

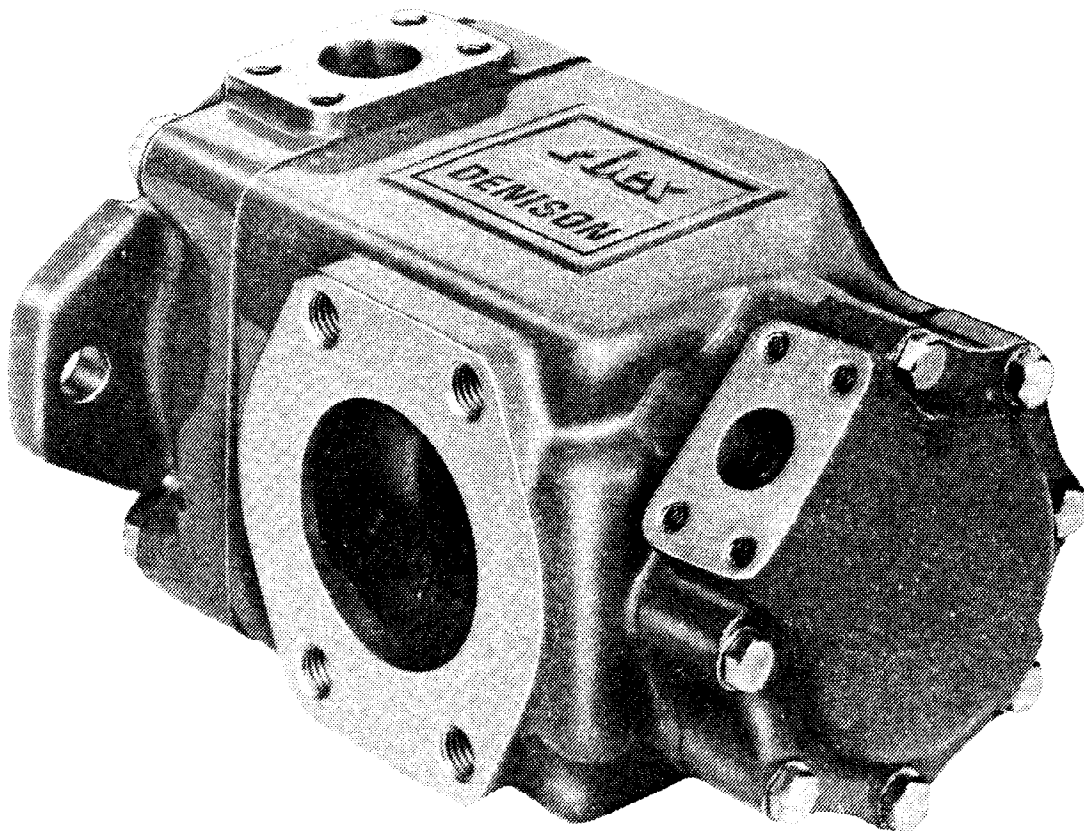
**Abex**

**DENISON**

**SERVICE LITERATURE**

**VANE TYPE DOUBLE PUMP-SERIES T5DC & T5SDC**

# **MODEL C INSTALLATION, OPERATION AND OVERHAUL INSTRUCTIONS**



**Vane Type Double Pump-SERIES T5DC & T5SDC**

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# Section I

## INTRODUCTION AND DESCRIPTION

### GENERAL

This manual covers installation, operation, maintenance and overhaul instructions for the Abex/Denison Model C T5DC series vane type double pumps. With improvements made to the "D" Cartridge, the Model C T5DC series which replace the A and B models reflects the latest design innovations for improved overall operational characteristics.

As of January 1, 1979 Model A and B pumps and their associated service parts will not be available. The transition to Model C will not affect parts interchangeability however, and users of A and B model pumps will have no difficulty in assembly or repair procedures if parts replacement is necessary. See pages 9 and 10 for Model C parts identification and interchangeability.

### DESCRIPTION

The Denison T5DC and T5SDC vane pumps are efficient, compact units designed for continuous duty up to 2500 PSI and 2500 RPM and intermittent duty up to 3000 PSI.<sup>1</sup>

Six basic cartridge sizes are offered for the "D" section with a rated delivery of 28, 31, 35, 38, 42 and 45 GPM @ 1200 RPM @ 100 PSI and seven basic cartridge sizes are offered for the "C" section with a rated delivery of 5, 8, 10, 14, 17, 22 and 25 GPM @ 1200 RPM @ 100 PSI. Any "D" car-

tridge may be used with any "C" cartridge which allows for 42 different model possibilities. Detailed operating characteristics are given for each cartridge size in table I.

The T5DC and T5SDC vane pumps consist of six basic components: (a) end cap, (b) "C" section unitized cartridge consisting of; rotor, vanes, vane holdout pins, cam ring, bearing and port plates, (c) center housing, (d) "D" section unitized cartridge consisting of; rotor, vanes, vane holdout pins, cam ring, bearing and port plates, (e) shaft and bearing and (f) mounting cap.

The T5DC and T5SDC vane pumps feature the use of unitized pumping cartridges for both the "D" and "C" pump section. The unitized cartridge assemblies are pre-tested and provide for ease of disassembly and assembly in the event it becomes necessary or desirable to make repairs, overhaul or revise the GPM delivery.

### THEORY OF OPERATION

The pumping operation of this unit (each cartridge) is obtained by providing a fixed interior cam surface and a rotating inner member (rotor) containing vanes which are held in contact with the inner cam surface. As the rotor is rotated by the drive shaft, the vanes are urged outward against the outward sloping cam surface, forming a cavity at the inlet ports of the port plates. Atmospheric pressure and suction created by the expanding

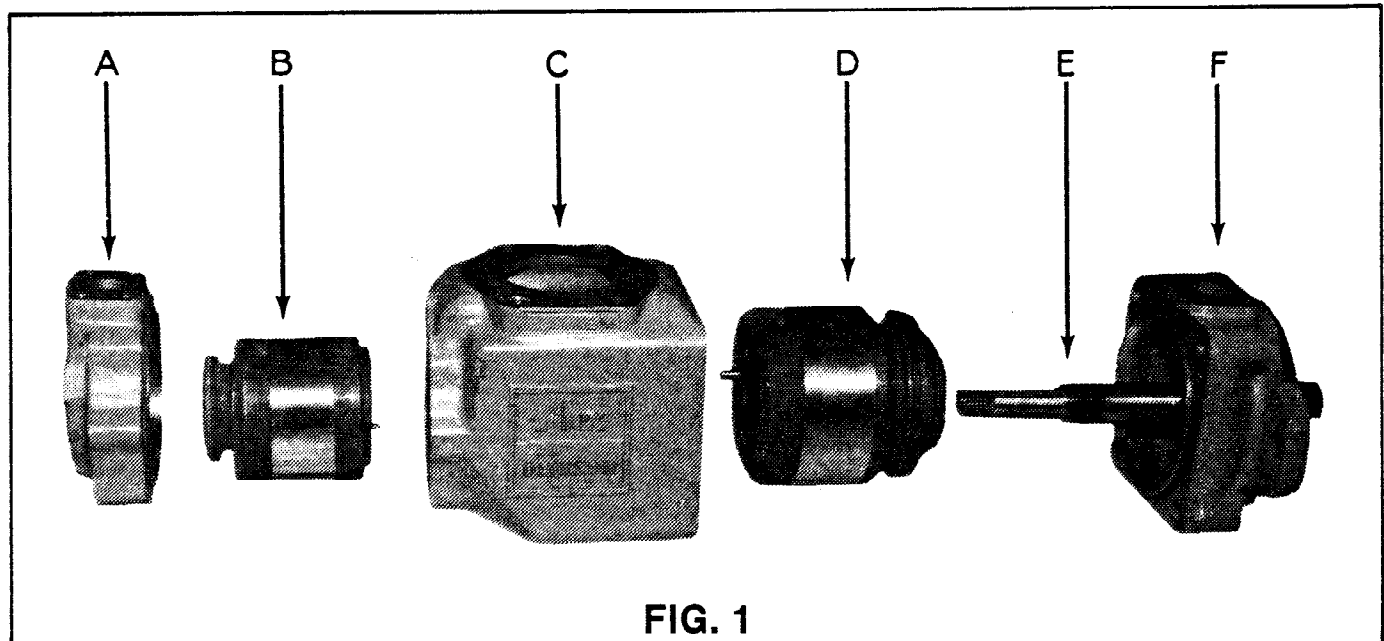


FIG. 1

<sup>1</sup>Ratings shown apply only to the T5DC pump when using hydraulic fluid containing anti-wear additives.

cavity between the rotating vanes fill the inlet cavity with fluid.

As the rotation continues and the vanes that had previously moved outward and now have fluid trapped between them and the port plates, follow the inward slope of the cam which decreases the cavity containing the trapped fluid and discharges the fluid at system pressure thru the pressure port openings in the port plates.

The rotating portion of the unitized cartridges feature the use of pressure actuated vanes which are urged against the cam ring by hollow pins located in the bottom of each rotor vane slot. Initial force to bring the vanes in contact with the cam ring contour during start up is provided by centrifugal force. The instant hydraulic pressure is obtained, the pins instantaneously separate from the bottom of the vanes in the pressure zone (inward sloping portion of cam) and allows fluid to fill the cavity under the pins until the pressure build up essentially equals the system operating pressure, which in turn, provides the force necessary to keep the vanes in contact with the cam ring contour.

### NOTE

When operating the pump at the Maximum outlet pressure, the pump shaft rotation should not be allowed to fall below 600 RPM in order to maintain proper vane to cam ring contact.

The inlet or suction flow for both the "D" cartridge and "C" cartridge feeds through a common 3" port in the center housing, through the large ports of each port plate for each cartridge and

through the center hole in the suction zone of each cam ring. The "D" cartridge port plates feature extended under vane suction ports in one direction of rotation which provides greater filling capabilities and requires that a different front and rear port plate be used when changing the direction of pump rotation.

The port plates and vanes for the "D" cartridge feature a design which assures positive contact of the vane against the cam ring contour and also provides for centering of the vanes between the port plates. The design of the vanes is such that one side is always the leading side (a notch on the vane bottom corner identifies the leading edge) and in the event the direction of pump rotation is reversed, the vanes must be reversed. It is also necessary to flip the cam ring 180° when reversing the direction of rotation.

The "C" cartridge provides tracking and centering of the vanes, however, it is not necessary to reverse the vanes or change the port plates when changing the direction of pump rotation. It is only necessary to flip the cam ring 180° and move the dowel pin to the proper hole when reversing the direction of rotation.

The initial axial clamping pressure is provided to the port plates and cam rings of the "D" and "C" cartridges by means of a square section seal under each pressure plate. The instant system pressure is obtained, internal hydraulic pressure proportional to system pressure provides the necessary force required to maintain axial port plate and cam ring clamping.

