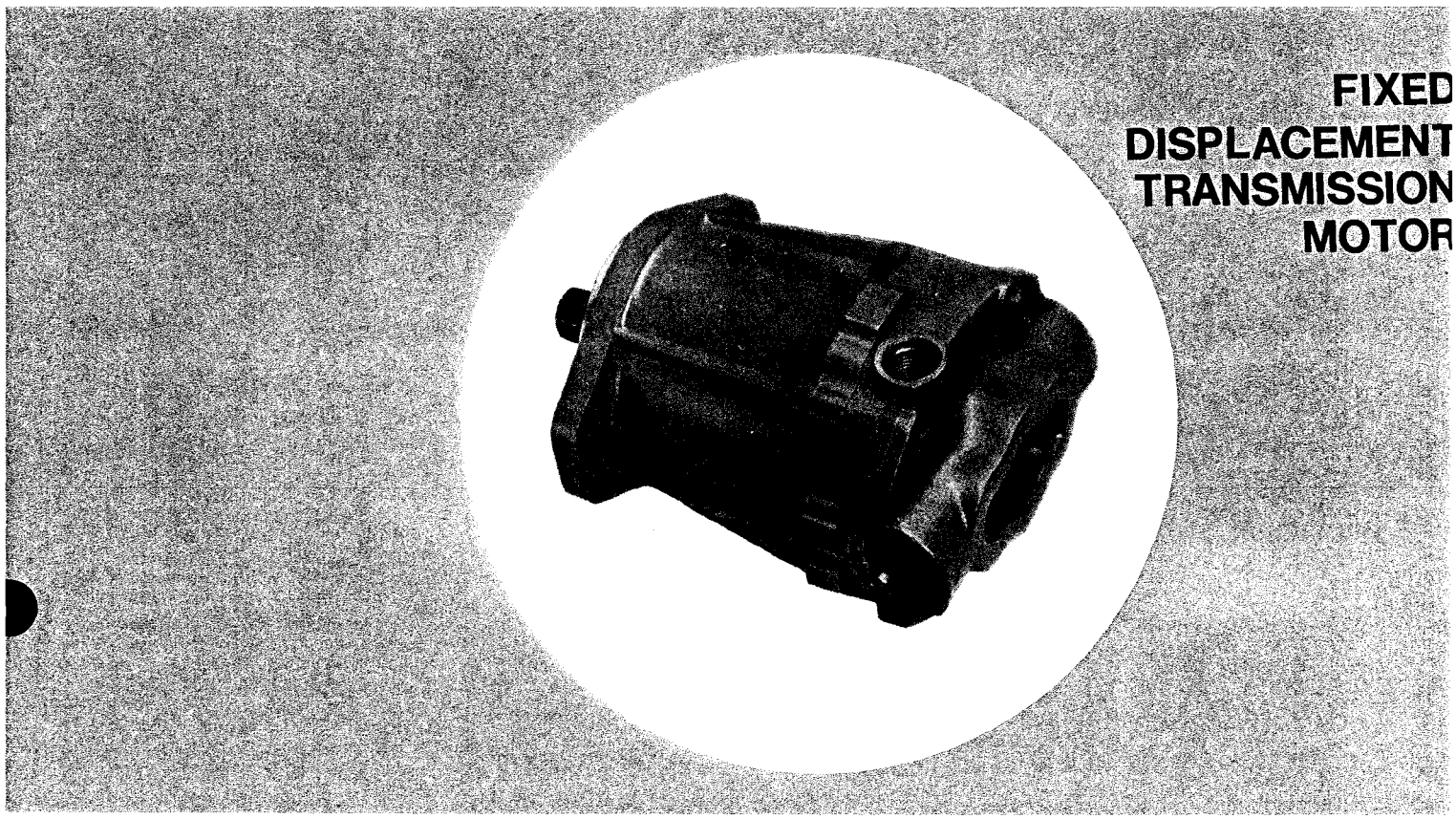
SPERRY VICKERS



FIXED DISPLACEMENT TRANSMISSION MOTOR

OVERHAUL MANUAL

MFE19(X)-*-20/21/30

SPERRY VICKERS
TROY, MI. 48084

Released 6-1-78

M-2843-S

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MODEL CODE BREAKDOWN

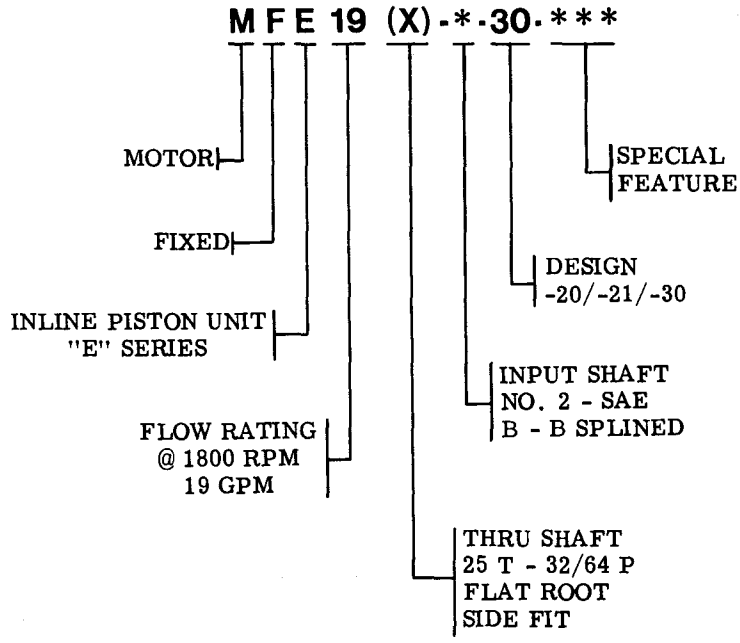


TABLE 1. MODEL CODE BREAKDOWN.

