-15)
116 C	◇	1	Drive Shaft Seal (see Shaft Seal Kit page 26)
117 C	◇	1	Ring, Retaining (see Shaft Seal Kit page 26)
118 C	◇	1	Spacer (see Shaft Seal Kit page 26)
119 C	95653-012	1	Soc Pipe Plug .125-27 NPTF (Optional) Used only with remote or pressure side filtration.

Legend ◆ Refer to specific item assembly parts list.
 ◇ Parts included in Kit. (Refer to specific Parts Kit list.)

Parts List – Series 2 Variable Displacement Pump

Item 1 C

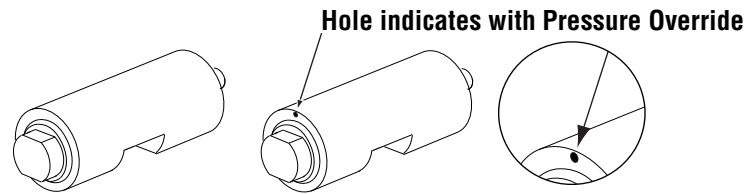
Main Housing

Item	Part No.	Qty.	Description
1 C	109747	1	Main Housing – 54,4 - 63,7 - 75,4 cm ³ /rev
	109745	1	Main Housing – 54,4 - 63,7 - 75,4 cm ³ /rev – with IPOR
	109746	1	Main Housing – 54,4 - 63,7 - 75,4 cm ³ /rev – with Speed Sensor
	109384	1	Main Housing – 54,4 - 63,7 - 75,4 cm ³ /rev – with IPOR and Speed Sensor
	109755	1	Main Housing – 89,2 - 105,5 cm ³ /rev
	109754	1	Main Housing – 89,2 - 105,5 cm ³ /rev – with IPOR
	109753	1	Main Housing – 89,2 - 105,5 cm ³ /rev – with Speed Sensor
	108812	1	Main Housing – 89,2 - 105,5 cm ³ /rev – with IPOR and Speed Sensor
	110484	1	Main Housing – 89,2 - 105,5 cm ³ /rev

Item 26 B

Servo Piston Sub-Assembly

Because critical calibrations have been made at the factory the Servo Assembly should not be disassembled.



1. Standard
2. With Pressure Override

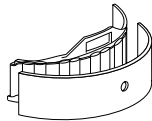
Note: There are two types of Servo Control Assemblies They are NOT interchangeable.

Servo Piston Sub-Assembly			Part Number	Part Number	Part Number	Part Number	Part Number
Item	Qty	Description	54,4 cm ³ /rev	63,7 cm ³ /rev	75,4 cm ³ /rev	89,2 cm ³ /rev	105,5 cm ³ /rev
26 B	1	Servo Piston S/A*	109558-002	109558-001	109558-001	110018-000	110018-000
	1	Servo Piston S/A	109559-002	109559-001	109559-001	110017-000	110017-000

* - with POR (Pressure Override)

Item 44 B

Swash Bearing Sub-Assembly

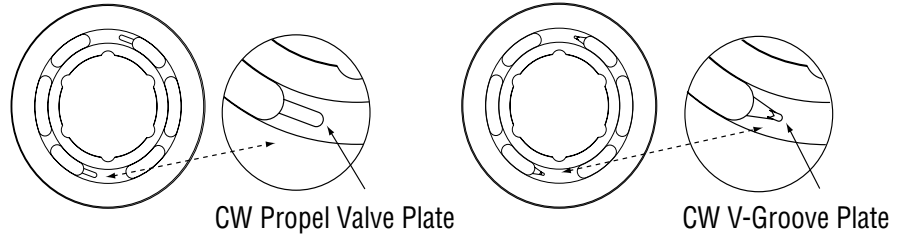


Servo Piston Sub-Assembly			Part Number	Part Number	Part Number	Part Number	Part Number
Item	Qty	Description	54,4 cm ³ /rev	63,7 cm ³ /rev	75,4 cm ³ /rev	89,2 cm ³ /rev	105,5 cm ³ /rev
44 B	1	Swash Bearing S/A*	107575	107575	107575	108707	108707

* Two Swash Bearings are needed when replacing we recommend that both Bearing Assemblies be replaced.

Parts List – Series 2 Variable Displacement Pump

Item 13 A Propel Valve Plate or V-Groove Plate



Plate, Propel Valve or Plate, V-Groove			Part Number Model 33, 39 54,4 - 63,7 cm ³ /rev	Part Number Model 46 75,4 cm ³ /rev	Part Number Model 54 89,2 cm ³ /rev	Part Number Model 64 105,5 cm ³ /rev
Item	Qty	Description				
13 A	1	Propel Valve Plate - CCW	107224	107784	103848	103976
13 A	1	Propel Valve Plate - CW	106458	106459	104297	103950
13 A	1	V-Groove Plate - CCW	106988	107808	104857	107143
13 A	1	V-Groove Plate - CW	106456	106457	104964	104006

CCW – Counter Clockwise CW – Clockwise

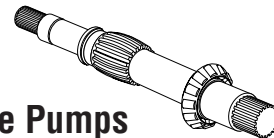
Item 14 B Bearing Plate



Bearing Plate			Part Number Model 33, 39 54,4 - 63,7 cm ³ /rev	Part Number Model 46 75,4 cm ³ /rev	Part Number Model 54 89,2 cm ³ /rev	Part Number Model 64 105,5 cm ³ /rev
Item	Qty	Description				
14 B	1	Bearing Plate	103241	104198	103852	103814

Item 2 C Drive Shaft Sub-Assembly

All Drive Shafts listed are used with High Torque Charge Pumps



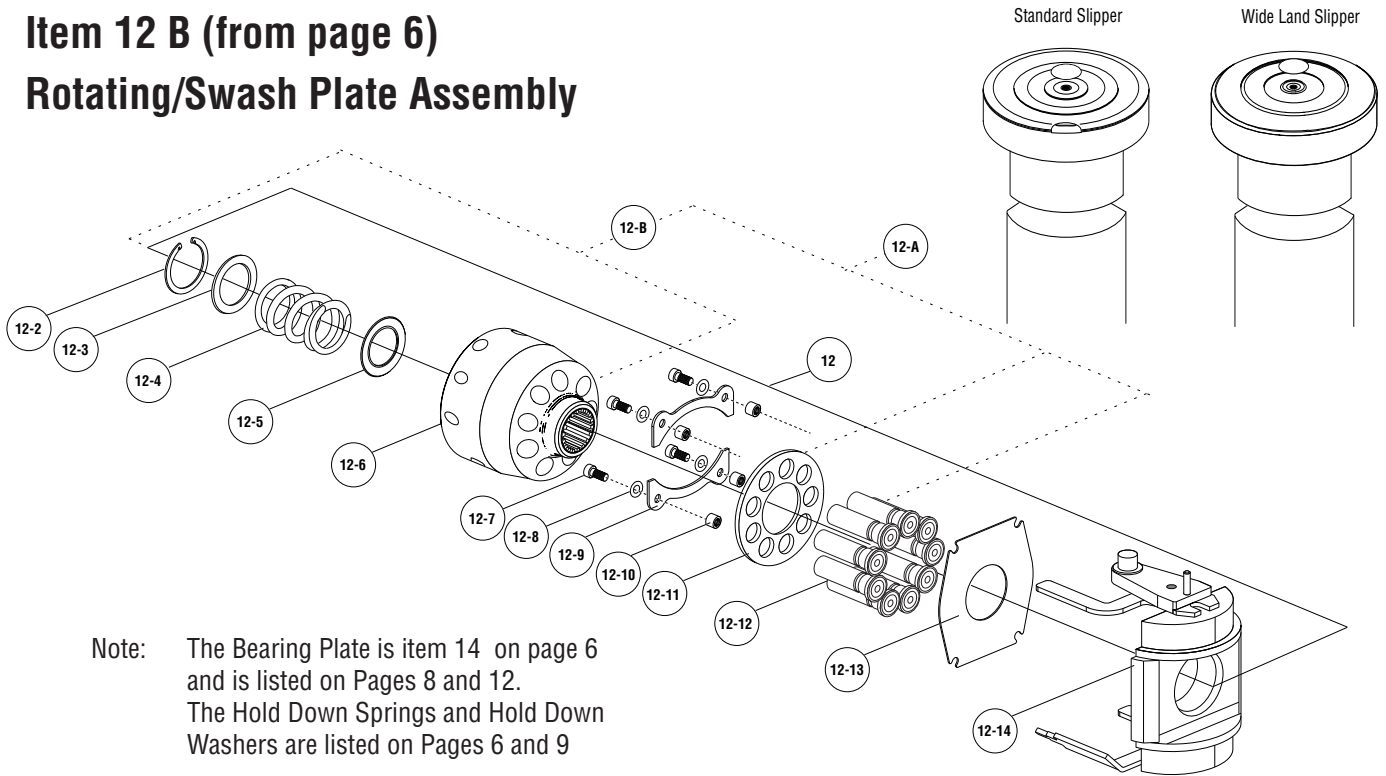
Item	Part No.	Qty.	Description
2 C	108029*	1	Drive Shaft S/A 23 Tooth 16/32 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103227 Pressed Bearing Cone and 103222-188 Retaining Ring.
	109738*	1	Drive Shaft S/A 23 Tooth 16/32 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103227 Pressed Bearing Cone and 103222-188 Retaining Ring - 3/8 - 24 UNF -2B .75 deep threaded hole in shaft end.
	108625*	1	Drive Shaft S/A 14 Tooth 12/24 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103227 Pressed Bearing Cone and 103222-188 Retaining Ring.
	108646*	1	Drive Shaft S/A 21 Tooth 16/32 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103227 Pressed Bearing Cone and 103222-188 Retaining Ring.
	108382**	1	Drive Shaft S/A 23 Tooth 16/32 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103808 Pressed Bearing Cone and 103222-200 Retaining Ring. Models 54,64.
	109140**	1	Drive Shaft S/A 14 Tooth 8/16 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103808 Pressed Bearing Cone and 103222-200 Retaining Ring. Models 54,64.
	10133**	1	Drive Shaft S/A 13 Tooth 8/16 Input Pitch Spline – 27 Tooth 24/48 Pitch Spline Output includes 103808 Pressed Bearing Cone and 103222-200 Retaining Ring. Models 54,64.

* – Models 33, 39 and 46 (54,4 - 63,7 - 75,4 cm³/rev)

** – Models 54 and 64 (89,2 - 105,5 cm³/rev)

Parts List – Series 2 Variable Displacement Pump

Item 12 B (from page 6) Rotating/Swash Plate Assembly



Note: The Bearing Plate is item 14 on page 6 and is listed on Pages 8 and 12.
The Hold Down Springs and Hold Down Washers are listed on Pages 6 and 9

Rotating/Swash Plate Assembly			Model 33, 39 54,4 - 63,7 cm ³ /rev	Model 46 75,4 cm ³ /rev	Model 54 89,2 cm ³ /rev	Model 64 105,5 cm ³ /rev
Item	Qty	Description	Part Number	Part Number	Part Number	Part Number
12	1	Rotating/Swash Plate Assy.	109752*	109367*	108424*	109435*
		Wide Land ✓	110292* ✓	110563* ✓	110290* ✓	110546* ✓
12-A	1	Rotating Group Kit**	109428	109419	109431	109434
		Wide Land ✓	110291 ✓	110562 ✓	110289 ✓	110545 ✓
12-B	1	Barrel Kit	990730-000	990731-000	990732-000	990733-000
12-2	1	Retaining Ring	‡ 103278-200	‡ 130278-200	‡ 103278-225	‡ 103278-225
12-3	1	Spacer Cyl Barrel Spring	‡ 103242	‡ 103242	‡ 103815	‡ 103815
12-4	1	Cylinder Barrel Spring	‡ 103240	‡ 103240	‡ 103813	‡ 103813
12-5	1	Spacer Shaft Spring	‡ 107758	‡ 107758	‡ 108337	‡ 108337
12-6	1	Barrel and Sleeve	‡ 109427	‡ 109418	‡ 109430	‡ 109433
12-7	4	Cap Screw (Kit) NSS	‡ 990723-000	‡ 990723-000	‡ 990724-000	‡ 990724-000
12-8	4	Washer (Kit) NSS	‡ 990723-000	‡ 990723-000	‡ 990724-000	‡ 990724-000
12-9	2	Hold Down Strap (Kit) NSS	‡ 990723-000	‡ 990723-000	‡ 990724-000	‡ 990724-000
12-10	4	Fixed Clr. Spacer (Kit) NSS	‡ 990723-000	‡ 990723-000	‡ 990724-000	‡ 990724-000
12-11	1	Slipper Retainer Plate	103244	104211	103853	103817
12-12	9	Slipper Piston S/A	109768	109748	109757	109758
	9	Slipper Piston S/A ✓	110216 ✓	106609 ✓	110220 ✓	110222 ✓
12-13	1	Fixed Clr Thrust Plate	107854	107854	108341	108341
12-14	1	Swash Plate S/A	109366	109366	109254	109254

NSS - Not Sold Separately S/A - Sub Assembly ‡ – Parts included in Rotating/Swash Plate Assy. ✓ – Wide Land Slipper

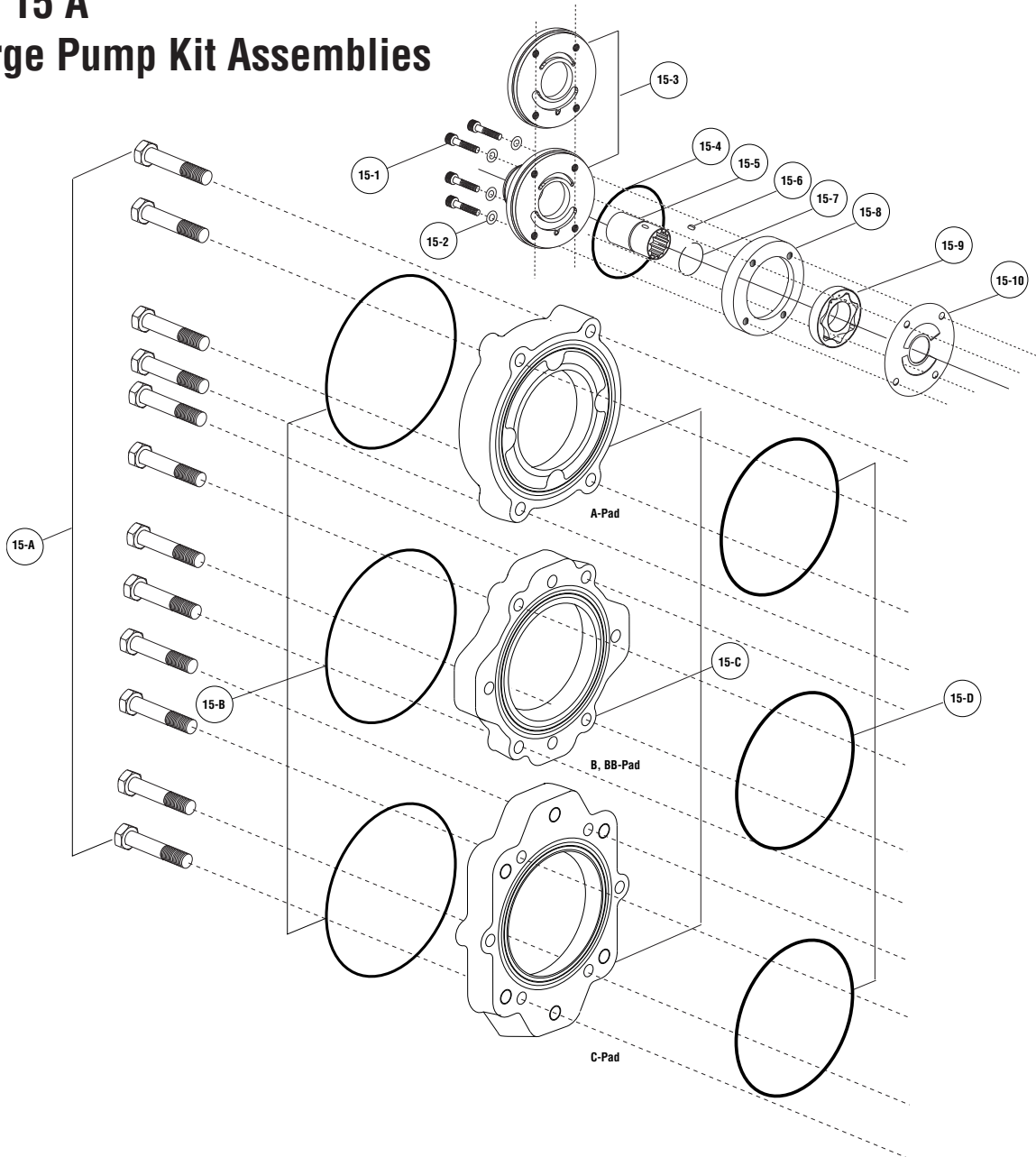
* These are Complete Rotating/Swash Plate Group Assemblies and include Items 12-2 through 12-14.

** Rotating Group Kit includes item 12-B (Barrel Kit), item 12-11 (Slipper Retaining Plate) and item 12-12 (Slipper piston S/A).

Parts List – Series 2 Variable Displacement Pump

Item 15 A

Charge Pump Kit Assemblies



A-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 9 Tooth 16/32 Pitch Spline (Available For All Models)

B-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 13 Tooth 16/32 Pitch Spline (Available For All Models)

BB-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 15 Tooth 16/32 Pitch Spline (Available For All Models)

C-pad, High Torque Charge Pump, 4 Bolt Mount, No Shaft Seal, 14 Tooth 12/24 Pitch Spline (Available For All Models)

Item 15 A

Charge Pump Kit Assemblies

Kit Number	Charge Pump Kit Description	Displacement	Adaptor Bolts (4 ea) 15-A	Flange O-Ring Cust. 15-B	Pad Adaptor 15-C	Adaptor O-Ring 15-D	Charge Cover Bolts (4 ea) 15-1	Sealing Washers (4 ea) 15-2	Charge Cover S/A 15-3	Charge Cover O-Ring 15-4	Shaft 15-5	Key 15-6	Retaining Ring 15-7	Eccentric Ring 15-8	Gerotor S/A 15-9	Valve Plate 15-10
990665-000	No Pad - High Torque	14cc/.85CID	N/A	N/A	N/A	N/A	95912-150	103223-000	108026-000	8761-157	109302-001	101305-000	109312-000	107882-001	107881-001	108362-000
990677-000	No Pad - High Torque	14cc/.85CID	N/A	N/A	N/A	N/A	95912-150	103223-000	108026-000	8761-157	109302-001	101305-000	109312-000	N/A	N/A	N/A
990680-000	A Pad - High Torque	14cc/.85CID	103090-125	8761-042	108075-000	8761-159	95912-150	N/A	108027-000	8761-157	109303-001	101305-000	109312-000	N/A	N/A	N/A
990668-000	A Pad - High Torque	14cc/.85CID	N/A	8761-042	N/A	8761-159	95912-150	N/A	108027-000	8761-157	109303-001	101305-000	109312-000	107882-001	107881-001	N/A
990671-000	B Pad - High Torque	14cc/.85CID	N/A	8761-045	N/A	N/A	95912-150	N/A	108027-000	8761-157	109304-001	101305-000	109312-000	107882-001	107881-001	N/A
990683-000	B Pad - High Torque	14cc/.85CID	103090-125	8761-045	108076-000	8761-159	95912-150	N/A	108027-000	8761-157	109304-001	101305-000	109312-000	N/A	N/A	N/A
990686-000	BB Pad - High Torque	14cc/.85CID	103090-125	8761-045	108076-000	8761-159	95912-150	N/A	108027-000	8761-157	109305-001	101305-000	109312-000	N/A	N/A	N/A
990674-000	BB Pad - High Torque	14cc/.85CID	N/A	N/A	N/A	N/A	95912-150	N/A	108027-000	8761-157	109305-001	101305-000	109312-000	107882-001	107881-001	N/A

