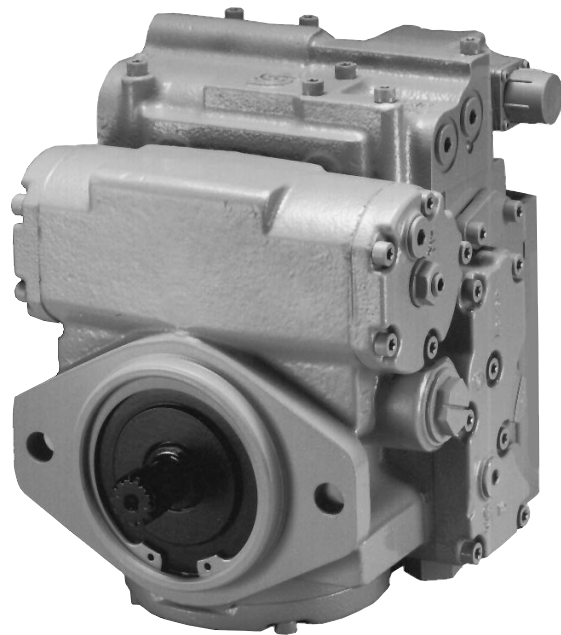


SAUER  SUNDSTRAND

Series 42



Axial Piston

Pumps

Service Instructions

1. Introduction

1.1 Using This Manual

The Adjustment and Minor Repair procedures detailed herein may be performed by trained personnel without voiding the unit warranty.



Cleanliness is a primary means of assuring satisfactory transmission life. Cleaning parts by using a clean solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign materials and chemicals. When performing service activities, protect all exposed sealing surfaces and open cavities from damage and foreign material.

Whenever removing a service component, it is recommended that any gaskets and O-rings be re-

placed. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly. All gasket sealing surfaces must be cleaned prior to installing new gaskets.

All exploded view drawings depict the 28cc frame size. For variances in the 41cc frame size, see the outline drawings in section 3. Differences in wrench size and torquing for the two frame sizes are noted in the text. Note that exterior housing screws are mostly Torx-type T30 or T45.

These symbols are used within drawings:

-  Apply petroleum jelly.
-  Lubricate with clean hydraulic oil.

1.2 Safety Precautions

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. The following general precautions should be taken into consideration whenever servicing a hydrostatic system.

Loss of Hydrostatic Braking Ability

WARNING
When Series 42 units are used in vehicular hydrostatic drive systems, the loss of hydrostatic drive line power in any mode of operation (e.g. acceleration, deceleration or “neutral” mode) may cause a loss of hydrostatic braking capacity. A braking system which is independent of the hydrostatic transmission must, therefore, be provided which is adequate to stop and hold the system should the condition develop.

Disable Work Function

WARNING
Certain service procedures may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing them in order to prevent injury to the technician and bystanders.

Fluid Under High Pressure

WARNING
Use caution when dealing with hydraulic fluid under pressure. Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury. This fluid may also be hot enough to burn. Serious infection or reactions can develop if proper medical treatment is not administered immediately.

Flammable Cleaning Solvents

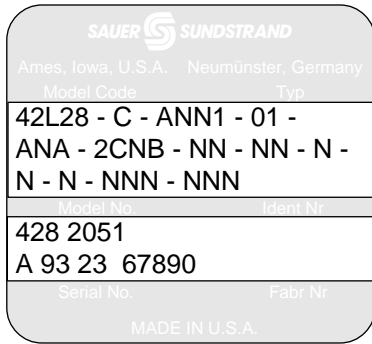
WARNING
Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

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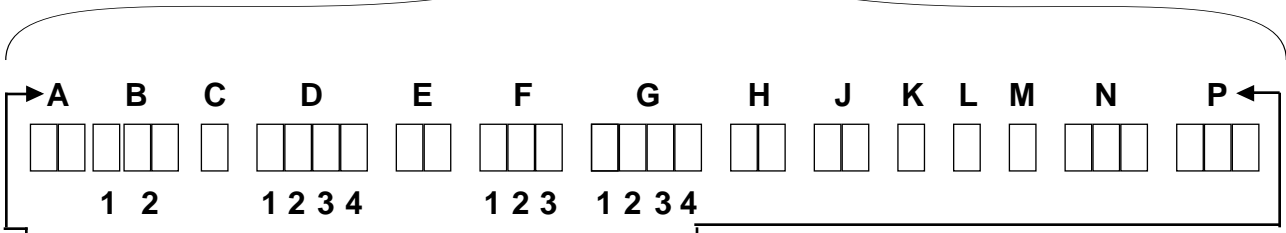
2. Model Code

Refer to the model code exhibited on the unit's name plate for information regarding the configuration of the unit.



Note: Some options listed here may not currently be available. Some options on your unit may not be listed here. This is not an order code. See the Series 42 Price Book for up-to-date ordering information.

X	XX	XX	XXXXX
Location	Year	Week	Sequence No.



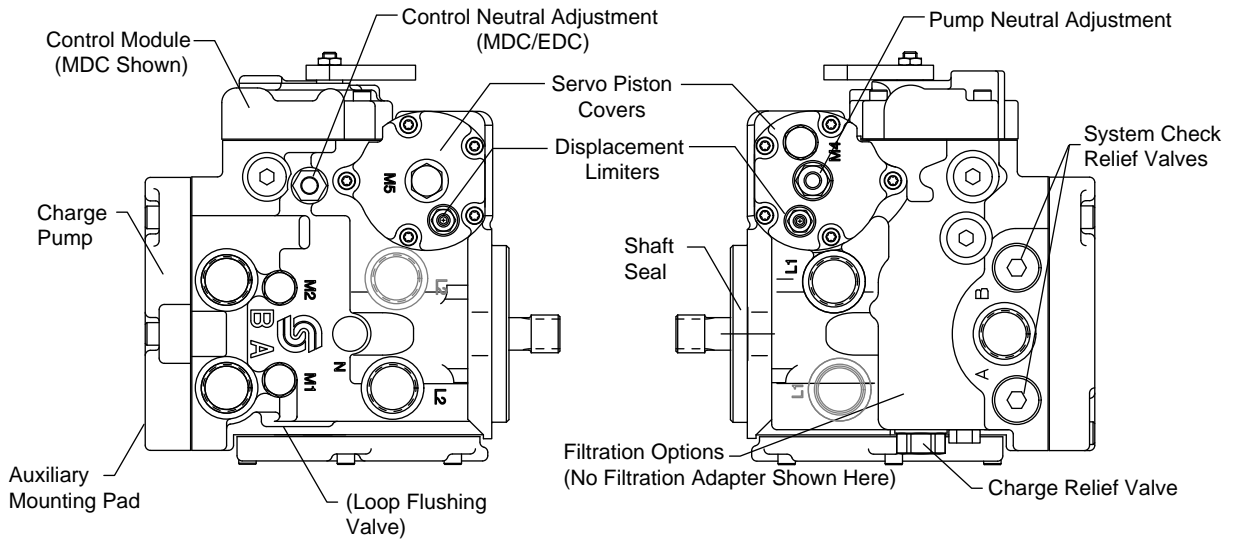
A	Series	42
B	1	Rotation L = CCW R = CW
	2	Displacement 28 = 28 cm ³ (1.71 in ³) 41 = 41 cm ³ (2.50 in ³)
C	Input Shaft Configurations	C = 13T 16/32P Spline D = 15T 16/32P Spline E = 19T 16/32P Spline G = 1.000 in. O.D. Straight Keyed K = 1.000 in. O.D. Tapered (1.5 in/ft)
D	1	Control Type N = None A = MDC, Linear, Low Force C = MDC, Non-Linear, Low Force E = EDC (Electric Displacmt Contrl) F = FNR (3-Pos Forwrd-Neut-Revrs) G = NFP (Non-Feedback Proportl)
	2	NSS for MDC or PCP for EDC or Connector for FNR or Style for NFP N = None or Not Applicable 1 = NSS / Weatherpack for MDC, or PCP Style for EDC or 12V Electric for NFP 2 = 12 V DIN for FNR 3 = NSS+BAS / CW Handle Rot. / Weatherpack for MDC or Hydraulic for NFP 5 = NSS+BAS / CCW Handle Rot. / Weatherpack for MDC
	3	Solenoid Override with MDC or EDC Input or Inching/Braking for NFP N = None or Not Applicable A = 12V Override / Weather Pack, or EDC Input = 14-85 mA or 400 - 1200 mA or 5-20 bar for NFP E = 12V Override / Brake Port
	4	Handle for MDC or Connector for EDC or Connector for NFP N = None or Not Applicable 1,6 = Standard Handle for MDC or M/S Connector for EDC or Amp Connector for NFP 2,5 = Clevis Handle for MDC or Weather Pack for EDC

E	Control Response Time	x1 = Fast x2 = Medium x3 = Slow
F	1	Port Style A,J,P = SAE Threaded O-Ring Boss N = None
	2	Loop Flushing/Cooling 2,3 = Loop Flushing/Cooling Shuttle
	3	Filtration N = None (Ext. Charge Supply) A = Suction (No Adapter Plate) C = Remote Pressure (Partial Flow) G = Suction (Adapter Plate)
G	1	Charge Pump N = None 2 = 11 cm ³ /rev (0.67 in ³ /rev)
	2	Charge Relief Setting C = 14 bar (205 psi) F = 20 bar (280 psi)
	3	Special Drive Features N = None 1 = NFP
	4	Rear Auxilliary Mounting Pad N = None A = SAE-A, 9 Tooth B = SAE-B, 13 Tooth T = SAE-A Special, 11 Tooth
H	High Pressure Relief Setting - Port "A"	NN = Check Valve only, No HPRV 14 = 140 bar (2030 psi) 17 = 175 bar (2450 psi) 19 = 190 bar (2755 psi) 21 = 210 bar (3045 psi) 23 = 230 bar (3330 psi) 25 = 250 bar (3625 psi) 28 = 280 bar (4060 psi) 30 = 300 bar (4350 psi) 34 = 345 bar (5000 psi) 00 = No HPRV, No Check Valves
J	High Pressure Relief Setting - Port "B"	
K	Loop Bypass Valve	N = None B = Yes
L	Displacement Limiters - Side 1	N, 0 = None
M	Displacement Limiters - Side 2	A, 1 = Yes, Set at Max Disp
N	Special Hardware Features	NNN = None
P	Special Non-Hardware Features	NNN = None

3. Component and Port Locations

3.1 Component Locations

A pump with a manual displacement control (MDC) and no filtration adapter is shown. With non-feedback and automotive controls, the positions of the case drains vary (shown in gray). With a filtration adapter, the porting in the "Filtration Options" area varies (see section 4.16).

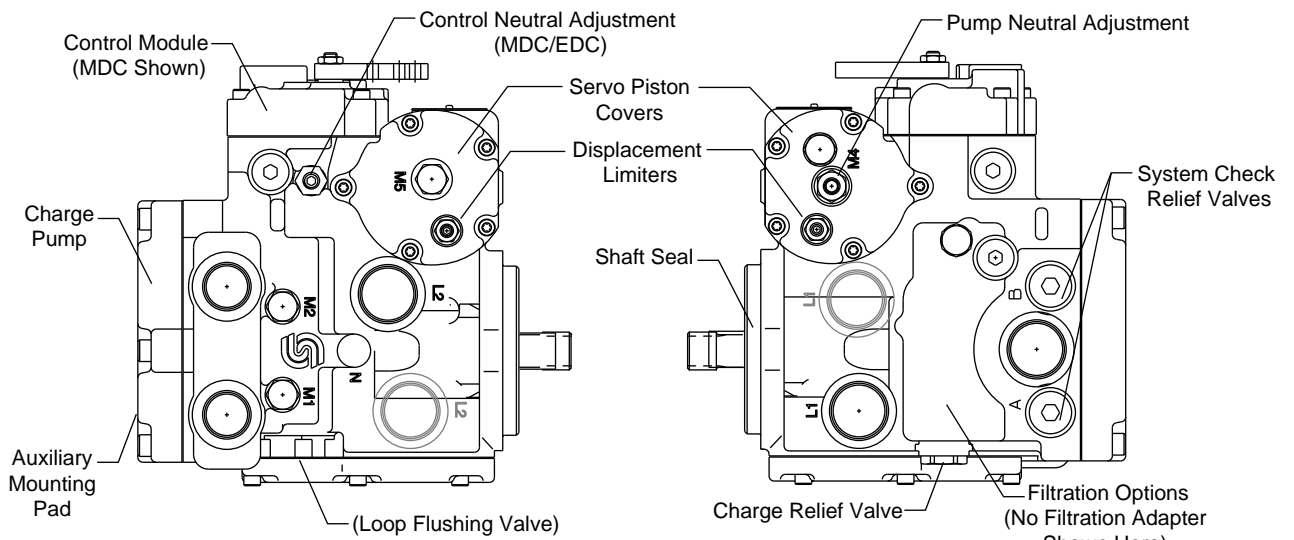


Left Side View (Side "2")

Right Side View (Side "1")

P100101 E

Series 42 28cc Variable Pump



Left Side View (Side "2")

Right Side View (Side "1")

