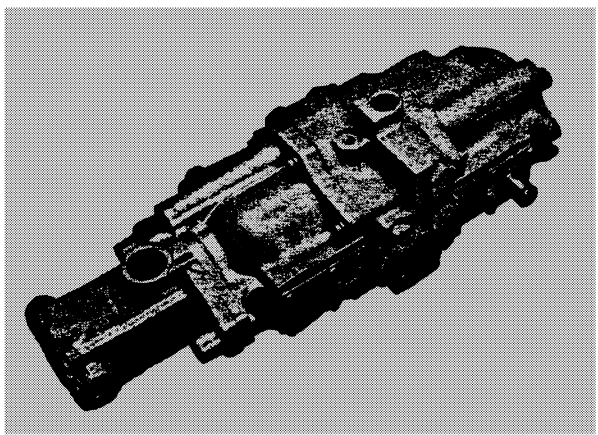
SPERRY VICKERS

VARIABLE DISPLACEMENT DOUBLE

TRANSMISSION PUMP



OVERHAUL MANUAL

TA1919V10* -20 DESIGN
TA1919V20* -20 DESIGN

M-2835-S

Released 4-1-77

SPERRY VICKERS
TROY, MI. 48084

40040011
Reprinted

TABLE OF CONTENTS

Section I - INTRODUCTION

A. PURPOSE OF MANUAL

This manual describes the basic operational characteristics and provides service and overhaul information for the Sperry Vickers TA1919V10* and TA1919V20* transmission pump packages. The information contained herein pertains to the latest design series as listed in Table 1.

B. GENERAL INFORMATION

1. Related Publications - Service parts information and installation dimensions are not contained in this manual. The parts and installation drawings listed in Table 2 are available from any Sperry Vickers application engineering office or from:

Technical Publications
1401 Crooks Road
Troy, Michigan 48084

2. Model Codes - Variations within each basic model series are covered in the model code. Table 1 is a complete breakdown of the codes covering these units. Service inquiries should always include the complete unit model code number as stamped on the transmission mounting flange.

MODEL SERIES	PARTS DRAWING	INSTALLATION DRAWING
TA1919V10*	M-2834-S	MB-198
TA1919V20*	M-2837-S	

Table 2.

Section II - DESCRIPTION

A. GENERAL

Assembly of a typical hydrostatic transmission pump package is shown in Figure 1. In general, the transmission consists of two piston pumps located back to back on a common valve block.

Four cross-line check valves and a supercharge relief valve are located in the common valve block.

Valving variations include four cross-line relief valves.

CAUTION

Sperry Vickers engineering must review each new application to determine necessity of relief valves.

Connected to one end of the pump package is a supercharge vane pump which supplies circuit replenishing flow and auxiliary functions.

Four types of covers are available with the supercharge pump:

1. Standard - No special features.
2. F - Flow control cover - Maximum flow regulated to external circuit. Built in relief valve.
3. P - Priority valve cover - Primary circuit flow controlled, secondary circuit receives excess flow. Primary circuit relief, no secondary circuit relief.
4. D - Flow divider cover - Secondary outlet receives 60% and primary outlet 40% of total flow. (Available with V10 pumps only.)

NOTE

Special cover operating theory explained in section III.

B. APPLICATION.

Pump ratings in USGPM as shown in the model coding are at 1800 RPM. For ratings at other speeds, methods of installation and other application information, Sperry Vickers application engineering personnel should be consulted.

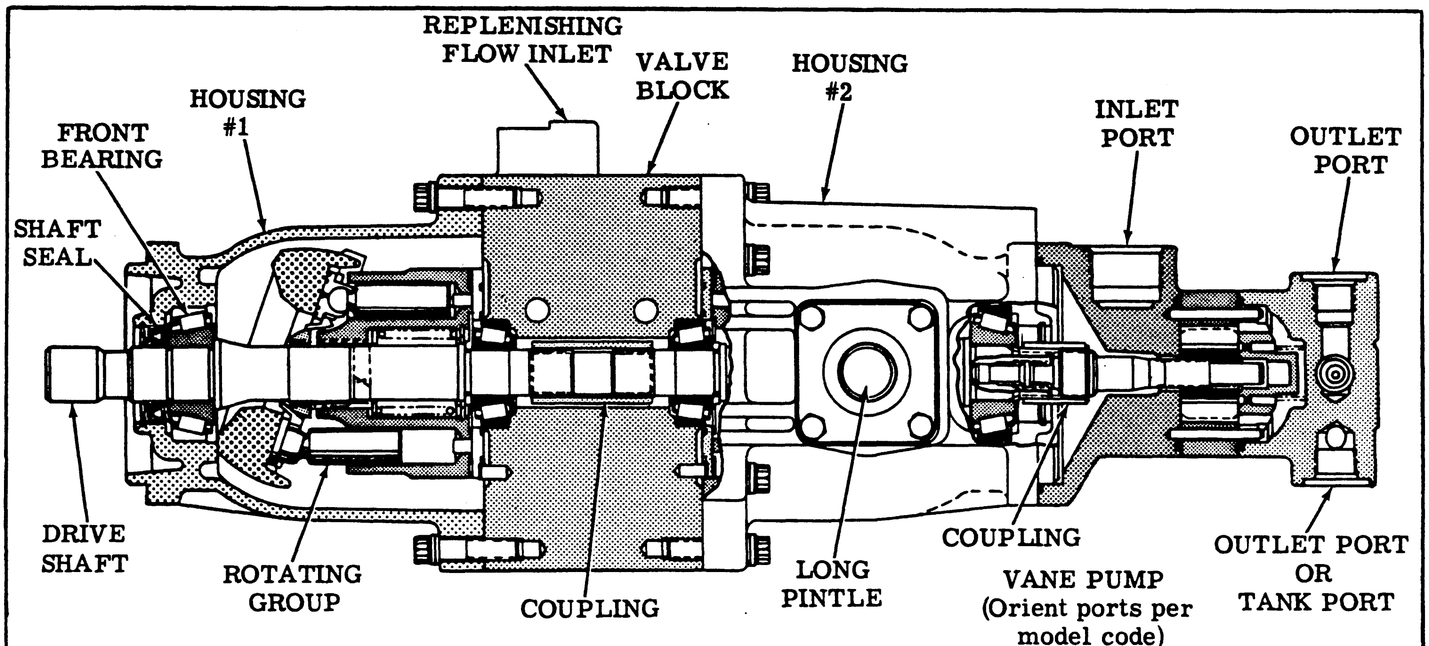


Figure 1. Sectional View of Typical Double Transmisson Pump Package.