990666-000	No Pad – High Torque	21cc/1.28CID	N/A	N/A	N/A	N/A	95912-175	103223-000	108026-000	8761-157	109302-003	101311-000	109312-000	107882-003	107881-003	108362-000
990678-000	No Pad – High Torque	21cc/1.28CID	N/A	N/A	N/A	N/A	95912-175	103223-000	108026-000	8761-157	109302-003	101311-000	109312-000	N/A	N/A	N/A
990681-000	A Pad – High Torque	21cc/1.28CID	103090-125	8761-042	108075-000	8761-159	95912-175	N/A	108027-000	8761-157	109303-003	101311-000	109312-000	N/A	N/A	N/A
990669-000	A Pad – High Torque	21cc/1.28CID	N/A	8761-042	N/A	8761-159	95912-175	N/A	108027-000	8761-157	109303-002	101311-000	109312-000	107882-003	107881-003	N/A
990672-000	B Pad – High Torque	21cc/1.28CID	N/A	8761-045	N/A	8761-159	95912-175	N/A	108027-000	8761-157	109304-002	101311-000	109312-000	107882-003	107881-003	N/A
990684-000	B Pad – High Torque	21cc/1.28CID	103090-125	8761-045	108076-000	8761-159	95912-175	N/A	108027-000	8761-157	109304-002	101311-000	109312-000	N/A	N/A	N/A
990687-000	BB Pad – High Torque	21cc/1.28CID	103090-125	8761-045	108076-000	8761-159	95912-175	N/A	108027-000	8761-157	109305-002	101311-000	109312-000	N/A	N/A	N/A
990675-000	BB Pad – High Torque	21cc/1.28CID	N/A	8761-045	N/A	8761-159	95912-175	N/A	108027-000	8761-157	109305-002	101311-000	109312-000	107882-003	107881-003	N/A

990667-000	No Pad – High Torque	28cc/1.70CID	N/A	N/A	N/A	N/A	95912-200	103223-000	108026-000	8761-157	109302-004	101311-000	109312-000	107882-004	107881-004	108362-000
990679-000	No Pad – High Torque	28cc/1.70CID	N/A	N/A	N/A	N/A	95912-200	103223-000	108026-000	8761-157	109302-004	101311-000	109312-000	N/A	N/A	N/A
990682-000	A Pad – High Torque	28cc/1.70CID	103090-125	8761-042	108075-000	8761-159	95912-200	N/A	108027-000	8761-157	109303-002	101311-000	109312-000	N/A	N/A	N/A
990670-000	A Pad – High Torque	28cc/1.70CID	N/A	8761-042	N/A	8761-159	95912-200	N/A	108027-000	8761-157	109303-002	101311-000	109312-000	107882-004	107881-004	N/A
990673-000	B Pad – High Torque	28cc/1.70CID	N/A	8761-045	N/A	8761-159	95912-200	N/A	108027-000	8761-157	109304-002	101311-000	109312-000	107882-004	107881-004	N/A
990685-000	B Pad – High Torque	28cc/1.70CID	103090-125	8761-045	108076-000	8761-159	95912-200	N/A	108027-000	8761-157	109304-002	101311-000	109312-000	N/A	N/A	N/A
990676-000	BB Pad – High Torque	28cc/1.70CID	103090-125	8761-045	108076-000	8761-159	95912-200	N/A	108027-000	8761-157	109305-002	101311-000	109312-000	N/A	N/A	N/A
990688-000	BB Pad – High Torque	28cc/1.70CID	103090-125	8761-045	108076-000	8761-159	95912-200	N/A	108027-000	8761-157	109305-002	101311-000	109312-000	N/A	N/A	N/A
990673-000	No Pad – High Torque	28cc/1.70CID	N/A	8761-045	N/A	8761-159	95912-200	N/A	108027-000	8761-157	109302-002	101311-000	109312-000	107882-004	107881-004	N/A

990742-000	C Pad - High Torque	14cc/.85CID	104511-150 (6 ea.)	8761-158	108081-000	8761-159	◇	◇	108027-000	8761-157	109306-001	101311-000	109312-000	◇	◇	◇
990743-000	C Pad - High Torque	21cc/1.28CID 28cc/1.70CID	104511-150 (6 ea.)	8761-158	108081-000	8761-159	◇	◇	108027-000	8761-157	109306-002	101311-000	101312-000	◇	◇	◇

◇ = When replacing use the existing Bolts, Eccentric Ring , Gerotor S/A and Valve Plate.

NOTE: All Parts can be purchased separately.

Parts List – Series 2 Variable Displacement Pump

Item 3 A

End Covers*

Item	Part No.	Qty.	Displacement	Main Ports	POR	Options
3 A	110718	1	54,4 & 63,7 cm ³ /rev	62	N	Remote Filter Ports
	110568	1	54,4 & 63,7 cm ³ /rev	61	N	
	110619	1	54,4 & 63,7 cm ³ /rev	61	Y	
	110300	1	54,4 & 63,7 cm ³ /rev	62, M12X1.75	N	
	110202	1	54,4 & 63,7 cm ³ /rev	62, M12X1.75	Y	
	109766	1	54,4 & 63,7 cm ³ /rev	62	Y	
	109493	1	54,4 & 63,7 cm ³ /rev	62	N	
	108896	1	54,4 & 63,7 cm ³ /rev	62	Y	Remote Filter Ports
	108859	1	75,4 cm ³ /rev	62	Y	Remote Filter Ports
	110560	1	75,4 cm ³ /rev	62	N	Remote Filter Ports
	110628	1	75,4 cm ³ /rev	61	Y	
	110301	1	75,4 cm ³ /rev	62, M12X1.75	N	
	110201	1	75,4 cm ³ /rev	62, M12X1.75	Y	
	109470	1	75,4 cm ³ /rev	62	N	
	109147	1	75,4 cm ³ /rev	62	Y	
	110358	1	89,2 cm ³ /rev	61	Y	Remote Filter Ports
	110541	1	89,2 cm ³ /rev	61	Y	
	110356	1	89,2 cm ³ /rev	62	N	Remote Filter Ports
	110270	1	89,2 cm ³ /rev	61	N	
	109783	1	89,2 cm ³ /rev	62	Y	
	109784	1	89,2 cm ³ /rev	62	Y	Remote Filter Ports
	109281	1	89,2 cm ³ /rev	62	N	
	109400	1	89,2 cm ³ /rev	62	N	Pressure Transducer
	108344	1	105,5 cm ³ /rev	62	Y	
	109176	1	105,5 cm ³ /rev	62	N	
	109145	1	105,5 cm ³ /rev	62	N	Pressure Transducer
	109742	1	105,5 cm ³ /rev	62	Y	Remote Filter Ports
	109845	1	105,5 cm ³ /rev	62, M12X1.75	Y	Pressure Side Filter
	110322	1	105,5 cm ³ /rev	62	N	Remote Filter Ports
	110357	1	105,5 cm ³ /rev	61	Y	Remote Filter Ports

* All listed End Covers are for High-Torque Charge Pumps

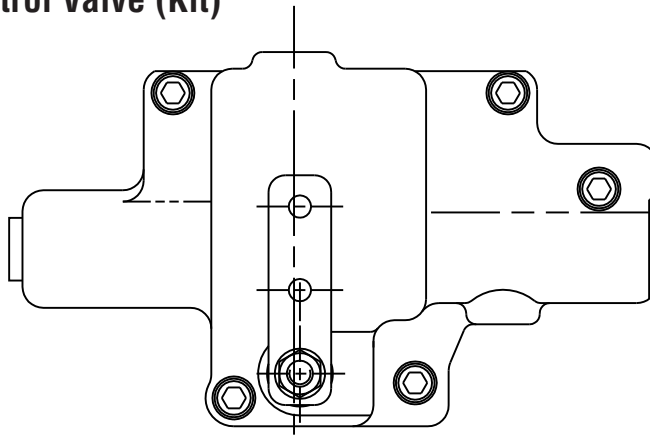
POR = Pressure Override

Parts List – Series 2 Control Valve Assemblies

Item 6 C

Control Valves

990704-000 – Manual Control Valve (Kit)



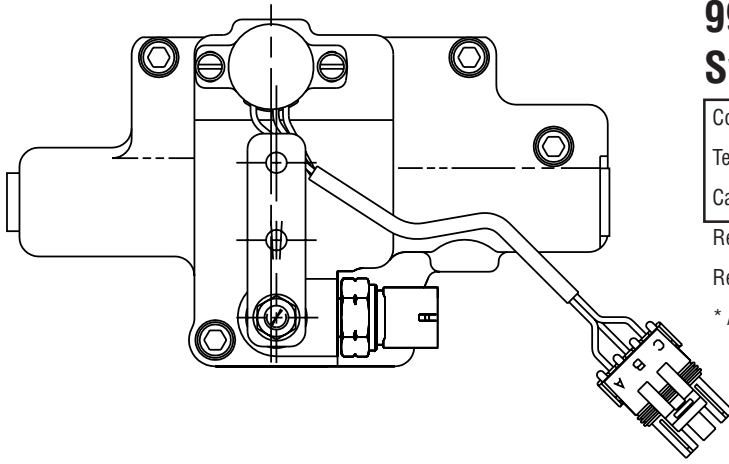
Item	Part No.	Qty.	Description
6 C	990704-000	1	Manual Control Valve (Kit) includes below;
	110038-001	1	Manual Control Valve S/A
	108992-000	1	Control Gasket
	95912-088	1	Cap Screw SOC HD 5/16-18 GR 8
	95912-150	4	Cap Screw SOC HD 5/16-18 GR 8
	109280-000	1	Control Link S/A
	96081-031	1	Nut 5/16-18
	96100-031	1	Washer
	103048-000	1	Control Lever
	95729-000	1	Control Lever

990708-000 – Manual Control Valve Wide Band (Kit)

Item	Part No.	Qty.	Description
6 C	990708-000	1	Manual Control Valve Wide Band (Kit) includes below;
	110038-002	1	Manual Control Valve Wide Band S/A
	108992-000	1	Control Gasket
	95912-088	1	Cap SOC HD 5/16-18 GR 8
	95912-150	4	Cap Screw SOC HD 5/16-18 GR 8
	109280-000	1	Control Link S/A
	96081-031	1	Nut 5/16-18
	96100-031	1	Washer
	103048-000	1	Control Lever
	95729-000	1	Control Lever

Parts List – Series 2 Control Valve Assemblies

990706-000 – Manual Control Valve with N/C Neutral Lockout & Potentiometer (Kit)



990764-000 – Neutral Lockout Switch Mating Connector Kit*

Connector (1) – Cross Reference Delphi/Packard P/N 1201 5792
 Terminal (2) – Cross Reference Delphi/Packard P/N 1208 9040
 Cable Seal (2) – Cross Reference Delphi/Packard P/N 1201 5323

Recommended wire size: 18 - 20 AWG

Recommended cable diameter: 2.03 - 2.85 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Item	Part No.	Qty.	Description
6 C	990706-000	1	Manual Control Valve with N/C Neutral Lockout & Potentiometer (Kit) includes below;
	110040-000	1	Manual Control Valve with N/C Neutral Lockout & Potentiometer
7 C	108992-000	1	Control Gasket
	95912-088	1	Cap Screw SOC HD 5/16-18 GR 8
	95912-150	4	Cap Screw SOC HD 5/16-18 GR 8
	109280-000	1	Control Link S/A
	96081-031	1	Nut 5/16-18
	96100-031	1	Washer
	103048-000	1	Control Lever
	95729-000	1	Control Lever
	◇ 107851-000	1	Potentiometer
	◇ 16040-208	2	Screw 8-32 UN
	◇ 95897-008	2	Washer
	◇ 107762-000	1	Potentiometer Gasket
	109195-000	1	Feedback Shaft S/A
	8761-010	1	O-Ring
	109196-000	1	Hollow Dowel

N/C = Normally Closed ◇ = Parts included in Kit P/N 990719-000 see Below

990719-000 – Potentiometer Kit

Part No.	Qty.	Description
107851-000	1	Potentiometer
16040-208	2	Screw SF Head Mach 8-32 UN
95897-008	2	Washer
107762-000	1	Potentiometer Gasket

990763-000 – Potentiometer

Mating Connector Kit*

Connector (1) – Cross Reference Delphi/Packard P/N 1201 0717
 Terminal (3) – Cross Reference Delphi/Packard P/N 1208 9040
 Cable Seal (3) – Cross Reference Delphi/Packard P/N 1208 9679

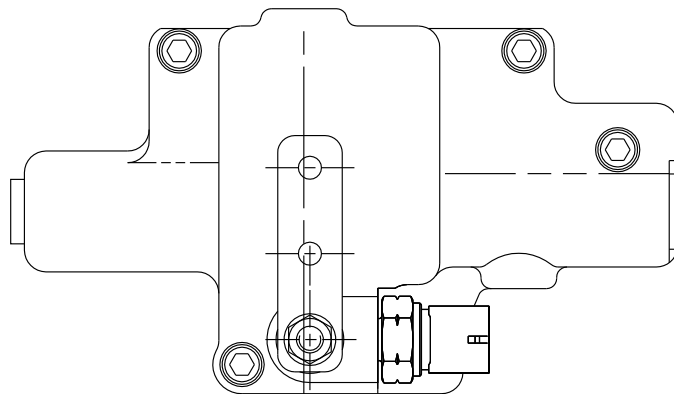
Recommended wire size: 18 - 20 AWG

Recommended cable diameter: 1.6 - 2.15 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Parts List – Series 2 Control Valve Assemblies

990705-000 – Manual Control Valve with N/C Neutral Lockout (Kit)



Item	Part No.	Qty.	Description
6 C	990705-000	1	Manual Control Valve with N/C Neutral Lockout (Kit) includes below;
7 C	110039-000	1	Manual Control Valve with N/C Neutral Lockout
	108992-000	1	Control Gasket
	95912-088	1	Cap Screw SOC HD 5/16-18 GR 8
	95912-150	4	Cap Screw SOC HD 5/16-18 GR 8
	109280-000	1	Control Link S/A
	96081-031	1	Nut 5/16-18
	96100-031	1	Washer
	103048-000	1	Control Lever
	95729-000	1	Control Lever

N/C = Normally Closed

990764-000 – Neutral Lockout Switch Mating Connector Kit*

Connector (1)	– Cross Reference Delphi/Packard P/N 1201 5792
Terminal (2)	– Cross Reference Delphi/Packard P/N 1208 9040
Cable Seal (2)	– Cross Reference Delphi/Packard P/N 1201 5323

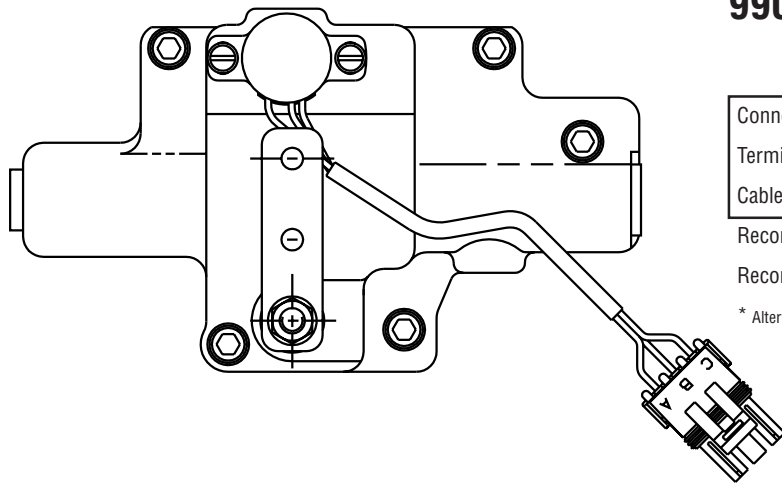
Recommended wire size: 18 - 20 AWG

Recommended cable diameter: 2.03 - 2.85 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Parts List – Series 2 Control Valve Assemblies

990707-000 – Manual Control Valve with Potentiometer (Kit)



990763-000 – Potentiometer Mating Connector Kit*

Connector (1)	– Cross Reference Delphi/Packard P/N 1201 0717
Terminal (3)	– Cross Reference Delphi/Packard P/N 1208 9040
Cable Seal (3)	– Cross Reference Delphi/Packard P/N 1208 9679

Recommended wire size: 18 - 20 AWG

Recommended cable diameter: 1.6 - 2.15 mm

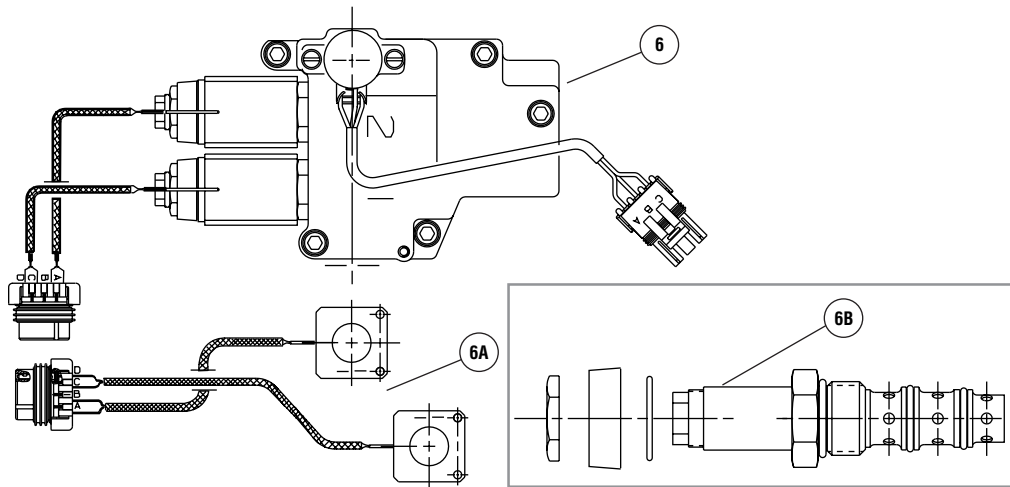
* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Item	Part No.	Qty.	Description
6 C	990707-000	1	Manual Control Valve with Potentiometer (Kit) includes below;
7 C	110025-000	1	Manual Control Valve with Potentiometer
	108992-000	1	Control Gasket
	95912-088	1	Cap Screw SOC HD 5/16-18 GR 8
	95912-150	4	Cap Screw SOC HD 5/16-18 GR 8
	109280-000	1	Control Link S/A
	96081-031	1	Nut 5/16-18
	96100-031	1	Washer
	103048-000	1	Control Lever
	95729-000	1	Control Lever
	◇ 107851-000	1	Potentiometer
	◇ 16040-208	2	Screw 8-32 UN
	◇ 95897-008	2	Washer
	◇ 107762-000	1	Potentiometer Gasket
	109195-000	1	Feedback Shaft S/A
	8761-010	1	O-Ring
	109196-000	1	Hollow Dowel

◇ = Parts included in Kit P/N 990719-000 see Page 18

Parts List – Series 2 Control Valve Assemblies

Solenoid Control Valve Assemblies & Mating Connector (Kits)



Item	Part No.	Qty.	Description
6	990718-000	1	SA Control Valve with Potentiometer 24Vdc (Kit)
	110114-000	1	SA Control Valve with Potentiometer 24Vdc S/A
			includes below:
6A	109453	1	Coil, 24Vdc S/A
6B	108724	2	Proportional Solenoid Cartridge
6	990693-000	1	SA Control Valve with Potentiometer 12Vdc (Kit)
	109124-000	1	SA Control Valve with Potentiometer 12Vdc
			includes below;
6A	109132	1	Coil, 12Vdc S/A
6B	108724	2	Proportional Solenoid Cartridge
7C	108876-000	1	Both Kits include below; Control Gasket
	95912-125	2	Cap Screw Soc HD 5/16-18 GR8
	95912-175	5	Cap Screw Soc HD 5/16-18 GR8
	◇ 107851-000	1	Potentiometer
	◇ 16040-208	2	S/F Head Mach Screw 8-32 UN
	◇ 95897-008	2	Washer
	◇ 107762-000	1	Potentiometer Gasket
	109195-000	1	Feedback Shaft S/A
	8761-010	1	O-Ring
	109196-000	1	Hollow Dowel

◇ = Parts included in Kit P/N 990719-000 see Page 18

990765-000 Solenoid Control Mating Connector Kit*

Solenoid Mating Connector Kit

Connector (1) – Cross Reference Delphi/Packard P/N 1212 4583
 Terminal (4) – Cross Reference Delphi/Packard P/N 1204 5773
 Cable Seal (4) – Cross Reference Delphi/Packard P/N 1204 8086
 Secondary Lock (1) – Cross Reference Delphi/Packard P/N 1204 7948
 Recommended wire size: 18 - 20 AWG
 Recommended cable diameter: 2.03 - 2.78 mm