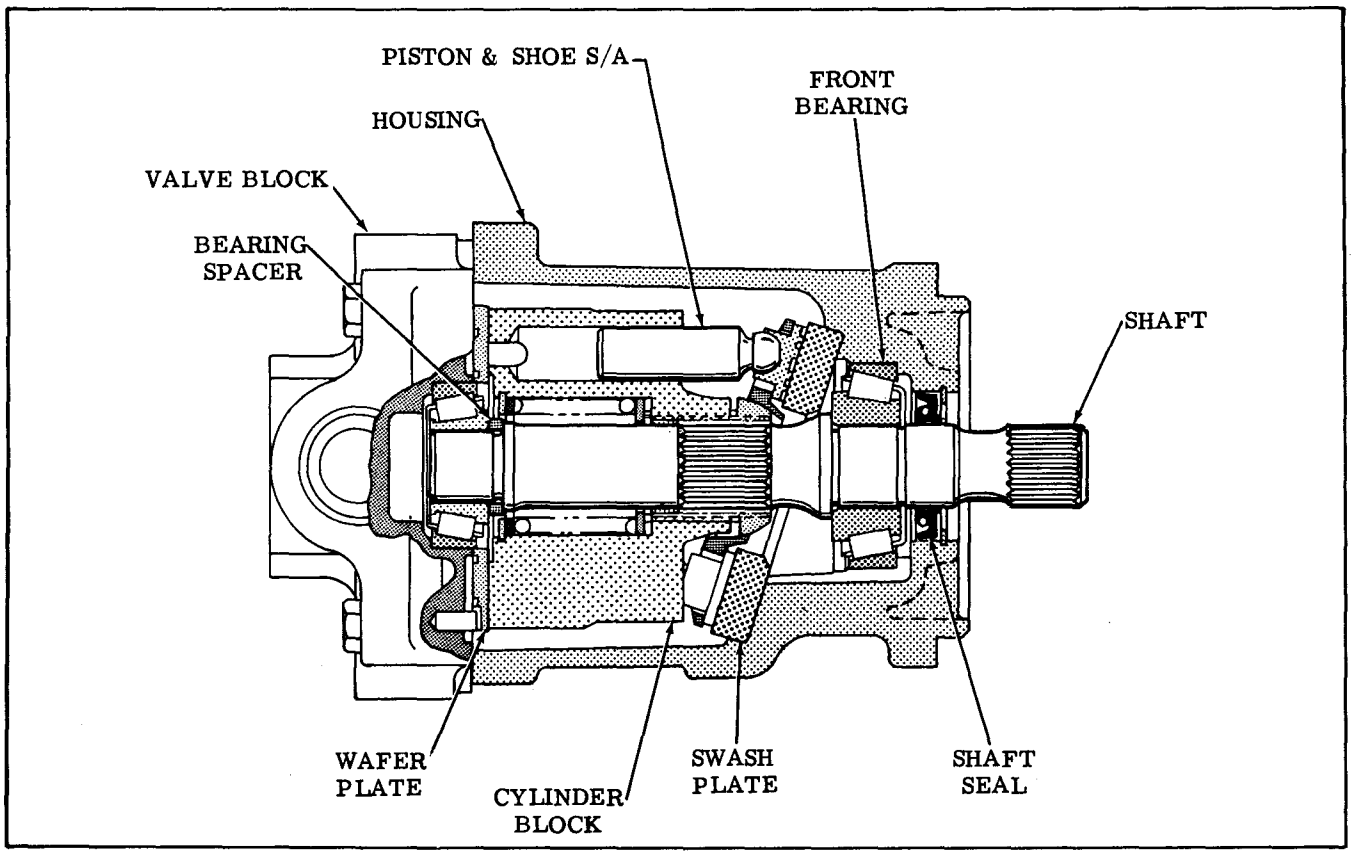


FIGURE 1. SECTIONAL VIEW OF INLINE PISTON MOTOR.

Section I - INTRODUCTION

A. PURPOSE OF MANUAL

This manual describes basic operational characteristics and provides service and overhaul information for the Sperry Vickers MFE19(X)-**-*** inline piston motor. 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:

Sperry Vickers
Technical Publications
1401 Crooks Rd.
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 or frame size and assembly number as stamped on the motor mounting flange.

MODEL	PARTS DRAWING	INSTALLATION DRAWING
MFE19(X)-*-20/21/30-***	M-2832-S	MB-198

Table 2.

Section II - DESCRIPTION

A. GENERAL

Assembly of a typical inline piston motor is shown in Figure 1. Reference to each of the motors basic components are shown.

B. APPLICATION

Motor ratings in USGPM as shown in the model coding Table 1, are at 1800 RPM. For ratings at other speeds, methods of installation and other application information, Sperry Vickers application engineering personnel should be consulted.

Section III - PRINCIPLES OF OPERATION

A. PISTON MOTOR

NOTE

Refer to Figure 2 throughout the theory of operation.

Fluid under pressure is applied to the inlet of the piston motor causing rotation of the motor shaft. As fluid moves into the inlet port, force is applied to all pistons located within the inlet kidney slot. Each of these pistons exert an axial force against the swash plate through the piston shoes. The angle of the swash plate converts this axial force into motion and the piston and shoe S/A's slide against the swash plate in the direction of rotation.

The angular force developed by this sliding motion is transmitted into the cylinder block and subsequently to the motor shaft through a connecting spline.

The pistons continue to move out of the cylinder block until they approach the outlet kidney slot. At this time pressure drops, the motion of the pistons reverse and fluid is pushed out of the cylinder block into the outlet kidney slot.

Section IV - INSTALLATION AND OPERATING INSTRUCTIONS

A. INSTALLATION DRAWINGS

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

B. MOUNTING AND DRIVE CONNECTIONS

CAUTION

Motor 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 inline piston motor mounting flange (Figure 3) assures correct mounting and shaft alignment. Make sure the pilot is firmly seated in the accessory pad.

Care should be exercised in tightening the mounting screws to prevent misalignment.

2. Indirect drive is not recommended for these motors without Sperry Vickers engineering approval.

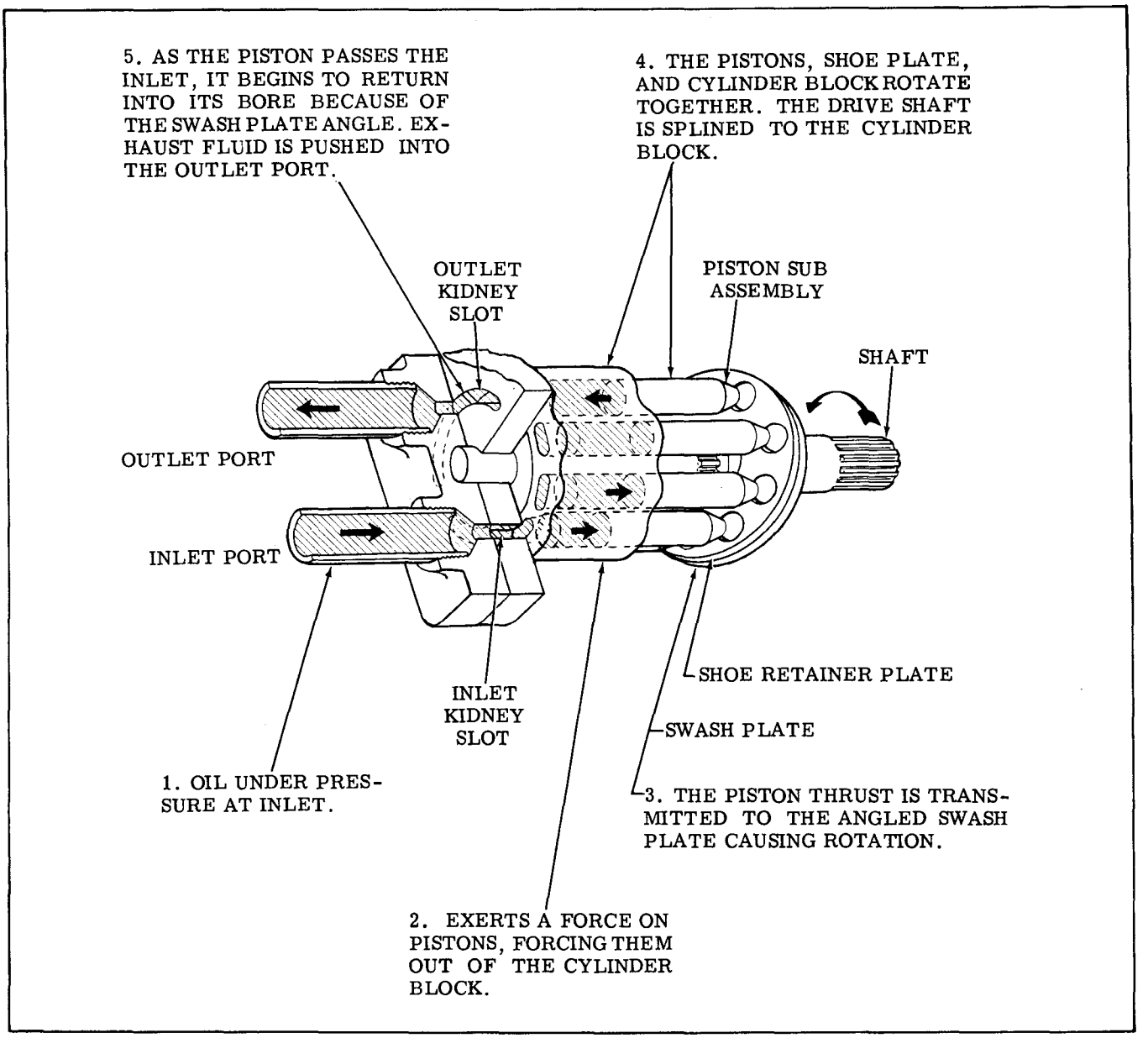


Figure 2. Inline Piston Motor Operation.