To determine the performance characteristics of a given model, refer to Table I below:

## TABLE I OPERATING CHARACTERISTICS—TYPICAL

Total input power is the sum of that required by each section at its operating conditions.

Speed RPM	"D" Cartridge Port P1 Shaft End Pump										"C" Cartridge Port P2 Cap End Pump											
	Code	Theo. Displ. Delivery		Theo. Delivery		Input Power vs. Pressure					Code	Theo. Displ.		Theo. Delivery		Input Power vs. Pressure						
		in. rev.	ml. rev.	gal. min.	liter min.	1000 psi HP	69 bar KW	2000 psi HP	138 bar KW	3000 psi HP		207 bar KW	in. rev.	ml. rev.	gal. min.	liter min.	1000 psi HP	69 bar KW	2000 psi HP	138 bar KW	3000 psi HP	207 bar KW
1200 1800 2500	028	5.48	89.8	28.0	106.0	17.0	12.7	34.4	25.7	49.4	36.9	005	0.96	15.7	5.0	18.9	3.6	2.7	7.0	5.2	—	—
42.0				159.0	28.0	20.9	53.2	39.7	79.2	59.1	7.5				28.4	5.2	3.9	10.0	7.5	—	—	
58.4				221.0	39.0	29.1	74.0	55.2	110.0	82.1	10.4				39.4	8.0	6.0	15.0	11.2	22.0	16.4	
1200 1800 2500	031	6.05	99.1	31.0	117.3	19.0	14.1	38.4	28.6	56.8	42.4	008	1.56	25.6	8.0	30.3	5.0	3.7	10.0	7.5	—	—
46.5				176.0	30.4	22.7	58.0	43.3	86.2	64.3	12.0				45.4	8.0	6.0	15.0	11.2	23.0	17.2	
64.5				244.1	42.2	31.5	80.6	60.1	119.8	89.4	16.6				62.8	12.0	9.0	23.0	17.2	33.0	24.6	
1200 1800 2500	035	6.83	111.9	35.0	132.5	22.0	16.4	43.0	32.1	64.0	47.7	010	2.00	32.8	10.0	37.8	6.0	4.5	13.0	9.7	19.0	14.2
52.5				198.7	34.6	25.8	65.6	48.9	97.4	72.7	15.0				56.8	10.0	7.5	20.0	14.9	29.0	21.6	
72.9				275.9	48.0	35.8	91.0	67.9	135.2	100.9	20.8				78.7	14.0	10.4	29.0	21.6	41.0	30.6	
1200 1800 2500	038	74.0	121.3	38.0	143.8	23.2	17.3	46.6	34.8	69.6	51.9	014	2.73	44.7	14.0	53.0	9.0	6.7	18.0	13.4	26.0	19.4
57.0				215.7	37.2	27.8	71.6	53.4	106.0	79.1	21.0				79.5	14.0	10.4	27.0	20.1	39.0	29.1	
79.1				299.4	51.6	38.5	99.4	74.2	147.2	109.8	29.2				110.5	19.0	14.2	37.0	27.6	55.0	41.0	
1200 1800 2500	042	8.17	133.9	42.0	159.0	26.6	19.8	51.2	38.2	76.8	57.3	017	3.49	57.2	18.0	68.1	12.0	9.0	22.0	16.4	33.0	24.6
63.0				236.4	40.6	30.3	78.4	56.5	116.8	87.1	27.0				102.2	18.0	13.4	34.0	25.4	50.0	37.0	
87.5				331.2	56.4	42.1	109.0	81.3	162.0	120.9	37.5				141.9	25.0	18.6	48.0	35.8	70.0	52.2	
1200 1800 2500	045	8.76	143.6	45.0	170.3	28.5	21.3	54.9	41.0	82.3	61.4	022	4.23	69.3	22.0	83.3	13.0	9.7	26.0	19.4	40.0	29.8
67.5				255.5	43.5	32.5	84.0	62.7	125.0	93.3	33.0				124.9	20.0	14.9	40.0	29.9	60.0	44.8	
93.7				354.6	60.5	45.1	116.9	87.2	173.5	129.4	45.8				173.3	30.0	22.4	56.0	41.8	84.0	52.7	
1200 1800 2500	025	5.04	62.6	26.2	99.2	15	11.2	30.0	22.4	—	025	5.04	62.6	26.2	99.2	15	11.2	30.0	22.4	—	—	
39.3				148.7	23	17.2	45.0	33.6	—	—												
54.5				206.3	32	23.9	62.0	46.3	—	—												

## Section II INSTALLATION

### MOUNTING

This pump may be mounted in any position, however it is recommended that a horizontal position be used whenever possible. The inlet port and the outlet port of the "D" section (shaft end) (P1) allows four relative positions in 90° intervals. The inlet port and the outlet port of the "C" section (cap end) (P2) allows eight relative positions in 45° intervals. If so desired, the porting relationship between the inlet and the "D" section outlet may be changed by removing the four bolts securing the mounting cap to the center housing and rotating the mounting cap relative to the center housing to the desired porting arrangements. When replacing the four bolts they must be torqued to the recommended value (135 ft. lbs.).

The porting relationship between the inlet and the "C" section outlet may be changed by removing the seven bolts securing the end cap to the center housing and rotating the end cap relative to the center housing to the desired porting arrangement. When replacing the seven bolts, they must be torqued to the recommended value (50 ft. lbs.).

The mounting hub and mounting bolt hole location conform to SAE-C, 2 bolt standard in both the spline and key shaft options. For proper operation, the pump shaft must be in alignment with the power source shaft and should be checked with a dial indicator. The mounting pad or adapter into which the pump pilots must be concentric with the power source shaft within 0.006 TIR. The shaft concentricities are particularly important if the pump shaft is rigidly connected to the power source without a flexible coupling or a coupling that allows only for minor misalignment.

### PIPING

All fluid lines, either pipe, tubing or flexible hose must be of adequate size and strength to assure free flow to and from the pump. *Note: DO NOT USE GALVANIZED PIPE.* Galvanized coating may flake off after continued use. The inlet line must be of proper size to prevent restriction of the fluid flow to the pump. Excessive inlet restrictions will prevent proper operation and may cause damage due to cavitation. The inlet piping must be sized to meet or exceed the minimum inlet requirements as outlined in Tables II & III.

If rigid pipe or tubing is used, the workmanship must be accurate in order to eliminate strain on

the pump housing, mounting cap or end cap or the fluid connectors. Sharp bends, elbows or reducers in the lines should be eliminated or minimized whenever possible. All system piping must be cleaned with solvent or equivalent cleaning agent before connecting to the pump.

### FLUIDS

**Type** — It is recommended that the fluid used in the T5DC pump have a petroleum base and contain agents which provide oxidation inhibition and anti-rust, anti-foam and deaerating properties.

**Anti-wear Additives** — It is strongly recommended that fluid used contain the necessary additives to secure high anti-wear characteristics. Comparative operating pressures and speed limits for anti-wear and non anti-wear fluids are shown in Table V.

### TABLE II

**Inlet Pressure, Minimum T5DC**—as measured at pump inlet flange with petroleum base fluids. Multiply Absolute Pressures by Multiplier shown in TABLE IV to find inlet pressures for Fire Resistant Fluids.

Speed	Gauge Pressure				Absolute Pressure	
	PSIG	Bar	In. Hg.	mm Hg.	PSIA	Bar
1200	-3	-0.20	(-6)	(-152)	8.0	0.55
1500	-3	-0.20	(-6)	(-152)	9.0	0.62
1800	-3	-0.20	(-6)	(-152)	10.5	0.72
2500	0	0	0	0	14.5	1.0

<sup>a</sup>Except for pumps with 045 cam rings which are rated as follows at their 2500 rpm max.

2500	+0.5	+0.03	+1.0	+25	15.2	1.05
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### TABLE III

**Inlet Pressure, Minimum T5SDC**—as measured at pump inlet flange with petroleum base fluids. Multiply Absolute Pressures by Multiplier shown in TABLE IV to find inlet pressures for Fire Resistant Fluids.

Speed	Gauge Pressure				Absolute Pressure	
	PSIG	Bar	In. Hg.	mm Hg.	PSIA	Bar
1200	-3	-0.20	(-6)	(-152)	8	0.55
1500	-3	-0.20	(-6)	(-152)	9	0.62
1800	0	0	0	0	14.5	1.0
2000	3.5	0.24	+7	178	18	1.24
2200	7	0.48	+14	356	21.5	1.48
2500	14	0.97	+28	711	28.5	1.97

**Automotive Crankcase Oils** — Certain types of these fluids (API Service Class MS or a new API class SC, SD or SE) contain detergents, anti-wear additives and other properties as previously specified. The fact that detergents tend to hold water in suspension as an emulsion may cause precipitates to form which might contribute to filtration problems. These fluids may be used only if little or no water is present.

**Non-petroleum Base or Fire-Resistant Fluids** — When it becomes necessary to use these types of fluids, the T5SDC pump should be used on some types (Fyrquel 220 or equivalent) and must be used with other fire-resistant fluids. To determine performance characteristics or ratings for a particular fluid, a Denison Sales Representative should be consulted.

**Operating Temperature** — For the most efficient pump operation, refer to Table IV.

**Pump Inlet Conditions** — During pump operation, the inlet conditions must be sufficient to provide filling without cavitation. The use of an improper grade of oil, improper or restrictive inlet piping may result in an inlet vacuum in excess of recommendations and will reduce the pump service life or may cause damage to the pump parts. An inlet pressure of 1 to 10 PSIG is desirable. During high speed operation, it is particularly important to provide proper inlet pressures. If a pressurized or

boosted inlet system is used, the inlet pressure must not exceed 15 PSIG.

Refer to Table II and Table III for minimum inlet requirements.

**NOTE:**

When an inlet strainer is used, it should have a minimum capacity equal to twice the GPM output of the pump.

**TABLE IV**

Fluid Type†	Denison Spec.	Pump Series Usable	Max. Temp.		Max System Pressure <sup>a</sup>		Suction Pressure Multiplier
			°F	°C	PSI	Bar	
Antiwear Petroleum Base Fluids for Severe Duty	HF-0	T5, T5S	210	100	3000	207	1.0
Antiwear Petroleum Base Fluids	HF-2	T5, T5S	210	100	3000	207	1.0
Non-antiwear Petroleum Base Fluids	HF-1	T5, T5S	210	100	2500	172	1.0
Crankcase Oils	HF-6	T5, T5S	210	100	3000	207	1.0
Transmission Fluids	HF-7	T5, T5S	160	71	2500	172	1.0
Water-in-Oil Invert Emulsions	HF-3	T5S only	120	49	2500	172	1.25
Water Glycols	HF-4	T5S only	120	49	2000	138	1.25
Synthetic Fluids (Phosphate Ester & Others)*	HF-5	T5S only	160	71	2500	172	1.35

†See Denison Fluids Bulletin 2002 for further information.