Potentiometer Mating Connector Kit

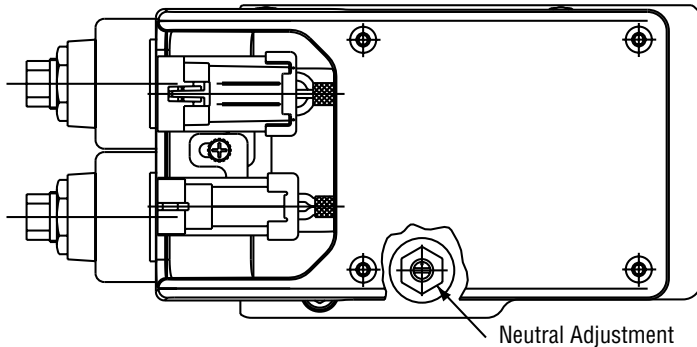
Connector (1) – Cross Reference Delphi/Packard P/N 1201 0717
 Terminal (3) – Cross Reference Delphi/Packard P/N 1208 9040
 Cable Seal (3) – Cross Reference Delphi/Packard P/N 1208 9679
 Recommended wire size: 18 - 20 AWG
 Recommended cable diameter: 1.6 - 2.15 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Parts List – Series 2 Control Valve Assemblies

(EP) Electronic Proportional Displacement Control (Kits)

990762-000 – EP Control Mating Connector Kit*



Command Input Signal Mating Connector

- Connector (1) – Cross Reference Delphi/Packard P/N 1211 0293
- Terminal (3) – Cross Reference Delphi/Packard P/N 1204 8074
- Cable Seal (3) – Cross Reference Delphi/Packard P/N 1204 8086
- Secondary Lock (1) – Cross Reference Delphi/Packard P/N 1205 2845
- Recommended wire size: 18 - 20 AWG
- Recommended cable diameter: 2.03 - 2.80 mm

Power Supply Mating Connector

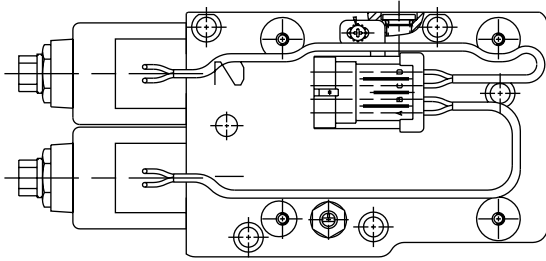
- Connector (1) – Cross Reference Delphi/Packard P/N 1205 2641
- Terminal (2) – Cross Reference Delphi/Packard P/N 1204 8074
- Cable Seal (2) – Cross Reference Delphi/Packard P/N 1204 8086
- Secondary Lock (1) – Cross Reference Delphi/Packard P/N 1205 2634
- Recommended wire size: 18 - 20 AWG
- Recommended cable diameter: 2.03 - 2.80 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Kit Number	Valve Kit Description	Control Valve S/A Qty 1	Gasket Control Qty 1	Screw, Cap Soc HD 5/16-18 GR8 Qty 5	Control Link S/A Qty 1	EP Control Electronics S/A Qty 1	Screw, Button Head Cap 10-24 Qty 4	Lockwasher Qty 4
990703-000	EP Control 24 Vdc ±100mA	110307-024	110003-000	95912-200	109280-000	110224-100	101673-175	16045-203
990702-000	EP Control 12Vdc ±100mA	110307-012	110003-000	95912-200	109280-000	110224-100	101673-175	16045-203
990701-000	EP Control 24Vdc ±5 Vdc	110307-024	110003-000	95912-200	109280-000	110224-505	101673-175	16045-203
990700-000	EP Control 12Vdc ±5 Vdc	110307-012	110003-000	95912-200	109280-000	110224-505	101673-175	16045-203
990699-000	EP Control 24Vdc 4-20mA	110307-024	110003-000	95912-200	109280-000	110224-420	101673-175	16045-203
990698-000	EP Control 12Vdc 4-20mA	110307-012	110003-000	95912-200	109280-000	110224-420	101673-175	16045-203
990697-000	EP Control 24Vdc 1-5 Vdc	110307-024	110003-000	95912-200	109280-000	110224-015	101673-175	16045-203
990696-000	EP Control 12Vdc 1-5 Vdc	110307-012	110003-000	95912-200	109280-000	110224-015	101673-175	16045-203

Parts List – Series 2 Control Valve Assemblies

EP Control Solenoid Actuated Valve Assemblies (Kits)



990767-000 – EP Solenoid Mating Connector Kit*

EP Solenoid Mating Connector Kit

- Connector (1) – Cross Reference Delphi/Packard P/N 1204 7950
- Terminal (4) – Cross Reference Delphi/Packard P/N 1204 8074
- Cable Seal (4) – Cross Reference Delphi/Packard P/N 1204 8086
- Secondary Lock (1) – Cross Reference Delphi/Packard P/N 1204 7948

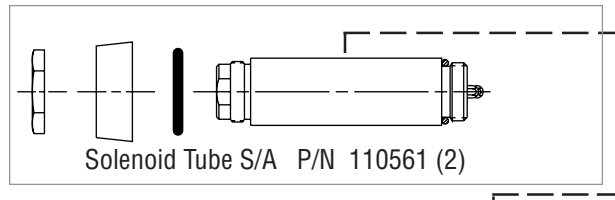
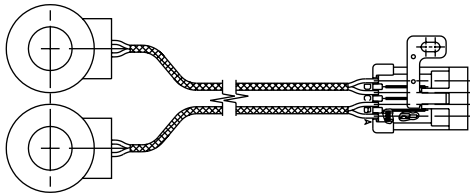
Recommended wire size: 16 - 18 AWG

Recommended cable diameter: 2.03 - 2.80 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

Coil 24Vdc P/N 110306-024 (1)

Coil 12Vdc P/N 110306-012 (1)



Kit Number	Kit Description	Control Valve S/A* Qty 1	Gasket Control Qty 1	Screw, Cap Soc HD 5/16-18 GR8 Qty 5	Control Link S/A Qty 1
990695-000	EP Control Solenoid Actuated 24 Vdc	110307-024	110003-000	95912-200	109280-000
990694-000	EP Control Solenoid Actuated 12 Vdc	110307-012	110003-000	95912-200	109280-000

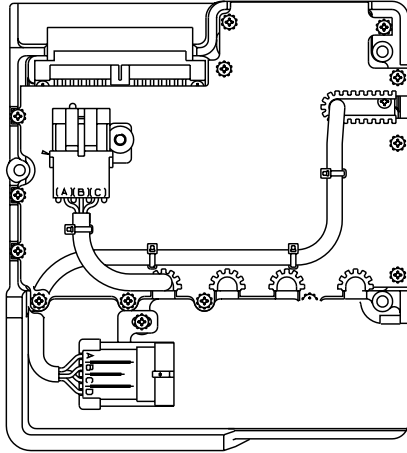
Solenoid Tube S/A Qty 2	Coil 12 Vdc Qty 1	Coil 24 Vdc Qty 1
110561	N/A	110306-024
110561	110306-012	N/A

* Includes Solenoid Tube S/A and Coil

Above parts are included in the Kit but may be purchased separately.

Parts List – Series 2 Control Valve Assemblies

(MUX) Multiplex Displacement Control



990768-000 – MUX Mating Connector Kit*

MUX Mating Connector	
Connector** (1)	– Cross Reference Delphi/Packard P/N 1203 4163
Terminal.(8)	– Cross Reference Delphi/Packard P/N 1210 3881
Cable Seal Plug (6)	– Cross Reference Delphi/Packard P/N 1203 4413

Recommended wire size: 16 - 18 AWG

Recommended cable diameter: 2.03 - 2.40 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

** Includes Cable Seal

Note: 3 Way Connector and 4 Way connector interface with SA Control Valve with Potentiometer reference on Page 21.

990750-000 – MUX Displacement Control (Kit)

Item	Part No.	Qty.	Description
6 C	990750-000	1	MUX Displacement Control (Kit) includes below;
	109831-002	1	Programmed MUX Controller S/A
	101673-200	1	Screw, SOC Button Head Cap, 10-24
	101673-150	2	Screw, SOC Button Head Cap, 10-24
	109011-000	1	Stand Off 54-64

Item 85

990745-000 Speed Sensor Kit

Part No.	Qty.	Description
107852-000	1	Magnetic Speed Sensor
16160-125	1	Retaining Ring
8761-016	1	O-Ring
108307-000	1	Plug

990766-000 – Speed Sensor Mating Connector Kit*

Connector*** (1)	– Cross Reference Delphi/Packard P/N 1216 2193
Terminal (2)	– Cross Reference Delphi/Packard P/N 1212 4075

Recommended wire size: 16 - 18 AWG

Recommended cable diameter: 2.0 - 2.40 mm

* Alternate reference source: Pioneer Standard Electronics 1-800-257-6613

*** Includes Cable Seal

990660-000 – Solenoid Control and Speed Sensor Mating Connector Kit*

Kit includes:	990765-000 Solenoid Control Mating Connector Kit
	990766-000 Speed Sensor Mating connector Kit

Parts List – Series 2 Kits

990713-000

Low Pressure Relief Valve Kit

Item	Part No.	Qty.	Description
48 C	9900713-000	1	LPRV Plug S/A Includes Below:
48-1	109077-00	1	LPRV Plug
48-2	8785-012	1	O-Ring
48-3	108870-002	1	LPRV Spring
48-4	108869-000	1	LPRV Poppet
48-5	16048-253*	10	Shim (.020)

Approximate	
PSI	.020 Shim
300 – 320	= 5 Shims
320 – 340	= 6 Shims
340 – 348	= 7 Shims
435	= 12 Shims

LPRV = Low Pressure Relief Valve * See table for the Required Shims to Acheive PSI setting

990709-000

Shaft Seal Kit – Models 33, 39, 46 54,4 – 63,7 – 75,4 cm³/rev

Item	Part No.	Qty.	Description
116 C	108395-000	1	Drive Shaft Seal
117 C	101680-250	1	Retaining Ring
118 C	107836-000	1	Spacer

990753-000

Shaft Seal Kit – Models 54, 64 89,2 – 105,4 cm³/rev

Item	Part No.	Qty.	Description
116 C	110192-000	1	Drive Shaft Seal
117 C	101680-250	1	Retaining Ring
118 C	107836-000	1	Spacer

990715-000

Shim Kit, End Cover Bearing Models 33, 39, 46 / 54,4 – 63,7 – 75,4 cm³/rev

Item	Part No.	Qty.	Description
41 A	107744-003	1	Bearing Shim
41 A	107744-005	1	Bearing Shim
41 A	107744-010	1	Bearing Shim
41 A	107744-015	1	Bearing Shim
41 A	107744-020	1	Bearing Shim
41 A	107744-030	1	Bearing Shim

990388-000

Shim Kit, End Cover Bearing Models 54, 64 / 89,2 – 105,4 cm³/rev

Item	Part No.	Qty.	Description
41 A	103798-003	1	Bearing Shim
41 A	103798-005	1	Bearing Shim
41 A	103798-010	1	Bearing Shim
41 A	103798-015	1	Bearing Shim
41 A	103798-020	1	Bearing Shim
41 A	103798-030	1	Bearing Shim

990723-000

Hold Down Kit – Models 33, 39, 46 54,4 – 63,7 – 75,4 cm³/rev

Item	Part No.	Qty.	Description
12-6	95912-100	4	Cap Screw 5/16-18
12-7	108377-000	4	Washer
12-8	107858-000	4	Hold Down Strap
12-9	103237-001	4	Spacer

990724-000

Hold Down Kit – Models 54, 64 89,2 – 105,4 cm³/rev

Item	Part No.	Qty.	Description
12-6	95912-125	4	Cap Screw 5/16-18
12-7	108377-000	4	Washer
12-8	108340-000	4	Hold Down Strap
12-9	103237-002	4	Spacer

Parts List – Series 2 Kits

990710-000 Repair Gasket Kit

Item	Part No.	Qty.	Description
5 A	108480-000	1	End Cover Gasket (54,4 - 63,7 - 75,3)
5 A	108974-000	1	End Cover Gasket (89,2 - 105,5)
15-2 A	103223-000	4	Sealing Washer
15-4 A	8761-156	1	O-Ring (charge Cover)
15-4 A	8761-157	1	O-Ring (charge Cover)
27 C	8761-144	2	O-Ring (54,4 - 63,7 - 75,3)
27 C	8761-157	2	O-Ring (89,2 - 105,5)
28 C	108300-000	2	Ring Seal (54,4 - 63,7 - 75,3)
28 C	108915-000	2	Ring Seal (89,2 - 105,5)
32 C	8761-139	2	O-Ring (54,4 - 63,7 - 75,3)
32 C	8761-145	2	O-Ring (89,2 - 105,5)
26 B	16254-8	1	Thread Seal
49 C	8785-012	2	O-Ring
57 A	110457-000	4	Static Face Seal
59 A	8761-017	2	O-Ring
60 A	108562-000	2	Back-up Ring
87 C	8761-016	1	O-Ring (speed sensor)
91	107762-000	1	Gasket, (potentiometer)
93	8761-010	1	O-Ring (potentiometer)
15-B	8761-042	2	O-Ring A-Pad (cust)
15-B	8761-045	2	O-Ring B-Pad (cust)
15-B	8761-158	1	O-Ring C-Pad (cust)
15-C	8761-157	1	O-Ring Pad (charge cover)
15-C	8761-158	1	O-Ring Pad (charge cover)
7 C	110003-000	1	EP Control Gasket
7 C	108992-000	1	MAN Control Gasket
7 C	108879-000	1	SOL Control Gasket
	8785-008	1	O-Ring
	104713-000	1	Dust Seal
	8785-004	19	O-Ring
	8785-016	2	O-Ring
	8785-002	1	O-Ring
	8785-010	1	O-Ring
	8785-006	2	O-Ring

Repair Information – Series 2 Variable Displacement Pump

The following repair information may be used in the inspection, conversion and repair of the Eaton Series 2 Variable Displacement Pump. The Pump Shown in this section incorporates the manual displacement control, high pressure relief valves, internal pressure override valves and the high torque auxiliary pump option.

Complete Disassembly

The following procedures describe complete disassembly of the Series 2 variable displacement pump. As the variable displacement pump is available in two frame sizes with many displacements and options, these procedures cover the basic units only.



Figure 1

The procedures for the units with options that are not shown are basically the same. The level of cleanliness maintained when repairing the pump could affect pump performance. Work in a clean area. After washing the parts with clean solvent, blow the parts dry with air. Inspect all mating surfaces. Replace all damaged parts. Do not use grit paper, files or grinders on finished parts.

NOTE: Whenever a pump is disassembled, it is a good policy to replace all seals. Lubricate new seals with petroleum jelly before installation. Use only clean, recommended hydraulic fluid on finished surfaces before reassembly.

It is recommended that the exterior of the pump be thoroughly cleaned before disassembly. Make sure all open ports are sealed.



Figure 2

To remove the input shaft seals retaining ring, use a pair of internal retaining ring pliers with .090 straight tips and carefully remove the retaining ring and spacer ring(s) from the pump housing. It will be easier to remove the

actual shaft seal later on during the disassembly of the pump. (see Figure 2).

To remove the control valve assembly, use 1/4 in. bit socket or hex key and remove the control valve assembly's five retaining cap screws. With the retaining cap screws removed, remove the control valve assembly by simply lifting it straight up. (see Figure 3)



Figure 3



Figure 4

Next remove the control valve assembly gasket and discard. (see Figure 4)

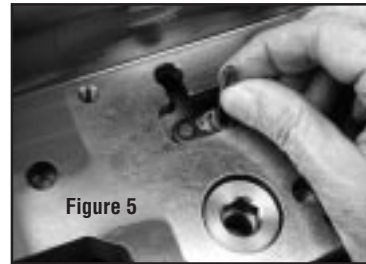


Figure 5

Remove the control valve feedback assembly by simply lifting it straight up. (see Figure 5)

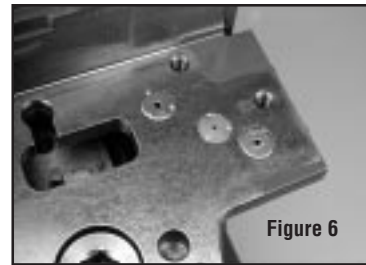


Figure 6

Depending upon the type of control used, and application used on, determines orifice size and location. The orifices are staked in three places to retain them in their pockets. The orifices sizes are stamped on the face of each orifice. These orifices need not be removed unless

orifice size need to be changed. (see Figure 6)

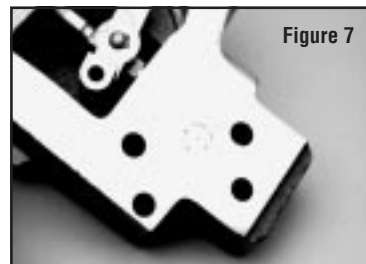


Figure 7

The orifice on earlier manufactured pump (P) were either staked in the control housing shown here or a loose fit in the control housing. (see Figure 7)

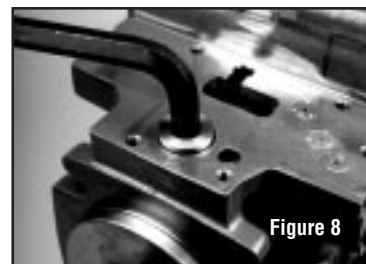
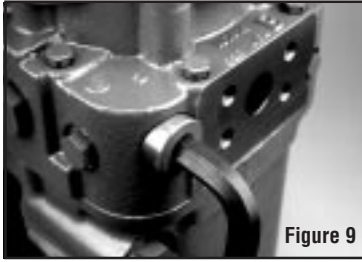


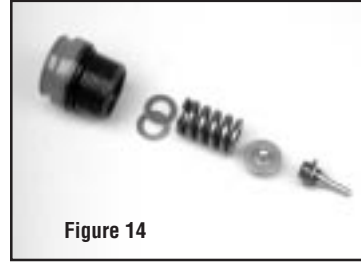
Figure 8

Using a 9/16 hex key or allen wrench, remove the socket head plug. This plug is used to retain the clocking link which we will remove later. (see Figure 8)

Repair Information – Series 2 Variable Displacement Pump



Next using a 9/16 hex key or allen wrench remove the two high pressure relief valves or check valve assemblies. (see Figure 9)



Shown here are all the parts used in the internal pressure override. Valve plug, shims spring end and valve poppet. (See Figure 14)

Depending upon the pumps model, the pump will incorporate either two high pressure relief valves or check valve assemblies. When high pressure relief valves are used, the high pressure relief valve located on the low side of the closed circuit will act as a check valve. (see Figure 10)



NOTE: The internal pressure override valve setting can be changed simply by adding or deleting shims.



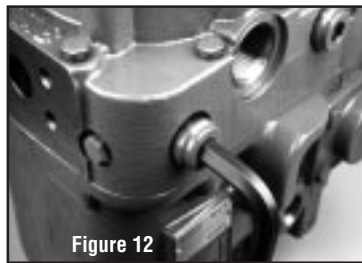
Next, using a 1-1/4 in. socket or end wrench, remove the charge pressure relief valve plug and valve spring and valve poppet from the pump housing. (see Figure 15)



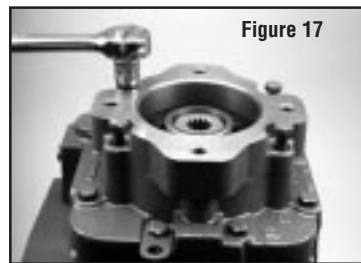
The high pressure relief valve settings are marked on the end of each relief valve assembly as shown here. (see Figure 11)



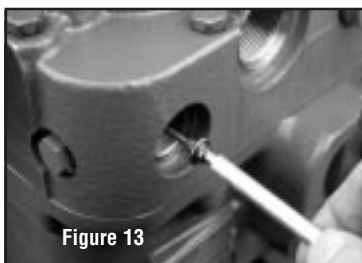
Shown here are all the parts used in the charge pressure relief valve. Plug, shims, valve spring and valve poppet. The charge pressure relief valve setting can be changed simply by adding or deleting shims. (see Figure 16) Note: Some models use a single charge pressure relief valve cartridge.



