



Dual Path Mobile Pumps

Parts and Repair Manual

350 Series

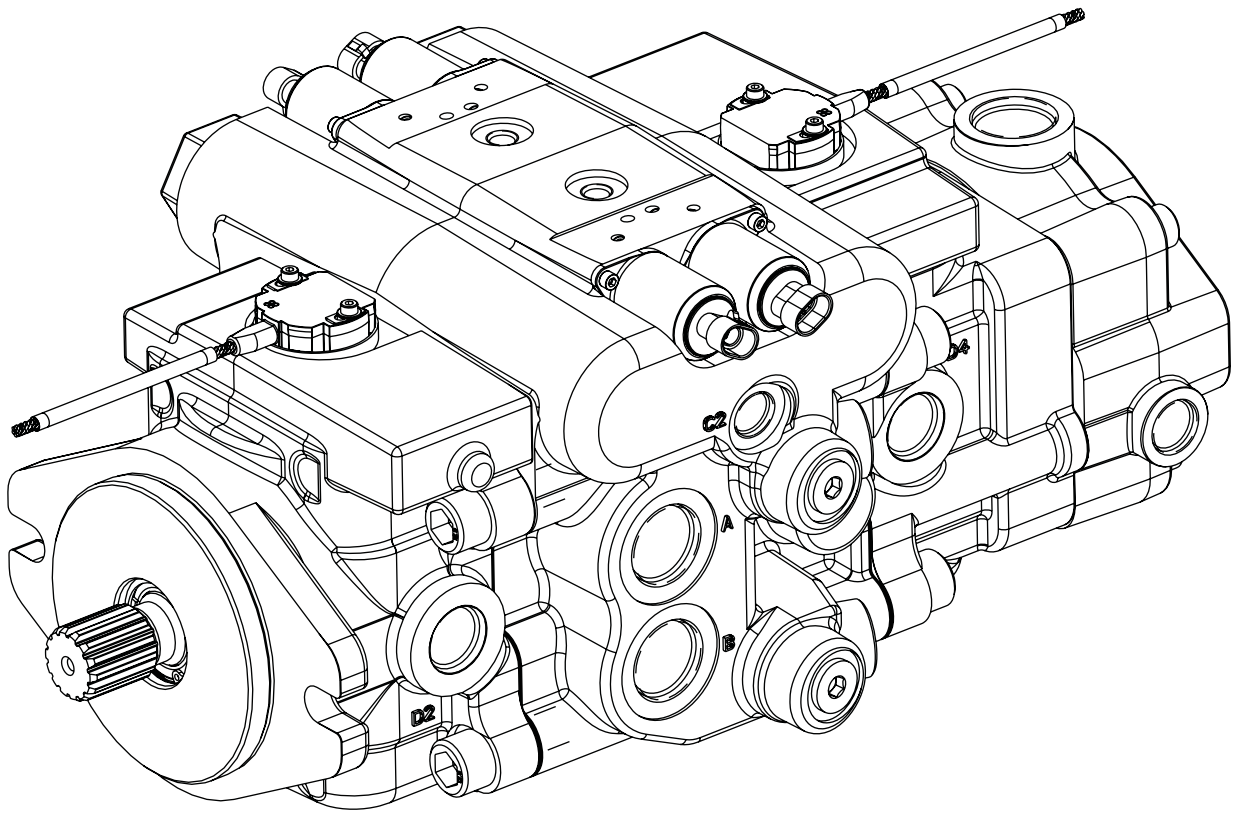


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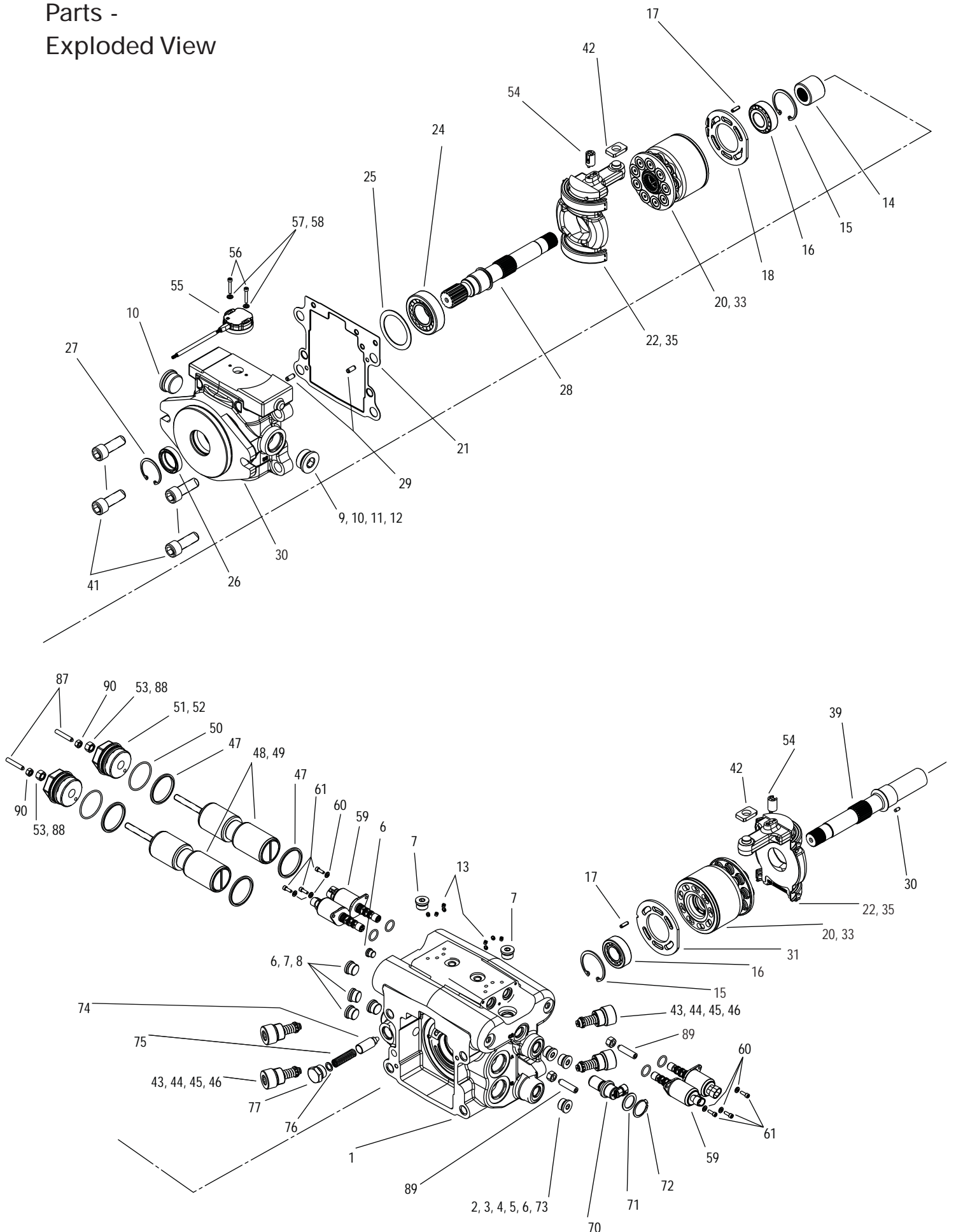
Introduction

This manual provides service information for the Eaton Model 350 Series Piston Pumps. Step-by-step instructions for the complete assembly of the pump are given. For dis-assembly, follow the reverse of the assembly instructions.

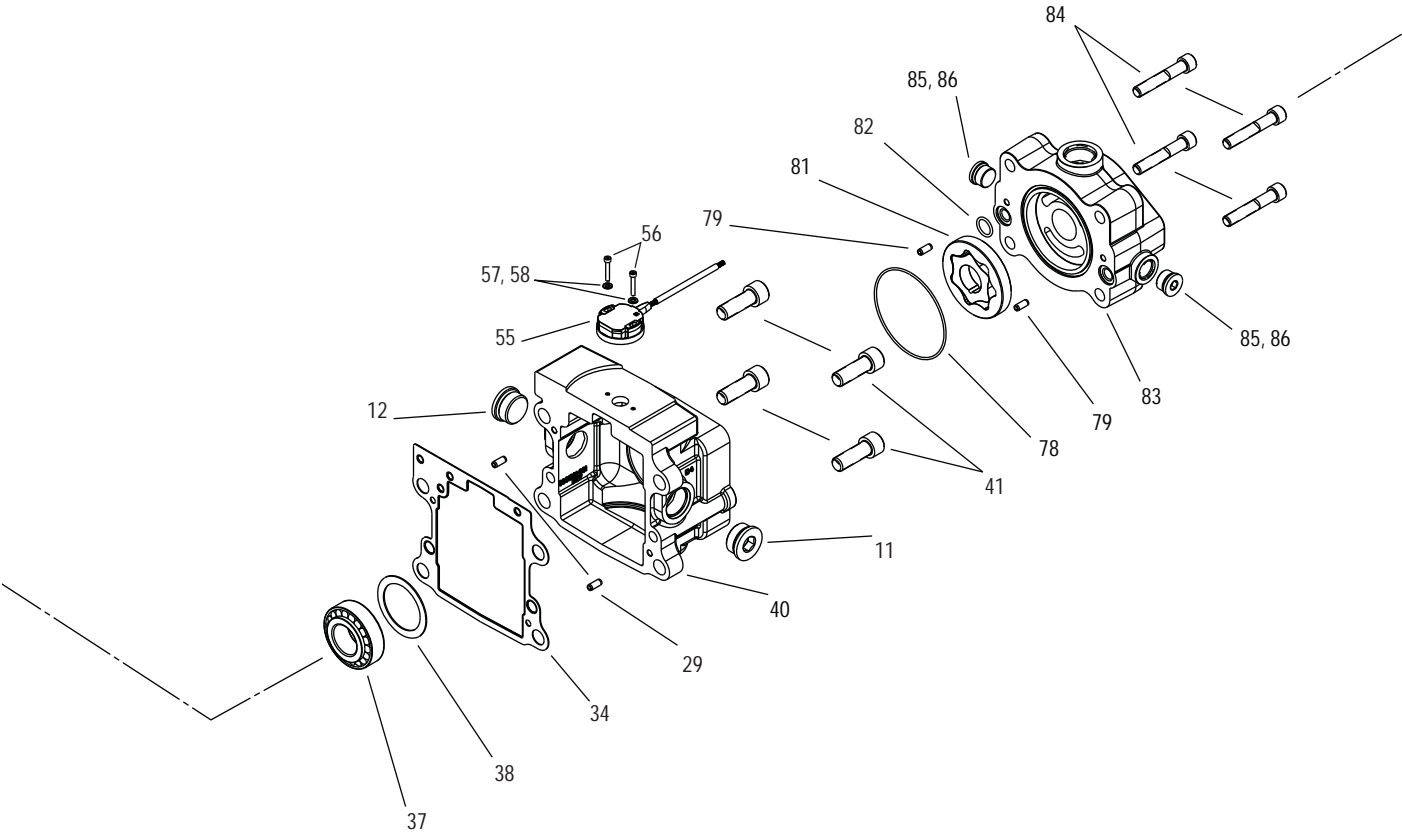
These recommendations should be followed to insure successful repairs.

- Remove the pump from the vehicle.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting 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.
- 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 (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat torquing sequence to make up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Parts - Exploded View



Parts -
Exploded View



Note: Investigating having this page fold out from page 3 so that Parts drawings are together

Parts List

ITEM #	QTY	PART #	DESCRIPTION
1	1	5989802-XXX*	Housing with Control Assembly HA, MA, MB, MC, MD, ME, MF and Main Ports A & B
1	1	5989803-XXX*	Housing with Control Assembly SA, SB, SC and Main Ports A & B
1	1	5989804-XXX*	Housing with Control Assembly HA, MA, MB, MC, MD, ME, MF and Main Port C
1	1	5989805-XXX*	Housing with Control Assembly SA, SB, SC and Main Port C
2-5	7	16103-308	Plug Assembly
6-8	3	16103-304	Plug Assembly
9-12	4	16103-316	Plug Assembly
13	8	472187	Plug Expander Type
14	1	5986543-001	Coupler
15	2	16077-033	Retaining Ring
16	2	5988198-001	Bearing, Taper
17	2	16026-610	Pin, Roll
18	1	5990287-001	Valve Plate, LH (2.50) - 41cc
	1	5990288-001	Valve Plate, RH (2.50) - 41cc
	1	5990289-001	Valve Plate, LH (3.00) - 49cc
	1	5990290-001	Valve Plate, RH (3.00) - 49cc
	1	5987231-001	Valve Plate, LH (3.80) - 62cc
	1	5986812-001	Valve Plate, RH (3.80) - 62cc
20	1	4999504-001	Rotating Kit LH (2.50) - 41cc
	1	5991532-001	Rotating Kit RH (2.50) - 41cc
	1	4999502-001	Rotating Kit LH (3.00) - 49cc
	1	5991530-001	Rotating Kit RH (3.00) - 49cc
	1	4999506-001	Rotating Kit LH (3.80) - 62cc
	1	5991720-001	Rotating Kit RH (3.80) - 62cc
21	1	5989712-001	Gasket, Flange
22	1	5990298-001	Swashplate Sub-assembly
24	1	5988197-001	Bearing, Taper
25	A/R	114746-XXX	Shim
26	1	4993012-003	Shaft Seal A, High Pressure Polyacrylate
	1	16253-020	Shaft Seal B, High Pressure Nitrile
27	1	16077-028	Ring, Retaining Internal
28	1	5987541-001	Drive Shaft - Front 4-Bolt C (14T)
	1	5989544-001	Drive Shaft - Front 2-Bolt C (14T)
	1	5991587-001	Drive Shaft - Front 2-Bolt B (Dia. 1.00 taper)
	1	5992243-001	Drive Shaft - Front 2-Bolt B (15T)
	1	5992425-001	Drive Shaft - Front 2-Bolt C (19T)
	1	5993096-001	Drive Shaft - Front 2-Bolt B (14T)
29	4	16026-810	Pin, Roll
30	1	5990395-XXX*	Flange, Front 4-Bolt C (Manual)
	1	5990396-XXX*	Flange, Front 4-Bolt C (Solenoid)
	1	5990398-XXX*	Flange, Front 2-Bolt C (Manual)
	1	5990399-XXX*	Flange, Front 2-Bolt C (Solenoid)
	1	5990095-XXX*	Flange, Front 2-Bolt B (Manual)
	1	5990096-XXX*	Flange, Front 2-Bolt B (Solenoid)
	1	5993095-XXX*	Flange, Front 2-Bolt B (HRC)
	1	5991841-XXX*	Flange, Front 2-Bolt C (HRC)
31	1	5990287-001	Valve Plate LH (2.50) - 41cc
	1	5990288-001	Valve Plate RH (2.50) - 41cc
	1	5990289-001	Valve Plate LH (3.00) - 49cc
	1	5990290-001	Valve Plate RH (3.00) - 49cc
	1	5987231-001	Valve Plate LH (3.80) - 62cc
	1	5986812-001	Valve Plate RH (3.80) - 62cc

* Reference individual assembly parts lists for further detail.

A/R - as required

Parts List

ITEM #	QTY	PART #	DESCRIPTION
33	1	4999504-001	Rotating Kit LH (2.50) - 41cc
	1	5991532-001	Rotating Kit RH (2.50) - 41cc
	1	4999502-001	Rotating Kit LH (3.00) - 49cc
	1	5991530-001	Rotating Kit RH (3.00) - 49cc
	1	4999506-001	Rotating Kit LH (3.80) - 62cc
	1	5991720-001	Rotating Kit RH (3.80) - 62cc
34	1	5989712-001	Gasket, Flange
35	1	5990298-001	Swashplate Sub-Assembly
37	1	5988197-001	Bearing, Taper
38	A/R	114746-001	Shim
39	1	5987349-001	Drive Shaft - Rear (15T w/ Charge Pumps 1, 2)
	1	5987349-002	Drive Shaft - Rear (15T w/ Charge Pumps 3, 4)
	1	5989545-001	Drive Shaft - Rear (15T w/o Charge Pump)
	1	5991280-001	Drive Shaft - Rear (13T w/ Charge Pumps 1, 2)
	1	5991280-002	Drive Shaft - Rear (13T w/ Charge Pumps 3, 4)
	1	5991466-001	Drive Shaft - Rear (13T w/o Charge Pump)
	1	5992244-001	Drive Shaft - Rear (11T w/o Charge Pump)
40	1	5990401-XXX*	Flange, Rear 2-Bolt B (Manual)
	1	5990402-XXX*	Flange, Rear 2-Bolt B (Solenoid)
	1	5991202-XXX*	Flange, Rear Charge Pump (Manual)
	1	5991203-XXX*	Flange, Rear Charge Pump (Solenoid)
	1	5992240-XXX*	Flange, Rear 2-Bolt A (Manual)
	1	5992241-XXX*	Flange, Rear 2-Bolt A (Solenoid)
	1	5991842-XXX*	Flange, Rear Charge Pump (HRC)
	1	5992242-XXX*	Flange, Rear 2-Bolt A (HRC)
	1	5996777-XXX*	Flange, Rear 2-Bolt B (HRC)
41	8	114978-045	Screw, Cap, Hex Socket Head
42	2	4999637-001	Follower, Servo Piston
43-46	1	110700-XXX	Relief Valve Sub-assembly (reference page 13 for further detail)
47	4	5987241-001	Piston Ring
48	1	5989959-001	Servo Piston Sub-assembly (Used with Controls: MA, MB, MC, MD, MF, SA, SB, SC)
	1	5989958-001	Servo Piston Sub-assembly (Used with Control: HA)
49	1	5989959-001	Servo Piston Sub-assembly (Used with Controls: MA, MB, MC, MD, MF, SA, SB, SC)
	1	5989958-001	Servo Piston Sub-assembly (Used with Control: HA)
50	2	16015-34	O-Ring
51	1	5989898-001	Servo Cap Plug
	1	5991129-001	Servo Cap Plug
52	1	5989898-001	Servo Cap Plug
	1	5991129-001	Servo Cap Plug
53	2	5996839-001	Nut, Sealing
54	2	5990203-001	Magnet Carrier
55	2	5990202-001	Feedback Sensor (SB) - Control
	2	5990202-002	Feedback Sensor (SA) - Control
56	4	5996053-002	Screw
57	4	4994180-016	Washer
58	4	16133-208	O-Ring
59	4	5991234-001	Proportional Flow Regulator (SA Control)
60	6	95897-008	Washer
61	6	16147-204	Screw, Cap, Hex Socket Head
62	2	4999960-001	Feedback Control Link
63	2	5987239-001	Gasket

* Reference individual assembly parts lists for further detail.