**TABLE V  
OPERATING SPECIFICATIONS**

Fluid Type	Denison Fluid Spec.	T5DC Continuous			**T5DC Intermittent			T5SDC Continuous			**T5SDC Intermittent		
		Speed RPM	Pressure PSI	Bar	Speed RPM	Pressure PSI	Bar	Speed RPM	Pressure PSI	Bar	Speed RPM	Pressure PSI	Bar
Antiwear Petroleum Base	HF-0 HF-2	2500	2500	172	2500	3000	207	2500	2500	172	2500	3000	207
Crankcase Oils	HF-6	2500	2500	172	2500	3000	207	2500	2500	172	2500	3000	207
*Non Antiwear Petroleum Base	HF-1	2500	2000	138	2500	2500	172	2500	2500	172	2500	3000	207
Transmission Fluids (ATF)	HF-7	—	—	—	—	—	—	2500	2000	138	2500	2500	172
Water-in-Oil Emulsions	HF-3	—	—	—	—	—	—	1800	2000	138	1800	2500	172
Water Glycols	HF-4	—	—	—	—	—	—	1800	2000	138	1800	2500	172
Synthetic Fluids	HF-5	—	—	—	—	—	—	1800	2500	172	1800	3000	207

\*Petroleum base fluid without anti-wear additives is not recommended, however, if used the reduced ratings listed apply.  
 \*\*Pressure indicated is not to exceed 12 seconds per minute of operation.

## Section III OPERATING INSTRUCTIONS

### PRE-START CHECK

Before initial starting of the pump, the following checks should be made.

- a. Check the rotation of the power source to be sure the pump will rotate in the direction indicated by the arrow on the pump identification tag.
- b. Check inlet and discharge to be sure all connections are tight and connected properly.
- c. Check all mounting bolts and flanges to be sure they are tight and properly aligned.
- d. When possible the rotating element or pump shaft should be rotated by hand to assure that it rotates freely.

### PRIMING

If the pump is installed with a positive head on the inlet, priming will be instantaneous upon start up. It is recommended that a minimum pump shaft speed of 600 RPM be obtained for priming, however, this speed will vary with different inlet and outlet conditions. When a pressure relief

valve is used at the outlet, it should be backed off to the minimum setting. When possible, an air bleed off should be provided in the circuit to facilitate purging the system of air. When it is not possible or practical to provide a positive head at the pump inlet or the installation is such that a suction lift results, the following procedure is recommended.

- a. Manually fill the pump housing with fluid.
- b. Start rotation in a jogging manner until a prime is picked up.
- c. Bleed off air that may become trapped in the pump.

To prevent possible damage to the internal parts, the pump should never be started dry or without internal lubrication.

### NOTE:

If the pump does not prime properly or pressure cannot be obtained within 15 seconds it should be shut down and condition corrected.

## Section IV MAINTENANCE

### GENERAL

The internal parts of this pump are lubricated by the operating fluid, therefore, preventative maintenance is limited to keeping the fluid in the system clean. The system filters should be replaced frequently and if a suction strainer is used it must not be allowed to become restricted. When possible, dirt should not be allowed to accumulate on the pump or around the shaft seal. All fittings and bolts should be tight.

### NOTE:

It is especially important that the suction or inlet piping and fittings be tight and in good repair to prevent air from being drawn into the system.

In the event the pump does not perform properly or a malfunction occurs, refer to the "Trouble Shooting Chart" before proceeding with an overhaul.

**TABLE VI  
TROUBLE SHOOTING**

Trouble	Probable Cause	Possible Remedy
External Leakage	<ul style="list-style-type: none"> <li>a. Seal failure</li> <li>b. Damaged casting</li> <li>c. Damaged or defective seal between housing and mounting cap.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace seal.</li> <li>b. Replace casting.</li> <li>c. Replace seal.</li> </ul>
Leakage at Fittings	<ul style="list-style-type: none"> <li>a. Cracked or damaged flange or fittings.</li> <li>b. Damaged or defective flange threads.</li> <li>c. Damaged or defective "O" ring seal.</li> <li>d. Burr on mating surfaces.</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace flange or fittings.</li> <li>b. Replace flange.</li> <li>c. Replace "O" ring seal.</li> <li>d. Remove burr.</li> </ul>
Loss in Pump RPM Under Load.	<ul style="list-style-type: none"> <li>a. Power source too small for pump being used.</li> </ul>	<ul style="list-style-type: none"> <li>a. Provide larger power source.</li> </ul>
Pump Not Delivering Oil	<ul style="list-style-type: none"> <li>a. Pump does not prime.</li> <li>b. Wrong direction on shaft rotation.</li>   <li>c. Tank fluid level too low.</li> <li>d. Fluid inlet line or suction strainer clogged or undersized.</li>   <li>e. Air leak in suction line.</li> <li>f. Fluid viscosity too heavy to pick up prime.</li> <li>g. Broken pump shaft or internal parts.</li> </ul>	<ul style="list-style-type: none"> <li>a. Bleed air from system.</li> <li>b. Reverse direction of shaft. Convert pump to reverse direction of rotation. (Check rotation arrows on Ident. plate &amp; cam ring.)</li> <li>c. Add fluid and check level to be certain suction line is submerged.</li> <li>d. Clean strainer of all foreign material. Provide proper size strainer (should have a capacity equal to 2 x pump volume in GPM).</li> <li>e. Tighten and seal connections. Replace seals.</li> <li>f. Use lighter viscosity fluid.</li> <li>g. Replace damaged parts per overhaul instructions.</li> </ul>
Pump Not Developing Pressure	<ul style="list-style-type: none"> <li>a. Relief valve setting too low.</li> <li>b. Relief valve sticking open.</li>   <li>c. Vane hold out pins not loading vanes.</li> <li>d. Free recirculation of fluid to tank being allowed.</li> </ul>	<ul style="list-style-type: none"> <li>a. Reset relief valve.</li> <li>b. Check for defective or malfunctioning valve.</li> <li>c. Disassemble and check pins &amp; pin bores for burrs or damage: Check for foreign material.</li> <li>d. Check directional control valve for open center or neutral position. Check for open bypass valve.</li> </ul>
Noisy or Erratic Operation	<ul style="list-style-type: none"> <li>a. Air leak at pump inlet or suction lines.</li>   <li>b. Housing and mounting cap separation.</li> <li>c. Restricted or clogged inlet line or strainer.</li> <li>d. Excessive pump RPM (cavitation).</li>   <li>e. Worn vanes, cam ring or port plates.</li> <li>f. Worn vane holdout pins or clogged oil feed holes in pins.</li> <li>g. Worn bearings.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check for air leaks by pouring system fluid around joints and listen for change in sound level. Tighten as required.</li> <li>b. Check bolts for proper torque.</li>   <li>c. Provide larger inlet line or strainer. Clean strainer.</li> <li>d. Provide power source that does not exceed maximum pump RPM recommendations for existing inlet conditions.</li> <li>e. Disassemble per overhaul instructions and replace worn parts.</li> <li>f. Disassemble per overhaul instructions. Replace pins if worn or clean if clogged.</li> <li>g. Disassemble and replace.</li> </ul>
Seal Failure	<ul style="list-style-type: none"> <li>a. Excessive inlet pressure.</li> </ul>	<ul style="list-style-type: none"> <li>a. Decrease inlet pressure. Inlet pressure must not exceed 15 PSI.</li> </ul>

Problems encountered not indicated in this table should be referred to the Customer Service Center or nearest Abex/Denison representative.



## Section V OVERHAUL

### GENERAL

The instructions in this section cover complete disassembly, inspection and reassembly of the Abex/Denison Model C T5DC series vane type double pumps.

As noted in the introduction on page 3, effective January 1, 1979 Model A and B T5DC series pumps and related service parts will not be available. The Model A and B T5DC series will be replaced by the Model C design modification. Under this model change the T5QDC has been discontinued, but may be serviced with Model C T5DC parts.

Model C pumps (T5DC and T5SDC) feature re-designed side plates and vanes in the "D" cartridge to improve the overall operating characteristics of the pumps. The rear shaft support bearing was originally relocated from the "D" cartridge to the "C" cartridge on the Model B units. This modification has been continued on all Model C pumps.

Servicing of the earlier Model (A and B) pumps with Model C parts requires that certain procedures be followed to gain full advantage of the design improvements. In some cases replacement of one part may require replacement of another. Below is a summary of changes to the affected parts, and how to identify Model A and B from Model C parts.

### "D" CARTRIDGE PRESSURE PLATE AND PART PLATE (See Figure VI)

Model C "D" cartridge side plates can be identified by noting the pair of  $\frac{1}{8}$ " holes drilled in the pressure ramp area of the pressure plate only. Model A and B pressure plates do not have these holes. It must also be noted that the bearing which was previously located in the "D" cartridge port plate on Model A pumps has been deleted. With the introduction of the Model B series units, this bearing was relocated to the "C" cartridge port plate. When either changing pump rotation or updating Model A and B units, both side plates must be replaced. Direction of rotation is determined from the shaft end of the pump.

### "D" CARTRIDGE VANES (See Figure VI)

Model C "D" Cartridge vanes can be identified by a pair of holes drilled into the trailing side of the vane which connect to the drain passages bridging the over and undervane areas. This modification improves the low speed operational

characteristics of the "D" cartridge.

Model A and B vanes do not have these holes.

### DRIVE SHAFT (See Figure III)

Model C shafts can be identified by noting the location of the rear bearing support area. On Model A pumps the rear bearing was located in the "D" cartridge port plate. On Model B and C units it has been relocated to the port plate in the "C" cartridge. This modification which provides increased shaft support was first introduced on Model B units and has been continued in the Model C configuration.

### "D" CARTRIDGE

Model C "D" cartridges can be identified by noting the absence of any shaft support bearing in the port plate since this bearing has been relocated to the "C" cartridge port plate on Model B and C units.

### "C" CARTRIDGE

Model C "C" cartridges can be identified by noting the shaft bearing located in the port plate. The bearing was first relocated to this position on Model B units. This modification has been continued on all Model C "C" cartridges.

### SERVICING MODEL A AND B T5DC, T5QDC AND T5SDC PUMPS

Except for the above changes, all other parts used in the Model C T5DC and T5SDC pumps are common with those used in Model A and B units. Should the entire pump be replaced, no changes in the hydraulic circuit are required.

Model C T5DC pumps are completely interchangeable with Model A and B T5DC and T5QDC pumps. Model C T5SDC pumps are completely interchangeable with Model A and B T5SDC units. It is recommended that when servicing Model A and B pumps, complete cartridges be replaced. If however, it is necessary to replace individual cartridge parts, it must be noted that service procedures and parts interchangeability vary on the earlier (Model A and B) pumps.