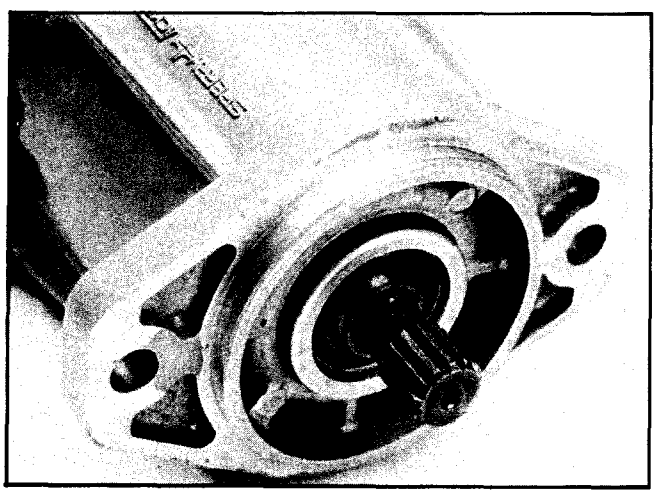


Figure 3. Motor Pilot Flange.

C. SHAFT ROTATION.

Motors are capable of rotation in either direction. To reverse motor direction, simply reverse flow direction.

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. Connecting lines (hose or tubing) should be at least the SAE port size of the unit.

3. The number of bends in tubing should be kept to a minimum to prevent excessive turbulance 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 motors. Any oil selected for use with motors is acceptable for use with valves or pumps.

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 component manufacturer.

Where special considerations indicate 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 filter, breathers, reservoir, 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 a 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 a relief valve depends on the work requirements of the system components.

Section V - SERVICE AND MAINTENANCE

A. SERVICE TOOLS

The following standard tools for overhauling the piston motor are shown in Figure 4.

1. Torque wrench with short extension and sockets.
2. (0 - 1 inch). micrometer.
3. Feeler gage.
4. Internal Truarc pliers.

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.

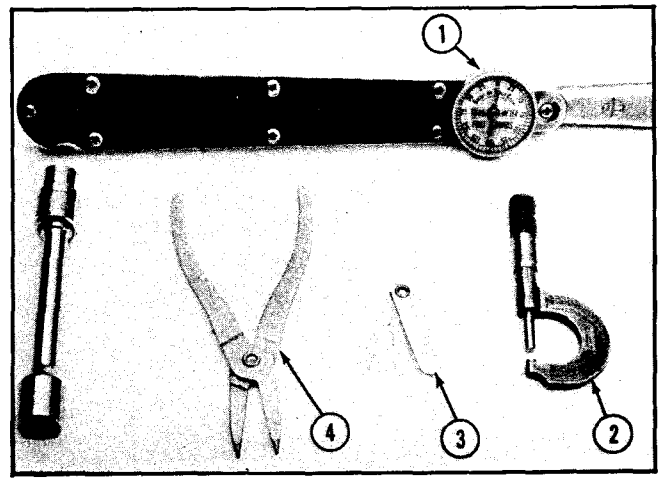


Figure 4. Standard Tools.

SPECIAL TOOLS

Special tools are shown in Figures 5, 6, 7, 8, and 9.

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 and motor can result. In suction 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.

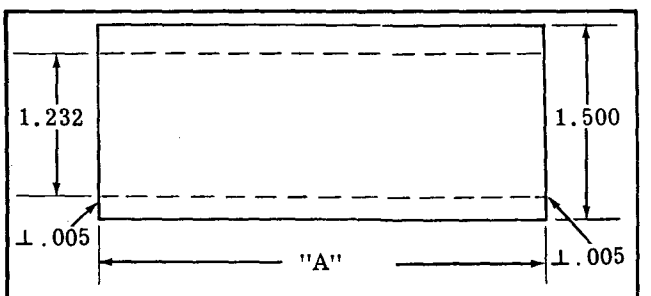
4. Air bubbles in the reservoir can ruin the motor and other components. If bubbles are seen, locate the source of the air and seal the leak. (See Table 3.)

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

C. ADDING FLUID TO THE SYSTEM

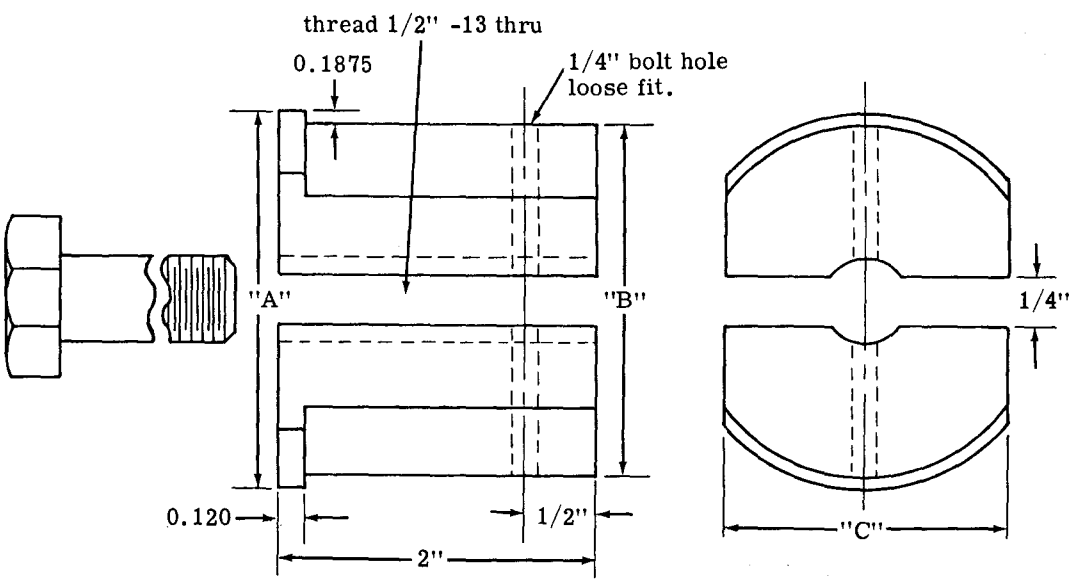
When hydraulic fluid is added to replenish the system, it should always be poured through a fine wire screen (200 mesh or finer) or preferably pumped through a 10 micron (absolute filter).

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



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

Figure 5. Special Shaft Bearing Removal and Installation Tools.



Bearing Race Puller			
Description	A	B	C
Housing	2.125	1.625	1.500

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

Figure 6. Housing Bearing Race Removal Tool.