MODEL CODE BREAKDOWN

TA1919 V10 F L - 1 A R - 07 A D 625 H - 20

DOUBLE TRANSMISSION PUMP
Each rated at 19 USGPM at 1800 rpm

AUXILIARY VANE PUMP

VANE PUMP COVER OPTION (OMIT IF NOT REQUIRED)
D - Flow divider
F - Flow control
P - Priority flow

ROTATION VIEWED FROM SHAFT END
R - Right hand (clockwise)
L - Left hand (c'clockwise)

INPUT SHAFT
1 - SAE B-B straight keyed
2 - SAE B-B splined

CONTROL PINTLE LOCATION VIEWED FROM SHAFT END WITH DRAIN PORT UP

CODE	PUMP #1	PUMP #2
A	Right hand side	Right hand side
B	Left hand side	Right hand side
C	Right hand side	Left hand side
D	Left hand side	Left hand side

MAIN RELIEF VALVE
R - Relief valve
O - No relief valve

VANE PUMP RING CAPACITY USGPM AT 1200 RPM
04 - 4 06 - 6
05 - 5 07 - 7

DESIGN NUMBER

VANE PUMP RELIEF VALVE SETTING, "F" & "P" COVER
A - 250 psi G - 1750 psi
B - 500 psi H - 2000 psi
C - 750 psi J - 2250 psi
D - 1000 psi K - 2500 psi
E - 1250 psi O - No relief valve ("D" cover)
F - 1500 psi

FLOW RATE THROUGH ORIFICE IN "F" COVER
2,3,4,5,6,7 or 8 USGPM

FLOW RATE THROUGH ORIFICE IN "P" COVER
1, 2, 3, 4 or 6 USGPM

PERCENT OF SECONDARY FLOW ("D" COVER)

POSITION OF VANE PUMP OUTLET, OR PRIMARY OUTLET, VIEWED FROM COVER END.
A - Opposite inlet
B - 90° c'clockwise from inlet
C - In line with inlet
D - 90° clockwise from inlet

VANE PUMP INLET POSITION VIEWED FROM COVER END
A - In line with case drain
C - 180° opposite case drain

TABLE 1a.

MODEL CODE BREAKDOWN

TA1919 V20 F L - 1 A R - 07 A D 6 H - 20

DOUBLE TRANSMISSION PUMP
Each rated at 19 USGPM at 1800 rpm

AUXILIARY VANE PUMP

VANE PUMP COVER OPTION (OMIT IF NOT REQUIRED)
F - Flow control
P - Priority flow

ROTATION VIEWED FROM SHAFT END
R - Right hand (clockwise)
L - Left hand (c'clockwise)

INPUT SHAFT
1 - SAE B-B straight keyed
2 - SAE B-B splined

CONTROL PINTLE LOCATION VIEWED FROM SHAFT END WITH DRAIN PORT UP

CODE	PUMP #1	PUMP #2
A	Right hand side	Right hand side
B	Left hand side	Right hand side
C	Right hand side	Left hand side
D	Left hand side	Left hand side

MAIN RELIEF VALVE
R - Relief Valve
O - No relief valve

VANE PUMP RING CAPACITY USGPM AT 1200 RPM

07 - 7	10 - 10	13 - 13
08 - 8	11 - 11	
09 - 9	12 - 12	

DESIGN NUMBER

VANE PUMP RELIEF VALVE SETTING, "F" & "P" COVER

A - 250 psi	F - 1500 psi
B - 500 psi	G - 1750 psi
C - 750 psi	H - 2000 psi
D - 1000 psi	J - 2250 psi
E - 1250 psi	K - 2500 psi

FLOW RATE THROUGH ORIFICE IN "F" COVER
2,4,6,8 or 10 USGPM

FLOW RATE THROUGH ORIFICE IN "P" COVER
2, 2.5, 3, 4, 6 or 8 USGPM

POSITION OF VANE PUMP OUTLET, OR PRIMARY OUTLET, VIEWED FROM COVER END
A - Opposite inlet
B - 90° c'clockwise from inlet
C - In line with inlet
D - 90° clockwise from inlet

VANE PUMP INLET POSITION VIEWED FROM COVER END
A - In line with case drain
C - 180° opposite case drain

TABLE 1b.

A. PISTON PUMP

Rotation of the pump drive shaft causes the cylinder block, shoe plate and pistons to move against the yoke face. See Figure 2. The angle of the yoke face imparts a reciprocating motion to each piston within the cylinder block. Inlet and outlet ports connect to a kidney slotted wafer plate. As the pistons move out of the cylinder block a vacuum is created and fluid is forced into the void by replenishing pressure. The fluid moves with the cylinder block past the intake kidney slot to the outlet (pressure) kidney slot. The motion of the piston reverses and fluid is pushed out of the cylinder block into the outlet port.

B. VANE PUMP

Vane pump fluid flow is developed by the pumping cartridge. The action of the cartridge is illustrated in Figure 3. The rotor is driven within the cam ring by the drive shaft, which is coupled to a power source. As the rotor turns, centrifugal force causes the vanes to follow the elliptical inner surface of the cam ring.

Radial movement of the vanes and turning of the rotor cause the chamber volume between the vanes to increase as the vanes pass the inlet sections of the cam ring. This results in a low pressure condition which allows atmospheric pressure to force fluid into the chambers. (Fluid outside the inlet is at atmospheric pressure or higher.)

This fluid is trapped between the vanes and carried past the large diameter or dwell section of the cam ring. As the outlet section is approached, the cam ring diameter decreases and the fluid is forced out into the system. System pressure is fed under the vanes, assuring their sealing contact against the cam ring during normal operation.

C. HYDRAULIC BALANCE

The pump cam ring is shaped so that the two pumping chambers are formed diametrically opposed. Thus, hydraulic forces which would impose side loads on the shaft are cancelled.

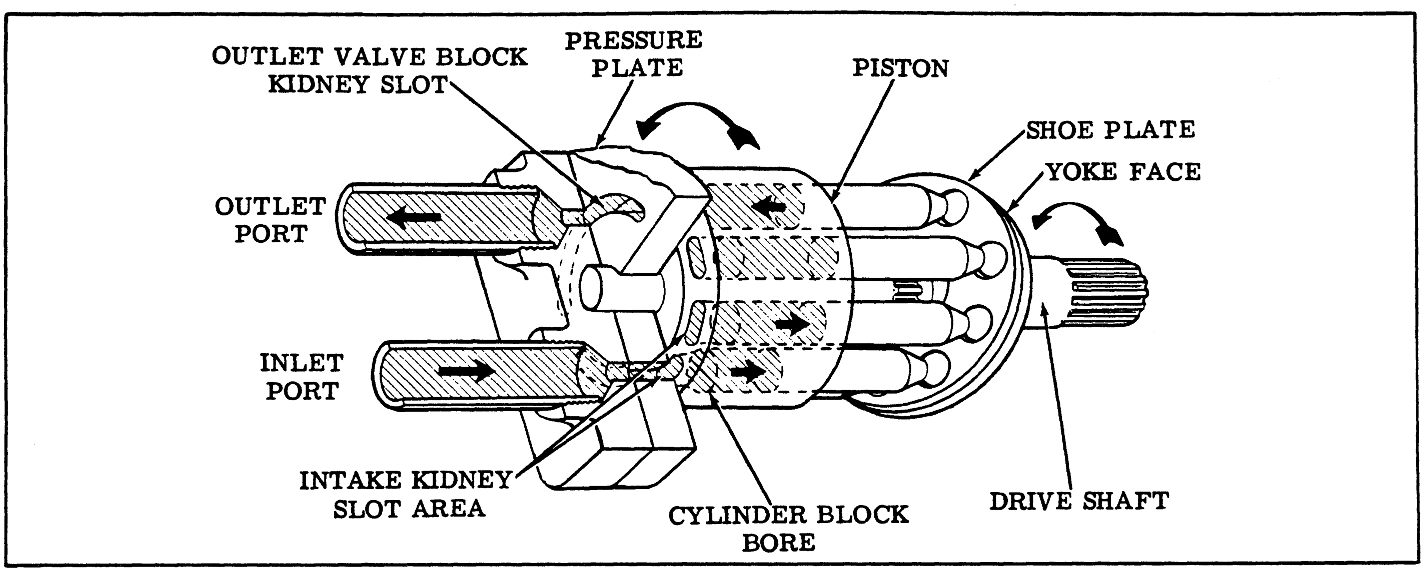


Figure 2.