Replacement of one part may require others be replaced also. Determine which model pump is to be repaired by referring to the Model Code on page 14. After determination is made, refer to the tables below for individual parts replacement recommendations.

**MODEL C PARTS  
INTERCHANGEABILITY FOR  
MODEL A SERIES  
W/OUT SHAFT REPLACEMENT**

	T5DC	T5- QDC	T5- SDC
"D" CARTRIDGE	1.1	1.1	1.1
"C" CARTRIDGE	1.2	1.2	1.2
"D" PORT PLATE	1.3	1.4	1.5
"D" PRESSURE PLATE	1.6	1.4	1.5
"C" PORT PLATE	1.7	1.7	1.7
"D" SECTION VANES	1.8	1.8	1.8

- 1.1 To replace the "D" cartridge of the Model A T5DC, T5QDC and T5SDC install a Model C T5D cartridge of the proper version and displacement.
- 1.2 To replace the "C" cartridge of the Model A T5DC, T5QDC and T5SDC, remove the bearing from the proper version and displacement Model C "C" cartridge and install.
- 1.3 In the T5DC, the port plate may be replaced without replacing the pressure plate. Use Model C T5D (single pump) port plate. Vanes must also be replaced with Model C vanes if either Model C plates are installed.
- 1.4 In the T5QDC, both the port plate and pressure plate must be replaced together. Use Model C T5D (single pump) port plate and pressure plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.5 In the T5SDC, both the port plate and pressure plate must be replaced together. Use Model C T5SD (single pump) port plate and pressure plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.6 In the T5DC, the pressure plate may be replaced without replacing the port plate. Use Model C T5D (single pump) pressure plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.7 All "C" section cartridge parts may be replaced directly with Model C parts except for the port plate which must have the bearing removed before installation.
- 1.8 Model C "D" section vanes will replace Model A vanes without changing other parts. All ten vanes must be replaced.

**MODEL C PARTS  
INTERCHANGEABILITY FOR  
MODEL B SERIES  
AND MODEL A SERIES WITH  
SHAFT REPLACEMENT**

	T5DC	T5- QDC	T5- SDC
"D" CARTRIDGE	1.1	1.1	1.1
"C" CARTRIDGE	1.2	1.2	1.2
"D" PORT PLATE	1.3	1.4	1.5
"D" PRESSURE PLATE	1.6	1.4	1.5
"C" PORT PLATE	1.7	1.7	1.7
"D" SECTION VANES	1.8	1.8	1.8

- 1.1 To replace the "D" cartridge of the Model A or B T5DC, T5QDC and T5SDC install Model C "D" cartridge of the proper version and displacement.
- 1.2 To replace the "C" cartridge of the Model A or B T5DC, T5QDC and T5SDC, install Model C "C" cartridge of the proper version and displacement.
- 1.3 In the T5DC the port plate may be replaced without replacing the pressure plate. Use Model C "D" section T5DC port plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.4 In the T5QDC, both the port plate and pressure plate must be replaced together. Use Model C T5DC port plate and pressure plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.5 In the T5SDC, both the port plate and pressure plate must be replaced together. Use Model C T5SDC port plate and pressure plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.6 In the T5DC, the pressure plate may be replaced without replacing the port plate. Use Model C "D" section T5DC port plate. Vanes must also be replaced with Model C vanes if Model C plates are installed.
- 1.7 Use Model C "C" section port plate to replace Model A port plate.
- 1.8 Model C "D" section vanes will replace Model A or B vanes without changing other parts. All ten vanes must be replaced.

## SPECIAL TOOLS

No special tools, other than a shaft seal driver, are required to repair these pumps. This tool should be used to install the shaft seal properly. See Figure II to make this special tool.

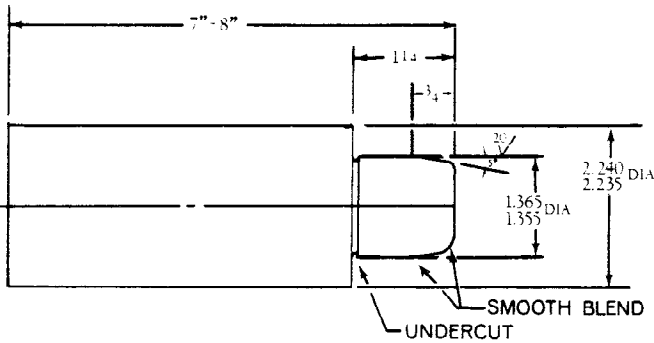


FIG. II

## DISASSEMBLY AND INSPECTION FIGURE VII

Sometimes a malfunction in the small section of the pump, "C" cartridge (P2), can be corrected without removing the pump from the power source. To service the large section, "D" cartridge, (P1) the complete pump must be removed.

1. Drain all fluid from the pump and thoroughly clean the exterior surface.
2. Prepare a clean, lint free surface on which to lay the internal parts for inspection and repair.
3. Inspect all internal parts for scratches, nicks and excessive wear. Slight imperfections may be removed with a fine India stone.
4. All parts must be cleaned with a suitable solvent and dried with clean, dry compressed air. Protect parts from dirt and rust until time of assembly with a film of clean hydraulic fluid.
5. During assembly all lapped and ground surfaces must be lubricated with clean hydraulic fluid. Use extreme care not to damage these surfaces.

Secure the pump in a vise or other suitable holding fixture with the shaft (11) extended down.

Note position of the two outlet ports (P1 & P2) with reference to the inlet port in the center housing (5) before removing any screws so that the two outlet ports may be returned to their original position at reassembly. Discard all seals as they are removed.

## A. END CAP

1. Remove the seven screws (1) from the end cap (2). Remove the end cap by rotating it on the center housing before pulling outward. Remove the rubber seal (3) from the end cap.
2. Remove the "C" unitized cartridge (4) from the center housing (5) and lay aside on a clean surface for disassembly and inspection later. See page 16, Figure V for cartridge disassembly and assembly instructions.

## B. SHAFT END

2. Remove the four screws (15) and separate the center housing (5) from the mounting flange (14). Items 6 through 14 will be removed as a unit. Firmly grasp the unitized cartridge assembly (6) and while rotating it, pull outward to remove the complete cartridge from the mounting flange and lay aside on a clean surface for disassembly and inspection later. See page 20, Figure VI for cartridge disassembly and assembly instructions.
2. Remove the rubber seal (13) from the mounting flange. Remove retaining ring (7) and press the shaft and bearing assembly (items 8, 9, 10 and 11) from the mounting flange. Remove shaft seal (12) from the mounting flange.

## C. SHAFT

1. Examine the ball bearing (9) for wear before removing it from the shaft. Apply a little pressure to the outer race and rotate the bearing to check the balls and race for wear or cracks and check for looseness. Remove the bearing from the shaft if a replacement is needed. Inspect the outside diameter of the shaft at the point of contact with bearing in the "C" cartridge ("D" cartridge on Model A) and the sealing surface for the shaft seal. *Do not remove the bearing from the shaft if both are reusable.*

Omit the next procedure if not required.

2. Remove retaining ring (8) and press bearing (9) from the shaft (11). Remove retaining ring (10).

## NOTE

See Figure III for critical areas on the shaft.

## WARNING

Retaining ring (10) *must* be removed by passing over the bearing surface of the shaft and *never* over the shaft seal surface. A damaged seal surface will cause the shaft seal to leak.

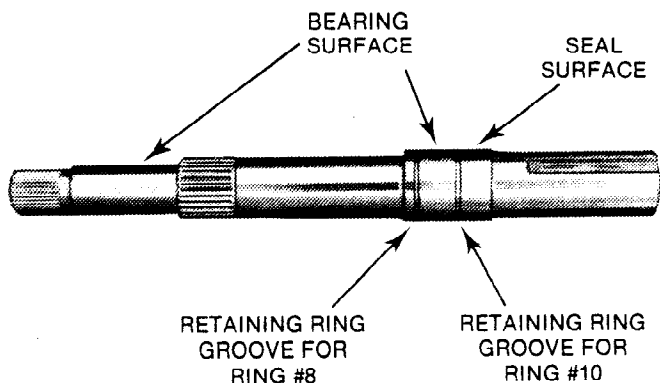


FIG. III

## REASSEMBLY FIGURE VII

Immerse the seals and bearing in clean hydraulic fluid to make the reassembly easier and to provide initial lubrication.

### A. SHAFT END

1. Place the mounting flange (14) on a clean surface with the large open end facing up. Use a shaft seal driver (See Figure II) and install the shaft seal (12) in the flange (14). Make certain the open side of the seal is toward the inside of the mounting flange. The shaft seal driver will prevent damage to the seal during installation.
2. Install retaining ring (10) in the groove between the bearing surface and the seal surface. *Do not allow the retaining ring to touch the seal surface on the shaft.* Press bearing (9) over the same end of the shaft and install retaining ring (8). See Figure III. Be sure retaining rings (8 & 10) are fully seated in grooves.
3. Apply lubricating fluid to the inside of the shaft seal (12) and install the shaft assembly (8, 9, 10 and 11) in the mounting flange (14).
4. Install retaining ring (7) in the mounting flange (14) and against the bearing (9) to hold the shaft assembly in place. Make certain retaining ring (7) is fully seated in the groove.

5. Install seal (13) on the pilot of the mounting flange (14).

### B. CENTER HOUSING AND "D" UNITIZED CARTRIDGE (P1)

1. Place the center housing (5) on a clean flat surface with the large open end up and install the "D" unitized cartridge assembly (6) in the housing. Make certain that Driv-Lok pin (Fig. VI, Item 6c) enters the drilled hole in the housing.
2. Apply lubricating fluid to the two seals on the cartridge (6) and seal (13) on the mounting flange (14). This fluid will lessen the chance of damaging the seals when installing the mounting flange.
3. Install the mounting flange (14) with the attached shaft assembly by inserting the shaft through the cartridge assembly and into the center housing (5). Rotate the shaft to engage the spline in the rotor.

## NOTE

Position the P1 outlet port in the mounting flange (14) and the inlet port in the center housing (5) in required position by turning the mounting flange.

4. Install the four screws (15) and torque to 135 ft./lbs.

### C. "C" UNITIZED CARTRIDGE (P2) AND END CAP

1. Install the "C" unitized cartridge assembly (4) in the small end of the center housing (5). Make certain that the Driv-Lok pin (Fig. V, Item 4b) enters the drilled hole in the housing.
2. Install rubber seal (3) on end cap (2).
3. Apply lubricating fluid to the two seals on the cartridge (4) and to seal (3) on the end cap (2).
4. Install end cap (2) over the exposed end of cartridge (4) and rotate until the P2 outlet is in the desired position.
5. Install the seven screws (1) and torque to 50 ft./lbs.