P100102 E

Series 42 41cc Variable Pump

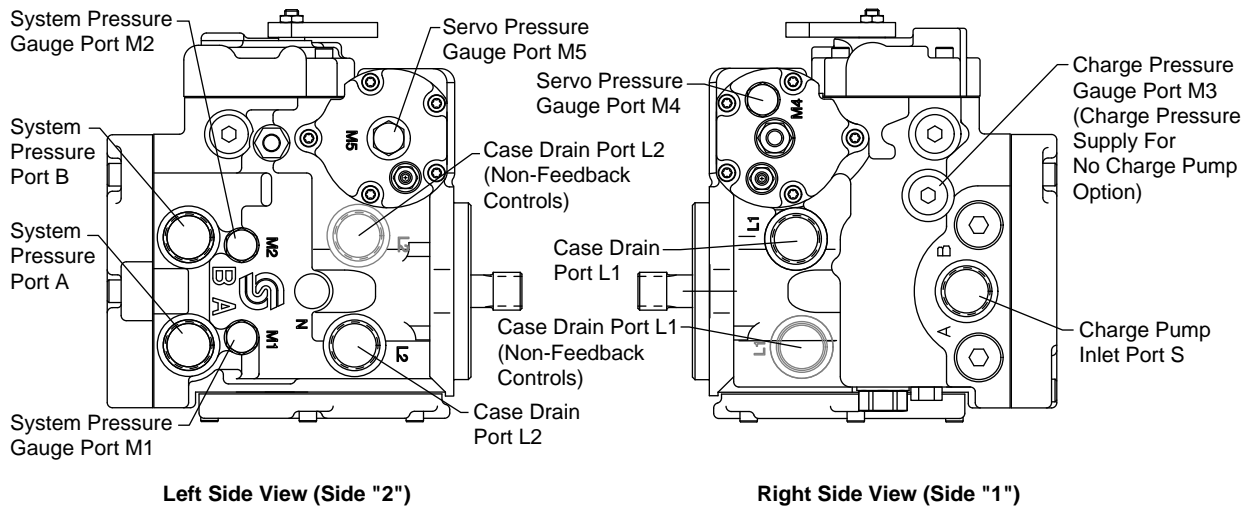
Series 42 Component and Port Locations

3.2 Ports and Pressure Gauges

Proper servicing of pumps and motors requires that pressure be measured and monitored at various points in the hydraulic circuit. The Series 42 pump has several locations at which to take these measure-

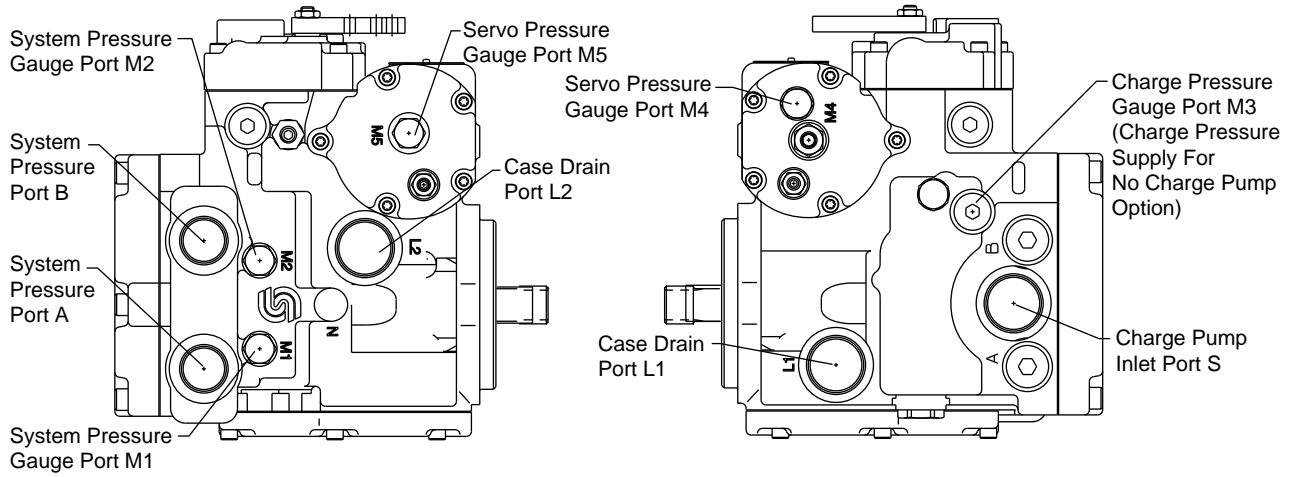
ments. The following outlines show the locations of the various gauge ports. The tables show the recommended gauge size and the fitting size for each port. Refer to this page when installing pressure gauges.

Gauge Port Name	Pressure Measured	Recommended Gauge Size	Fitting	
			028	041
M1 & M2	System Pressure for Ports A and B	600 bar or 10,000 psi	9/16–18 O-Ring Fitting	9/16–18 O-Ring Fitting
M3	Charge Pressure	60 bar or 1000 psi	3/4–16 O-Ring Fitting	3/4–16 O-Ring Fitting
M4 & M5	Servo Pressure	60 bar or 1000 psi	9/16–18 O-Ring Fitting	9/16–18 O-Ring Fitting
L1 & L2	Case Pressure	35 bar or 500 psi	1-1/16–12 O-Ring Fitting	1-5/16–12 O-Ring Fitting
S	Charge Pump Inlet Vacuum	1 bar, absolute or 30 in Hg Vacuum	1-1/16–12 O-Ring Fitting	1-5/16–12 O-Ring Fitting



28cc Base Unit with MDC and No Filtration Adapter

P100103 E

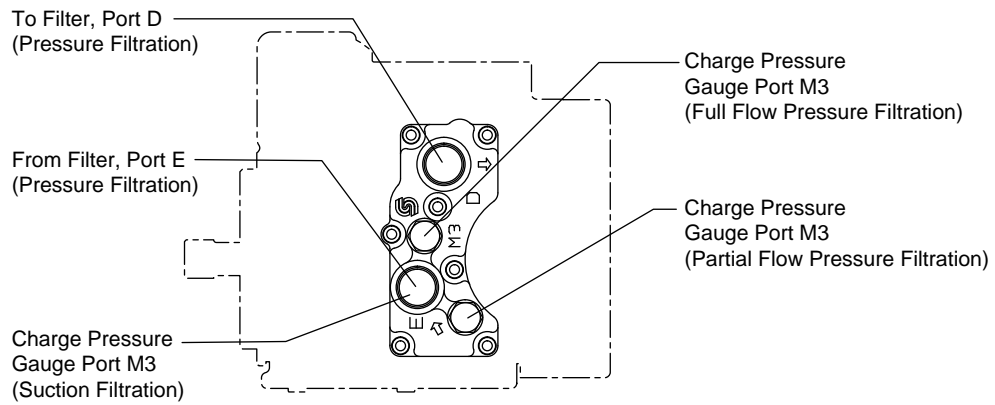


Left Side View (Side "2")

Right Side View (Side "1")

P100104 E

41cc Base Unit with MDC and No Filtration Adapter



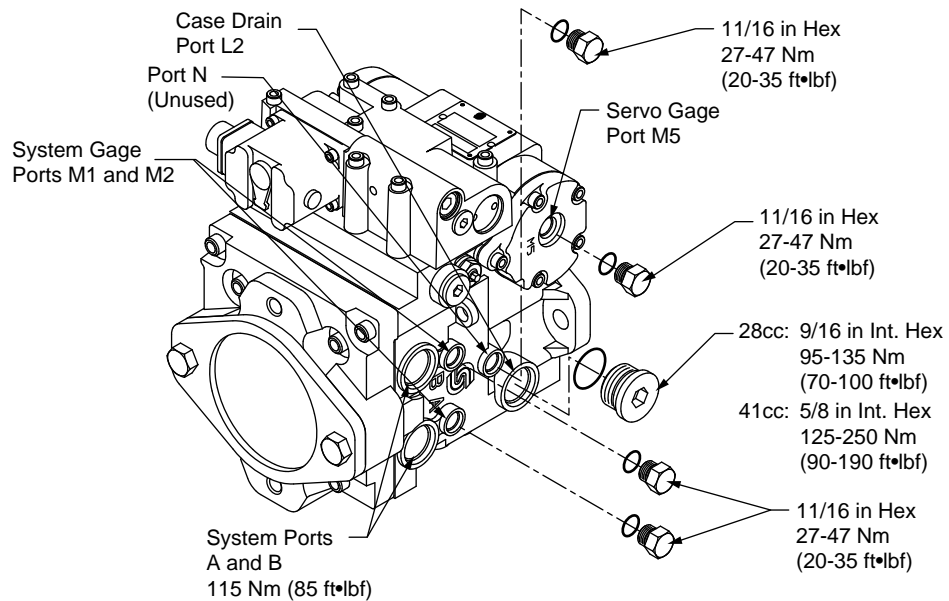
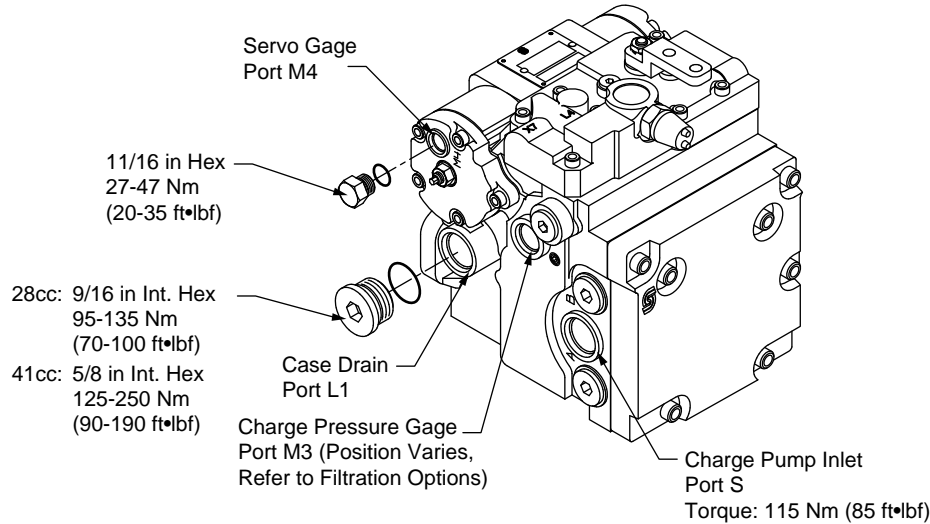
P100105 E

Filtration Adapter (28cc and 41cc Models)

4. Adjustment and Minor Repair Instructions

4.1 Size and Torque for Plugs and Fittings

Plug and fitting sizes are given here. Place a fresh O-ring, lightly lubricated with petroleum jelly, whenever a plug is removed. Each should be torqued as indicated. A 28cc unit with manual displacement control (MDC) is shown.



E100001 E

4.2 Pump "Neutral" Adjustment

The pump neutral adjustment sets the position of the servo piston and pump swashplate relative to the controlling mechanism.

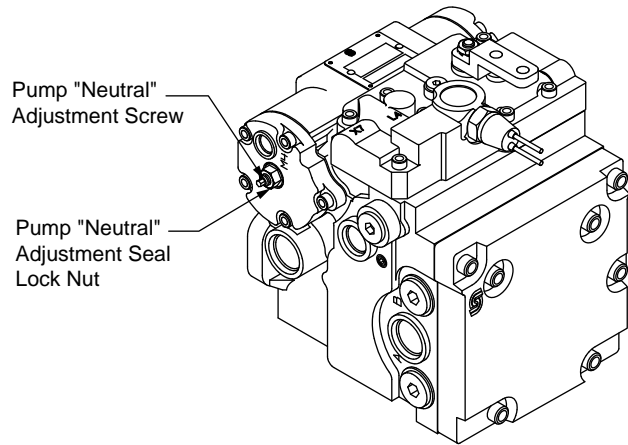
WARNING

The following procedure requires the vehicle / machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.

1. Disconnect machine function.
2. Connect a hose between gauge ports M4 and M5 to equalize the pressures on both ends of the pump servo piston.
3. Install pressure gauges in gauge ports M1 and M2 to measure system pressure.
4. Start the prime mover and operate at normal speed.
5. Loosen the pump "neutral" adjustment seal lock nut [28cc⇒13 mm Hex; 41cc⇒17 mm Hex]. Turn the pump "neutral" adjustment screw [28cc⇒5 mm Hex; 41cc⇒7 mm Hex] until the system pressure gauge readings are equal.
6. Turn the adjustment screw clockwise until one of the gauges registers an increase in system pressure. Note the position of the adjustment screw.
Turn the screw counterclockwise until the other gauge registers an increase in system pressure. Note the position of the adjustment screw.
7. Turn the adjustment screw clockwise to a position halfway between the positions noted above. The system pressure gauges should indicate equal pressures.
8. While holding the adjustment screw in position, torque the seal lock nut [28cc⇒20-26 Nm (15-19 ft•lbf); 41cc⇒28-51 Nm (21-37 ft•lbf)] .
9. Stop the prime mover and remove the hose between gauge ports M4 and M5. Remove the pressure gauges installed in gauge ports M1 and M2. Reinstall the plugs in the gauge ports.
10. Reconnect work function.

IMPORTANT

If the pump is equipped with an MDC or EDC, the CONTROL "neutral" adjustment MUST also be performed before putting the pump into service (see next section).



E100002 E

**Pump Neutral Adjustment Screw
(MDC Control Shown)**

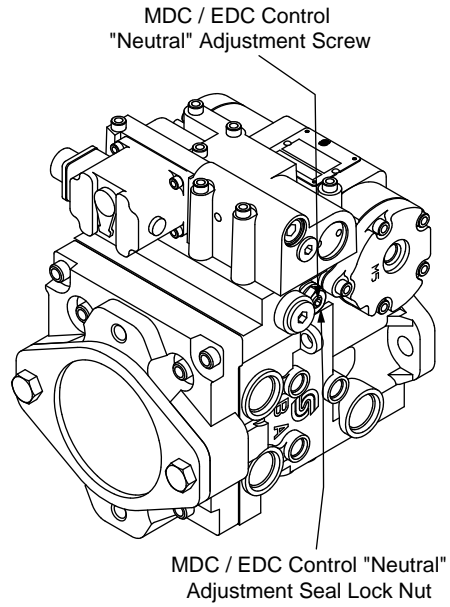
4.3 Control "Neutral" Adjustment for MDC/EDC Controls

The control neutral adjustment aligns the pump swashplate and the control spool so that a zero angle control setting provides a zero degree swashplate setting. This adjustment should be performed whenever any part of the control or swashplate mechanisms is adjusted or removed or after the pump neutral setting (previous section) is adjusted.

WARNING
The following procedure requires the vehicle / machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.