Using a 12 mm hex key or allen wrench remove the two optional internal pressure override valve plugs, springs and spring end. NOTE: Not all models incorporate these optional internal pressure override valves. (see Figure 12)



Next, using a 5/16 in. hex key or allen wrench remove the auxiliary pump mounting flange retaining cap screws. With the retaining cap screws removed, remove the mounting flange from the pump end cover (see Figure 17)

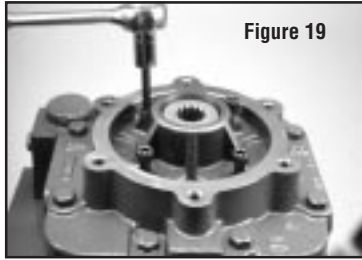


Using a pair of needle nose pliers remove the valve poppet. (see Figure 13)

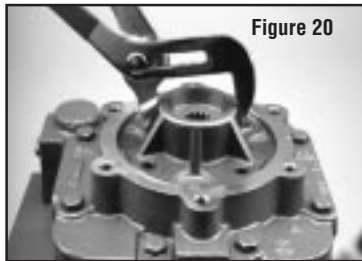


Turn the auxiliary pump adapter over and using an O-Ring pick or similar tool, remove the seal ring. (see Figure 18)

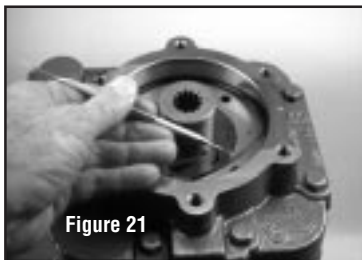
Repair Information – Series 2 Variable Displacement Pump



Using a 1/4 bit socket or hex key, remove the charge pump cover retaining cap screws. (see Figure 19)



With the cap screws removed, remove the charge pump cover by using a large pair of adjustable pliers. Remove by gently rocking the cover back-and-forth as you pull upward. (see Figure 20)



Next, remove the charge pump covers sealing O-ring from the pump end cover. (see Figure 21)



Remove the charge pump coupling and gerotor star. (see Figure 22)



The gerotor star is a slip fit on the coupling and is driven by a small key, caution must be used not to lose this key. To remove the star, simply slide it from the coupling. It is not necessary to remove the retaining ring from the

coupling as it is used for location purposes only. (see Figure 23)



Next, remove the gerotor outer ring from the eccentric ring located in the pump end cover. (see Figure 24)



With the gerotor outer ring removed from the eccentric ring, remove the eccentric ring. The position of this eccentric ring in the end cover is one of the items used to determine charge pump input rotation. Before removing you may want to note its position for reassembly. (see Figure 25)

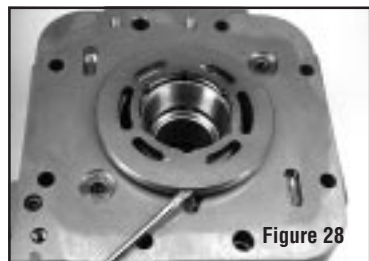


Next, remove the charge pump valve plate. The position of this valve plate is also used to determine charge pump input rotation. Before removing you may also want to note its position. (see Figure 26)



Using the proper size socket or end wrench, remove the end cover retaining cap screws. Caution should be used when removing the retaining cap screws as the end cover has an internal preload. If the end cover does not rise when the cap screws are loosened, you may have to tap the end cover to break the gasket seal.

With the retaining cap screws removed, carefully remove the pump end cover. When removing, Caution must be used not to drop any internal parts such as the valve plate, bearing cup, etc. which may or may not stick to the end cover. Caution must be used when handling all close tolerance parts. (see Figure 27)

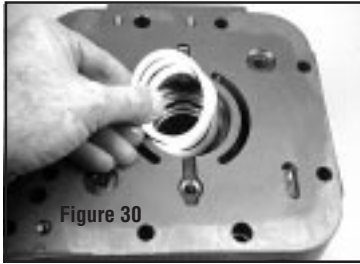


Carefully turn the end cover over and remove the valve plate and dowel pin. (see Figure 28)



With the valve plate removed, remove the rear bearing cup from the end cover. This bearing cup is a slip fit into the end cover. (see Figure 29)

Repair Information – Series 2 Variable Displacement Pump



Next, remove the rear bearing shims from the end cover. Make sure not to misplace these shims, as they are used to adjust the main pump shaft bearing end play or preload. (see Figure 30)



Do not remove the two Internal Pressure Override passage plugs located in the end cover as shown here. However, if the unit you are working on has the Internal Pressure Override option and you are going to change the pump input

rotation, these two plugs must be removed and installed into the other two passage ports. (see Figure 31)



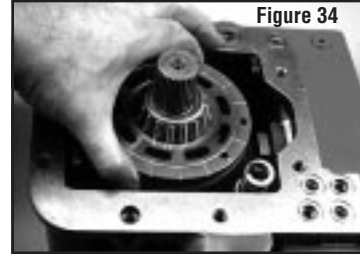
Remove the two hollow dowels from the pump housing. (see Figure 32)



Using an O-ring pick or similar tool, remove the sealing O-rings and backup rings from the pump housing. Only units with the optional Internal Pressure Override option incorporated the additional O-rings and backup rings as shown

here. (see Figure 33)

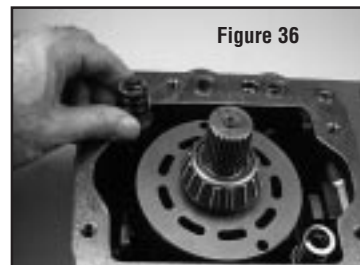
NOTE: Like in the pump end cover, when ever the pump input rotating is changed, the two passage plugs located in the pump housing must also be removed and installed into the other two ports.



Next, remove the bearing plate and two dowel pins from the cylinder barrel. NOTE: If a small screwdriver or similar tool is used to pry the bearing plate from the cylinder barrel, extreme caution must be used not to scratch or damage the cylinder barrel's or bearing plates lapped surfaces. (see Figure 34)

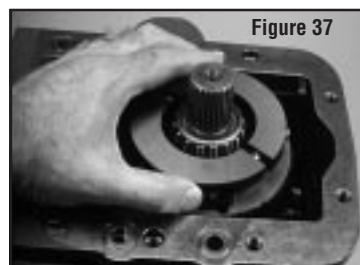


Shown here are both the valve and bi-metal bearing plates. The bearing plates are interchangeable with the same series plates used on the series one transmissions. The valve plates are also interchangeable with the same series plates used on the series one tandem pumps. The bearing plates are bidirectional and the valve plates are unidirectional. (see Figure 35)



Next, remove the hold-down springs. (see Figure 36)

NOTE: Earlier units did not use washers.



Install a low clearance split type bearing puller under the rear bearing. You can use the same size and type of puller that was used on the EATON Series 0 or ball guide transmissions. (see Figure 37) NOTE: IF you do not have a low clearance puller, please see the special tool section located on page 57 in the back of this manual for the dimensions required to make a low clearance puller.



Install the puller on the split type bearing puller. Do not remove the rear bearing at this time. Use the puller handle to remove the pump shaft, swashplate and rotating group from the pump housing. (see Figure 38)

Repair Information – Series 2 Variable Displacement Pump

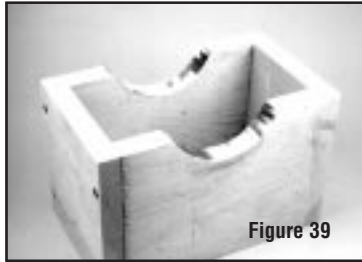


Figure 39

Shown here is a simple wooden box that may be used to support the rotating group during disassembly and reassembly. Cut two radius that match the radius machined on the back side of the swashplate into the top of the box. (see Figure 39)

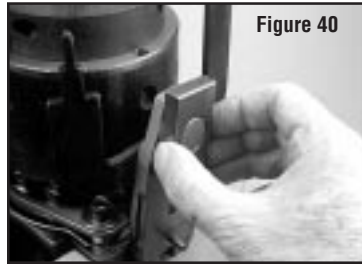


Figure 40

With the swashplate and rotating group supported, remove the slide block from the swashplate. (see Figure 40)

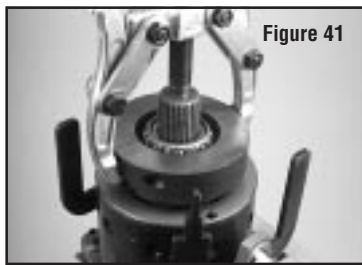


Figure 41

Next, remove the rear bearing by using the bearing puller that was previously installed. (see Figure 41)

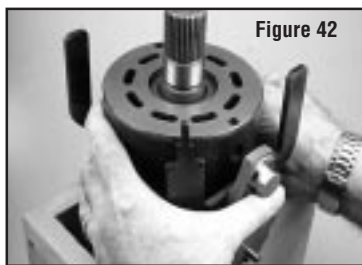


Figure 42

With the rear bearing removed, carefully slide the swashplate and rotating group up and over the pump shaft assembly. (see Figure 42)



Figure 43

Remove the pump shaft assembly from the support box. When it is necessary to replace the front bearing, a hydraulic press will be needed to remove the bearing from the shaft. Replacement bearings are pressed to a specific dimension.

These dimensions, per each pump model, are listed on page 57 in the back of this manual. (see Figure 43)



Figure 44

Reposition the swashplate and rotating group back on the support base. Next, using a 1/4 in. allen wrench or bit socket, remove the screws, spacers and strap from only one side of the swashplate. At this time also loosen the other side. This will make it easier to retain the assembly during handling. (see Figure 44)

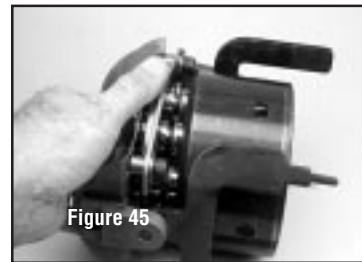


Figure 45

Reposition the swashplate and rotating group on a clean flat surface. Carefully remove the swashplate from the rotating group. Again using a 1/4 in. allen wrench or bit socket remove the screws, spacers and strap from the other side of the swashplate. (see Figure 45)

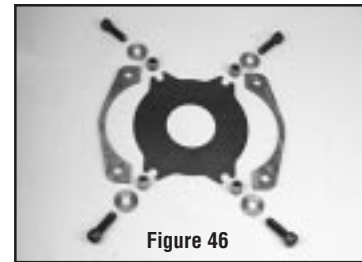


Figure 46

Shown here are all the parts used for the fixed hold down, retaining cap screws, washers, straps, spacers and thrustplate. (see Figure 46)



Figure 47

After separating the cylinder barrel assembly from the swashplate, remove the piston assemblies and piston retainer and place them on a clean protective surface for inspection and cleaning. (see Figure 47)

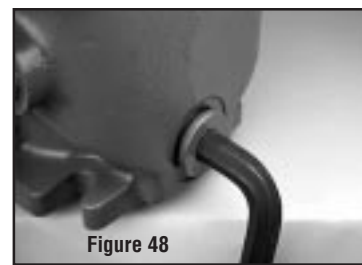
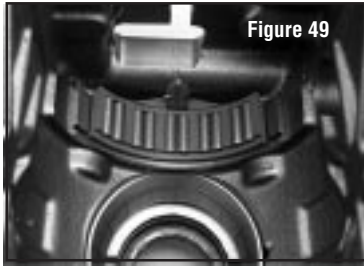


Figure 48

Using a 5/8 allen wrench or bit socket remove the clocking link retaining plug. (see Figure 48)

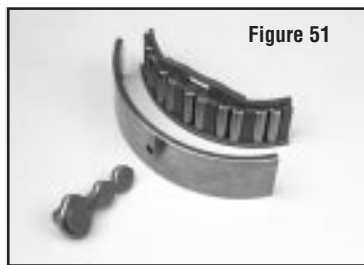
Repair Information – Series 2 Variable Displacement Pump



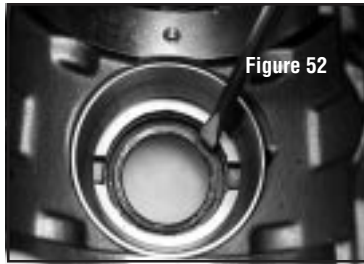
Next, remove the two swashplate bearings and clocking links. (see Figure 49)



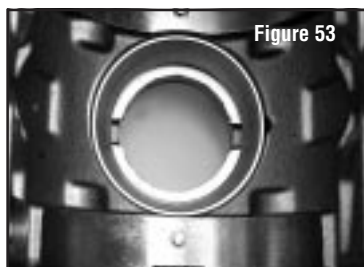
After removing the two swashplate bearings and clocking links, remove the two bearing races from the pump housing. (see Figure 50)



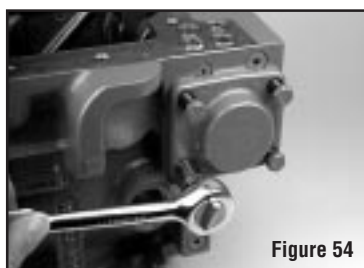
Shown here is only one side of the swashplate bearing assembly, clocking link, bearing race and bearing. (see Figure 51) The other side is identical.



With all the internal parts and assemblies removed from the pump housing it will now be easier to remove the shaft seal. To remove the seal, use a large screwdriver or similar tool and drive the seal from the housing. (see Figure 52)



To remove or replace the front bearing race. You will either have to press or pull the bearing race from the pump housing. (see Figure 53)



Reposition the pump housing. Using a 1/2 in. end wrench or socket, remove the retaining cap screws from the servo piston cover. (see Figure 54)



Next, using a 3/4 in. end wrench, remove the servo adjustment screw lock nut and special beveled washer from the adjustable side servo piston cover. (see Figure 55)



With the lock nut and washer removed, use a 1/2 in. end wrench or socket and remove the retain cap screws from the servo piston cover. Remove the servo piston cover from the pump housing. (see Figure 56)



Next, remove the servo cover by unscrewing it from the servo piston adjustment screw. (see Figure 57)



Using an O-ring pick or similar tool, remove the seals from the underside of both servo covers. (see Figure 58)



Any further disassembly of the servo piston is neither necessary nor recommended. The servo piston adjustment is a very critical adjustment and should not be tampered with. (see Figure 59)



Next, using an O-ring pick or similar tool remove the two servo piston seals from the pump housing. NOTE: Caution must be used when removing these seals so as not to scratch or damage the servo piston bore. (see Figure 60)

Repair Information – Series 2 Variable Displacement Pump

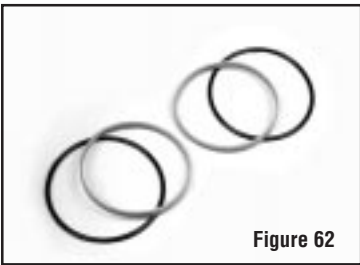
Complete Reassembly

Before reassembly, clean all parts and assemblies. Inspect and replace damaged parts and assemblies. When reworking parts, do not use coarse grit paper, files or grinders on finished surfaces. Replace all gaskets and seals.

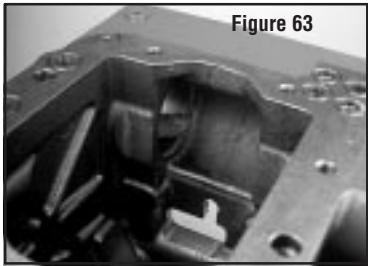
Lubricate all seals with petroleum jelly (Vaseline) for retention during reassembly. Freely lubricate all bearings and finished surfaces with clean hydraulic fluid.



The front bearing cup is a slip fit in the pump housing. When replacement is necessary, simply slip it in the pump housing. (see Figure 61)



Shown here are the seals used to seal the servo piston to the pump housing. Two each, O-rings and back up rings. (see Figure 62)



Lubricate and install the two new seals and back-up rings into the servo piston bore located in the pump housing. Install the black sealing ring first and then the blue back-up ring. Caution must be used not to twist or kink these seals during installation. (see Figure 63)



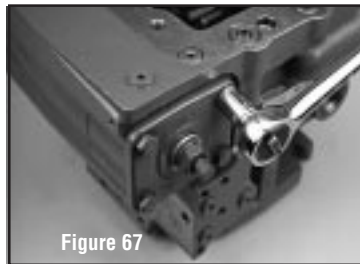
Lubricate and install new seals on both the servo piston covers. (see Figure 64)



Install the servo piston cover on the servo piston adjustment screw. Install about half way down the adjustment screw. Next, install a new threaded seal and special washer. Install the threaded seal first and then the special washer. The beveled side of the special washer must face the sealing washer. (see Figure 65)

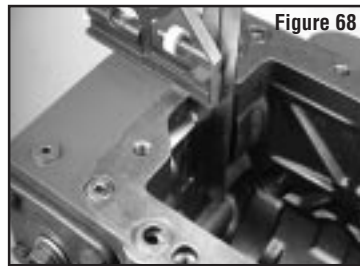


Install the lock nut on the servo piston adjustment screw. Do not tighten this lock nut at this time. Final servo piston adjustment will take place later on during reassembly. (see Figure 66)



Lubricate and install the servo piston assembly into the pump housing. Install into the opposite side of the pump housing the speed sensor port is located. The flat side of the servo piston must also be perpendicular to, and facing, the center of the pump housing.

Install the four servo cover retaining cap screws. Torque cap screws to 16 ft. lbs. [21,7 Nm] to 17 ft. lbs. [23 Nm]. (see Figure 67)

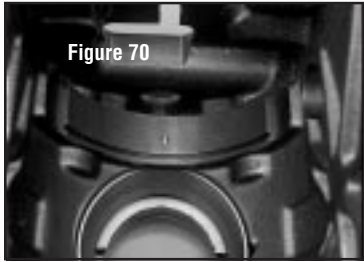


Using a square, make sure the flat side of the servo piston is perpendicular to the pump housing face. (see Figure 68)

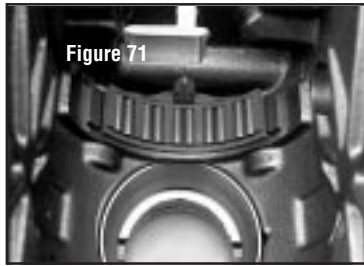


Install the remaining servo piston cover and remaining four servo cover retaining cap screws. Torque cap screws to 16 ft. lbs. [21,7 Nm] to 17 ft. lbs. [23 Nm]. (see Figure 69)

Repair Information – Series 2 Variable Displacement Pump



Lubricate and install the two bearing races into the pump housing. Install the races on their locating pins with the grooved side of the races towards the center of the pump housing. (see Figure 70)

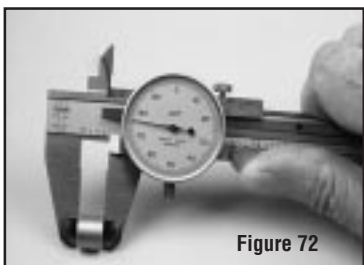
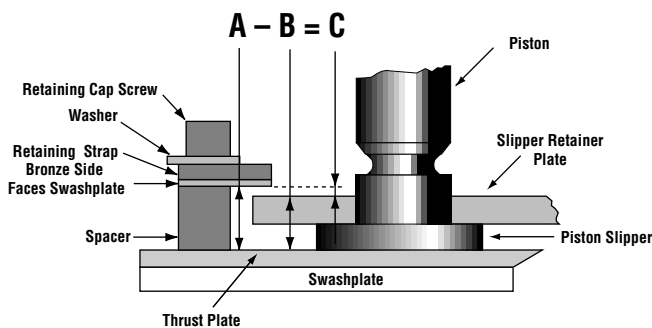


Install the two clocking links into the pump housing. Before installing, apply a small amount of petroleum jelly on the pin pivots. This will help to hold them in the up-right position when installing the swashplate assembly.

Next lubricate and install the two bearings into the pump housing by aligning the hole in the side of the bearings with clocking links. (see Figure 71)

Before installing the rotating group onto the swashplate, the fixed clearance must be checked. This preset fixed clearance is the clearance between the piston slipper face and thrust plate. The formula for this clearance is: Dimension (A) minus Dimension (B) equals Dimension (C). Dimension (C) must not exceed .008 inches.