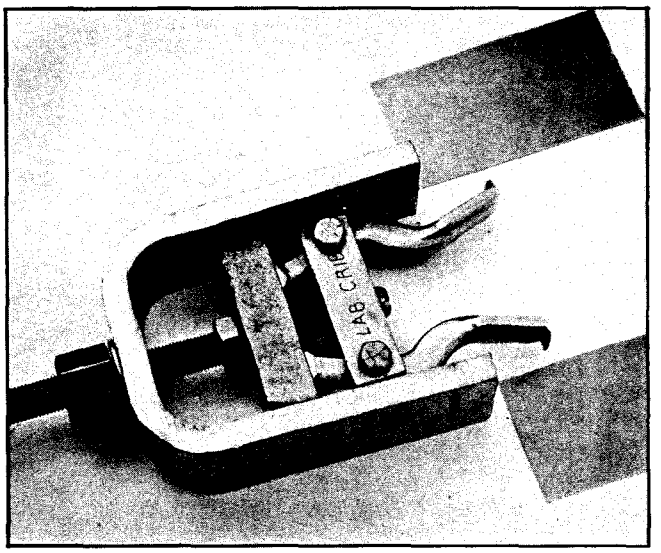


Figure 7. Valve Block Bearing Race Removal Tool.

D. ADJUSTMENTS

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

E. LUBRICATION

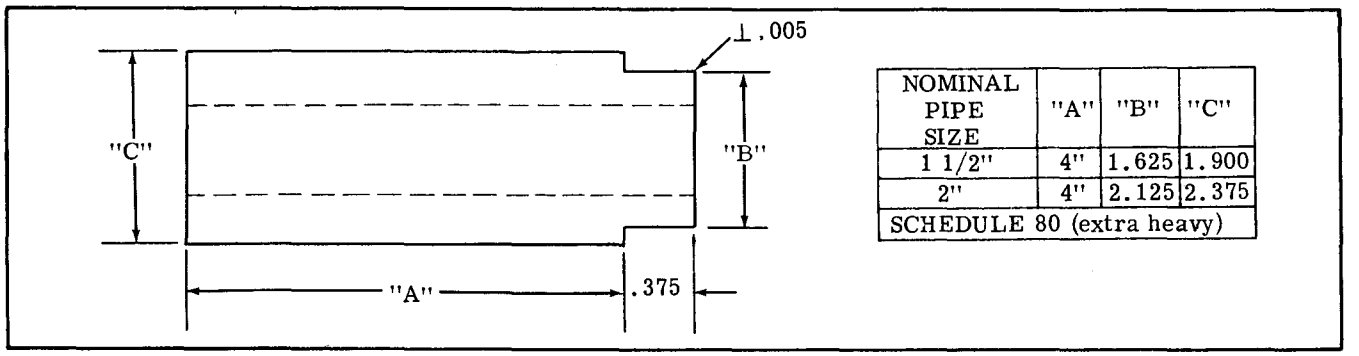
Internal lubrication is provided by the fluid in the system. Lubrication of the shaft couplings should be as specified by their manufacturers. Coat shaft splines with a dry lubricant, (Molycoat or equivalent) to prevent wear.

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. Substitutes may result in early failure. Part numbers are shown in the parts drawing listed in Table 2.

G. TROUBLE SHOOTING

1. Refer to Table 3 for trouble shooting data.



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 8. Special Bearing Race Installation Tools.

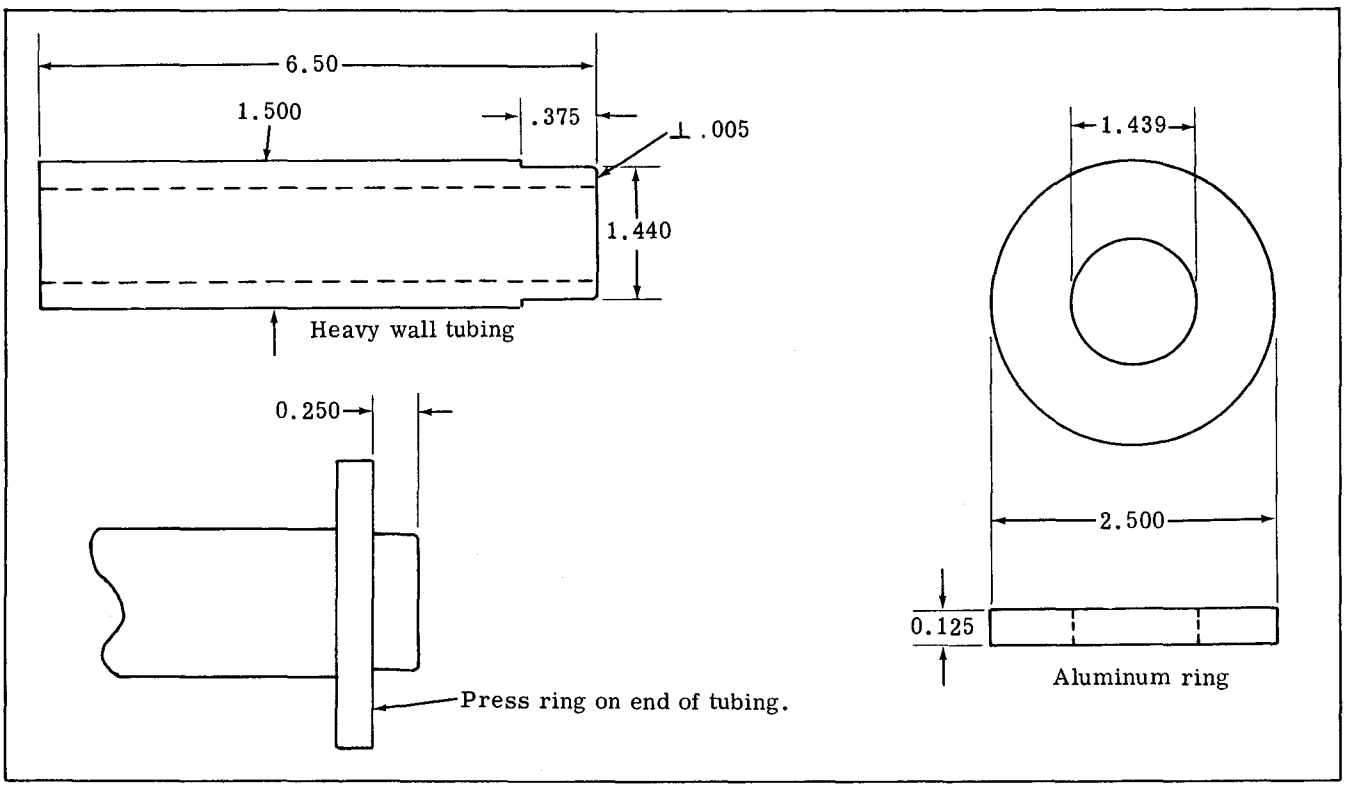


Figure 9. Shaft Seal Driver.

Trouble	Cause	Remedy
I. Excessive noise.	Low oil level in the reservoir.	Fill reservoir to proper level with the recommended fluid. DO NOT over fill or damage may result.
	Air in the system.	1. Open reservoir cap and operate hydraulic system until purged. 2. "Bleed" hydraulic lines at highest point downstream of pump and while system is under pressure.
	Vacuum condition.	Check inlet pump (suction) lines and fittings for air leaks.
	Oil too thick.	Be certain correct type of oil is used for refilling or adding to the system.
	Cold weather.	Run hydraulic system until units are warm to the touch and noise disappears.
II. Overheating.	Internal leakage.	If established that excessive internal leakage exists, return vehicle to maintenance shop for evaluation and repair.
	Heat exchanger not functioning.	Locate trouble and repair or replace.
	Fluid level low.	Add oil to operating level.
III. System not developing pressure.	Relief replenishing valve open.	Replace one or both. Do not attempt to repair cartridges, they are factory assembled and preset.
	Loss of fluid internally slippage or cylinder block lift. (motor overspeed.)	Return vehicle to maintenance shop for repair of hydraulic system.
IV. Loss of fluid.	1. Ruptured hydraulic lines. 2. Loose fittings. 3. Leaking gaskets or seals.	Check all external connections, tubing and hoses. Tighten connections, replace ruptured tube or hose.
V. Miscellaneous.	1. Misadjusted or broken control linkage.	Locate and repair.
	2. Disconnected or broken drive mechanisms.	