1. Disconnect the work function. Disconnect the external control linkage (for MDC) or control signal input (for EDC) from the pump.
2. Install pressure gauges in gauge ports M4 and M5 to measure pressure on the pump servo piston.
3. Start the prime mover and operate at normal speed.
4. Loosen the CONTROL "neutral" adjustment seal lock nut (see drawing) [17 mm Hex] . Turn the control "neutral" adjustment screw [5 mm Int. Hex] until the servo piston pressure gauge readings are as close to equal as possible.
5. Turn the adjustment screw clockwise until one of the gauges registers an increase in pressure on the servo piston. Note the position of the adjustment screw.

 Turn the screw counterclockwise until the other gauge registers an increase in pressure on the servo piston. Note the position of the adjustment screw.
6. Turn the adjustment screw clockwise to a position halfway between the positions noted above. The servo piston pressure gauges should indicate nearly equal pressures.
7. While holding the adjustment screw in position, torque the seal lock nut [14-24 Nm (10-18 ft•lbf)].
8. Stop the prime mover and remove the pressure gauges installed in gauge ports M4 and M5. Reinstall the plugs in the gauge ports.
9. Reconnect the external control linkage (for MDC) or control signal input (for EDC) to the pump. Reconnect the work function.



E100003 E

Control Neutral Adjustment Screw (EDC Control Shown)

4.4 MDC Control Module

The manual displacement control (MDC) module provides control of the pump servo piston through a connection to the summing link pin within the pump housing. The following procedure shows how to remove and install the control housing. Section 4.6 explains how to remove and install the control spool and linkage.

1. Clean the external surfaces of the pump. If necessary, remove the MDC handle.
2. Remove the seven (7) control retaining screws [Torx T30] that secure the control to the pump housing. Remove the control and control gasket from the pump.

Note: See section 4.6 for instructions on removing/installing the control spool and linkage.

3. Clean the sealing surfaces of the control and the pump housing. Place a new gasket in position on the housing.

CAUTION

The control orifices are part of the control gasket. Refer to the appropriate Service Parts List to determine the correct gasket.

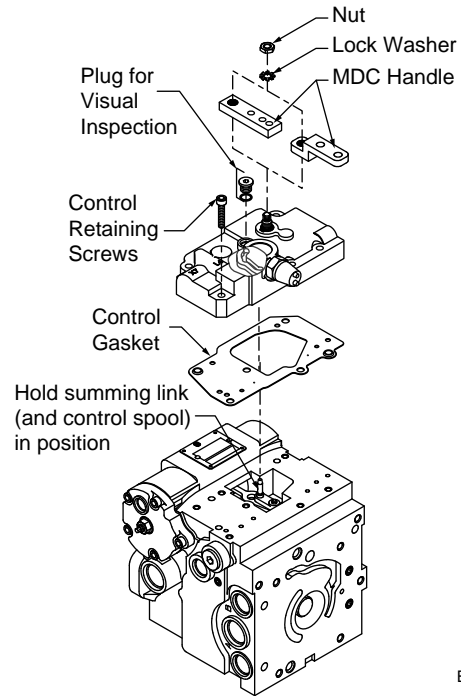
4. Hold the summing link pin in position while installing the control. (The spring on the control spool will tend to push the link to an extreme position.) The link pin **MUST** engage the slot in the control cam. A plug is provided on the MDC housing to permit visual inspection of linkage pin engagement.

Note: It may be easiest to lay the servo piston side of the control down first, then watch the link pin engage from the charge pump side of the pump.

5. Install and torque the control screws [15-17 Nm (11-13 ft•lbf)]. Perform Control Neutral Adjustment (Section 4.3).

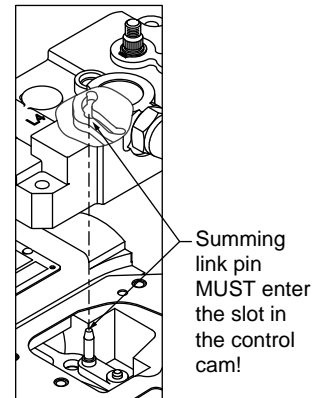
WARNING

Failure to properly engage the link pin with the control cam will result in incorrect control operation, which may lead to loss of control of the vehicle / machine.



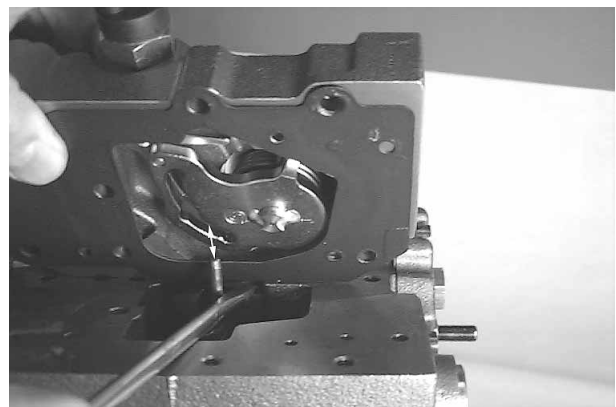
E100004 E

MDC Control Module Assembly



E100005 E

Link Pin Into Cam Slot



Link Pin Into Cam Slot

F100201

4.5 EDC Control Module

The Electric Displacement Control (EDC) provides a control function through connections to the summing link pin within the pump housing. The following procedure shows how to remove and install the control housings. The next section explains how to remove and install the control spool and linkage.

1. Clean the external surfaces of the pump. If necessary, remove control input signal.
2. Remove the seven (7) control retaining screws [Torx T30] that secure the control to the pump housing. Note the position of the different length screws. Remove the control and control gasket from the pump.

Note: See next section for instructions on removing/installing the control spool and linkage.

3. Clean the sealing surfaces of the control and the pump housing. Place a new gasket in position on the housing.

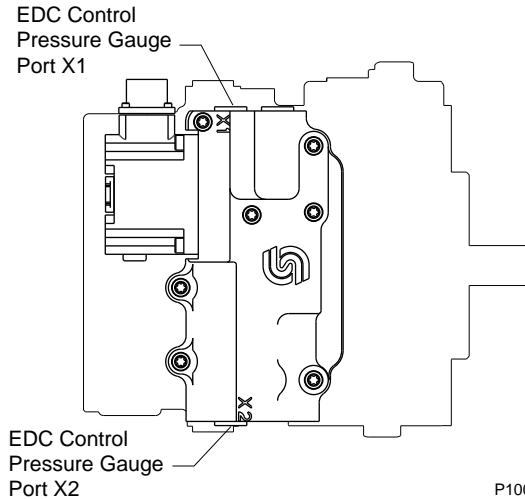
CAUTION
The control orifices are part of the control gasket. Refer to the appropriate Service Parts List to determine the correct gasket.

4. Hold the summing link pin in position while installing the control. (The spring on the control spool will tend to push the link to an extreme position.) The link pin **MUST** engage the hole in the control piston fork.

Note: It may be easiest to lay the servo piston side of the control down first, then watch the link pin engage from the charge pump side of the pump.

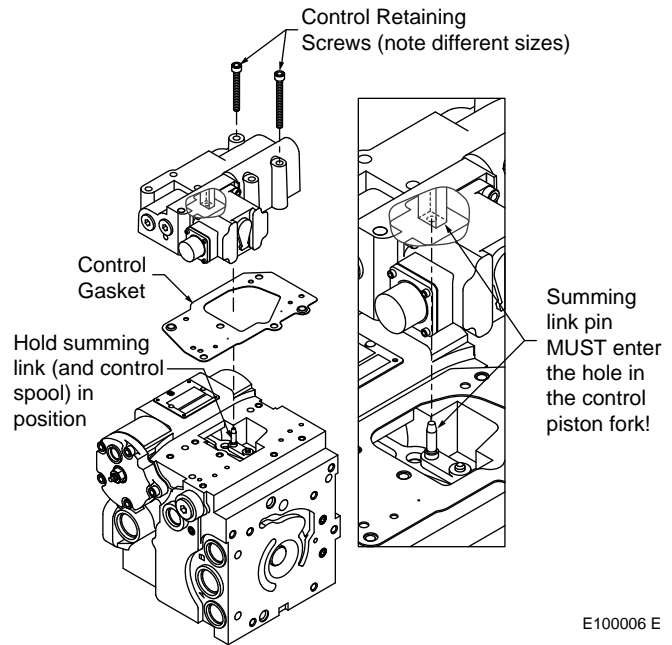
5. Install and torque the control screws [15-17 Nm (11-13 ft•lbf)]. Perform Control Neutral Adjustment (Section 4.3).

WARNING
Failure to properly engage the link pin with control piston fork will result in incorrect control operation, which may lead to loss of control of the vehicle / machine.



EDC Module Showing Port Locations

P100106 E



EDC Control Module Assembly

E100006 E

4.6 MDC/EDC Control Spool, Control Linkage, and Control Neutral Adjustment Screw

The control spool, control linkage, and control neutral adjustment screw can be removed for cleaning and to change the O-rings or the seal lock nut.

Removal of Spool, Linkage, and Adjustment Screw

1. Clean the external surfaces of the pump.
2. Remove the MDC or EDC module and the control gasket from the pump housing (see previous two sections).
3. Remove the summing link.
4. Remove the control spool bore plug [5/16 in Int. Hex] or screws [Torx T30], cover, and gasket. Remove the opposite bore plug [5/16 in Int. Hex], and remove the control spool and spring.
5. Remove the linkage pivot screw [4 mm Int. Hex], feedback link, and neutral adjustment link.
6. Remove the seal lock nut [17 mm Hex] and the control neutral adjustment screw [5 mm Int. Hex].

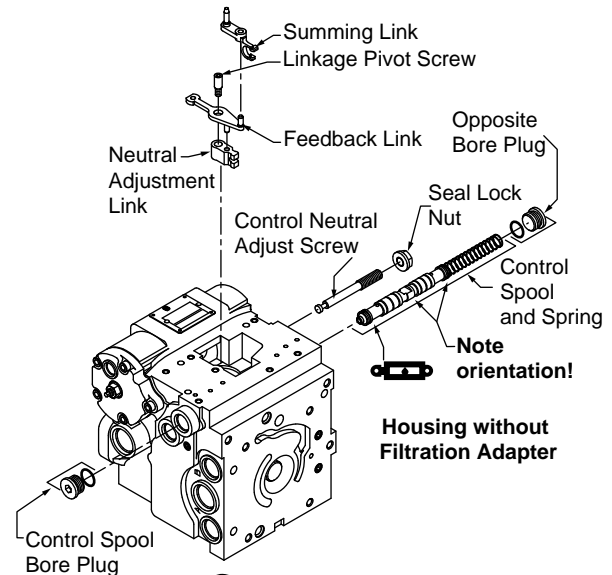
Installation of Spool, Linkage, and Adjustment Screw

1. Install the control neutral adjustment screw and seal lock nut. Do not tighten the nut.
2. Assemble the "neutral" adjustment link and feedback link, and install as shown. Install and torque the linkage pivot screw [8-15 Nm (6-11 ft•lbf)].
3. Lubricate and install the control spool and spring assembly noting proper orientation.

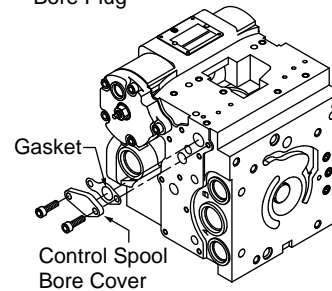
WARNING

The control spool and spring assembly MUST be oriented in the housing as shown for proper control operation.

4. Install and torque the control spool bore plug [41-94 Nm (30-70 ft•lbf)]. Or install the control spool cover (with a new gasket) or plug, and torque the screws [15-17 Nm (11-13 ft•lbf)].
5. Install the summing link. Hold the control spool in position while engaging the fork on the summing link with the flats on the spool. If necessary, rotate the spool to engage the summing link.
6. Install a new control gasket. Hold the summing link and control spool in position while reinstalling the MDC or EDC (see section 4.4 or 4.5). Perform Control Neutral Adjustment (section 4.3).



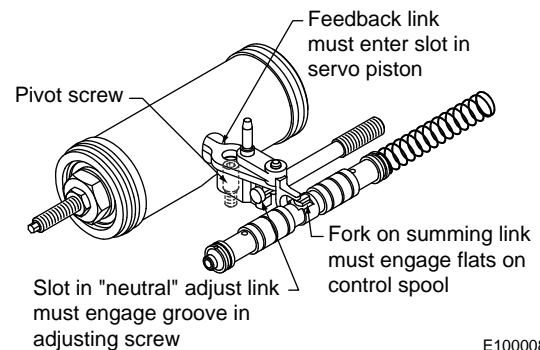
Housing without Filtration Adapter



Housing with Filtration Adapter

MDC/EDC Control Spool and Linkage

E100007 E



Servo Piston Linkage and Control Spool (Internal Parts Shown with Housing Removed)

E100008 E

4.7 MDC Neutral Start/Backup Alarm Switch

The Neutral Start Switch (NSS) prevents the engine and pump from being started when the pump is out of neutral. The NSS should be wired in series with the engine starting circuit. The switch contact is closed at the control handle's neutral position and opens when the control handle is rotated 1.5 to 2° from neutral.

The Backup Alarm Switch (BUA) outputs an electronic signal when the control handle is in a reverse position. This switch is normally wired in series with an audio output. The switch contact is open until the control handle is rotated 2.6 to 3.75° in the reverse direction.

CAUTION
The control handle's neutral position must agree with the pump's neutral position for the NSS/BUA to work effectively (see section 4.3).

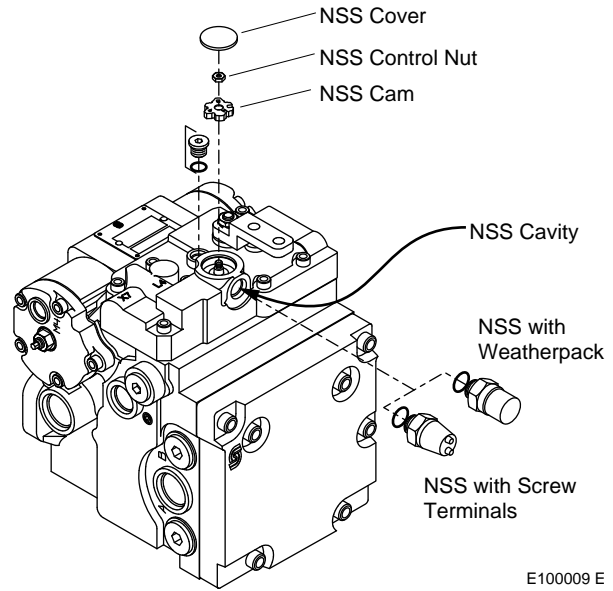
The Neutral Start / Backup Alarm Switch assembly can be configured for three different settings.