## UNITIZED PUMPING CARTRIDGES

The unitized pumping cartridges used in the T5DC and T5SDC series pump function in the same manner, however, due to the cartridge arrangement when installed in the pump, different assembly procedures *must* be followed for each cartridge.

It is recommended that a complete preassembled and pretested unitized cartridge be used when it becomes necessary to perform changes or over-

haul in the field. In the event it is desired to change or overhaul a unitized cartridge, the service man must be aware of the different assembly procedures required of the two cartridges.

Refer to Figure IV and observe the general line up of components and the position of the port plates and pressure plates of each unitized cartridge.

Before performing work on the "C" cartridge (P2), refer to Figure V and observe the location of the dowel pins in the port plate, pressure plate and cam ring. When viewing this cartridge from the port plate end, a *right-hand (CW)* assembly will have the directional arrow on the cam ring pointing left-hand (CCW). For a *left-hand (CCW)* assembly will have the directional arrow on the cam ring pointing right-hand (CW).

*assembly* the arrow will be pointing left-hand (CCW).

Before performing work on the "D" cartridge (P1), refer to Figure VI and observe the difference between the left-hand and right-hand plates. These plates are made for one rotation only. When viewing this cartridge from the port plate end, a *right-hand (CW)* assembly will have the directional arrow on the cam ring pointing left-hand (CCW). For a *left-hand (CCW)* assembly the arrow will be pointing right-hand (CW).

To insure proper pump operation, it is *imperative* that the following procedure be used when performing a cartridge overhaul.

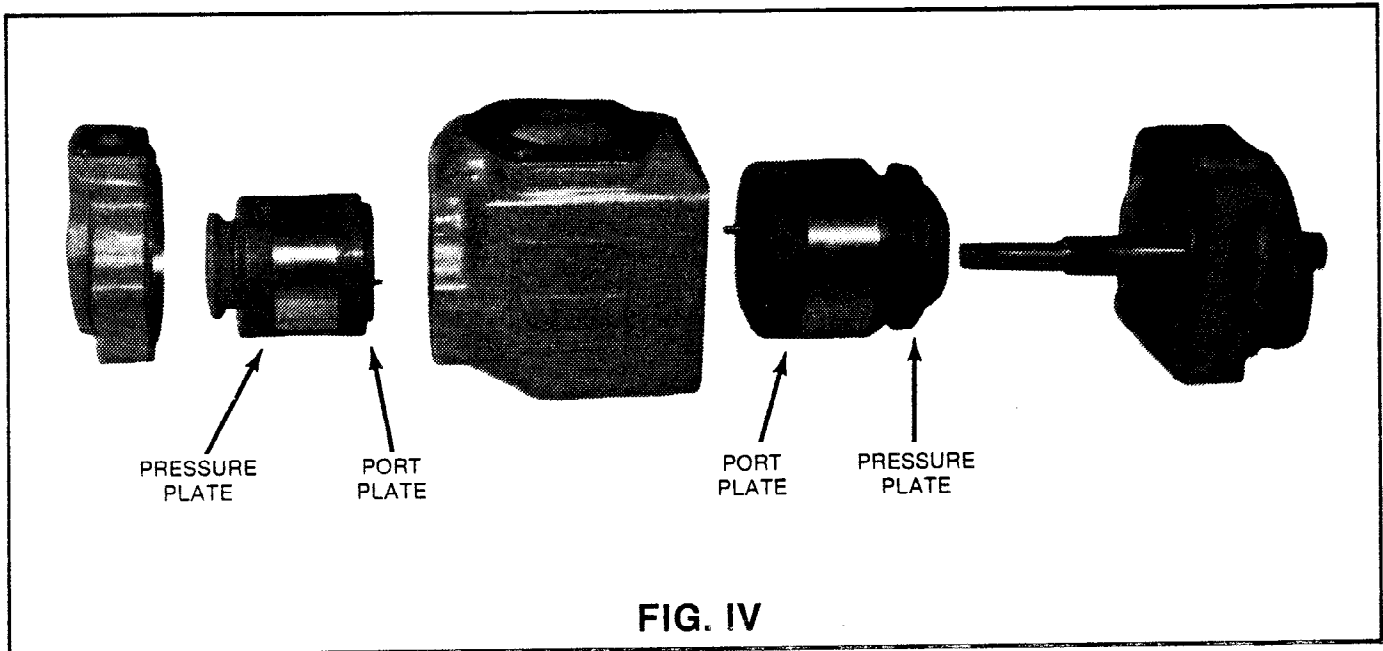


FIG. IV

# Model Number Code SERIES T5DC & T5SDC

Vane double pump series  
 Insert an "S" at the asterisk (\*)  
 for the severe duty pump.

T5\* DC 045 025 3 R00 C1 \* \*

Shaft end pump, outlet P2  
 "D" group (gpm at 1200 rpm ref.)

Code	gpm	L/min	Code	gpm	L/min
028	28	106	038	38	144
031	31	117	042	42	159
035	35	132	045	45	170

Cap end pump, outlet P2  
 "C" group (gpm at 1200 rpm ref.)

Code	gpm	L/min	Code	gpm	L/min
005	5	19	017	17	64
008	8	30	022	22	83
010	10	38	025	25	95

Special  
 Modification

Fluid Class  
 1. Compatible with Buna N  
 5. Compatible with Viton  
 (std for "S" pumps)

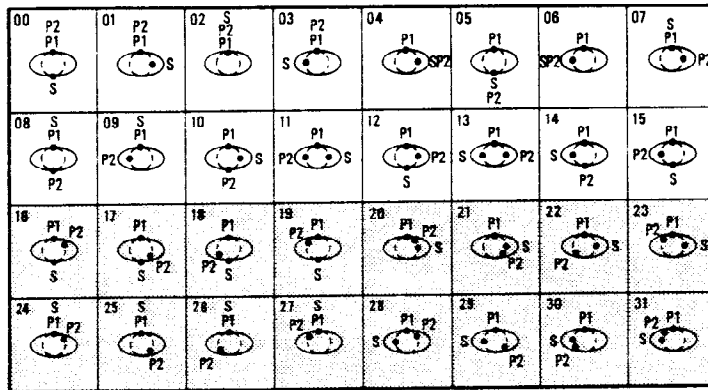
Design letter — subject  
 to change by mfr.

Port Combination see below

Shaft rotation (viewed from shaft end), R or L

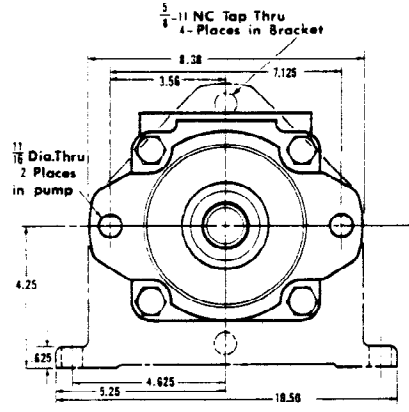
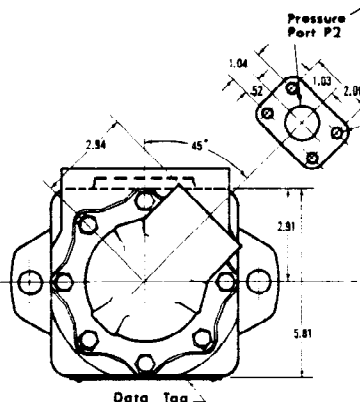
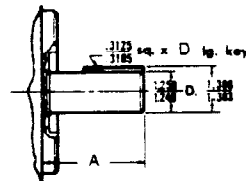
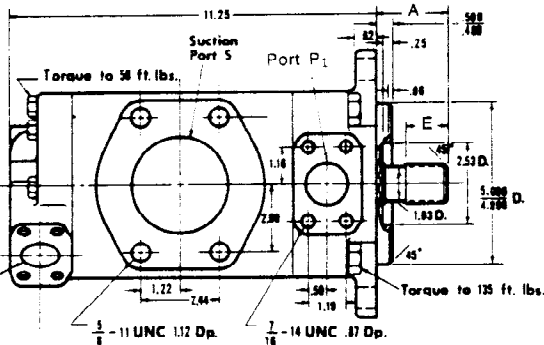
- Shaft
1. Keyed SAE-C
  2. Keyed Non SAE
  3. Splined SAE-C
  4. Splined Non SAE

S = SUCTION INLET; P1 = SHAFT END PUMP; P2 = CAP END PUMP



## DIMENSIONS

SHAFT DIMENSIONS								
Shaft Code	Shaft Type	Shaft Std.	Shaft Lgth.	Key Dimensions			Spine Lgth.	
				Square Key Sec.	Dim. Over Key	Lgth. of Key		
				A	B	C	D	E
1	Keyed	SAE-C	3.31	.3125	1.386	1.383	1.94	-
2	Splined	SAE-C	2.19	-	-	-	-	1.25
2	Keyed	Non SAE	2.88	.3125	1.386	1.383	1.50	-
4	Splined	Non SAE	3.06	-	-	-	-	1.86



# UNITIZED PUMPING CARTRIDGE ASSEMBLY

## Item 4 "C" Size (P2)

### GENERAL

The disassembly and reassembly instructions in this section although aimed primarily towards repair of Model C "C" cartridges (P1), apply also to Model A and B "C" cartridges. As noted on page 9, the T5QDC has been discontinued, but servicing of this unit may be accomplished with Model C T5DC parts.

### NOTE

On Model A pumps if the shaft has not been replaced, the bearing located in the "C" cartridge port plate must be removed before cartridge installation.

### DISASSEMBLY

1. Remove the two screws (4a) and the port plate (4c). The Driv-Lok pin (4b) is pressed into the port plate and should not be removed unless damaged and replacement is required.
2. Remove dowel pin (4d) cam ring (4e) and dowel pin (4j).
3. Remove the vanes (4f), and the pins (4g) from the rotor.
4. Remove the seals (4m and 4n) from the pressure plate.

Wash all the metal parts in cleaning solvent and dry thoroughly. Discard the rubber seals. Place all the parts on a clean lint free surface and inspect for wear marks, nicks and burrs. Light scoring on the wear surfaces of the port plate and pressure plate may be removed by lapping. The vanes must move freely in the rotor slots and not bind or have excessive play. The edges of the vanes and the rotor slots may be stoned with a fine India stone to remove all burrs. Inspect the cam ring for excessive wear (ripples or washboard marks on the contour). Replace a badly worn or defective cam ring and any parts that can not be reconditioned.

All metal parts that have been lapped or stoned, must be washed again in clean solvent and dried before they are assembled.