Table 3. Trouble Shooting Chart

Section VI - OVERHAUL

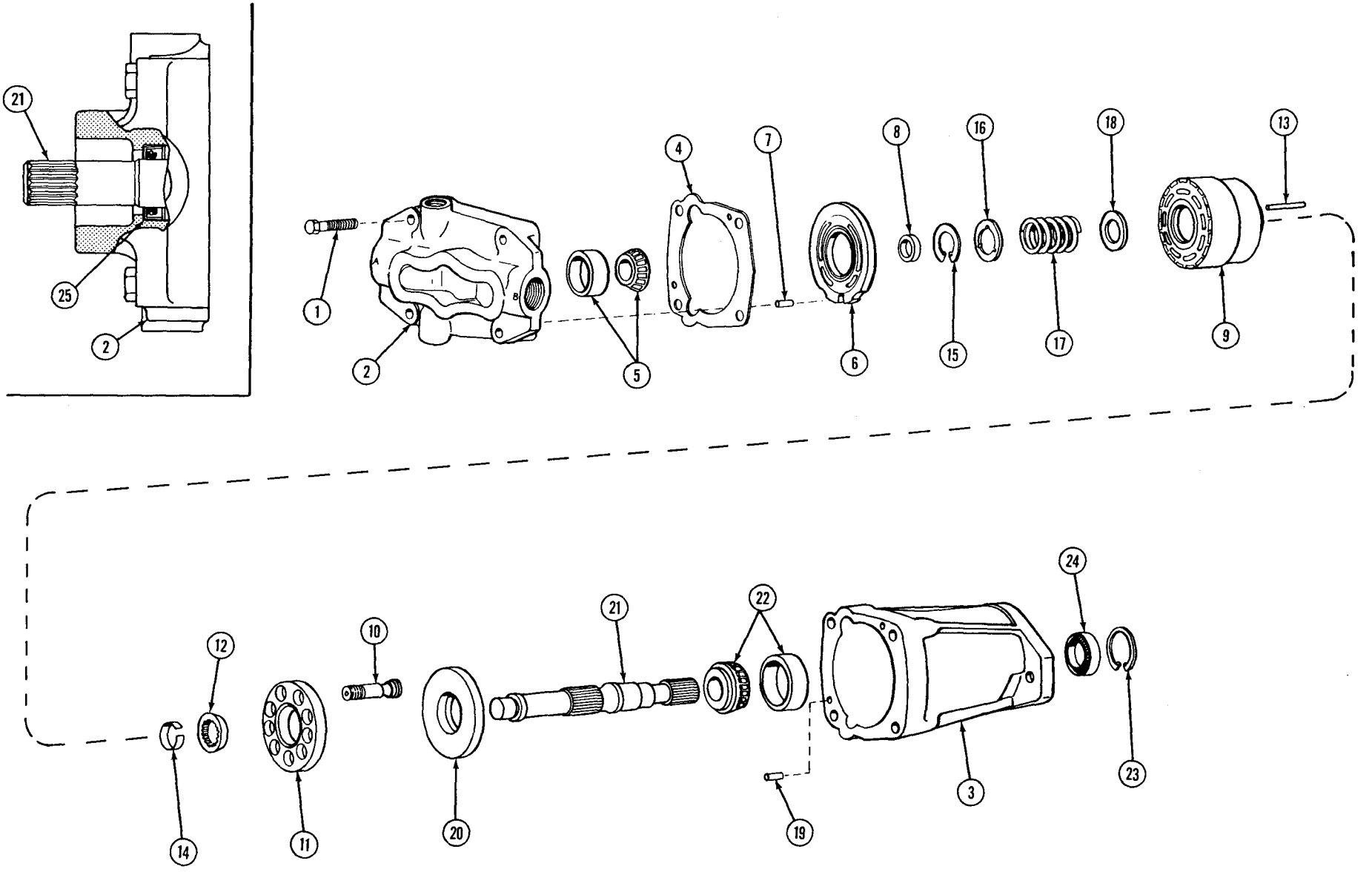
A. GENERAL

CAUTION

Block vehicle if it is on a slope. The piston motor 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.



-30 DESIGN UNITS HAVE A DRAIN OPENING ON TOP AND AT THE BOTTOM OF THE VALVE BLOCK. -20 AND -21 DESIGNS HAVE ONE DRAIN OPENING. ALSO, THE HOUSING AND GASKET ARE SLIGHTLY MODIFIED FROM THAT SHOWN.

Figure 10. Exploded View of Piston Motor

ITEM NUMBER	DESCRIPTION	QUANTITY PER UNIT
1	SCREWS	4
2	VALVE BLOCK	1
3	HOUSING	1
4	GASKET	1
5	BEARING & RACE	1
6	WAFER PLATE	1
7	PIN	1
8	SPACER	1
9	CYLINDER BLOCK	1
10	PISTON & SHOE SUBASSEMBLY	9
11	SHOE PLATE	1
12	SPHERICAL WASHER	1
13	PINS	3
14	PIN RETAINER	1
15	RETAINING RING	1
16	WASHER	1
17	SPRING	1
18	PIN WASHER	1
19	ALIGNMENT PIN	2
20	SWASH PLATE	1
21	SHAFT	1
22	BEARING & RACE	1
23	RETAINING RING	1
24	SHAFT SEAL (FRONT)	1
25	SHAFT SEAL (REAR)	1

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

After removing the motor 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 motor will generally not require disassembly to the extent described here. In general, disassembly is accomplished in the item number sequence shown in Figure 10. Special procedures are included in the following steps:

NOTE

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

B. DISASSEMBLY OF PISTON MOTOR ROTATING GROUP AND VALVE BLOCK

NOTE

Refer to Figure 10 throughout this procedure.

1. Remove four screws (1) from valve block (2). Separate valve block (2) and housing (3).

2. Remove gasket (4) then slide tapered roller bearing (5) from the end of shaft (21).

3. Remove wafer plate (6) from valve block (2) then remove pin (7) from valve block.

4. Slide bearing spacer (8) off shaft (21).

5. Remove rotating group parts (9 through 18) as a unit. Hold the shoe plate (11), piston and shoe subassemblies (10), and cylinder block (9) to prevent separation of the rotating group during removal.

NOTE

The rotating group consists of a cylinder block (9), nine piston and shoe subassemblies (10), a shoe plate (11), a spherical washer (12), three pins (13), a pin retainer (14), retaining ring (15), washer (16), spring (17) and pin washer (18). Wafer plate (6) is included as a loose item in the rotating group kit.

CAUTION

In the following step, the spring located within cylinder block (9) is under a high tension and can cause bodily harm if retaining ring (15) is removed without adequate caution. See Figure 11 for disassembly instructions.