A/R - as required

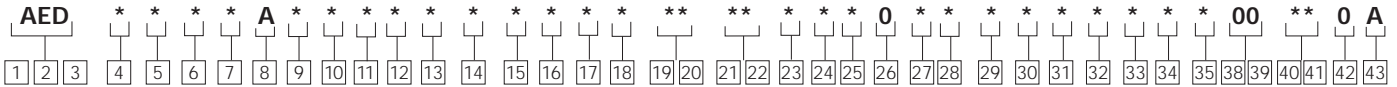
Parts List

ITEM #	QTY	PART #	DESCRIPTION
64	1	5986768-XXX*	Control Valve Sub-assembly
65	1	5986768-XXX*	Control Valve Sub-assembly
66	12	114975-025	Screw, Cap, Hex Socket Head
67	2	95729-000	Control Lever
68	2	16045-205	Lockwasher
69	2	16021-5	Nut
70	1	4995422-001	Magnetic Speed Sensor
71	1	16048-077	Washer
72	1	16160-125	Retaining Ring, Inverted Internal
73	1	16103-308	Plug Sub-assembly
74	1	4998532-001	Poppet
75	1	4998533-001	Spring, Compression
76	A/R	16048-597	Shim
77	1	72400-659	Plug Sub-assembly
78	1	16015-055	O-Ring
79	2	16026-810	Pin, Roll
80	1	101305-000	Charge Pump Drive Pin
81	1	5987263-XXX*	Gerotor Sub-assembly
82	2	16003-013	O-Ring
83	1	5991128-XXX*	Charge Pump Adapter (RH Rotation)
	1	5991230-XXX*	Charge Pump Adapter (LH Rotation)
84	4	114977-070	Screw, Cap, Hex Socket Head
85, 86	1	16103-310	Plug Sub-assembly
87	2	16139-644	Set Screw
88	2	5996839-001	Nut, Sealing
89	2	16139-444	Set Screw
90	2	5996838-001	Nut, Sealing
91	1	5991133-001	Actuator, Bypass Valve - Main Ports A, B, D, E
92	2	5991131-001	Actuator, Bypass Valve - Main Ports C, F

* Reference individual assembly parts lists for further detail.

A/R - as required

Model Code



1 2 3 Code Title

AED – Dual Servo Controlled Variable Displacement Axial Piston Pump

4 Displacement & Rotating Kit- Front

1 – 41.0 cm³/r [2.50 in³/r]
2 – 49.2 cm³/r [3.00 in³/r]
3 – 62.3 cm³/r [3.80 in³/r]
4 – 35.0 cm³/r [2.10in³/r]
 Destroyed from -
 41.0 cm³/r [2.50 in³/r]
5 – 45.0 cm³/r [2.75 in³/r]
 Destroyed FROM -
 49.2 cm³/r [3.00 in³/r]
6 – 54.0 cm³/r [3.30 in³/r]
 Destroyed FROM -
 62.3 cm³/r [3.80 in³/r]

5 Input Shaft Rotation

L – Left hand rotation (CCW)
R – Right hand rotation (CW)

6 Front Mounting

A – 2 Bolt C (SAE J744-127-2)
B – 4 Bolt C (SAE J744-127-4)
C – 2 Bolt B (SAE J744-101-2)

7 Input Shaft

A – Taper shaft 1.0 dia 1.5 taper
B – 14 Tooth 12/24 Pitch Spline Shaft
C –15 Tooth 16/32 Pitch Spline Shaft
D –19 Tooth 16/32 Pitch Spline Shaft

8 Valve Plate - Front

A – Type 1- Standard

9 Relief Setting for Front Main Port A - Front

0 – None, no relief valve or check valve
A – Check valve only
J – 207 bar [3000 lbf/in²]
K – 224 bar [3250 lbf/in²]
L – 241 bar [3500 lbf/in²]
M – 259 bar [3750 lbf/in²]
N – 280 bar [4000 lbf/in²]
R – 310 bar [4500 lbf/in²]
T – 345 bar [5000 lbf/in²]
U – 362 bar [5250 lbf/in²]
V – 380 bar [5500 lbf/in²]

10 Relief Setting for Front Main Port B - Front

0 – None, no relief valve or check valve
A – Check valve only
J – 207 bar [3000 lbf/in²]
K – 224 bar [3250 lbf/in²]
L – 241 bar [3500 lbf/in²]
M – 259 bar [3750 lbf/in²]
N – 280 bar [4000 lbf/in²]
R – 310 bar [4500 lbf/in²]
T – 345 bar [5000 lbf/in²]
U – 362 bar [5250 lbf/in²]
V – 380 bar [5500 lbf/in²]

11 Displacement & Rotating Kit - Rear

1 – 41.0 cm³/r [2.50 in³/r]
2 – 49.2 cm³/r [3.00 in³/r]
3 – 62.3 cm³/r [3.80 in³/r]
4 – 35.0 cm³/r [2.10in³/r]
 Destroyed from -
 41.0 cm³/r [2.50 in³/r]
5 – 45.0 cm³/r [2.75 in³/r]
 Destroyed FROM -
 49.2 cm³/r [3.00 in³/r]
6 – 54.0 cm³/r [3.30 in³/r]
 Destroyed FROM -
 62.3 cm³/r [3.80 in³/r]

12 Valve Plate - Rear

A – Type 1- Standard

13 Relief Setting For Front Main Port A - Rear

Ref Position 9 for options

14 Relief Setting For Front Main Port B - Rear

Ref Position 10 for options

15 Charge Pump

0 – No Charge Pump
1 – 13.9 cm³/r [.85in³/r], 1.3125-12 UN-2B SAE O-Ring Suction Inlet Port (S)
2 – 17.4 cm³/r [1.06 in³/r], 1.3125-12 UN-2B SAE O-Ring Suction Inlet Port (S)
3 – 21.0 cm³/r [1.28 in³/r], 1.3125-12 UN-2B SAE O-Ring Suction Inlet Port (S)
4 – 23.1 cm³/r [1.41 in³/r], 1.3125-12 UN-2B SAE O-Ring Port for Suction Inlet (S)

16 Charge Relief Setting

0 – No Charge Relief Setting
1 – 172 - 20.7 bar [250-300 lbf/in²] Relieved to Case
2 – 20.7 - 24.1 bar [300-350 lbf/in²] Relieved to Case
3 – 24.1 - 27.6 bar [350-400 lbf/in²] Relieved to Case
4 – 27.6 - 31 bar [400-450 lbf/in²] Relieved to Case
5 – 13.8 - 17.2 bar [400-450 lbf/in²] Relieved to Case

17 Charge Port Location

0 – None
1 – Inlet Right Side C2 (Only with Main Ports opposite side)
2 – Inlet Left Side C1
3 – Inlet Bottom C3 (Only with Main Ports Same Side, No Bypass Valve)

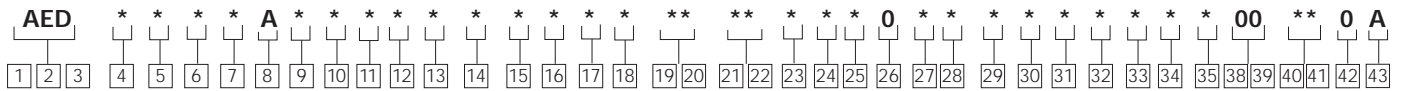
18 Auxiliary (Rear) Mount & Output Shaft

A – 2 Bolt B (SAE J744-101-2) Accepts 13T, 16/32 Pitch Spline
B – 2 Bolt B (SAE J744-101-2) Accepts 15T, 16/32 Pitch Spline
C – 2 Bolt A (SAE J744- 82-2) Accepts 11T, 16/32 Pitch Spline
D – 2 Bolt A (SAE J744-82-2) Accepts 9T, 16/32 Pitch Spline

19 20 Control Assembly - Front

SA – Solenoid Control - 12 Volt With Non-Contact Feedback Sensor with Metri-Pak Electrical Connectors
SB – Solenoid Control - 12 Volt
SC – Solenoid Control - 12 Volt
HA – Hydraulic Remote - Non Feedback, 5-15 bar [72-217 lbf/in²] Pilot Pressure
MA – Manual Control, Wide Band Neutral
MB – Manual Control, Standard
MC – Manual Control, High Gain
MD – Manual Control, Wide Band Neutral, Neutral Lockout switch
ME – Manual Control, Standard, Neutral Lockout switch
MF – Manual Control, High Gain, Neutral Lockout switch

Model Code



21 22 Control Assembly - Rear

SA – Solenoid Control - 12 Volt with Non-Contact Feedback Sensor
SB – Solenoid Control - 12 Volt with Redundant Non-Contact Feedback Sensor
SC – Solenoid Control - 12 Volt
HA – Hydraulic Remote - Non Feedback, 5-15 bar [72-217 lbf/in²] Pilot Pressure
MA – Manual Control, Wide Band Neutral
MB – Manual Control, Standard
MC – Manual Control, High Gain
MD – Manual Control, Wide Band Neutral, Neutral Lockout switch
ME – Manual Control, Standard, Neutral Lockout switch
MF – Manual Control, High Gain, Neutral Lockout Switch

23 Destroke Valve - Front

0 – Not required
1 – Destroke With 12 VDC Coil & Weather Pack Connector
2 – Destroke With 24 VDC Coil & Weather Pack Connector
3 – 12 VDC Coil & DIN 43650-A Connector
4 – Destroke with 24 VDC Coil & DIN 43650-A Connector

24 Control Supply Orifice (p) - Front

0 – No control, supply orifice
B – Diameter 0.71 [.028]
C – Diameter 0.91 [.036]
D – Diameter 1.12 [.044]
E – Diameter 1.32 [.052]

25 Control Servo Orifice (s1 and s2) - Front

0 – No control, servo orifice
B – Diameter 0.71 [.028]
C – Diameter 0.91 [.036]
D – Diameter 1.12 [.044]
E – Diameter 1.32 [.052]

26 Special Control Options - Front

0 – No Special Control Options
1 – Manual Control Lever

27 Destroke Valve - Rear

Ref Position 23 for options

28 Control Supply Orifice (p) - Rear

Ref Position 24 for options

29 Control Servo Orifice (s1 and s2) - Rear

Ref Position 25 for options

30 Special Control Options - Rear

0 – No Special Control Options
1 – Manual Control Lever
2 – Control Pressure EPRV Valve 12 VDC, Deutsch, -4 SAE O-Ring Port

31 Main Ports (A and B)

A – 4X 1.3125-12 UN-2B SAE O-Ring Ports; Same Side, Right
B – 4X 1.3125-12 UN-2B SAE O-Ring Ports; Same Side, Left
C – 4X 1.3125-12 UN-2B SAE O-Ring Ports; Opposite Side
D – 4X -16 STC TYPE II+ Direct Port; Same Side, Right
E – 4X -16 STC TYPE II+ Direct Port; Same Side, Left
F – 4X -16 STC TYPE II+ Direct Port; Opposite Side

32 Drain Port Size and Location - Front

0 – No Drain Port
1 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D1)
2 – 1.0625 -12 UN-2B SAE O-Ring Port - Right (D2)
3 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D1) and Right (D2)
4 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D1) and Right (D2), Left Side Plugged
5 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D1) and Right (D2), Right Side Plugged

33 Drain Port Size and Location - Rear

0 – No Drain Port
1 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D3)
2 – 1.0625 -12 UN-2B SAE O-Ring Port - Right (D4)
3 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D3) and Right (D4)
4 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D3) and Right (D4), Left Side Plugged
5 – 1.0625 -12 UN-2B SAE O-Ring Port - Left (D3) and Right (D4), Right Side Plugged

34 Auxiliary Port

0 – No Auxiliary Port
A – .750-16 UNF-2B SAE O-Ring Port - Left (C1) and Right (C2), Left Side Plugged
B – .750-16 UNF-2B SAE O-Ring Port - Left (C1) and Right (C2), Right Side Plugged
C – .750-16 UNF-2B SAE O-Ring Port - Left (C1) and Right (C2)
D – .750-16 UNF-2B SAE O-Ring Port - Left (C1) and Right (C2), Left Side Plugged, Remote Filter, Return from Filter to Charge Port Required

(continued from previous column)

E – .750-16 UNF-2B SAE O-Ring Port - Left (C1) and Right (C2), Right Side Plugged, Remote Filter, Return from Filter to Charge Port Required

35 Bypass Valve

0 – No Bypass Valve
A – With Bypass Valve

36 Sensor Options

0 – No Sensor
A – Magnetic Speed Sensor

37 Shaft Seal

A – Polyacrylate
B – Nitrile
C – Viton

38 39 Special Features

00 – No Special Features
AA – Diagnostic Ports - Front Pump 2X .3125-24 SAE O-Ring Ports (s1 & s2), Rear Pump 2X .3125-24 SAE O-Ring Ports (s1 & s2)
AB – Externally Adjustable Displacement Limiters
AC – Diagnostic Ports - Front Pump 2X .3125-24 SAE O-Ring Ports (s1 & s2), Rear Pump 2X .3125-24 SAE O-Ring Ports (s1 & s2), Externally Adjustable Displacement Limiters

40 41 Paint

0A – Primer Red
0B – Primer Black
CD – Primer Blue

42 Identification

A – Standard

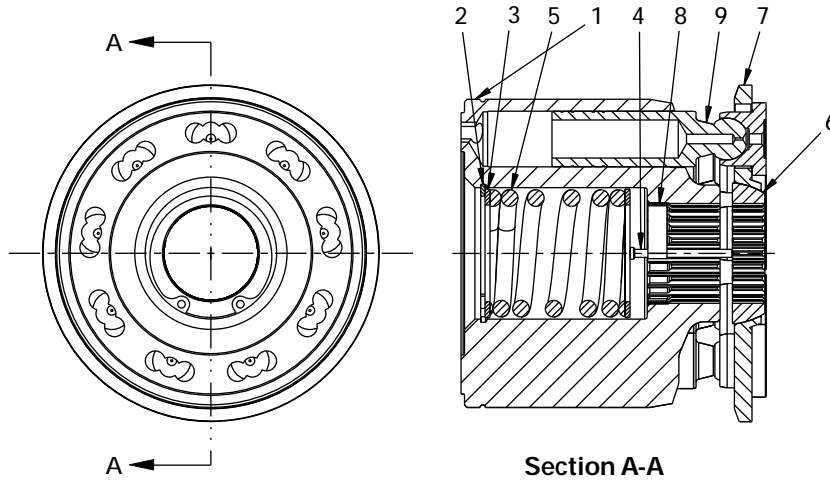
43 Design Code

A –

(#34 continues next column)

Item 20, 33 - Rotating Kit Assembly

Displacement 2.5 cid (41 cc)



Item 20, 33 Rotating Kit Assembly

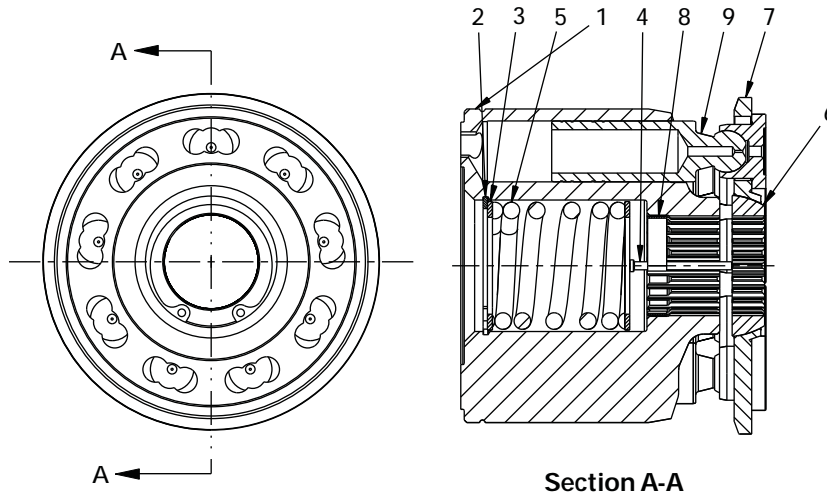
REF	PART NO.	QTY.	DESCRIPTION
	4999504-001	1	Rotating Kit Sub-Assembly
1	NSS	1	Cylinder Barrel
2	NSS	1	Internal Retaining Ring
3	NSS	2	Washer
4	NSS	3	Loading Pin
5	NSS	1	Spring
6	NSS	1	Pivot
7	NSS	1	Shoe Retainer
8	NSS	1	Load Pin Keeper
9	NSS	9	Piston Sub-Assembly

* 5991532-001 Rotating Kit S/A set up for Speed Sensor.

