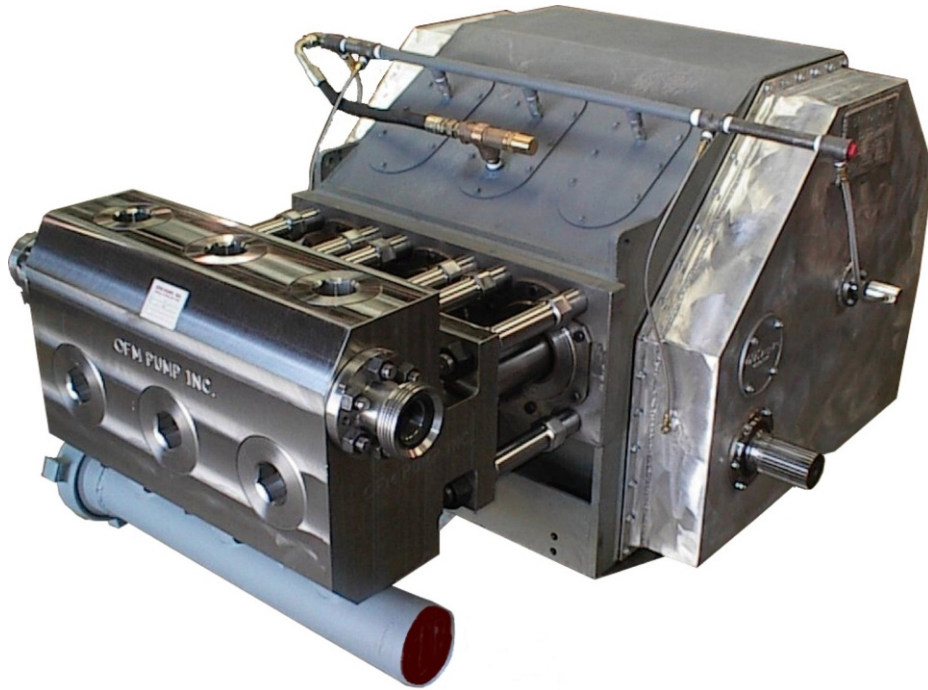


# OFM PUMP, INC.



## 2000 HP MAINTENANCE MANUAL

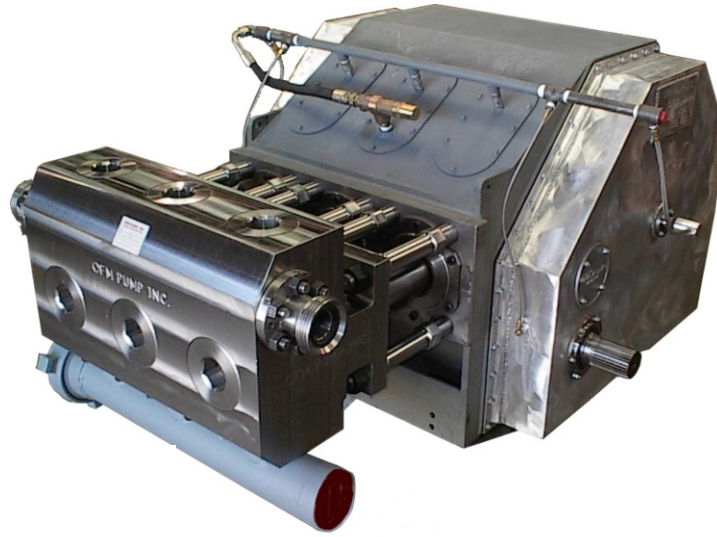
**P.O. Box 12192  
Odessa, TX. 79768**

