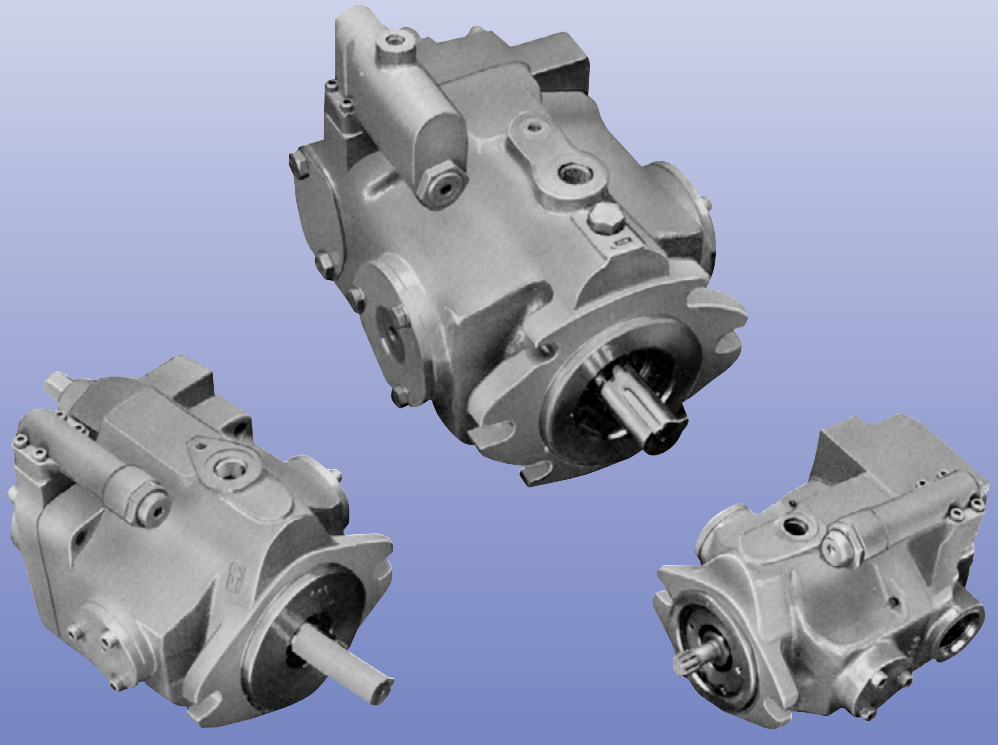
SAUER DANFOSS

Series L



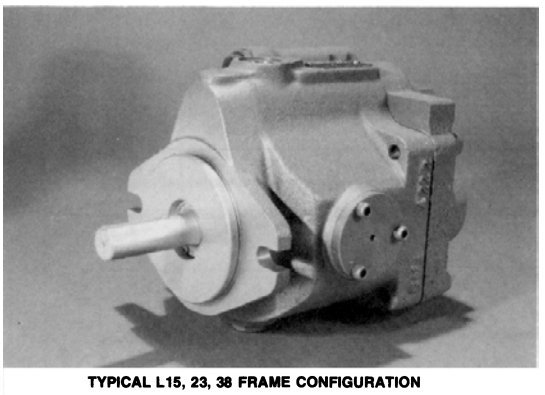
Open Circuit

Pumps

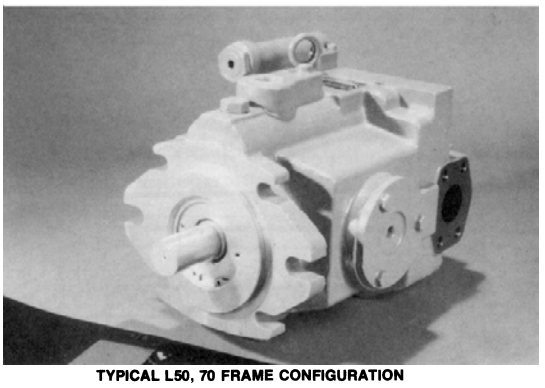
Service and Repair Manual

TABLE OF CONTENTS

SERIES L PUMPS: BASIC OPERATION



TYPICAL L15, 23, 38 FRAME CONFIGURATION



TYPICAL L50, 70 FRAME CONFIGURATION

The Series L family of open circuit pumps consists of five different frame sizes with displacements ranging from .913 cubic inches per revolution to 4.26 in.^{3}.

The variable displacement pump can be operated with fixed or variable output flow between 0 and maximum flow in one direction only.

A variety of controls are available to provide the most efficient means of matching output flow and pressure to the job requirements. These are further described in the "Configuration: Controls" section of this manual.

The standard flow adjusting screw enables the maximum pump delivery to be externally adjusted to match precise system flow requirements. During normal operation the swashplate will automatically vary from its deadhead position to maximum displacement. Varying the swashplate angle provides a means of varying the pump flow. The pump will always produce a volume of fluid in proportion to the angle of the swashplate at any given input speed. **For personnel and hydraulic system safety reasons, a relief valve in the system is always recommended.**

Specifications and Requirements

The Sauer-Sundstrand Series L pumps have certain pressures that must be maintained as well as some requirements and limitations which should be observed.

It should be noted that operation of L Series pumps not in accordance with pressure and speed ratings, and system requirements, can significantly reduce the expected life of the pump from that which is published in other manuals and brochures related to L Series pumps. Depending on the degree of excess and the specific application, sudden failure could occur.

SPECIFICATIONS

MODEL	DISPLACEMENT		MAXIMUM PRESSURE		MAXIMUM SPEED SUPER QUIET	MAXIMUM SPEED QUIET PUMP
	IN^3/REV	CC/REV	PSI	BAR	RPM	RPM
L15	.913	15	3000	210	1800	3600
L23	1.41	23	4000	280	1800	3200
L38	2.30	38	3000	210	1800	3000
L50	3.15	50	3000	210	1800	2400
L70	4.26	70	3000	210	1800	2200

Above ratings pertain to continuous maximum pressure and continuous maximum speed.

SYSTEM REQUIREMENTS

MINIMUM INLET PRESSURE (1)	5" HG. VACUUM	125 MM HG. VACUUM
Case Pressure	10 PSI Max.	.70 BAR Max.
Fluid Temperature	180°F Continuous 200°F Intermittent(2)	82°C Continuous 93°C Intermittent(2)
Inlet Filter	150 Mesh	
Return Line Filter	25 Micron	

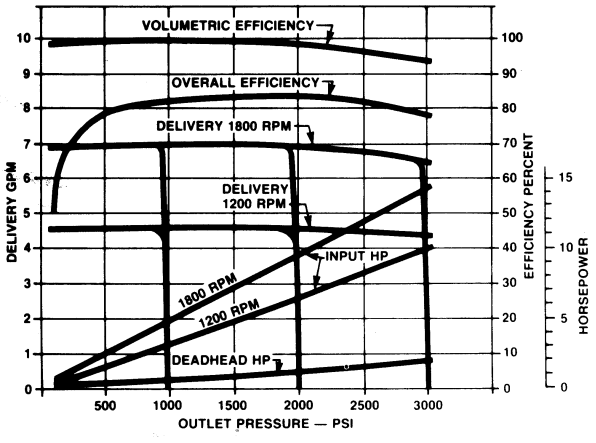
(1) Applies at reduced speed. Pressure is higher (positive) at maximum speed.

(2) Not to Exceed 5 Min.

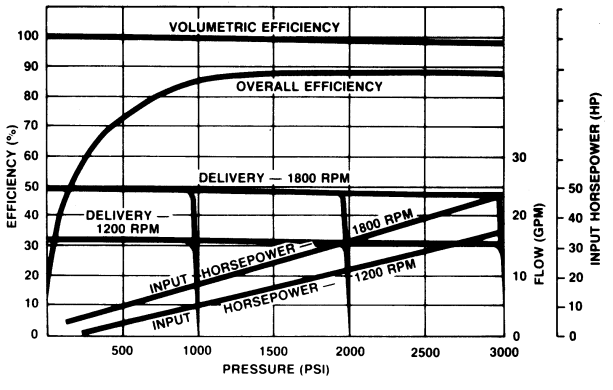
BASIC OPERATION

Performance Characteristics

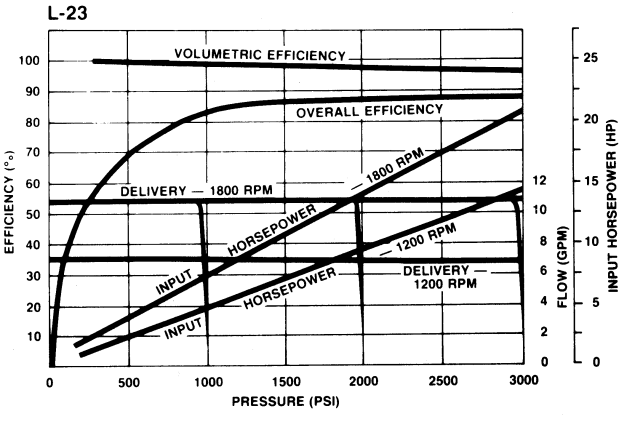
L-15



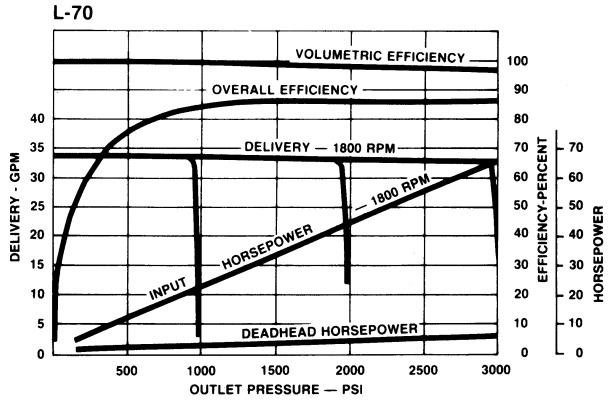
L-50



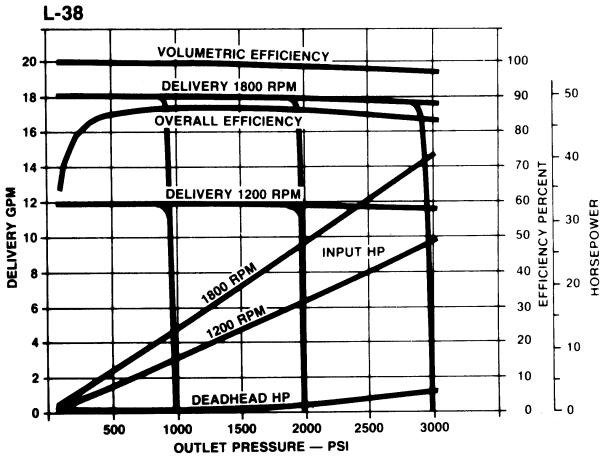
L-23



L-70

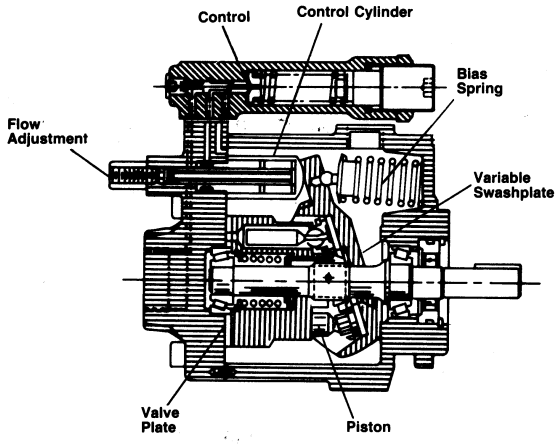


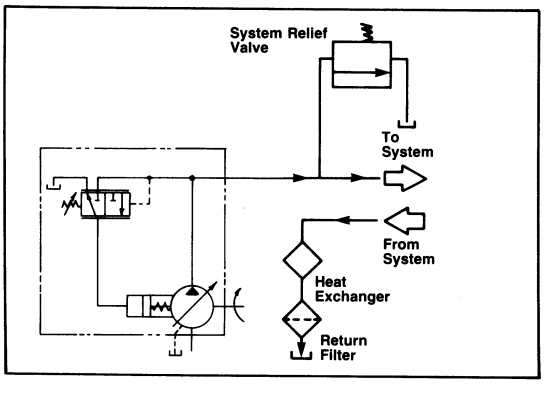
L-38

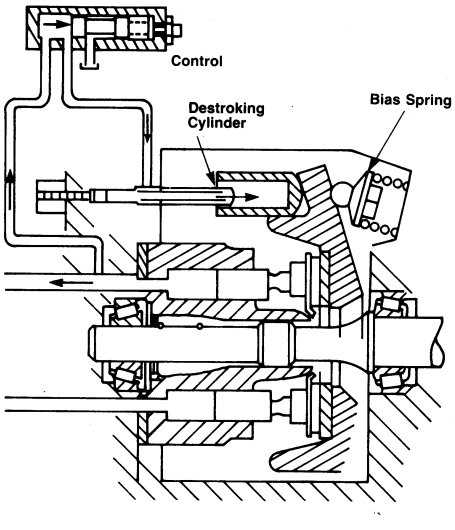


Note: Performance curves based on 120° oil temp and ISO VG46 oil and are representative of this series size.

BASIC OPERATION







Control Activated

Open Circuit Pump Design

Sauer-Sundstrand open circuit pumps are an axial piston, slipper pad design. There are nine pistons mounted in the cylinder block. As the cylinder block rotates, these pistons are forced in and out of their bores by the angle of the swashplate. This results in a specific amount of fluid being displaced for every revolution of the cylinder block.

The slipper pad attaches to a spherical ball on the end of the piston forming a ball and socket joint. This allows the slipper pad to tilt at any angle and make contact with the swashplate. The face of the slipper pad slides on a hydrostatic fluid film which uses fluid pressure to balance internal forces.

Basic Pump Operation

The variable displacement pump uses a tiltable swashplate to vary displacement (output flow). The swashplate is mounted on trunnion bearings and is spring loaded from the back side toward its maximum angle position when the control is deactivated.

The pump receives fluid directly from the reservoir without the requirement of a charge pump. Fluid is then pumped under pressure to the system and returns directly to the reservoir.

The speed of the actuator (cylinder, hydraulic motor, etc.) depends on the volume of fluid being pumped. The operating pressure depends on the machine load.

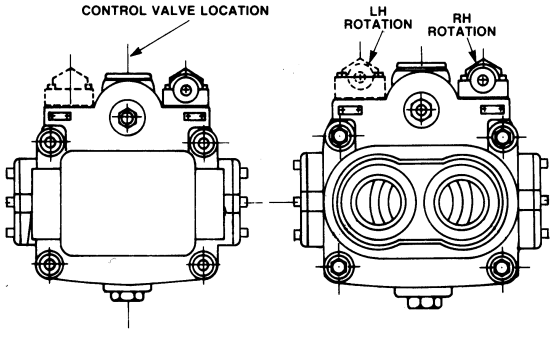
If the actuator is to be reversed, a directional control valve is necessary as the pump swashplate operates on one side of neutral only and the pump is unidirectional.

When the pump's automatic control is activated, fluid is ported into the destroking cylinder. This action destrokes the swashplate (reduces pump displacement) to obtain the desired pump flow.

The control can position the swashplace at any angle between its maximum and zero displacement to provide the pump flow necessary to maintain the setting of the control.

A variety of controls are available for the Series L which regulate pump displacement in response to pressure, flow, horsepower requirement or dual range pressure settings. However, all the controls operate on the same principal that when activated they port fluid to the destroking cylinder.

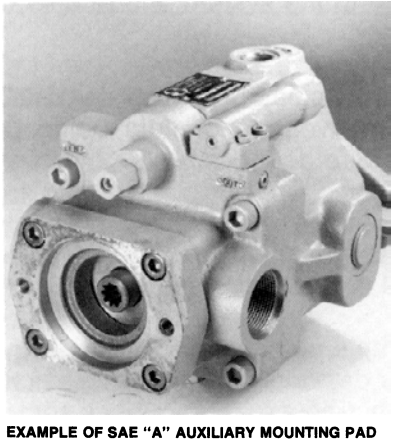
OPTIONAL CONFIGURATIONS



SIDE PORTING (X)
1.625-12 SAE STR THD
O-RING BOSS

END PORTING (Y)
1.625-12 SAE STR THD
O-RING BOSS

Direction Rotation	Ports	
	Inlet	Outlet
CW	A	B
CCW	B	A



EXAMPLE OF SAE "A" AUXILIARY MOUNTING PAD

The pressure compensator may be factory selected with 1000, 2000 or 3000 PSI springs. The maximum adjustment is limited internally to approximately 25% above factory setting. Standard units are shipped from the factory with the pressure compensator set at 500 PSI.

To meet the requirements of various applications, the Series L pumps are available with various options which change the configuration of the unit.

Rotation

Series L pumps can be either right hand or left hand rotation as viewed from the shaft end. A plate located on the top of the pump shows rotation direction. Right hand or clockwise rotation is the standard configuration with counter-clockwise rotation optional. The direction of rotation can not be changed without changing the end cap and valve plate.

System Ports

The Model L15, L23 and L38 open circuit pumps are designed with end ports as standard. Side ports are optional for applications where space is limited. The Model L50 and L70 are available with side ports only.

Auxiliary Pump Mounting Pad

The model L38 and L70 are available with an SAE "A" auxiliary mounting pad for installation of an additional hydraulic pump on the rear of the unit. This option can be used to reduce the overall hydraulic system space requirements as well as costs, since the auxiliary pump is driven directly off the main pump shaft.

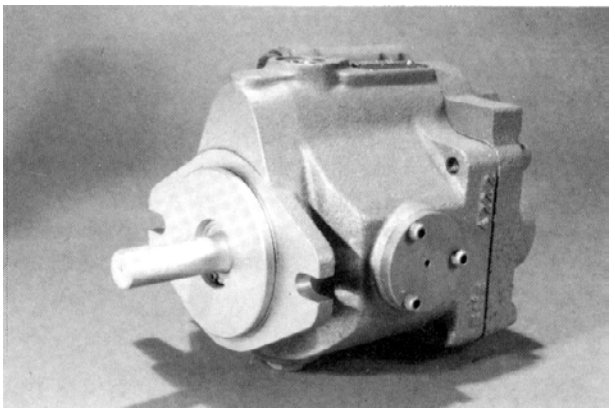
Quiet and Super Quiet Pumps

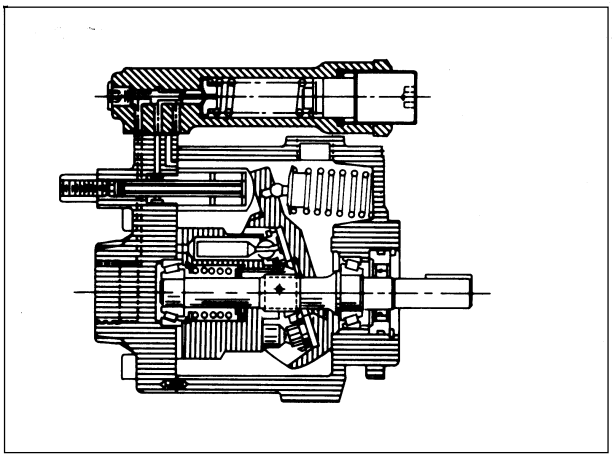
Quiet pumps are general purpose units capable of higher speeds and are recommended for open circuit mobile applications.

Super Quiet pumps are aimed at the industrial 1800 rpm market and are identified by a "K" at the end of the ordering code as well as part number. Example: Order Code L15-RBKY-PCX3XX-XK or Part Number L15-7026K.