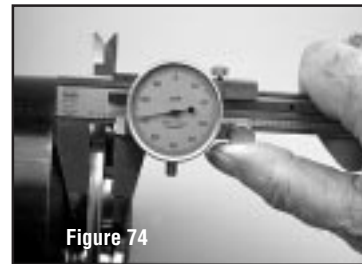
Max. Clearance (C) .008



The first step in checking the fixed clearance is to measure the height of the retaining strap spacer (dimension A). This can be done by using a micrometer or dial vernier calipers as shown here. (see Figure 72)



Lubricate and reassemble the rotating group. (see Figure 73)



The second step is to measure the combined thickness of both the piston slippers and retainer as shown here. The difference between step one and step two is the fixed clearance. Again the fixed clearance must not exceed .008 inches. Whenever this clearance exceeds .008 inches, the piston/slipper assemblies should be reevaluated. (see Figure 83)



Position the swashplate on the support base. Lubricate the thrustplate and install it on the swashplate. Install the two spacers, strap, washers and retaining screws. The two retaining screws should remain loose at this time. **IMPORTANT:** The bronze side of the strap must face the swashplate. (see Figure 75)



Carefully install the swashplate on the rotating group. (see Figure 76)



Carefully, retaining the swashplate and the rotating group together, install it back on the support base. Install the remaining two spacers, strap, washers and retaining screws. Unlike the Series 1 transmissions, these retaining screws **DO NOT** require Loctite. Torque all four retaining cap screws to 17 ft. lbs. [23 Nm] to 18 ft. lbs. [24.4 Nm]. (see Figure 77)

Repair Information – Series 2 Variable Displacement Pump

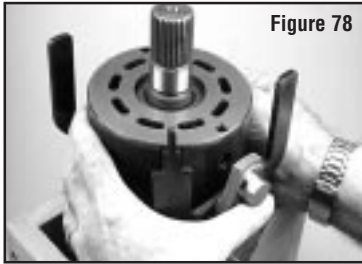


Figure 78 Lubricate and install the input shaft into the rotating group and swashplate assembly. (see Figure 78)

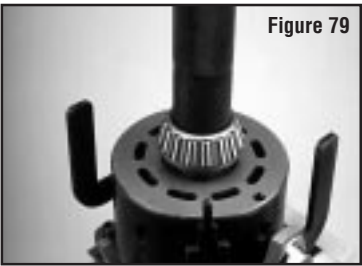


Figure 79 Lubricate and install the rear bearing on the shaft and bearing assembly. Support the shaft assembly in a slightly raised position. Next use a hydraulic press to press the rear bearing cone on the shaft. The bearing cone must be

firmly seated against the machined shoulder of the pump shaft. NOTE: The bearing cone may also be heated for installation. (see Figure 79)



Figure 80 In preparation of installing the swashplate and rotating group into the pump housing it helps to retain the two hold down arms. To do this, install two heavy rubber bands across both arms. (see Figure 80)



Figure 81 Lubricate and install the slide block on the swashplate. Before installing, apply a small amount of petroleum jelly to the back side of the slide. This will help to retain the slide block in position during assembly into the pump housing. (see Figure 81)

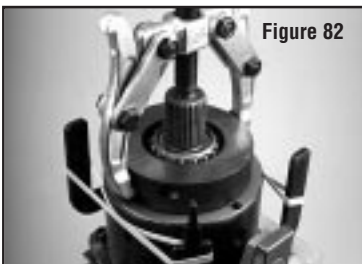


Figure 82 To help in the assembly of the swashplate and rotating group into the pump housing, reinstall the bearing puller on the rear bearing. The bearing puller can now be used as a handle to assemble the swashplate, rotating group and shaft assembly into the pump housing. (see Figure 82)

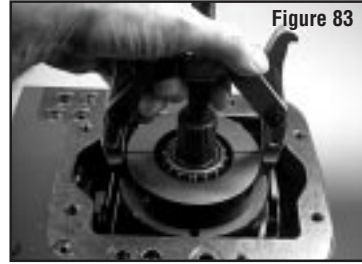


Figure 83 VERY CAREFULLY pick up the entire assembly and install it into the pump housing. Install by aligning the two notches located in the swashplate with the two clocking links and the swashplate side with the notch in the servo piston. IMPORTANT: The swashplate assembly must be firmly seated on the swashplate bearings. (see Figure 83)

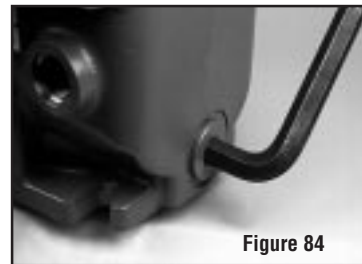


Figure 84 Install the lower clocking link retaining plug. Torque plugs to 125 ft. lbs. [169,5 Nm]. (see Figure 84)

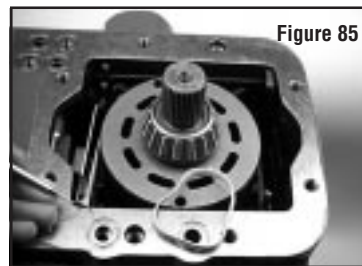


Figure 85 Remove the bearing puller and two rubber bands from the swashplate assembly. (see Figure 85)

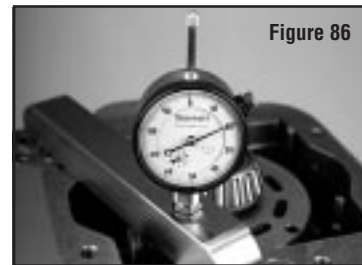


Figure 86 In preparation of zeroing in the swashplate, first place a parallel bars across the face of the pump housing. Make sure these bars are resting firmly on the housing face. Next using a depth micrometer, measure the distance from the parallel bar to the face of the swashplate. Make note of this dimension. (see Figure 86)

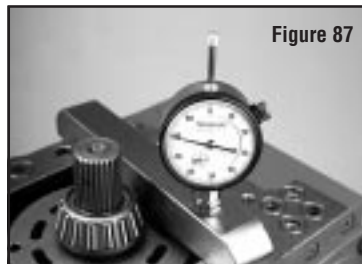


Figure 87 With the first dimension noted, move the depth micrometer to the opposite side of the swashplate and measure the distance from the parallel bars to the face of the swashplate. Again make note of this dimension. With the two dimensions noted, turn the face of the depth micrometer so that the zero position is right in between the two noted dimensions. (see Figure 87)

Repair Information – Series 2 Variable Displacement Pump

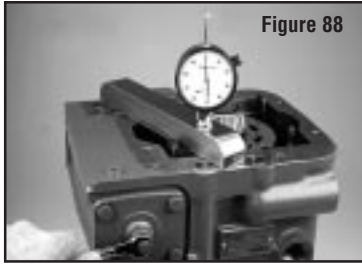


Figure 88

The next step in zeroing in the swashplate is to use a 3/8 in. end wrench to turn the servo piston adjustment screw clockwise or counterclockwise to bring the swashplate to the zero position. NOTE Earlier units used a screwdriver

slot to adjust the neutral position. (see Figure 88)

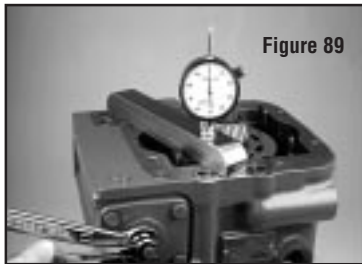


Figure 89

The final step is to hold the servo adjustment screw in the stationary position. Use 3/4 in. end wrench to tighten the servo adjustment screw lock nut, using caution not to disturb the neutral or zero swashplate position.

Torque the lock nut to 45 ft. lbs. [61 Nm]. (see Figure 89)

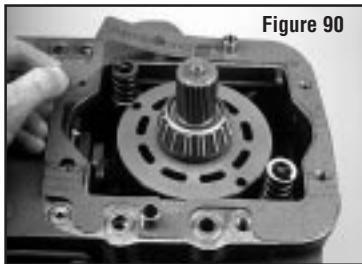


Figure 90

After removing the depth micrometer and parallel bar, install the two hollow dowel pins in the pump housing and the two hold-down springs and washers on the swashplate hold-down arms. (see Figure 90)

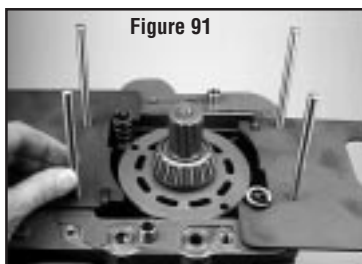


Figure 91

Next install the two hold down arm assembly alignment tool and dowels. NOTE: This is a very handy assembly tool, please see the special tool section located in the back of this manual for the dimensions required to make this special tool. (see Figure 91)

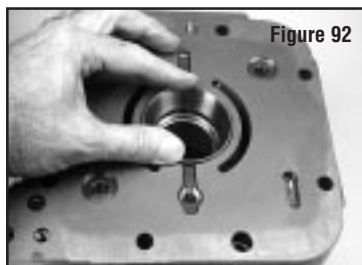


Figure 92

Lubricate and install the rear bearing shims and cup into the pump end cover. To check the shaft end play, the pump end cover must be installed without either the valve or bearing plates. This will help to remove the

cylinder barrel spring tension against the input shaft. (see Figure 92)

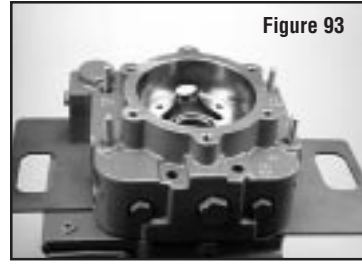


Figure 93

Aligning the pump end cover with the hold down arm assembly alignment tool (2) dowels, install the end cover. (see Figure 93)

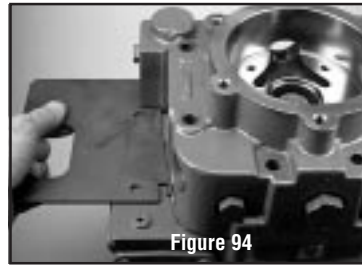


Figure 94

After installation remove the four dowel pins and carefully remove the alignment tool (2) using caution as not to disturb the housing gasket. (see Figure 94)

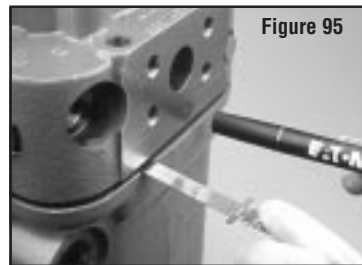


Figure 95

If you do not have the special alignment tool (2), the swash plated hold-down ears and springs still must be aligned with the recesses machined into the face of the end cover before it can set squarely on the pump housing. This can be done by slightly elevating the end cover

and using a machinist ruler or similar tool to align the ears and springs with the recess. This must be done on both sides of the end cover. (see Figure 95)

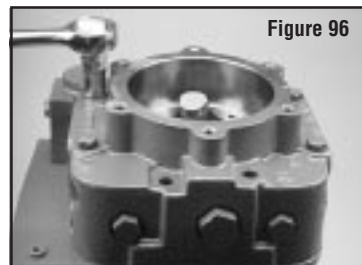


Figure 96

Install four of the end cover retaining cap screws. Tighten cap screws. (see Figure 96)

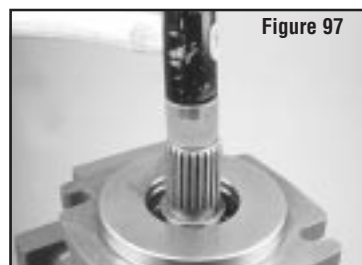


Figure 97

Reposition and support the pump assembly on its end cover. Use a hammer to gently tap the input shaft inward. (see Figure 97)

Repair Information – Series 2 Variable Displacement Pump

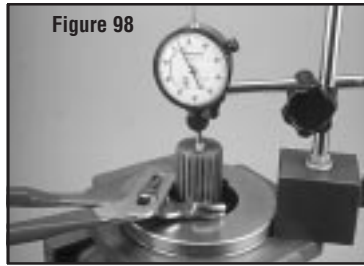


Figure 98

Install a magnetic base indicator on the mounting flange with the indicators gage probe on the input shaft. Next, using slip joint pliers, grip the input shaft as low as possible and pry upward to determine shaft end play. The indicator must read between .002 to .007 inch. To adjust shaft end play, either add or delete the shims located under the bearing cup located in the end cover. (see Figure 98)

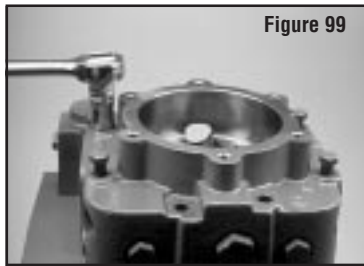


Figure 99

With the input shaft end play determined, remove the magnetic base indicator. Reposition the pump assembly and remove the end cover. Next lubricate and install the pump housing sealing and back-up rings. (see Figure 99)

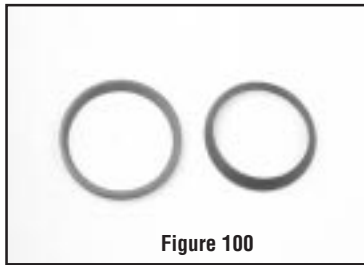


Figure 100

On units incorporating the pressure override option, special tapered sealing and back-up ring are used. Correct installation is with the sealing rings taper facing upward and with the back-up rings taper facing downward. (see Figure 100)



Figure 101

Next lubricate and install the pump housing sealing and back-up rings. (see Figure 101)

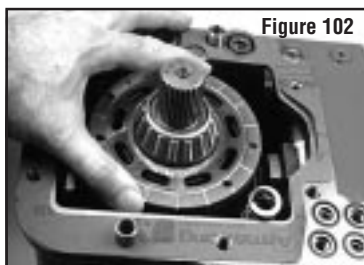


Figure 102

Install the two dowel pins in the cylinder barrel assembly block face. Freely lubricate the bearing plate and aligning with the dowel pins, install it on the cylinder barrel assembly. (see Figure 102)

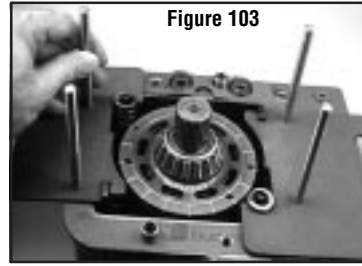


Figure 103

Again, use the two hold down arm assembly alignment tool and dowels on the pump housing. The next step is to install the charge pump assembly into the pump end cover before installing the end cover on the pump housing. (see Figure 103)

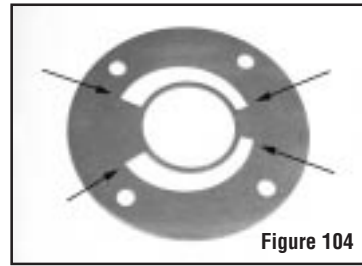


Figure 104

The position of the charge pump valve plate in the pump housing determines charge pump input rotation. Please note that one side of the kidney slots in the valve plate is wider than the other. (see Figure 104)

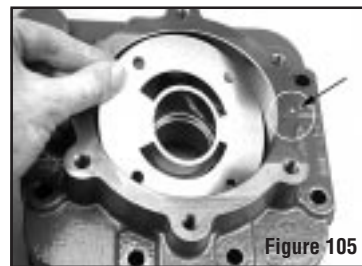


Figure 105

For pumps with clockwise input rotation, the wide side of the kidney slot must be on the (A) side of the pump end cover. Please note the (A) and (B) Stamped on the end cover, right next to the high pressure ports. For counterclockwise input rotation, the wide side of the kidney slot must be on the (B) side of the pump end cover. (see Figure 105)

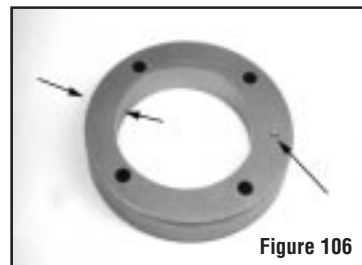


Figure 106

Like the valve plate, the eccentric ring also determines charge pump input rotation. Please note that one side of the eccentric ring is wider than the other. The wide side of the eccentric ring also has an identification "dot". (see Figure 106)

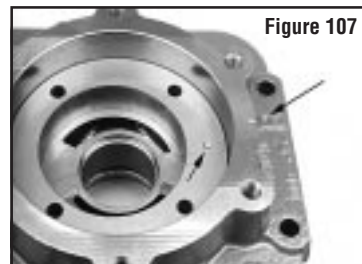


Figure 107

For pumps with clockwise input rotation, the identification "dots" must be in alignment or the wide side of the eccentric ring must be on the (B) side of the pump end cover. For counterclockwise input rotation, the identification "dots" must be misaligned or the wide side of the eccentric ring

must be on the (A) side of the pump end cover. (see Figure 107)

Repair Information – Series 2 Variable Displacement Pump

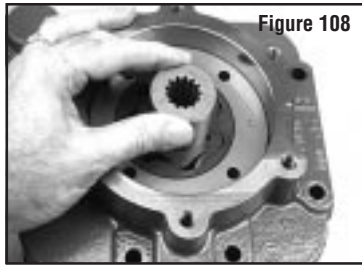


Figure 108

Lightly coat the charge pump drive key with petroleum jelly to help hold it in position during assembly. First install the drive key in its recess located in the charge pump coupling. Next install the gerotor star on the charge

pump coupling by aligning with the previously installed drive key. Next install the charge pump coupling assembly and gerotor's outer ring into the pump end cover. (see Figure 108)

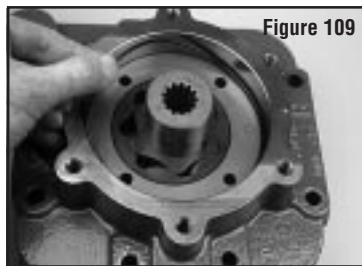


Figure 109

Next lightly coat the charge pump sealing ring with petroleum jelly and install it into the pump end cover. (See Figure 109)

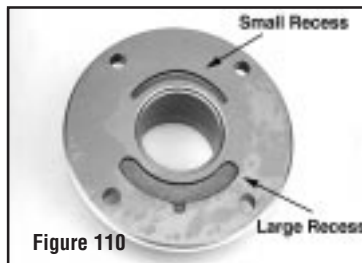


Figure 110

Before installing the charge pump cover assembly, please note that there is a small and large recess cast into the cover assembly. The large recess side of the charge pump cover must face toward the charge pump inlet. (see Figure 110)

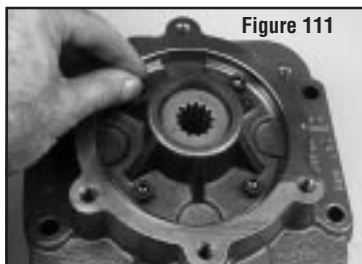


Figure 111

Aligning the large recess in the cover assembly with the charge pump inlet, install the charge pump cover over the coupling and into the pump end cover. Install the four retaining cap screws. (see Figure 111)



Figure 112

Using a "T" handle to rotate the charge pump assembly, torque the retaining cap screws to 20 ft. lbs. [27, Nm] to 24 ft. lbs. [32,5 Nm] Note: If the charge pump assembly does not have a through shaft, the charge pump

assembly must be rotated from the other side. (see Figure 112)

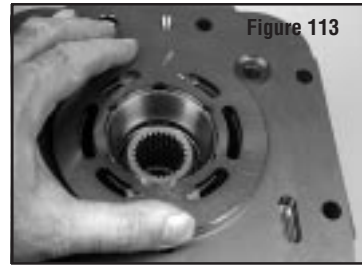


Figure 113

Install the dowel pin in the end cover. Lightly coat the end cover side of the valve plate with petroleum Jelly (Vaseline) for retention during assembly. Install the valve plate over the bearing cup and aligning with the dowel pin. (see Figure 113)

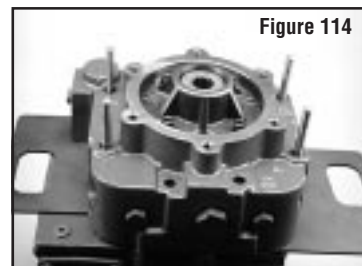


Figure 114

Aligning the pump end cover with the hold down arm assembly alignment tool (2) dowels, install the end cover. (see Figure 114)



Figure 115

You may have to rotate the charge pump coupling slightly to align the splines before the end cover will set squarely on the pump housing. Again, if the charge pump coupling does not have a through shaft, the pump input shaft may have to be rotated slightly to align the splines. (see Figure 115)

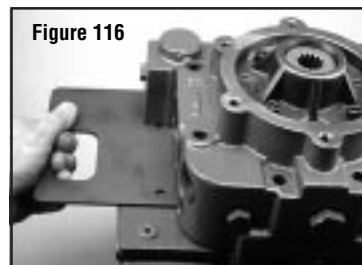


Figure 116

With the charge pump coupling, pump shaft splines aligned, along with the swashplate hold down ears and springs aligned with the recess machined into the face of the end cover, remove the four dowel pins and carefully remove the alignment tool (2) using caution as not to disturb

the housing gasket and sealing rings. (see Figure 116)