NSS - Not Sold Separately

Item 20, 33 - Rotating Kit Assembly

Displacement 3.0 cid (49 cc)



Item 20, 33 Rotating Kit Assembly

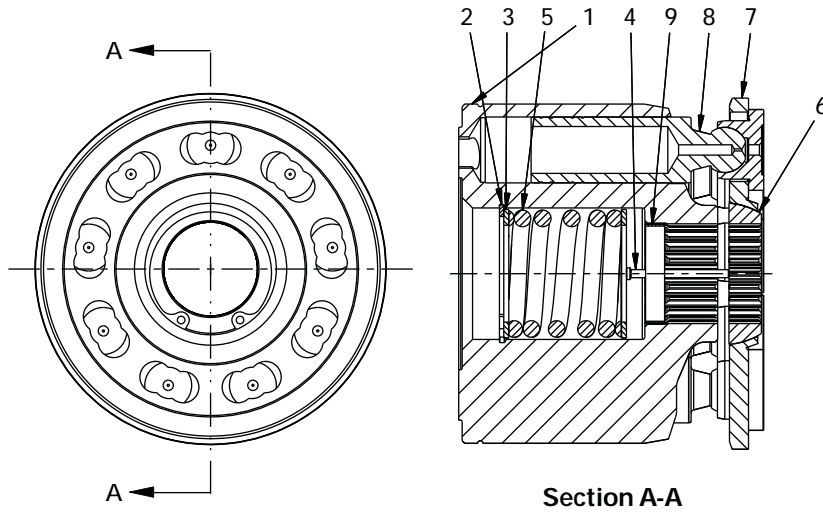
REF	PART NO.	QTY.	DESCRIPTION
	4999502-001	1	Rotating Kit Assembly
1	NSS	1	Cylinder Barrel
2	NSS	1	Internal Retaining Ring
3	NSS	2	Washer
4	NSS	3	Loading Pin
5	NSS	1	Spring
6	NSS	1	Pivot
7	NSS	1	Shoe Retainer
8	NSS	1	Load Pin Keeper
9	NSS	9	Piston Sub-Assembly

* 5991530-001 Rotating Kit S/A set up for Speed Sensor.

NSS - Not Sold Separately

Item 20, 33 - Rotating Kit Assembly

Displacement 3.8 cid (62 cc)



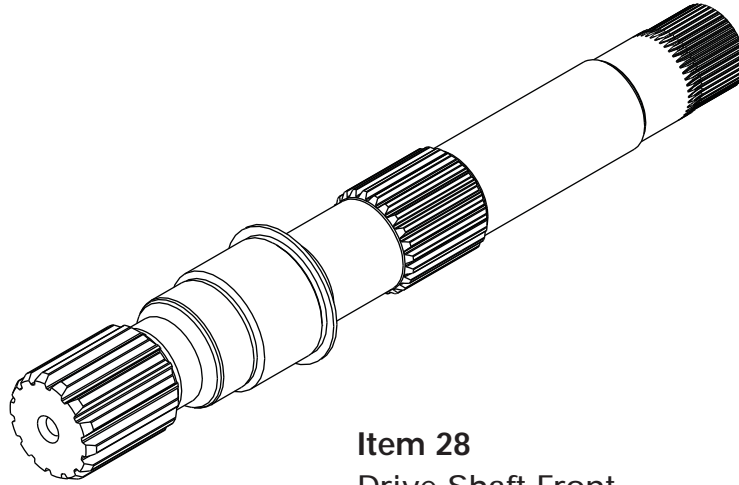
Item 20, 33 Rotating Kit Assembly

REF	PART NO.	QTY.	DESCRIPTION
	4999506-001	1	Rotating Kit Sub-Assembly
1	NSS	1	Cylinder Barrel
2	NSS	1	Internal Retaining Ring
3	NSS	2	Washer
4	NSS	3	Loading Pin
5	NSS	1	Spring
6	NSS	1	Pivot
7	NSS	1	Shoe Retainer
8	NSS	1	Load Pin Keeper
9	NSS	9	Piston Sub-Assembly

* 5991720-001 Rotating Kit S/A set up for Speed Sensor.

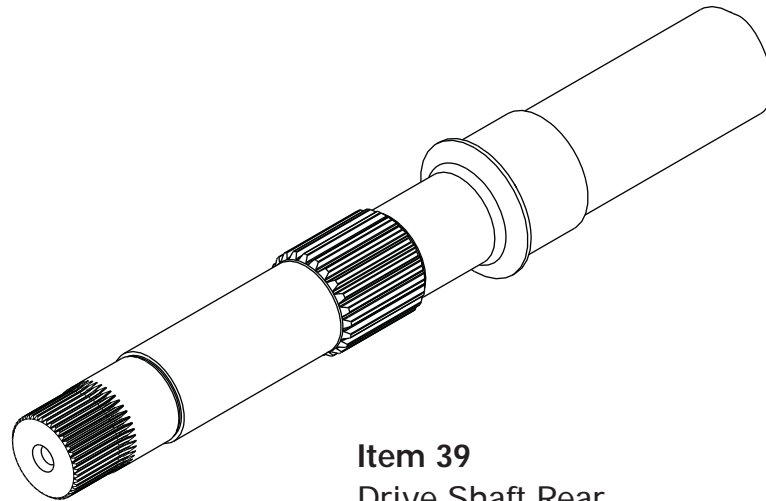
NSS - Not Sold Separately

Item 28, 39 - Drive Shafts



Item 28
Drive Shaft Front

PART NO.	DESCRIPTION
5987541-001	Drive Shaft - Front 4-Bolt C (14T)
5989544-001	Drive Shaft - Front 2-Bolt C (14T)
5991587-001	Drive Shaft - Front 2-Bolt B (Dia 1.00 taper)
5992243-001	Drive Shaft - Front 2-Bolt B (15T)
5992425-001	Drive Shaft - Front 2-Bolt C (19T)
5993096-001	Drive Shaft - Front 2-Bolt B (14T)



Item 39
Drive Shaft Rear

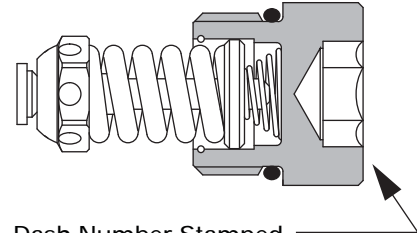
PART NO.	DESCRIPTION
5987349-001	Drive Shaft - Rear (15T w/Charge Pump)
5987349-002	Drive Shaft - Rear (15T w/Charge Pump)
5989545-001	Drive Shaft - Rear (15T w/o Charge Pump)
5991280-001	Drive Shaft - Rear (13T w/Charge Pump)
5991280-002	Drive Shaft - Rear (13T w/Charge Pump)
5991466-001	Drive Shaft - Rear (13T w/o Charge Pump)
5992244-001	Drive Shaft - Rear (11T w/o Charge Pump)

Item 43, 44, 45, 46 - Relief Valve Sub-Assembly

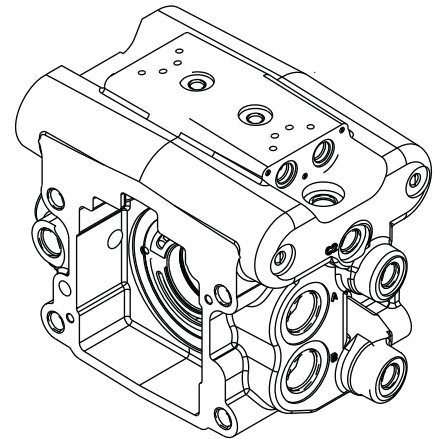
Item 1 - Housing Identification

Item 43, 44, 45, 46 Relief Valve Sub-Assembly

PART NO.	BAR [PSI]	PART NO.	BAR [PSI]
110700-150	103 [1500]	110700-350	241 [3500]
110700-175	121 [1750]	110700-375	259 [3750]
110700-200	138 [2000]	110700-400	276 [4000]
110700-225	155 [2250]	110700-425	293 [4250]
110700-250	172 [2500]	110700-450	310 [4500]
110700-275	190 [2750]	110700-475	328 [4750]
110700-300	207 [3000]	110700-500	345 [5000]
110700-325	224 [3250]	110700-550	380 [5500]



Dash Number Stamped here for Valve Pressure Setting Identification
Example: 500 x 10 = [5000 PSI] 345 bar

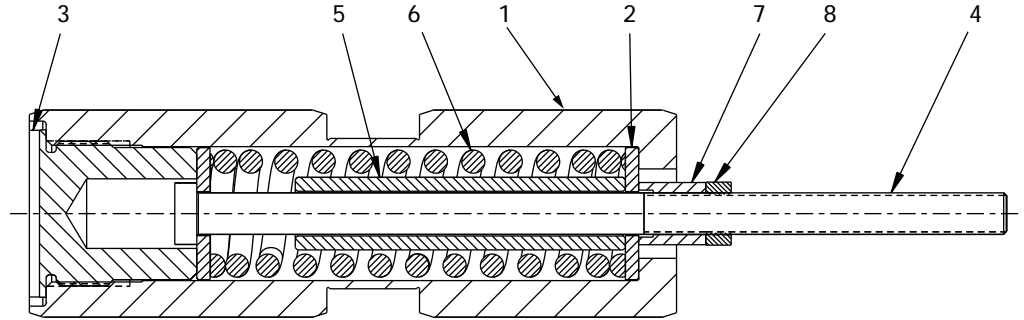


Item 1 Housing Identification

REF	PART NO.	QTY.	PUMP CONTROLS	MAIN PORTS	SPECIAL CONTROL OPTIONS
1	5989802-001 thru 5989802-016	1	HA,MA,MB,MC,MD,ME,MF	A - 4X 1.3125-12 UN-2B SAE, Same Side, Right B - 4X 1.3125-12 UN-2B SAE, Same Side, Left	
1	5989802-017 thru 5989802-032	1	HA,MA,MB,MC,MD,ME,MF	A - 4X 1.3125-12 UN-2B SAE, Same Side, Right B - 4X 1.3125-12 UN-2B SAE, Same Side, Left	Control Pressure EPRV Valve 12 VDC, Deutsch, -4 SAE O-Ring Port
1	5989803-001 thru 5989803-032	1	SA, SB, SC	A - 4X 1.3125-12 UN-2B SAE, Same Side, Right B - 4X 1.3125-12 UN-2B SAE, Same Side, Left	
1	5989804-001 thru 5989804-016	1	HA,MA,MB,MC,MD,ME,MF	C - 4X 1.3125-12 UN-2B SAE, Opposite Side	
1	5989804-017 thru 5989804-032	1	HA,MA,MB,MC,MD,ME,MF	C - 4X 1.3125-12 UN-2B SAE, Opposite Side	Control Pressure EPRV Valve, 12 VDC, Deutsch, -4 SAE O-Ring Port
1	5989805-001 thru 5989805-032	1	SA, SB, SC	C - 4X 1.3125-12 UN-2B SAE, Opposite Side	

Part number range is impacted by the addition of special features, special control options, sensor options, and pump controls. Please reference the pump assembly parts list for the exact housing part number.

Item 48, 49 - Servo Piston Assembly



Item 48, 49

Servo Piston Assembly - Used with
MA, MB, MC, MD, ME, SA, SB, SC Controls

REF	PART NO.	QTY.	DESCRIPTION
	5989958-001	1	Servo Piston Sub-Assembly
1	NSS	1	Servo Piston
2	NSS	2	Spring Retainer
3	NSS	1	Servo Piston Plug
4	NSS	1	Servo Piston Bolt
5	NSS	2	Spring Stop
6	NSS	1	Spring
7	NSS	1	Hex Nut
8	NSS	1	Thin Hex Nut

NSS - Not Sold Separately

Item 48, 49

Servo Piston Assembly - Used with
HA Control

REF	PART NO.	QTY.	DESCRIPTION
	5989959-001	1	Servo Piston Sub-Assembly
1	NSS	1	Servo Piston
2	NSS	2	Spring Retainer
3	NSS	1	Servo Piston Plug
4	NSS	1	Servo Piston Bolt
5	NSS	1	Spring
6	NSS	1	Spring
7	NSS	1	Hex Nut
8	NSS	1	Thin Hex Nut

NSS - Not Sold Separately

Item 64, 65

Index of Mechanical Servo Controllers – Control Valve Sub-Assembly

INDEX OF CONTROLLERS

Without Destroke Valve:

5986768-001	MA control: Manual Control, Wide Band Neutral
5986768-002	MB control: Manual Control, Standard
5986768-003	MC control: Manual Control, HIGH GAIN
5986768-004	MD control: Manual Control, Wide Band Neutral, Neutral Lockout Switch
5986768-005	ME control: Manual Control, Standard, Neutral Lockout Switch
5986768-006	MF control: Manual Control, High Gain, Neutral Lockout Switch

With Destroke Valve Option 1: Destroke with 12 VDC Coil & Weather Pack Connector

5986768-007	MA control: Manual Control, Wide Band Neutral
5986768-008	MB control: Manual Control, Standard
5986768-009	MC control: Manual Control, High Gain
5986768-015	MD control: Manual Control, Wide Band Neutral, Neutral Lockout Switch
5986768-016	ME control: Manual Control, Standard, Neutral Lockout Switch
5986768-017	MF control: Manual Control, High Gain, Neutral Lockout Switch

With Destroke Valve Option 2: Destroke with 24 VDC Coil & Weather Pack Connector

5986768-010	MA control: Manual Control, Wide Band Neutral
5986768-011	MB control: Manual Control, Standard
5986768-012	MC control: Manual Control, High Gain
5986768-019	MD control: Manual Control, Wide Band Neutral, Neutral Lockout Switch
5986768-020	ME control: Manual Control, Standard, Neutral Lockout Switch
5986768-021	MF control: Manual Control, High Gain, Neutral Lockout Switch

INDEX OF CONTROLLERS

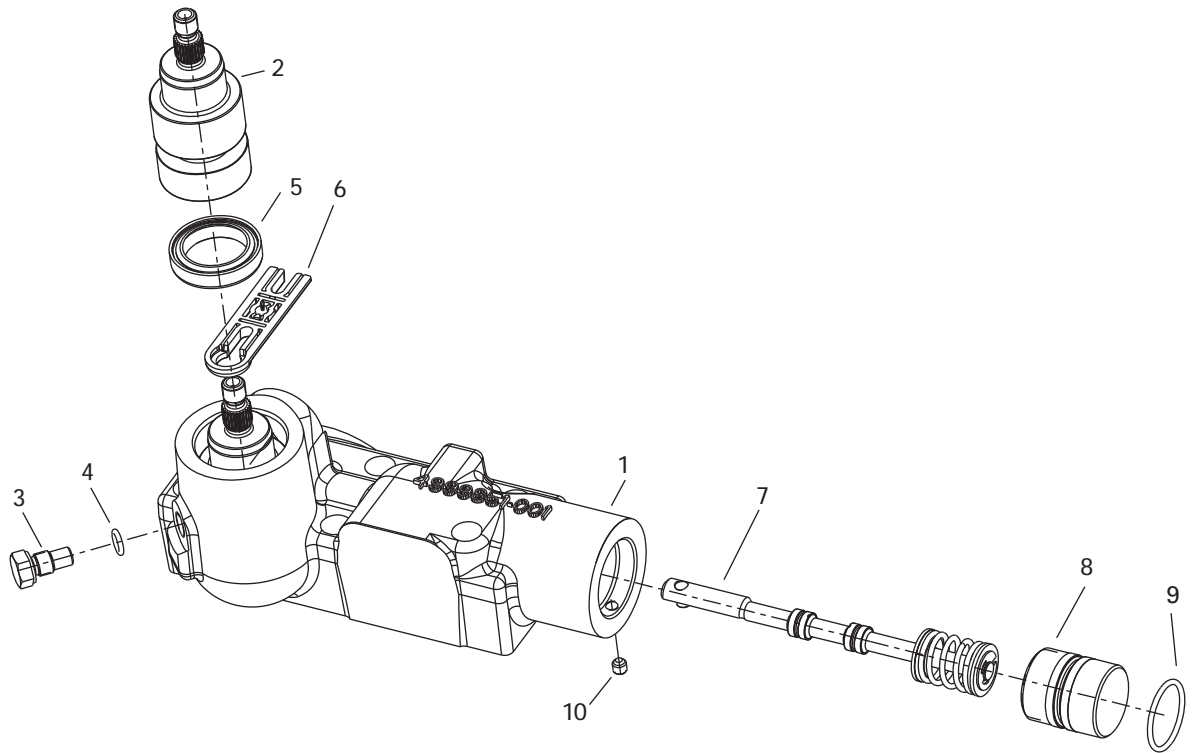
With Destroke Valve Option 3: Destroke with 12 VDC Coil & DIN 43650-A Connector