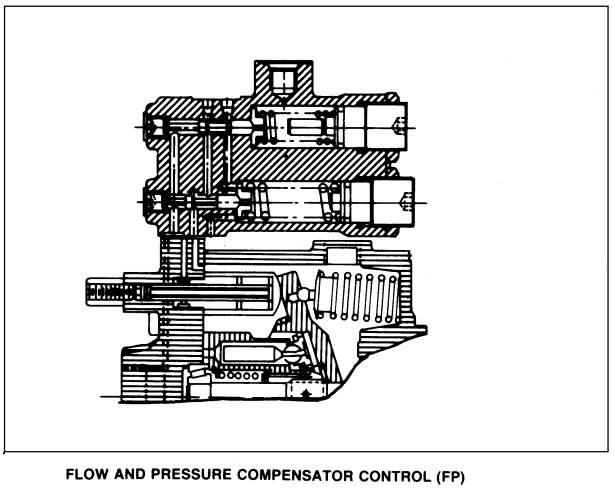
The Super Quiet version also has modified kidney slots on the cylinder block, valve plate, and in most cases, journal type bearings on the trunnion.

CONFIGURATION: CONTROLS





PRESSURE COMPENSATOR CONTROL (PC)

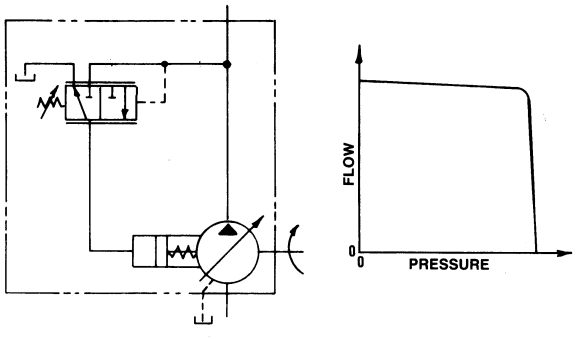


FLOW AND PRESSURE COMPENSATOR CONTROL (FP)

STANDARD CONTROLS

Pressure Compensator Control (PC)

The pressure compensator control automatically adjusts pump delivery to maintain volume requirements of system at a pre-selected adjustable operating pressure. Maximum pump delivery is maintained to approximately 50 PSI below the pressure control setting, before being reduced. The pressure compensator control has an adjustment range that must be specified. Standard factory range is 500 to 3000 PSI. Other optional ranges are 250-1000 PSI and 250-2000 PSI. Maximum adjustment is limited internally to approximately 25% above nominal.

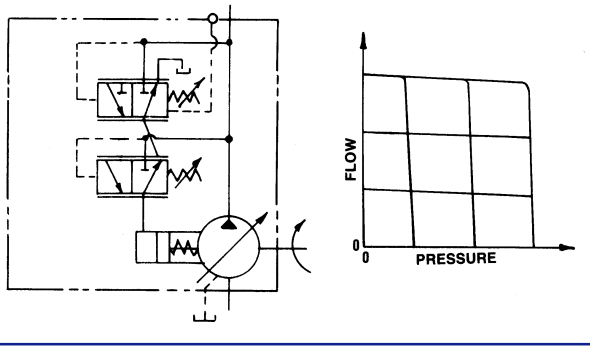


Flow and Pressure Compensator Control (FP)

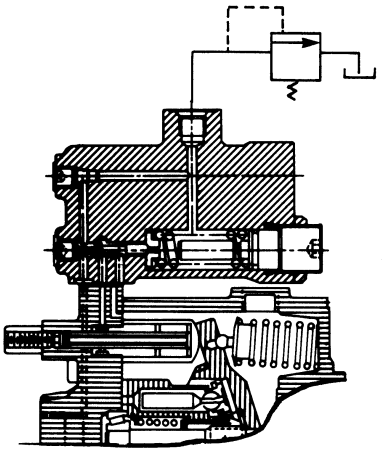
The flow compensator function matches output flow to system demand. The control will automatically adjust the pump displacement to match the flow requirement necessary to maintain the constant flow sensing pressure differential signal received from the system.

When system flow is not required, the pump standby pressure will equal the selected flow sensing differential pressure. When the system demands flow, the pump supplies only the volume necessary at the pressure required to operate the load.

This flow sensing pressure differential can be factory selected at 100, 200, 300, 400 and 600 PSI.



CONFIGURATION: CONTROLS



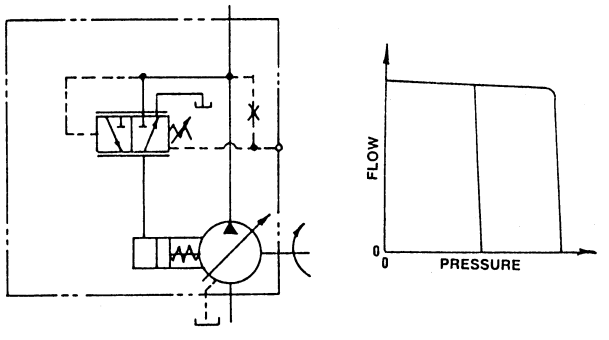
REMOTE CONTROL PRESSURE COMPENSATOR CONTROL (RC)

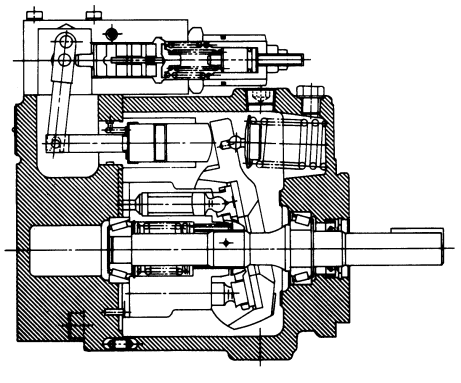
Remote Control Pressure Compensator Control (RC)

The remote control pressure compensator provides for remotely varying the compensator setting. The control will automatically destroke the pump at a preselected remote pilot relief valve setting. The remote pilot relief valve setting is directly proportional to the pressure compensator setting. The spring in the control is adjustable from 200 to 1200 PSI.

Note: Pumps prior to the following S/N were not adjustable; L15, 23, 38, S/N 84-36XXXX; L50, 70 S/N 84-48XXXX.

Thus a simple solenoid valve in the sense line, when vented back to tank, allows the pump to attain the spring setting on the control creating a control function for use in high-low pressure applications.



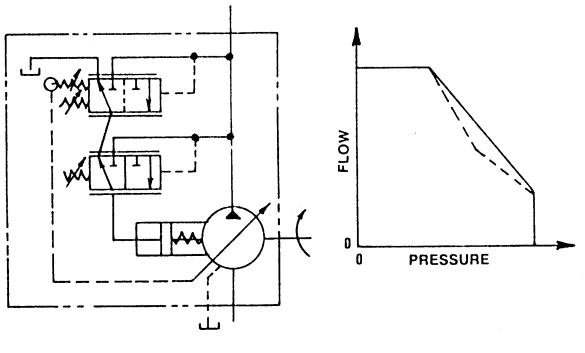


HORSEPOWER LIMITING CONTROL (TP)

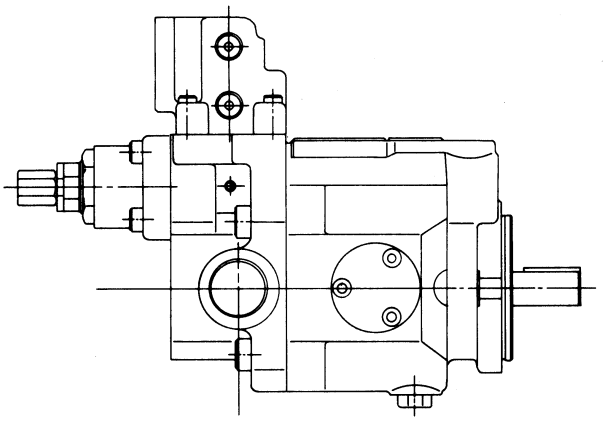
OPTIONAL CONTROLS

Horsepower Limiting Control (TP)

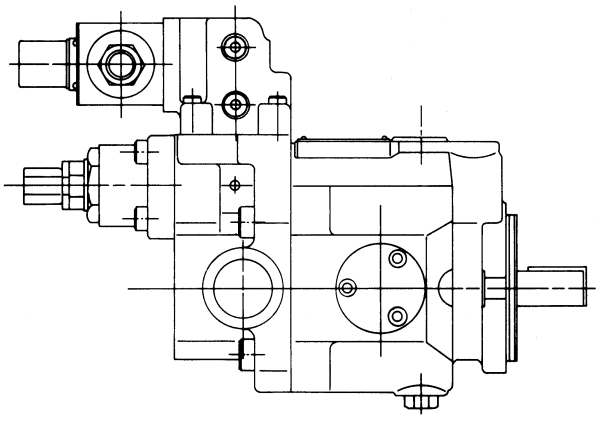
The horsepower limiting control is designed to limit flow at high pressure and is particularly suited for applications where the pump horsepower is greater than the available input horsepower. The control consists of a pressure control valve whose setting increases at decreasing pump displacement. Hence the valve controls discharge pressure and discharge rate at a specific RPM as illustrated below.



CONFIGURATION: CONTROLS



COMBINATION CONTROL WITH SYSTEM PRESSURE (CP)



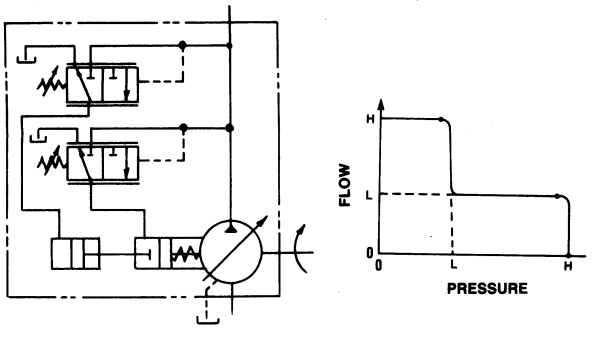
COMBINATION CONTROL WITH SOLENOID VALVE (CS)

Combination Controls (CP and CS)

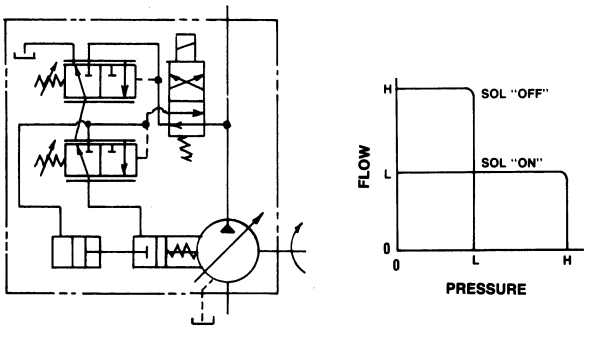
The installation of a combination control enables a single pump to operate at two pressures and two flow settings. This permits two performance capabilities as follows, depending on the working cycle.

- High volume flow at low pressure when the actuator is unloading
- Low volume flow at high pressure when the actuator is loading.

There are two models of combination controls available. The model CP is controlled automatically by system pressure. The model CS uses a solenoid valve on the pump which allows the performance characteristics to be changed by switching the solenoid valve.

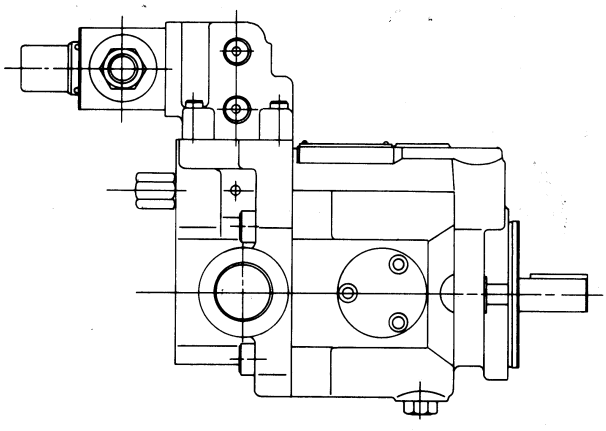


COMBINATION CONTROL WITH SYSTEM PRESSURE (CP)



COMBINATION CONTROL WITH SOLENOID VALVE (CS)

CONFIGURATION: CONTROLS

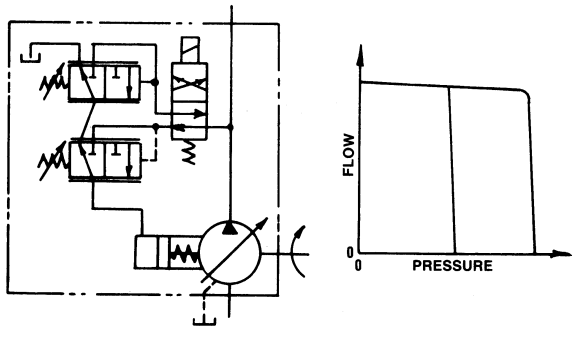


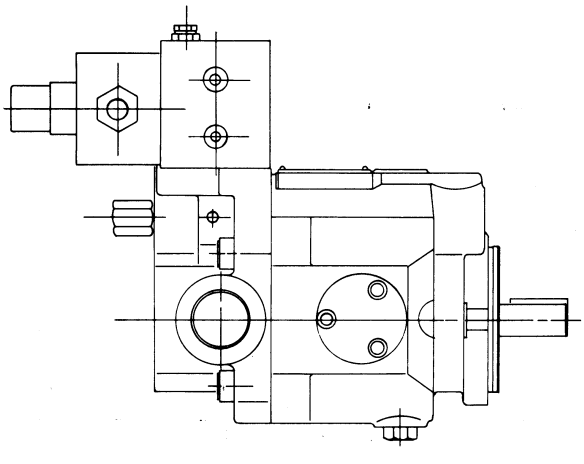
DUAL RANGE PRESSURE COMPENSATOR CONTROL (DR)

Dual Range Pressure Compensator Control (DR)

The dual range pressure compensator control operates in a manner similar to the combination control except that it operates within a given pressure range but at two separate pressure ranges. The control basically consists of two separate compensator sections each being set to the desired maximum pressure. A solenoid is used to select which section is in control at a given time.

Available pressure ranges are the same as are available on the standard pressure compensator control.

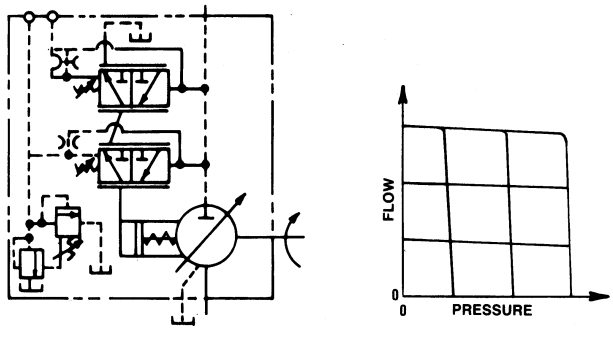




POWER MATCHING CONTROL (PM)

Power Matching Control (PM)

The power matching control consists of a remote pressure compensator valve whose setting is controlled by a solenoid operated proportional relief valve (integral to the control) along with a flow compensator control. The flow ΔP options available are the same as those for the Flow Compensator (FP) Control.



MAINTENANCE INFORMATION

Fluids

Hydraulic fluids used with Sauer-Sundstrand products should be carefully selected with assistance from a reputable supplier following the guidelines presented in the "Hydraulics Fluid Requirements" bulletin BLN-9887.
The following types of fluids have been used successfully in Sauer-Sundstrand hydrostatic products:

1. Anti wear hydraulic oil.
2. Type F Automatic Transmission Fluid
3. Engine oils meeting the requirements of API classification CD
4. Hydraulic transmission fluid of the type used by the agricultural industry for combined transmission, hydraulic and wet brake system.

The fluid selected should provide a viscosity between 150 and 275 SSU at 100^{0}F.

CAUTION

As with any hydraulic system, a key to successful operation and predicted life is cleanliness of the various components and the fluid. Strict compliance with component cleanliness recommendations and fluid filtration requirements are a must. Failure to follow such recommendations and requirements can result in excessive pump flow loss and control valve malfunctions that can render a complete system inoperative, or even cause catastrophic failure.

Installation

Prior to installing the pump, inspect for damage during shipment and handling. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

The pump should be connected to the prime mover so that the centers of both drive shafts are aligned. Incorrect alignment may result in eventual damage to the drive shaft, drive shaft bearings, or the drive shaft seal which can cause external oil leakage.

Start Up Procedure

Fill the reservoir with recommended hydraulic fluid which should be passed through a 25 micron (nominal) filter prior to entering the reservoir. Never reuse fluid.

The inlet line leading from the pump to the reservoir must be filled prior to start up. Check inlet line for properly tightened fittings and be certain it is free of restrictions and air leaks.

Be certain to fill the main pump housing with clean hydraulic fluid prior to start up. Fill main pump housing by pouring the filtered oil in the upper most case drain hole.

CAUTION

Operation of the pump with less than 160 PSI discharge pressure may reduce the life of the unit.

See machine operating manual for machine start up procedures.

On mobile applications, run at the lowest possible speed, with a minimum of 160 psi until system pressure as been established. Oce system pressure is positive, increase he speed to full RPM. On electric motor drives jog the motor several times before initial start-up. In both cases if system pressure is not maintained, shutdown the system and determine cause.

The hydraulic system should be operated for at least fifteen (15) minutes under light load conditions.

If control setting(s) is not per machine specifications refer to the control adjustment procedures in this manual.

Shut down the system and remove the pressure gauge. Check fluid level in the reservoir and add fluid if necessary.

The pump is now ready for operation.

System Maintenance

For satisfactory service, regular maintenance of fluid and filters must be performed.

Check fluid level daily. Change fluid more often if it becomes contaminated with any foreign matter (dirt, water, grease, etc.)

Change Inlet and Return Filter whenever fluid is changed and whenever filter indicator shows a change is necessary. Replace all fluid lost during filter change.

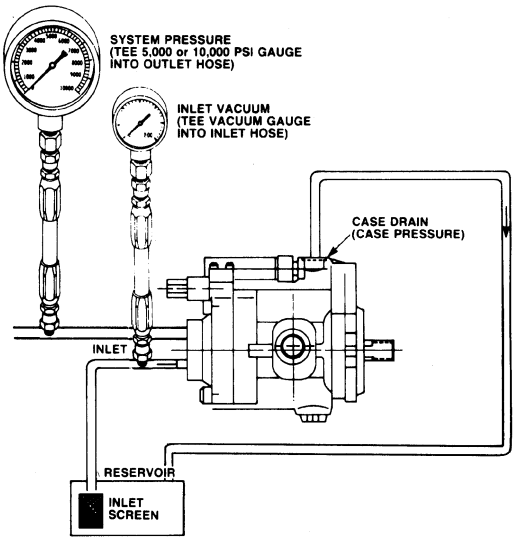
TROUBLESHOOTING

The information contained in this section provides a guide for troubleshooting Sauer-Sundstrand Series L pumps. It is a problem solving tool aimed at reducing unnecessary machine downtime. Following the fault-logic approach will assist in the expediant correction of system problems.

Various pressure and vacuum gauge readings can be a great asset in troubleshooting problems with the pump or support system.

It will be necessary to tee a high pressure gauge into the system pressure line to check the setting of the system relief valve as well as control settings.

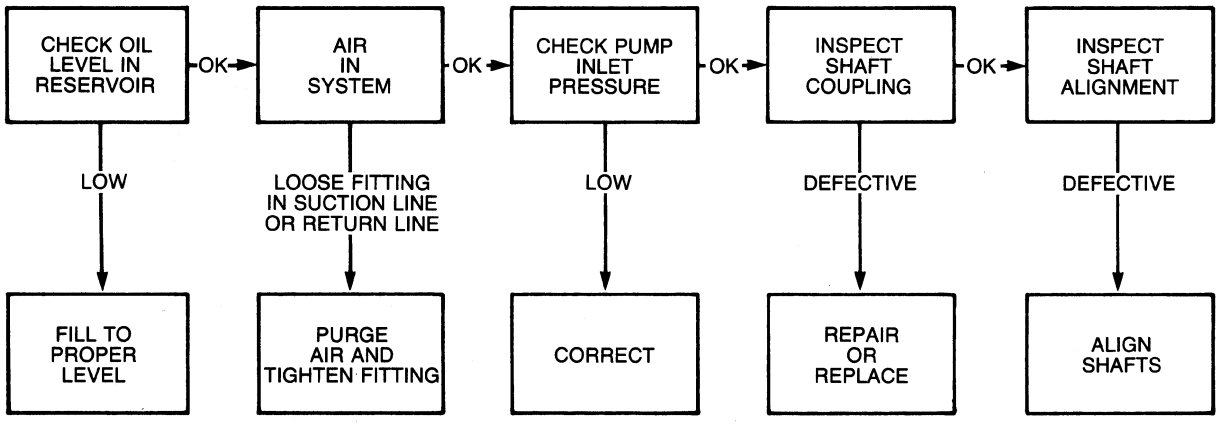
Measuring the inlet pressure will help locate restrictions in the inlet lines, filter, etc.