- i. A Neutral Start Switch only.
- ii. A Neutral Start Switch with Backup Alarm for units where clockwise (CW) handle rotation results in "reverse" motion.
- iii. A Neutral Start Switch with Backup Alarm for units where counterclockwise (CCW) handle rotation results in "reverse" motion.

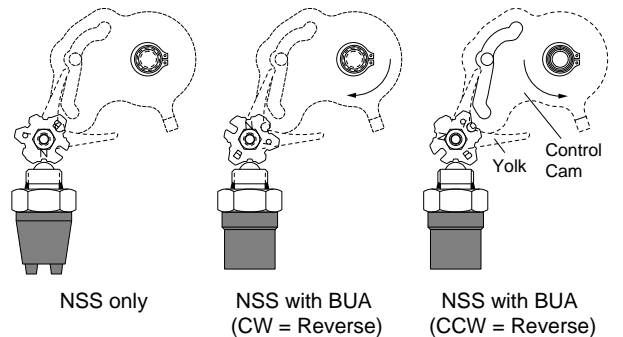
The setting must be in accordance with the configuration of the unit. See the model code (section 2) if uncertain of the type of NSS you have.

Alignment of the NSS requires a special alignment tool. Dimensions are given at right.

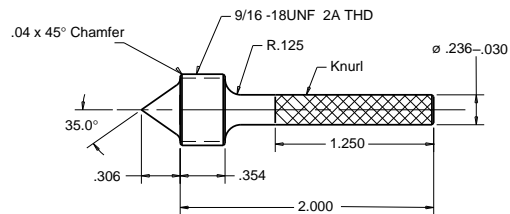
(continued)



NSS Assembly on MDC



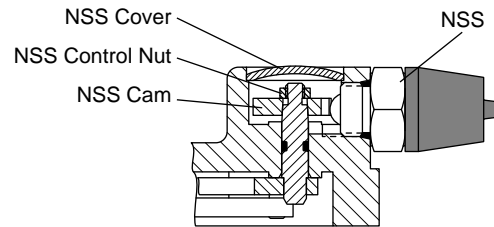
Top View of NSS Showing Cam Positions



Alignment Tool

Adjustment is performed by setting the cam position within the NSS assembly.

1. The MDC module must be removed from the pump housing. Refer to section 4.4.
2. Remove NSS [7/8 in Hex].
3. Remove the NSS cover by inserting a screwdriver into the NSS cavity and popping off the cover with a hammer. Be careful not to damage the internal hardware.
4. Remove the control nut [8 mm Hex].
5. Use a screwdriver to pop off the cam.
6. Set cam in proper orientation according to the unit's configuration (i, ii, or iii above).
7. Screw special alignment tool in NSS cavity to hold cam in place.
8. On the underside of the MDC module, clamp a pair of locking pliers around the spring contacts of the control cam. The pliers should hold the nub on the control cam to the pin underneath. This will hold the control cam in neutral position.
9. Screw control nut on cam [4.1-6.8 Nm (3-5 ft•lbf)].
10. Press new cover on top of cam cavity. This requires either an arbor press or a full-sized punch (punch depth = 1.06 mm (0.0417 in), punch width = 23.3 mm (0.916 in)).
11. Remove the alignment tool and the locking pliers.
12. Place a new lubricated O-ring on NSS.
13. Reconnect the NSS [25-29 Nm (18-22 ft•lbf)] to the MDC.
14. Reinstall MDC module onto pump housing (refer to section 4.4).



Side View of NSS and NSS Cavity

P100109 E



Underside of MDC Module Showing Where to Clamp Locking Pliers

F100202

4.8 MDC Solenoid Override Valve

The solenoid override valve is a safety feature that connects both ends of the servo control piston together when the solenoid is de-energized. Thus the pump can be put into stroke only when the solenoid is energized.

The solenoid override with brake release includes hydraulic control of a safety brake. When de-energized, a spring-applied, hydraulically-released brake is drained through port X7. For conditions where case back-pressure on the spring-applied brake is critical, an external drain to the reservoir can be connected through port L4.

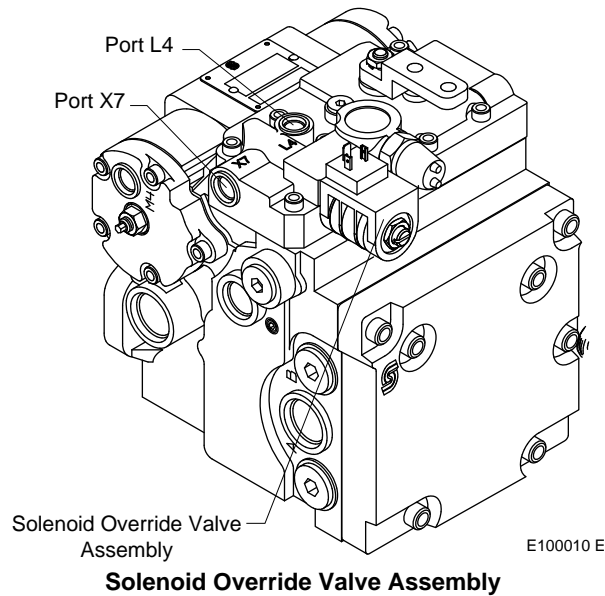
The solenoid override valve can be removed to inspect and remove foreign matter.

Removal

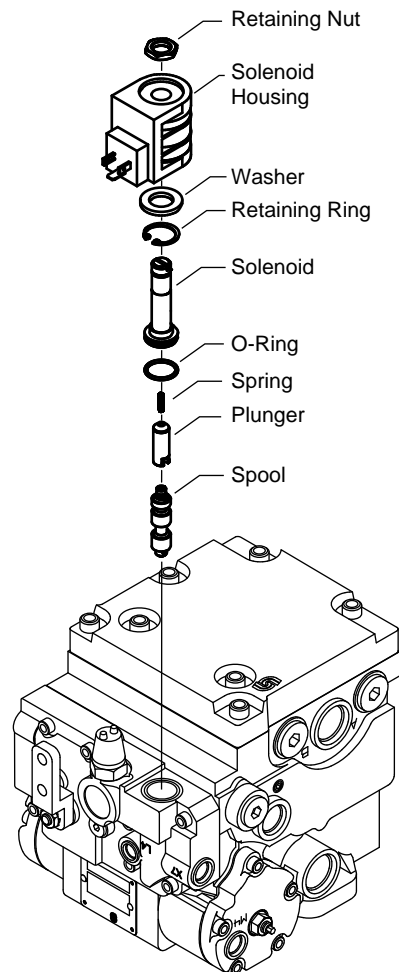
1. Remove retaining nut [9/16 in Hex].
2. Remove solenoid housing.
3. Remove retaining ring at base of solenoid.
4. Remove solenoid. This should be connected to internal spool.

Installation

1. Replace O-ring.
2. Place spring and plunger inside of solenoid.
3. Attach spool (male notch) to plunger (female notch).
4. Insert solenoid/spool assembly in solenoid override bore.
5. Snap retaining ring over base of solenoid.
6. Place washer at base of solenoid.
7. Install housing and retaining nut [2-4 Nm (1.5-3.5 ft•lbf)].



Solenoid Override Valve Assembly



Exploded View of Solenoid Override Assembly

4.9 FNR, NFPE, and NFPH Controls

The 3-position FNR control and the electric and hydraulic non-feedback proportional (NFPE and NFPH) controls are non-feedback type controls. The FNR and NFPE controls consist of modules mounted on the pump housing. The hydraulic input for NFPH is received through ports on the top of the pump [9/16–18 SAE O-ring fitting].

The non-feedback controls are set at the factory. The control modules can be removed to clean the ports and change the O-rings.

The orifice plugs for the FNR and NFPE are located inside the servo piston covers. The orifice plugs for the NFPH are located in the NFPH ports. Orifice plugs may be cleaned or replaced.

Note: Future models may contain orifice plate between module and pump housing.

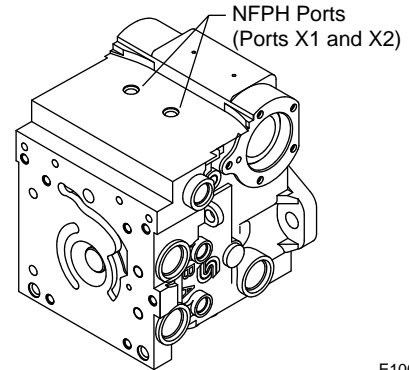
Removal and Installation of FNR and NFPE Modules

1. Clean pump and module housings.
2. Remove four (4) screws retaining module to housing [4 mm Int. Hex], and remove module from pump housing.
3. Remove O-rings from the control ports. Examine ports for cleanliness.
4. Clean sealing surfaces.
5. Replace locator pin.
6. Install new O-rings.
7. Replace screws [4.7-6.1 Nm (3.5-4.5 ft•lbf)].

Removal and Installation of FNR and NFPE Control Orifices

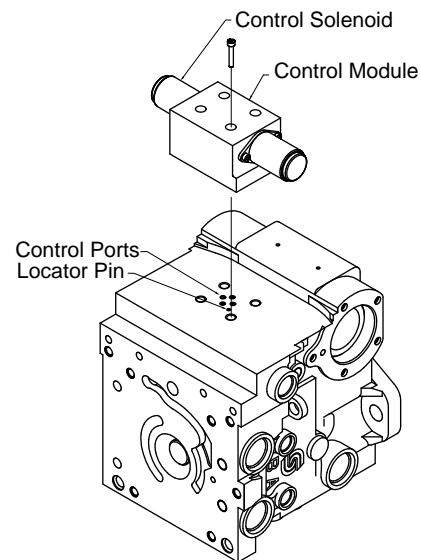
Note: Future models may contain an orifice plate between module and pump housing. This will take the place of the orifice plugs beneath the servo piston cover.

1. Remove servo piston cover (see section 4.17).
2. Remove orifice plug [1/8 in Int. Hex].
3. Examine orifice and port for cleanliness.
4. Install orifice plug [2.0-3.4 Nm (1.5-2.5 ft•lbf)].



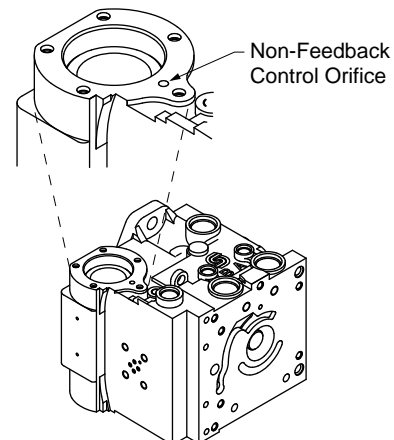
Position of NFPH Ports

E100012 E



NFPE Assembly (FNR Similar)

E100013 E



Location of Non-Feedback Control Orifice

E100014 E

4.10 System Check Relief Valves (High Pressure Relief, Charge Check, & Bypass Valves)

The charge check, high pressure relief, and the loop bypass functions are all contained within the system check relief (SCR) valve assembly. This assembly may be removed for cleaning and installation of fresh O-rings. The model code specifies whether high pressure relief valves, combination charge check/high pressure relief valves, and/or loop bypass valves are present or not.

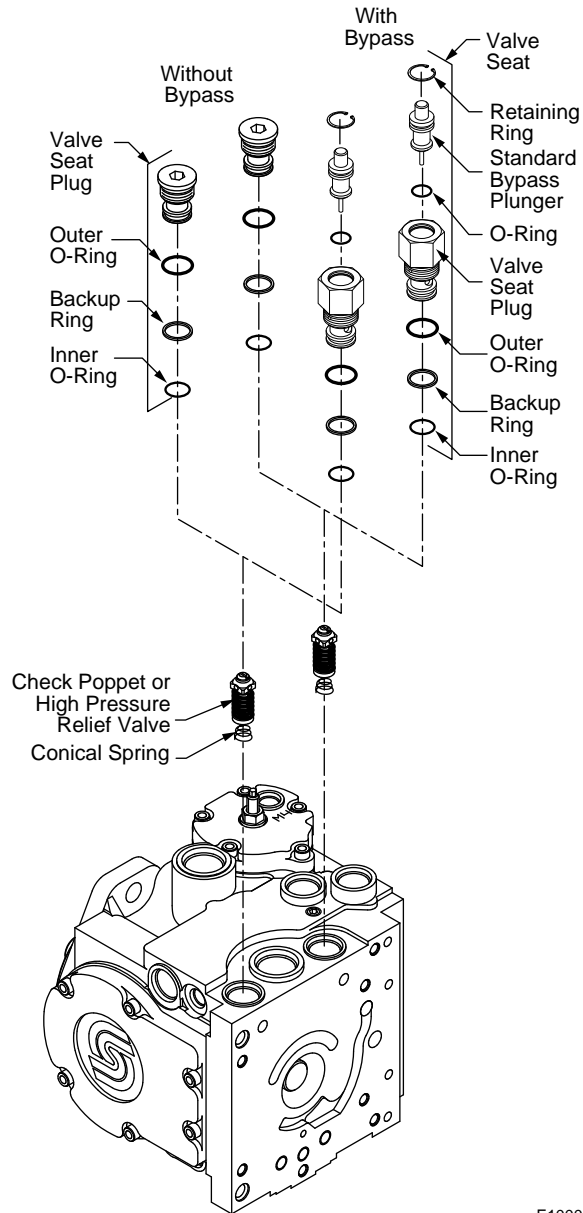
1. Remove the valve seat plugs [9 mm Int. Hex] or valve seat/bypass plugs [1 in Hex] from the pump housing.
2. Remove the check poppet or relief valve assemblies from the pump housing. The smaller end of each conical spring is crimped to retain it on the check poppet or relief valve. Do not remove.
3. Inspect the valves and mating seats in the special plugs for damage or foreign material.