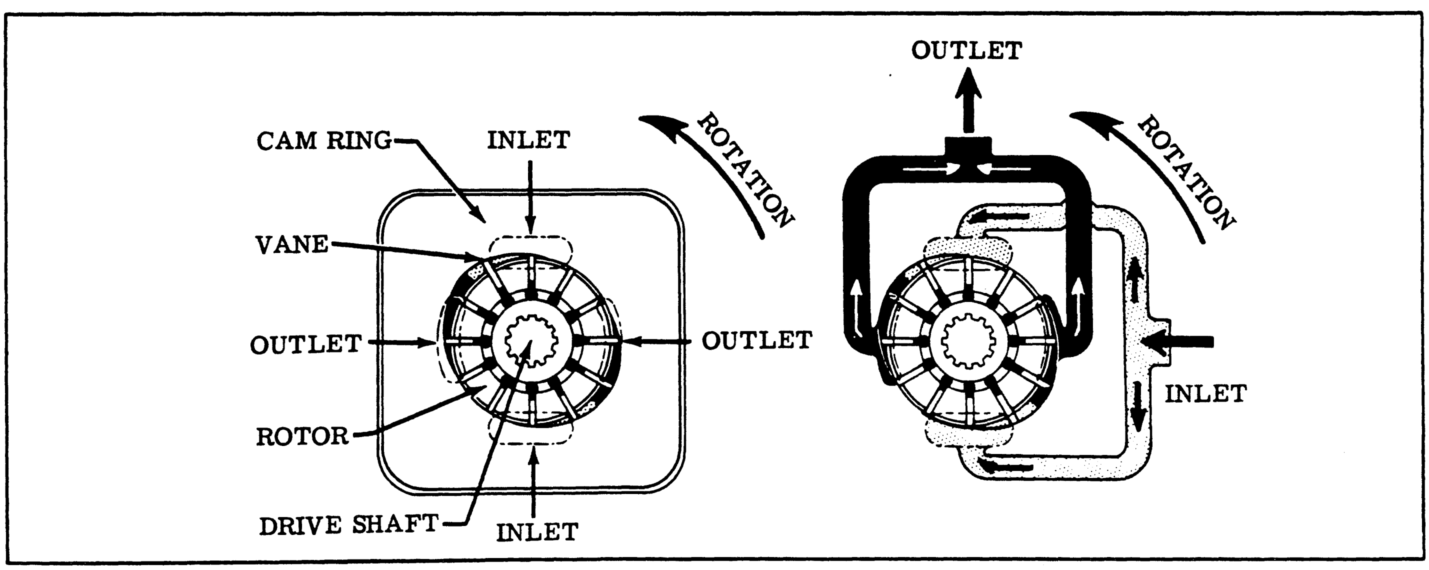


Figure 3.

D. PRESSURE PLATE

The pressure plate seals the pumping chamber as shown in Figure 4. A light spring holds the plate against the cartridge until pressure builds up in the system. System pressure is effective against the area at the back of the plate, which is larger than the area exposed to the pumping cartridge. Thus, an unbalanced force holds the plate against the cartridge, sealing the cartridge and providing the proper running clearance for the rotor and vanes.

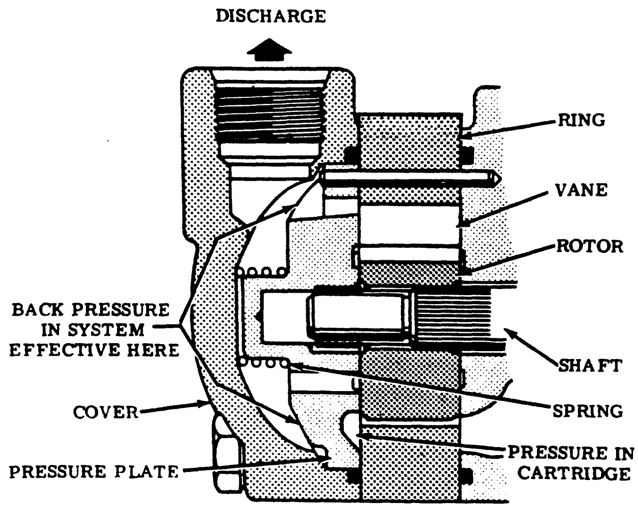


Figure 4

E. FLOW CONTROL AND RELIEF VALVE

1. Maximum flow to the operating circuit and maximum system pressure are determined by the integral flow control and relief valve in a special outlet cover used on some V10 and V20 pumps. This feature is illustrated pictorially in Figure 5. An orifice in the cover limits maximum flow. A pilot-operated type relief valve shifts to divert excess fluid delivery to tank, thus limiting the system pressure to a predetermined maximum.

2. Figure 5A shows the condition when the total pump delivery can be passed through the orifice.

This condition usually occurs only at low drive speeds. The large spring chamber is connected to the pressure port through an orifice. Pressure plus spring load in this chamber slightly exceeds pressure at the other end of the relief valve spool and the spool remains closed. Pump delivery is blocked from the tank port by the spool land.

3. When pump delivery is more than the flow rate determined by the orifice plug, pressure builds up across the orifice and forces the spool open against the light spring. Excess fluid is throttled past the spool to the tank port as shown in Figure 5B.

4. If pressure in the system builds up to the relief valve setting (Figure 5C), the pilot poppet is forced off its seat. Fluid in the light spring chamber flows through the spool and out to tank. This flow through the small sensing orifice, causes a pressure drop and prevents pressure in the light spring area from increasing beyond the relief valve setting. As pressure against the right end of the spool starts to exceed the relief valve setting, the pressure differential forces the spool to the left, against the light spring, porting the full pump flow to tank.

F. PRIORITY VALVE COVER

Refer to V10 and V20 priority valve cover schematic, Figure 6, pressure is sensed in cavities "A", "B" and "C". Primary flow into cavity "A" is restricted by the controlled flow orifice "O". Secondary flow will be zero until the pump flow rate through orifice "O" develops a pressure differential across the control spool.