Note

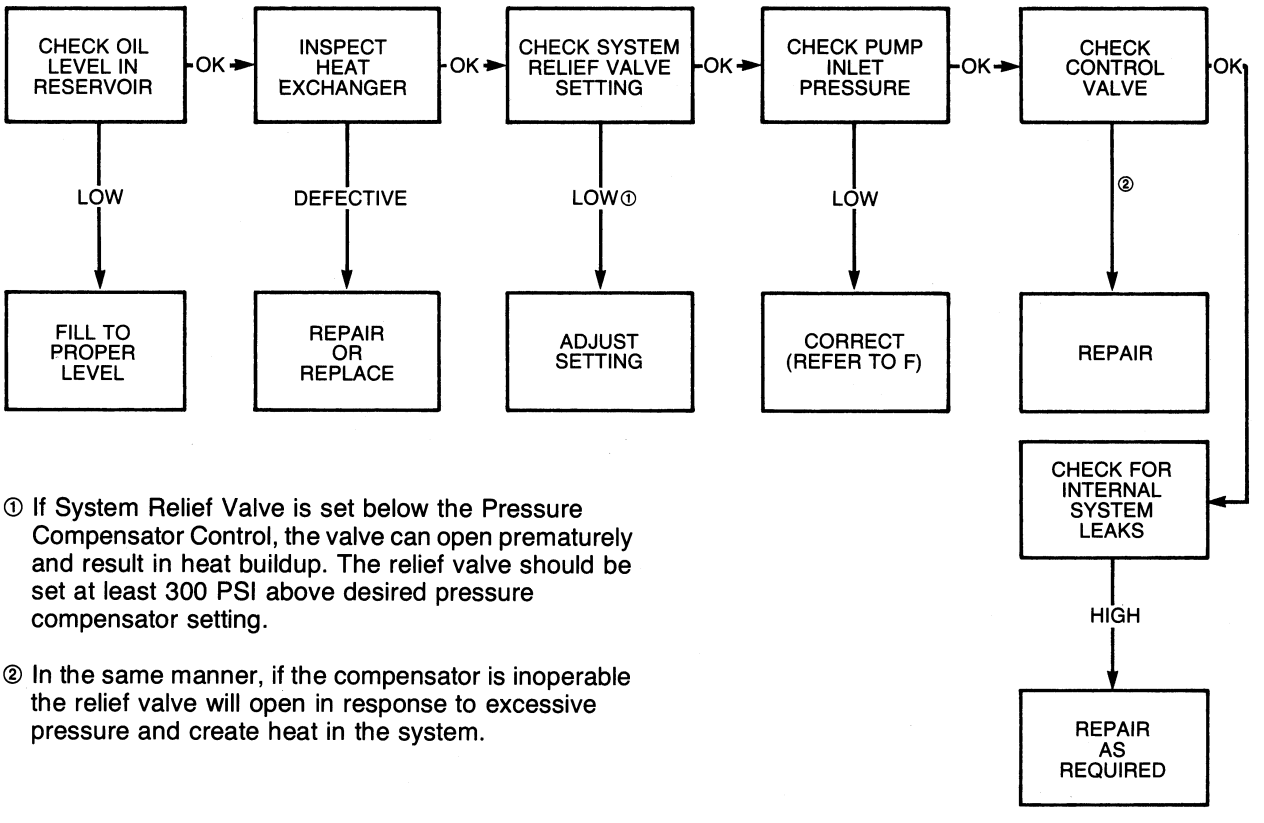
Snubbers are recommended to protect gauges. Gauge calibration is also necessary to insure accuracy of readings.

A. EXCESSIVE NOISE AND/OR VIBRATION



TROUBLESHOOTING

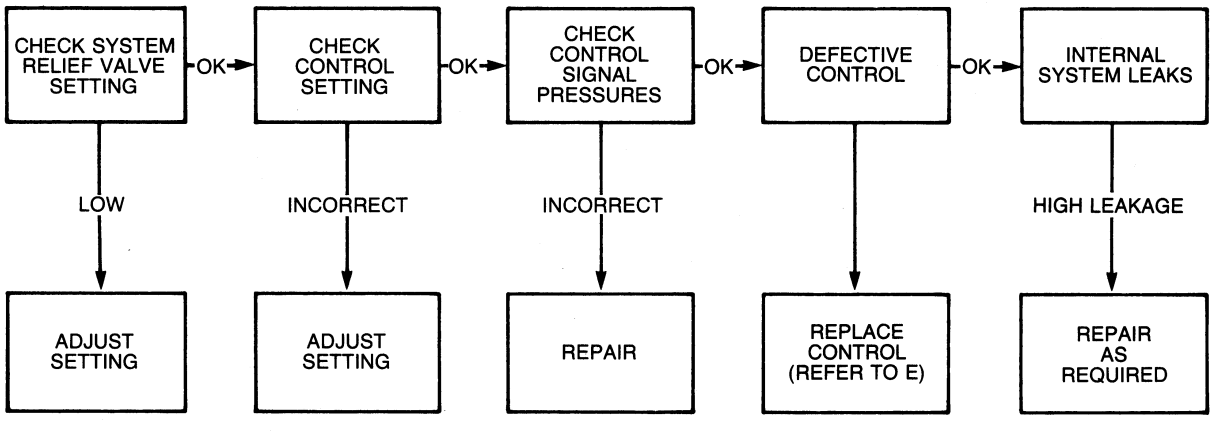
B. SYSTEM OPERATING HOT



① If System Relief Valve is set below the Pressure Compensator Control, the valve can open prematurely and result in heat buildup. The relief valve should be set at least 300 PSI above desired pressure compensator setting.

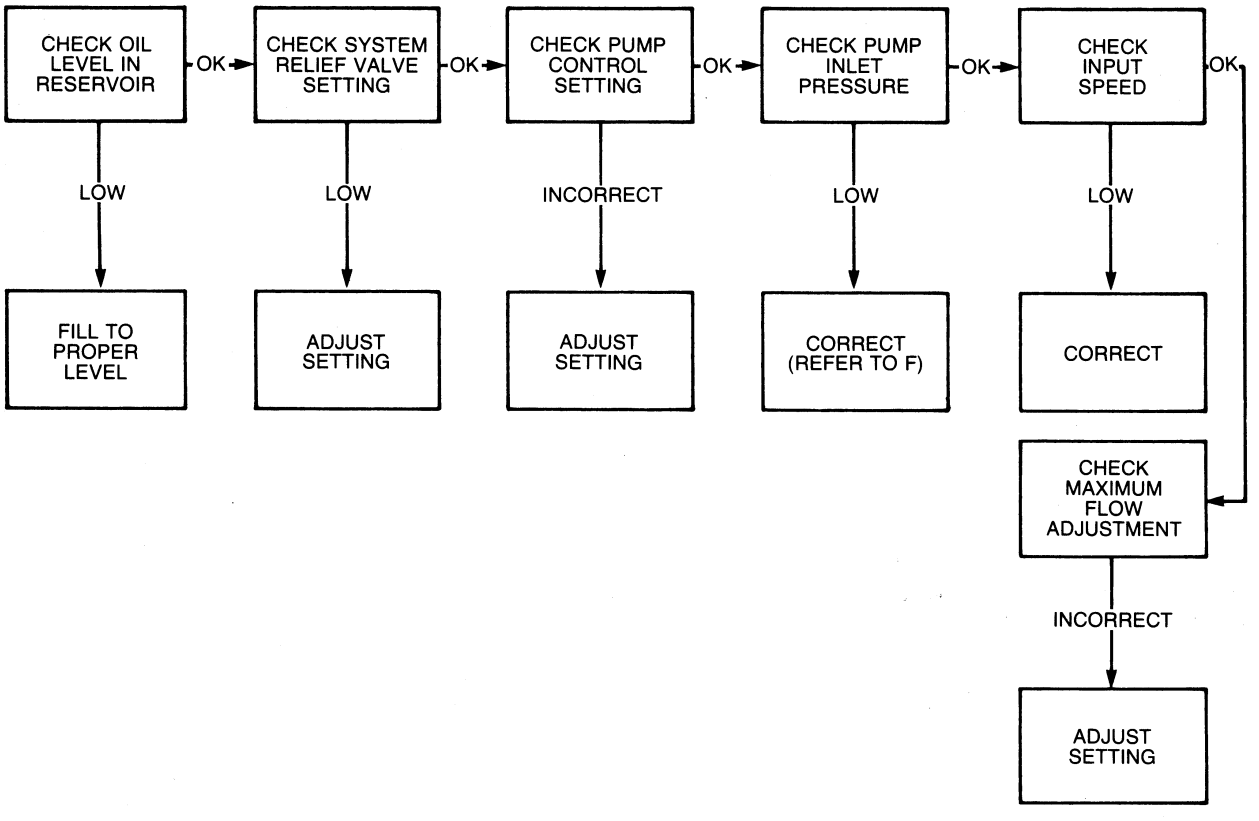
② In the same manner, if the compensator is inoperable the relief valve will open in response to excessive pressure and create heat in the system.

C. SYSTEM RESPONSE IS SLUGGISH

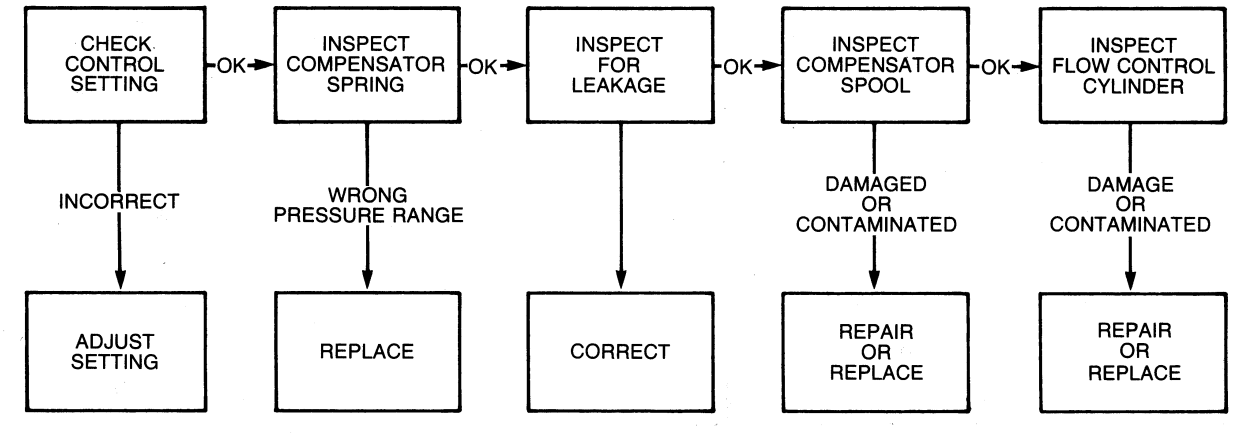


TROUBLESHOOTING

D. LOW PUMP OUTPUT FLOW

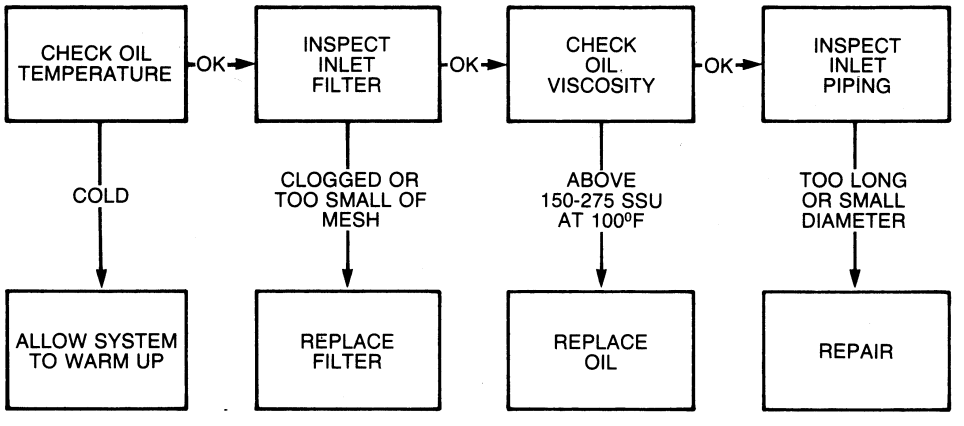


E. COMPENSATOR VALVE DOES NOT OPERATE



TROUBLESHOOTING

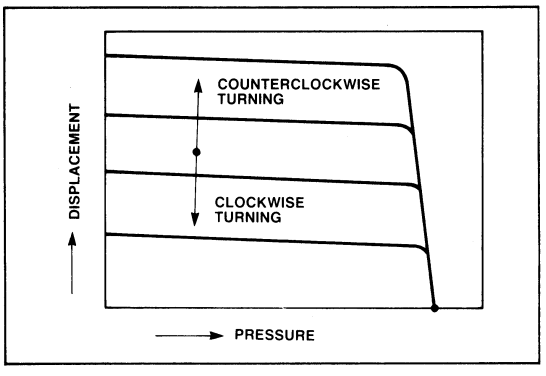
F. HIGH INLET VACUUM

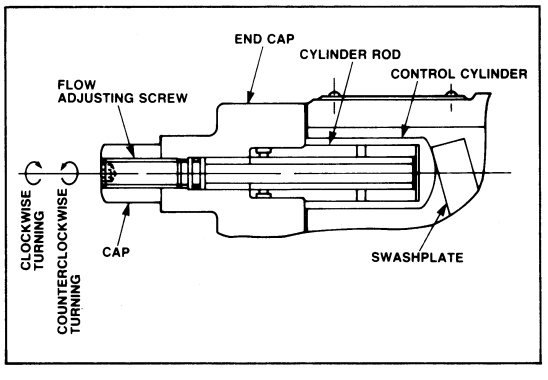


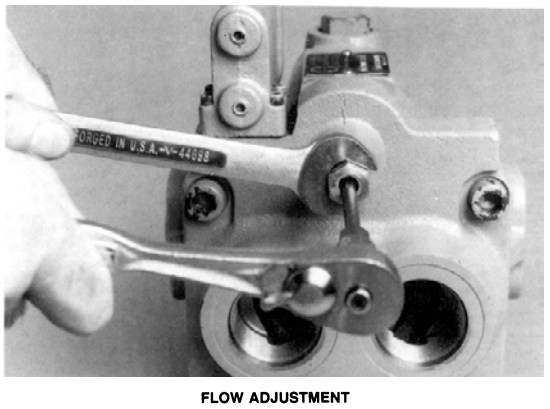
COMMON CAUSES OF WEAR AND PART DAMAGE

AFFECTED PART	PROBLEM	PROBABLE CAUSE
Shaft	Broken	A. Pump is used at higher than maximum working pressure. B. Seizure is due to lack of lubrication.
	Wear	Needle bearing wear on L-15 Excessive shaft end play on L23, L38, L50, L70 models
Cylinder Block Valve Plate	Seizure	A. Oil contamination
	Wear	A. Excessive oil temperature B. Cavitation C. Improper case drain filling D. Excessive speed E. Excessive pressure
Slipper Pads	Wear	A. Oil contamination B. Excessive speed C. Excessive pressure
Bearings	Damage	A. Improper shaft alignment B. Abnormal pressure C. Insufficient end play on L23, L38, L50, and L70 models.
Oil Seals	Damage	A. Excessive case leakage B. Excessive case pressure C. Improper shaft alignment
Control Cylinder Cylinder rod	Wear	A. Oil contamination

STANDARD CONTROL ADJUSTMENT







FLOW ADJUSTMENT

Maximum Flow Adjustment

Maximum volume or flow from the pump can be varied to match the application requirement by turning the flow adjusting screw located on the back of the pump.

Using appropriate wrenches, loosen the locknut and turn the adjusting screw clockwise to decrease maximum pump flow or counterclockwise to increase maximum flow.

The flow rate will be increased or decreased by approximately the following amount for each complete turn of the adjustment screw.

L15	.091 in.^{3}/rev. per turn
L23	.123 in.^{3}/rev. per turn
L38	.15 in.^{3}/rev. per turn
L50	.25 in.^{3}/rev. per turn
L70	.31 in.^{3}/rev. per turn

Stops are provided to limit both minimum and maximum positions of the screw within the following angle and displacement per revolution range.

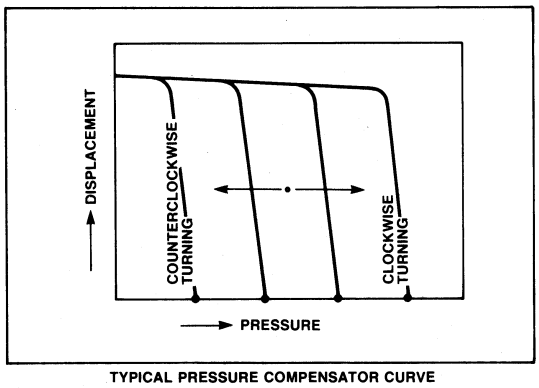
PUMP SIZE	SWASHPLATE ANGLE	DISPLACEMENT
L15	2^0 to 15^0	0.135 in.^{3}/rev. to .913 in.^{3}/rev.
L23	5^0 to 17^0	0.378 in.^{3}/rev. to 1.41 in.^{3}/rev.
L38	7^0 to 18^0	0.9 in.^{3}/rev. to 2.3 in.^{3}/rev.
L50	0 to 18^0	0 to 3.15 in.^{3}/rev.
L70	2^0 to 18^0	0.4 in.^{3}/rev. to 4.26 in.^{3}/rev.

After adjustment, hold the screw in place and torque the locknut to 12-16 ft. lbs.

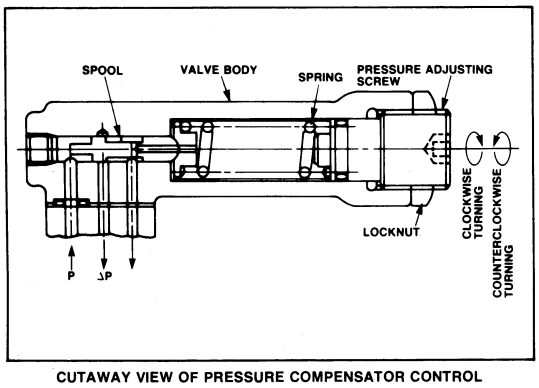
CAUTION

Excessive torque may damage threads and allow setting to change during operation.

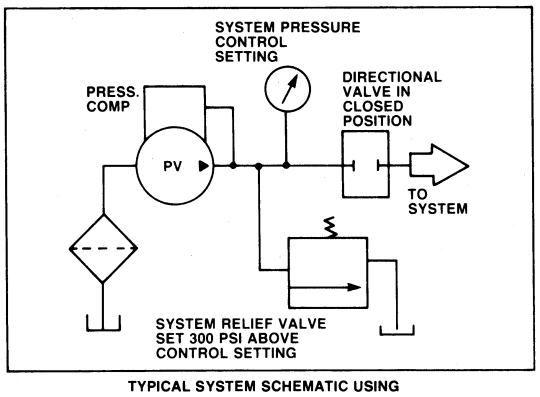
STANDARD CONTROL ADJUSTMENT



TYPICAL PRESSURE COMPENSATOR CURVE



CUTAWAY VIEW OF PRESSURE COMPENSATOR CONTROL



TYPICAL SYSTEM SCHEMATIC USING PRESSURE COMPENSATOR CONTROL

PRESSURE COMPENSATOR CONTROL (PC)

The following adjustment procedure is applicable for the pressure compensator function on the pressure compensator control, the flow and pressure compensator control and the remote pressure compensator control.