CAUTION
The relief valves are factory set and should not be tampered with, except for replacing the entire valve.

4. The O-ring on the standard bypass plunger may be replaced by removing the retaining ring and removing the plunger from the special valve seat plug. Remove the O-ring from the plunger and install a new O-ring. Reinstall the plunger and retaining ring.
5. Install a new outer O-ring, new backup ring, and new inner O-ring on each valve seat plug.
6. Check that the conical springs are properly retained on the check poppets or relief valves. Install the check poppet or high pressure relief valve assemblies into the pump housing .

CAUTION
The conical springs MUST be correctly positioned on the check poppets or relief valves after installation for proper pump operation.

7. Install the valve seat plugs or valve seat/bypass plugs into the pump housing and torque [40-95 Nm (30-70 ft•lb)].



System Check Relief Valve Components

E100015 E

4.11 Charge Relief Valve

The charge relief valve may be removed for cleaning and installation of fresh O-rings. The pressure setting may be changed. However, note that the setting will vary for different charge flows which depends on charge pump size and pump speed. The factory setting is set relative to case pressure at 1800 rpm. The actual charge pressure will vary at different speeds.

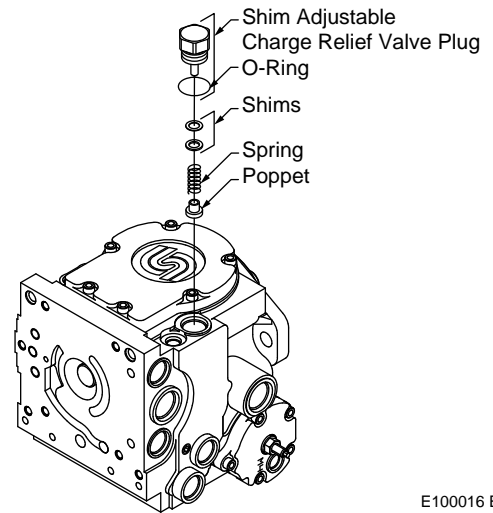
Shim Adjustable Style

1. Remove the shim adjustable charge relief valve plug [1 in Hex] from the pump housing. Remove the O-ring from the plug.
2. Remove the spring and poppet from the housing.
3. Do not alter the shims which may be installed between the spring and valve plug, or interchange parts with another valve. Inspect the poppet and mating seat in the housing for damage or foreign material.
4. If desired, the charge relief valve setting can be changed. An *approximate* rule of thumb is 4 bar / 1.25 mm (58 psi / 0.050 in). The effective setting will vary.

To confirm the charge relief valve setting, measure charge pressure (port M3) with the pump in stroke. The charge pressure should level off when the relief setting is reached.

5. Install a new O-ring on the valve plug. Reinstall the poppet, spring, and plug (with shims and O-ring) into the pump housing [55-135 Nm (40-100 ft•lb)].

(continued)



E100016 E

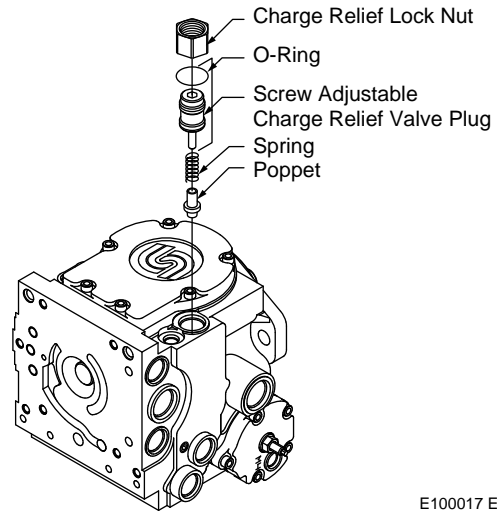
Shim Adjustable Charge Relief Valve Components

Approximate Relief Setting vs Shim Thickness	
4 bar / 1.25 mm	(58 psi / 0.050 in)

Screw Adjustable Style

1. Before removing the screw adjustable relief valve plug, mark the plug, lock nut, and housing so as to approximately maintain the original adjustment when assembling. Remove the screw adjustable charge relief valve plug by loosening the lock nut [1-1/16 in Hex] and unscrewing the plug [8 mm Int. Hex]. Remove the O-ring from the plug.
2. Remove the spring and poppet from the housing.
3. Inspect the poppet and mating seat in the housing for damage or foreign material.
4. Install a new O-ring on the valve plug. Reinstall the poppet and spring. Reinstall the plug with its lock nut [47-57 Nm (34-42 ft•lbf)], aligning the marks made at disassembly.
5. Check and adjust, if necessary, the charge pressure. For screw adjustable "anti-stall" charge relief valves, an approximate rule of thumb is 2.8 bar / quarter turn (40 psi / quarter turn).

To confirm the charge relief valve setting, measure charge pressure (port M3) with the pump in stroke. The charge pressure should level off when the relief setting is reached.



E100017 E

Screw Adjustable Charge Relief Valve Components

Approximate Relief Setting vs Screw Revolution	
2.8 bar / 1/4 turn	(40 psi / 1/4 turn)

4.12 Loop Flushing Valve

The loop flushing function consists of the loop flushing shuttle valve and the loop flushing relief valve. The assemblies may be removed for cleaning and installation of new O-rings. The relief valve poppet may be exchanged for one with a different flow rating, but the relief valve shims should not be changed out unless specifically instructed so by Sauer-Sundstrand. The function also can be defeated.

Loop Flushing Valve

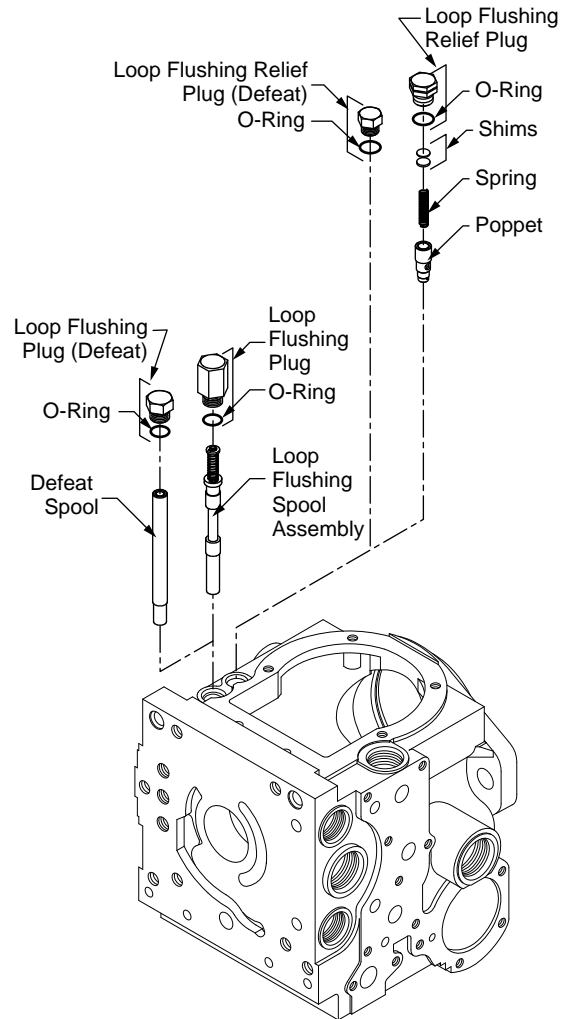
1. Remove the loop flushing valve plug from the pump housing [11/16 in Hex]. Remove the O-ring from the plug.
2. Remove the loop flushing valve spool assembly from the housing.
3. Inspect the parts for damage or foreign material. The centering spring must be securely retained to the spool by the washer.
4. Install the loop flushing valve spool assembly into its bore. Install a new O-ring on the loop flushing plug and install [27-47 Nm (20-35 ft•lbf)].

Loop Flushing Relief Valve

1. Remove the loop flushing relief valve internal hex plug [5/8 in Hex] from the pump housing. Remove the O-ring from the plug.
2. Remove the spring and poppet from the housing.
3. Do not alter the shims which are installed between the spring and valve plug, or interchange parts with another valve. Inspect the poppet and mating seat in the housing for damage or foreign material. Inspect the orifice in the valve poppet.
4. Install a new O-ring on the valve plug. Reinstall the poppet, spring, shims, and plug (with O-ring) into the pump housing [15-34 Nm (15-25 ft•lbf)].

Defeating Loop Flushing

1. Remove the loop flushing valve from the pump housing.
2. Install the defeat spool into the spool bore in the housing. Install the plain plug with O-ring into the housing [11/16 in Hex], and torque [27-47 Nm (20-35 ft•lbf)].
3. Remove the charge relief valve (these parts are not necessary).
4. Install the plain hex plug with O-ring into the end cap [5/8 in Hex], and torque [15-34 Nm (15-25 ft•lbf)].



Loop Flushing Valve and Loop Flushing Defeat Components

E100018 E

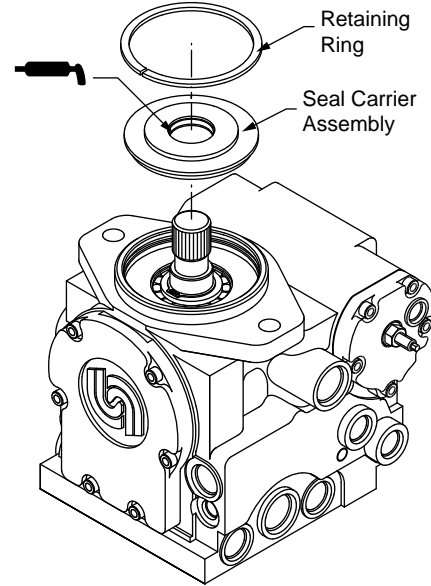
4.13 Shaft Seal and Shaft Replacement

A lip type shaft seal is used in Series 42 pumps. This seal and/or the shaft can be replaced without major disassembly of the unit. Replacement generally requires removal of the pump from the machine.

1. Position the pump with the shaft facing up.

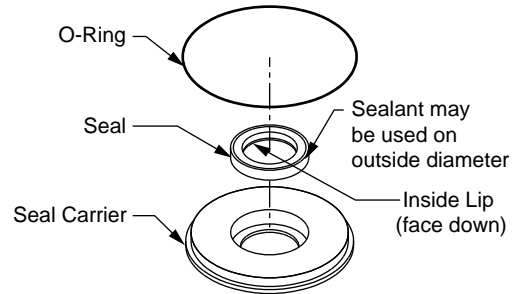
NOTE: If the unit is positioned horizontally when the shaft is removed, the cylinder block could move out of place, making shaft installation difficult.
2. Remove the retaining ring from the housing.
3. Pull out seal carrier assembly.
4. Remove the O-ring from the seal carrier. To install a new shaft only, proceed to step 8.
5. Place the seal carrier in an arbor press with the shaft bearing side down, and press out the old seal. An appropriately sized pipe spacer or socket wrench can be used as a press tool. Once removed, the seal is not reusable.
6. Inspect the seal carrier and the new seal for damage. Inspect the sealing area on the shaft for rust, wear, or contamination. Polish the sealing area on the shaft if necessary.
7. Press the new seal into the shaft bearing side of the seal carrier. The seal lip must face the outside of the pump. Be careful not to damage the seal. The outside diameter of the seal may be coated with a sealant (e.g. Loctite High Performance Sealant #59231) prior to installation. This aids in preventing leaks caused by damage to the seal bore in the seal carrier.

(continued)



E100019 E

Shaft Seal Components

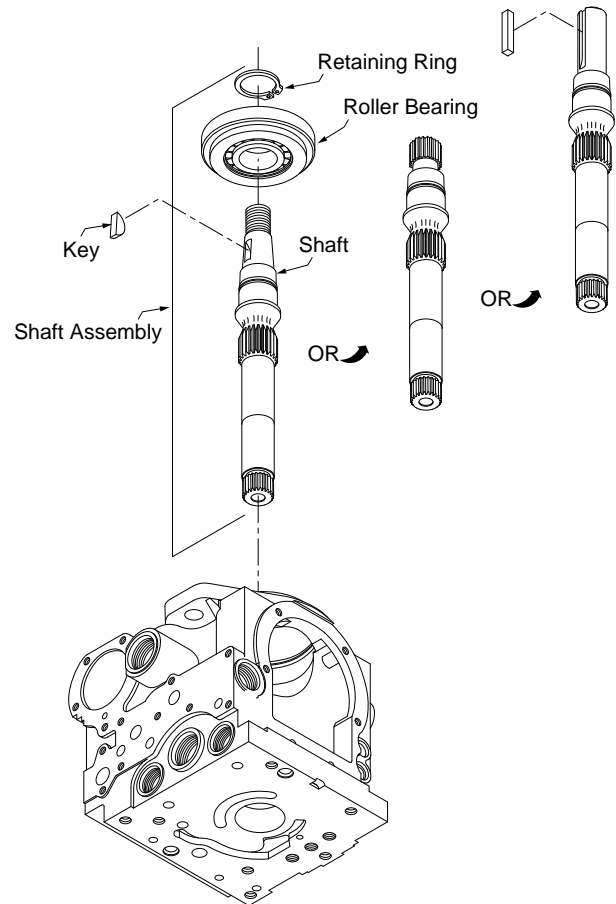


Press Seal to bottom of Seal Carrier

E100020 E

Installation of Shaft Seal

- If the shaft is not being replaced proceed to step 11.
8. Remove the shaft and roller bearing assembly from the pump or motor. The bearing assembly can be transferred to the new shaft (steps 9 and 10).
 9. Remove the retaining ring that secures roller bearing assembly with a snap ring plier. Remove the roller bearing assembly.
 10. Place roller bearing assembly on new shaft and secure with the retaining ring.
 11. Wrap the spline or key end of shaft with thin plastic to prevent damage to the seal lip during installation. Lubricate the inside diameter of the shaft seal with petroleum jelly.
 12. Place the O-ring onto the shaft bearing and lubricate with petroleum jelly.
 13. Slide the seal carrier assembly over the shaft and into the housing bore. Press against O-ring. Hold inward pressure against the shaft to compress the cylinder block spring while pressing the seal carrier into place.
 14. Install the retaining ring.