5986768-013	MA control: Manual Control, Wide Band Neutral
5986768-014	MB control: Manual Control, Standard
5986768-015	MC control: Manual Control, High Gain
5986768-022	MD control: Manual Control, Wide Band Neutral, Neutral Lockout Switch
5986768-023	ME control: Manual Control, Standard, Neutral Lockout Switch
5986768-024	MF control: Manual Control, High Gain, Neutral Lockout Switch

With Destroke Valve Option 4: Destroke with 24 VDC Coil & DIN 43650-A Connector

5986768-025	MA control: Manual Control, Wide Band Neutral
5986768-026	MB control: Manual Control, Standard
5986768-027	MC control: Manual Control, High Gain
5986768-028	MD control: Manual Control, Wide Band Neutral, Neutral Lockout Switch
5986768-029	ME control: Manual Control, Standard, Neutral Lockout Switch
5986768-030	MF control: Manual Control, High Gain, Neutral Lockout Switch

Item 64, 65
Mechanical Servo
Controllers –
(MA, MB)*

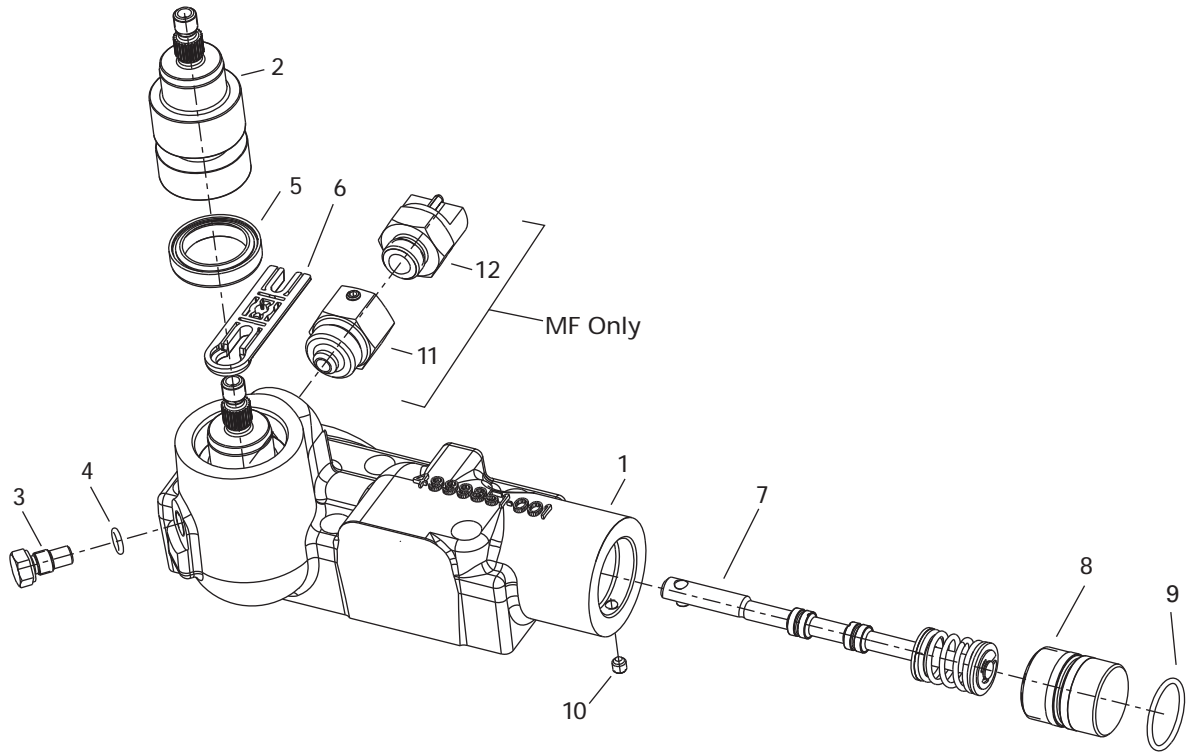


Item 64, 65
Control Valve Sub-Assembly

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-001	1	Housing, Control
2	5996108-001(MA) 4999870-001(MB)	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MB) 4999884-002(MA)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	1	Set Screw

*reference Index of Mechanical Servo Controllers on page 16.

Item 64, 65
Mechanical Servo
High Gain
Controllers –
(MC, MF)*

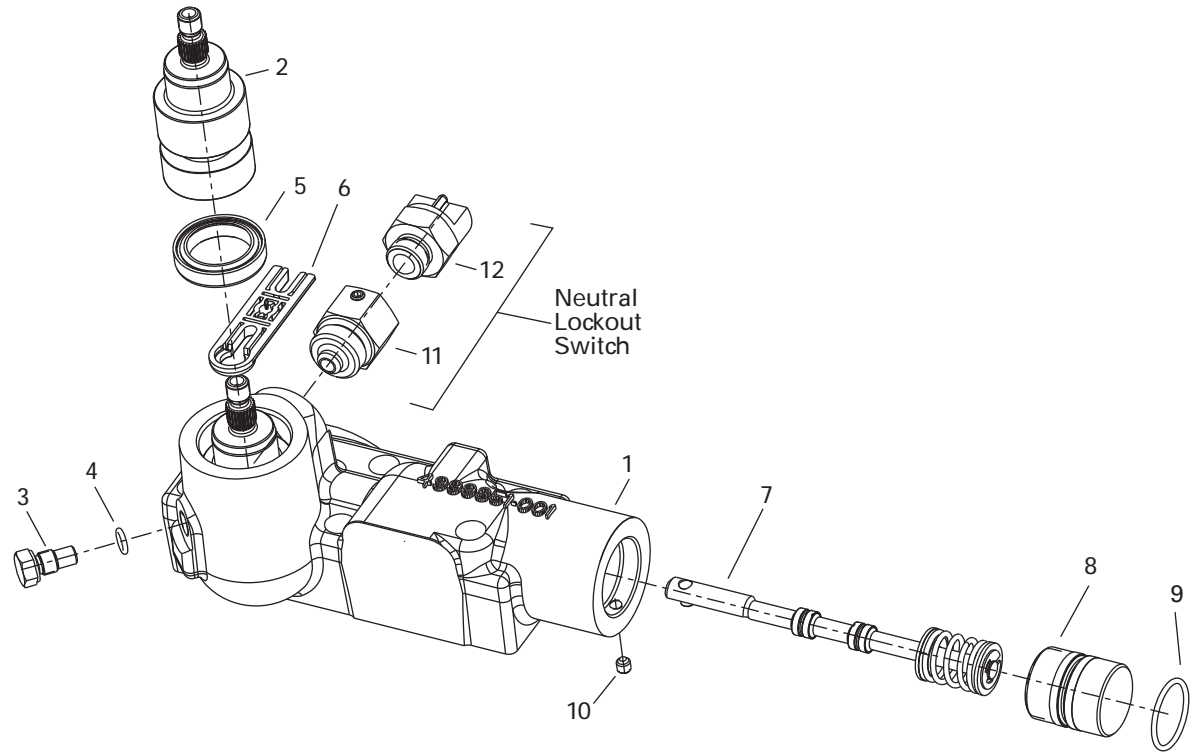


Item 64, 65
Control Valve Sub-Assembly

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-001(MC) 4999852-002(MF)	1	Housing, Control
2	4999852-001	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-003	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019 102149-019	1 2(MF)	Set Screw
11	72400-722	1	Adaptor Assembly, Neutral L/O (MF only)
12	109791-001	1	Switch, Neutral L/O (MF only)

*reference Index of Mechncal Servo Controllers on page 16.

Item 64, 65
Mechanical Servo
Neutral Lockout
Controllers –
(MD, ME)*

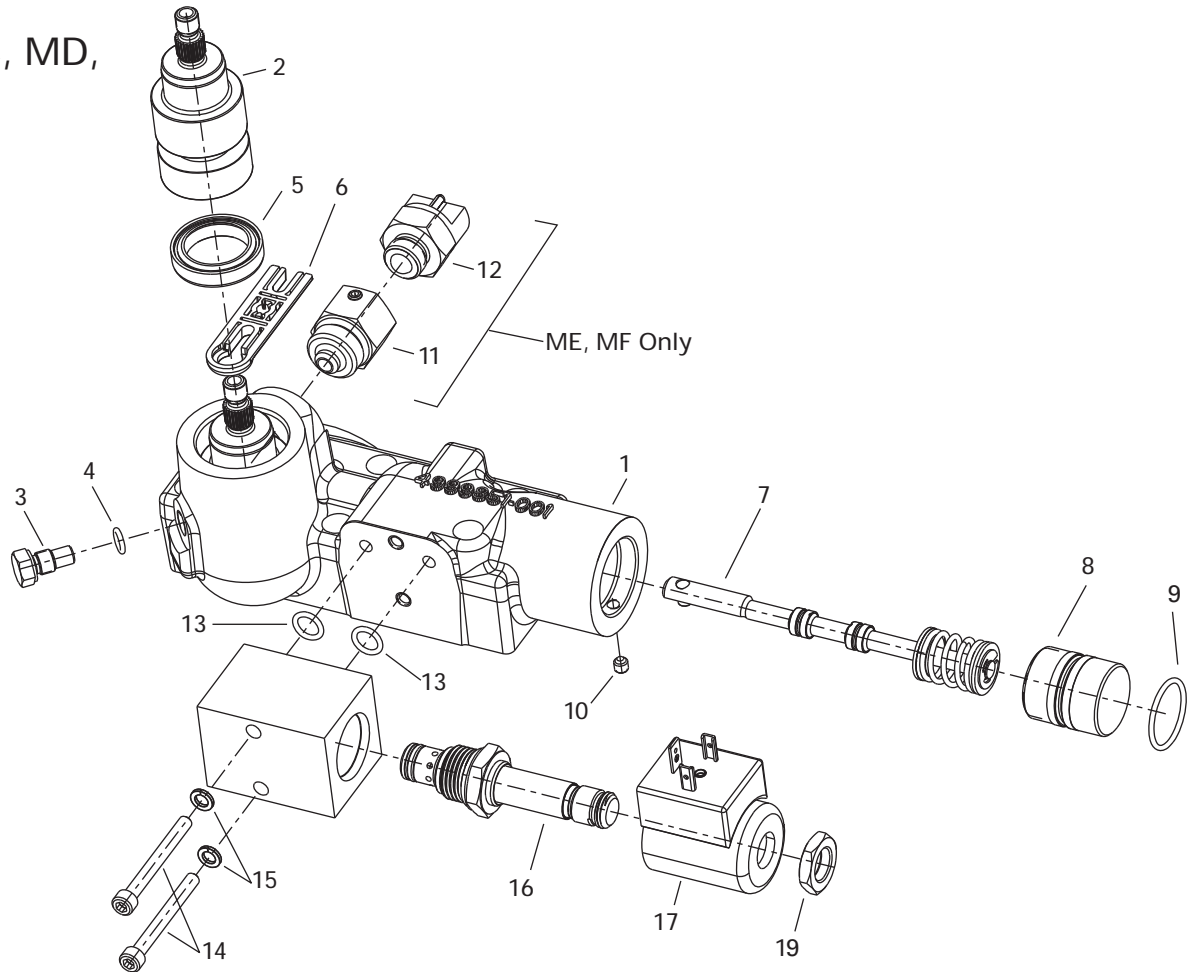


Item 64, 65
Control Valve Sub-Assembly

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-002	1	Housing, Control
2	5996108-001(MD) 4999870-001(ME)	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MD) 4999884-002(ME)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	2	Set Screw
11	72400-722	1	Adaptor Assembly, Neutral L/O (MF only)
12	109791-001	1	Switch, Neutral L/O (MF only)

*reference Index of Mechincal Servo Controllers on page 16.

Item 64, 65
Mechanical Servo
Destroke Valve —
Option 1
(MA, MB, MC, MD,
ME, MF)*

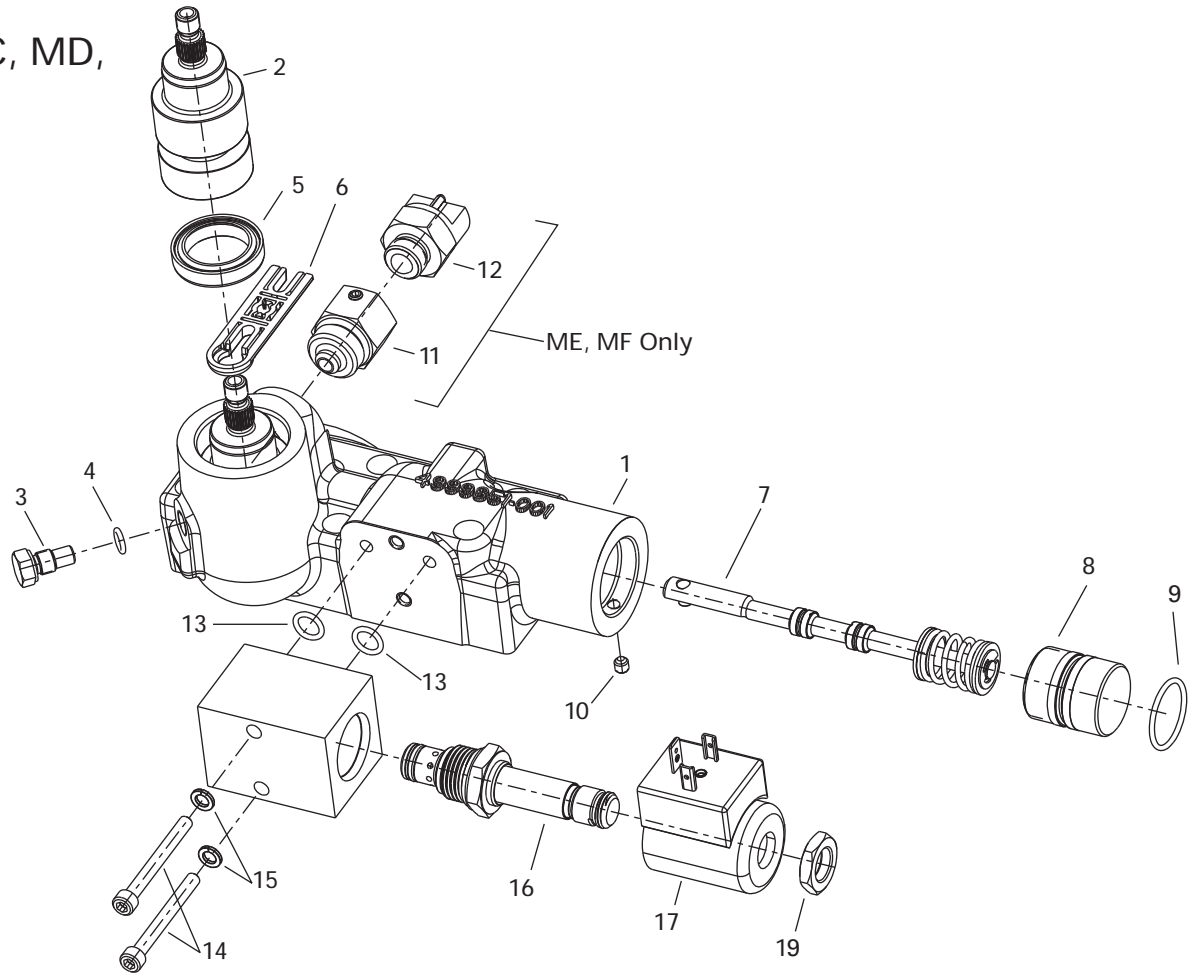


Item 64, 65
Control Valve Sub-Assembly — Destroke Valve Option 1

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-003(MA, MB, MC, MD) 4999852-004(ME, MF)	1	Housing, Control
2	5996108-001(MA, ME) 4999870-001(MB, MC, MD, MF)	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MA, ME) 4999884-002(MB, MF) 4999884-003(MC, MD)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	1	Set Screw
11	72400-722(ME, MF only)	1	Adaptor Assembly, Neutral L/O
12	109791-001(ME, MF only)	1	Switch, Netral L/O
13	16003-6	2	O-Ring
14	16148-316	2	Screw, Cap
15	16045-103	2	Washer, Lock
16	21607659	1	Valve
17	300AA00161A	1	Coil
18	72400-719	1	Manifold
19	20082	1	Nut

*reference Index of Mechincal Servo Controllers on page 16.