The standard pressure compensator adjustment range is 500 to 3000 PSI (35 BAR to 210 BAR). The following optional ranges are available.

250 - 1000 PSI (15 BAR to 70 BAR)
250 - 2000 PSI (15 BAR to 140 BAR)

It is necessary to refer to the machine specifications for specific control settings and any procedures peculiar to adjusting the control on each machine.

1. The system relief valve should be set at least 300 PSI (20 BAR) higher than the desired pressure compensator setting.

2. The flow compensator function, if present, must be disabled prior to adjusting the pressure compensator by connecting system pressure to the flow compensator feedback port.

3. Using an appropriate adapter, connect a high pressure gauge (10,000 PSI) into the pressure line from the pump.

WARNING

To set the pressure compensator requires deadheading the pump. Take necessary precautions of securing the work function so no movement of the load occurs, and also that the system high pressure relief valve is properly adjusted as noted earlier in paragraph (1).

4. Start the prime mover and allow fluid to reach normal operating temperature.

5. Note the high pressure gauge reading which is the pressure setting of the pressure compensator. Refer to machine specifications for proper pressure setting.

6. To adjust the pressure compensator loosen the locknut. Then, using appropriate hex wrench, turn the adjusting screw clockwise to increase setting or counterclockwise to decrease setting.

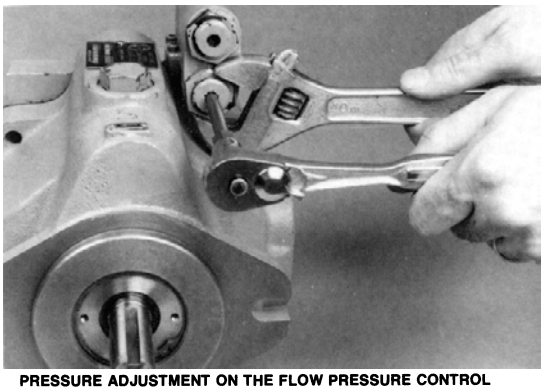
STANDARD CONTROL ADJUSTMENT

If the pressure setting does not increase in response to turning the adjustment screw clockwise, the system relief valve may be improperly adjusted.

7. Once the desired pressure setting (shown on the pressure gauge) is obtained, hold the adjustment screw in place and torque the locknut to 16-20 ft. lbs.

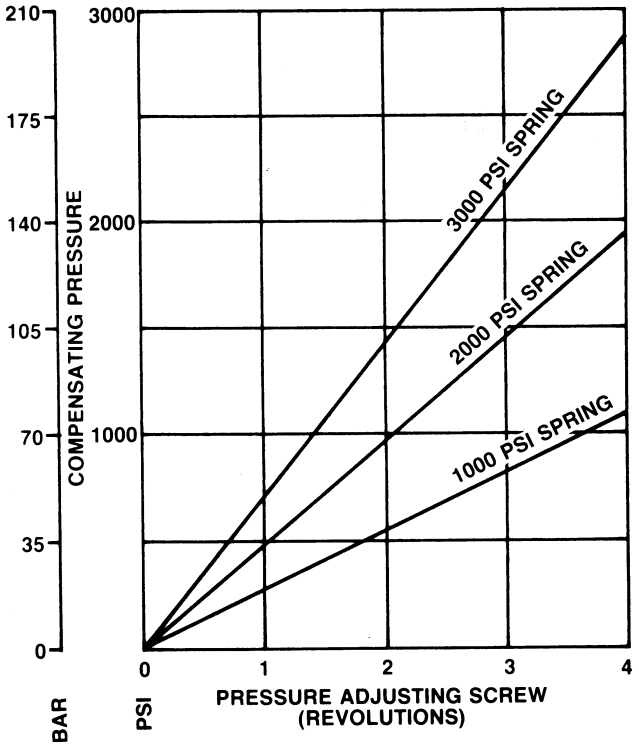
NOTE

Cycle pump 2 or 3 times to insure pressure setting is maintained.

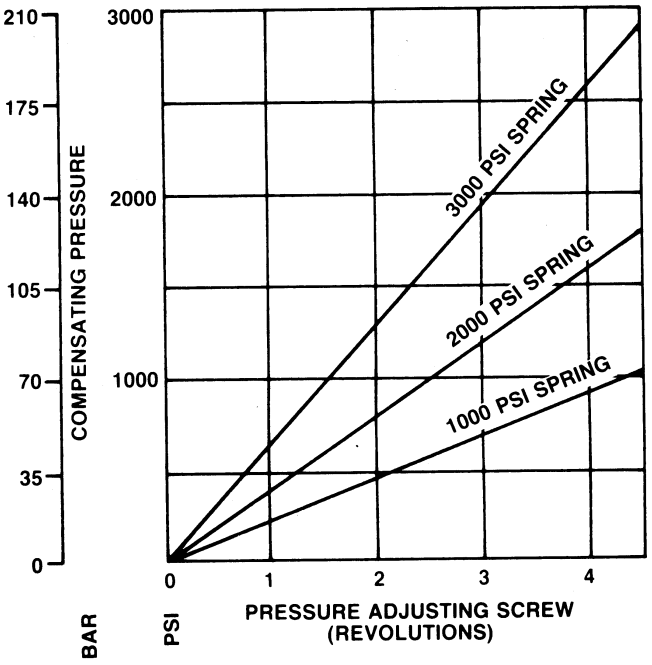


PRESSURE ADJUSTMENT ON THE FLOW PRESSURE CONTROL

L15, L23, & L38



L50 & L70



STANDARD CONTROL ADJUSTMENT

FLOW COMPENSATOR ADJUSTMENT (FP)

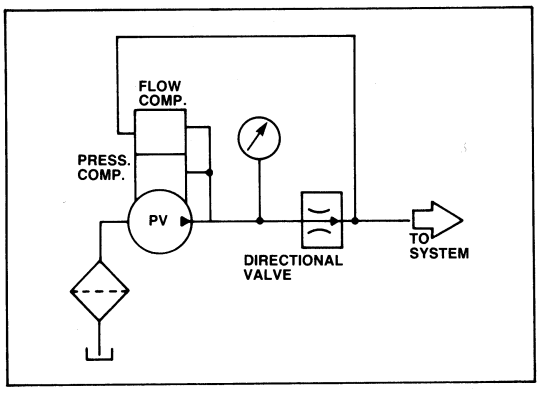
The flow compensator control also contains a pressure compensator function which must be adjusted separately as outlined on the previous page.

Before adjusting the flow compensator control, it may be necessary to refer to the machine specifications for specific control settings and any procedures peculiar to adjusting the control for your machine.

WARNING

Adjustment of the pressure compensator requires deadheading the pump. Take necessary precautions of securing the work function so no movement of the load occurs, and also that the system high pressure relief valve is properly adjusted as noted earlier in paragraph (1).

1. Using an appropriate adapter, tee a high pressure gauge into the high pressure line from the pump.



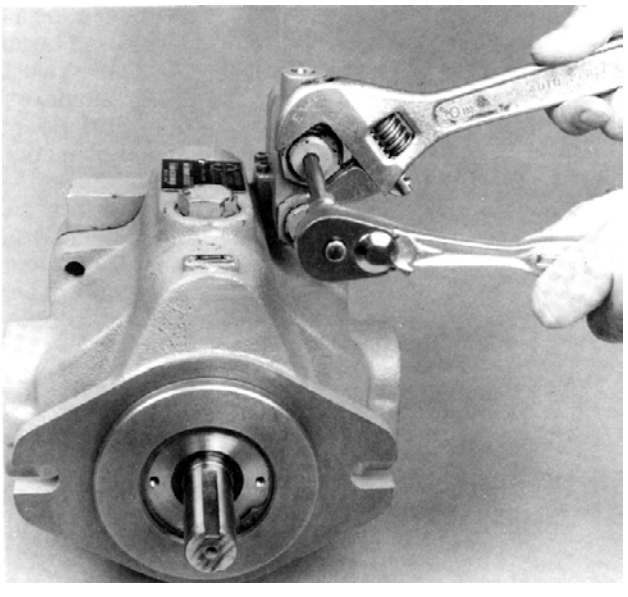
2. Start the prime mover and allow fluid to reach normal operating temperature.

3. Using appropriate wrenches loosen the adjustment screw locknut and back the screw out (CCW) until spring pressure is relieved.

4. A. If a closed center valve is used in conjunction with the pump, read system pressure with the valve in the closed position.

   B. If a closed center valve is not used, disconnect the feedback line at the control and leave the control port open. Plug the feedback line, bottom out a cylinder or stall a motor function, and read system pressure.

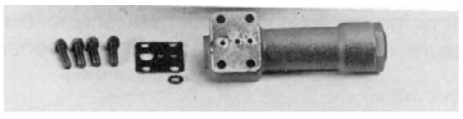
5. Turn the flow compensator adjustment screw in until system pressure equals the desired flow compensator pressure.

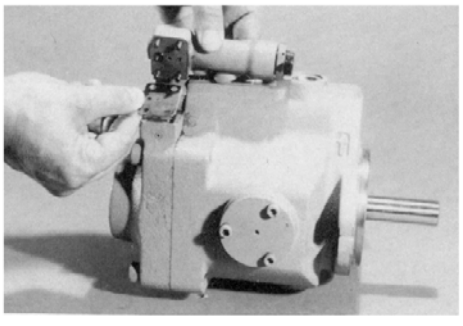


The Δ pressure setting is adjusted with the top adjustment screw. The bottom adjustment screw is for the pressure compensator.

6. Once the desired Δ pressure setting (shown on the pressure gauge) is obtained, hold the adjustment screw in place and torque the locknut to 16-20 ft. lbs.

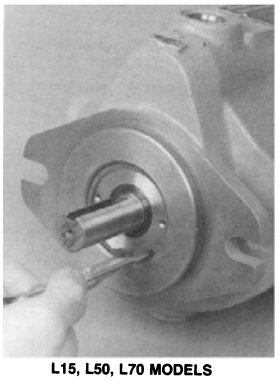
MINOR REPAIRS



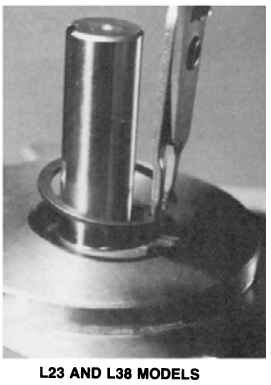


REMOVAL OF A STANDARD CONTROL

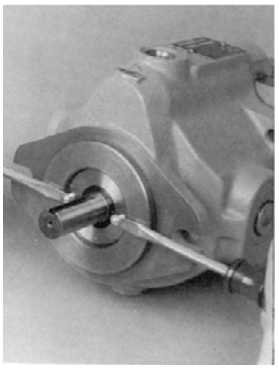
L15, L50, L70 STYLE SHOWN



L15, L50, L70 MODELS



L23 AND L38 MODELS



INTRODUCTION

The areas of repair indicated are classed as minor repairs and may be performed, following the procedures in this section, without voiding the unit warranty. Although specific units are illustrated, these procedures apply to all series and types of units in the Series L Family.

GENERAL

Cleanliness is a primary means of insuring satisfactory pump life, on either new or repaired units. Cleaning parts by using a solvent wash and air drying is adequate, providing clean solvent is used. As with any precision equipment, the internal mechanism and related items must be kept free of foreign materials and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material.

It is recommended that all gaskets and o-rings be replaced. All gasket sealing surfaces must be cleaned prior to installing a new gasket. Lightly lubricate all o-rings with clean petroleum jelly prior to assembly.

SHAFT SEAL

Removal

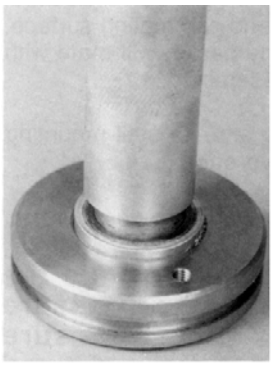
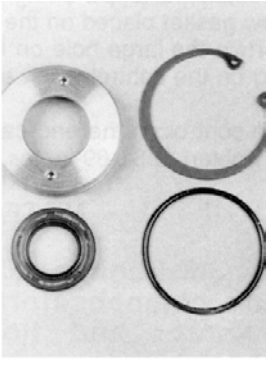
Two types of shaft seals are used on the L Series pumps. The L15, L50 and L70 models each utilize a seal retainer and O-ring. The L23 and L38 models, however, use a replaceable seal and retaining ring only. Refer to the appropriate instructions which follow for seal replacement. Please note: The seal retainer on the L50 manufactured after seriel no 84-50XXXX has been eliminated.

Using retaining ring pliers, remove the retaining ring from the shaft end of the pump.

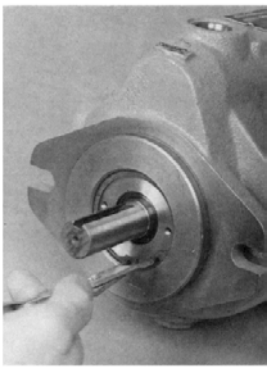
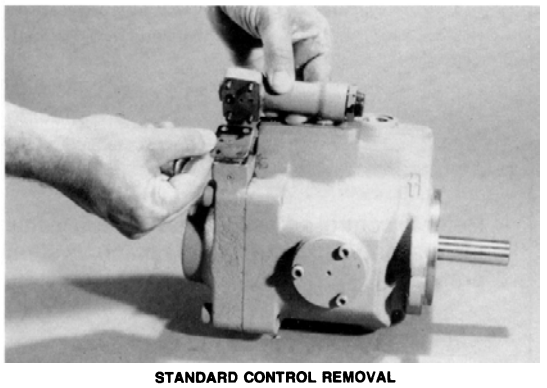
CAUTION

The retaining ring holds the shaft in the housing on the L15 model. Do not pull on the shaft after the retaining ring has been removed. In the event the shaft is pulled from the housing, do not attempt to slide it back into the unit.
The shaft aligns all cylinder block components, which have probably now become misaligned. Reinstalling the shaft by sliding it back in will damage the cylinder block assembly. Once the shaft has been removed, it becomes necessary to remove the end cap and cylinder block. Refer to the major repair section of this manual.

MINOR REPAIRS



STANDARD CONTROL REMOVAL

L15, L50 and L70 Models

Install a screw into each of the two threaded holes in the face of the seal retainer. (The screws which hold the control onto the end cap will fit.)

Pull or pry the seal retainer from the housing. The retainer will not come out easily as it is held in place by a large o-ring.

Using a seal driver or similar tool, remove the seal from the seal retainer. Discard the seal when removed.

Remove and discard the o-ring from the outside of the seal retainer.

L23 and L38 Models

Using a punch, or some type of sharp instrument, puncture the shaft seal and gently pry it out of the housing. Remove the old seal from the shaft and discard.

Installation

L15, L50 and L70 Models

Use a seal driver or similar tool to press a new seal into the seal retainer. Make certain the seal is bottomed on the counterbore within the retainer.

CAUTION

Do not use excessive force as seal will be damaged.

Install a new o-ring on the outside of the seal retainer.

Lubricate the o-ring with oil and slide the seal retainer over the shaft and into the housing. Press the seal retainer into the housing until the retaining ring groove is exposed.

Install the retaining ring with the beveled side out. Make certain the retaining ring has snapped into the groove completely.

L23 and L38 Models

Lubricate the new seal with oil and carefully slide it over the shaft. Make sure the shaft is covered or other measures have been taken to protect the seal from damage by the shaft keyway.

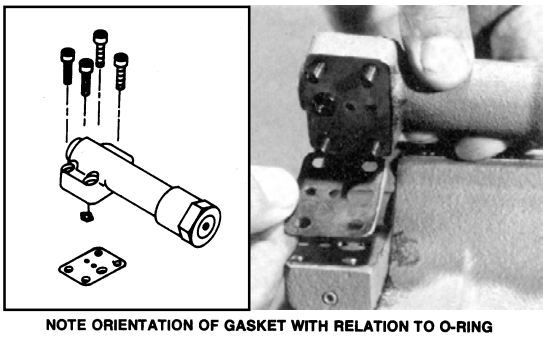
Press the seal into place and securely install the retaining ring in the groove within the housing.

CONTROL

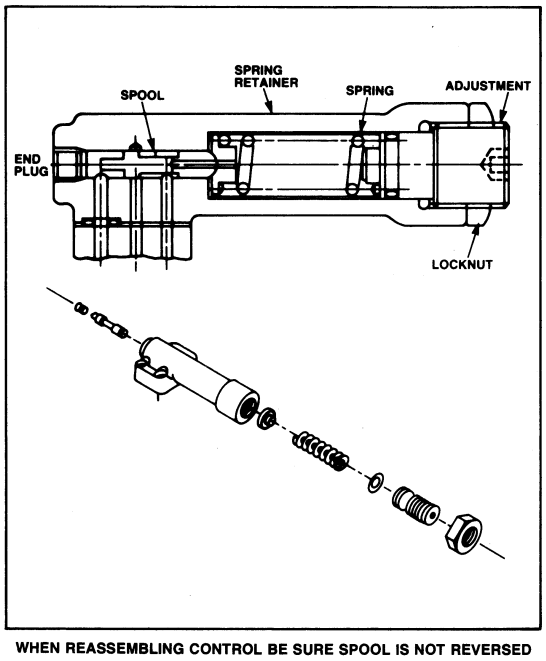
Using an internal hex wrench, remove the four socket head screws which hold the control on the end cap.

Remove the control and gasket from the end cap. Remove the o-ring from the groove in the mating surface of the control.

MINOR REPAIRS



NOTE ORIENTATION OF GASKET WITH RELATION TO O-RING



WHEN REASSEMBLING CONTROL BE SURE SPOOL IS NOT REVERSED

It is suggested that a new o-ring be installed on the control and a new gasket placed on the end cap mating surface. Make certain the large hole on the gasket will mate with the o-ring on the control when assembled.

Place the control on the end cap and reinstall mounting screws. Tighten to 61-69 in. lbs. torque.

NOTE

The standard controls, which include the pressure compensator, remote pressure compensator and flow and pressure compensator controls, for the L15, L23 and L38 are interchangeable between the three models. Likewise, the standard controls are interchangeable between the L50 and L70 models. All other controls are not interchangeable.

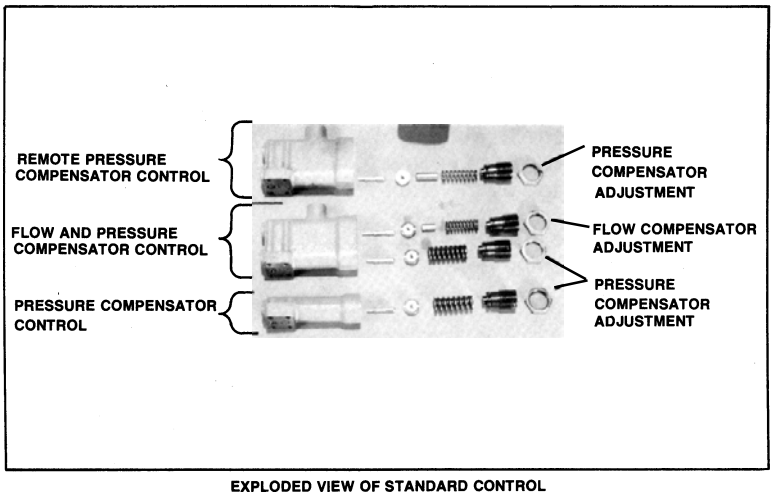
STANDARD CONTROL DISASSEMBLY

If the control is not performing properly because of a sticking or contamination, it can be further disassembled for cleaning or repair.

Using appropriate wrenches, loosen the adjustment screw locknut and remove the adjustment screw. The control spring and spring retainer can now be removed from the cavity.

Using an internal hex wrench remove the threaded plug from the opposite end of the control and remove the control spool.