Shaft Components

E100021 E

4.14 Auxiliary Mounting Pads

The following procedure can be used to remove and install a new auxiliary mounting pad or to install a fresh O-ring for the current auxiliary mounting pad. Several auxiliary mounting pads are available.

Auxiliary mounting pads are integrated into the charge pump cover. When nothing is mounted on the pads, a flange cover is attached to protect the mounting flange. This cover is removed when mounting a pump.

Removal of Auxiliary Mounting Pad

1. Remove the auxiliary pump or remove the two screws retaining the flange cover ["A" Pad⇒9/16 in Hex; "B" Pad⇒3/4 in Hex]. Remove the O-ring.
2. Orient pump so that charge pump cover (auxiliary pad) is facing up.
3. Remove the charge pump cover. The auxiliary pad is integrated into the charge pump cover. Use a Torx T45 male driver to remove the screws.

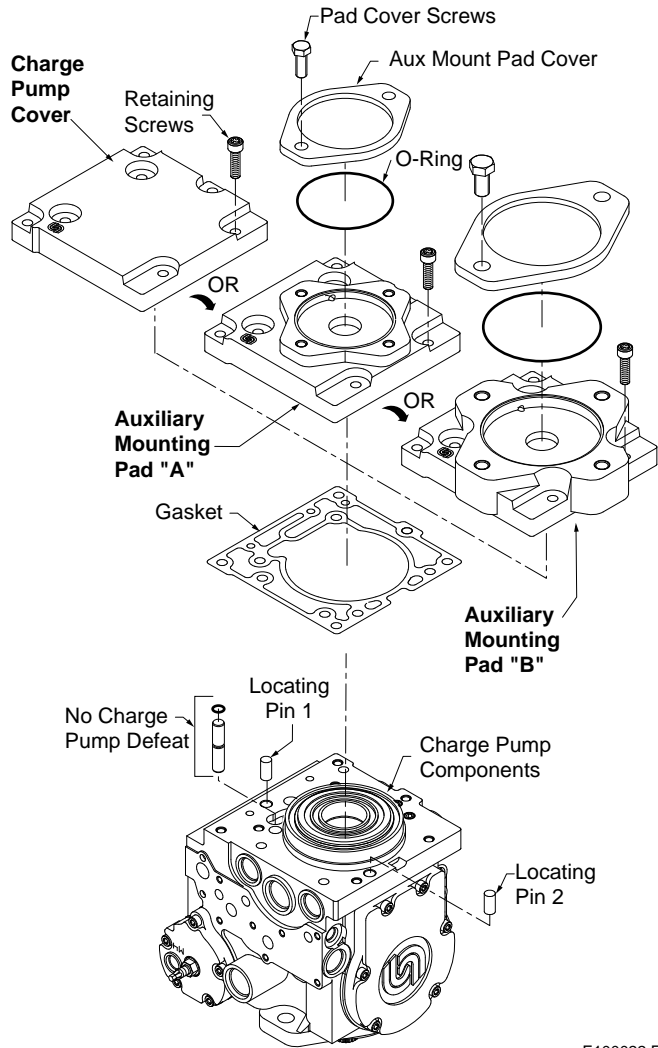
Note: If a different auxiliary pad is being installed, then a new drive coupling must be installed. To do this follow the instructions in the section on removing and installing the charge pump (next section).

Note: If the charge pump components come out with the charge pump cover refer to section 4.15 on how to properly reinstall them.

4. Install a new charge pump cover gasket.
5. Install the charge pump cover (auxiliary pump mounting pad is integrated in cover).

NOTE: The threaded screw holes in the auxiliary pump mounting pad used on very early production pumps with the SAE "A" pad option are drilled through into the area between the gerotor cover and charge pump cover. Any of these holes which are not used to attach the flange cover or auxiliary pump should be plugged with internal hex set screws installed hand tight to prevent the entrance of water or dirt into this area.

6. Attach the auxiliary pump. If no pump is to be attached on an auxiliary mounting pad, the pad should be protected with a flange cover and O-ring to prevent leakage.



E100022 E

Auxiliary Pad Options and Components

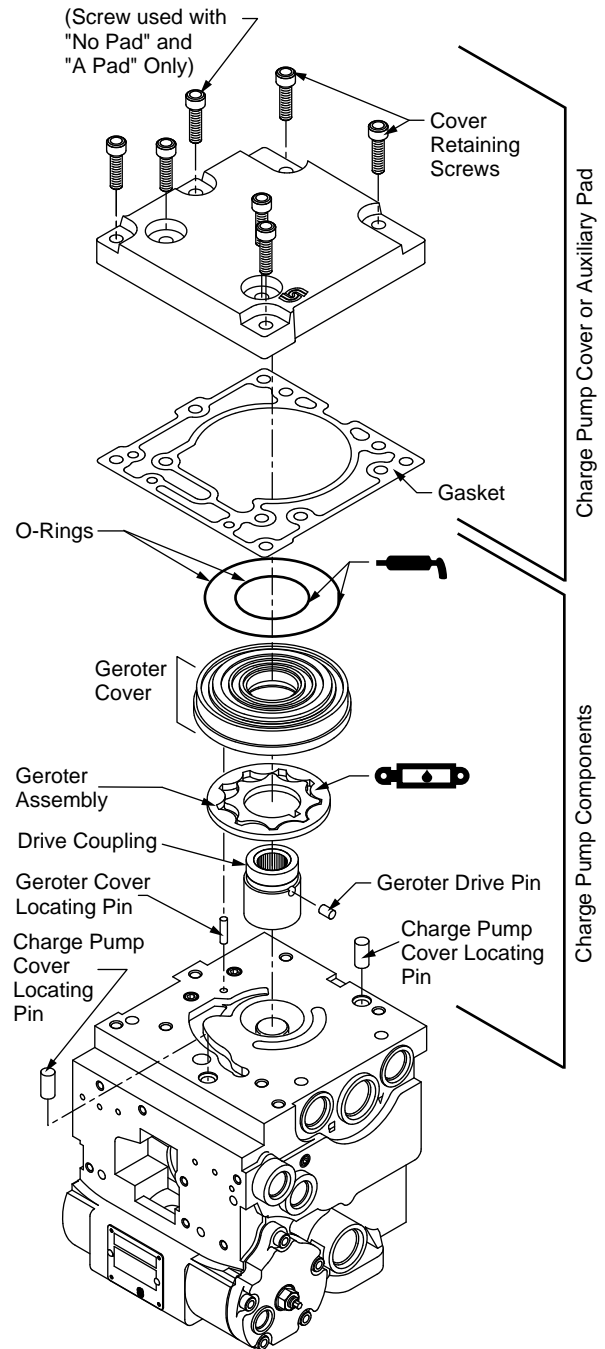
4.15 Charge Pump

The charge pump may be disassembled to inspect and clean, or to change the auxiliary shaft drive coupling.

Note: For units without integral charge pumps see the last page of this section for additional information.

1. Remove auxiliary pump, if necessary.
2. Remove the screws retaining the charge pump cover to the pump housing [Torx T45] (seven (7) screws are used with the "no pad" or SAE "A" auxiliary mounting pad charge pump cover, while six (6) screws are used with the SAE "B" auxiliary mounting pad charge pump cover). Remove the charge pump cover, gasket, and the cover locating pins.
3. Remove the gerotor cover assembly from the charge pump cover or the back of the pump housing. Remove the gerotor cover O-rings. Two (2) O-rings are used on the gerotor cover of all pumps. (An additional O-ring was used on the gerotor cover of very early production pumps with the SAE "A" pad option.)
4. Remove the gerotor assembly from the gerotor cover or pump housing.
5. Remove the gerotor drive pin and drive coupling. Remove the gerotor cover locating pin from the pump housing.
6. Each part should be inspected separately if they are to be reused. If either of the gerotor assembly parts needs to be replaced, they must both be replaced. Always replace the O-rings and charge pump cover gasket. Inspect the journal bearing in the gerotor cover for excessive wear.
7. Prior to assembly, lubricate the gerotor assembly with clean hydraulic oil.
8. Install the gerotor drive pin into the hole in the drive coupling, and retain with grease or petroleum jelly.
9. Install the drive coupling onto the pump shaft with the smaller outside diameter oriented away from the pump shaft. **Different couplings are used with the different auxiliary pad options.**
10. Install the gerotor assembly onto the coupling.

(continued)



Charge Pump Components

E100023 E

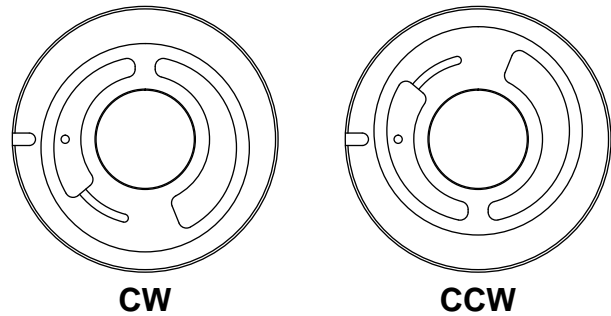
11. Install the gerotor cover locating pin into the pump housing. Install the gerotor cover assembly over the gerotor. The locating pin must engage the slot in the gerotor cover.

*NOTE: The charge pump rotation is determined by the location of the gerotor recess and pressure balance hole in the gerotor cover. **Different gerotor covers are used for clockwise and counterclockwise rotation pumps.***

12. Install new pressure balance O-rings onto the gerotor cover and retain with petroleum jelly or grease. (An additional O-ring was used on the gerotor cover of very early production pumps with the SAE "A" pad option.)
13. Install the charge pump cover locating pins and a new charge pump cover gasket.
14. Install the charge pump cover. The cover must engage the gerotor cover and the locating pins. Install the charge pump cover screws and torque evenly [36-43 Nm (26-32 ft•lbf)].
15. If necessary, reinstall auxiliary pump.

For units without an integral charge pump see the next section.

(continued)



Determining Charge Pump Orientation Looking Inside of Gerotor Pump Cover

P100110 E

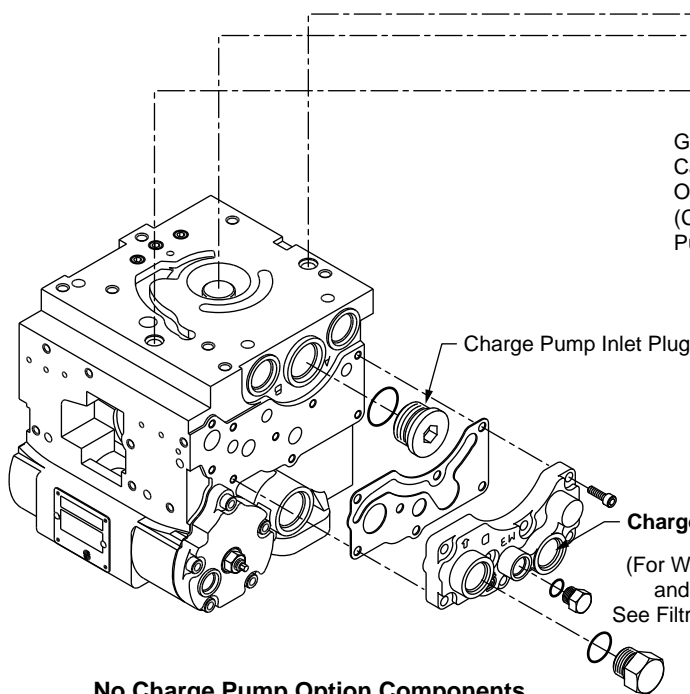
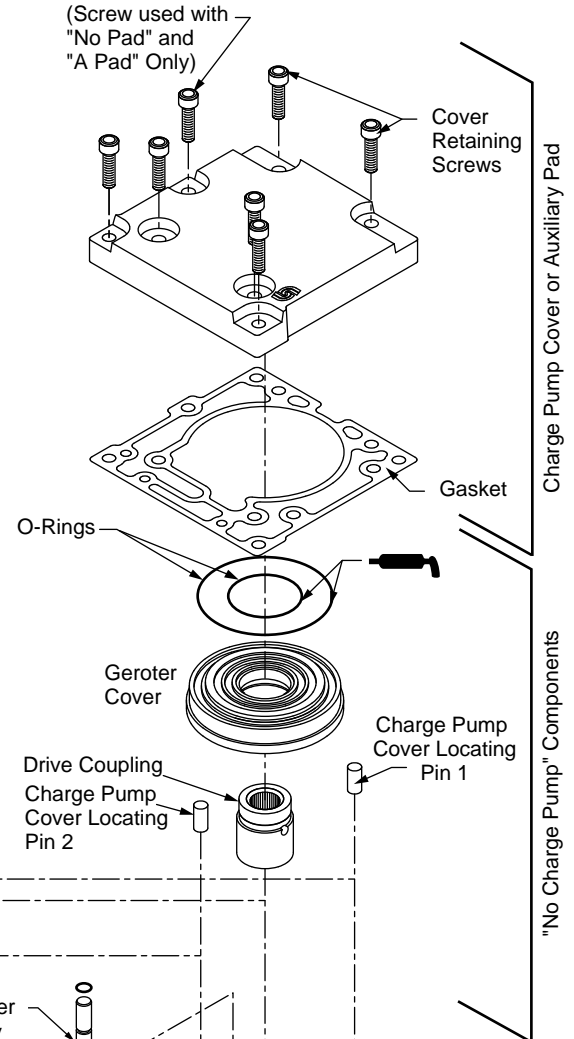
Units without Integral Charge Pump

Variable Pumps without an integral charge pump do not have a gerotor assembly, gerotor drive pin, or gerotor cover locating pin installed. The charge pump inlet port is plugged with an O-ring plug.