**(432) 381-7390  
(877) 381-7390  
(432) 385- 1205 Fax**

September 2003

# **OFM WELL SERVICE PUMPS**

**FOR ACIDIZING, CEMENTING, CIRCULATING,  
FRACTURING & SAND CONTROL SERVICE**



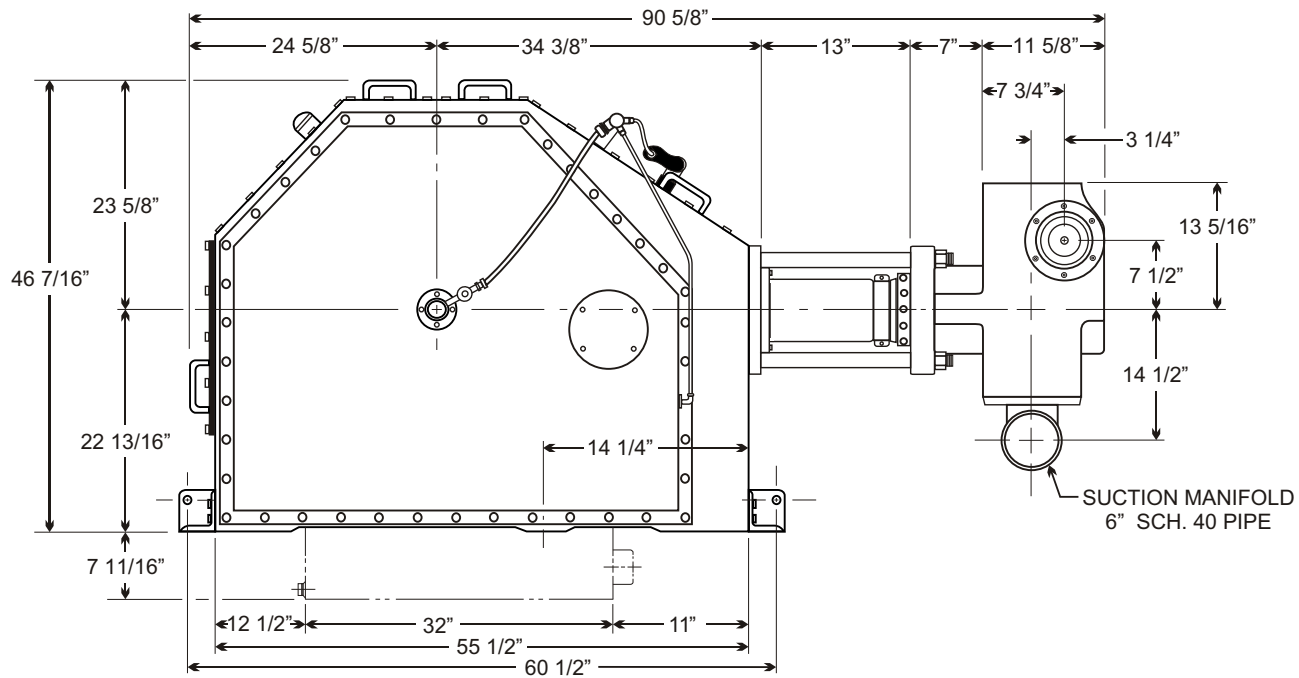
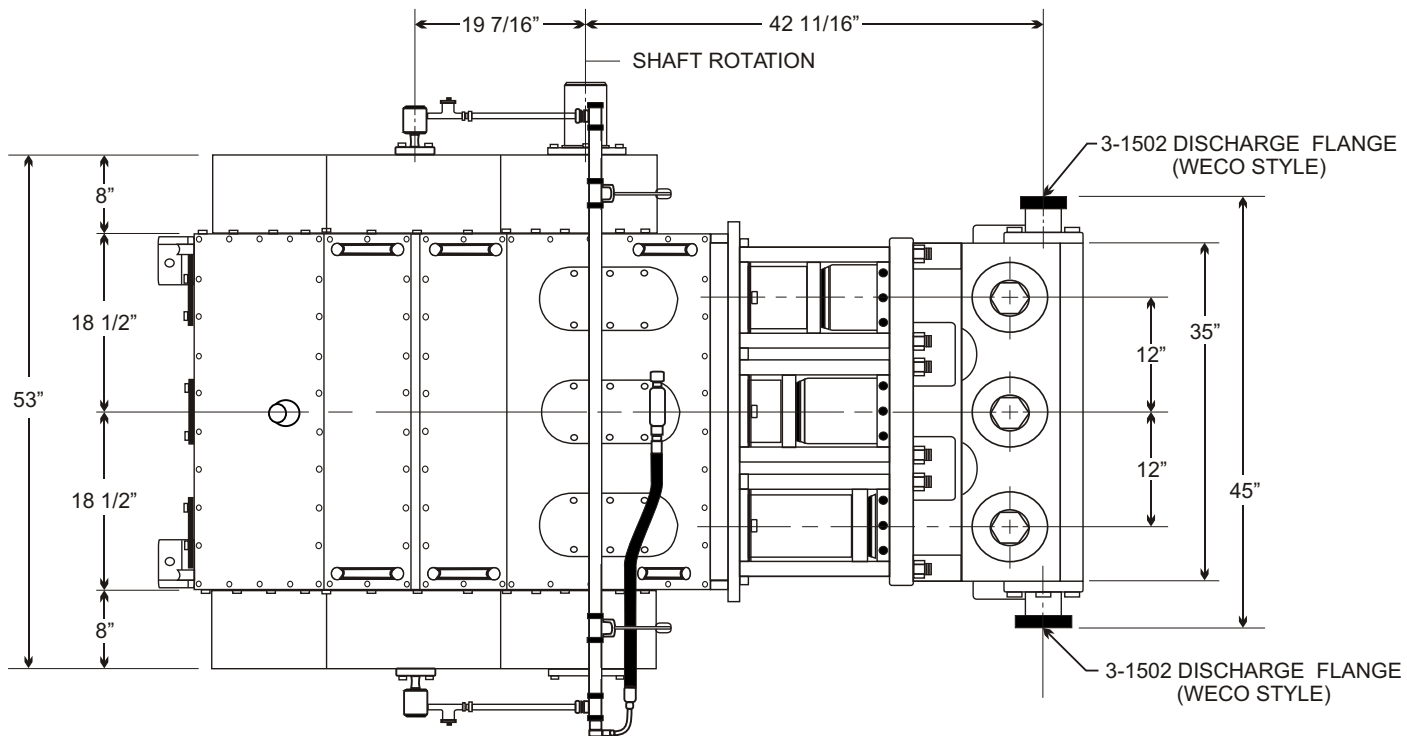
## **OFM 2000 PUMP PUMP SPECIFICATIONS**