Flush the control cavity with clean solvent and wash all parts in solvent and air dry. Examine spool and cavity surfaces for nicks or scratches and replace any parts found to be defective.



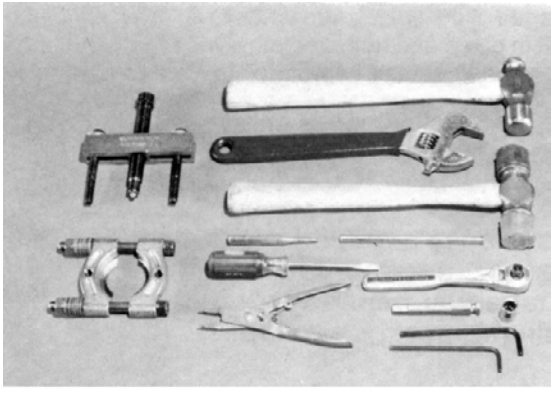
EXPLODED VIEW OF STANDARD CONTROL

Replace spring and spring retainer in cavity from adjustment end and reinstall adjustment screw and locknut. Install control spool in opposite end of control and install plug. Insure that orientation of spool is correct.

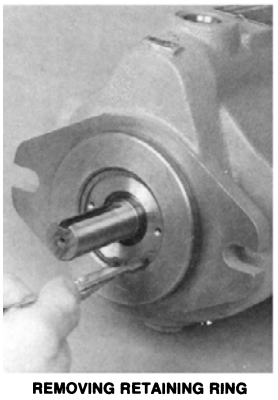
Reinstall control on pump housing replacing o-ring and control gasket as part of the procedure.

Refer to control adjustment procedure in this manual and set control for maximum system pressure.

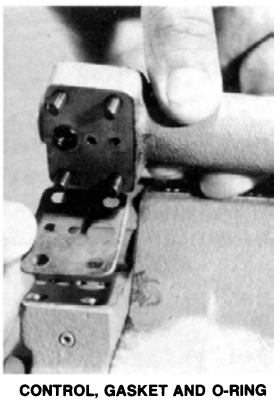
MAJOR REPAIRS - DISASSEMBLY



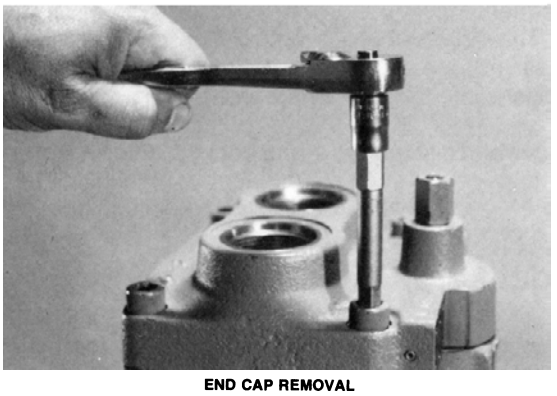
TYPICAL CONTROLS NEEDED FOR REPAIRS



REMOVING RETAINING RING



CONTROL, GASKET AND O-RING



END CAP REMOVAL

INTRODUCTION

The major repairs explained in this section will affect the unit warranty; therefore, the equipment manufacturer should be consulted prior to undertaking such repairs.

The following procedures have been written to cover all Series L models. However, because of differences in bearings and trunnions between the models, the procedures are divided into various sections. Proceed with disassembly and reassembly as follows, referring to those steps which cover "All Models" or the model on which you are working. Be sure to accomplish steps in the order that appear in this manual.

Thoroughly clean the pump prior to disassembly. Cleaning with a solvent wash and air drying is adequate, providing clean solvent is used.

SHAFT SEAL REMOVAL

L23, 38, 50 & 70 Only

Remove the shaft seal as outlined in Minor Repairs procedures. The shaft seal must be removed before the end cap screws are loosened to prevent the seal being damaged.

SHAFT SEAL REMOVAL
L15 Only

Do not remove the shaft seal on the L-15 model at this time. It will be removed at a later stage in the repair procedures.

END CAP REMOVAL/DISASSEMBLY All Models

Remove the control valve as outlined in the Minor Repairs section of this manual.

Using appropriate wrenches, remove the protective locknut from the maximum flow adjustment screw.

Using the proper wrench loosen the four socket head bolts which hold the end cap to the pump housing. Remove two of the bolts opposite each other.

MAJOR REPAIRS - DISASSEMBLY

REMOVING THE END CAP

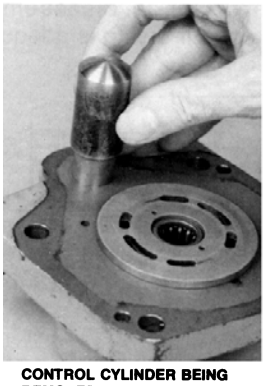
There is an internal loading on the end cap and as the last two screws are loosened, it should begin to separate from the housing. Loosen the screws alternately until the end cap has separated from the housing, then remove the screws entirely.

The end cap can now be lifted off the pump. However, be certain that the valve plate does not fall and become damaged. If the valve plate tends to lift off with the end cap, hold it in place and remove both parts together. If the valve plate remains on the bearing plate, remove it at this time.

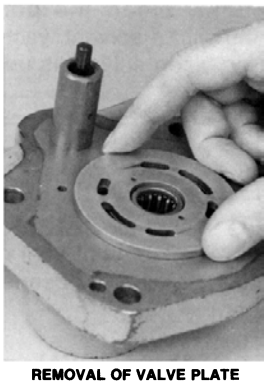
CAUTION

All surfaces exposed are critical and caution must be used to avoid damage. Surface damage will cause low efficiency or even a totally inoperative pump.

Remove the control cylinder by sliding it off the cylinder rod.



CONTROL CYLINDER BEING REMOVED



REMOVAL OF VALVE PLATE

CAUTION

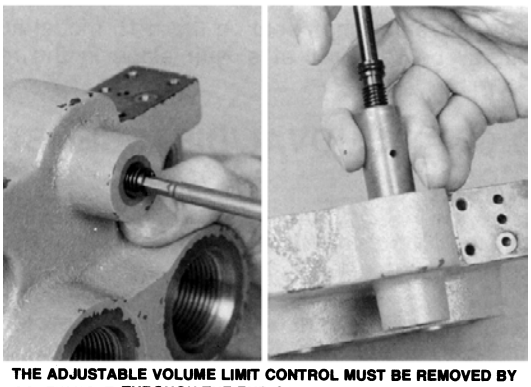
Do not attempt to remove the tube around which the control cylinder was fitted. The tube was pressed into the end cap during manufacturing and is not replaceable.

Remove the valve plate from the end cap.

Remove the valve plate locating pin.

Using an internal hex wrench, remove the maximum flow adjustment screw by turning it clockwise through the end cap. The adjustment screw may be pulled through the cylinder rod once the threaded portion of the screw has surpassed the threads in the end cap.

Remove and discard the o-ring from the adjustment screw.

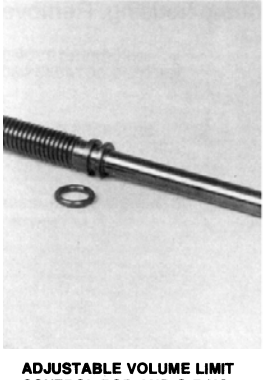


THE ADJUSTABLE VOLUME LIMIT CONTROL MUST BE REMOVED BY SCREWING IT THROUGH THE END CAP

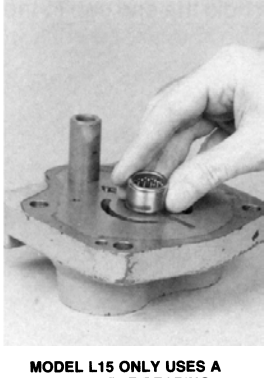
BEARING REMOVAL
Model L-15 Only

Inspect the needle bearing in the end cap. If the bearing is not damaged, worn or contaminated it is not necessary to remove it from the end cap.

If the needle bearing needs to be replaced, a bearing puller will be required to remove it from the end cap.



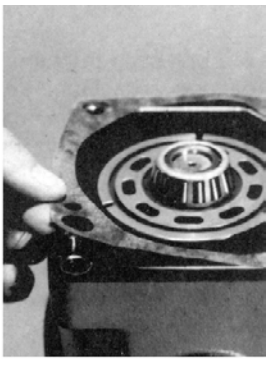
ADJUSTABLE VOLUME LIMIT CONTROL ROD AND O-RING



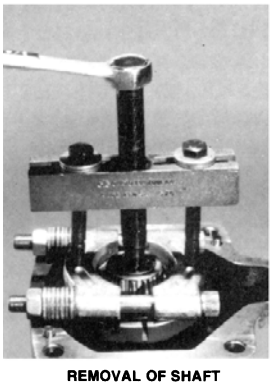
MODEL L15 ONLY USES A REAR NEEDLE BEARING

MAJOR REPAIRS - DISASSEMBLY

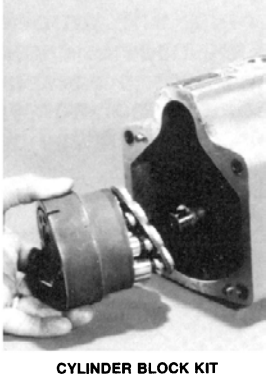
BEARING SHIM



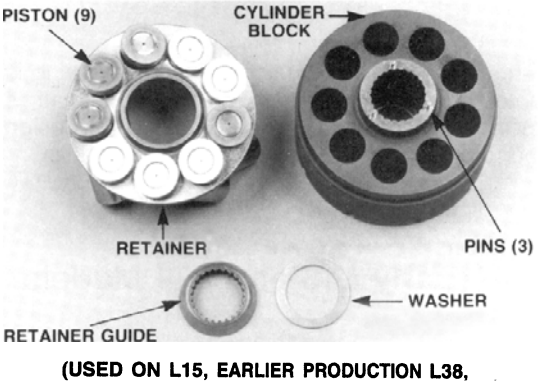
END CAP GASKET



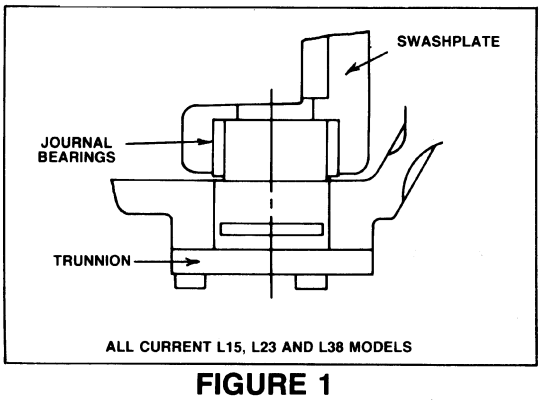
REMOVAL OF SHAFT BEARING



CYLINDER BLOCK KIT BEING REMOVED



(USED ON L15, EARLIER PRODUCTION L38, AND L70 MODELS ONLY)



ALL CURRENT L15, L23 AND L38 MODELS

FIGURE 1

BEARING REMOVAL L23, 38, 50 and 70

Remove the bearing race from the end cap. The race is installed with a slip fit. Note that there may be shims installed between the bearing race and the cap to adjust end play. Retain these shims for reassembly. Loss of these shims will result in improper end play causing reduced bearing life and possibly reduced pump performance.

Using a clam type bearing puller, remove the tapered roller bearing from the shaft. Care must be taken not to damage the cylinder block surface or contaminate the unit during this operation. A spacer is also required to protect the end of the pump shaft from damage by the puller screw.

ROTATING GROUP REMOVAL All Models

Remove the end cap gasket from the pump housing.

With the pump laying horizontally, slide the cylinder block assembly off the shaft while holding the external end of the shaft.

If the cylinder block assembly does not remain together during removal, it can be reassembled at a later time. The rotating group consists of a retainer, retainer guide, washer (on L15, earlier production L38, and L70 only), three pins, nine pistons and the cylinder block.

Remove the thrust plate from its counterbore in the swashplate. The thrust plate may be difficult to remove due to the oil between the flat surfaces of the thrust plate and the swashplate. Avoid damaging all critical surfaces.

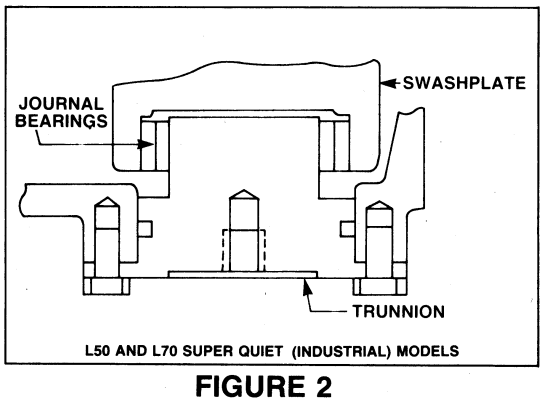
TRUNNIONS

Dependent upon the particular pump model there are four different trunnion types which may be encountered. In the disassembly and assembly instructions these will either be designated as bolt style or pin style.

Figure 1

Figure 1 is a bolt style trunnion which uses a journal bearing. The outer journal is pressed into the swashplate. This design may be found on all current L15, L23, L38 models.

MAJOR REPAIRS - DISASSEMBLY



FIGUR E 2

Figure 2

Figure 2 is a bolt style trunnion which uses two separate journal bearings. The inner journal bearing is pressed onto the trunnion. The outer journal is pressed into the swashplate. The design may be found on L50 and L70 Super Quiet (Industrial) models.

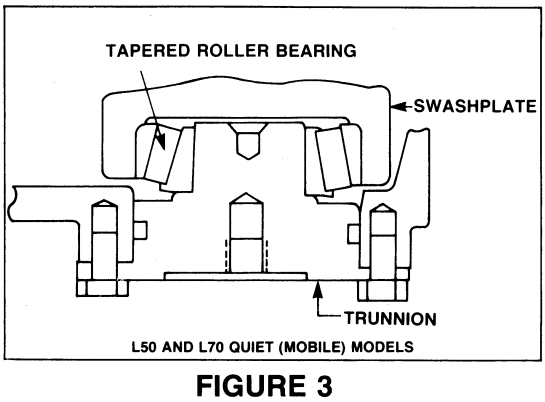


FIGURE 3

Figure 3

Figure 3 is a bolt style trunnion which uses a tapered roller bearing. The bearing cone is pressed onto the trunnion and the cup is pressed into the swashplate. This design may be found on L50 and L70 Quiet (Mobile) models.

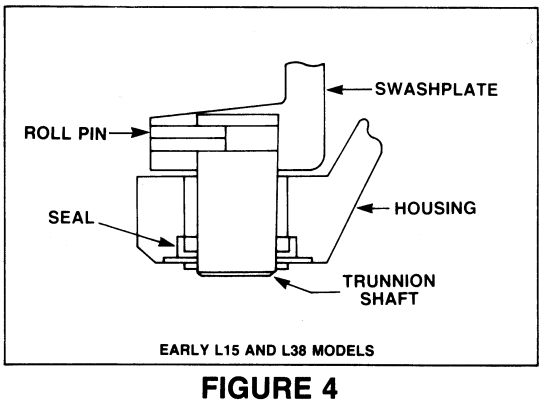
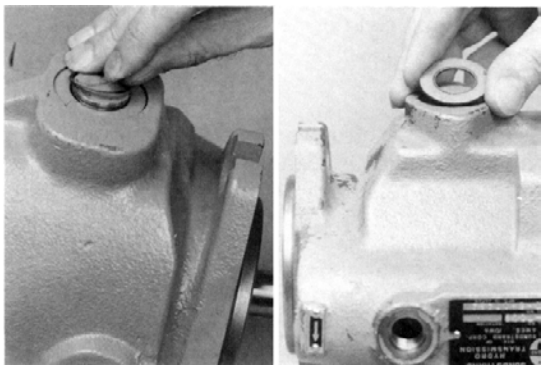


FIGURE 4

Figure 4

Figure 4 shows a pin style trunnion. A needle bearing is pressed into the pump housing. The trunnion shaft is connected to the swashplate by a roll pin. This design may be found only on early model L15 and L38 units.



TRUNNION REMOVAL
Pin Style (Early L15 and L38 Models)

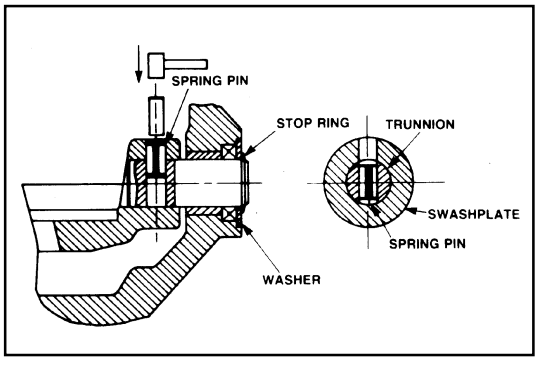
Note: The pump shaft on the Model L15 may be removed prior to trunnion and swashplate removal if desired. On this model only, the shaft is removed from the front and can therefore be removed at anytime.

This will allow for additional access for removal of the trunnion shafts. The model L38 has a front roller bearing and requires swashplate removal in order to remove the shaft.

Using a small flat blade screwdriver, remove the retaining ring from both trunnion shafts. These retaining rings are the spiral type which may be reused later if not distorted during removal.

Remove the washer from both trunnion shafts.

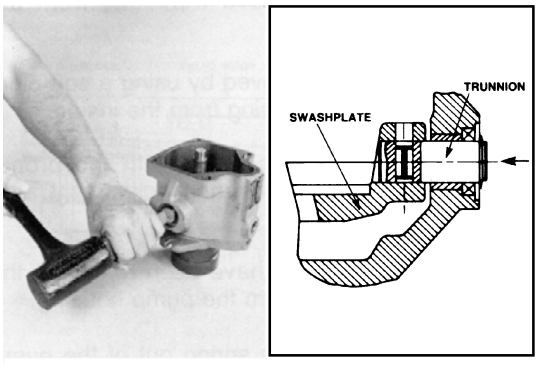
MAJOR REPAIRS - DISASSEMBLY



TRUNNION PIN REMOVAL

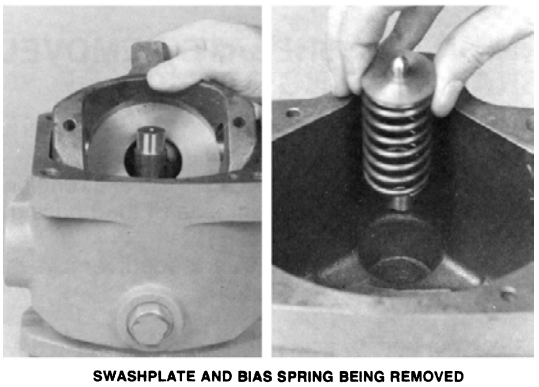
Using a round flat point punch, tap each spring pin which fastens the trunnion shaft to the swashplate until the pin is inserted into the trunnion shaft.

Do not attempt to drive the spring pin completely through, as the bottom side of the swashplate is not drilled.



REMOVAL OF TRUNNION SHAFT

Using a rubber or plastic hammer and a soft blunt object (such as a wooden dowel) tap each trunnion shaft into the housing to remove it.

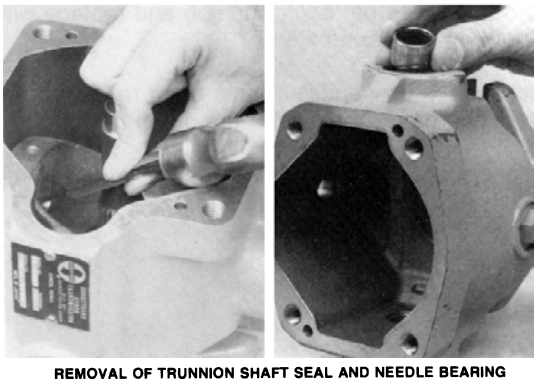


SWASHPLATE AND BIAS SPRING BEING REMOVED

Once the trunnion shafts have been taken out, remove the spring pins by tapping the completely through the shafts.

Lift the swashplate out of the pump housing.