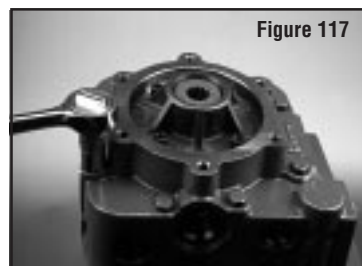
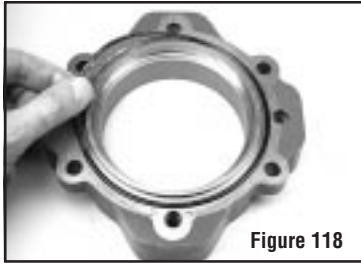


Figure 117

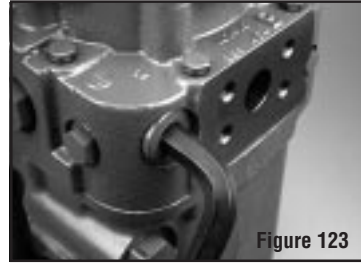
With the hold-down springs aligned, install the end cover retaining cap screws. Torque cap screw as follows:

Model 39 to 46 • 35 ft. lbs. [47,4 Nm] to 40 ft. lbs. [54 Nm] Model 54 to 64 • 60 ft. lbs. [81,3 Nm] to 65 ft. lbs. [88,1 Nm] (see Figure 117)

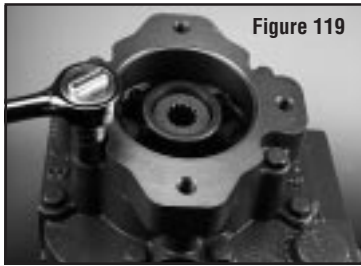
Repair Information – Series 2 Variable Displacement Pump



Lubricate and install the seal ring on the auxiliary pump mounting flange. (see Figure 118)



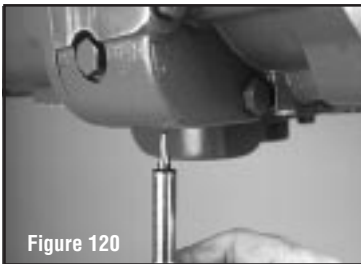
Next, install the high pressure valves or check valve assemblies. Torque to 120 ft. lbs. [162,7 Nm] to 130 ft. lbs. [176,2 Nm] (see Figure 23)



Aligning the retaining cap screw holes, install the auxiliary pump mounting flange on the pump end cover. Install the retaining cap screws. Torque cap screws to 20 ft. lbs. [27,1 Nm] to 24 ft. lbs. [32,5 Nm]. (see Figure 119)



Install the charge pressure relief valve poppet or optional relief valve cartridge into the pump housing. (see Figure 124)



Using a small deep wall socket or similar tool, lubricate and install the internal pressure override valve poppet into the pump housing. NOTE: It works best to install the poppet vertically into the pump housing. (see Figure 120)



Next install the valve plug, shims, and valve spring. NOTE: Because of heavy valve spring tension, you must both push and turn to start the charge pressure plug. (see Figure 125)



Next, install the valve plug, shims, and valve spring. NOTE: Again it works best in install these parts vertically into the pump housing. In doing it vertically, there will be less chance of the parts falling out of position. (see Figure 121)



Torque plug to 120 ft. lbs. [162,7 Nm] to 130 ft. lbs. [176,2 Nm]. (see Figure 126)



Torque plug to 100 ft. lbs. [135,6 NM] to 105 ft. lbs. [142,3 Nm]. (see Figure 122)



Install the clocking link plug. Torque plug to 125 ft. lbs. [169,5 Nm]. (see Figure 127)

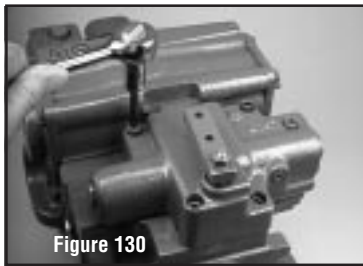
Repair Information – Series 2 Variable Displacement Pump



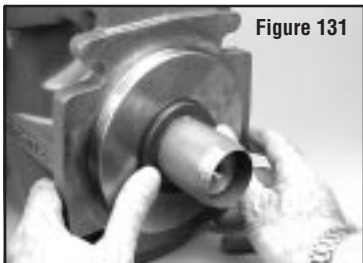
Lubricate and install the control feedback assembly on the swashplate assembly. (see Figure 128)



Next, aligning with the retaining cap screws holes, install the control valve gasket on the pump housing. (see Figure 129)



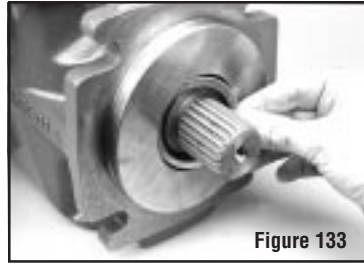
Aligning the control valve assembly with the feedback link, install the control valve assembly on the pump housing. Next, install the control valve assembly retaining cap screws. Torque cap screws to 20 ft. lbs. [27,1 Nm] to 24 ft. lbs. [32,5 Nm] (see Figure 130)



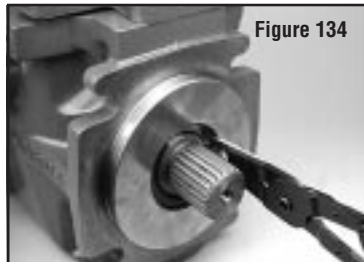
Protecting the shaft seal with a seal bullet or similar tool, install the seal into the pump housing. Install the seal with the lip of the seal facing inward. (see Figure 131)



Using a seal driver or similar drive the seal into the pump housing. Drive the seal in just far enough to install the spacer washer and retaining ring. (see Figure 132)



Next, install the spacer washer on top of the seal. When severe wear in the seal area of the pump shaft is noted, you may want to add an additional spacer washer to relocate the seal to a different location. A maximum of two spacer may be used. (see Figure 133)



Using internal retaining ring pliers, install the retaining ring into the pump housing (see Figure 134)



Again using a seal driver or similar tool as shown here, tap the retaining ring inward until it snaps firmly in its groove. (see Figure 135)

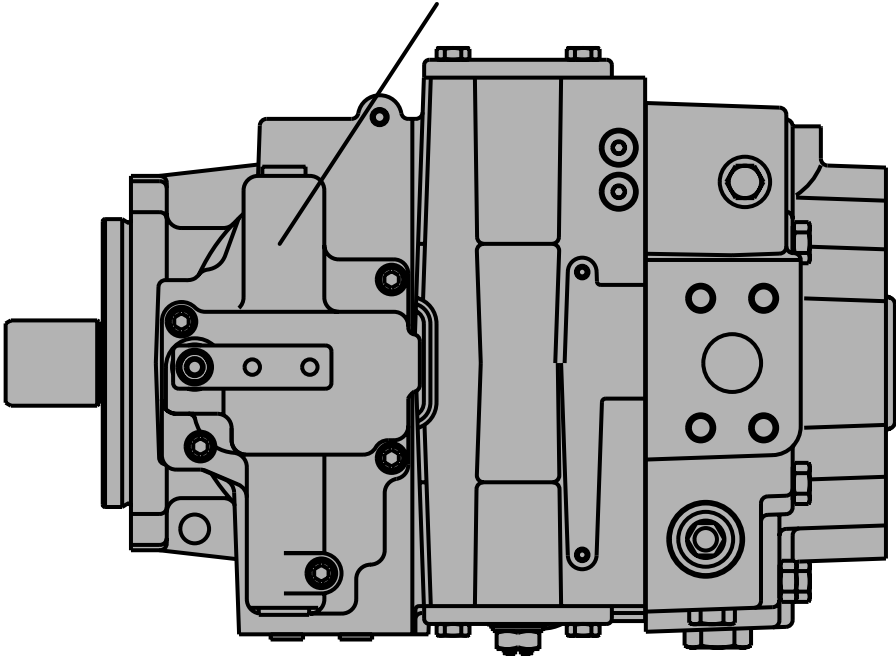


The Series 2 Variable Displacement Pump is now ready for test and installation. (see Figure 136)

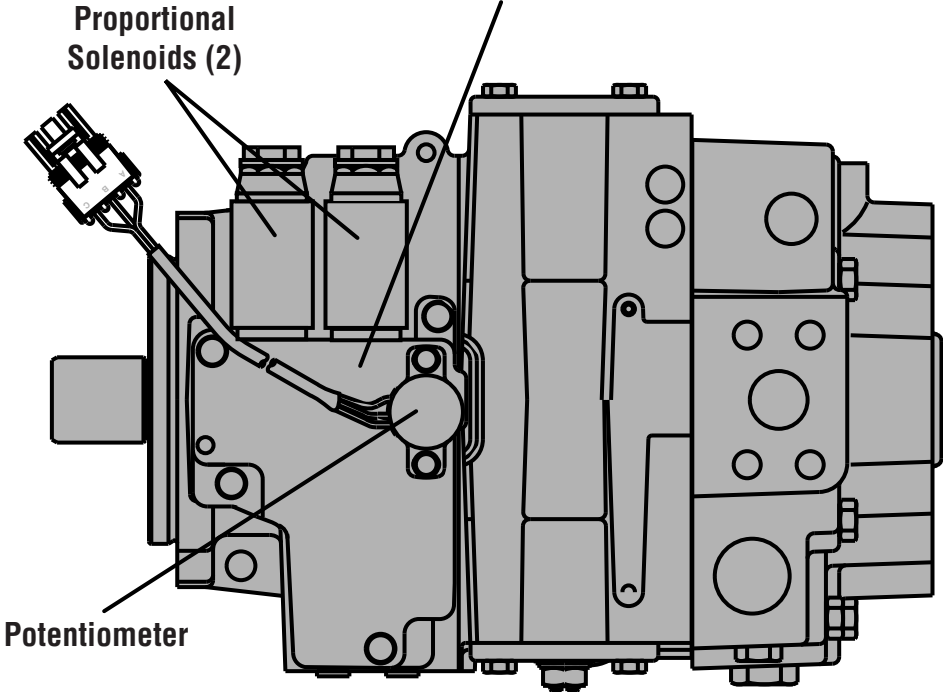
Troubleshooting – Series 2 Variable Displacement Pump

This section provides the information necessary to troubleshoot a typical hydrostatic system using an Eaton Series 2 hydrostatic pump. Using this section will help you to diagnose any minor problems that may occur. Maintaining cleanliness while you work will prevent contamination of the hydrostatic system and insure continuous and satisfactory transmission life.

Manual Displacement Control

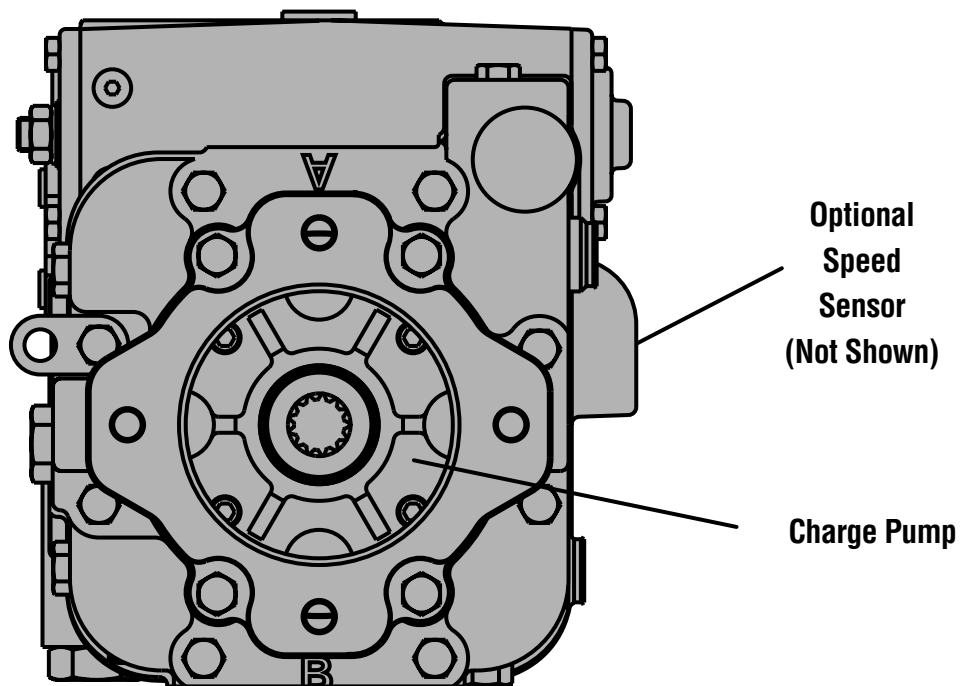
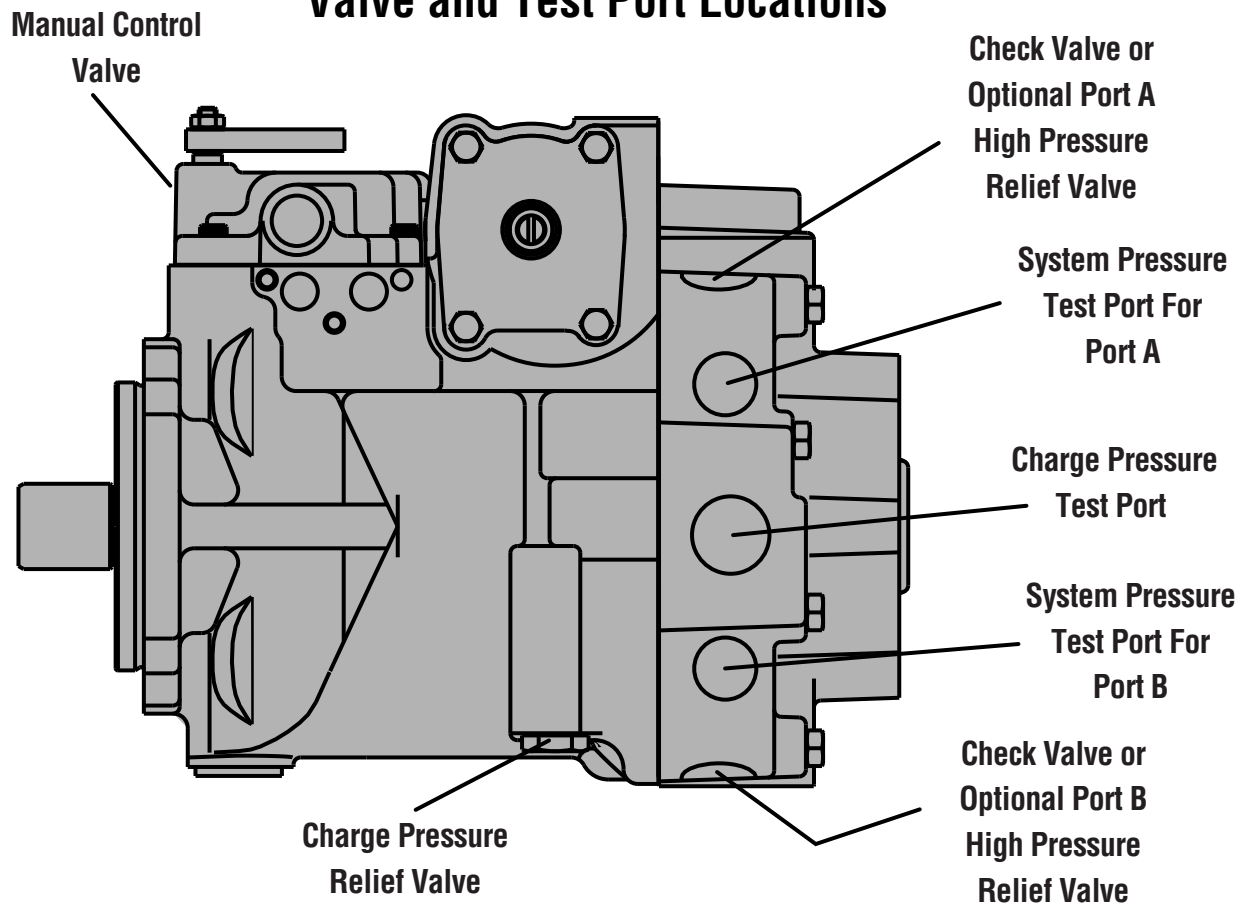


Electronic Solenoid Operated Control With Electronic Feedback



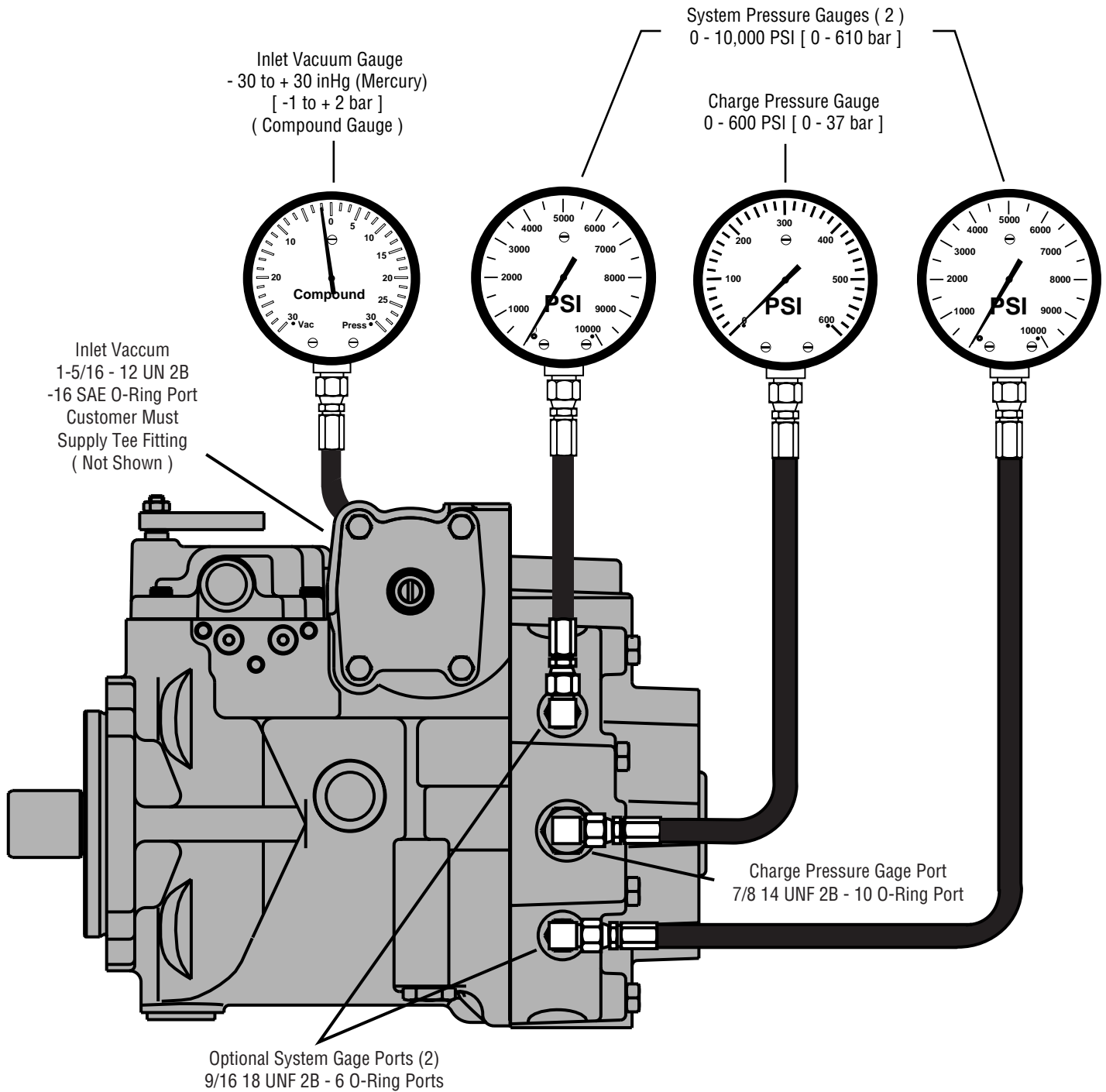
Troubleshooting – Series 2 Displacement Variable Pump

Valve and Test Port Locations



Troubleshooting – Series 2 Variable Displacement Pump

Gauge Requirements, Gauge Port Size and Locations



Troubleshooting – Series 2 Variable Displacement Pump

Pressure Readings

The pressures given in this manual are gauge pressures or delta pressures. A pressure gauge reads zero when connected to atmospheric pressure. Any reading above or below this zero point is referred to as gauge pressure (PSI). Delta pressure is the difference of two gauge pressures in a hydraulic circuit.