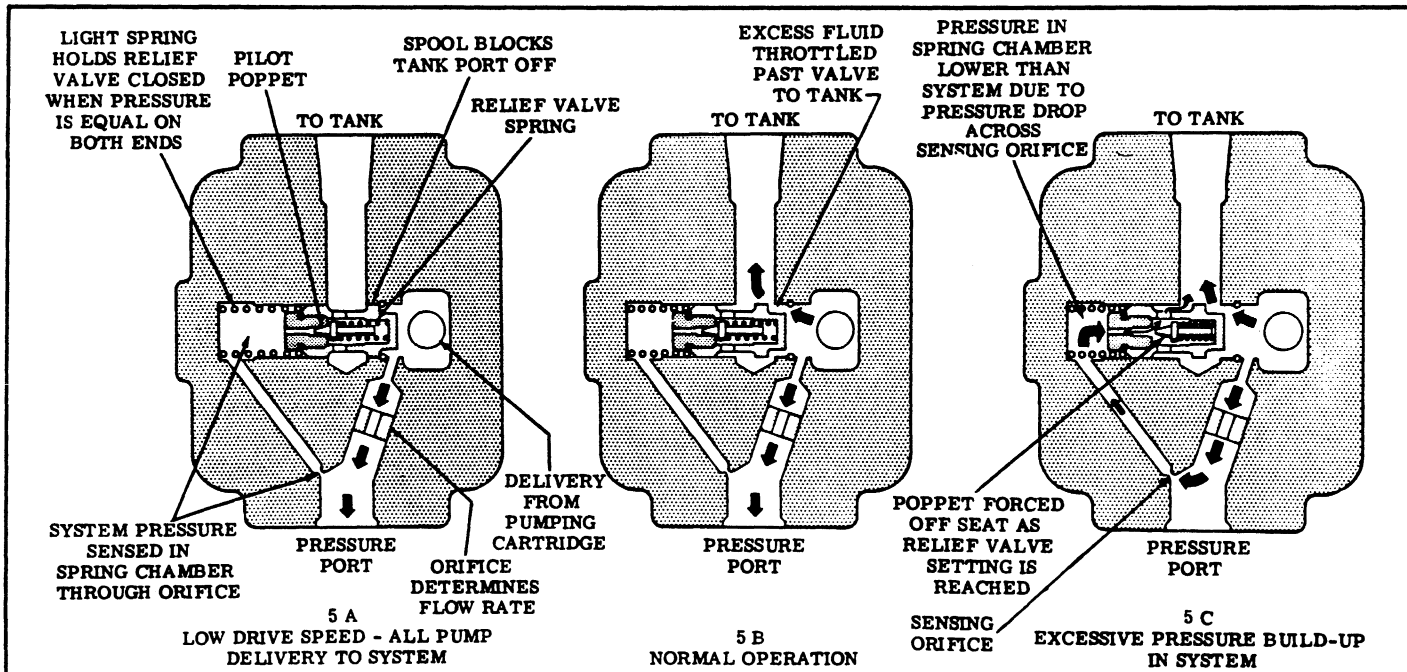


Figure 5

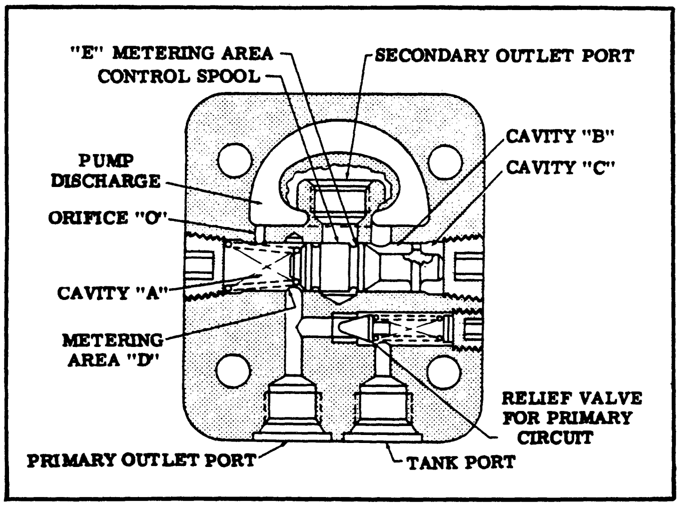


Figure 6. Priority Valve Cover

When pump delivery is increased, pressure builds up in cavities "B" and "C" because of the resistance to flow through orifice "O". This causes the spool to shift toward cavity "A" against the spring. The amount of spool shift is proportional to the pressure differential between cavities "A" and "C".

Flow from the primary port is held to an almost constant volume, as determined by orifice "O", and the metering action of the control spool at area "D". Flow to the secondary port varies with pump delivery. Metering area "E" diverts excess flow to the secondary port.

This single spool design cannot give precisely controlled flow to the primary circuit because of the effects of varying conditions of flows and pressures. For example: If the primary circuit is operating at 1000 PSI and the secondary at 100 PSI, the spool must be metering at "E". However, if primary pressure is 100 PSI and secondary is 1000 PSI, the spool must be metering at "D". As the two systems approach the same pressure, the probability of flow fluctuation increases because the spool may shift between these two metering points.

CAUTION

The pump has a built-in relief valve in the primary circuit. However, an external relief valve must be provided for the secondary circuit to protect the pump.

G. FLOW DIVIDER VALVE COVER.

V10 units are available with the flow divider valve cover. Refer to sectional view, Figure 7.

The vane pump cartridge develops flow which is forced through the large and small drilled orifices into the spool area.

Metering area "C" is open to the primary port. This prevents pressure from building up at the small orifice end of the spool.

Metering area "B" is closed preventing flow into the secondary port.

Pressure builds up in the large orifice area of the spool. This pressure slowly forces fluid across the dashpot spool land into area "A". As pressure builds up in area "A", the spool is forced to the left partially opening metering area "B" and partially closing metering area "A". Secondary flow begins from the pump cartridge passing through the large orifice, then crosses metering area "B" into the secondary port. The spool continues to move to the left until pressure in the small orifice area equals the pressure in the large orifice area. At this point, spool travel stops. A relationship of primary to secondary port flows will exist proportional to the drilled orifice areas.

The design of the flow divider valve cover is such that 60% flow will be available at the secondary port and 40% flow at the primary port.