Lift the spring retainer and bias spring out of the pump housing.



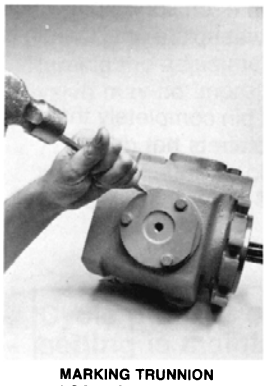
REMOVAL OF TRUNNION SHAFT SEAL AND NEEDLE BEARING

Using a hammer and a small flat point punch, remove both trunnion seals by tapping them to the outside of the housing. Do not damage the trunnion needle bearings if they do not need replaced. Discard the seals when removed.

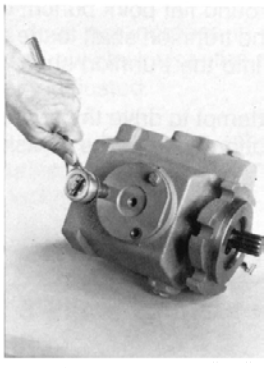
Removal of the trunnion needle bearings should be done with an arbor or other similar type press. Press the bearing through the trunnion bore toward the inside of the housing. A spacer must be used between the press and the bearings.

The bearing should not be driven out of the bore, as this may result in damage to the bore.

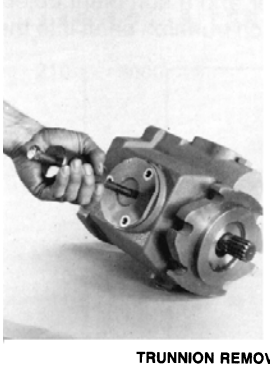
MAJOR REPAIRS- DISASSEMBLY



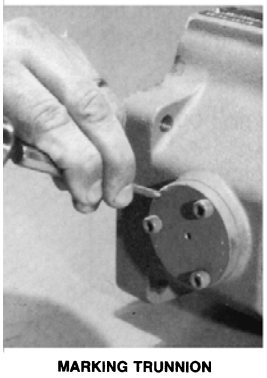
MARKING TRUNNION LOCATION



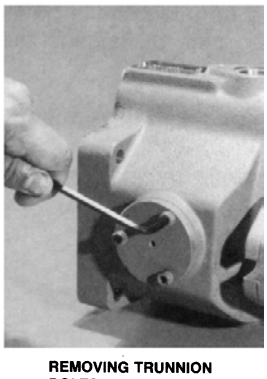
REMOVING TRUNNION BOLTS



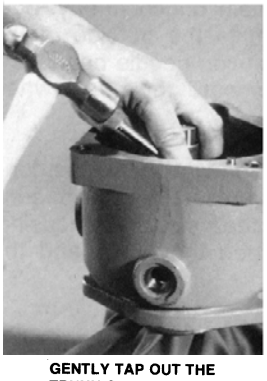
TRUNNION REMOVAL ON L50/70 UNITS



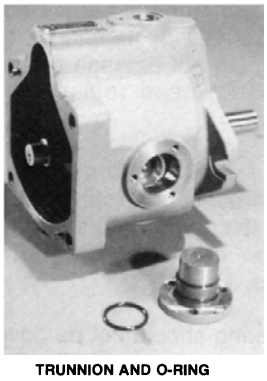
MARKING TRUNNION LOCATION



REMOVING TRUNNION BOLTS



GENTLY TAP OUT THE TRUNNION



TRUNNION AND O-RING REMOVAL

TRUNNION/SWASHPLATE REMOVAL Roller Bearing Style (L50 and L70 Quiet (Mobile) Models)

With a punch or metal scibe, mark right and left trunnions to insure reassembly to the correct side of the housing.

Using a wrench remove the three hex head screws from each trunnion.

With a slide type puller, remove trunnions from the housing.

The trunnion may also be removed by using a soft blunt object to drive it out of the housing from the inside.

Be certain to keep the plastic shims with the proper trunnion to insure satisfactory bearing adjustment after reassembly.

After both trunnion assemblies have been removed, the swashplate can be removed from the pump housing.

Lift the spring retainer and bias spring out of the pump housing.

TRUNNION/SWASHPLATE REMOVEL JOURNAL BEARING STYLE (All Models)

With a punch or metal scribe, mark right and left trunnions to insure reassembly to the correct side of the housing.

Using a hex or internal hex wrench as needed, remove the three cap screws from each trunnion.

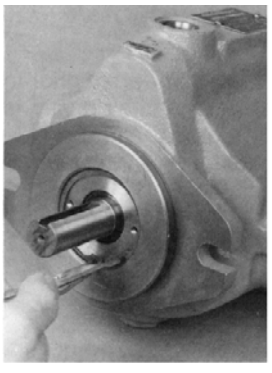
Remove each trunnion by using a soft, blunt object to drive it out of the housing from the inside.

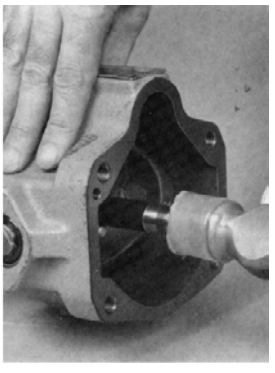
Remove o-ring seal from each trunnion and replace with new o-ring prior to reassembly.

After both trunnion assemblies have been removed, the swashplate can be removed from the pump housing.

Lift the spring retainer and bias spring out of the pump housing.

MAJOR REPAIRS - DISASSEMBLY

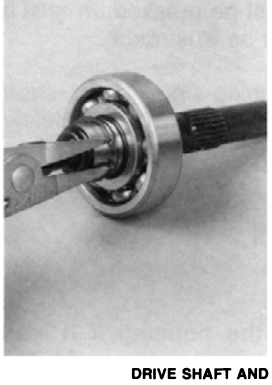


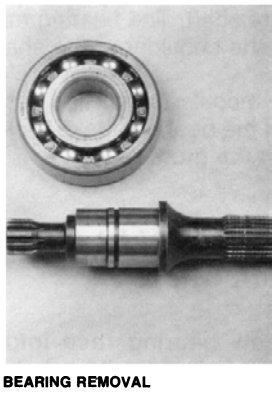


SHAFT/FRONT BEARING REMOVAL L15 Only

Using a pair of retaining ring pliers, remove the shaft seal retaining ring.

With a rubber or plastic head mallet, tap the pump shaft on the end cap end so the shaft and seal assembly are removed from the pump housing.



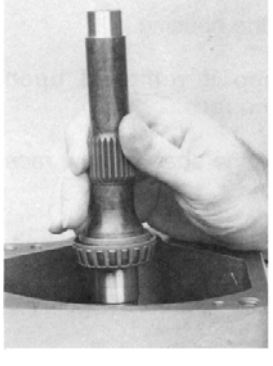


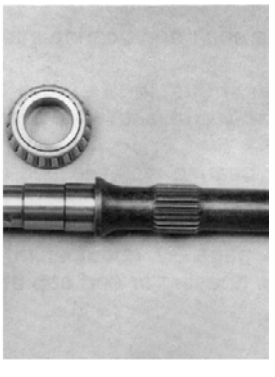
DRIVE SHAFT AND BEARING REMOVAL

Slide the seal off the shaft after it has been removed from the housing.

If the shaft bearing requires replacement, remove the retaining ring from the bearing end of the shaft.

The bearing can now be pressed off the shaft using an arbor type press. Use care not to damage any area of the shaft.

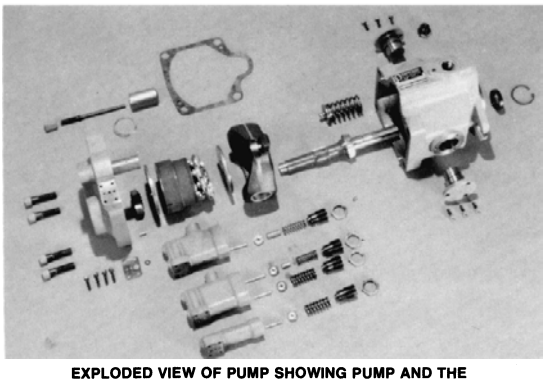




SHAFT/FRONT BEARING REMOVAL L23, 38, 50 & 70

Once the swashplate has been removed, the shaft can be easily removed from the end cap side of the housing. The front bearing is pressed onto the shaft and will be removed with the shaft. However, the bearing race will remain in the housing.

The tapered bearing can be pressed off the shaft if necessary. Be careful not to damage the seal diameter of the shaft while removing the bearing.

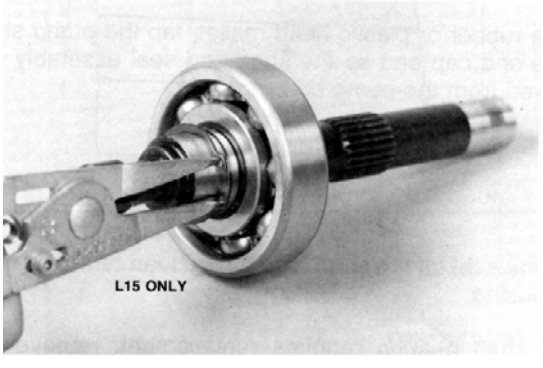


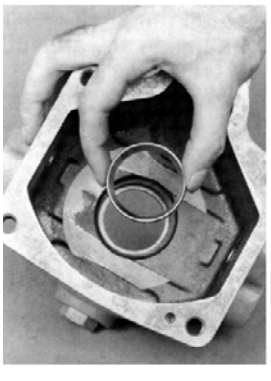
EXPLODED VIEW OF PUMP SHOWING PUMP AND THE THREE STANDARD CONROLS

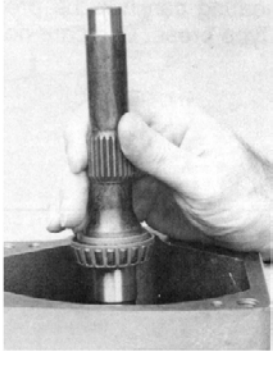
ALL MODELS

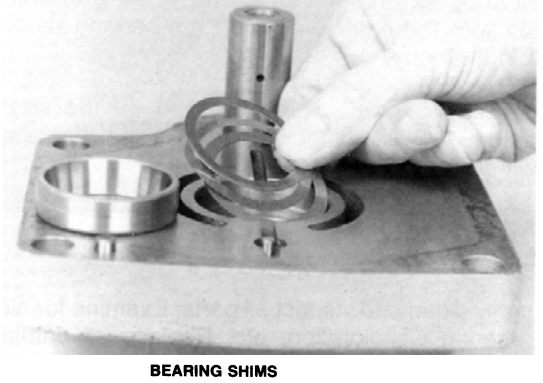
Thoroughly clean and inspect all parts. Examine for nicks, burrs, scoring discoloration, etc. Replace all damaged parts.

MAJOR REPAIRS - ASSEMBLY









BEARING SHIMS

Assembly

Make sure all parts have been thoroughly cleaned prior to assembly. Cleaning with a solvent wash and air drying is adequate, providing clean solvent is used. Reassemble with new o-rings and gaskets. Lubricate all o-rings prior to installation with clean petroleum jelly.

SHAFT BEARING INSTALLATION All Models

Press the bearing onto the shaft if previously removed. When pressing on the shaft bearing for the L15 model, make sure the writing on the bearing is toward the seal end of the shaft. The bearing must be pressed on until it rests on the shoulder of the shaft as illustrated.

On L15 models, install the retaining ring on the shaft ahead of the bearing. Make certain the ring is completely seated in the groove.

SHAFT INSTALLATION L23, 38, 50, & 70

Press new bearing race into the housing if it was previously removed or if a new bearing cone was installed on the shaft.

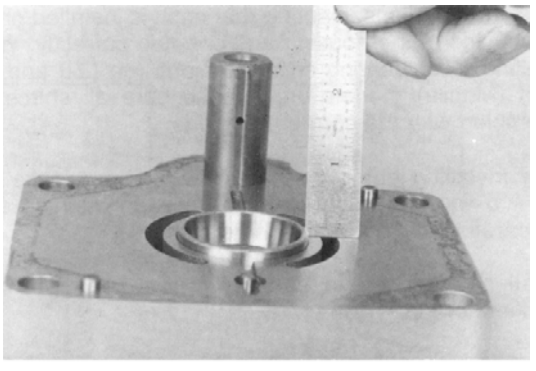
Insert the shaft and bearing into the housing.

Replace shims in the end cap if removed upon disassembly and install the bearing race.

If a new bearing was pressed on the shaft, a new race must also be installed.

Refer to page 32 about shim thickness if drive shaft, bearings, housing or end cap are being replaced.

MAJOR REPAIRS - ASSEMBLY



CHECKING PROPER BEARING RACE PROTRUSION

When properly installed the bearing race will protude approximately 7/64″ above the surface of the end cap. It functions with the small pin installed in the end cap to hold the valve plate in the proper position.

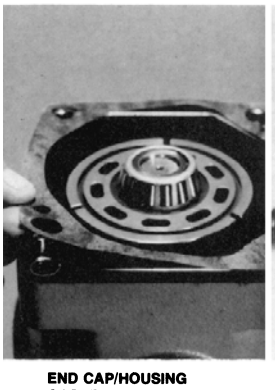
Shaft and play must also be checked after complete assembly to insure proper setting.

END CAP ASSEMBLY
All Models

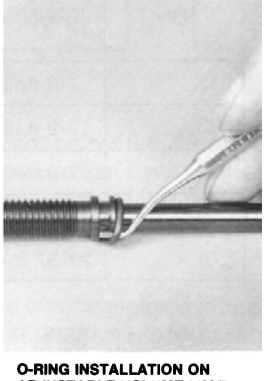
Install the valve plate locating pin in the end cap. The pin will protrude from the housing approximately .050-.094″.

Install the end cap gasket onto the housing being certain the locating pins are in place.

Install a new o-ring on the maximum angle adjusting screw. The o-ring must be well lubricated prior to installation.



END CAP/HOUSING GASKET



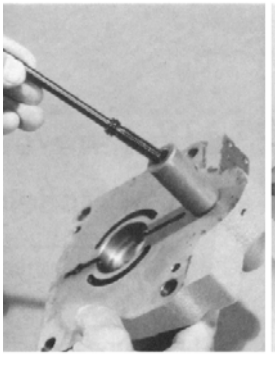
O-RING INSTALLATION ON ADJUSTABLE VOLUME LIMIT ROD

Install the maximum flow adjustment screw (threaded end first) into the cylinder rod.

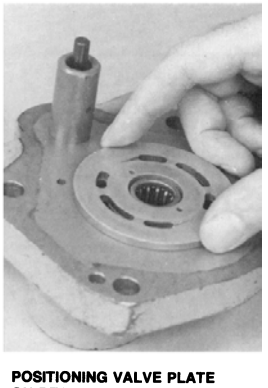
Using an internal hex wrench, turn the adjustment screw counterclockwise until the screw is against the internal thread stop. This is the maximum flow position.

Lubricate the end cap face with clean hydraulic oil. Then install the valve plate so that the slot locates over the locating pin and the center bore fits over the protruding needle bearing or bearing race.

Lubricate the cylinder rod and the inside of the control cylinder with clean hydraulic oil. Slide the control cylinder onto the cylinder rod.



INSTALLING VOLUME LIMIT AND ADJUSTMENT ROD



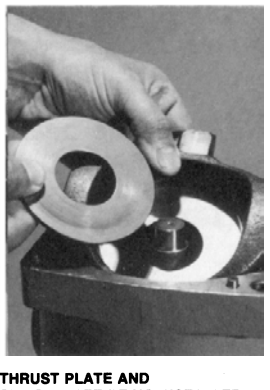
POSITIONING VALVE PLATE ON BEARING RACE AND PIN

TRUNNION/SWASHPLATE INSTALLATION
Bolt Style

Install bias spring and spring retainer into the housing.

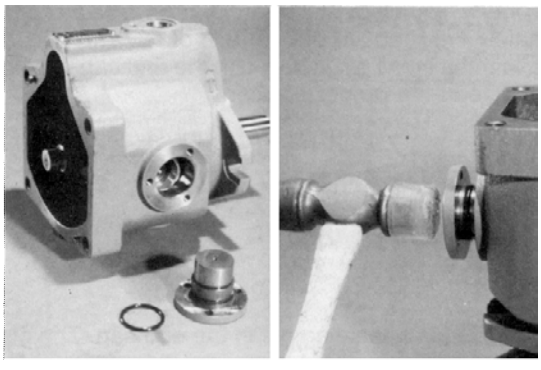
Insert the swashplate into the housing insuring that spring retainer is completely inserted in the hole in the back side of the swashplate.

BIAS SPRING AND RETAINER INSTALLATION

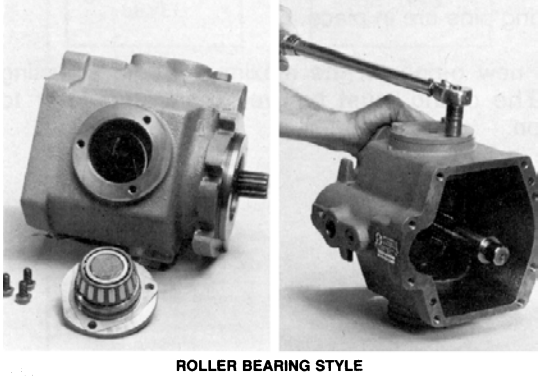


THRUST PLATE AND SWASHPLATE BEING INSTALLED

MAJOR REPAIRS - ASSEMBLY



JOURNAL BEARING STYLE



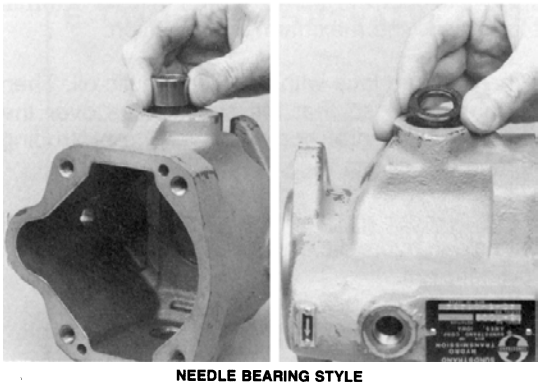
ROLLER BEARING STYLE

Install the trunnions, insuring that each is installed on the correct side of the housing and oriented correctly. When installing roller bearing style trunnions (on L50 and L70 Quiet (Mobile) models only) make sure all shims are assembled with the correct trunnions.

When installing journal bearing style trunnions make sure a new o-ring has been installed on each trunnion shaft and carefully drive trunnions into place.

Install cap screws in each trunnion and tighten to specified torque.

UNIT	TRUNNION BOLT TORQUE FT.-LB.
L15	7-9 ft.-lbs.
L23	7-9 ft.-lbs.
L38	7-9 ft.-lbs.
L50	16-21 ft.-lbs.
L70	27-37 ft.-lbs.



NEEDLE BEARING STYLE

TRUNNION/SWASHPLATE INSTALLATION
Pin Style (Early L15 and L38 Models)

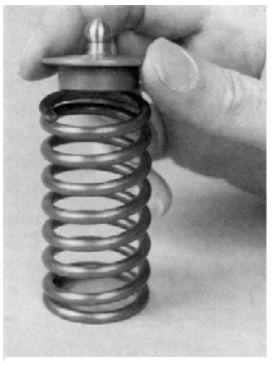
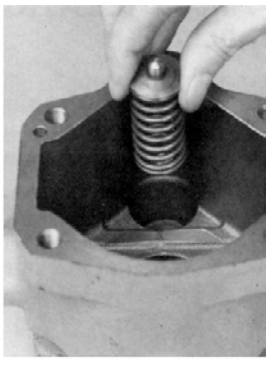
Using an arbor type press, install a new trunnion needle bearing in each trunnion if previously removed. The bearing must be oriented so that the writing on the bearing cage is toward the outside of the housing.

Press the bearing in until it is flush to .016″ (.4mm) below the counterbore for the trunnion seal.

CAUTION

Do not drive the bearing in with a hammer, as this will result in damage to the bearing and possibly the trunnion bore.