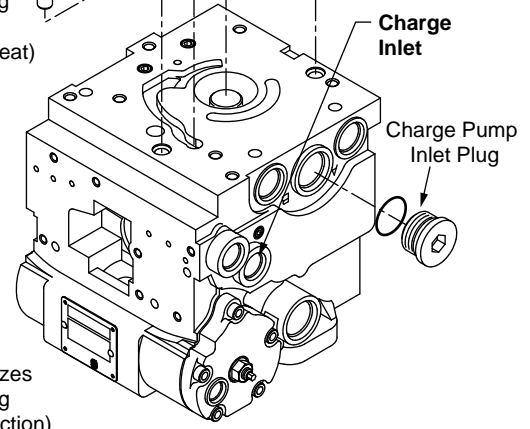
For these units that are equipped with **housings without filtration adapters**, the gerotor cavity outlet is plugged with a special plug installed in a housing passage. The 3/4—16 charge inlet fitting should be torqued to 68 Nm (50 ft•lbf).

For these units that are equipped with **housings that include filtration adapters**, the gerotor cavity outlet is plugged with an O-ring plug installed in the "To Filter" port of a "Full Filter Flow" (charge relief valve after filter) filter adapter. The 7/8—14 charge inlet fitting should be torqued to 95 Nm (70 ft•lbf).

CAUTION
 A "Partial Filter Flow" (charge relief valve before filter) adapter must not be used on variable pumps without an integral charge pump. If this design adapter is used, the charge relief valve will be defeated.



**No Charge Pump Option Components
 (Housing with Filtration Adapter)**



**No Charge Pump Option Components
 (Housing without Filtration Adapter)**

E100024 E

4.16 Filtration

Filtration of foreign matter from the hydraulic fluid is of primary importance. Dirt and foreign fluids within the hydraulic circuit will greatly reduce the life of the hydraulic equipment.

Filter-Related Pump Hardware

Filtration mechanisms for the Series 42 pump may be before (suction filtration) or after (charge pressure filtration) the charge pump. Sauer-Sundstrand provides a filtration adapter to provide for each type of filtration configuration. If filtration is provided for elsewhere in the hydraulic circuit, the pump will not have a filtration adapter.

Pumps equipped with housings without filtration adapters have an additional construction bore next to the charge relief valve which is unused and plugged [5/8 in Hex, 21-33 Nm (15-25 ft•lbf)]. When these pumps are equipped with suction filtration, the external charge inlet is plugged [5/16 in Int. Hex, 41-94 Nm (30-70 ft•lbf)].

Pumps equipped with housings that include filtration adapters have the appropriate adapter and gasket fastened to the housing with screws [Torx T30, 16 Nm (12 ft•lbf)]. The position of the M3 gauge port [11/16 in Hex, 11-13 Nm (8-10 ft•lbf)] will vary depending on filtration type.

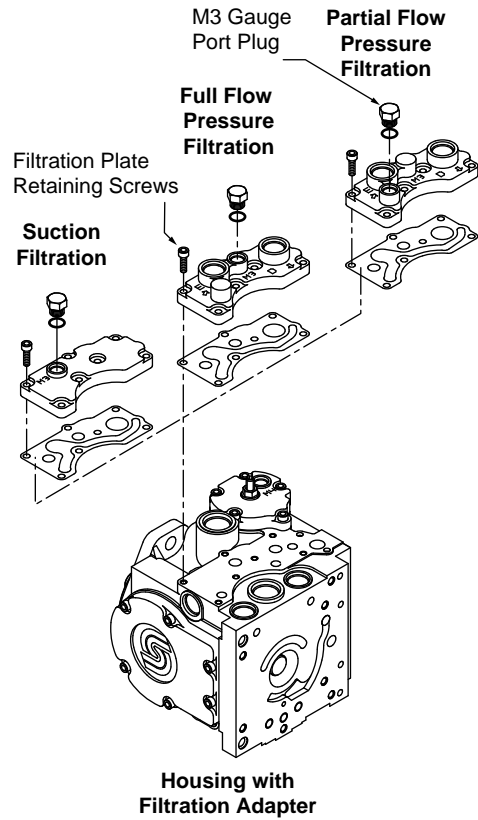
Filter Specifications

The selection of a filter depends on a number of factors including the contaminant ingress rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval. A filter capable of controlling the fluid cleanliness to ISO 4406 Class 18/13 or better is recommended and may be located either on the inlet (suction filtration) or discharge (charge pressure filtration) side of the charge pump.

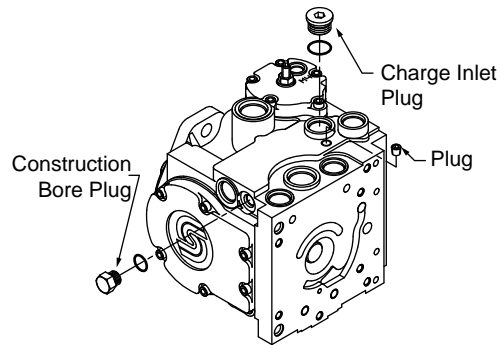
Filter capacity depends on desired maintenance levels. As a rough guide, a capacity in grams equal to twice the charge flow in gpm or 1/2 charge flow in l/min has been found to be satisfactory for many closed circuit systems.

Filter efficiency as measured by a "Beta" (β) ratio* should be as in the table at right.

See Sauer-Sundstrand publication BLN-9887 or 697581 and ATI-E 9201 for more information on filtration.



Housing with Filtration Adapter



Housing without Filtration Adapter (Suction Filtration Only)

E100025 E

Filtration Type	β -ratio
Closed Circuit Suction Filtration or Open Circuit Return Line Filtration	$\beta_{10} \geq 2$
Systems Sharing a Reservoir with Other Gears, Clutches, or Cylinders	$\beta_{10} \geq 10$
Charge Pressure Filtration	$\beta_{10} \geq 10$

* Filter β_x -ratio is a measure of filter efficiency defined by ISO 4572. It is defined as the ratio of the number of particles greater than a given size (x) upstream of the filter to number of particles greater than the same size downstream of the filter. The β_x -ratio applies to a specific particle size, measured in microns.

4.17 Servo Piston Covers

The servo piston cover can be removed to change the gasket or to inspect/change the control orifices for NFP or FNR controls (section 4.9).

1. On the right side (side "1") of the pump, remove the pump "neutral" adjustment seal lock nut [13 mm Hex]. (Not necessary on side "2")
2. Remove the servo piston cover screws [Torx T30].
3. The left side (side "2") servo cover can be removed directly.

On the right side (side "1") of the pump, the cover should be pushed away from the pump housing. It is then necessary to turn the "neutral" adjustment screw [5 mm Hex] clockwise (inward) far enough for the servo cover to clear the nearby drain port. Then pull the cover away from the housing and turn the cover counterclockwise to disengage it from the adjustment screw.

4. Remove the gasket.

Note: FNR and NFPE control orifice plugs are located here, see section 4.9 for more information.

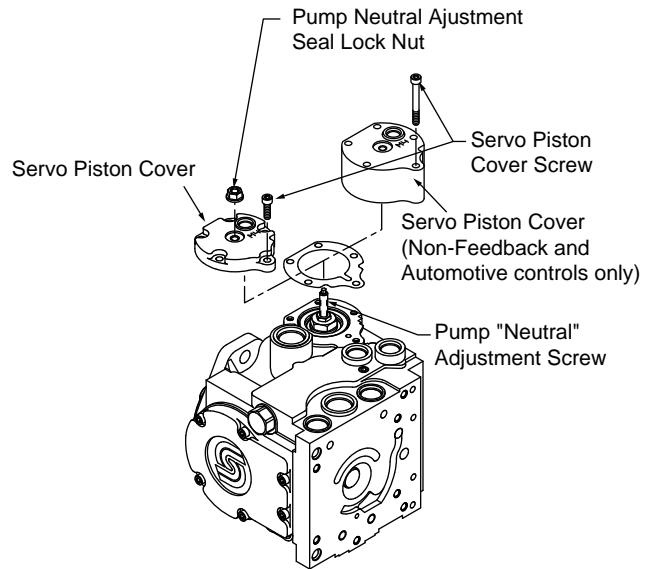
5. Install new gasket.
6. On the right side (side "1"), screw the servo piston cover on the neutral adjustment screw. Then, while holding the cover, turn the neutral adjustment screw CCW to engage the cover to the screw threads.
7. Install servo piston cover screws (15-17 Nm (11-13 ft•lbf)).
8. On the right side (side "1"), loosely install neutral adjustment seal lock nut. Perform pump neutral adjustment (section 4.2).

WARNING

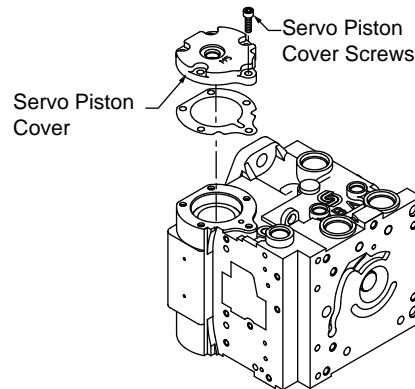
After installing the servo piston cover on right side (side "1") of the pump, the pump "neutral" adjustment and control neutral adjustment **MUST** be performed before the vehicle / machine is put back into service.

CAUTION

Performance of the above procedure may adjust the position of the displacement limiter somewhat.



Servo Piston Cover – Right Side (Side "1")



Servo Piston Cover – Left Side (Side "2")

Servo Piston Cover Components

E100026 E

4.18 Displacement Limiter Adjustment

Displacement limiters can limit the maximum swash-plate position. For Series 42 pumps, displacement limiters are available on one or both sides of the servo piston.

Adjustment of the displacement limiters should be performed on a test stand.

WARNING
 Care should be taken in adjusting displacement limiters to avoid undesirable speed conditions. The limiter screw must have full thread engagement in the servo piston cover, and the seal lock nut must be retorqued after every adjustment to prevent unexpected changes in operating conditions and external leakage during unit operation.

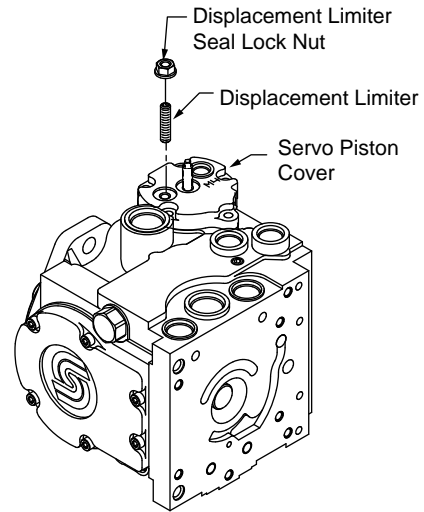
1. Mount pump on test stand.
2. Loosen displacement limiter seal lock nut [13 mm Hex]. Do not remove.
3. Adjust displacement limiter [4 mm Int. Hex]. **Tighten the seal lock nut every time the pump is to be tested** [20-26 Nm (15-19 ft•lbf)].

One full turn of the displacement limiter adjustment screw will change the displacement of the pump *approximately* as follows.

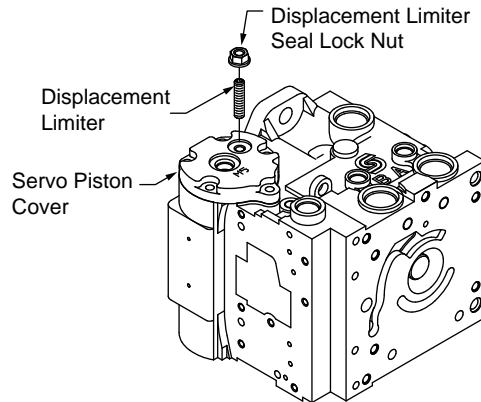
28cc	3.6 cc/rev	0.22 in ³ /rev
41cc	5.0 cc/rev	0.31 in ³ /rev

4. After reaching proper displacement tighten the seal lock nut [20-26 Nm (15-19 ft•lbf)].

If necessary, repeat procedure for displacement limiter on other side.



Displacement Limiter – Right Side (Side "1")
 (Exploded View, No Need to Remove Limiter or Nut)



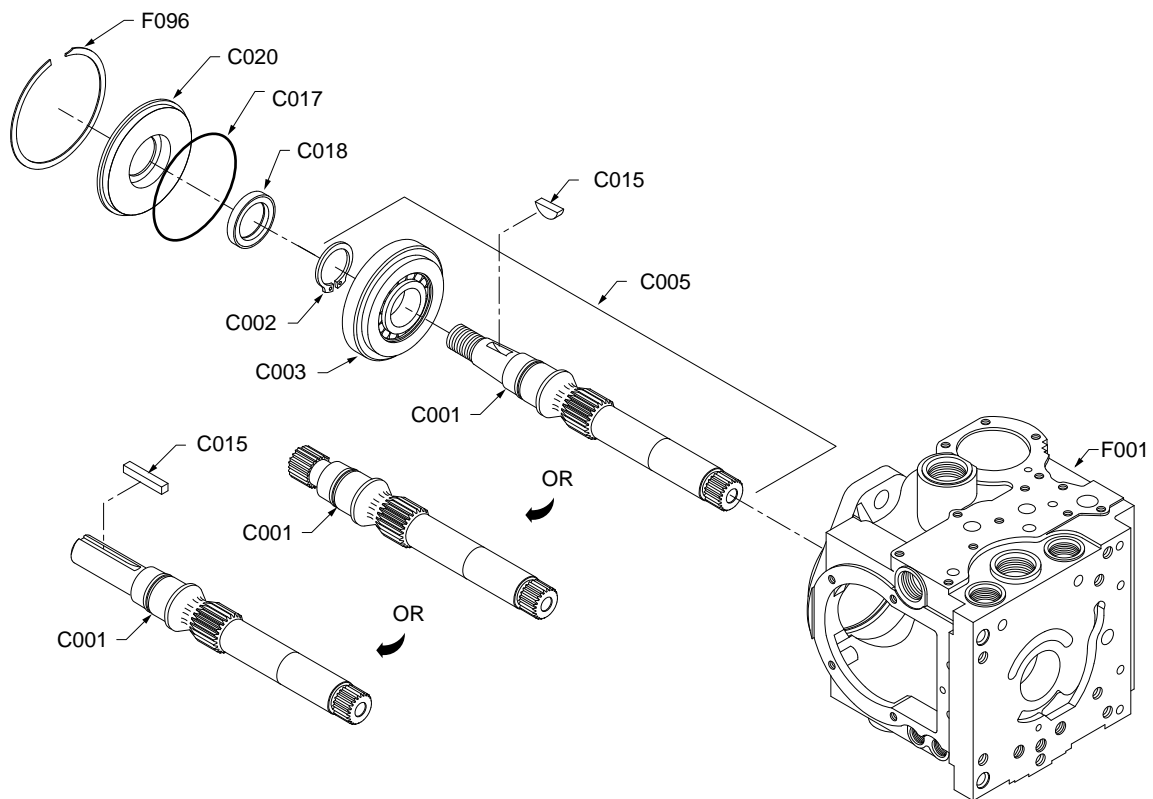
Displacement Limiter – Left Side (Side "2")
 (Exploded View, No Need to Remove Limiter or Nut)