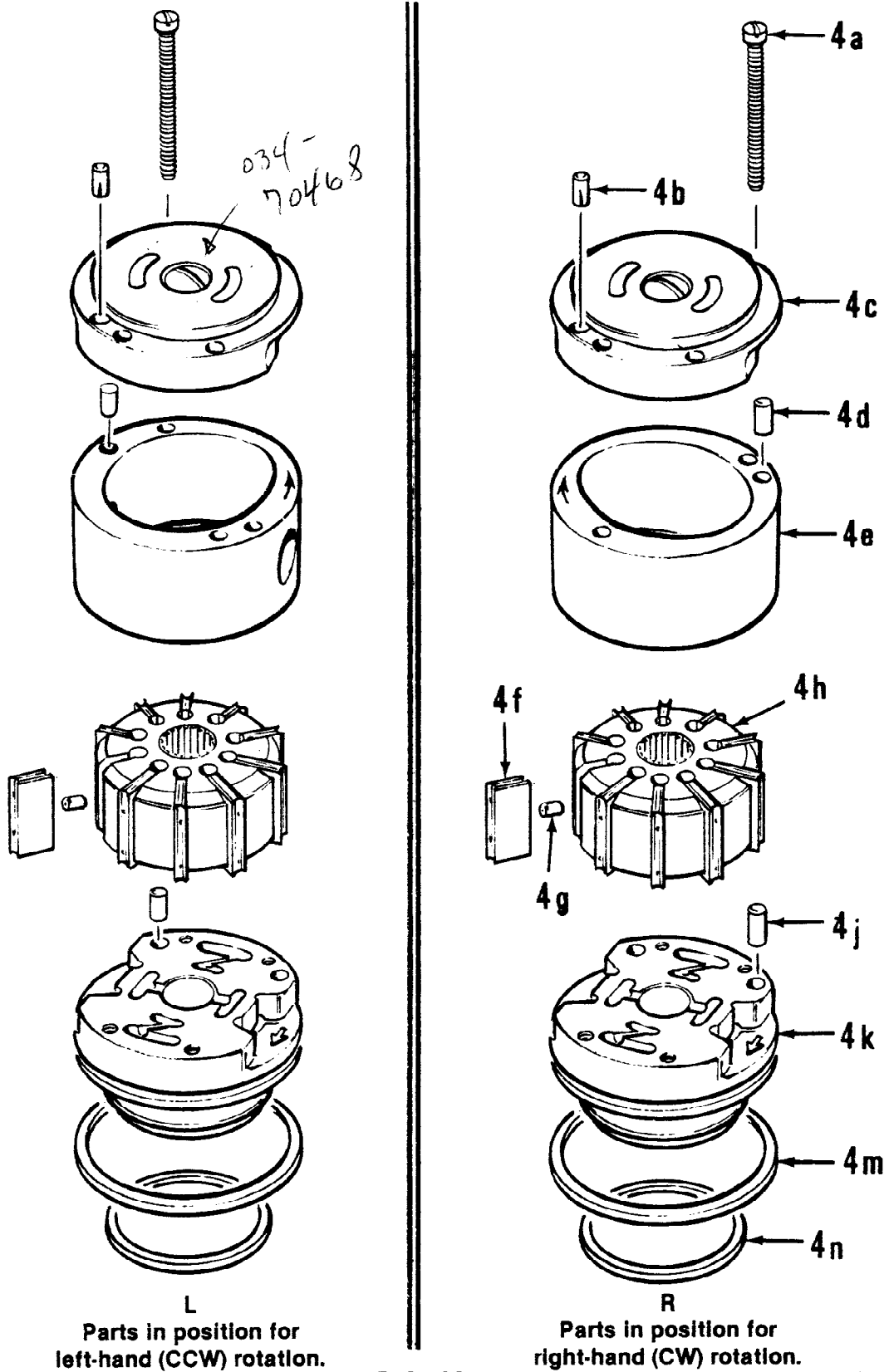
Make certain that all internal passages in the port plate, pressure plate, rotor, vanes and vane pins are open and clean.

### REASSEMBLY

The "C" cartridge is made up using the same parts regardless of the direction of rotation. Refer to page 16, Figure V and observe that screws (4a) and dowel pins (4d and 4j) are not inserted in the same holes for left-hand (CCW) as for right-hand (CW) operation. The arrow on the cam ring (4e) must point in the direction that the pump is intended to run.

1. Place the pressure plate (4k) on a clean flat surface with the wear face up and apply clean hydraulic fluid to the face.  
*Again, check the rotation of the pump where this cartridge will be used.*
2. Insert dowel pin (4j) in the pressure plate using the hole nearest the arrow that indicates the desired rotation.
3. Center the rotor assembly (4h) on the pressure plate with the splined side of the rotor up.
4. Insert one vane holdout pin (4g) in each vane slot in the rotor assembly. The holdout pins must move freely and be inserted against the bottom of the hole.
5. Install the vanes (4f) in the rotor with the bottom of the vane toward the center of the rotor. (The bottom is the precision ground flat surface).
6. Place the cam ring (4e) over the dowel pin (4j). *The arrow on the cam ring must indicate the same direction as the arrow which is closer to dowel pin (4j) in the pressure plate (4k).*
7. Install dowel pin (4d) in the cam ring. If the Driv-Lok pin (4b) was removed from the port plate (4c), it must be replaced.
8. If removed, press the Driv-Lok pin (4b) into the hole provided in the back of the port plate (4c) (grooved end first).
9. Pour clean hydraulic fluid over the cam ring and rotor assembly and install the port plate assembly (4c) over the dowel pin (4d). The port plate must be positioned to allow the two screws (4a) to pass through the cam ring and enter the pressure plate.
10. Insert the two screws (4a) and tighten. Install seals (4m) and (4n) on the pressure plate.

**"C" UNITIZED CARTRIDGE (P2)  
for T5DC & T5SDC**





## T5DC and T5SDC "C" UNITIZED CARTRIDGE PARTS LIST

(Cap End of Pump) REFER TO FIG. V

ITEM 4 UNITIZED CARTRIDGE ASSEMBLY "C" SIZE FOR T5SDC*		These parts and common parts listed below are a complete T5SDC "C" Size Unitized Cartridge Assembly			
Right Hand (CW) or Left Hand (CCW)		4c Port Plate Assembly	4e Cam Ring	4m Seal	4n Seal
Model No.	Code No.				
T5SDC-005-R T5SDC-005-L	S14-28469 S14-28470	S14-28450	034-70741	695-20238	695-20229
T5SDC-008-R T5SDC-008-L	S14-28471 S14-28472		034-70742		
T5SDC-010-R T5SDC-010-L	S14-28473 S14-28474		034-70743		
T5SDC-014-R T5SDC-014-L	S14-28475 S14-28476		034-70744		
T5SDC-017-R T5SDC-017-L	S14-28477 S14-28478		034-70745		
T5SDC-022-R T5SDC-022-L	S14-28479 S14-28480		034-70746		
T5SDC-025-R T5SDC-025-L	S14-40693 S14-40694		034-70874		
QTY.	1		1		

ITEM 4 UNITIZED CARTRIDGE ASSEMBLY "C" SIZE FOR T5DC*		These parts and common parts listed below are a complete T5DC "C" size Unitized Cartridge Assembly			
Right Hand (CW) or Left Hand (CCW)		4c Port Plate Assembly	4e Cam Ring	4m Seal	4n Seal
Model No.	Code No.				
T5DC-005-R T5DC-005-L	S14-42558 S14-42559	S14-42586	034-48782	691-10238	691-10229
T5DC-008-R T5DC-008-L	S14-42560 S14-42561		034-48784		
T5DC-010-R T5DC-010-L	S14-42562 S14-42563		034-48573		
T5DC-014-R T5DC-014-L	S14-42564 S14-42565		034-48574		
T5DC-017-R T5DC-017-L	S14-42566 S14-42567		034-48575		
T5DC-022-R T5DC-022-L	S14-42568 S14-42569		034-48576		
T5DC-025-R T5DC-025-L	S14-42570 S14-42571		034-70337		
QTY.	1		1		

\*For use with petroleum base fluids.

\*\*For use with fire resistance fluids and severe duty applications.

## COMMON "C" UNITIZED CARTRIDGE PARTS FOR ALL MODELS

Item	Qty	Part No.	Description
4a	2	317-06266	$\frac{9}{32} \times 2\frac{1}{4}$ Fillister hd. screw
4b	1	323-82010	$\frac{3}{16}$ dia x $\frac{1}{2}$ Driv-Lok Pin
4d	1	324-21208	$\frac{3}{16}$ dia x $\frac{1}{2}$ dowel pin
4f	10	034-48577	Vane

Item	Qty	Part No.	Description
4g	10	034-24982	Vane holdout pin
4h	1	S14-23178	Rotor assembly
4j	1	324-21208	$\frac{3}{16}$ dia x $\frac{1}{2}$ dowel pin
4k	1	034-48571	Pressure plate

## UNITIZED PUMPING CARTRIDGE ASSEMBLY

### Item 6 "D" Size (P1)

### GENERAL

The disassembly and reassembly instructions contained in this section although aimed primarily towards repair of Model C "D" cartridges (P1), apply also to the servicing of Model A and B "D" cartridges. The T5QDC has been discontinued, but servicing of this unit may be accomplished with Model C T5DC parts. The service procedures vary on the Model A and B "D" cartridges, and the replacement of one part may require others to be replaced also.

Refer to pages 9 and 10 for Model C parts identification and interchangeability recommendations.

### DISASSEMBLY

1. Remove the four screws (6a), lockwashers (6b) and the port plate (6d). The Driv-Lok pin (6c) is pressed into the port plate and should not be removed unless damaged and replacement is required.
2. Remove dowel pin (6e), cam ring (6f) and dowel pin (6k).
3. Remove the vanes (6g), and the pins (6h) from the rotor (6j).

Note the position of the chamfer on one bottom corner of the vane. Vanes must be returned to this position if the rotation remains the same after reassembly.

4. Remove the seals (6h) and (6p) from the pressure plate (6m).

Wash all the metal parts in cleaning solvent and dry thoroughly. Discard the rubber seals.

Place all the parts on a clean lint free surface and inspect for wear marks, nicks and burrs. Light scoring on the wear surfaces of the port plates may be removed by lapping. The vanes must move freely in the rotor slots and not bind or have excessive play. The edge of the vanes and the rotor slots may be stoned with a fine India stone to remove all burrs. Inspect the cam ring for excessive wear (ripples or washboard marks on the contour). Replace a badly worn or defective cam ring and any parts that can not be reconditioned. All

metal parts that have been lapped or stoned must be washed again in clean solvent and dried before they are assembled.

Make certain that all internal passages in the port plate, rotor, vanes and vane pins are open and clean.

### REASSEMBLY

#### NOTE

Refer to pages 21, 22 and 23 for correct part numbers for a specific model (CW or CCW). The Port Plates and Cartridges are designed for either direction and are not interchangeable. All other Cartridge parts are interchangeable. See Fig. VI.

1. Place pressure plate (6m) on a clean bench with the wear face up and apply clean hydraulic fluid. Install dowel pin (6k) in pressure plate.
2. Center the rotor (6j) on the pressure plate with the splined side of the rotor up.
3. Insert one vane pin (6h) in each vane slot in the rotor. The pins must move freely and be inserted against the bottom of the hole.