For example:

$$\begin{array}{r} \text{Charge pressure reading of 340 PSI [23,4 bar]} \\ \text{Minus Case pressure reading of 20 PSI [1,5 bar]} \\ \hline \text{Equals Differential pressure of 360 D PSI [23,4 bar]} \end{array}$$

Typical hydrostatic circuits usually include inlet pressure, case pressure, low or charge pressure and system or high pressure. These pressures will vary per each individual application and operating conditions.

Nominal Operating Pressures (At Normal Operating Temperature)

Inlet Vacuum: Should not exceed 10 in. Hg. [254 mm Hg]
(inches of mercury) for an extended period of time

Case pressure: Should not exceed 40 PSI [2,8 bar]
for an extended period of time

Charge Pressure:* Neutral 340 PSI [23,4 bar]
Forward or Reverse 280 PSI [19,3 bar]

*Charge Pressure Relief valves are factory preset to their nominal setting with a 2 GPM [7,6 l/min] flow rate. The original valve pressure will increase approximately 3 PSI [,21 bar] per 1 GPM [3,8 l/min] additional flow over the valve.

The charge pressures given above are typical. Higher charge pressures may be set at the factory for your particular application.

Troubleshooting – Series 2 Variable Displacement Pump

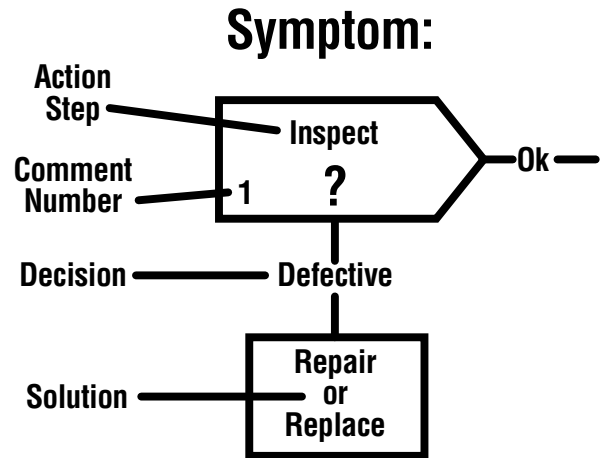
Fault-Logic Trouble Shooting

This Fault-Logic Trouble Shooting Guide is designed as a diagnostic aid in locating possible transmission problems by the user. Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems, eliminating unnecessary machine down time.

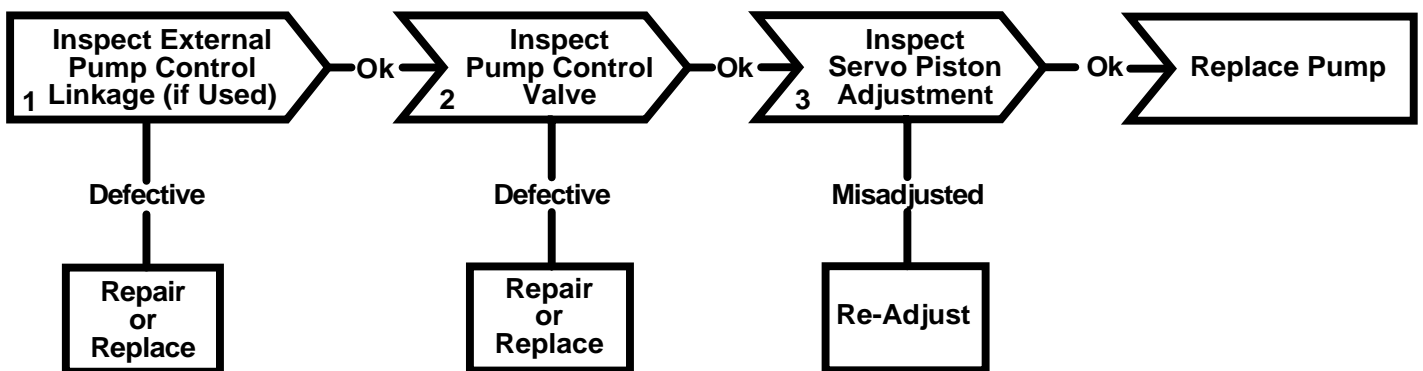
Following the fault-logic diagrams are diagram action comments to further help explain the action steps shown in the diagrams.

Where applicable, the action comment number of the statement appears in the action block of the diagram.

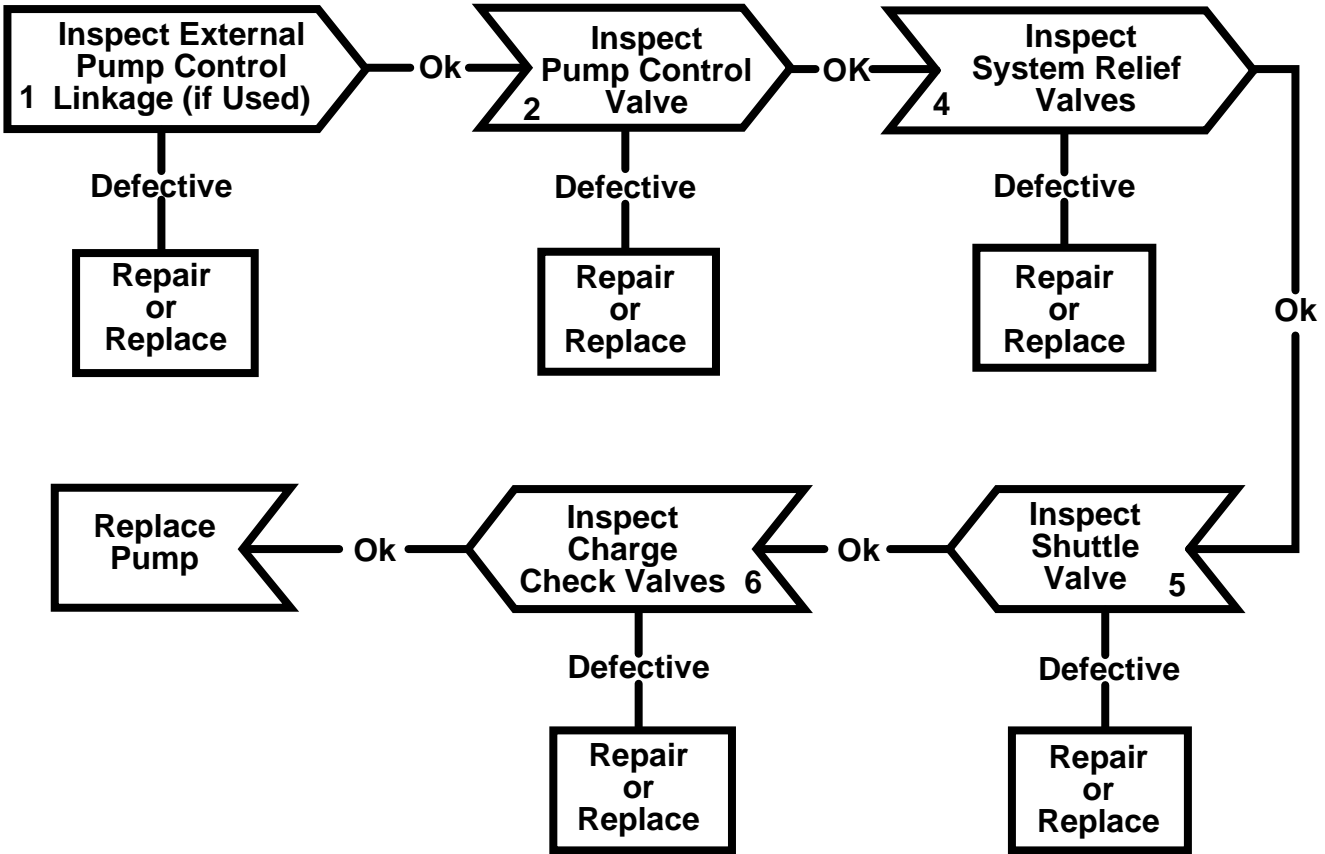
Explanatory Diagram



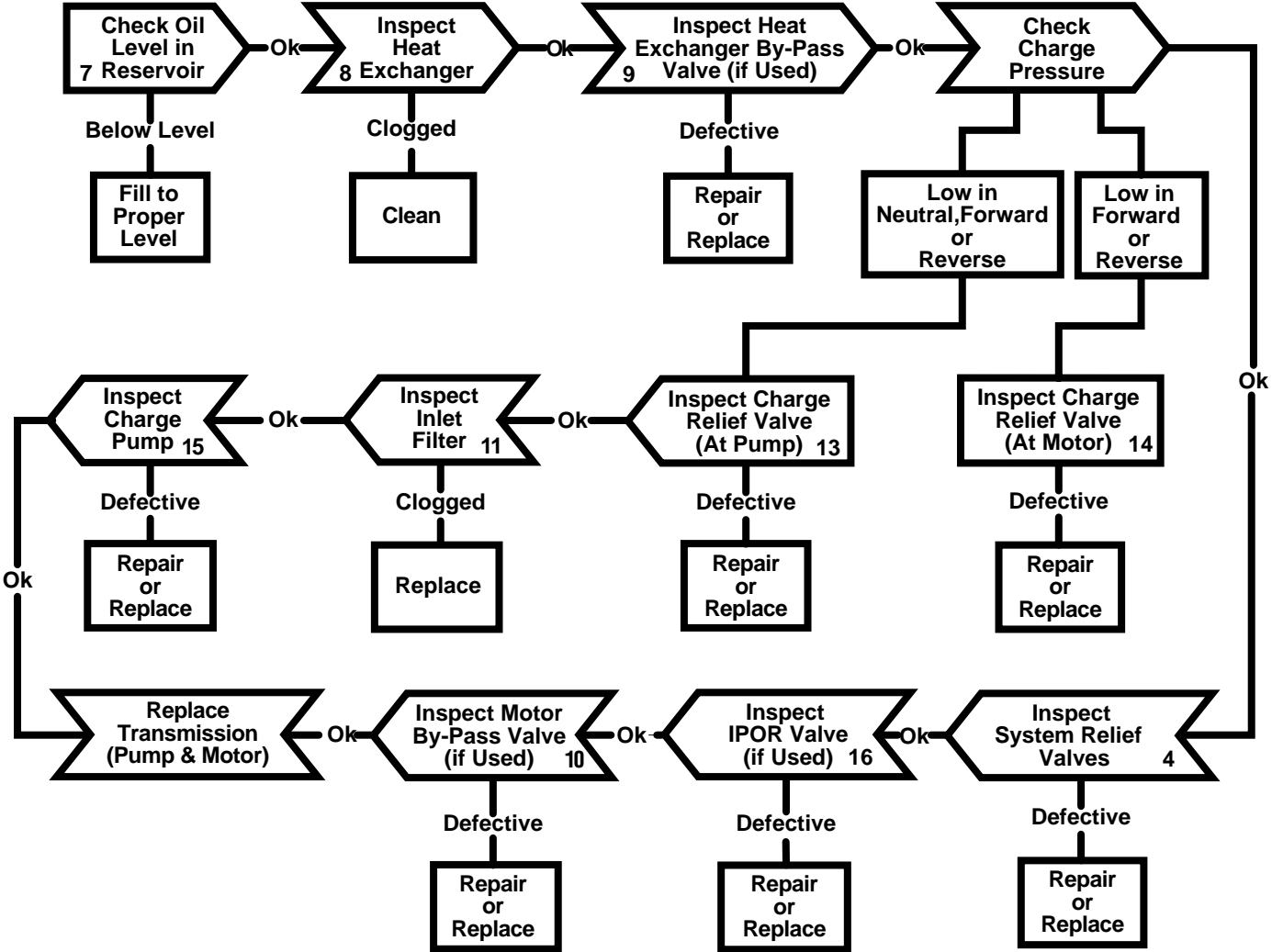
Neutral Difficult or Impossible to Find



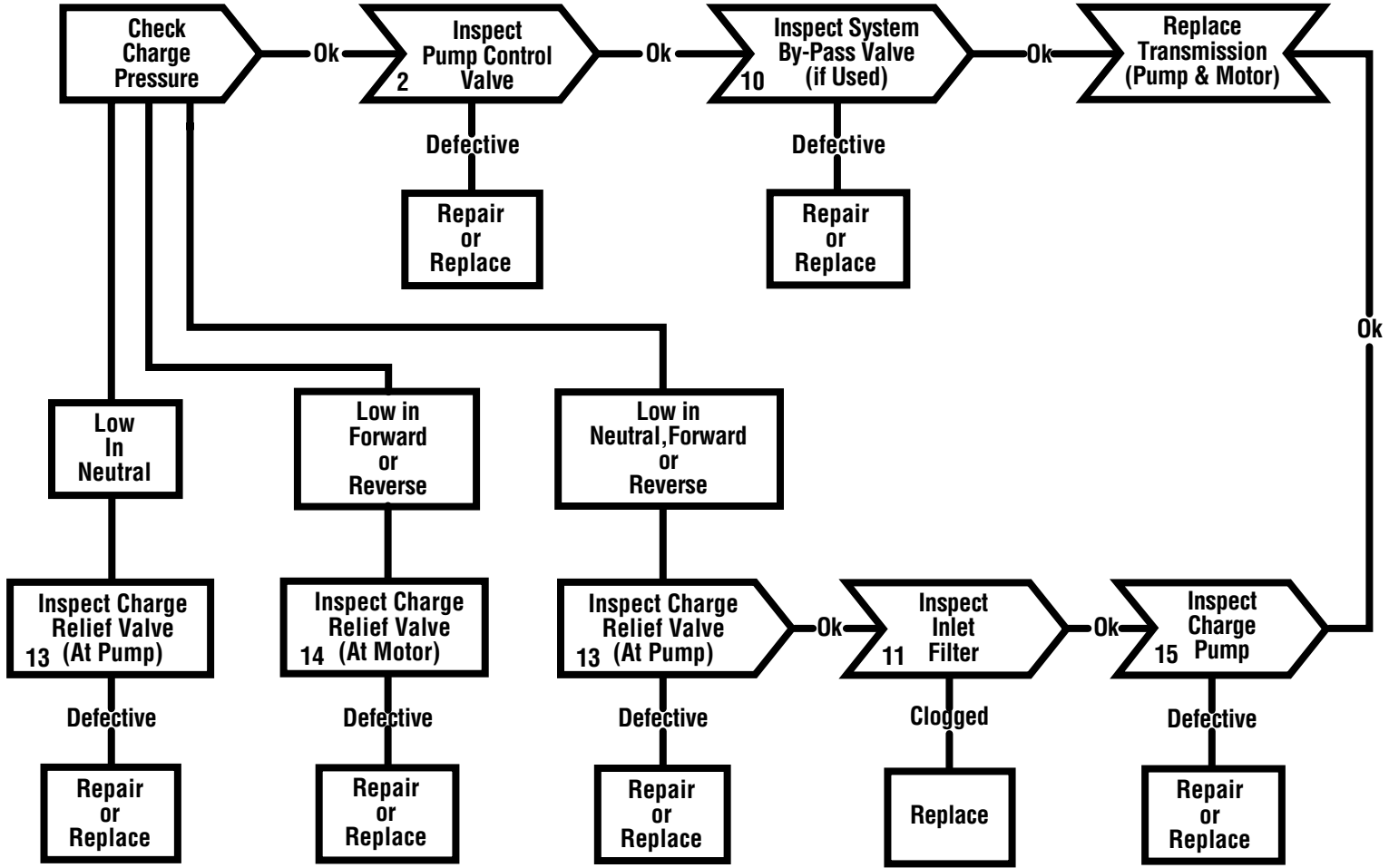
Transmission Operates in One Direction Only



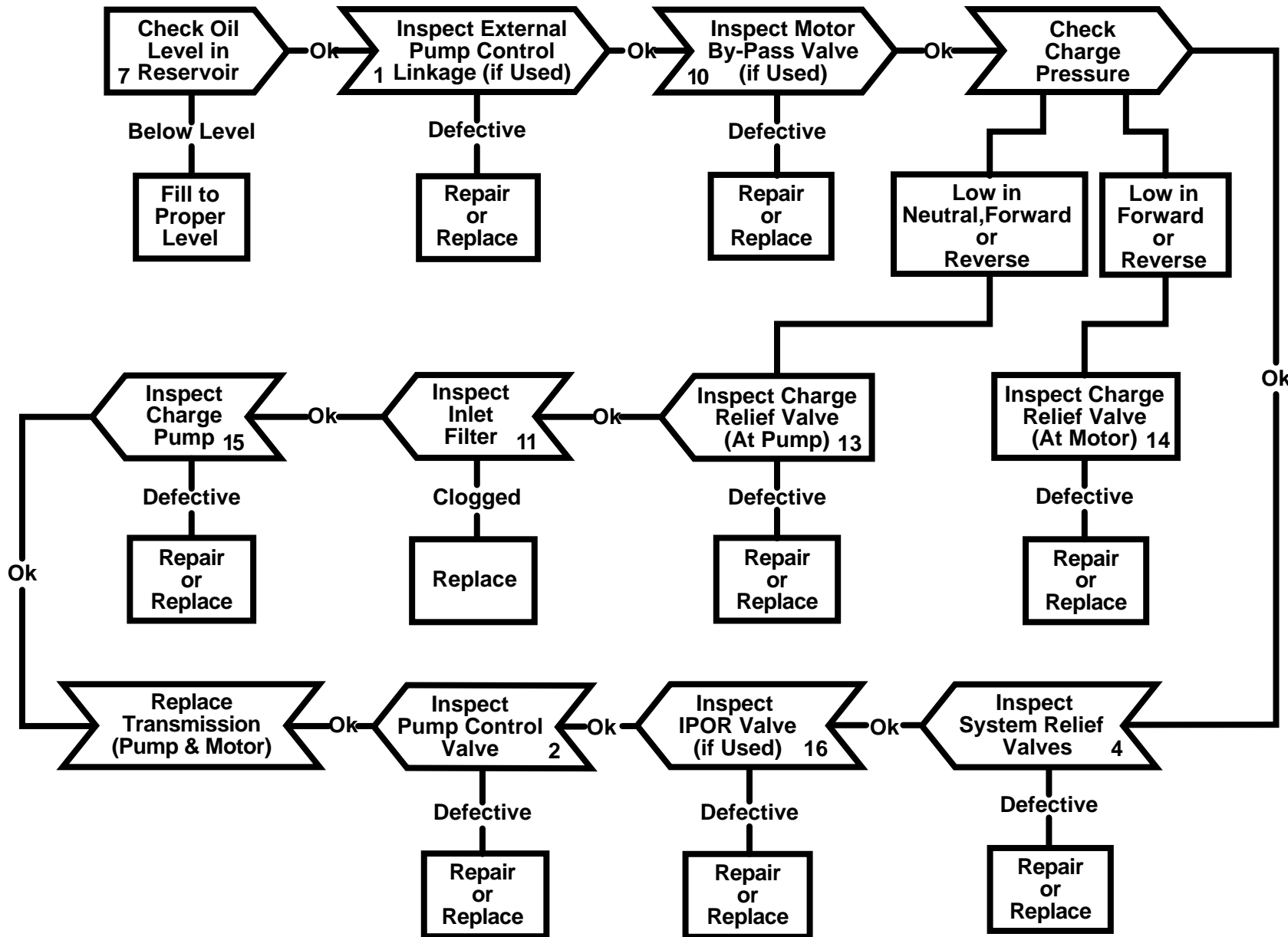
System Operating Hot



System Response Sluggish



System Will Not Operate in Either Direction



Troubleshooting – Series 2 Variable Displacement Pump

1. Inspect External Pump Control Linkage for:
 - Manual Operated Controls**
 - A. Misadjusted or disconnected
 - B. Binding, bend or broken
 - Hydraulic Remote Controls**
 - A. Improper pilot pressure
 - B. Defective proportional valve (see proportional valve manual)
 - Electrical Operated Controls**
 - A. Disconnected electric signal connection
2. Inspect Pump Control Valve for:
 - Manual Operated Controls**
 - A. Plugged control orifice
 - B. Damaged mounting gasket
 - C. Misadjusted, damaged or broken neutral return spring
 - D. Broken control connector pin
 - E. Broken or missing control linkage pin(s)
 - F. Worn, struck or bent control spool
 - Hydraulic Remote Controls**
 - A. Plugged control orifice
 - B. Damaged mounting gasket
 - C. Misadjusted, damaged or broken neutral return spring
 - D. Broken control connector pin
 - E. Broken or missing control linkage pin(s)
 - F. Worn, struck or bent control spool
 - G. Worn, or stuck hydraulic control pistons
 - Electrical Operated Controls**
 - A. Plugged control orifice
 - B. Damaged mounting gasket
 - C. Worn, stuck or bent control spool
 - D. Stuck solenoid valve(s)
 - E. Defective solenoid coil(s)
 - F. Misadjusted Potentiometer
 - G. Defective Potentiometer
 - H. Misadjusted speed sensor (on motor when used)
 - I. Defective speed sensor
 - J. Defective electronics module
3. Inspect Servo Piston for:
 - A. Improper servo piston adjustment
4. Inspect System Relief Valves for:
 - A. Improper pressure relief setting (consult owners/operator manual for system relief valve settings)
 - B. Valve poppet held off seat
 - C. Broken valve springs (2)
 - D. Broken valve stem
5. Inspect Shuttle Valve for:
 - A. Bent or broken return centering spring
 - B. Worn or stuck shuttle spool
 - C. Bent or broken shuttle spool
6. Inspect Charge Check Valves for:
 - A. Valve held off seat
 - B. Broken valve spring
7. Check Oil Level in Reservoir:
 - A. Consult owner/operators manual for the proper type fluid and level
8. Inspect Heat Exchanger for:
 - A. Obstructed air flow (air cooled)
 - B. Obstructed water flow (water cooled)
 - C. Improper plumbing (inlet to outlet)
 - D. Obstructed or insufficient fluid flow
 - E. Cooling fan failure (if used)
9. Inspect Heat Exchanger By-Pass Valve for:
 - A. Improper pressure setting
 - B. Stuck or broken valve

Hydraulic Fluid Recommendations

Introduction

The ability of Eaton hydrostatic components to provide the desired performance and life expectancy depends largely on the fluid used. The purpose of this document is to provide readers with the knowledge required to select the appropriate fluids for use in systems that employ Eaton hydrostatic components.