Pump Type.....Horizontal Reciprocating Power Pump Positive Displacement with Single-Acting Plungers	Crank Shaft.....Alloy Steel Nitrided
Maximum Input Horsepower.....2,000 Intermittent, 800 Continuous	Connecting Rod.....Two Piece Bolted Joint
Stroke Length.....8 Inches	Crosshead Guide.....Bronze Replaceable
Maximum Rod Load.....225,000 Lbs.	Fluid End.....Plunger Type Monoblock Design. Machined From High Strength Alloy Steel, Heat Treated and Ultrasonic Tested
Approximate Weight.....12,500 Lbs.	Plunger Diameter.....3-3/4 to 7-1/2 Inches
Pump End Power.....Fabricated of High Strength Steel	Discharge Outlet.....2 or 3 Inch WECO Union
Gears.....Double Helical	Suction Inlet.....6 or 8 Inch Diameter
Gear Ratio.....6.353 : 1	Valves and Seats.....Hardened Steel, Replaceable Insert
Rod Bearings.....Shell Type Replaceable	Power End Lubrication.....35 GPM Required, Optional Hydraulic Lubrication System w/ Sump Available
Main Bearings.....Straight Roller	
Pinion Bearings.....Spherical Roller	

### **INTERMITTENT SERVICE PERFORMANCE DATA\*\***

PLUNGER DIAMETER (INCHES)	GALLONS PER REV.	PUMP SPEED IN CRANKSHAFT REVOLUTIONS PER MINUTE (RPM)											
		50		100		150		200		250		330	
		GPM	PSI	GPM	PSI	GPM	PSI	GPM	PSI	GPM	PSI	GPM	PSI
7-1/2	4.59	229	5093	459	5093	689	4232	918	3174	1148	2539	1515	1924
7	3.99	200	5845	400	5845	600	4858	800	3643	1000	2915	1320	2208
6-3/4	3.72	186	6288	371	6288	557	5232	743	3924	928	3139	1225	2378
6-1/2	3.45	172	6781	345	6781	517	5634	690	4225	862	3380	1138	2561
6	2.94	147	7958	294	7958	441	6612	588	4959	735	3967	970	3005
5-3/4	2.70	135	8665	270	8665	405	7200	540	5400	675	4320	890	3273
5-1/2	2.47	123	9470	247	9470	370	7870	494	5900	617	4720	814	3580
5	2.04	102	11459	204	11459	306	9522	408	7142	510	5713	673	4328
4-1/2	1.65	83	14147	165	14147	248	11759	330	8819	413	7055	545	5345
4	1.31	65	17905*	131	17905*	196	14874	261	11155	327	8924	431	6761
3-3/4	1.15	57	20372*	115	20372*	172	16905*	229	12700	287	10150	378	7689
<b>INPUT POWER BRAKE HORSEPOWER</b>		802		1603		2000		2000		2000		2000	
<b>PINION RPM @ 6.353:1 GEAR RATIO</b>		318		635		953		1271		1588		2097	

\* Application to be approved by OFM PUMP, INC.  
\*\* Based on 85% ME and 100% VE - Intermittent service only.



NOT A SCALE DRAWING
<b>INSTALLATION DETAIL OF OFM MODEL 2000</b>
<b>GEAR RATIO 6.353 : 1 PE.</b>
OFM PUMP, INC.
APPROXIMATE WEIGHT 12,500 Lbs.

MAINTENANCE AND OPERATION  
MANUAL  
OFM 2000 HP TRIPLEX PLUNGER PUMP

CUSTOMER: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

PURCHASE ORDER #: \_\_\_\_\_

SALES ORDER #: \_\_\_\_\_

OFM PUMP, INC.  
P.O. BOX 12192  
2243 N. FM 1936  
ODESSA, TX. 79768

PHONE: (432) 381-7390  
(877) 381-7390  
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## **GENERAL INFORMATION**

The OFM 2000HP Triplex is a horizontal single acting 2000 horsepower pump with an 8" stroke and various plunger sizes from 3-3/4" through 7-1/2" diameter. The weight of this pump will vary slightly due to various accessories but should not exceed 13,500 lbs. All sizes of plunger fluid ends are inter-changeable on the power end. This pump was designed and has proven successful for high horse power displacement of frac fluids on mobile equipment.

The power end is available in 6.353:1 gear ratio model. The power end is designed for a force fed lube system throughout to supply gear oil to the rod bearings, main bearings, etc. Because of the various drive arrangements powering these pumps, the lube pump itself is not built-in but must be mounted externally in the way best suited to each application.

The fluid end is available in 3-3/4" through 7-1/2" plunger sizes. All fluid ends are of an alloy steel one-piece design.

The fluid end and power end are joined by 12 alloy steel stay bolts which remain in the power end when the fluid end is removed. The plunger is also separable from the pony rod so that the inside of the power end is never exposed during fluid end maintenance.

The following material in the manual has been compiled by the Engineering Department to assist you in obtaining the best possible service from this pump. Special attention should be given to the LUBRICATION SYSTEM Section in this manual. Should any other specific information be needed, contact the OFM Pump, Inc. Engineering Department at the Odessa, Texas, plant. Due to continuing efforts to improve the quality of its product, OFM Pump, Inc., reserves the right to revise any specification herein without prior notice.