#### CAUTION

The vanes must be installed properly for the pump to function. Examine the vanes very closely and notice the precision finish on the bottom of the vane and that the two drilled holes on the bottom are smaller than the holes on top of the vanes.

Also observe that one corner has been removed to indicate that this is the leading edge of the vane.

4. Install the vanes (6g) in the rotor with the bottom of the vane toward the center of the rotor and the leading edge in the direction of rotation.

#### NOTE

When the vanes are in position for a left-hand pump, the marked corner of the vane will be visible to the assembler. In right-hand

models, the marked corner must be against the pressure plate (6m) and is not visible to the assembler.

5. Install the cam ring (6f) over the dowel pin (6k) with the arrow pointing in the direction that the pump is intended to run. Install dowel pin (6e) in cam ring.

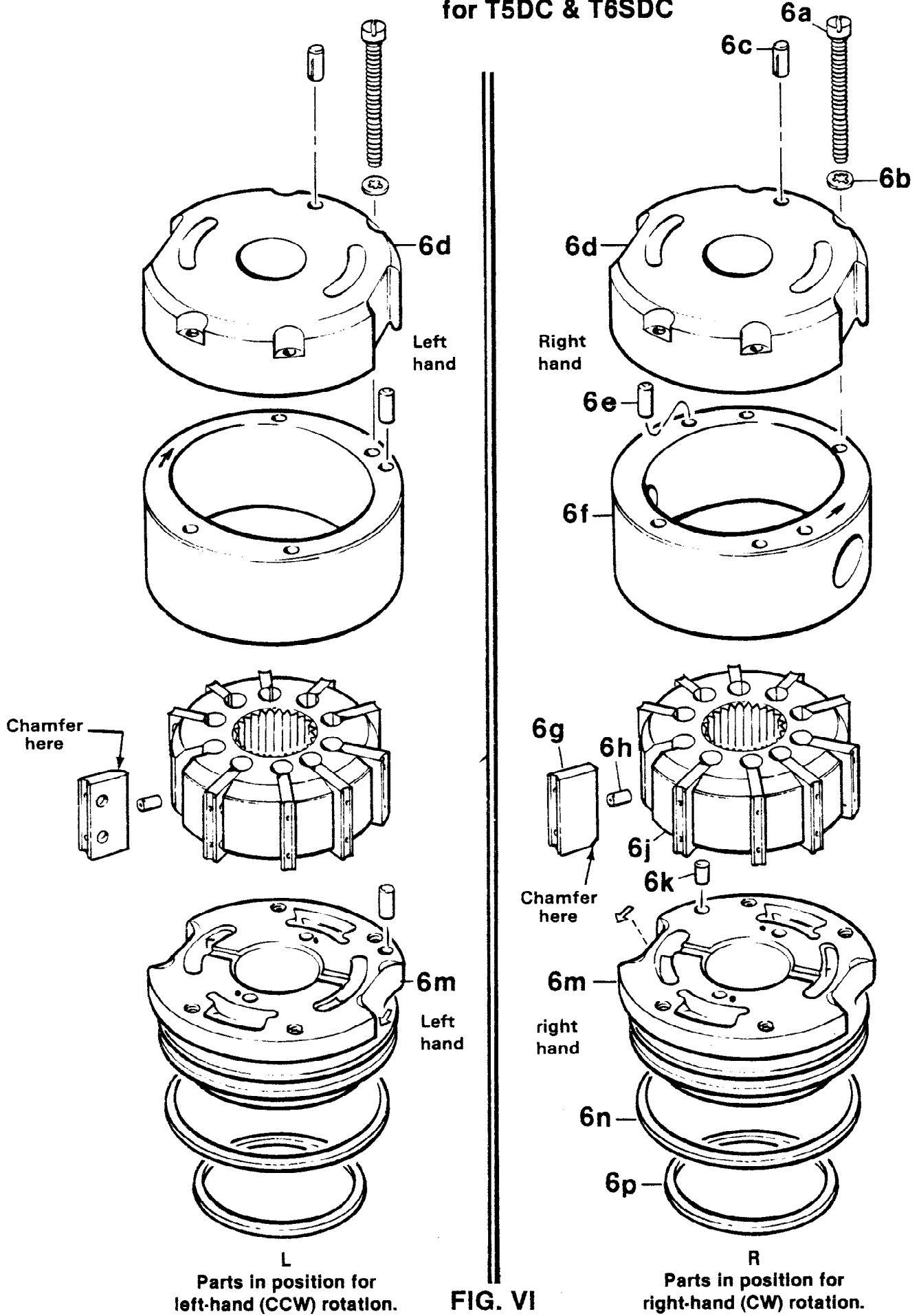
### **NOTE**

The arrow on the cam ring must indicate the same direction as the stamped arrow on the pressure plate, also the leading edge of the vane must be in the cor-

rect position. See vane positioning in note above.

6. If removed, press the Driv-Lok pin (6c) into the back of the port plate (6d) (Grooved End First).
7. Pour clean hydraulic fluid over the cam ring and rotor and install the port plate (6d) over the dowel pin (6k).
8. Insert the four screws (6a) and lockwashers (6b) through the port plate (6d), cam ring (6f) and into the pressure plate (6m) and tighten with a screw driver. Install seals (6n) and (6p) on the pressure plate.

**"D" UNITIZED CARTRIDGE (P1)  
for T5DC & T6SDC**



**FIG. VI**

## MODEL A T5DC, T5QDC AND T5SDC UNITIZED CARTRIDGE PARTS LIST WITHOUT SHAFT REPLACEMENT

ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5DC*		These parts and common parts listed below are a complete T5DC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation		S14-26824	034-48532 034-48533 034-48534 034-48535 034-48536 034-48537	034-72328	691-10232	691-10244
T5DC-028-R	S14-53688					
T5DC-031-R	S14-53690					
T5DC-035-R	S14-53692					
T5DC-038-R	S14-53694					
T5DC-042-R	S14-53696					
T5DC-045-R	S14-53698					
Left Hand or CCW Rotation		S14-26825	034-48532 034-48533 034-48534 034-48535 034-48536 034-48537	034-72237		
T5DC-028-L	S14-53689					
T5DC-031-L	S14-53691					
T5DC-035-L	S14-53693					
T5DC-038-L	S14-53695					
T5DC-042-L	S14-46215					
T5DC-045-L	S14-53699					
QTY.	1	1	1	1	1	1

ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5SDC**		These parts and common parts listed below are a complete T5SDC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation		S14-53713	034-70747 034-70748 034-70749 034-70750 034-70751 034-70752	034-72328	695-20232	695-20244
T5SDC-028-R	S14-53700-5					
T5SDC-031-R	S14-53702-5					
T5SDC-035-R	S14-53704-5					
T5SDC-038-R	S14-53706-5					
T5SDC-042-R	S14-53708-5					
T5SDC-045-R	S14-53710-5					
Left Hand or CCW Rotation		S14-53697	034-70747 034-70748 034-70749 034-70750 034-70751 034-70752	034-72237		
T5SDC-028-L	S14-53701-5					
T5SDC-031-L	S14-53703-5					
T5SDC-035-L	S14-53705-5					
T5SDC-038-L	S14-53707-5					
T5SDC-042-L	S14-53709-5					
T5SDC-045-L	S14-53711-5					
QTY.	1	1	1	1	1	1

\*For use with petroleum base fluids.

\*\*For use with fire resistant fluids and severe duty applications.

### COMMON "D" UNITIZED CARTRIDGE PARTS FOR ALL MODELS

Item	Qty	Part No.	Description	Item	Qty	Part No.	Description
6a	4	317-10320	10-24 x 3 Fillister hd. screw	6g	10	034-72190	Vane
6b	4	348-10010	Lock Washer	6h	10	034-24984	Vane holdout pin
6c	1	323-82004	1/4 x 3/4 Driv-Lok Pin	6j	1	S14-22869	Rotor Assembly
6e	1	324-21612	1/4 x 3/4 dowel pin	6k	1	324-21612	1/4 x 3/4 dowel pin

## MODEL C T5DC & T5SDC "D" UNITIZED CARTRIDGE PARTS LIST

ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5DC*		These parts and common parts listed below are a complete T5DC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation						
T5DC-028-R	S14-53712	034-48991	034-48532	034-72328	691-10232	691-10244
T5DC-031-R	S14-53714		034-48533			
T5DC-035-R	S14-53716		034-48534			
T5DC-038-R	S14-53718		034-48535			
T5DC-042-R	S14-53720		034-48536			
T5DC-045-R	S14-53722		034-48537			
Left Hand or CCW Rotation						
T5DC-028-L	S14-46216	034-48990	034-48532	034-72237		
T5DC-031-L	S14-53715		034-48533			
T5DC-035-L	S14-53717		034-48534			
T5DC-038-L	S14-53719		034-48535			
T5DC-042-L	S14-53721		034-48536			
T5DC-045-L	S14-53723		034-48537			
QTY.	1	1	1	1	1	1

ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5SDC**		These parts and common parts listed below are a complete T5SDC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation						
T5SDC-028-R	S14-53724-5	034-48991	034-70747	034-72328	695-20232	695-20244
T5SDC-031-R	S14-53726-5		034-70748			
T5SDC-035-R	S14-53728-5		034-70749			
T5SDC-038-R	S14-53730-5		034-70750			
T5SDC-042-R	S14-53732-5		034-70751			
T5SDC-045-R	S14-53734-5		034-70752			
Left Hand or CCW Rotation						
T5SDC-028-L	S14-53725-5	034-48990	034-70747	034-72237		
T5SDC-031-L	S14-53727-5		034-70748			
T5SDC-035-L	S14-53729-5		034-70749			
T5SDC-038-L	S14-53731-5		034-70750			
T5SDC-042-L	S14-53733-5		034-70751			
T5SDC-045-L	S14-53735-5		034-70752			
QTY.	1	1	1	1	1	1

\*For use with petroleum base fluids.

\*\*For use with fire resistant fluids and severe duty applications.