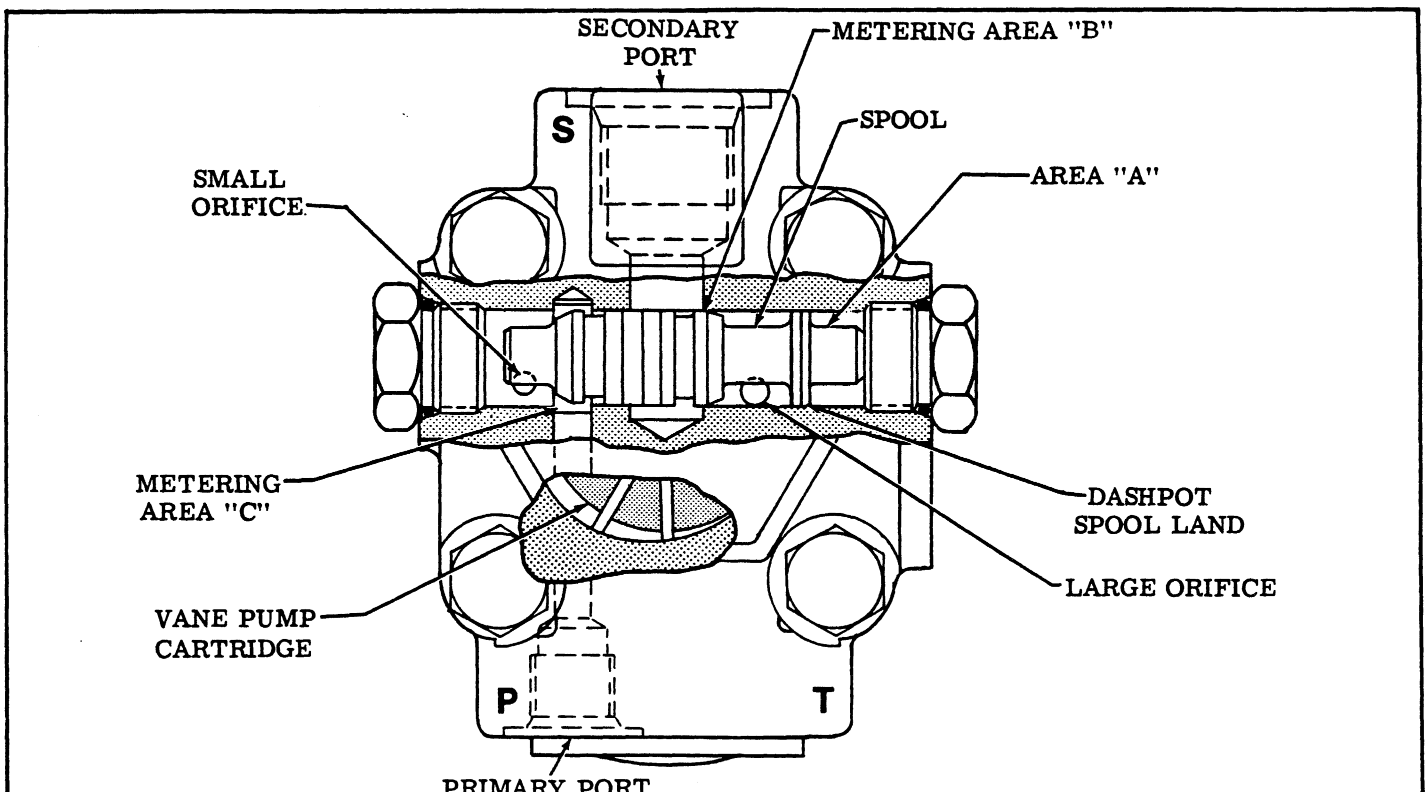


Figure 7. Flow Divider Valve Cover

A. INSTALLATION DRAWINGS

The installation drawing listed in Table 2 will show installation dimensions and port locations.

B. MOUNTING AND DRIVE CONNECTIONS

CAUTION

Pump shafts are designed to be installed in couplings with a slip fit. Pounding can injure the bearings. Shaft tolerances are shown on the installation drawing. (See Table 2)

1. Direct Mounting - A pilot on the transmission pump mounting flange (Figure 8) assures correct mounting and shaft alignment. Make sure the pilot is firmly seated in the accessory pad of the power source. Care should be exercised in tightening the mounting screws to prevent misalignment.

2. Indirect drive is not recommended for these pumps without Sperry Vickers Engineering approval.

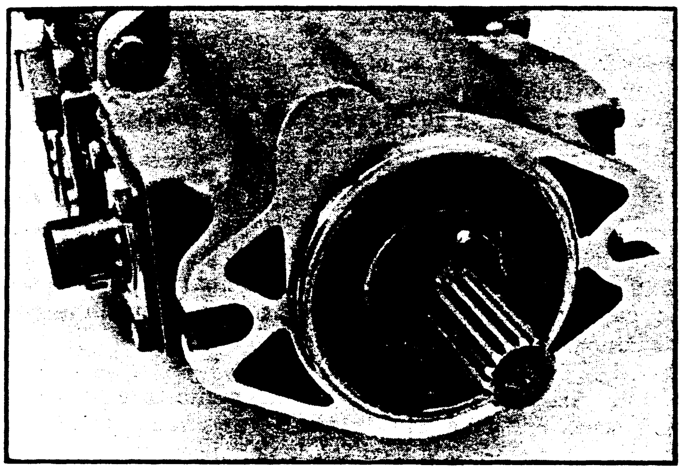


Figure 8. Transmission Pilot Flange.

C. SHAFT ROTATION

Pumps are normally assembled for right-hand (clockwise) rotation as viewed from the shaft end. A pump made for left-hand rotation is identified by an "L" in the model code (See Table 1).

CAUTION

Never drive a pump in the wrong direction of rotation. Seizure may result necessitating expensive repairs.

D. PIPING AND TUBING

1. All pipes and tubing must be thoroughly cleaned before installation. Recommended methods of cleaning are sand blasting, wire brushing and pickling.

NOTE

For instructions on pickling, refer to instruction sheet 1221-S.

2. To minimize flow resistance and the possibility of leakage, only as many fittings and connections as are necessary for proper installation should be used.

3. The number of bends in tubing should be kept to a minimum to prevent excessive turbulence and friction of oil flow. Tubing must not be bent too sharply. The recommended radius for bends is three times the inside diameter of the tube.

E. HYDRAULIC FLUID RECOMMENDATIONS

GENERAL DATA

Oil in a hydraulic system performs the dual function of lubrication and transmission of power. It constitutes a vital factor in a hydraulic system, and careful selection of it should be made with the assistance of a reputable supplier. Proper selection of oil assures satisfactory life and operation of system components with particular emphasis on hydraulic pumps. Any oil selected for use with pumps is acceptable for use with valves or motors.

Data sheet M-2950-S for oil selection is available from Sperry Vickers Technical Publications Troy, Mi.

Oil recommendations noted in the data sheet is based on our experience in industry as a hydraulic com-

Where special considerations indicated a need to depart from the recommended oils or operating conditions, see your Sperry Vickers representative.

CLEANLINESS

Thorough precautions should always be observed to insure the hydraulic system is clean:

1. Clean (flush) entire new system to remove paint, metal chips, welding shot, etc.

2. Filter each change of oil to prevent introduction of contaminants into the system.

3. Provide continuous oil filtration to remove sludge and products of wear and corrosion generated during the life of the system.

4. Provide continuous protection of system from entry of airborne contamination, by sealing the system and/or by proper filtration of the air.

5. During usage, proper oil filling and servicing of filters, breathers, reservoirs, etc., cannot be over emphasized.

6. Thorough precautions should be taken, by proper system and reservoir design, to insure that aeration of the oil will be kept to a minimum.

SOUND LEVEL

Noise is only indirectly affected by the fluid selection, but the condition of the fluid is of paramount importance in obtaining optimum reduction of system sound levels.

Some of the major factors affecting the fluid conditions that cause the loudest noises in a hydraulic system are:

1. Very high viscosities at start-up temperatures

can cause pump noises due to cavitation.

2. Running with a moderately high viscosity fluid will impede the release of entrained air. The fluid will not be completely purged of such air in the time it remains in the reservoir before recycling through the system.

3. Aerated fluid can be caused by ingestion of air through the pipe joints of inlet lines, high velocity discharge lines, cylinder rod packings, or by fluid discharging above the fluid level in the reservoir. Air in the fluid causes a noise similar to cavitation.

F. OVERLOAD PROTECTION

Relief valves limit pressure in the system to a prescribed maximum and protect components from excessive pressure. The setting of the relief valve depends on the work requirements of the system components.

Relief valves are not required for all applications. In applications designed without relief valves, pressure relief is obtained by spinning the wheels.

G. VANE PUMP PORT POSITIONS

The pump cover can be assembled in four positions with respect to the body. A letter in the model code (Table 1) identifies the cover position as shown in Figure 9.

Disassembly and assembly procedures are in section VI-B through O.

H. START-UP

With a minimum drive speed of 800 RPM, a pump should prime almost immediately, if provision is made to initially purge the air from the system.

Failure to prime within a reasonable length of time may result in damage due to lack of lubrication. Inlet lines must be tight and free from air leaks. However, it may be necessary to crack a fitting on the outlet side of the pump to purge entrapped air.

Section V - SERVICE AND MAINTENANCE

A. SERVICE TOOLS

The following standard tools for overhauling the transmission unit are shown in Figure 10.

1. Torque wrench with short extension and sockets.
2. 1" micrometer
3. 1" depth micrometer
4. External Truarc pliers (0200)
5. Internal Truarc pliers (2300)

In addition to the above tools, an arbor press is required to service bearings, etc. Maintenance of this unit is intricate and should not be attempted without the proper tools.