6. Remove parts (15) through (18) from the cylinder block (9).

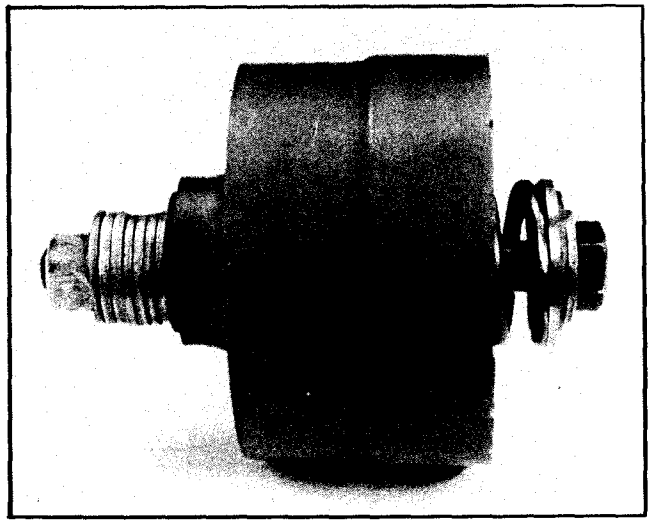


Figure 11. Cylinder block subassembly disassembly tool. (Tighten nut, remove snap ring, loosen nut to relieve spring tension).

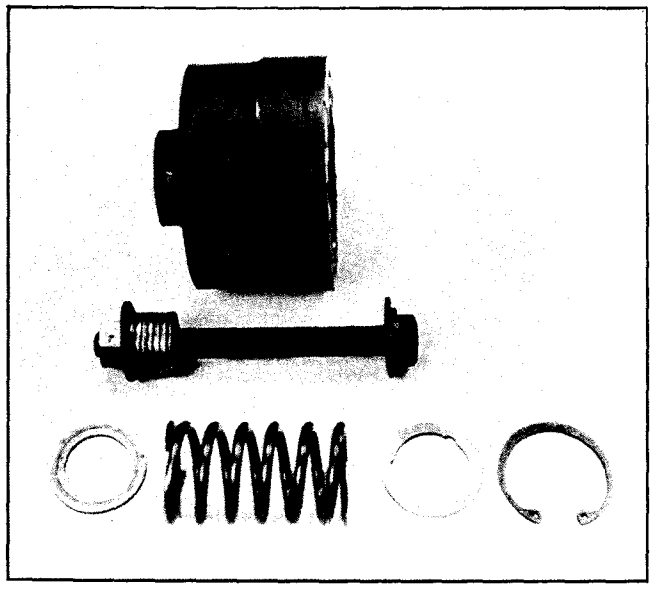


Figure 11a. Cylinder block subassembly parts.

7. Disassemble valve block (2) as follows:

a. Remove two locating pins (19) if damaged, be careful not to scratch the face of valve block or housing during removal.

b. Check bearing (5) for score marks or brinelling of the rollers. If the shaft bearing (5) is defective, remove bearing race (5) from the valve block. Use tool shown in Figure 7 and refer to Figure 12 for removal information. If unit is a through shaft model, remove rear shaft seal (25) from valve block (2). See insert view on Figure 10.

8. Remove swash plate (20) from housing (3).

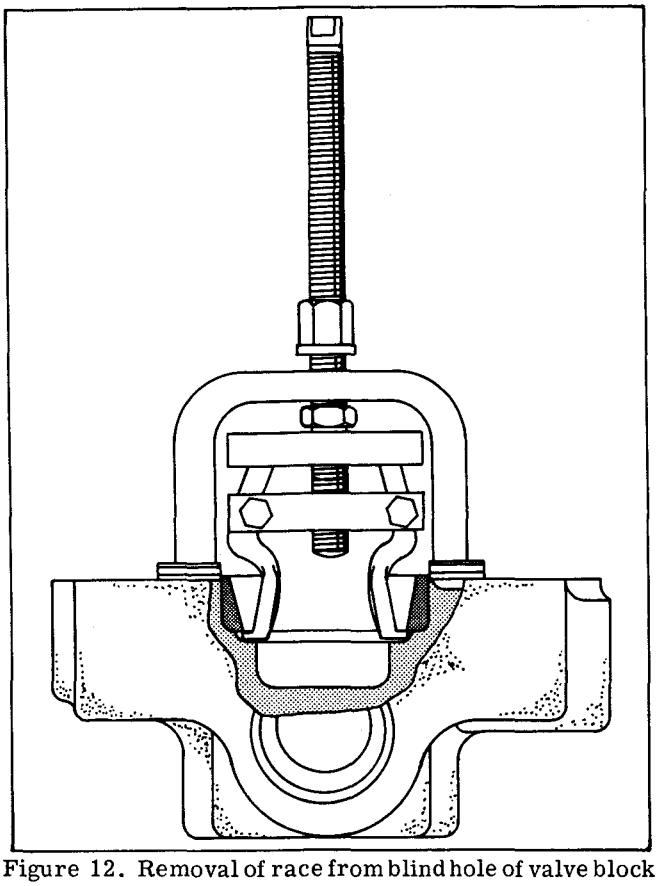


Figure 12. Removal of race from blind hole of valve block

C. REMOVAL OF THE FRONT SHAFT BEARING

NOTE

The following steps concerning removal of the front shaft bearing may not be required. Inspect shaft for broken splines, burrs, and wear in the area of shaft seal(s). Replace shaft if wear exceeds 0.005T.I.R. Inspect the front bearing for scuffing, peeling or spalling of the rollers and/or roughness when turned in the race, DO NOT remove the bearing from the shaft if the bearing is functional. If the front shaft bearing or shaft is defective, perform the following steps in the order indicated. See Figure 5 for special removal tool dimensions and refer to Figure 13 during the shaft bearing removal.

1. Pull shaft (21) and bearing from housing (3).
2. Remove drive shaft bearing as follows:

a. Install a nine inch piece of 1-1/2 inch heavy wall tubing over drive shaft (21). The end of the tubing will rest against the inner race of tapered roller bearing (22) and extend out beyond the end of the shaft.

b. Place the shaft and bearing with tubing into an arbor press with drive spline up. See Figure 13.

c. Press the drive shaft through the bearing. A 0.001 inch press exists between the shaft and bearing so considerable force is required to remove the bearing from the shaft. DO NOT remove the bearing race unless bearing (22) was found defective. Refer to Figure 14 for bearing race removal insutructions. Use special tool shown in Figure 6.