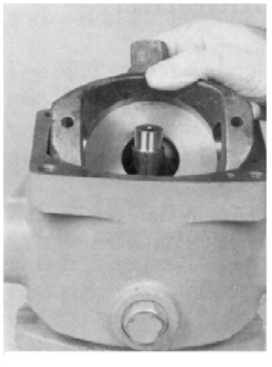
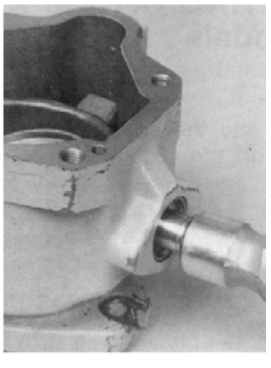
MAJOR REPAIRS - ASSEMBLY

Install the trunnion seal in each trunnion. These are a press fit, so care must be taken not to use excessive force which might damage the seal. Press the seal in until it touches the bottom of the seal counterbore.

Install the bias spring and spring retainer into the housing.

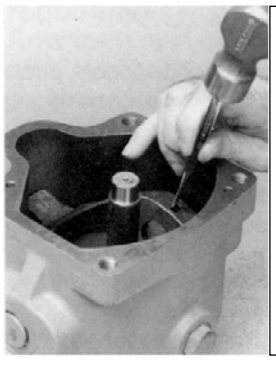
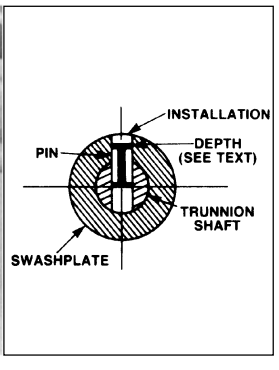
Prior to installing the swashplate, engage a new spring pin in each spring pin hole in the swashplate. Do not tap the pins too far into the swashplate or the trunnions will not slip into place.

Insert the swashplate into the housing insuring that the spring retainer is completely inserted in the hole in the back side of the swashplate.

With the swashplate in place, slide the trunnion shaft through the trunnion bore of the housing and into the swashplate. Make sure the spring pin holes in the shaft and the swashplate are in alignment. It may be necessary to use a rubber or plastic head mallet for final positioning.

Once the trunnion shaft is in place, insure that the oil seal is not damaged.

Use a round flat point punch to tap the spring pin into the swashplate until the top of the pin is .060 - .125" below the surface.

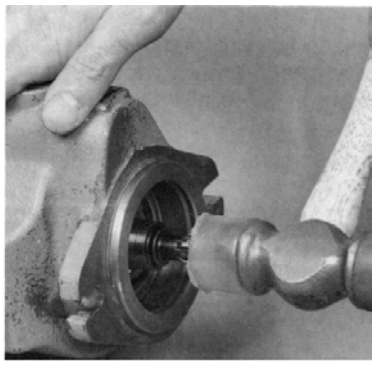
Follow the exact procedure for the other trunnion shaft installation.


Install the trunnion washer.

Install the spiral retaining ring on the trunnion shaft. Make certain the retaining ring is completely seated in the groove.

Repeat trunnion washer and retaining ring installation on opposite trunnion.

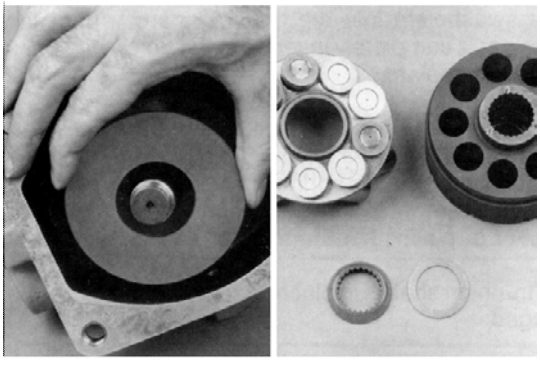
MAJOR REPAIRS - ASSEMBLY



SHAFT INSTALLATION
L15 Only

Install the pump shaft assembly into the housing. Although this should be a slip fit, tapping the end of the shaft with a rubber or plastic type mallet may be necessary.

Install the shaft seal and retaining ring as outlined in the minor repairs section of this manual.



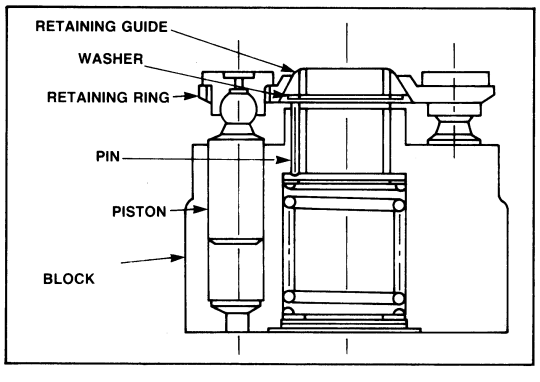
ROTATING GROUP ASSEMBLY
All Models

Lubricate the thrust plate with clean hydraulic oil and install it into the counterbore of the swashplate. Make certain the thrustplate lies flat against the swashplate face.

Prior to assembly of the cylinder block, inspect the pistons, retaining ring, retaining guide, washer and pins for damage, contamination or excessive wear. Replace any parts found to be defective. If one or more pistons are found to be defective, it is necessary to replace the complete cylinder block kit.

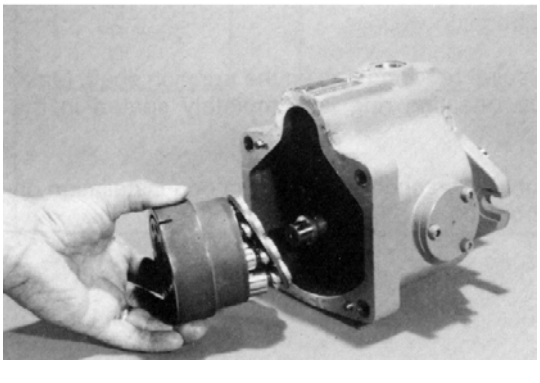
Install locating pins in neck end of cylinder block.

On L15, earlier production L38, and L70 models place the washer on the three pins. Install the retaining ring guide on the washer.



Place slipper retainer over retainer guide as illustrated. The guide should protrude through the center of the retaining ring. Make certain the washer remains centered under the retaining ring guide.

Note: On L50 and L70 models, after serial no. 84-36XXXX have brass cylinder blocks and a mating steel valve plate.

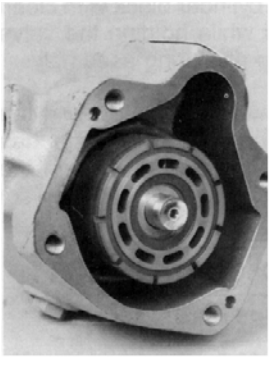


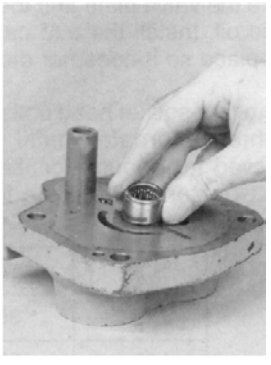
Lubricate each of the pistons with clean hydraulic oil and install through the retaining ring and into the block.

Lubricate the slipper pads with clean hydraulic oil.

Then place the pump in a horizontal position and slide the cylinder block assembly onto the shaft and against the thrust plate. Use care that the washer and retaining guide do not come off the locating pins.

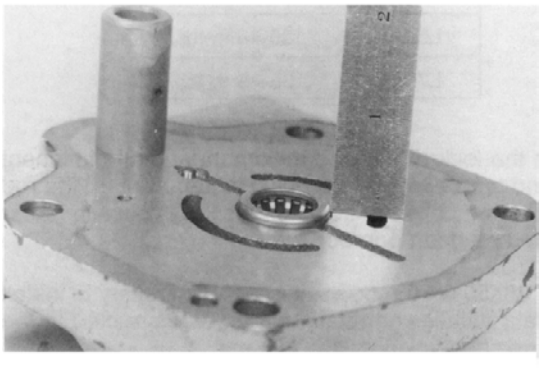
MAJOR REPAIRS - ASSEMBLY





When properly installed, a spring load can be felt when pushing against the cylinder block.

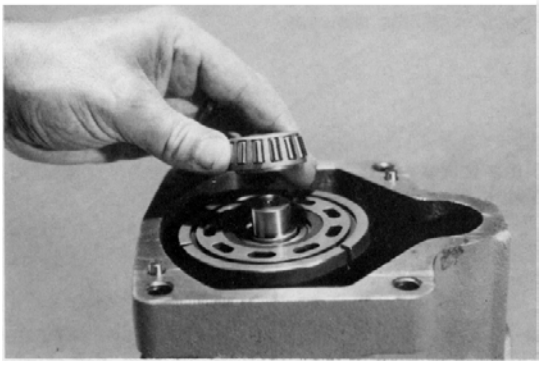
Stand the unit vertically with the shaft seal down to insure all parts remain in position. Then rotate the cylinder block two or three times to confirm that the piston slippers are completely in contact with the thrust plate.



END CAP BEARING INSTALLATION L15 Only

Press a new needle bearing into the end cap if the old one was previously removed. The writing on the end of the bearing cage should be visible when the bearing is installed.

Press the bearing in to the point that it protrudes above the end cap .088-.098″



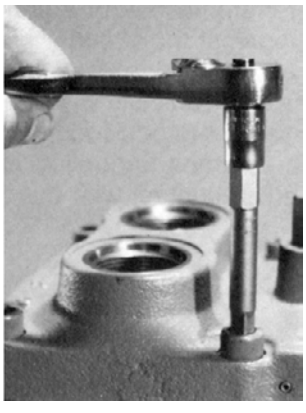
END CAP BEARING AND BEARING RACE INSTALLATION L23, 38, 50 & 70

Install the tapered bearing on the pump shaft with an arbor type press for the most satisfactory results. The bearing must not be driven onto the shaft. Press against the inner race of the bearing and use care not to damage the roller cage.

The bearing must be pressed on until it rests on the shoulder of the shaft to insure adequate bearing clearance.

An alternative method of installing the bearing is to use the bearing puller bar and press the bearing onto the shaft with the center screw of the puller bar. A spacer must be used between the center screw and the bearing.

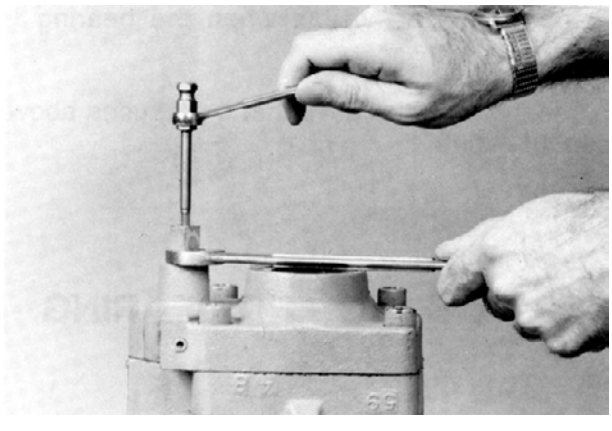
MAJOR REPAIRS - ASSEMBLY



Lubricate the valve plate and the cylinder block with clean hydraulic oil. Install the end cap while holding the valve plate in place so it does not drop off during assembly.

Install the four socket head bolts which attach the end cap and tighten alternately until the internal spring has compressed far enough for the end cap to rest on the housing. Tighten bolts to the following torque value for each model.

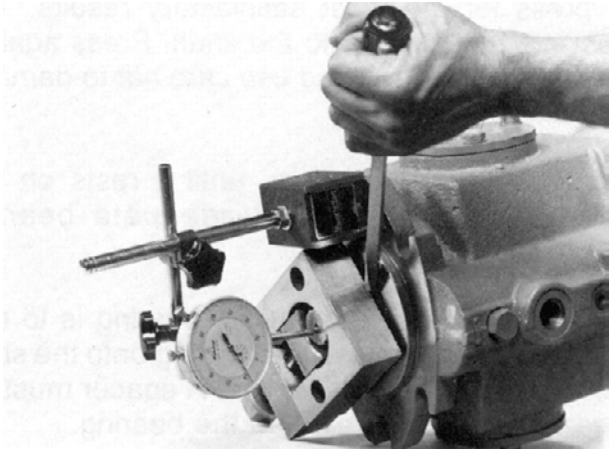
SIZE	TORQUE
L15	35-45 ft.-lbs.
L23	62-80 ft.-lbs.
L38	62-80 ft.-lbs.
L50	35-45 ft.-lbs.
L70	35-45 ft.-lbs.



Replace the lock nut on the maximum angle adjustment screw and torque to 12-16 ft. lbs. Remember that the rod will need to be correctly adjusted for the application after the pump has been primed.

On L23, 38, 50 & 70 models, it is now necessary to install shaft seal retainer and retaining ring as instructed in the Minor Repairs section of this manual.

Reinstall the control assembly as outlined in the Minor Repairs section of this manual.



If any of the following components have been replaced, the shaft end play must be checked.

Drive Shaft	Housing
Bearings	End Cap

All parts and gaskets must be assembled prior to checking end play. If adjustment is necessary, the pump must be partially disassembled and a shim of the proper thickness installed under the bearing race in the end cap.

The shaft end play should be between .003 and .015″ on L23, L38, L50 & L70.

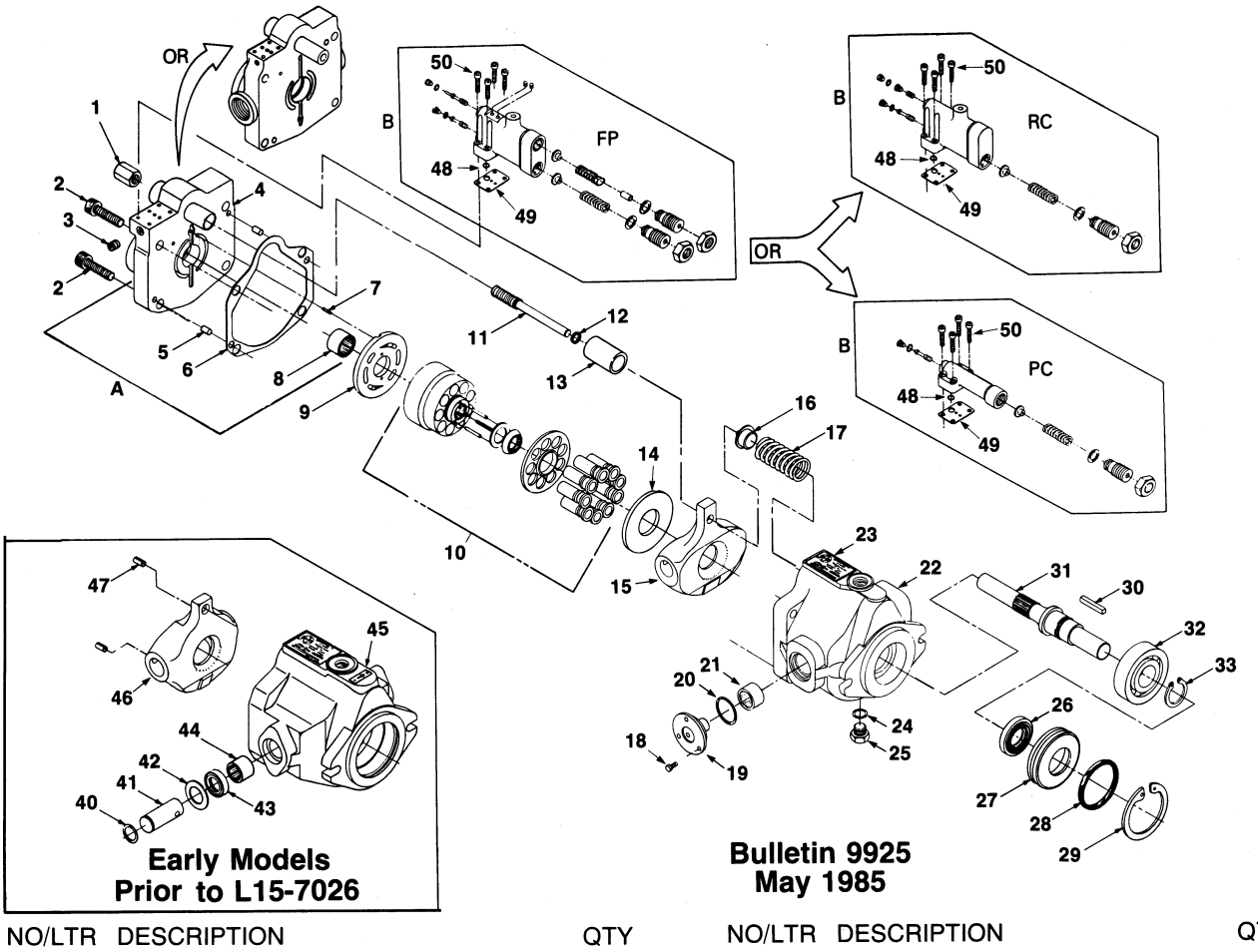
If the unit will not be installed immediately, cover all openings (ports, fittings, etc.) to prevent oxidation and contamination.

CAUTION

The pump housing and all hydraulic lines must be filled with clean hydraulic oil prior to start up.