Item 64, 65
Mechanical Servo
Destroke Valve —
Option 2
(MA, MB, MC, MD,
ME, MF)*

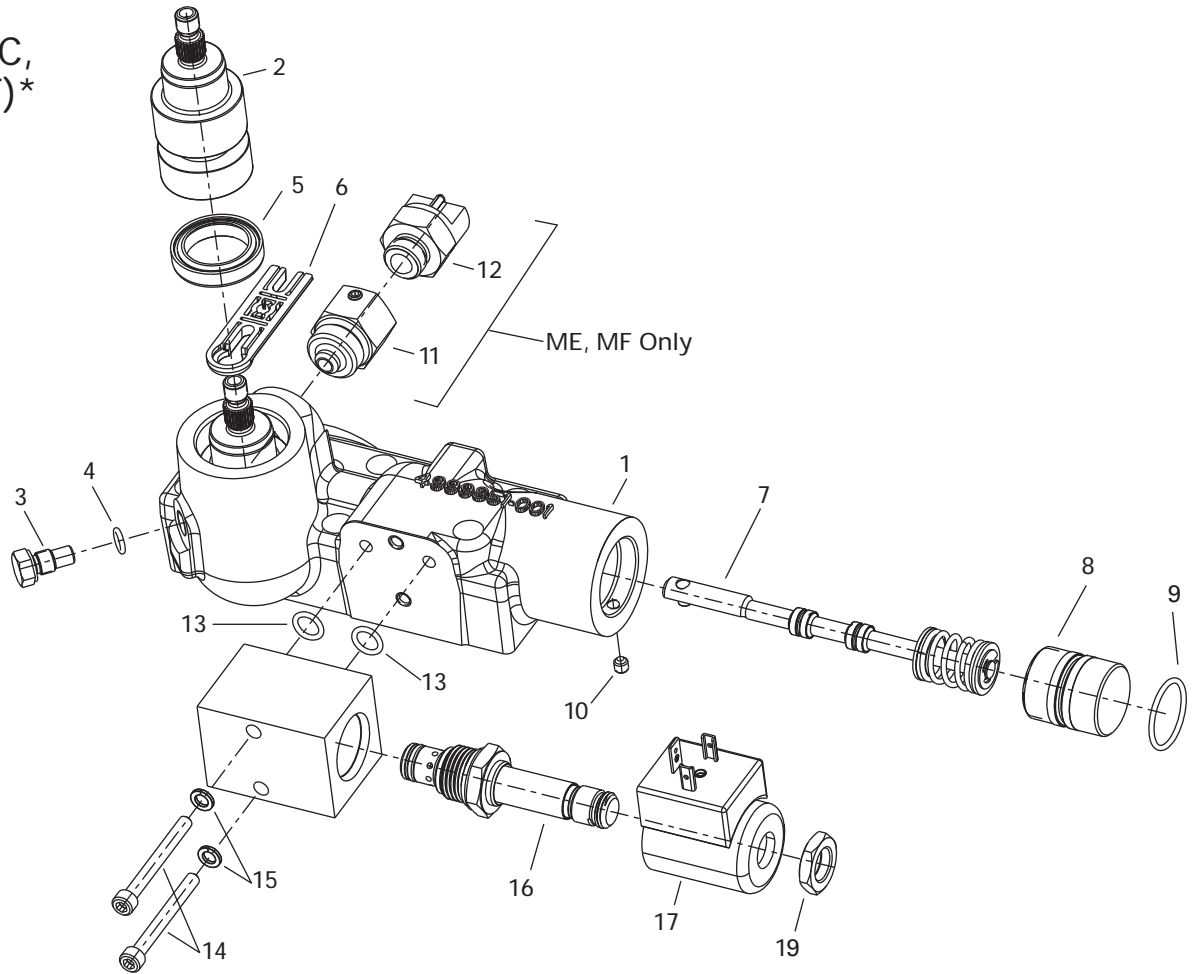


Item 64, 65
Control Valve Sub-Assembly — Destroke Valve Option 2

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-003(MA, MB, MC,) 4999852-004(MD, ME, MF)	1	Housing, Control
2	5996108-001(MA, MD, ME) 4999870-001(MB, MC, MF)	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MA, ME) 4999884-002(MB, MF) 4999884-003(MC, MD)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	1, 2(MD, ME, MF)	Set Screw
11	72400-722(MD, ME, MF only)	1	Adaptor Assembly, Neutral L/O
12	109791-001(MD, ME, MF only)	1	Switch, Netral L/O
13	16003-6	2	O-Ring
14	16148-316	2	Screw, Cap
15	16045-103	2	Washer, Lock
16	21607659	1	Valve
17	300AA00250A	1	Coil
18	72400-719	1	Manifold
19	20082	1	Nut

*reference Index of Mechncal Servo Controllers
on page 16.

Item 64, 65
Mechanical Servo
Destroke Valve —
Option 3
(MA, MB, MC,
MD, ME, MF)*

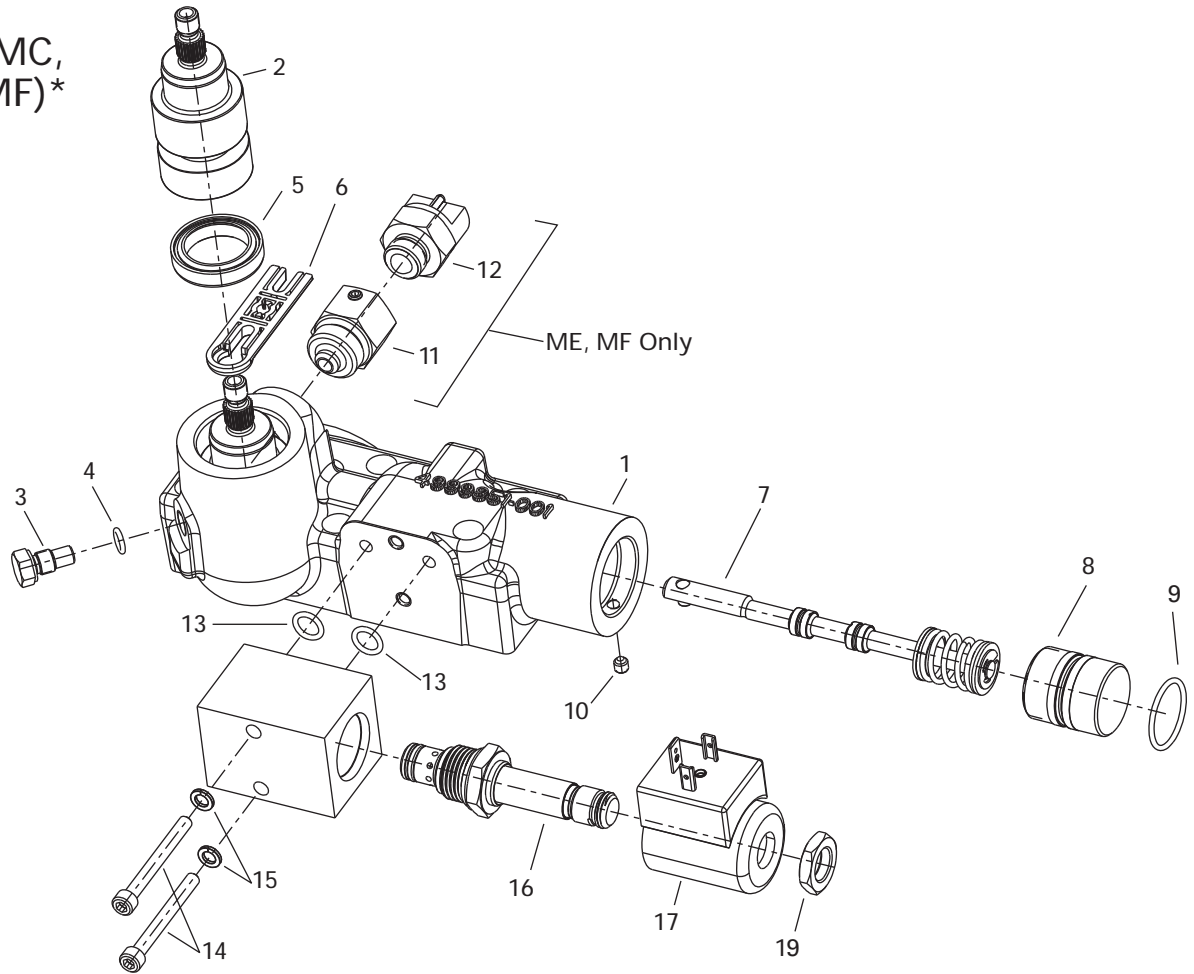


Item 64, 65
Control Valve Sub-Assembly — Destroke Valve Option 3

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-003(MA, MB, MC,) 4999852-004(MD, ME, MF)	1	Housing, Control
2	5996108-001(MA,) 4999870-001(MB, MC, MD, ME, MF)	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MA, ME) 4999884-002(MB, MF) 4999884-003(MC, MD)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	1, 2(MD, ME, MF)	Set Screw
11	72400-722(MD, ME, MF only)	1	Adaptor Assembly, Neutral L/O
12	109791-001(MD, ME, MF only)	1	Switch, Netral L/O
13	16003-6	2	O-Ring
14	16148-316	2	Screw, Cap
15	16045-103	2	Washer, Lock
16	21607659	1	Valve
17	300AA00001A	1	Coil
18	72400-719	1	Manifold
19	20082	1	Nut

*reference Index of Mechincal Servo Controllers on page 16.

Item 64, 65
Mechanical Servo
Destroke Valve —
Option 4
(MA, MB, MC,
MD, ME, MF)*



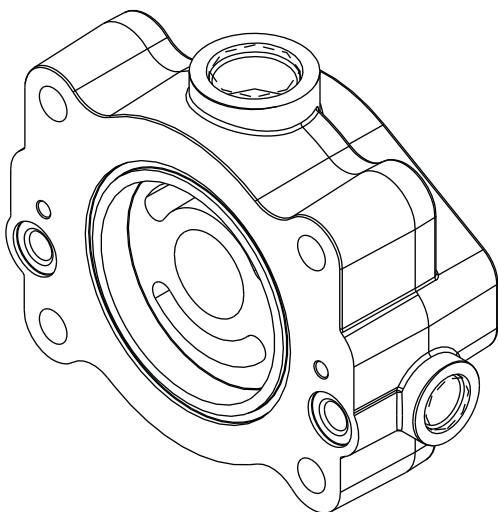
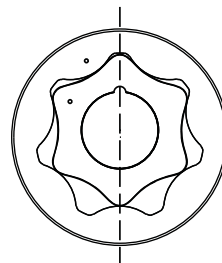
Item 64, 65
Control Valve Sub-Assembly — Detroke Valve Option 4

REF	PART NO.	QTY.	DESCRIPTION
1	4999852-003(MA, MB, MC,) 4999852-004(MD, ME, MF)	1	Housing, Control
2	499870-001	1	Input Control Shaft Sub-Assembly
3	5987125-001	2	Plug
4	16133-2	3	O-Ring
5	72401-503	1	Seal, Shaft
6	5992233-001	1	Link, Feedback
7	4999884-001(MA, ME) 4999884-002(MB, MF) 4999884-003(MC, MD)	1	Spool Sub-Assembly
8	72400-507	1	Plug
9	16015-8	1	O-Ring
10	102149-019	1, 2(MD, ME, MF)	Set Screw
11	72400-722(MD, ME, MF only)	1	Adaptor Assembly, Neutral L/O
12	109791-001(MD, ME, MF only)	1	Switch, Netral L/O
13	16003-6	2	O-Ring
14	16148-316	2	Screw, Cap
15	16045-103	2	Washer, Lock
16	21607659	1	Valve
17	300AA00002A	1	Coil
18	72400-719	1	Manifold
19	20082	1	Nut

*reference Index of Mechincal Servo Controllers
on page 16.

Item 83 - Charge Pump Adapter Assembly

Gerotor Sizes Available



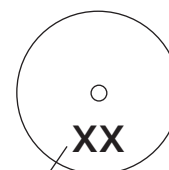
PART NO. NUMBER	ITEM 1	ITEM 2	DISPLACEMENT cm ³ /r [in ³ /r]
5987263-001	5987262-001	5989547-001	13,9 [0.85]
5987263-002	5987262-002	5989547-002	17,4 [1.06]
5987263-003	5987262-003	5989547-003	21 [1.28]
5987263-004	5987262-004	5989547-004	23,1 [1.40]

GEROTOR POCKET DEPTH

DISPLACEMENT cm ³ /r [in ³ /r]	DEPTH OF POCKET mm [in]	ROTATION	REMOTE FILTER	SUCTION CHARGE FILTER
13,9 [0.85]	13,9 [0.85]	R - rotation L - rotation	5991128-005 5991230-005	5991128-001 5991230-001
17,4 [1.06]	17,4 [1.06]	R - rotation L - rotation	5991128-006 5991230-006	5991128-002 5991230-00
21 [1.28]	21 [1.28]	R - rotation L - rotation	5991128-007 5991230-007	5991128-003 5991230-003
23,1 [1.40]	23,1 [1.40]	R - rotation L - rotation	5991128-008 5991230-008	5991128-004 5991230-004

Orifices Sizes Available

PART NO.	HOLE DIA. mm [inches]
101619-021	0,53 [.021]
101619-024	0,61 [.024]
101619-028	0,71 [.028]
101619-032	0,81 [.032]
101619-036	0,91 [.036]
101619-040	1,02 [.040]
101619-044	1,12 [.044]
101619-052	1,32 [.052]
101619-057	1,45 [.057]
101619-065	1,65 [.065]



Last two digits
of dash number
stamped on face of
orifice.

Assembly

Required Tools

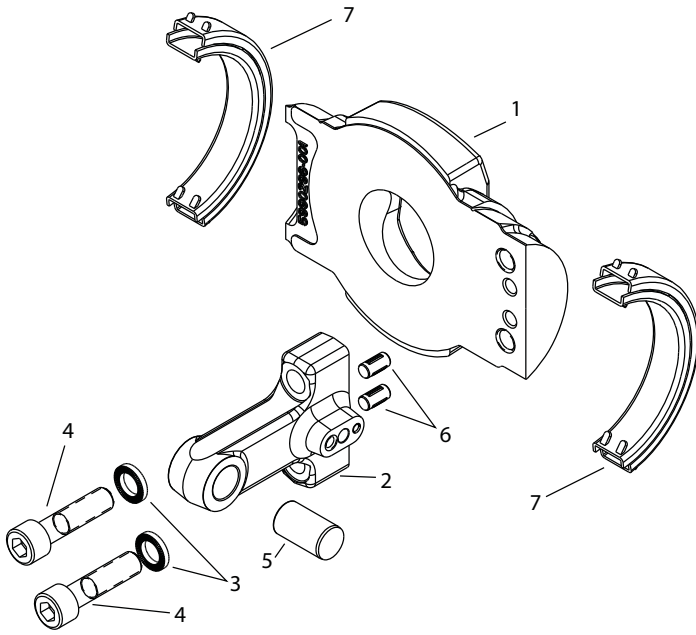
9/16 in. Hex Key (Allen)	Adjustable-grip pliers	Torque Wrench (145 ± 10 N/m – 107 ± 7 lb/ft capacity)
7/16 in. End Wrench	Snap-ring pliers	Rubber Mallet
9/16 in. End Wrench	Internal Retaining Ring Pliers (straight .070 tip)	Light Petroleum Jelly
3/4 in. End Wrench	Internal Retaining Ring Pliers (straight .090 tip)	Seal Driver
1 in. End Wrench	External Retaining Ring Pliers (straight .090 tip)	Arbor press
9/16 in. Socket	9/32 in. Retaining E-ring, Applicator	Loctite (#247 and #290 or equivalent)
3/4 in. Socket	1/2 in. Retaining E-ring, Applicator	EZ-Clip Tool
7/16 in. Socket	O-Ring Pick	Seat Installation Tool
		Locking C-Clamp

Assembly

Swash Plate Sub-Assembly

Note:

Disassembly of the Swash Plate and Manual Servo Controller is the reverse of the assembly processes outlined starting on page 25 in this manual.



REF	PART NO.	QTY.	DESCRIPTION
1	5990297-001	1	Swashplate
2	4999620-001	1	Arm, Swash
3	5987468-016	2	Washer, Nord-Lock
4	5996773-040	2	Hex Socket Head Cap Screw
5	5986958-001	1	Dowel Pin
6	5987967-001	2	Drive-Lok Pin
7	5991097-001	2	Bearing, Swash



Step 1

Press 15mm diameter dowel pin (item 5) into opening at end of swash arm (item 2).

Step 2

Insert 2 Drive-Lok dowel pins (item 6) into smooth-bore holes in swash plate (item 1).

Step 3

Align smooth-bore holes in flat surface of swash arm with Drive-Lok pins; fit swash arm to swash plate and press parts together with an arbor press.