## PARTS AND SERVICE INFORMATION

OFM Pump Inc. maintains a large inventory of replacement parts at all times to ensure prompt service of its product line. To ensure receiving the proper parts, with the least delay, it will be necessary to include the following information when ordering:

- (1) The part number and description – see assembly prints at the back of this manual.
- (2) The quantity of each part required.
- (3) The fluid end or power end model number and serial number – see identification tag on the pump.
- (4) Your purchase order or requisition number.
- (5) Designate the shipping method you prefer. If overseas shipment, also designate which export and crating company you prefer.

Parts and service orders may be placed through.

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There will be a restocking charge on any undamaged parts returned for credit as follows:

<u>Time Since Shipment</u>	<u>% Restocking Fee</u>
0 to 1 Year	15%
1 to 2 Years	25%
Over 2 Year	50%

Returned parts must be shipped prepaid to the Odessa plant and should include a memo with the invoice number on which the parts were billed.

Additional copies of this manual may be obtained from the Engineering Department at the Odessa plant for a minimal charge.

## **SHIPPING AND STORAGE**

All pumps are shipped dry and must be flushed and filled with the proper lubricant before operating. All pumps should be flushed with diesel or some other light oil regardless of how they were shipped or what type of container shipped in. Where the pumps are shipped ocean cargo, care should be taken to crate the pump in a water-tight container and ship below deck to prevent excess rust and salt water contamination.

Pumps are not prepared for dry storage and should be put in service as soon as possible. To prepare a pump for storage after prior use, clean the fluid end and flush it with some type of rust preventive. Plug all discharge and suction openings at the fluid end. Drain oil from the power end, clean and flush with some type of rust preventive which will not clog oil passages. Remove crankcase breather and tape or plug all openings. Coat the pinion extensions and pony rods with a heavy rust preventive and store pump inside in a warm, dry place

## STANDARD TERMS AND CONDITIONS OF SALE

- (1) This quotation is an offer to sell. Hereinafter OFM Pump, Inc. will be "Seller". Hereinafter the person to whom this quotation is addressed will be "Buyer". Hereinafter the products and services offered for sale in this quotation will be "the goods". The agreement formed by Buyer's acceptance of this quotation hereinafter will be the "Contract".
- (2) Delivery of the goods will be F.O.B. Seller's plant, Odessa, Texas, unless otherwise provided. All shipping dates are based on receipt of a purchase order with complete information contained therein. Shipping dates are based on standard quality control checks as part of a normal production sequence. Additional inspection or testing required by Buyer which affects the normal production sequence, will extend the shipping dates accordingly. Such additional inspection or testing will be charged to Buyer.
- (3) Seller shall not be liable for its failure or delay in delivery due to acts of God, orders bearing priority ratings established pursuant to law, differences with workmen, local labor shortages, fire, flood, or other casualty, governmental regulations or requirements, shortages or failures of all materials, supplies, fuel, power or transportation, breakdown of equipment or any other causes also beyond Seller's reasonable control whether of similar or of dissimilar nature to those enumerated. Seller shall have such additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its customers in such a manner as it may consider to be equitable, giving such priorities to delivery hereunder as may be reasonably possible. In no event shall Seller be liable for any consequential damages or claims resulting from failure or delay in delivery.
- (4) Seller will replace, F.O.B. Seller's plant, Odessa, Texas, any goods furnished hereunder found to be defective or otherwise failing to conform to this quotation, or at Seller's option, Seller will allow appropriate credit not to exceed the price paid for such goods. Claims must be made promptly after receipt of the goods by Buyer and Seller must be given reasonable opportunity to investigate Buyer's remedies with respect to any goods that are found to be defective or otherwise not in conformity with this quotation shall be limited exclusively to the right of replacement thereof or the allowance of appropriate credit not to exceed the quotation price. In addition, the goods are guaranteed against defects of material and workmanship for a period of six months from the date of shipment from Seller's plant, Odessa, Texas, when such goods are used in a service and within the design parameters for which they were manufactured. Seller's liability shall be limited to free replacement, F.O.B. Seller's plant, Odessa, Texas, of any goods found to be defective in material or workmanship by Seller's inspection and shall not include claims for labor, costs, expenses of Buyer resulting from such defects, damages, arising from delays, loss of use or other direct, indirect, incidental, or consequential damages of any kind. In case of any goods not wholly of Seller's manufacture, Seller's liability shall be limited the extent of its recovery from manufacturer of such goods under its liability Seller.
- (5) Except in the particulars specified by Buyer and expressly agreed to in writing by Seller, the goods furnished hereunder shall be produced in accordance with the manufacturer's standard practices. All products however, including those produced to meet an exact specification, shall be subject to tolerances and variances consistent with good mill practice in respect to dimension, weight, straightness, section, composition, and mechanical conditions and quality; to deviations from tolerances and variations consistent with practical testing and inspection methods; and to regular mill practice on over and under shipment.
- (6) Seller warrants the goods are merchantable and conform to the specifications set forth in this quotation. Seller further warrants the use of the goods will not infringe any claim of United States patent covering the goods themselves. However, Seller does not warrant the goods will not infringe any such patent when not manufactured by or for Seller, or when specially made, in whole or in part, to Buyer's design specifications. In addition, Seller does not warrant the goods will not infringe any such patent if used or sold in combination with other material for use in any process. EXCEPT FOR THE WARRANTIES CONTAINED IN THIS PARAGRAPH AND PARAGRAH (4) ABOVE SELLER MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF FITNESS FOR PARTICULAR PURPOSE.