SPECIAL TOOLS

Special tools are shown in Figures 11, 12, 13 and 14.

B. INSPECTION

Periodic inspection of the fluid condition and tube or piping connections can save time-consuming breakdowns and unnecessary parts replacement. The following should be checked regularly:

1. All hydraulic connections must be kept tight. A loose connection in a pressure line will permit the fluid to leak out. If the fluid level becomes so low as to uncover the inlet pipe opening in the reservoir, extensive damage to the pump can result. In suction or return lines, loose connections permit air to be drawn into the system resulting in noisy and/or erratic operation.

2. Clean fluid is the best insurance for long service life. Therefore, the reservoir should be checked periodically for dirt or other contaminants.

If the fluid becomes contaminated the system should be drained and the reservoir cleaned before new fluid is added.

3. Filter elements also should be checked and replaced periodically. A clogged filter element results in a higher pressure drop. This can force particles through the filter which would ordinarily be trapped, or can cause the by-pass to open, resulting in a partial or complete loss of filtration.

4. Air bubbles in the reservoir can ruin the pump and other components. If bubbles are seen, locate the source of the air and seal the leak. (See Table 3).

5. A pump which is running excessively hot or noisy is a potential failure. Should a pump become noisy or overheated, the machine should be shut down immediately and the cause of improper operation corrected.

C. ADDING FLUID TO THE SYSTEM

When hydraulic fluid is added to replenish the system, it should always be poured through a fine wire screen (200 mesh or finer) or preferably pumped through a 10 micron (absolute) filter.

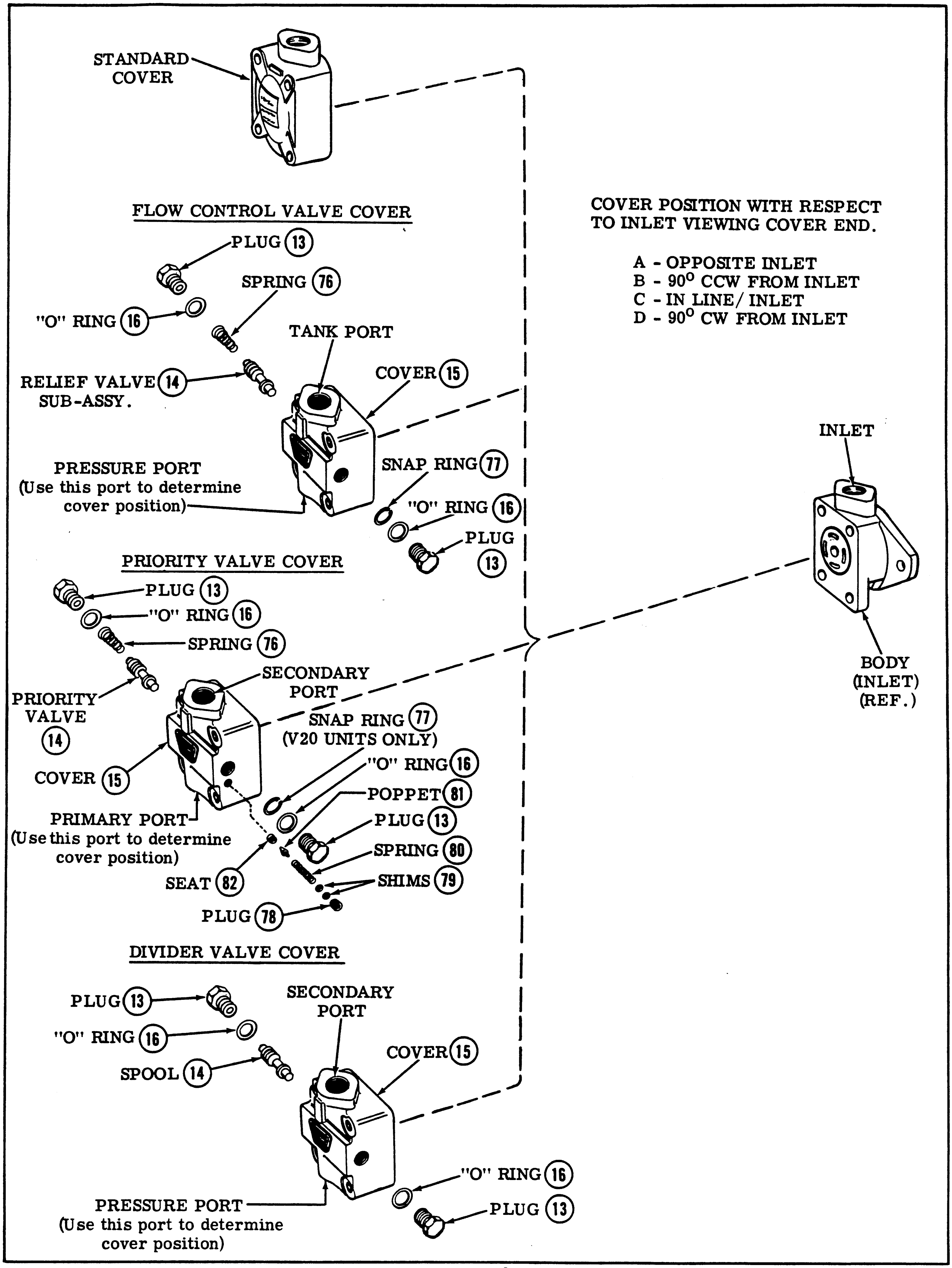
It is important that the fluid be clean and free of any substance which could cause improper operation or wear of the pump or other hydraulic units. Therefore, the use of cloth to strain the fluid should be avoided to prevent lint getting into the system.

D. ADJUSTMENTS

No periodic adjustments are required, other than to maintain proper shaft alignment with the driving medium.

E. LUBRICATION

Internal lubrication is provided by the fluid in the



STANDARD COVER
FLOW CONTROL VALVE COVER
PLUG (13)
SPRING (76)
"O" RING (16)
TANK PORT
RELIEF VALVE (14) SUB-ASSY.
COVER (15)
PRESSURE PORT (Use this port to determine cover position)
SNAP RING (77)
"O" RING (16)
PLUG (13)
PRIORITY VALVE COVER
PLUG (13)
"O" RING (16)
SPRING (76)
SECONDARY PORT
PRIORITY VALVE (14)
SNAP RING (77) (V20 UNITS ONLY)
COVER (15)
"O" RING (16)
POPPET (81)
PRIMARY PORT (Use this port to determine cover position)
PLUG (13)
SPRING (80)
SEAT (82)
SHIMS (79)
PLUG (78)
DIVIDER VALVE COVER
PLUG (13)
SECONDARY PORT
"O" RING (16)
COVER (15)
SPOOL (14)
"O" RING (16)
PRESSURE PORT (Use this port to determine cover position)
PLUG (13)
COVER POSITION WITH RESPECT TO INLET VIEWING COVER END.
A - OPPOSITE INLET
B - 90° CCW FROM INLET
C - IN LINE/ INLET
D - 90° CW FROM INLET
INLET
BODY (INLET) (REF.)

Figure 9.