Step 4

Place assembled swash plate and swash arm on a stable work surface, with swash arm pointing up.



Step 5

Fit together two Nord-Lock washers (item 3) so that the stepped faces match, and the faces with radial teeth face out. Assemble another pair of washers the same way.

Step 6

Place one pair of washers on each shoulder of the swash arm, aligned with the threaded holes.

Step 7

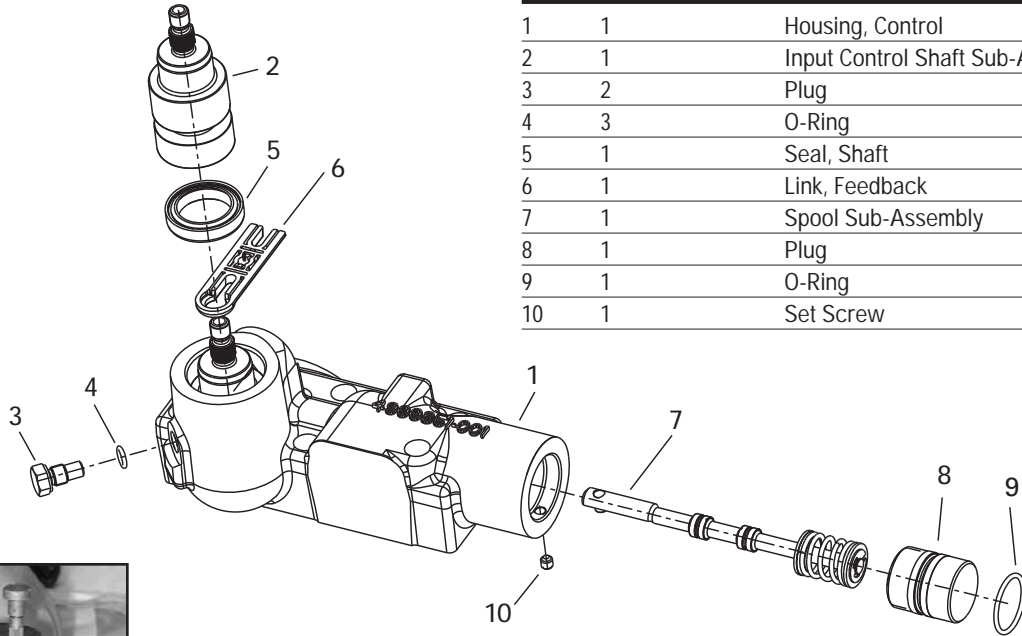
Insert an M10 x 1.25 x 40mm socket-head cap screw (item 4) through each pair of washers and into threads; tighten to 79 n/m (58 lb/ft).

Assembly Mechanical Servo Control Assembly

Note:

Disassembly of the Swash Plate and Manual Servo Controller is the reverse of the assembly processes outlined starting on page 25 in this manual.

REF	PART NO.	QTY.	DESCRIPTION
1	1		Housing, Control
2	1		Input Control Shaft Sub-Assembly
3	2		Plug
4	3		O-Ring
5	1		Seal, Shaft
6	1		Link, Feedback
7	1		Spool Sub-Assembly
8	1		Plug
9	1		O-Ring
10	1		Set Screw



Step 1

Insert the knurled end of a 4mm head pin 4999869-001 in the smooth-bore hole on a control input shaft (item 2).

Step 2

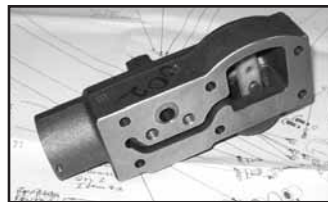
Press the head pin into place with an arbor press.

Step 3

Fit the control input shaft, head pin first, into a control housing (item 1).

Step 4

With the control input shaft in place, turn over the control housing.



Step 5

Insert a feedback link (item 6), keyhole opening first, through the flat side of the control housing.

Step 6

On one side, turn the control input shaft; on the other side, guide the head pin into the keyhole opening on the feedback link; turn until connection is secure.

Step 7

Insert a control spool sub-assembly (item 7) through the spoolbore on the control housing (item 1).

Step 8

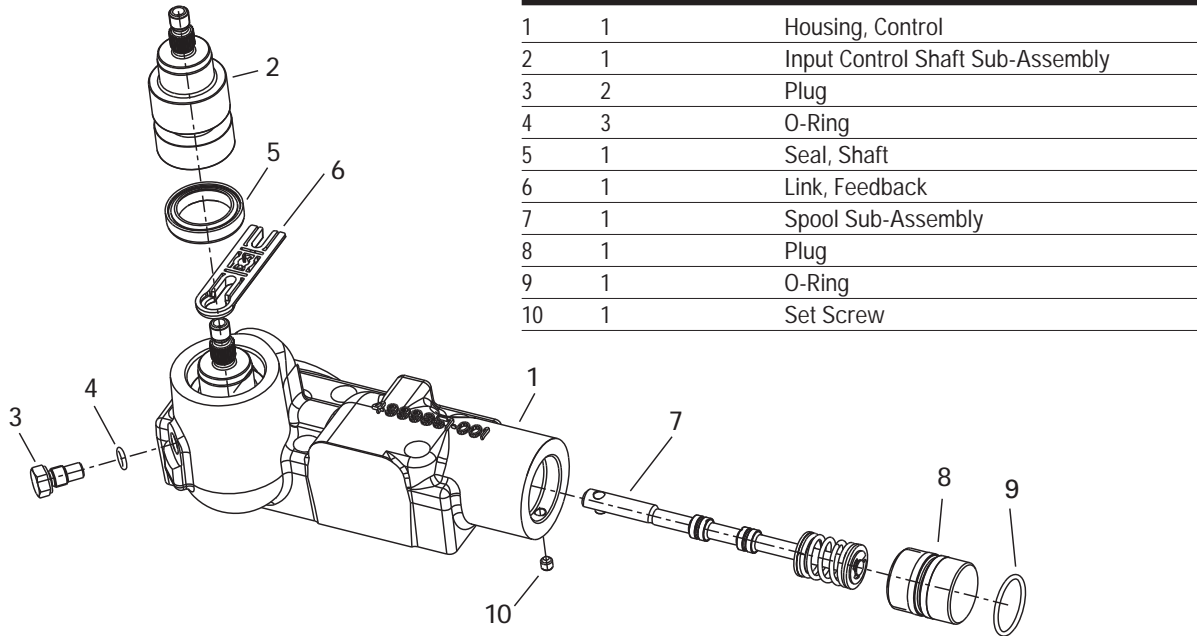
Once the control spool shaft is fully inserted, turn the spool until the dowel pin faces up.

Assembly

Mechanical

Servo Control

Assembly



REF	PART NO.	QTY.	DESCRIPTION
1	1	1	Housing, Control
2	1	1	Input Control Shaft Sub-Assembly
3	2	1	Plug
4	3	1	O-Ring
5	1	1	Seal, Shaft
6	1	1	Link, Feedback
7	1	1	Spool Sub-Assembly
8	1	1	Plug
9	1	1	O-Ring
10	1	1	Set Screw

Step 9

Align the center hole on the feedback link with the dowel pin on the control spool. Press the feedback link (item 6) onto the dowel pin until the end of the dowel pin is flush with the surface of the feedback link.

Step 10

Fit an O-Ring (item 4) under the head of a threaded retaining plug (item 3). Lubricate the O-Ring.

Step 11

Align the 6.35mm groove in the control input shaft with the threaded hole on the control housing.

Step 12

Insert the retaining plug (item 3) in the threaded hole; make sure the plug fits in the 6.35mm groove. Tighten to 11 n/m (8 lb-ft).

Step 13

Fit an O-Ring (item 9) in the center groove on a spool bore plug (item 8). Insert the plug, threaded end first, in the spool bore; it should fit around the spring end of the spool shaft sub-assembly.

Step 14

Using adjustable-grip pliers, turn the spool bore plug until there is no play where the spool shaft meets the feedback link. Adjust tightness as needed; both under-tightening and over-tightening the plug will result in unwanted play.

Step 15

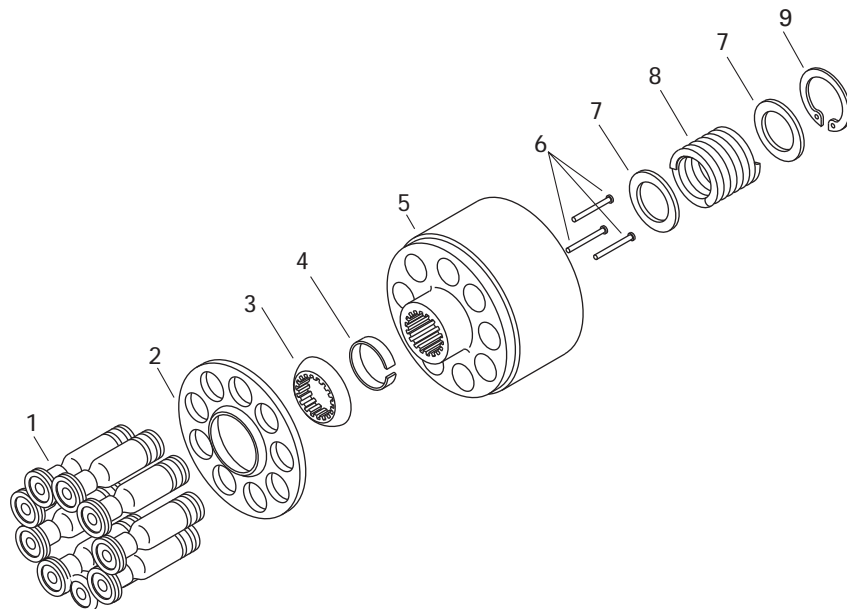
Insert a 4.7mm set screw (item 10) in the threaded hole near the end of the spool shaft port. Tighten to 3 n/m (2.2 lb-ft).

Step 16

Fit a control input shaft seal (item 5) over the exposed end of the control input shaft; using a seal installation tool, press down on the seal until it is flush with the face of the input shaft port. (Note: If necessary, use a shaft coupler to press the seal into place).

Assembly

Rotating Kit



REF	QTY.	DESCRIPTION
1	9	Piston Sub-Assembly
2	1	Shoe Retainer
3	1	Pivot
4	1	Load Pin Keeper
5	1	Cylinder Barrel
6	3	Loading Pin
7	2	Washer
8	1	Spring
9	1	Internal Retaining Ring

Assembly



Step 1

To reassemble the rotating kit assembly, complete the following: Compress the pin keeper (item 4) and install in the spline of the cylinder barrel. Install the three pins (item 6) with head end to the inside of the barrel and position in the special grooves of the cylinder barrel spline.



Step 2

Install the washer, spring, and second washer into the cylinder barrel. Use the two 3/8 in. I.D. washers, nut and 3/8 in. x 3-1/4 in. cap screw to compress the spring and retain with retaining ring. Remove the nut, cap screw, and the two washers.

Step 3

Install the pivot (item 3) onto the three pins, shoe retainer onto the pivot, and piston assemblies thru the shoe retainer and into cylinder barrel, resting on shoe retainer.

Step 4

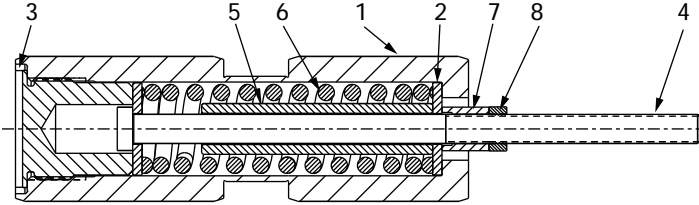
Insert (9) piston assemblies
 41cc (2.50 cid) - 4994911-001
 49cc (3.00 cid) - 4994908-001
 62cc (3.8 cid) - 4994583-001
 into the shoe retainer
 4994890-001 41/49cc (2.50/3.0cid)
 4994892-001 62cc (3.8cid)
 so that the brass swivels face up.

Insert the pivot into the shoe retainer from beneath so that the tapered faces match.

Holding the pivot in place, lower the piston assemblies into their respective cylinders. The pivot should rest on the three loading pins.

Assembly

Servo Piston Assembly



REF	PART NO.	QTY.	DESCRIPTION
1	5989957-001	1	Servo Piston
2	5989955-001	2	Spring Retainer
3	4999972-001	1	Plug, Servo Piston
4	5989956-001	1	Servo Piston Bolt
5	5989958-001 5989954-001	1	Spring Stop
6	5989952-001	1	Spring
7	72400-542	1	Nut, Hex
8	16024-6	1	Thin Finished Hex Nut, UNF



Step 1

Hold a servo piston bolt (item 4) head end down, on a work surface.



Step 2

Slide a spring retaining washer (item 2) onto the servo piston bolt so that the stamped word "IN" faces up, toward where the spring will go.



Step 3

Slide the spring (item 6) and springstop over the bolt so that both parts rest on the spring retaining washer.

Note: If assembling a HRC controlled pump, a second spring will be installed in place of the displacement limiter.



Step 4

Place the second spring retaining washer (item 2) over the servo piston bolt, with the stamped word "IN" facing the spring.



Step 5

Thread a spring compression nut (item 7) onto the servo piston bolt, with the inside counterbored (smooth) end facing the spring. Tighten the spring compression nut until it is snug against the spring retaining washer.



Step 6

Insert the servo piston bolt assembly into the piston (item 1), threaded end first.

Step 7

Thread a piston plug (item 3) into the open end of the servo piston.



Step 8

Using a vise and two pieces of shim stock, grip the piston by the recessed groove. Do not mar the rounded surfaces of the servo piston.



Step 9

Tighten the piston plug (item 3) to 71 ± 3 n/m (52.4 ± 2.2 lb-ft).

Assembly

Servo Piston/ Dual Pump Housing Assembly



Step 10

Thread a locking nut (item 8) onto the servo piston bolt until it fits against the spring compression nut.

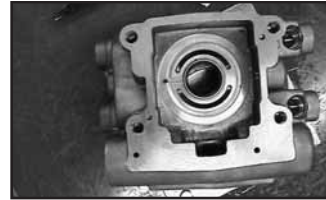
Step 11

Apply one drop of Loctite 290 to the threads of the servo piston bolt where the spring compression nut and locking nut will meet.

Step 12

This step may require two people: Using a 5mm hex key, hold the servo piston bolt steady, then use two 9/16-inch open-ended wrenches to tighten the locking nut against the spring compression nut. The servo piston bolt should turn freely but should not move in or out of the servo piston.

Dual Pump Housing Assembly



Step 1

Place the center housing on a stable work surface.



Step 2

Using snap-ring pliers, insert a snap ring 16077-33 in each of the two grooves inside the bearing bore.



Step 3

Compress a piston backup ring 5987241-001 and insert it in the servo piston bore, which is perpendicular to the bearing bore; let the backup ring expand into the seal groove.



Step 4

Insert a Teflon glide ring 5987241-001 in the same way, so that it fits in the seal groove inside the backup ring.



Step 5

Using the same method, install backup rings and Teflon glide rings in the other side of the servo piston bore.

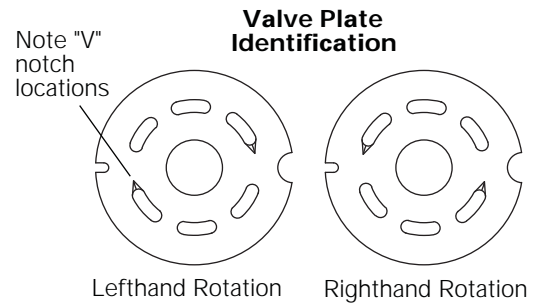


Step 6

Lubricate the leading edge of a servo piston assembly, and insert it in the piston bore. The threaded servo piston bolt should extend about 20mm (.80 in) beyond the housing.

Assembly

Rear Pump Assembly

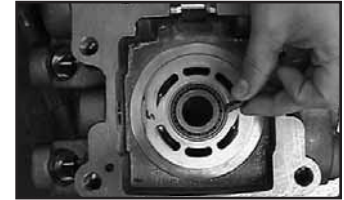


Step 7

Fit an O-Ring (p/n 16015-34) in the groove on a servo cap plug 5989898-001.

Step 8

Place the servo cap plug over the servo piston bolt, and turn the servo cap plug until tight. Torque will be adjusted later.



Step 9

Turn the housing so that the bearing bore faces up.

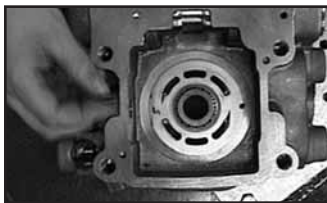
Step 10

Insert a roll pin 16026-610 into the guide hole near the bearing bore; tap it in firmly with a rubber mallet.



Step 11

Insert 52mm tapered roller bearing 5988197-001 in bearing bore, with taper narrowing from top to bottom; bearing cup should rest on snap ring.



Step 12

Set the valve plate (Refer to item 18, page 5 and item 31, page 6 for part numbers) over the bearing bore, aligning the notch with the roll pin.



Step 13

For a pump with left-hand rotation, the front valve plate should also have left-hand rotation, and vice versa for right-hand rotation. The valve plates are labeled according to direction.