## STANDARD TERMS AND CONDITIONS OF SALE (Con't.)

(7) Seller shall not be liable for any damage or deterioration of the goods occurring while the goods are in transit after leaving Seller's plant, Odessa, Texas.

(8) Buyer agrees to tender payment for the goods in United States dollars according to terms stated in this quotation. Consular fees for legalizing invoices, stamping bills of lading or other documents required by the laws of any country are not included in quotation or selling prices. If instructed in writing Seller will make arrangements for said documents as agent for Buyer, but Seller assumes no liability whatsoever for making such arrangements. Any tax or other charges imposed by law on the sale or production of the goods or the performance of service hereunder shall be paid by Buyer. In the event the law specifically imposes such tax or charges upon Seller, Buyer will indemnify Seller for the payment of such taxes or charges.

(9) Seller reserves the right to change or to modify the design or construction of any of its products, in due course of its manufacturing procedure without incurring any obligation to furnish or to install such changes or modifications on products previously or subsequently sold.

(10) Buyer shall not be entitled to change or to modify, except with the written consent of Seller, any specifications, details, or instructions, comprised in this quotation.

(11) Insistence by buyer on suspension of manufacture or of shipment, if not agreed in writing by Seller, may be treated by Seller as a wrongful termination of Contract and Buyer thereupon shall be liable for all damages arising out of such wrongful termination.

(12) Seller reserves the right at any time to require from Buyer satisfactory security for the due performance of all its obligations and Buyer's refusal to furnish satisfactory security or its failure to perform any of its obligations under this or any other existing contract will entitle Seller, upon the dispatch of notice to Buyer, to suspend shipment or to cancel the Contract, or so much of it as remains unexecuted, without prejudice to any claim for damages Seller may be entitled to make.

(13) No terms or conditions other than those stated herein and no agreement or understanding, oral or written, in any way purporting to modify these terms and conditions shall be binding upon Seller unless hereinafter agreed in writing by Seller. Seller hereby objects to and rejects any and all additional terms and conditions imposed by Buyer, whether contained in Buyer's purchasing or shipping release forms or elsewhere. All proposals, negotiations and representations, if any, made prior to or with reference hereto are merged herein.

(14) Waiver by Seller of any default, breach, or non-performance hereunder neither shall constitute nor be construed as a waiver of any subsequent default, breach, or non-performance hereunder whether of a similar or dissimilar nature to the previous default, breach or non-performance.

(15) Any clause required to be included in a contract of this type by any applicable and valid federal, state, or local law, or administrative rule or regulation having the effect of law shall be deemed to be incorporated herein.