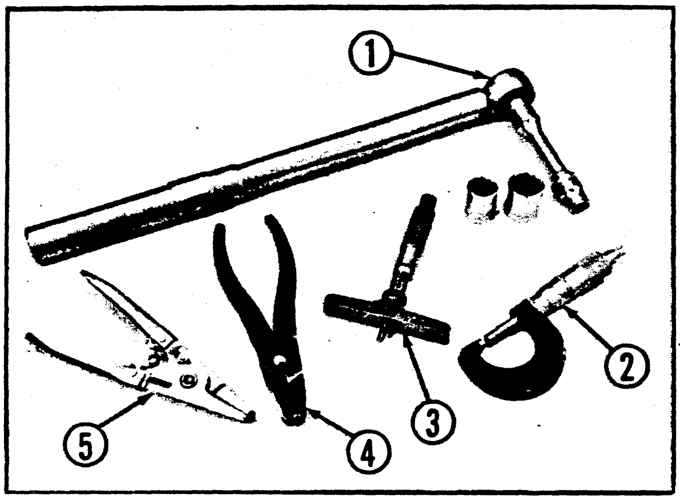
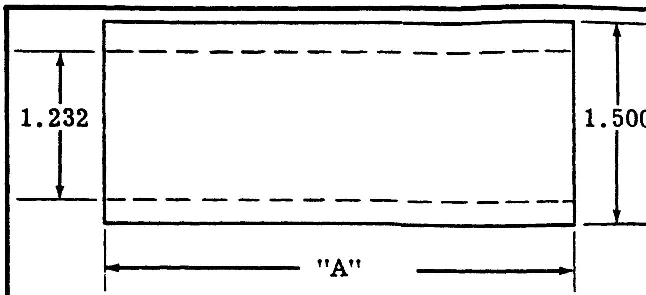
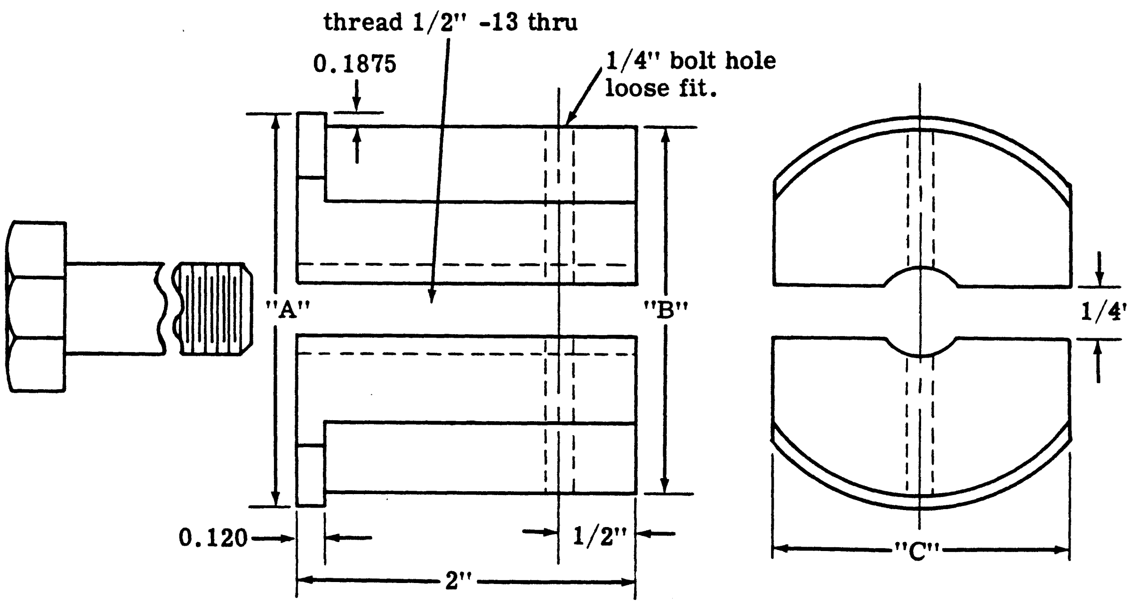


Figure 10. Standard Tools



USE FOR	"A"
Intermediate shaft bearing installation	4"
Drive shaft bearing installation	6"
Drive shaft bearing removal	9"
1 1/2" heavy wall tubing	

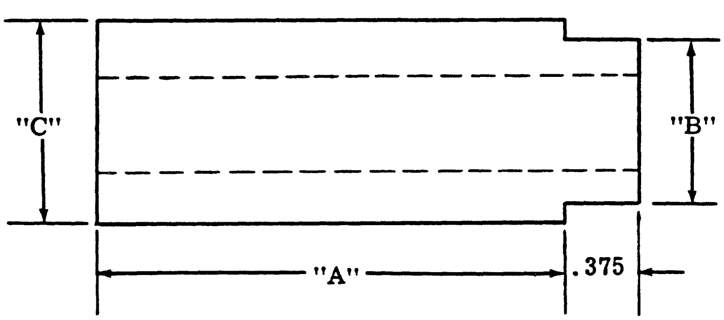
Figure 11. Special Shaft Bearing Removal and Installation Tools.



Bearing Race Puller			
Description	A	B	C
Valve Block	1.675	1.300	1.250
Housing	2.125	1.625	1.500

Use a 5" long 1/2" -13 hex head screw with this tool.

Figure 12. Bearing Race Removal Tools



NOMINAL PIPE SIZE	"A"	"B"	"C"
1 1/2"	4"	1.625	1.900
2"	4"	2.125	2.375
SCHEDULE 80 (extra heavy)			

Figure 13. Special Bearing Race Installation Tools.