One of the most important characteristics to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements for Eaton's Heavy Duty Hydrostatic product line are specified later in this document.

Viscosity and Temperature

Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydrostatic system. Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where the cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydrostatic system was designed. In actual applications this sequence varies; hydrostatic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature. Equipment manufacturers who use Eaton hydrostatic components in their products should anticipate temperature in their designs and make the appropriate fluid recommendations to their customers.

Cleanliness

Cleanliness of the fluid in a hydrostatic system is extremely important. Eaton recommends that the fluid used in its hydrostatic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 μm and a maximum of 80 particles per milliliter greater than 15 μm . When components with different cleanliness requirements are used in the same system, the cleanest standard should be applied. OEM's and distributors who use Eaton hydrostatic components in their products should provide for these requirements in their designs. A reputable filter supplier can supply filter information.

Fluid Maintenance

Maintaining correct fluid viscosity and cleanliness level is essential for all hydrostatic systems. Since Eaton hydrostatic components are used in a wide variety of applications it is impossible for Eaton to publish a fluid maintenance schedule that would cover every situation. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. OEM's and distributors who use Eaton hydrostatic components should test and establish fluid maintenance schedules for their products. These maintenance schedules should be designed to meet the viscosity and cleanliness requirements laid out in this document.

Fluid Selection

Premium grade petroleum based hydraulic fluids will provide the best performance in Eaton hydrostatic components. These fluids typically contain additives that are beneficial to hydrostatic systems. Eaton recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors. Premium grade petroleum based hydraulic fluids carry an ISO VG rating.

SAE grade crankcase oils may be used in systems that employ Eaton hydrostatic components, but it should be noted that these oils may not contain all of the recommended additives. This means using crankcase oils may increase fluid maintenance requirements.

Hydraulic fluids that contain V.I. (viscosity index) improvers, sometimes called multi-viscosity oils, may be used in systems that employ Eaton hydrostatic components. These V.I. improved fluids are known to "shear-down" with use. This means that their actual viscosity drops below the rated value. Fluid maintenance must be increased if V.I. improved fluids are used. Automotive automatic transmission fluids contain V.I. improvers.

Synthetic fluids may be used in Eaton hydrostatic components. A reputable fluid supplier can provide information on synthetic fluids. Review applications that require the use of synthetic fluids with your Eaton representative.

Hydraulic Fluid Recommendations (Cont.)

Viscosity and Cleanliness Guidelines

Product Line	Minimum	Optimum Range	Maximum	ISO Cleanliness Requirements	Comments
Heavy Duty Piston Pumps and Motors	10cSt [60 SUS]	16 - 39 cSt [80 - 180 SUS]	2158 cSt [10,000 SUS]	18/13	

Additional Notes:

- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups. Thick oil can cause high case pressures which in turn cause shaft seal problems.
- If the natural color of the fluid has become black it is possible that an overheating problem exists.
- If the fluid becomes milky, water contamination may be a problem.
- Take fluid level reading when the system is cold.
- Contact your Eaton representative if you have specific questions about the fluid requirements of Eaton hydrostatic components.

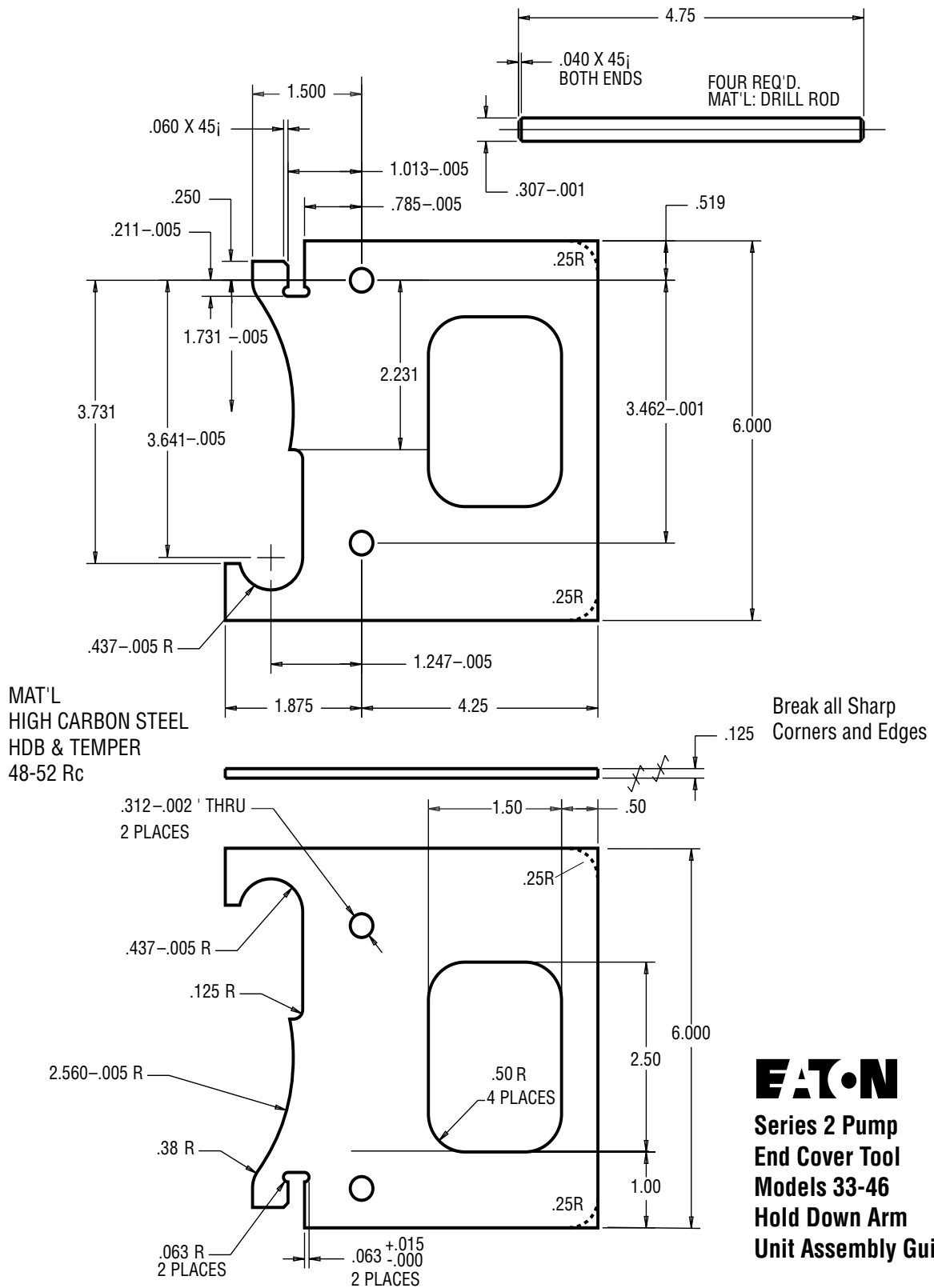
Biodegradable Oil (Vegetable) Guidelines

Product Line	Rating With Biodegradable Oil	Comments
Heavy Duty Piston Pumps and Motors	80% of normal pressure rating listed for mineral oils.	82° C (180° F) max fluid temp (unit) 71° C (160° F) max fluid temp (reservoir)

Additional Notes:

- Viscosity and ISO cleanliness requirements must be maintained as outlined on page 14.
- Based on limited product testing to date, no reduction in unit life is expected when operating at the pressure ratings indicated above.
- Vegetable oil is miscible with mineral oil. However, only the vegetable oil content is biodegradable. Systems being converted from mineral oil to vegetable oil should be repeatedly flushed with vegetable oil to ensure 100% biodegradability.
- Specific vegetable oil products may provide normal unit life when operating at pressure ratings higher than those indicated above.

Special Tools – Series 2 Variable Displacement Pump



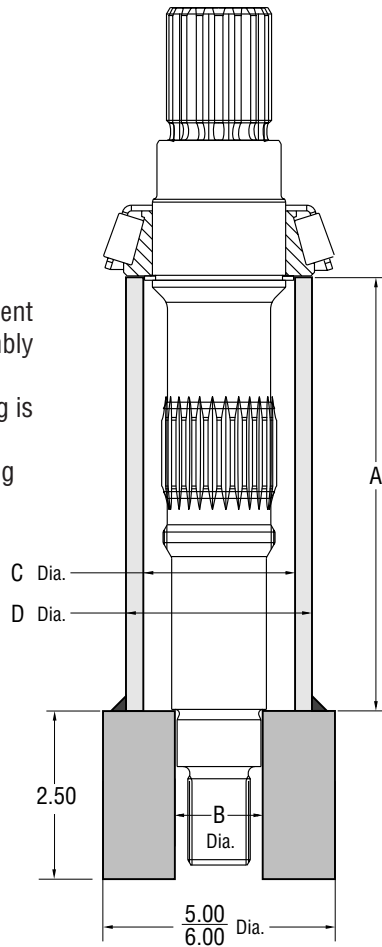
EATON
 Series 2 Pump
 End Cover Tool
 Models 33-46
 Hold Down Arm
 Unit Assembly Guide

FH00-1754

Special Tools – Series 2 Variable Displacement Pump

Main Shaft Bearing Stop Limit Tool

It is recommended that replacement shafts be purchased as an assembly with the bearing already pressed into place. In the event a bearing is replaced in the field it must be pressed into place to the following dimensions, in order prevent damage to the pump.



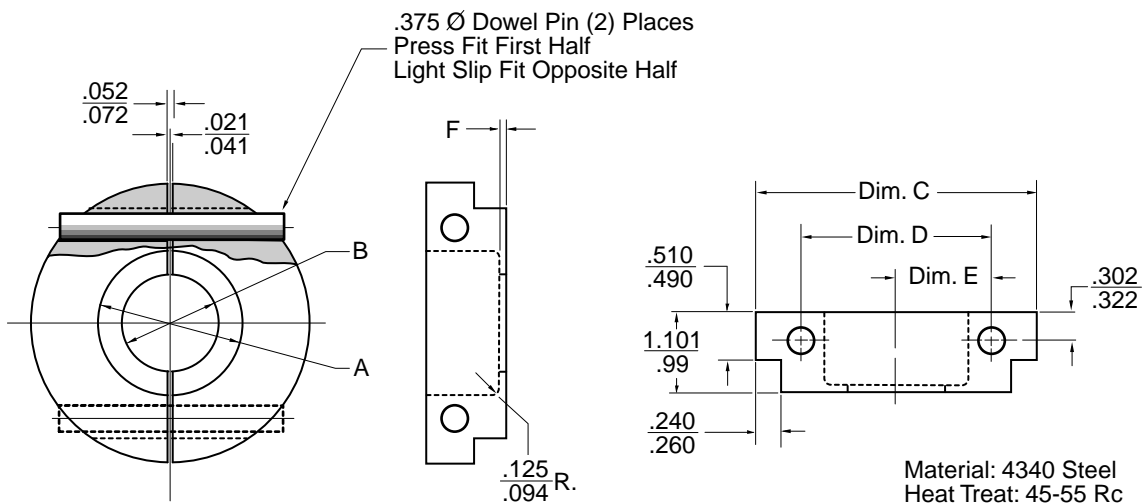
	Model	
	33,39,46	54,64
A ± .001	6.113	6.692
B ± .030	1.31	1.37
C ± .030	2.18	2.32
D	3.00 min.	3.00 min.

Material – Steel

(All dimensions are given in inches.)

Low Clearance Bearing Puller

Model	A	B	C	D	E
33,39,46	2.36/2.38	1.55/1.57	4.26/4.24	2.99\3.01	1.49/1.51
54,64	2.55/2.57	1.64/1.66	4.46/4.43	3.18/3.21	1.59/1.61



Model Code – Series 2 Variable Displacement Pump

The following 31-digit coding system has been developed to identify all of the configuration options for the Series 2 hydrostatic pump. Use this model code to specify a pump with the desired features. All 31-digits of the code must be present when ordering. You may want to photocopy the matrix below to ensure that each number is entered in the correct box.

Model Code—Heavy Duty Series 2 Pump																														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
A	C	L																				0								A

Position 1, 2, 3 Product Series

ACL Hydrostatic-Heavy Duty Variable Pump (Series II)

Position 4, 5, 6 Displacement

054 54 cm³/r [3.3 in³/r]

064 64 cm³/r [3.9 in³/r]

075 75 cm³/r [4.6 in³/r]

089 89 cm³/r [5.4 in³/r]

105 105 cm³/r [6.4 in³/r]

Position 7, 8 Input Shaft †

14 14 Tooth 12/24 Pitch Spline

21 21 Tooth 16/32 Pitch Spline

23 23 Tooth 16/32 Pitch Spline

† Ask your Eaton representative for additional shaft options

Position 9 Input Rotation

L Counterclockwise (Lefthand)

R Clockwise (Righthand)

Position 10 Valve Plate

0 V-groove

1 Propel

Position 11 Main Ports (Includes Gage Ports)

A 25,4 [1.00] - Code 61 Per SAE J518

B 25,4 [1.00] - Code 62 Per SAE J518

C 25,4 [1.00] - Code 61 with M10 X 1 Threaded Holes

D 25,4 [1.00] - Code 62 with M12 X 1.75 Threaded Holes

NOTE: You must choose relief valve settings for both ports A & B

0 None

B 205 bar [3000 lbf/in²]

C 240 bar [3500 lbf/in²]

D 275 bar [4000 lbf/in²]

E 310 bar [4500 lbf/in²]

F 345 bar [5000 lbf/in²]

G 380 bar [5500 lbf/in²]

H 415 bar [6000 lbf/in²]

L 430 bar [6250 lbf/in²]

Position 14 and 15 Press Override (POR) Setting Ports A & B

NOTE: You must choose pressure override settings for both ports A and B. The pressure override setting should be 35 bar less than the high pressure relief valve.

0 None

A Pressure Transducer (No pressure override valve)

B 205 bar [3000 lbf/in²]

C 240 bar [3500 lbf/in²]

D 275 bar [4000 lbf/in²]

E 310 bar [4500 lbf/in²]

F 345 bar [5000 lbf/in²]

G 380 bar [5500 lbf/in²]

M 395 bar [5725 lbf/in²]

H 415 bar [6000 lbf/in²]

Position 16,17 Special Pump Features

00 No Special Features

01 Plugged Magnetic Speed Sensor Port

02 Magnetic Speed Sensor

03 Adjustable Servo Stop (one direction)

Position 18,19 Control

EB CAN Multiplex Electronic Control

EE Electronic Proportional Control 12 Vdc and Electronic Driver with 1 to 5 Vdc Potentiometric Command Input

EF Electronic Proportional Control 24 Vdc and Electronic Driver with 1 to 5 Vdc Potentiometric Command Input

EG Electronic Proportional Control 12 Vdc and Electronic Driver with 4 to 20 mA Command Input

EH Electronic Proportional Control 24 Vdc and Electronic Driver with 4 to 20 mA Command Input

EJ Electronic Proportional Control 12 Vdc and Electronic Driver with +/- 5 Vdc Differential Command Input

EK Electronic Proportional Control 24 Vdc and Electronic Driver with +/- 5 Vdc Differential Command Input

- EL Electronic Proportional Control 12 Vdc and Electronic Driver with +/- 100 mA Command Input
- EM Electronic Proportional Control 24 Vdc and Electronic Driver with +/- 100 mA Command Input
- HA Hydraulic Remote Control with 5-15 bar control range
- MA Manual Displacement Control
- MB Manual Displacement Control (up to 24 Vdc) Normally Closed Neutral Lockout
- MC Manual Displacement Control with Neutral Detent
- ML Manual Displacement Control w/Wide Band Neutral.

Position 20* Control Orifice Supply (P)

Position 21* Control Orifice Servo (S₁)

Position 22* Control Orifice Servo (S₂)

- 0 None
- A 0,53 [.021] Diameter
- B 0,71 [.028] Diameter
- C 0,91 [.036] Diameter
- D 1,12 [.044] Diameter
- E 1,22 [.048] Diameter
- F 1,32 [.052] Diameter
- G 1,45 [.057] Diameter
- H 1,65 [.065] Diameter
- J 1,85 [.073] Diameter
- K 2,06 [.081] Diameter
- L 2,39 [.094] Diameter
- M 2,59 [.102] Diameter

* Eaton recommends you chose an orifice for control orifice supply (P). The servo orifice (S₁) and the servo orifice (S₂) are optional, except when specifying a pressure override.

Position 23 Control Special Features

- 0 No Control Special Features
- 3 Destroke valve

Position 24 Charge Pump Displacement

- 0 None
- 1 13,9 cm³/r [0.85 in³/r] (Pump Disp. 54-89 cm³/rev)
- 2 17,4 cm³/r [1.06 in³/r] (Pump Disp. 54-105 cm³/rev Std for 105)
- 3 21,0 cm³/r [1.28 in³/r] (Pump Disp. 54-105 cm³/rev)
- 4 27,9 cm³/r [1.70 in³/r] (Pump Disp. 54-105 cm³/rev)
- 5 34,7 cm³/r [2.12 in³/r] (Pump Disp. 89-105 cm³/rev)

Position 25 Auxiliary Mounting

- 0 None, High Speed Charge Pump (Models 54 to 75 cm³/rev)
- 1 None, High Torque Charge Pump (Models 54 to 105 cm³/rev)
- A A-pad, High Speed Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 9 Tooth 16/32 Pitch Spline (Available For 54-75 cm³/rev Only)
- B B-pad, High Speed Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 13 Tooth 16/32 Pitch Spline (Available For 54-75 cm³/rev Only)
- C A-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 9 Tooth 16/32 Pitch Spline (Available For All Models)
- D B-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 13 Tooth 16/32 Pitch Spline (Available For All Models)
- E B-B-pad, High Torque Charge Pump, Dual 2 Bolt Mount, No Shaft Seal, 15 Tooth 16/32 Pitch Spline (Available For All Models)
- F C-pad, High Torque Charge Pump, 4 Bolt Mount, No Shaft Seal, 14 Tooth 12/24 Pitch Spline (Available For All Models)

Position 26 Charge Pump Options

- 0 None
- A Remote Pressure Side Filter Ports

Position 27 Charge Pressure Relief Valve Setting

- 0 None
- A 21 bar [304.5 lbf/in²] - Standard
- B 22,5 bar [326.3 lbf/in²]
- C 24 bar [348 lbf/in²]
- D 25,5 bar [369.8 lbf/in²]
- E 27 bar [391.5 lbf/in²]
- F 28,5 bar [413.3 lbf/in²]
- G 30 bar [435 lbf/in²]

Position 28 Charge Pump Special Features

- 0 No Charge Pump Special Features

Position 29 Paint and Packaging

- 0 Painted Primer Blue (Standard)

Position 30 Identification On Unit

- 0 Standard

Position 31 Design Code

- A A

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