(16) The Contract will be governed by and construed according to the laws of the State of Texas insofar as applicable and by the laws of the United States of America.

# **OFM PUMP, INC.**

## **2000 HP MAINTENANCE MANUAL**

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**September 2003**

## **PUMP DESIGN DATA**

### **POWER ENDS**

#### Power end Case:

- (1) Fabricated Steel, stress relieved, line bored
- (2) Light gauge aluminum covers with cork neoprene gaskets
- (3) Aluminum or steel seal retainers
- (4) Bronze crosshead guide sleeves
- (5) 4 heavy-duty roller bearings at main journals
- (6) 1" pipe lubrication inlet
- (7) 4" pipe oil drainback outlet
- (8) ½" pipe braided metallic oil hoses to each crankshaft lubrication inlet
- (9) ¼" pipe braided metallic oil hoses to main bearings, crossheads, and pinion gears
- (10) Pre-drilled for bolt on oil sump

#### Crankshaft:

- (1) One piece, forged alloy steel
- (2) Heat treated and ground
- (3) Drilled for lubrication to rod journal's through each end
- (4) Diameter at:
  - a. main journals ----- 16.000"
  - b. rod journals ----- 7.250"
  - c. gear fit ----- 7.000" with 1-1/4" standard keyway

#### Bull Gears:

- (1) Helical gears at each side of pump to counteract thrust
- (2) Machined from alloy steel, heat treated and ground
- (3) Utilizes bronze thrust ring to take minimal end thrust
- (4) Attached to crankshaft with 1-1/2" keyway and 4 – 1-1/4" cap screws

Pinion Gears:

- (1) Integrally machined on alloy pinion shaft

Pinion Shaft:

- (1) Supported by two (2) heavy-duty spherical roller bearings
- (2) Pinion gear teeth integrally machined on alloy shaft

Pinion Bearing Housing:

- (1) Precision machined from steel
- (2) Attached to power end case with 8 – 3/4" cap screws

Crosshead:

- (1) Ductile iron full cylindrical design with top oil groove
- (2) Bronze thrust seat to accept rod load instead of wrist pin
- (3) Bronze crosshead bushing for wrist pin to crosshead
- (4) Dimensions ----- 9.860" 0.0 x 11-7/8" **long**

Connecting Rod:

- (1) Alloy steel with precision machined head to accept rod load instead of wrist pin
- (2) Attaches to rod bearing housing with 6 – 3/4" alloy studs and self-locking nuts

Connecting Rod Bearing Housing:

- (1) Jig machined from cast steel
- (2) Cap attached to base with 4 - 1" cap screws and 2 – 5/16" dowel pins

Rod Bearing:

- (1) Machined from 80-20-10 bearing bronze
- (2) Dimensions ----- 7.262" I.D. x 3/8" wall thickness x 7.250" long

Wrist Pin:

- (1) Serves to return crosshead only – accepts none of the rod load
- (2) Slip fit in crosshead with 2 each external snap rings

Wrist Pin Bushing:

- (1) Machined from bronze
- (2) Press fit in connecting rod

Pony Rod:

- (1) Clamp type connection to plunger
- (2) Mild steel with hard overlay seal surface
- (3) Attaches to crosshead with 6- 3/4" cap screws

Stay Rod:

- (1) Machined from heat treated alloy steel
- (2) Precision machined shoulder lengths for correct alignment between power end and fluid end
- (3) 1-3/4" – 8 thrd. at both ends with 2 3/4" hex on power end side.