Displacement Limiters

E100027 E

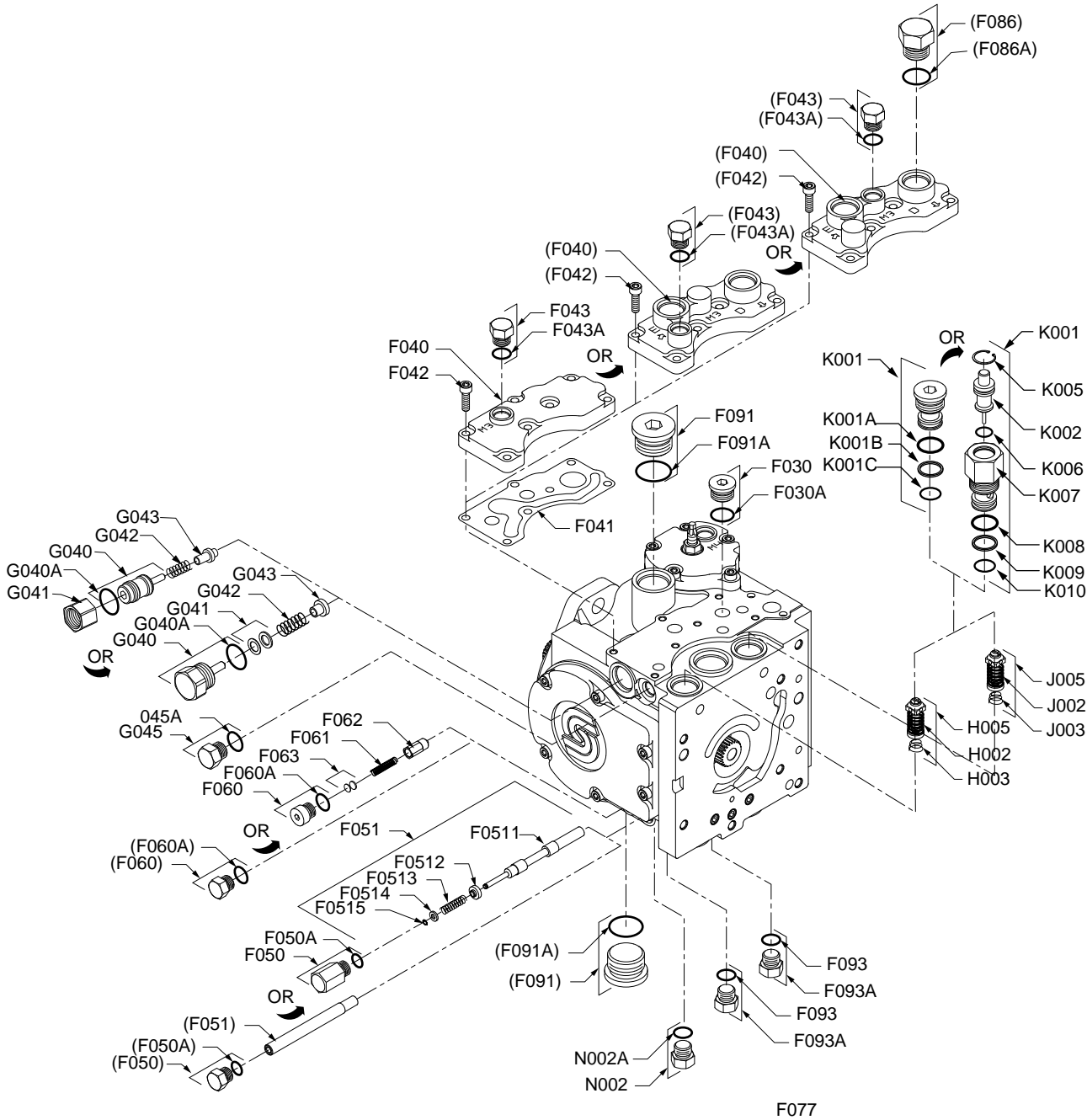
5. Exploded View Parts Drawings

5.1 Shaft Options

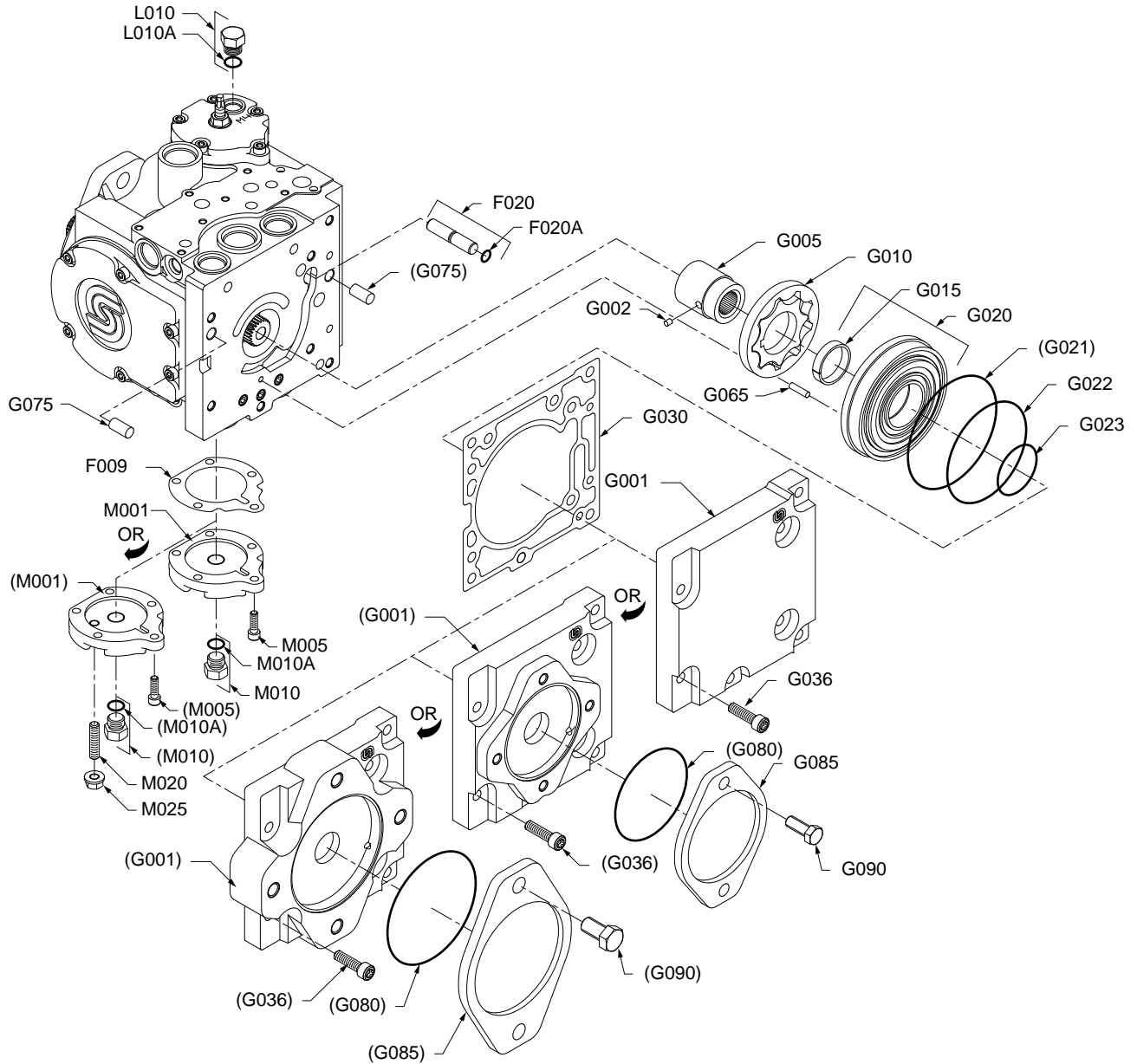


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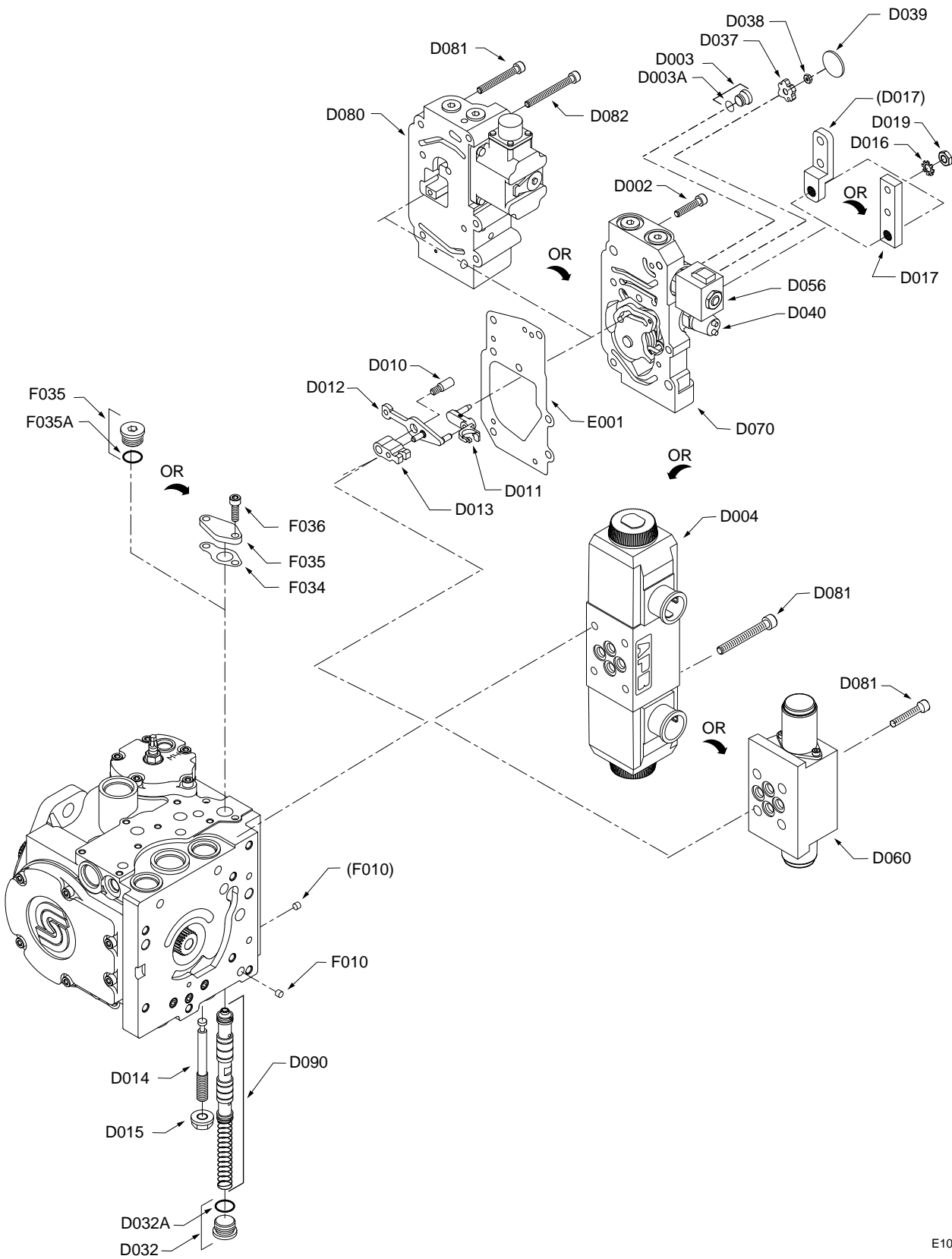
5.2 Filtration, Charge Relief, System Relief, and Loop Flushing



5.3 Charge Pump, Auxiliary Pads, and Servo Covers



5.4 Control Options



Notes

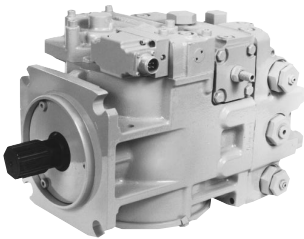
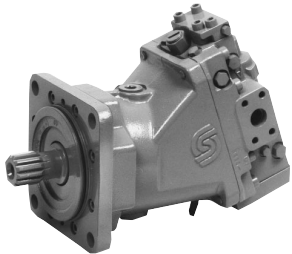

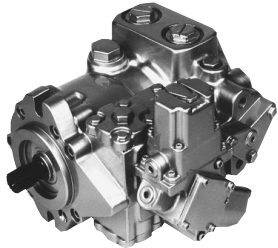
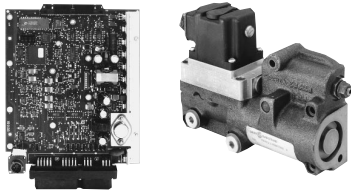
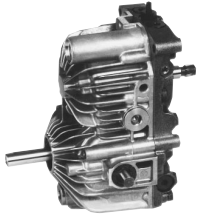

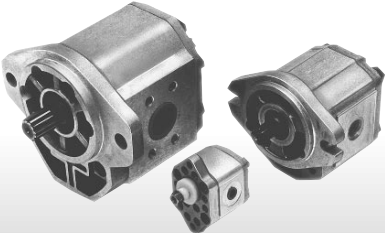

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