GENERAL PARTS IDENTIFICATION

MODEL L15



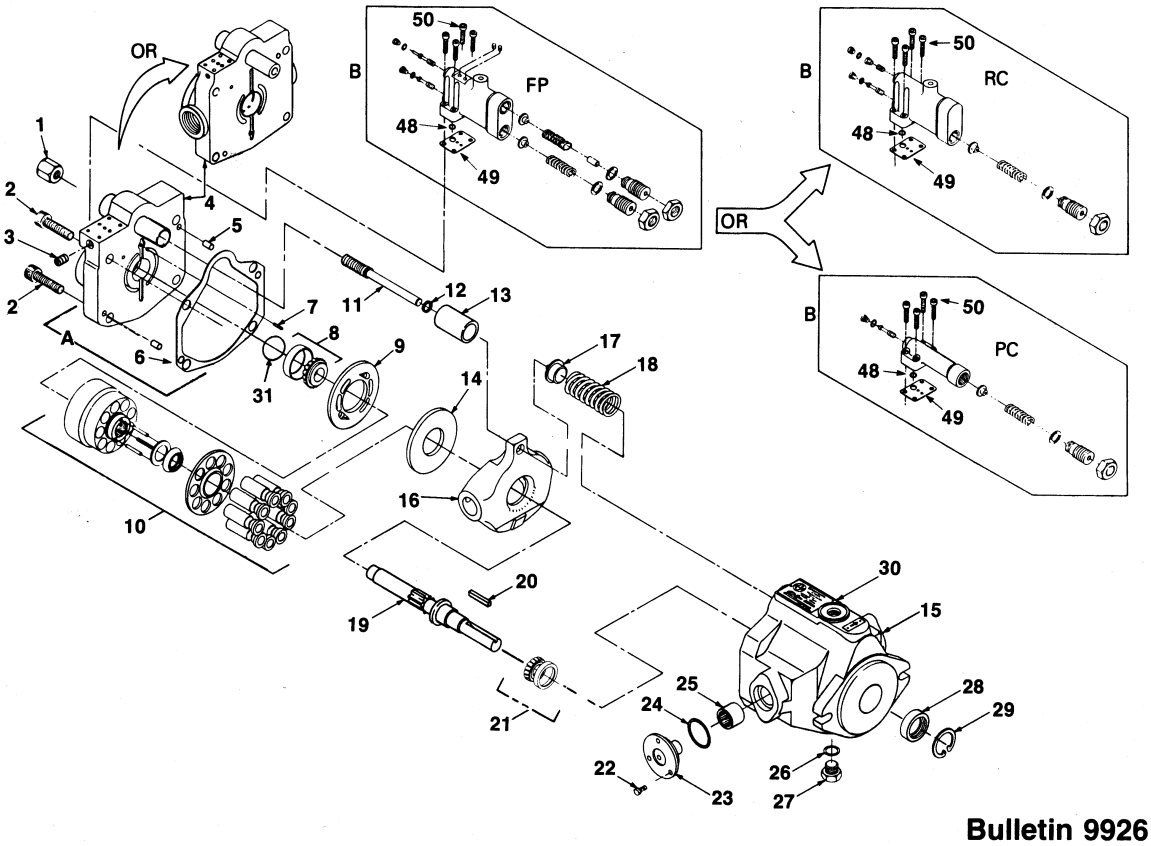
Early Models Prior to L15-7026

Bulletin 9925 May 1985

NO/LTR	DESCRIPTION	QTY
1	Lock Nut	1
2	Socket Head Bolt	4
3	Plug	1
4	End Cap	1
5	Locating Pin - End Cap	2
6	End Cap Gasket	1
7	Locating Pin - Valve Plate	1
8	Bearing - Rear	1
9	Valve Plate	1
10	Cylinder Block Kit	1
11	Flow Adjustment Screw	1
12	O-Ring	1
13	Control Cylinder	1
14	Thrust Plate	1
15	Swashplate	1
16	Spring Retainer	1
17	Spring	1
18	Socket Head Bolt	6
19	Trunnion	2
20	O-Ring	2
21	Journal Bearing	2
22	Housing	1
23	Name Plate	1
24	O-Ring	1
25	Plug	1
26	Lip Seal - Shaft	1
27	Seal Retainer	1
28	O-Ring	1
29	Retaining Ring	1
30	Key	1
31	Shaft	1
32	Bearing - Front	1
33	Retaining Ring	1
A	End Cap Kit	1
B	Control Valve Kit	1
48	O-Ring	1
49	Gasket	1
50	Socket Head Bolt	4
	Early Models	
40	Retainer, Ring Trunnion	2
41	Trunnion	2
42	Washer	2
43	Lip Seal, Trunnion	2
44	Bearing, Trunnion Needle	2
45	Housing	1
46	Swashplate	1
47	Swashplate Pin	2

GENERAL PARTS IDENTIFICATION

MODEL L23

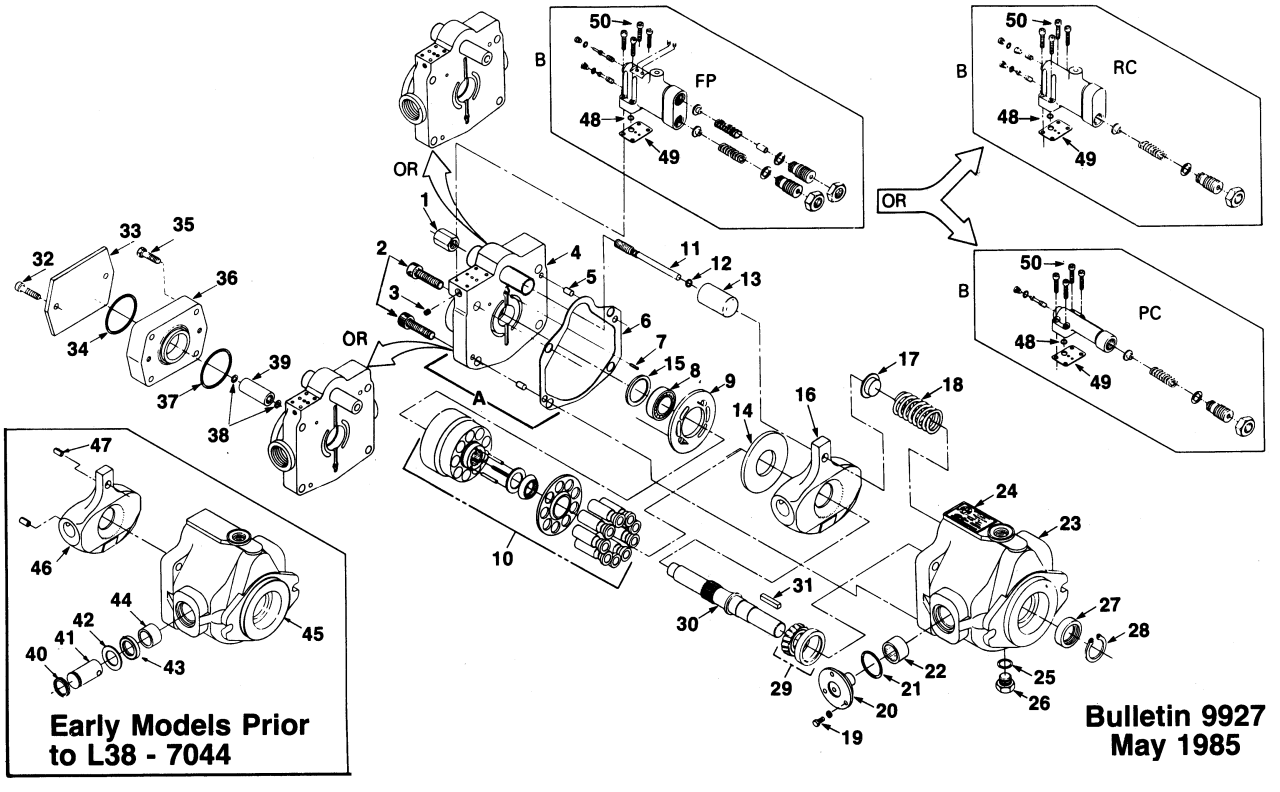


Bulletin 9926
May 1985

NO/LTR	DESCRIPTION	QTY	NO/LTR	DESCRIPTION	QTY
1	Lock Nut	1	20	Key	1
2	Socket Head Bolt	4	21	Bearing Kit - Front	1
3	Plug	1	22	Hex Socket Cap Screw	6
4	End Cap	1	23	Trunnion	2
5	Locating Pin - End Cap	2	24	O-Ring	2
6	End Cap Gasket	1	25	Journal Bearing	2
7	Locating Pin - Valve Plate	1	26	O-Ring	1
8	Bearing Kit - Rear	1	27	Plug	1
9	Valve Plate	1	28	Lip Seal - Shaft	1
10	Cylinder Block Kit	1	29	Retaining Ring	1
11	Flow Adjustment Screw	1	30	Name Plate	1
12	O-Ring	1	31	Shim	1
13	Control Cylinder	1	A	End Cap Kit	1
14	Thrust Plate	1	B	Control Valve Kit	1
15	Housing	1	48	O-Ring	1
16	Swashplate	1	49	Gasket	1
17	Spring Retainer	1	50	Socket Head Bolt	4
18	Spring	1			
19	Shaft	1			

GENERAL PARTS IDENTIFICATION

MODEL L38



NO/LTR	DESCRIPTION	QTY
1	Lock Nut	1
2	Socket Head Bolt	4
3	Plug	3
4	Cover	1
5	Locating Pin - End Cap	2
6	End Cap Gasket	1
7	Locating Pin, Valve Plate	1
8	Bearing Kit, Rear	1
9	Valve Plate	1
10	Cylinder Block Kit	1
11	Flow Adjustment Screw	1
12	O-Ring	1
13	Control Cylinder	1
14	Thrust Plate	1
15	Shim	1
16	Swashplate	1
17	Spring Retainer	1
18	Spring	1
19	Socket Head Bolt	6
20	Trunnion	2
21	O-Ring	2
22	Journal Bearing	2
23	Housing	1
24	Name Plate	1
25	O-Ring	1
26	Plug	1
27	Lip Seal - Shaft	1
28	Retaining Ring	1
29	Bearing Kit, Front	1

NO/LTR	DESCRIPTION	QTY
30	Shaft	1
31	Key	1
A	End Cap Kit	1
B	Control Valve Kit	1
48	O-Ring	1
49	Gasket	1
50	Socket Head Bolt	4

Auxiliary Pump Mounting Pad

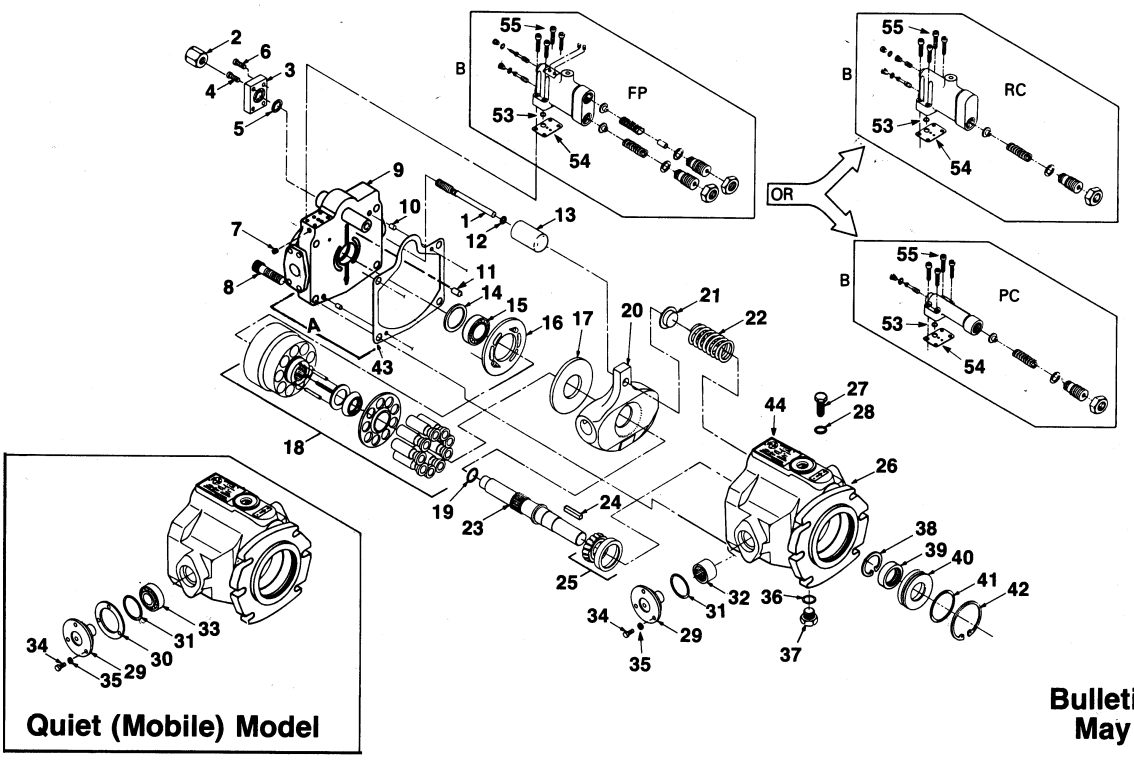
32	Hex Head Cap Screw	2
33	Cover	1
34	O-Ring	1
35	Hex Head Cap Screw	4
36	Auxiliary Mounting Adapter	1
37	O-Ring	1
38	Retaining Ring	2
39	Coupling	1

Early Models

40	Retainer, Ring Trunnion	2
41	Trunnion	2
42	Washer	2
43	Lip Seal, Trunnion	2
44	Bearing, Trunnion Needle	2
45	Housing	1
46	Swashplate	1
47	Swashplate Pin	2

GENERAL PARTS IDENTIFICATION

MODEL L50



Quiet (Mobile) Model

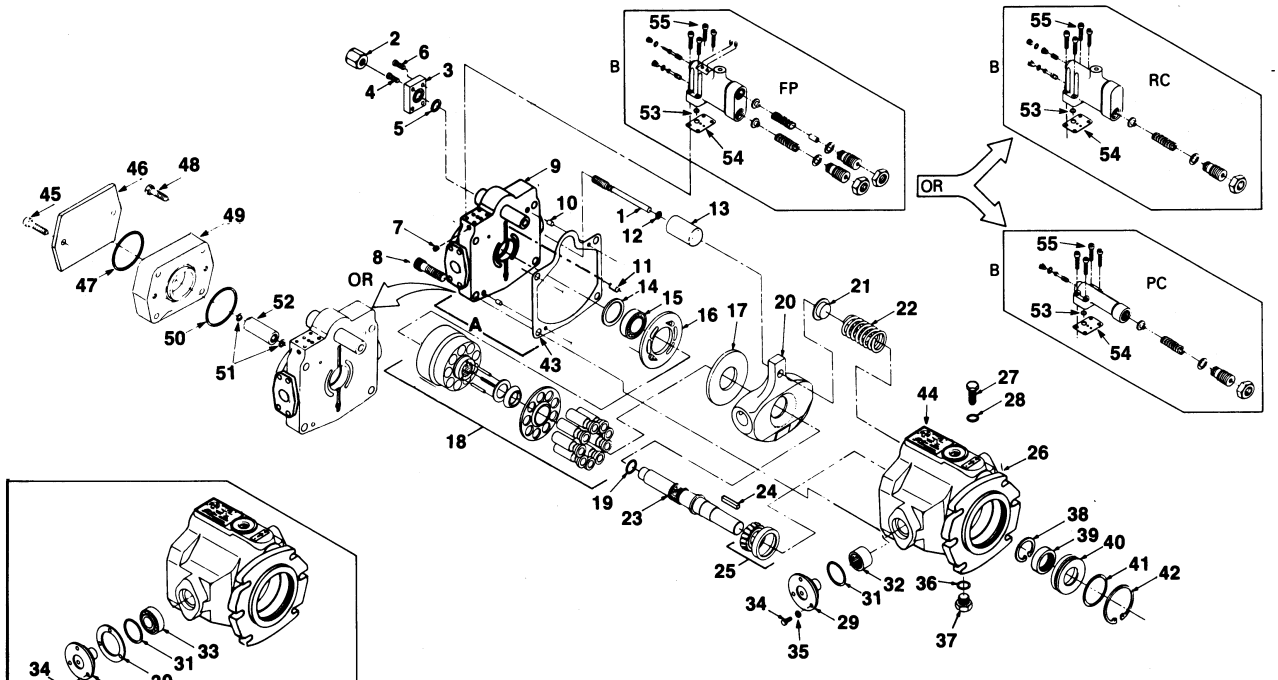
Bulletin 9928
May 1985

NO/LTR	DESCRIPTION	QTY
1	Flow Adjustment Screw	1
2	Lock Nut	1
3	Cover	1
4	Hex Socket Cap Screw	2
5	O-Ring	1
6	Hex Head Cap Screw	2
7	Plug	1
8	Hex Head Cap Screw	6
9	End Cap	1
10	Locating Pin - End Cap	2
11	Locating Pin - Valve Plate	1
12	O-Ring	1
13	Control Cylinder	1
14	Shim	1
15	Bearing Kit, Rear	1
16	Valve Plate	1
17	Thrust Plate	1
18	Cylinder Block Kit	1
19	Spacer	1
20	Swashplate	1
21	Spring Retainer	1
22	Spring	1
23	Driveshaft	1

NO/LTR	DESCRIPTION	QTY
24	Key	1
25	Bearing Kit, Front	1
26	Housing	1
27	Plug	1
28	Seal Washer	1
29	Trunnion	2
30	Shim	2
31	O-Ring	2
32	Bearing, Journal	2
33	Bearing, Roller (Mobile Version)	2
34	Cap Screw	6
35	Washer	6
36	O-Ring	1
37	Plug	1
38	Retaining Ring	1
39	Lip Seal	1
40	Seal-Retainer	1
41	O-Ring	1
42	Retaining Ring	1
43	Gasket - End Cap	1
44	Name Tag	1
A	End Cap Kit	1
B	Control Valve Kit	1
53	O-Ring	1
54	Gasket	1
55	Socket Head Bolt	4

GENERAL PARTS IDENTIFICATION

MODEL L70



Quiet (Mobile) Model

Bulletin 9929
May 1985

NO/LTR	DESCRIPTION	QTY
1	Flow Adjustment Screw	1
2	Lock Nut	1
3	Cover	1
4	Hex Socket Cap Screw	2
5	O-Ring	1
6	Hex Head Cap Screw	2
7	Plug	1
8	Hex Head Cap Screw	6
9	End Cap	1
10	Locating Pin - End Cap	2
11	Locating Pin - Valve Plate	1
12	O-Ring	1
13	Control Cylinder	1
14	Shim	1
15	Bearing Kit, Rear	1
16	Valve Plate	1
17	Thrust Plate	1
18	Cylinder Block Kit	1
19	Spacer	1
20	Swashplate	1
21	Spring Retainer	1
22	Spring	1
23	Driveshaft	1
24	Key	1
25	Bearing Kit, Front	1
26	Housing	1
27	Plug	1
28	Seal Washer	1
29	Trunnion	2
30	Shim	2
31	O-Ring	2
32	Bearing, Journal	2
33	Bearing, Roller (Mobile Version)	2
34	Cap Screw	6
35	Washer	6
36	O-Ring	1
37	Plug	1
38	Retaining Ring	1
39	Lip Seal	1
40	Seal-Retainer	1
41	O-Ring	1
42	Retaining Ring	1
43	Gasket - End Cap	1
44	Name Tag	1
A	End Cap Kit	1
B	Control Valve Kit	1
53	O-Ring	1
54	Gasket	1
55	Socket Head Bolt	4
	Auxiliary Pump Mounting Pad	
45	Hex Head Cap Screw	2
46	Cover	1
47	O-Ring	1
48	Hex Head Cap Screw	4
49	Auxiliary Mounting Adapter	1
50	O-Ring	1
51	Retaining Ring	2
52	Coupling	1

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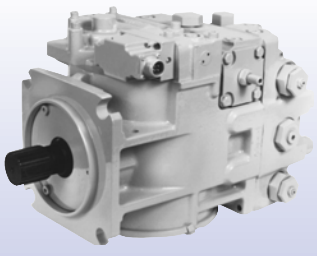
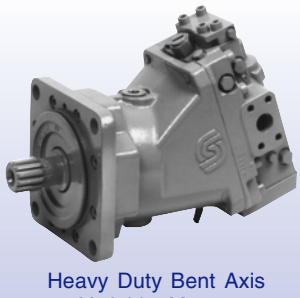
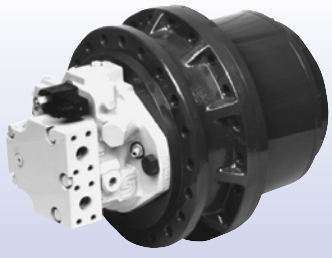


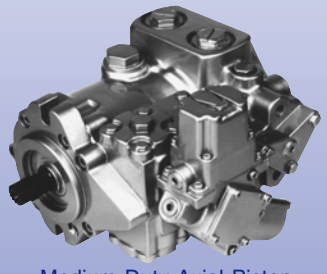
Heavy Duty Axial Piston Pumps and Motors



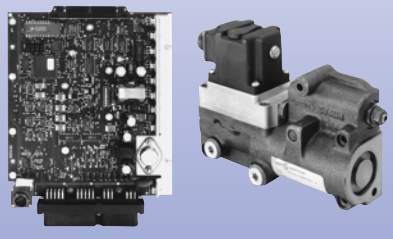
Heavy Duty Bent Axis Variable Motors



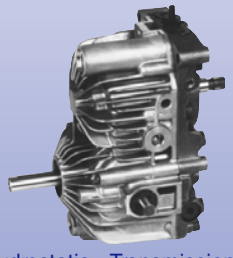
Cartridge Motors/ Compact Wheel Drives



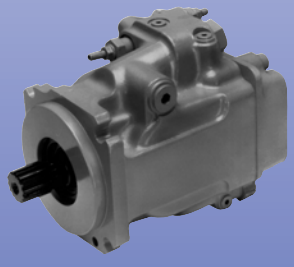
Medium Duty Axial Piston Pumps and Motors



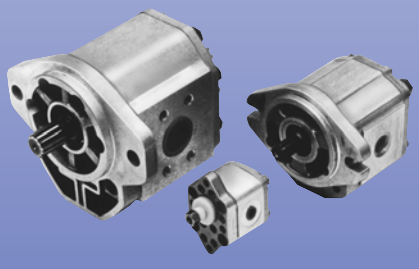
Mikrocontrollers and Electrohydraulic Controls



Hydrostatic Transmissions Packages



Open Circuit Axial Piston Pumps



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