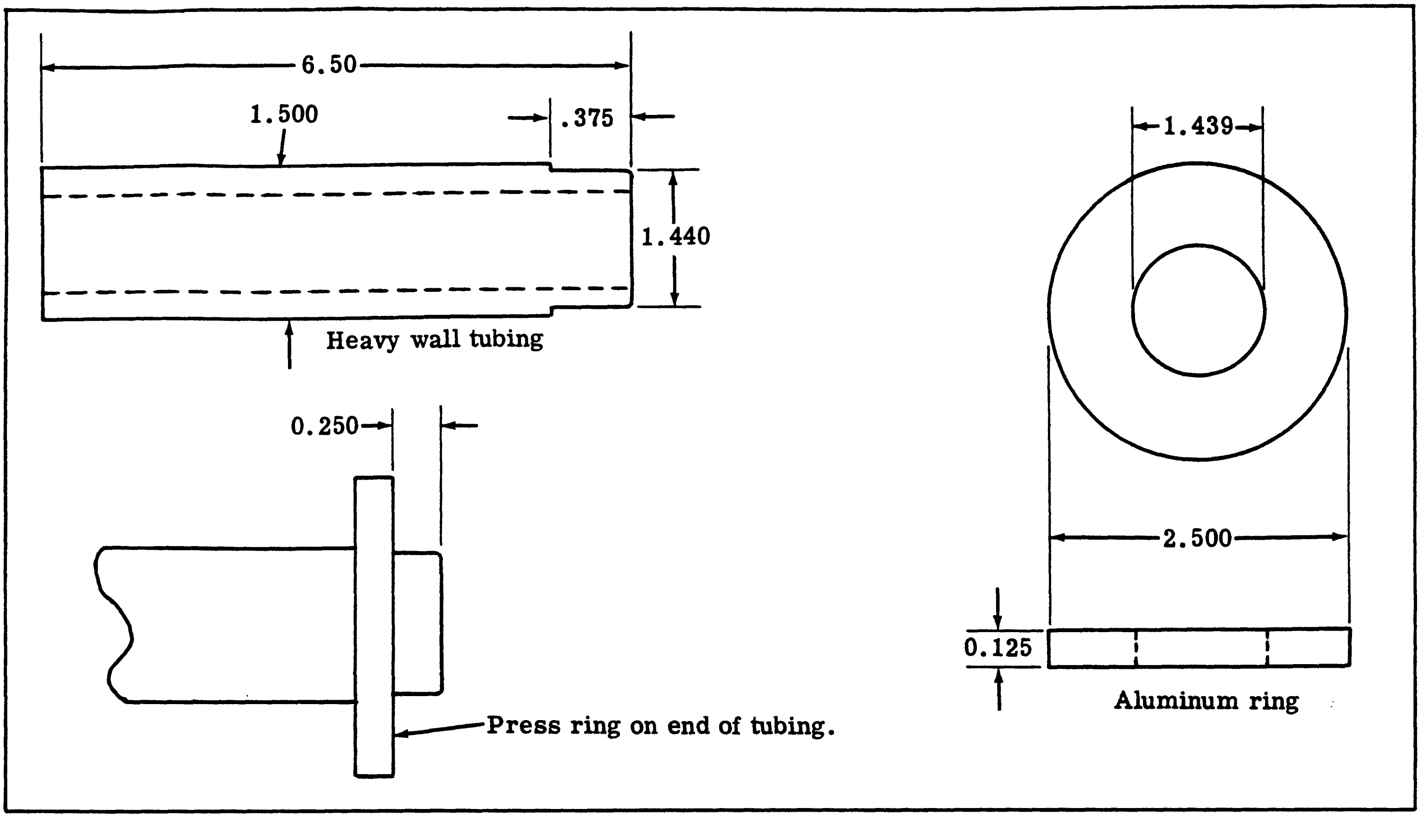


Figure 14. Shaft Seal Driver

system. Lubrication of the shaft couplings should be as specified by their manufacturers. Coat shaft splines with a dry lubricant, (Molycoat or equivalent) to prevent wear.

F. REPLACEMENT PARTS

Reliable operation throughout the specified operating range is assured only if genuine Sperry Vickers parts are used. Sophisticated design processes and material are used in the manufacture of our parts. Substitutions may result in early failure. Part numbers are shown in the parts drawings listed in Table 2.

G. TROUBLE-SHOOTING

Table 3., lists the common difficulties experienced with transmission pumps and hydraulic systems. It also indicates probable causes and remedies for each of the troubles listed.

Section VI - OVERHAUL

GENERAL

CAUTION

Block vehicle if it is on a slope. The transmission cannot act as a parking brake.

CAUTION

Before breaking a circuit connection, make certain that power is off and system pressure has been released.
Lower all vertical cylinders, discharge accumulators, and block any load whose movement could generate pressure.

Drain the oil from the vehicle hydraulic system. Use new clean oil when restoring the unit to service.

After removing the transmission from the vehicle and before disassembly, cap or plug all ports and disconnected hydraulic lines. Clean the outside of the unit thoroughly to prevent entry of dirt into the system.

CAUTION

Absolute cleanliness is essential when working on a hydraulic system. Always work in a clean area. The presence of dirt and foreign materials in the system can result in serious damage or inadequate operation.

Periodic maintenance of the transmission will generally not require disassembly to the extent described here. However, the sequence can also be used as a guide for partial disassembly. In general, disassembly is accomplished in the item number sequence shown in Figure 15. Special procedures are included in the following steps:

NOTE

Discard and replace all "O" rings, gaskets and shaft seals removed during disassembly.

A. REMOVAL AND DISASSEMBLY OF THE V10 VANE PUMP.

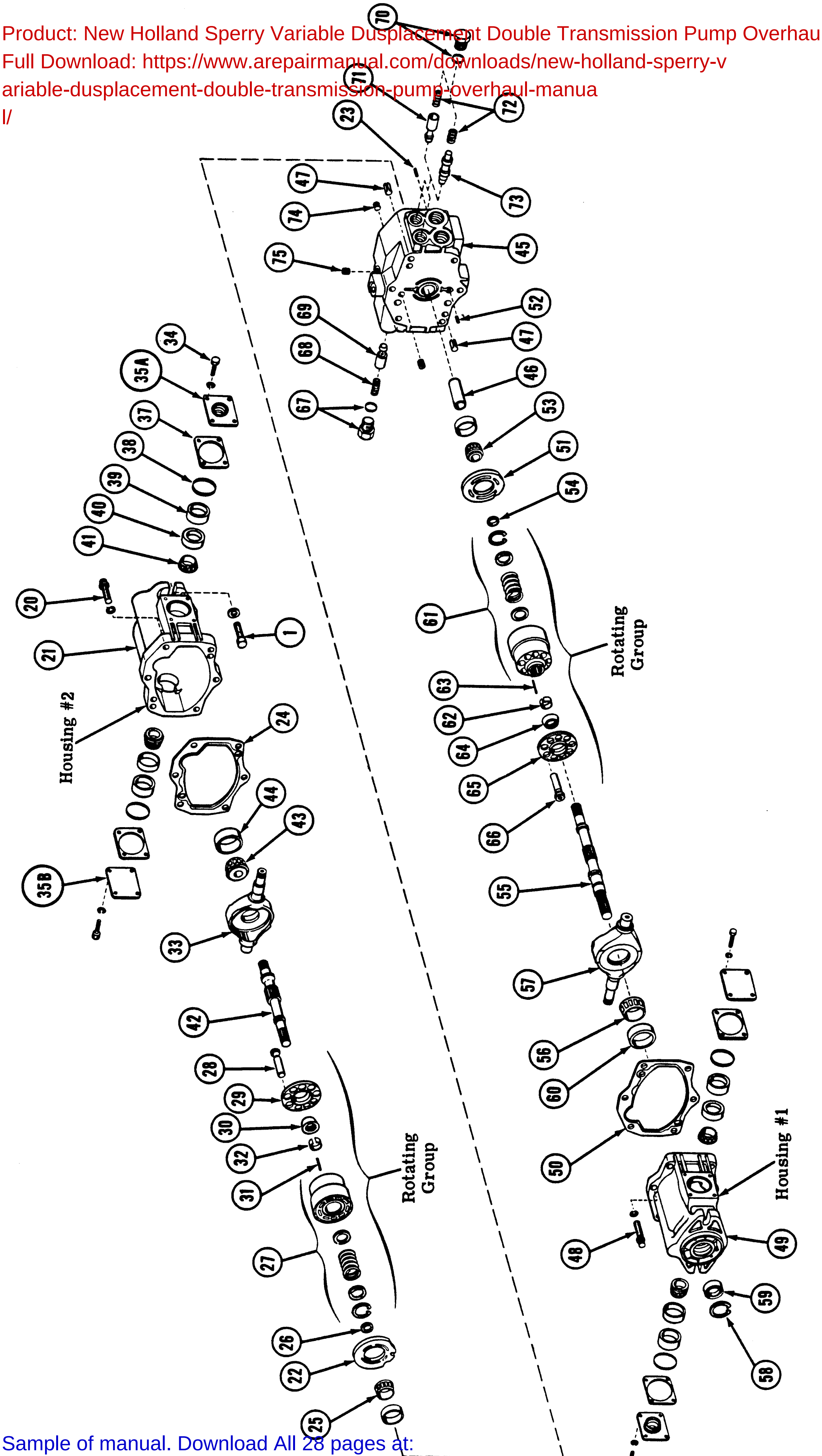


Figure 15. Exploded View