REFERENCE VALVE PLATE IDENTIFICATION ABOVE

Step 14

Insert roll pins (p/n 16026-810) in the two guide holes for the gasket. Tap them firmly in place with a rubber mallet.

Assembly

Rear Pump Assembly



Step 15

Lubricate the valve plate and each piston bore in the cylinder barrel with clean hydraulic fluid.



Step 16

Center the cylinder barrel on the valve plate with the brass shoes facing up; apply clean hydraulic fluid to the brass shoes.

Step 17

Set the gasket 5984712-001 on the roll pins.

Step 18

Insert the rear pump shaft through the rotating kit until it engages the spline.



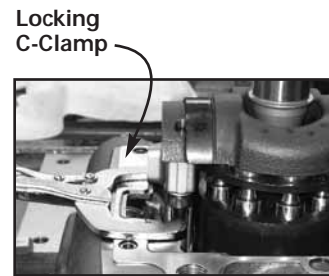
Step 19

Place a follower 4999637-001 over the dowel pin on one of the swash arms.



Step 20

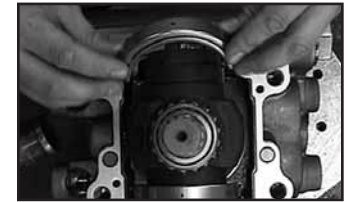
Lower the swash plate assembly into the housing so that the flat side of the plate rests on the brass shoes, and the follower 4999637-001 fits in the groove on the servo piston.



Locking C-Clamp

Step 21

Level the swash plate by hand, and use a locking C-clamp on the swash arm to keep the assembly from moving.



Step 22

Apply petroleum jelly to the inner faces of the cradle bearings 5991097-001.



Step 23

Slide one cradle bearing onto each end of the swash plate, so that the alignment tabs engage and the cradle bearings are held in place.



Step 24

Set the bearing cone 5988197-001 on the rear pump shaft, with the narrow side up.



Step 25

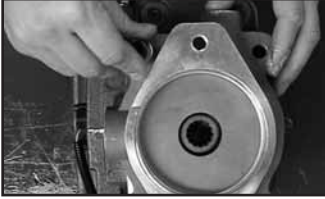
Apply petroleum jelly to the outside of the cup side of the taper bearing and place it in the bearing bore of the rear flange.

Step 26

Remove the locking C-clamp, taking care not to tip the swash plate assembly.

Assembly

Rear Pump Assembly



Step 27

Turn the rear flange over and place it on the housing. Lower the flange in place so that the bolt holes are aligned.



Step 28

Insert a 16mm x 45mm socket-head cap screw 114978-045 in each of the four bolt holes; tighten them to 145 ± 10 n/m (107 ± 7 lb-ft).



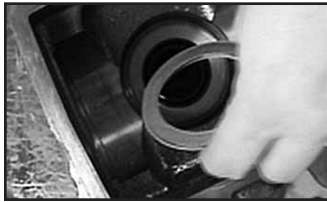
Step 30

Measure the shaft end play: Place a dial indicator with a magnetic base on the face of the rear flange, and set the rod tip on the end of the rear pump shaft.



Step 31

Tap the end of the shaft with a rubber mallet, and set the dial indicator to zero. Then tap the other end of the shaft and record the result.



Step 32

Subtract 0.05mm from the recorded measurement; this will be the thickness of the required shim stack.

Step 33

Loosen the cap screws 114978-045 from the rear flange, then remove the flange from the housing and set it aside. Hold the swash arm in place with a locking C-clamp.

Step 34

Combine shims to reach the required thickness.



Step 35

Remove the taper bearing cup from the flange, and place the shims in the bearing bore. Set the bearing cup back in place on top of the shim stack.

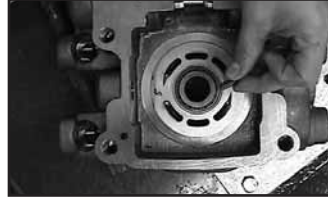
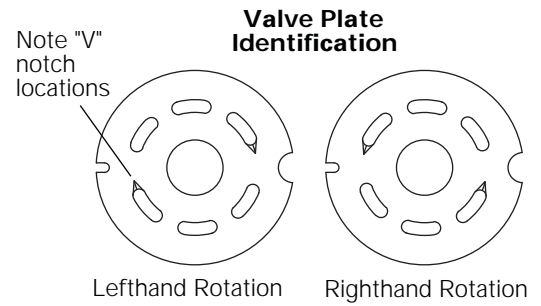


Step 36

Set the rear flange on the housing again; insert the cap screws 114978-045, remove the locking clamp, and tighten the cap screws to 145 ± 10 n/m (107 ± 7 lb-ft).

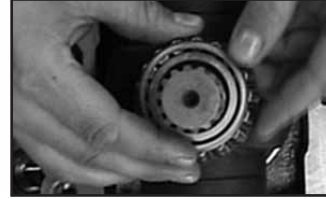
Assembly

Front Pump Assembly



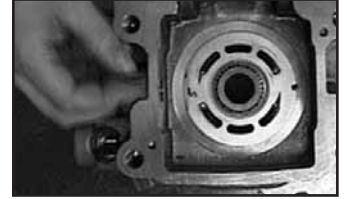
Step 1

Turn the housing so that the bearing bore faces up.



Step 2

Insert a roll pin 16026-610 into the guide hole near the bearing bore; tap it in firmly with a rubber mallet.



Step 3

Insert 52mm tapered roller bearing 5988197-001 in bearing bore, with taper narrowing from top to bottom; bearing cup should rest on snap ring.

Step 4

Set the valve plate (Refer to Item 18, page 5 for part number) over the bearing bore, aligning the notch with the roll pin.



Step 5

For a pump with left-hand rotation, the front valve plate should also have left-hand rotation, and vice versa for right-hand rotation. The valve plates are labeled according to direction.



Step 6

Insert roll pins 16026-810 in the two guide holes for the gasket. Tap them firmly in place with a rubber mallet.

Step 7

Lubricate the valve plate and each piston bore in the cylinder barrel with clean hydraulic fluid.



Step 8

Center the cylinder barrel on the valve plate with the brass shoes facing up; apply clean hydraulic fluid to the brass shoes.

REFERENCE VALVE PLATE IDENTIFICATION ABOVE



Step 9

Set the gasket 5989712-001 on the roll pins.



Step 10

Insert the front pump shaft through the rotating kit until it engages the spline.

Step 11

Place a follower 4999637-001 over the dowel pin on one of the swash arms.

Step 12

Lower the swash plate assembly into the housing so that the flat side of the plate rests on the brass shoes, and the follower fits in the groove on the servo piston.

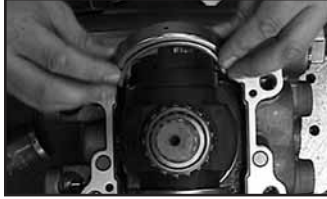
Assembly

Front Pump Assembly



Step 13

Level the swash plate by hand, and use a locking C-clamp on the swash arm to keep the assembly from moving.



Step 14

Apply petroleum jelly to the inner faces of the cradle bearings (p/n 5991097-001).



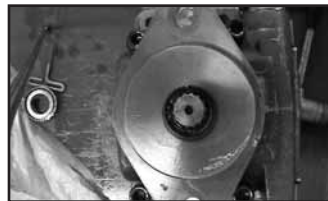
Step 15

Slide one cradle bearing 5991097-001 onto each end of the swash plate, so that the alignment tabs engage and the cradle bearings are held in place.



Step 16

Set the bearing cone on the rear pump shaft, with the narrow side up.



Step 17

Apply petroleum jelly to the outside of the cup side of the taper bearing and place it in the bearing bore of the front flange.



Step 18

Remove the locking C-clamp, taking care not to tip the swash plate assembly.

Step 19

Turn the flange over and place it on the housing. Lower the flange in place so that the bolt holes are aligned.

Step 20

Insert a 16mm x 45mm socket-head cap screw 114978-045 in each of the four bolt holes; tighten them to 145 ± 10 n/m (107 ± 7 lb-ft).



Step 21

Fix the assembled housing to the work surface.



Step 22

Measure the shaft end play: Place a dial indicator with a magnetic base on the face of the front flange, and set the rod tip on the end of the front pump shaft.

Step 23

Tap the end of the shaft with a rubber mallet, and set the dial indicator to zero.

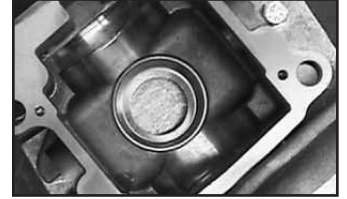


Step 24

Using adjustable grip pliers or other suitable tool, pry the shaft end up and record the result on the dial indicator.

Assembly

Front Pump Assembly



Step 25

Subtract 0.05mm from the recorded measurement; this will be the thickness of the required shim stack.

Step 26

Loosen the cap screws 114978-045 from the front flange, then remove the flange from the housing and set it aside. Hold the swash arm in place with a locking C- clamp.

Step 27

Combine shims to reach the required thickness.

Step 28

Remove the taper bearing cup from the flange, and place the shims in the bearing bore. Set the bearing cup back in place on top of the shim stack.



Step 29

Set the front flange on the housing again; insert the cap screws, remove the locking clamp, and tighten the cap screws to 145 ± 10 n/m (107 ± 7 lb-ft).

Step 30

Slide the shaft seal (Refer to Item 28, page 5 for part numbers) over the end of the front shaft. Carefully push the shaft seal down into the bore until the snap ring groove is visible.

Step 31

Compress a snap ring 16077-028 and insert it in the bore. Press down on the snap ring until it engages the groove, approximately 5mm below the chamfer at the top of the bore.

Step 32

Insert the charge relief poppet 4998532-001 into the charge relief bore.

Step 33

Insert the charge relief spring 4998533-001 into the charge relief poppet.

Step 34

Apply an O-Ring 16133-10 to a charge relief valve plug 72400-658 and work it under the head of the plug.

Step 35

Apply petroleum jelly to the charge relief valve plug.

Step 36

Place the plug on the exposed end of the spring, and compress the spring until the plug threads engage the bore threads. Tighten the plug to 39 n/m (28.8 lb-ft).



Assembly

Front Pump Assembly



Step 37

Insert a high-pressure relief valve in the first pressure relief port. Tighten to 143 n/m (105.5 lb-ft).



Step 38

Repeat process for other three pressure relief valves and ports.



Step 39

Assemble a speed sensor: Slide an O-Ring 4995422-001 on the straight end of the sensor (Refer to Item 55, page 5 for part number), place a washer 16048-077 and snap ring 16120-125 on the plug end of the sensor.

Step 40

Insert the sensor sub-assembly in the speed sensor port. Using snap-ring pliers, work the snap ring into port until it engages the snap ring groove.



Assemble the Controller

Step 41

Insert a feedback pin 4999960-001 through each 17mm hole on the two controller mounting faces. Using a 5/16-inch socket, tighten each feedback pin to 14 n/m (10.3 lb-ft).



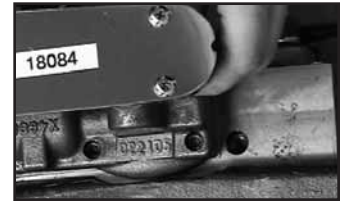
Step 42

Insert an M6 x 25mm socket-head cap screw 114975-025 in each of (6) holes in the controller housing.



Step 43

Place the controller gasket 5987239-001 over the exposed ends of the cap screws.

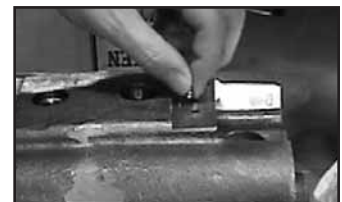


Step 45

Align the feedback link inside the controller housing with the feedback pin extending from the mounting plate. Tighten the screws to 14 n/m (10.3 lb-ft).

Step 44

Lift the controller housing toward the controller mounting face, taking care not to let the gasket or screws fall.



Displacement Limiters

Step 46

If the pump includes displacement limit ports, insert a displacement limiting screw 16139-644 in each of the two larger ports.

Step 47

Install a sealing nut 5996839-001 over each displacement limiting screw and tighten to 16 n/m (11.8 lb-ft).

Step 48

Repeat this process for the two smaller displacement limit ports, tightening the sealing nuts 5996838-001 to 9 n/m (6.6 lb-ft).

Step 49

Seal unused ports with appropriate plugs.

Troubleshooting

Fault - Logic Troubleshooting

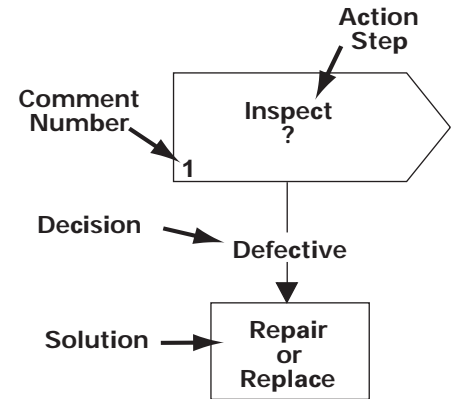
This fault - logic trouble shooting guide is a diagnostic aid in locating transmission problems.

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.

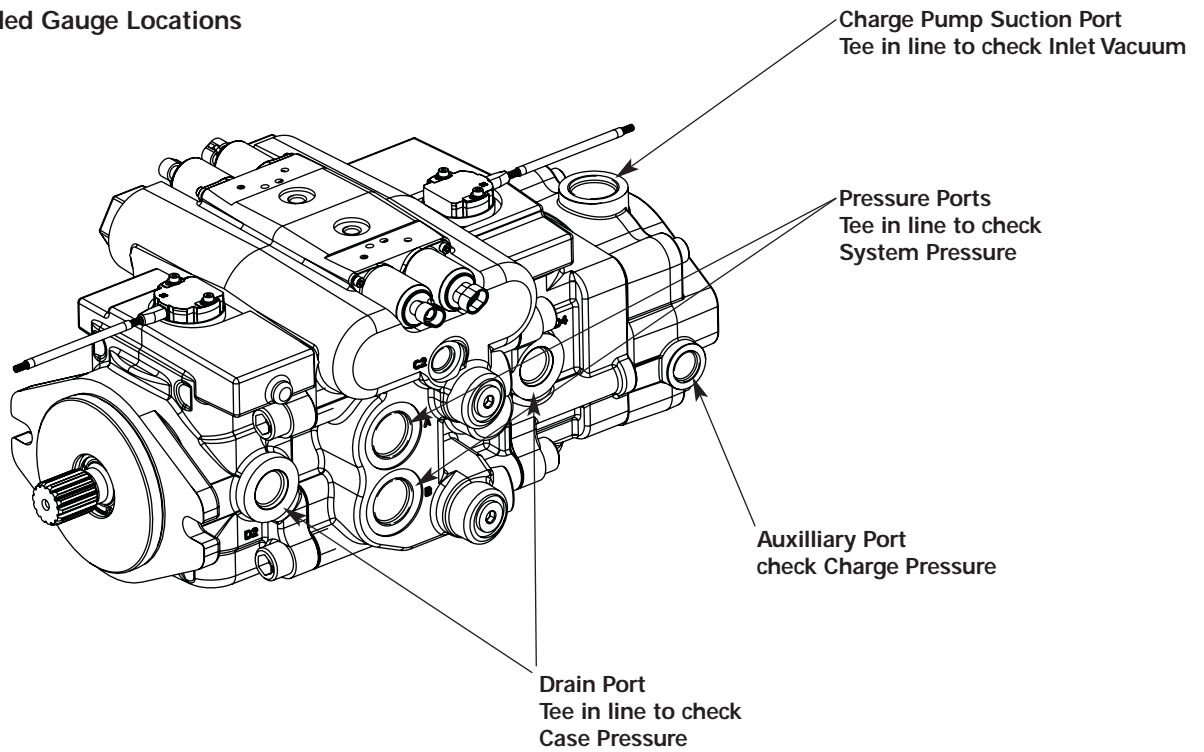
Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram

Symptom:



Recommended Gauge Locations



Gauges Recommended

Inlet vacuum gauge: 2 bar to 1 bar [30 psi to 30 inHg]

System pressure gauge: 700 bar [10,000 psi]

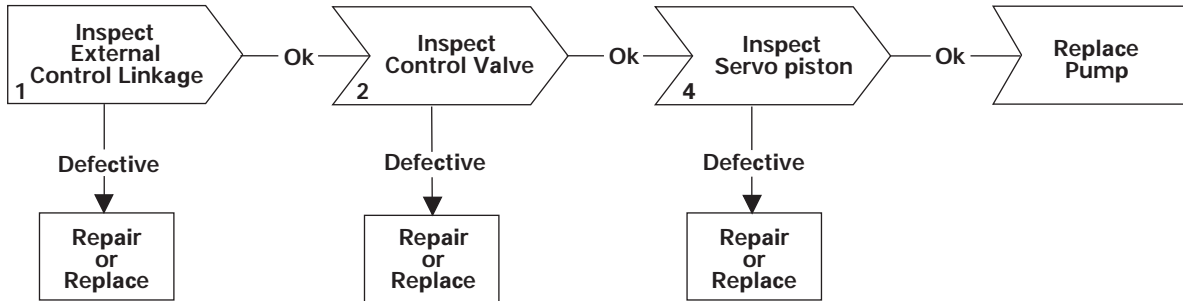
Charge pressure gauge: 0 to 50 bar [0 to 600 psi]