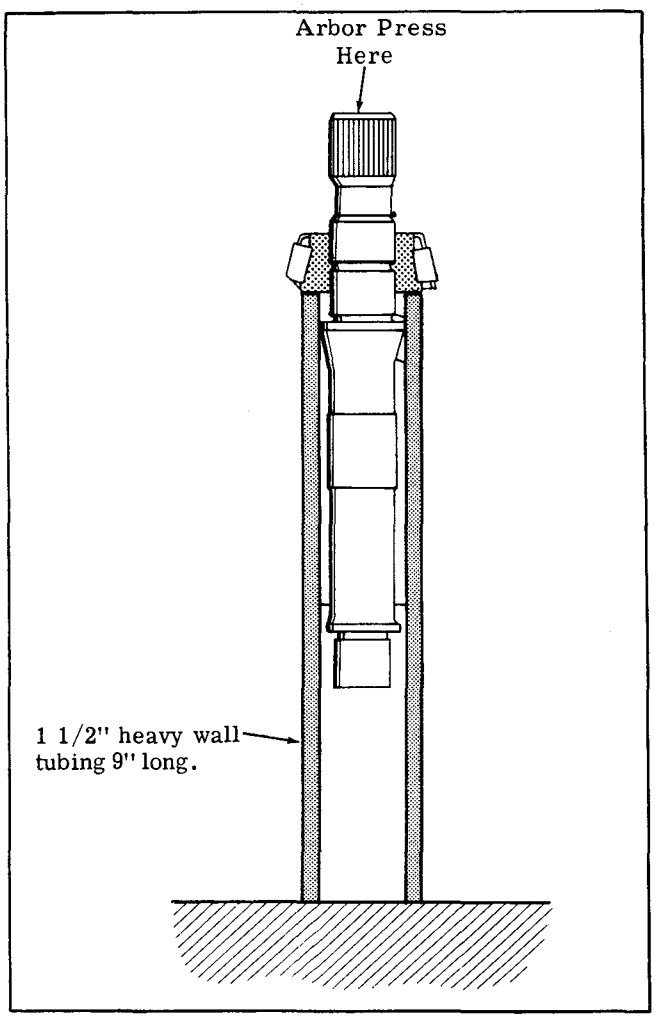


Figure 13. Front Bearing Removal

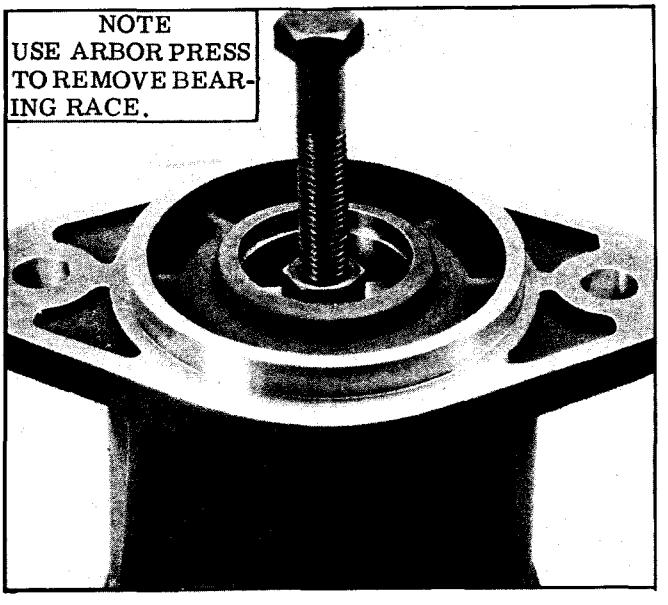


Figure 14. Removal of the bearing race located within the housing.

3. Remove retaining ring (23) and press shaft seal (24) out of the housing. Use a short piece of 1-1/2 inch heavy wall tubing as a tool.

NOTE

All parts must be thoroughly cleaned and kept clean during inspection and assembly. Clean all removed parts, using a commercial solvent that is compatible with the system fluid. Compressed air may be used in cleaning, but it must be filtered to remove water and contamination. Clean compressed air is particularly useful in cleaning valve block passages.

D. INSPECTION REPAIR AND REPLACEMENT

NOTE

Replace all parts that do not meet the following specifications.

1. Check bearing spacer (8) for burrs. Remove small burrs with an India stone.

2. Inspect cylinder block face (9) for wear, scratches and/or erosion between cylinders. Check the spring, washers, and retaining ring located within the cylinder block.

3. Check each cylinder block bore for excessive wear. Use the piston and shoe subassemblies (10) for this purpose. The piston should be a very close fit and slide easily in and out of the bore. No bind can be tolerated. If binding is evident, clean the cylinder block and piston, lubricate with clean hydraulic fluid and try again. Even minor contamination of the fluid could cause the piston to freeze up in the cylinder bore.

4. Inspect each piston and shoe subassembly (10) for maximum end play of 0.005 inch between the piston and shoe.

5. The face thickness dimension of each shoe must be within 0.001 inch of each other.

6. Inspect shoe plate (11) for excessive wear and cracking in the area of spherical washer (12). If heavy wear or cracks are found, replace the shoe plate and spherical washer at the same time.

7. Check spherical washer (12) for burrs, wear and possible scratches due to pin (13) breakage or contamination. Replace if wear is excessive.

8. Inspect pins (13) for equal length, excessive wear and possible bending. Replace all pins simultaneously if one is defective.

9. The pin retainer (14) may develop burrs. Remove all burrs with an India stone.

10. Inspect the bronze face of wafer plate (6) for excessive wear, scratches, and possible fractures. If the wafer plate is fractured, make sure the new plate rests flat against the valve block at assembly and that wafer plate pin (7) does not extend too far and hold the wafer plate away from the valve block.

11. Inspect swash plate (20) for scratches, wear and possible cracks. Replace if defective.

12. Inspect housing (3) for cracks, cross threads and wear. Check snap ring groove for wear and the proper depth. Check gasket mounting face for deep scratches or damage that could cause leakage past the gasket. Clean up burrs and small scratches with an India stone.

13. Inspect the valve block (2) for burrs, nicks, plugged body passages, flatness of the pump wafer plate area and erosion. Repair or replace the valve block if defective.

NOTE

Check flatness of the valve block face in the areas around locating pins (19) and bolt openings. Use an Arkansas stone to remove burrs or raised metal in these areas.

NOTE

If the bearing race was removed from valve block (2), install a new bearing race as shown in Figure 15. Use tool shown in Figure 8.

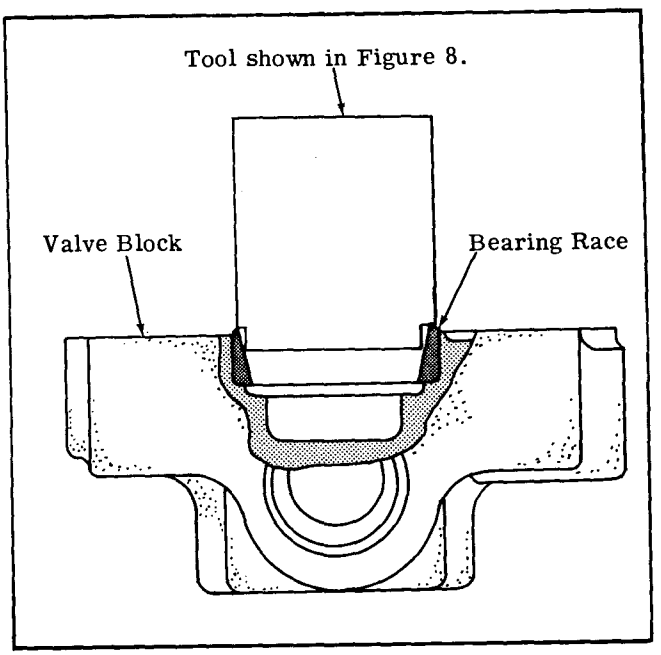


Figure 15. Valve Block Race Installation Procedure.

E. ASSEMBLY OF PISTON MOTOR HOUSING PARTS

NOTE

Flood all parts with system fluid at assembly to provide initial lubrication.

NOTE

If new shaft bearings (5 or 22), shaft (21), valve block (2) or housing (3) are being replaced, a complete shaft bearing preload adjustment must be performed. If the same parts are returned to service, the preload adjustment can be omitted.

1. If the shaft bearing (22) requires replacement, install a new bearing race into housing (3). Use tool shown in Figure 8 to press bearing race in place. Make sure the bearing race is oriented properly to accept the roller bearing before pressing into the housing. The race must be bottomed against the shoulder of the housing at completion of press.