### COMMON "D" UNITIZED CARTRIDGE PARTS FOR ALL MODELS

Item	Qty	Part No.	Description	Item	Qty	Part No.	Description
6a	4	317-10320	10-24 x 3 Fillister hd. screw	6g	10	034-72190	Vane
6b	4	348-10010	Lock Washer	6h	10	034-24984	Vane holdout pin
6c	1	323-82004	1/4 x 3/4 Driv-Lok Pin	6j	1	S14-22869	Rotor Assembly
6e	1	324-21612	1/4 x 3/4 dowel pin	6k	1	324-21612	1/4 x 3/4 dowel pin

**MODEL B AND MODEL A  
T5DC, T5QDC AND T5SDC UNITIZED CARTRIDGE PARTS LIST  
WITH SHAFT REPLACEMENT**

ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5DC*		These parts and common parts listed below are a complete T5DC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation						
T5DC-028-R	S14-53712	034-48991	034-48532	034-72328	691-10232	691-10244
T5DC-031-R	S14-53713		034-48533			
T5DC-035-R	S14-53715		034-48534			
T5DC-038-R	S14-53717		034-48535			
T5DC-042-R	S14-53720		034-48536			
T5DC-045-R	S14-53722		034-48537			
Left Hand or CCW Rotation						
T5DC-028-L	S14-46216	034-48990	034-48532	034-72237		
T5DC-031-L	S14-53714		034-48533			
T5DC-035-L	S14-53716		034-48534			
T5DC-038-L	S14-53718		034-48535			
T5DC-042-L	S14-53721		034-48536			
T5DC-045-L	S14-53723		034-48537			
QTY.	1	1	1	1	1	1
ITEM 6 UNITIZED CARTRIDGE ASSEMBLY "D" SIZE FOR T5SDC**		These parts and common parts listed below are a complete T5SDC "D" size Unitized Cartridge Assembly				
Model No.	Code No.	6d Port Plate	6f Cam Ring	6m Pressure Plate	6n Seal	6p Seal
Right Hand or CW Rotation						
T5SDC-028-R	S14-53724-5	034-48991	034-70747	034-72328	695-20232	695-20244
T5SDC-031-R	S14-53726-5		034-70748			
T5SDC-035-R	S14-53728-5		034-70749			
T5SDC-038-R	S14-53730-5		034-70750			
T5SDC-042-R	S14-53732-5		034-70751			
T5SDC-045-R	S14-53734-5		034-70752			
Left Hand or CCW Rotation						
T5SDC-028-L	S14-53725-5	034-48990	034-70747	034-72237		
T5SDC-031-L	S14-53727-5		034-70748			
T5SDC-035-L	S14-53729-5		034-70749			
T5SDC-038-L	S14-53731-5		034-70750			
T5SDC-042-L	S14-53733-5		034-70751			
T5SDC-045-L	S14-53735-5		034-70752			
QTY.	1	1	1	1	1	1

\*For use with petroleum base fluids.

\*\*For use with fire resistant fluids and severe duty applications.

**COMMON "D" UNITIZED CARTRIDGE PARTS FOR ALL MODELS**

Item	Qty	Part No.	Description
6a	4	317-10320	10-24 x 3 Fillister hd. screw
6b	4	348-10010	Lock Washer
6c	1	323-82004	1/4 x 3/4 Driv-Lok Pin
6e	1	324-21612	1/4 x 3/4 dowel pin

Item	Qty	Part No.	Description
6g	10	034-72190	Vane
6h	10	034-24984	Vane holdout pin
6j	1	S14-22869	Rotor Assembly
6k	1	324-21612	1/4 x 3/4 dowel pin

## T5DC & T5SDC PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	7	306-40111	HEX HEAD CAP SCREW 3/8-16 x 2
2	1	034-48579	END CAP (P2)
3	1	*671-10156 **695-10156	SQUARE SECTION SEAL #156 SQUARE SECTION SEAL #156
4	1	See Page 17 AND FIGURE V	"C" UNITIZED CARTRIDGE ASSY. (P2)
4	1		
5	1	034-48133	CENTER HOUSING
6	1	SEE PAGES 21, 22 & 23 AND FIGURE VI	"D" UNITIZED CARTRIDGE ASSY. (P1)
7	1	356-32283	INTERNAL SNAP RING 5008-283
8	1	034-70853	EXTERNAL SNAP RING 5100-137
9	1	230-00207	BALL BEARING
10	1	034-70853	EXTERNAL SNAP RING 5100-137
11	1	034-71361	SPLINED SHAFT (STD.) CONTAINED IN S14-42518 BELOW
	1	034-71362	SPLINED SHAFT (OPT.) CONTAINED IN S14-42519 BELOW
	1	034-71363	KEYED SHAFT (STD.) CONTAINED IN S14-42520 BELOW
	1	034-71364	KEYED SHAFT (OPT.) CONTAINED IN S14-42521 BELOW
	1	034-46754	KEY (USE WITH 034-71363 SHAFT)
	1	034-49676	KEY (USE WITH 034-71364 SHAFT)
12	1	*620-82062 **620-82066	SHAFT SEAL SHAFT SEAL
13	1	*671-10159 **695-10159	SQUARE SECTION SEAL SQUARE SECTION SEAL
14	1	034-48135	MOUNTING FLANGE
15	4	306-40156	HEX HEAD CAP SCREW 5/8-11 x 3
	1	*S14-20467	SEAL KIT FOR T5DC
	1	**S14-20467-5	SEAL KIT FOR T5SDC
	1	S14-42518	SHAFT ASSY. (ITEMS 8, 9, 10 & 11)
	1	S14-42519	SHAFT ASSY. (ITEMS 8, 9, 10 & 11)
	1	S14-42520	SHAFT ASSY. (ITEMS 8, 9, 10 & 11 W/KEY 034-46754)
	1	S14-42521	SHAFT ASSY. (ITEMS 8, 9, 10 & 11 W/KEY 034-49676)

## FLUID CONNECTION KITS (OPTIONAL) T5DC & T5SDC

Port Size & Location	Model *** Number	Code *** Number	Type (Thread Size)	These Parts Are A Complete Kit		
				Connection No.	*** Seal No.	Screw
(P2) PRESSURE 1"	FS4-P16-12-33	S14-10787	1" NPTF	034-27265	691-10222	3/8-16 x 1 3/4
	FS4-W16-12-35	S14-08054	1" IPS socket weld	034-24348		
	FS4-S21-17-52	S14-08445	SAE 16	034-24476		
(P1) PRESSURE 1 1/4"	FS4-P20-12-32	S14-06617	1 1/4" NPTF	034-24189	671-00223	7/16-14 x 2 1/4
	FS4-W20-12-36	S14-08055	1 1/4" IPS socket weld	034-24347	691-10224	7/16-14 x 2 1/4
	FS4-S26-13-38	S14-06618	SAE 20	034-24190	671-00223	7/16-14 x 1 1/2
SUCTION 3"	FS4-P48-12-34	S14-07428	3" NPTF	034-23145	671-00240	5/8-11 x 2 3/4
	FS4-W48-12-37	S14-07430	3" IPS socket weld	034-24159		
QTY.				1	1	4

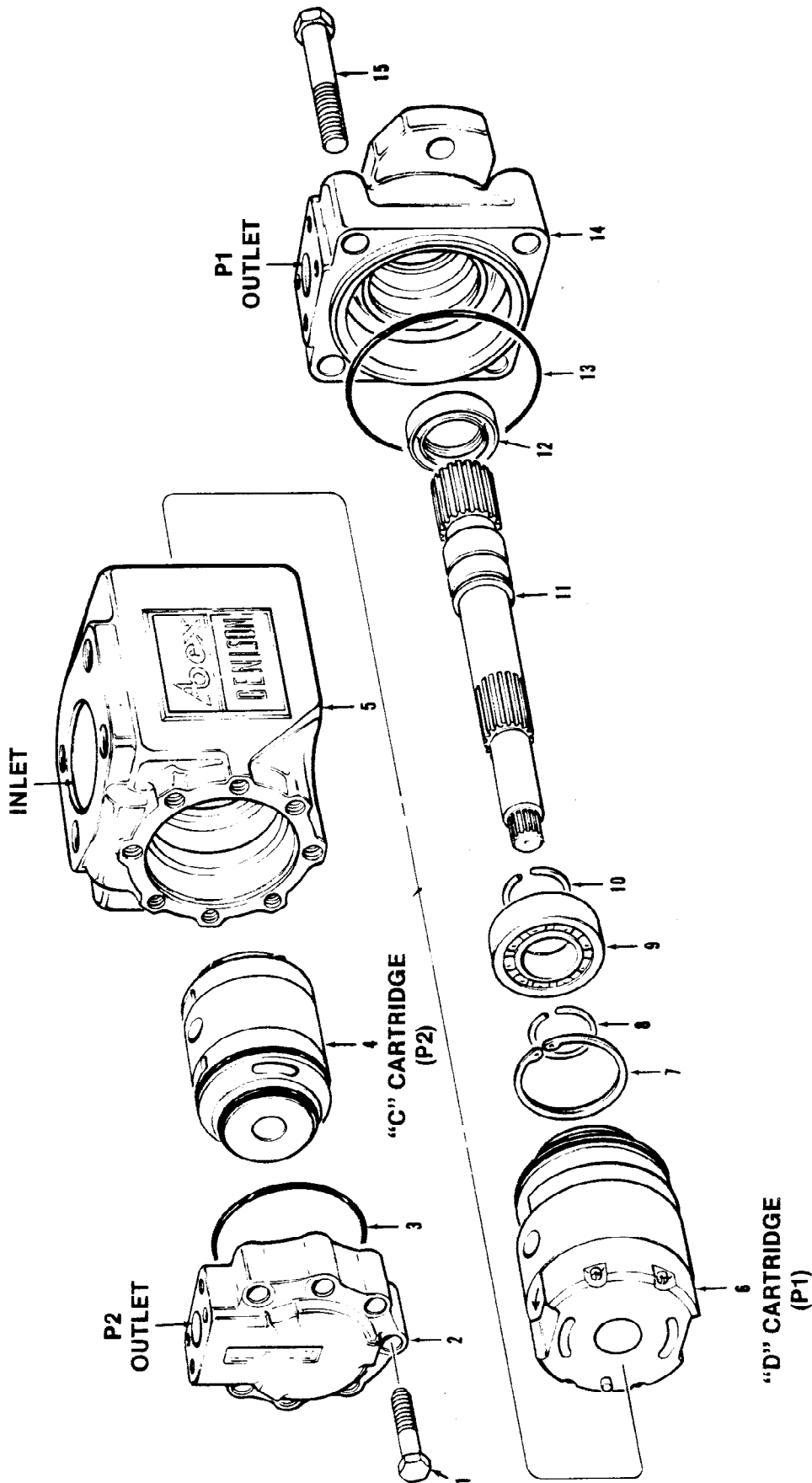
Foot mounting bracket kit (optional) Code. No. S14-08057 (includes 034-24342 bracket and 2 screws 5/8-11 x 1 1/4)

\*For use with petroleum base fluids.

\*\*For use with fire resistant fluids and severe duty applications.

\*\*\*For T5SDC add -5 to model number and code number when ordering a kit and change seal prefix to 675 or 695 when ordering seals separately.





CARTRIDGES ILLUSTRATED FOR  
CW (RIGHT HAND) ROTATION

FIG. VII

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# Abex

**Fluid Power Group**  
Aerospace/Denison/Jetway/Mead/Remco

An **IC Industries** Company

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