Case pressure gauge: 0 to 25 bar [0 to 300 psi]

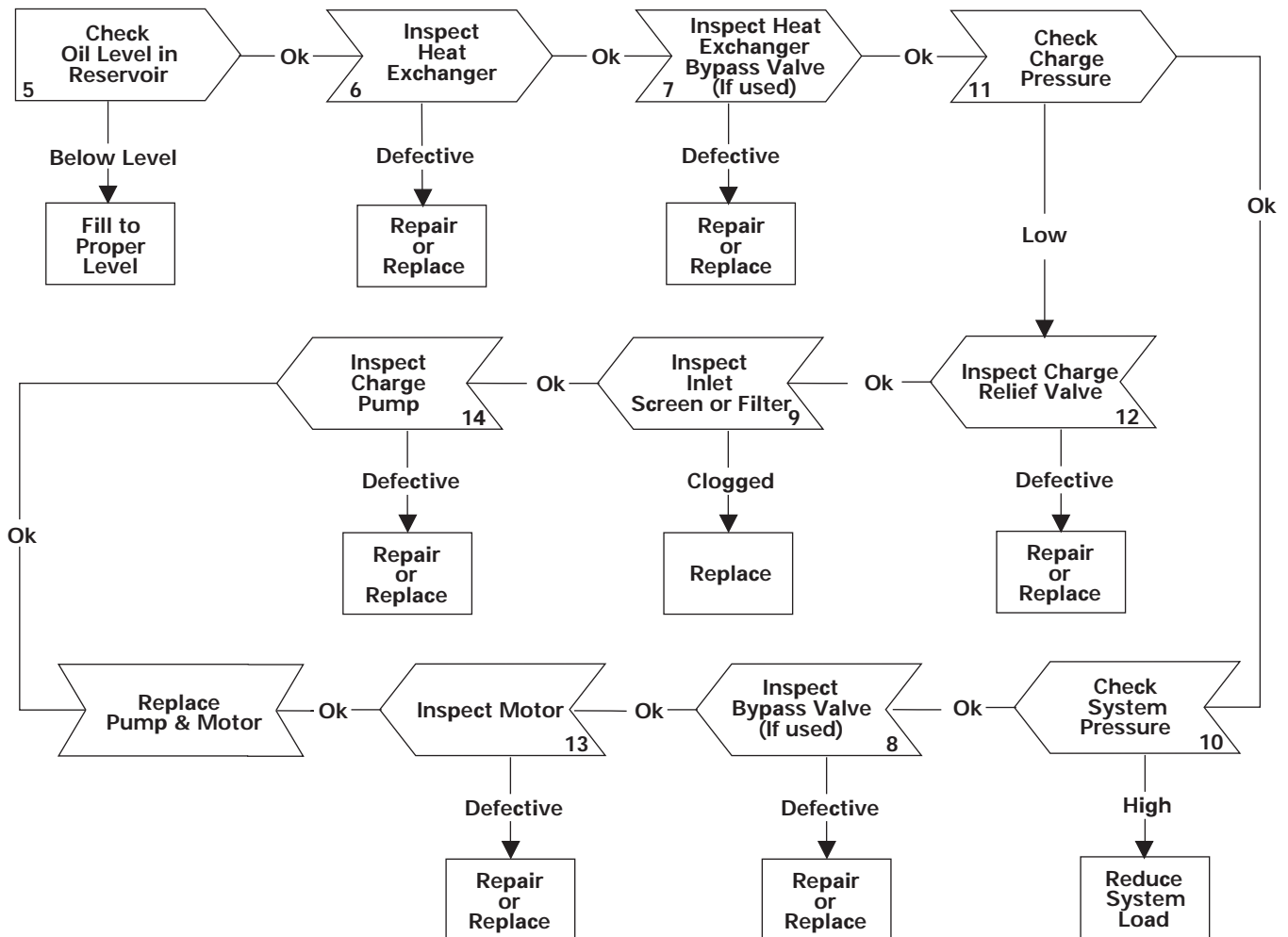
Troubleshooting

Fault - Logic Troubleshooting

Symptom: Neutral Difficult or Impossible to Find



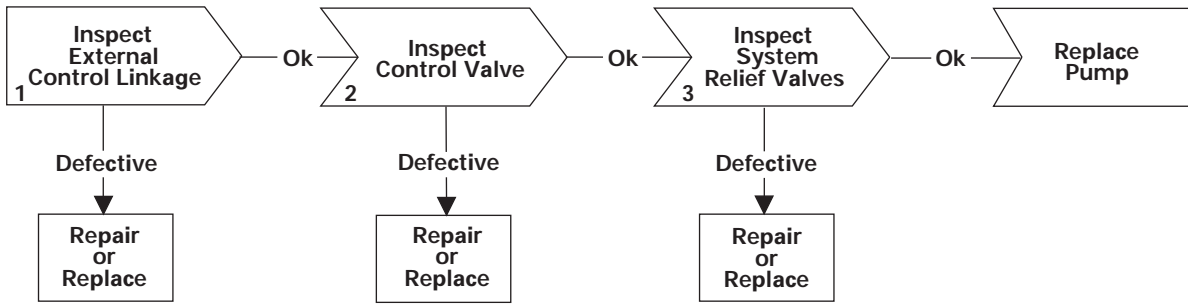
Symptom: System Operating Hot



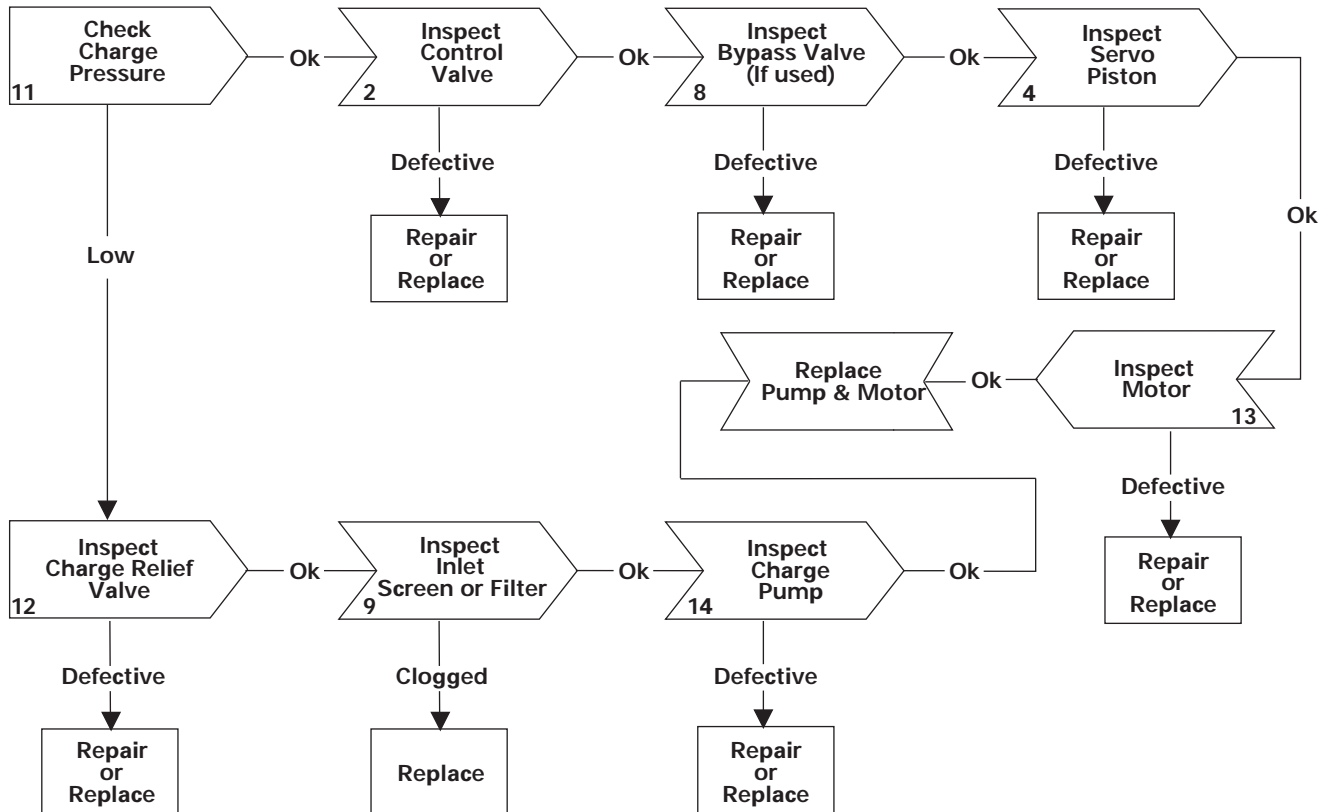
Troubleshooting

Fault - Logic Troubleshooting

Symptom: Operates in One Direction Only



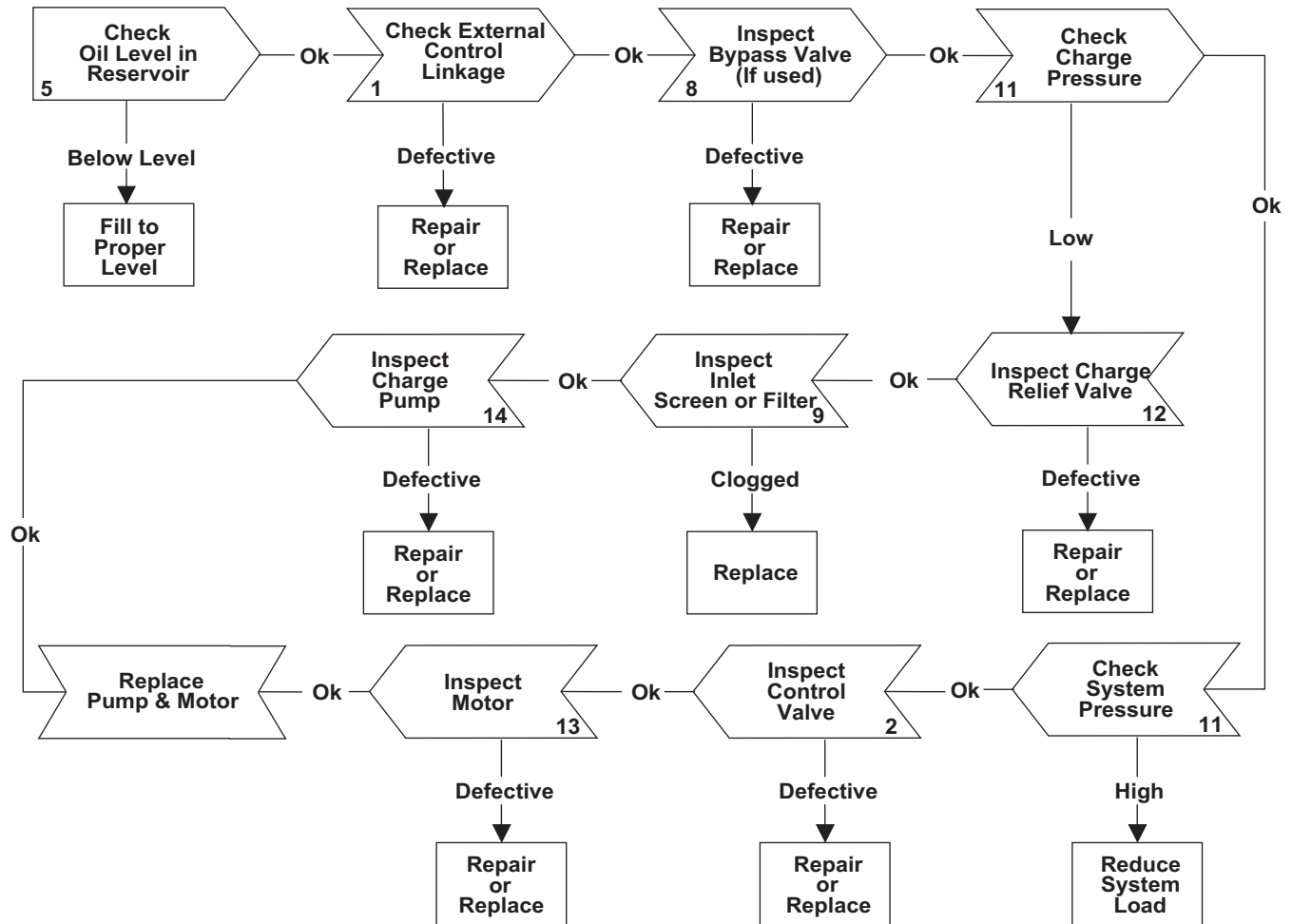
Symptom: System Response Sluggish



Troubleshooting

Fault - Logic Troubleshooting

Symptom: System Will Not Operate in Either Direction



Troubleshooting

Fault - Logic Troubleshooting

Diagram Action Step Comments

- 1 **Inspect External Control Linkage for:**
 - a. misadjusted or disconnected
 - b. binding, bent, or broken
- 2 **Inspect Control Valve for:**
 - a. plugged control orifice(s)
 - b. damaged mounting gasket
 - c. misadjusted, damaged or broken neutral return spring
 - d. broken control connector pin
 - e. faulty destroke valve (if used)
 - f. galled or stuck control spool
 - g. neutral detent or lockout switch misadjusted (if used)
- 3 **Inspect System Relief Valves * for:**
 - a. improper pressure relief setting
 - b. damaged or broken spring
 - c. valve held off seat
 - d. damaged valve seat
- 4 **Inspect Servo Piston for:**
 - a. misadjusted, damaged or broken neutral return spring assembly
 - b. galled or stuck servo piston
 - c. damaged or missing o-ring and/or back-up ring
- 5 **Check Oil Level in Reservoir:**
 - a. consult owner/operators manual for the proper type fluid and level
- 6 **Inspect Heat Exchanger for:**
 - a. obstructed air flow (air cooled)
 - b. obstructed water flow (water cooled)
 - c. improper plumbing (inlet to outlet)
 - d. obstructed fluid flow
- 7 **Inspect Heat Exchanger Bypass Valve for:**
 - a. improper pressure adjustment
 - b. stuck or broken valve
- 8 **Inspect Bypass Valve for: (if used)**
 - a. held in a partial or full open position
- 9 **Inspect Inlet Screen or Filter for:**
 - a. plugged or clogged screen or filter element
 - b. obstructed inlet or outlet
 - c. open inlet to charge pump
- 10 **Check System Pressure:**
 - a. See figure 3-1 for location of pressure gauge installation
 - b. consult owner/operators manual for maximum system relief valve settings
- 11 **Check Charge Pressure:**
 - a. See figure 3-1 for location of charge pressure gauge installation
 - b. consult owner/operators manual for maximum charge relief valve settings
- 12 **Inspect Charge Relief Valve for:**
 - a. improper charge relief pressure setting *
 - b. damaged or broken spring
 - c. poppet valve held off seat

- 13 **Inspect Motor for:**
 - a. consult owner/operator manual for motor operation and trouble shooting

- 14 **Inspect Charge Pump for:**
 - a. broken or missing drive key
 - b. damaged or missing o-ring
 - c. excessive gerotor clearance
 - d. galled or broken gerotor set*

System/Charge Relief Valve Pressure Settings

Inlet Vacuum	0,203 bar [6 inHg] max.
Case Pressure	1,7 bar [25 PSI] maximum
Charge Pressure	17,24 to 20,68 bar [250 to 300 PSI]*
System Pressure	345 bar [5000 PSI] maximum** 207 bar [3000 PSI] continuous

*Min: 13.8–17.2 Bar [200–250 psi], Max: 27.6–31 Bar [400–450 psi]

**380 Bar [5500 psi] Max, 276 Bar [4000 psi] Continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting is stamped on each valve with a three digit number. To identify, multiply the noted number by 10 to get the valves pressure setting.

Example: 10 x 500 = [5000 PSI] 345 bar

Start-Up Procedure

When initially starting a new or a rebuilt transmission system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1. After the transmission components have been properly installed, fill the servo pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.
2. Install and adjust all control linkage.
3. Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.
4. Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.
5. Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.
6. After the system starts to show signs of fill, slowly move pump swashplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.
7. Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.
8. Check all line connections for leaks and tighten if necessary.
9. The machine is now ready to be put into operation.
10. Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second at approximately 50 hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

How to Order

Single Pump - Product Number:

<u>552AK</u>	<u>00001</u>	<u>A</u>
A	B	C

Dual Pump - Product Number:

<u>558AK</u>	<u>00001</u>	<u>A</u>
A	B	C

Tandem Pumps - Product Number:

<u>559AK</u>	<u>00001</u>	<u>A</u>
A	B	C