2. Install shaft (21) into front shaft bearing (22) as follows:

Use a short piece of 1-1/2 inch heavy wall tubing (approximately 6 inches long), over the drive spline of the shaft (Tubing ends must be square within 0.005

inch). The tubing must be long enough to make contact with the inner race of the front bearing. Press the shaft through the bearing with an arbor press until the bearing bottoms against the shoulderof the shaft. See Figure 16.

3. Remove the short piece of tubing and turn shaft bearing (22) in its race with the end of the shaft. The bearing rollers must turn free and smooth.

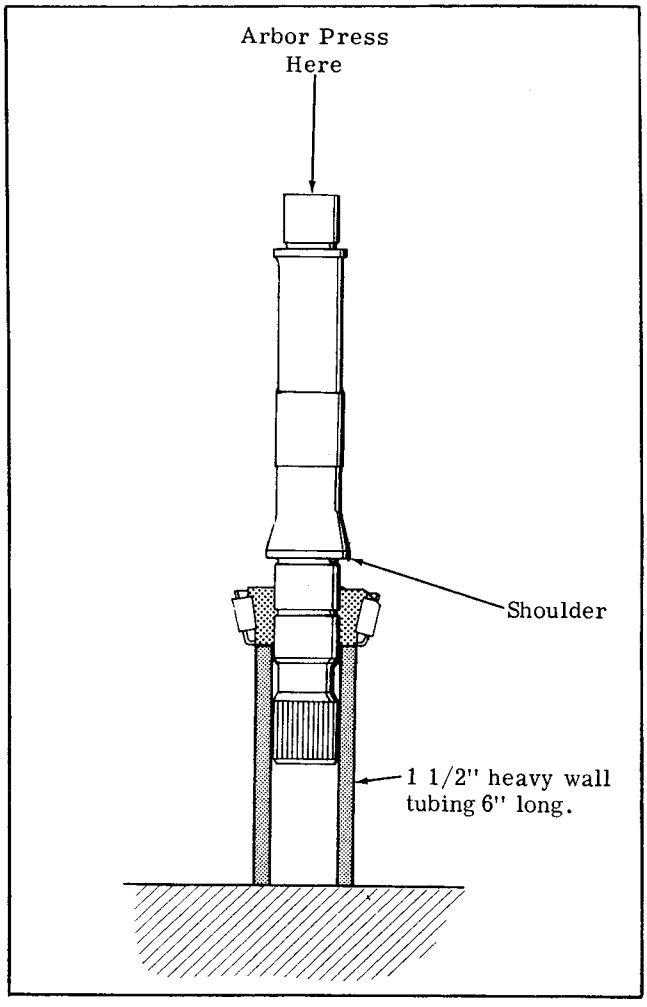


Figure 16. Front Bearing Installation.

NOTE

If the shaft bearings, shaft, valve block, or housing were not replaced, use the bearing spacer removed during the disassembly procedure to preload the shaft bearings and perform step G. 10. If preload adjustment is necessary, perform steps G.4. through G.10.

4. Obtain a shaft bearing spacer kit and install the thickest bearing spacer (8) over shaft (21) with the chamfer facing into the housing (toward the shoulder on the shaft).

5. Slide bearing (5) on the shaft and up against spacer (8). The small diameter of the tapered roller bearing must face out of the housing.

6. Install valve block (2) to housing (3) without gasket (4) and rotating group. Turn shaft (21) to seat the bearings then torque the valve block attaching screws (1) to five (5) lbf. in. Retorque screws while turning shaft. The bearings are seated when shaft does not free up while turning. Check the opening between the valve block and housing to be as even as possible.

7. Use a feeler gage to measure the opening between valve block (2) and housing (3). Four measurements should be obtained equidistant around the unit. A tapered feeler gage is especially useful for this purpose. Average the four readings by adding them together and dividing by four (4). Calculate thickness of the shaft bearing spacer as follows:

+0.150		Measured thickness of bearing spacer
-0.027		Average gap
+0.003	±0.001	Preload setting
+0.020		Compressed thickness of gasket
0.146	±0.001	Required bearing spacer thickness to provide 0.003 ±0.001 inch preload.

8. Remove four mounting screws (1) and remove valve block (2) from housing (3). If unit is a through shaft model, install a new rear shaft seal (25) into valve block (2). Garter spring will face into the motor.

9. Remove bearing (5) and bearing spacer (8).

10. Locate a bearing spacer with calculated dimensions and place with shaft bearing (5). Use the original spacer if preload is not preformed. Set aside for final assembly.

11. Assemble spring (17), two washers (16) and (18) and retaining ring (15) into the cylinder block (9). See Figure 11 for instructions. Set the cylinder block S/A on a flat surface. Use Kraft paper between the block and surface to prevent scratching the cylinder block face.

12. Install pin retainer (14) into the cylinder block (9). Position the pin retainer approximately 1/4 inch below the surface, and orient the open end of the pin retainer to be away from the large spline openings.

13. Slide three pins (13) into cylinder block S/A until they bottom against pin washer (18).

14. Place spherical washer (12) on top of the three pins: Then install the shoe plate (11) with nine piston and shoe subassemblies (10) over the spherical washer and into the cylinder block S/A. Wobble the shoe plate to make sure that each piston is free within its bore in the cylinder block. (Flood all parts with clean hydraulic fluid).

15. Install swash plate (20) over shaft (21) into housing (3). Set housing (3) on its side and hold the shaft end so drive shaft (21) is horizontal. Slide the rotating group into the housing. Rotate drive shaft (21) if necessary, to match the shaft splines to cylinder block (9) and spherical washer (12).

16. Install bearing spacer (8) with chamfer toward the shoulder of drive shaft (21).

17. Install tapered roller bearing (5) over the shaft and against the spacer. The small diameter of the tapered roller bearing must face toward valve block (2).

18. Install two (2) housing pins (19) and place a new gasket (4) over them. Cover the unit and set aside for final assembly.

F. FINAL ASSEMBLY OF PISTON MOTOR

NOTE

Flood all parts with system fluid to provide initial lubrication at assembly.

1. Install shaft seal (25) into valve plate (2) with garter spring facing shaft bearing. MFE19X models only. Be careful not to damage the seal during installation.

2. Assemble wafer plate locating pin (7) into valve block (2). Refer to Figure 10.

3. Assemble wafer plate (6) over the bearing race and locating pin (7) with wear surface away from valve block (2). See Figure 10. Make sure wafer plate is flat against valve block (2). Check height of pin to be sure that it does not hold the wafer plate away from the valve block.

4. Assemble valve block to housing with four attaching screws (1). Cross torque the screws to 42-45 lbf. ft., (57-61 N. m.). Be careful not to cut rear shaft seal (25) on through shaft models. (Tape shaft spline with plastic tape.)

5. Tape the spline end of drive shaft (21) with plastic tape to prevent cutting new shaft seal (24). Start taping the shaft close to the housing and work toward the end of the shaft. Install a new shaft seal (24) (garter spring inward) in position over the shaft and press evenly into the housing. Use shaft seal driver shown in Figure 9. The seal must be positioned just below. (approximately 0.020 inch), the retaining ring groove. Install retaining ring (23) into the housing. Use internal Truarc pliers to install retaining ring. (NOTE: Shaft seal will contact the tapered roller bearing and be damaged if pressed too deep into the housing bore.)

Section VII - TEST PROCEDURE

If test equipment is available, the motors should be tested at the recommended speeds and pressures shown on the installation drawing (See Table 2).

NOTE

Refer to general procedures concerning oil recommendations, filling of the motor housings, etc., before placing the inline piston motor into service.

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