## FLUID ENDS

### Plunger Type Fluid End:

- (1) Machined from heat treated and sonic tested alloy steel forging
- (2) Available in 3-3/4" through 7-1/2" plunger sizes
- (3) Plungers are mild steel with hard overlay surface and clamp connection
- (4) Available with Chevron adjustable, or **rubber spring loaded packing**
- (5) Utilizes a discharge flange at each end with a variety of thread connections
- (6) Uses wing guided valves with tapered seats
- (7) Uses 6" Sch. 40 suction manifold open at each end with a variety of connections

## LUBRICATION SYSTEM

This pump must be lubricated by an extreme pressure gear oil at a flow rate of 30 to 35 GPM to the power end's lube inlet (see the "Lube Oil Recommendation" charts included in this section of the manual for specific grades and marketers). These specifications must be adhered to due to the pumps light weight/high horsepower design utilizing bronze rod bearings rather than the heavy roller bearings usually associated with massive high horsepower pumps. Due to the various applications and drive arrangements, the lube pump and other lube system components are not built into the power end and must be equipped separately for each individual application. The selection and mounting arrangement of all the lube system components becomes critical with the use of heavy gear oil. All the hydraulic components required such as filters, strainer, etc., are designed and rated for use with light hydraulic oils. Obviously the resistance to flow of heavy gear oil through strainers and even hoses is much greater than with light hydraulic oil. This higher resistance to flow must be compensated for in all the components selected except the lube pump itself.

The following specifications pertaining to the lube system components are absolutely vital to the life of this pump even under low horsepower conditions:

### The Lube Pump:

Because of its positive displacement design and its reliability in so-called contaminated systems, the gear type pump should always be used as a lube pump. In order to select the proper gear pump, the mounting and drive arrangement must first be known.

On these triplex pumps which have an engine and transmission or torque converter drive, the lube pump should be driven from one of the accessory drive locations provided on that equipment so that the lube pump always runs at engine speed. This will provide the most lubrication when it is needed even at high pressure/low speed operation of the triplex. It will also be very important to mount the lube pump as low as possible, preferably at the transmission PTO, so that the lube pump suction does not have to lift the

heavy gear oil any higher than absolutely necessary. The lube pump should be set up with a positive drive so that any possibility of belt slippage, etc., is eliminated. This can be accomplished by the use of a flange mount pump with a splined shaft or a foot mount pump with a small driveline. The engine speed must now be known. If the engine is to be operated at 2000 RPM, 1200 RPM or whatever, a gear pump must be selected that will deliver 30 GPM minimum at that speed. As most gear pumps are offered with several different sizes of inlet and outlet ports, the largest porting arrangement available should be chosen for reasons to be determined later.

#### The Lube Pump Suction Piping:

These requirements are usually the most misunderstood of all and have frequently led to triplex pump damage because of a restricted flow of oil to the lube pump suction inlet. These specifications are based on four simple but very important hydraulic “rule of thumb” requirements.

- (1) The flow velocity of the oil through the suction piping should not exceed 2 feet per second except, if necessary, for a short distance of no more than a few inches. Therefore, for a flow rate of 30 GPM to the lube pump inlet, a pipe or hose no smaller than 2-1/2" I.D. must be used. (This explains the need for the largest porting available on the gear pump so that the hose does not have to be reduced down with a bell reducer any more than is absolutely necessary at the lube pump inlet).
- (2) The vacuum reading directly at the lube pump inlet while it is operating at full speed must not exceed 8" Hg or 4 PSI. This reading should be checked at whatever temperature will be experienced by the triplex pump on a cold start-up.

- (3) The suction strainer should be sized 3 times larger than the actual flow of oil that is to pass through it. Therefore, for a flow rate of 30 GPM, a strainer should be used that is rated at no less than 90 GPM. Also, to compensate for the use of a heavy gear oil, a 30-mesh strainer should be used instead of the 100 mesh strainer. This will decrease the vacuum caused by the oil flow being restricted as it flows through the strainer and will also increase the length of time between strainer cleaning intervals. A strainer with a 3 or 5 PSI relief valve should always be used so that if the strainer does become clogged, the oil pump will not starve for oil. Two basic types of strainers are available. The “in-sump” type strainer, if used, should be installed in such a way that it can be easily removed for periodic cleaning. The “in-line” canister-type strainer, if used, will probably require bell reducers on the inlet and outlet to accommodate the large suction piping. This type strainer should also be clearly marked to use only strainer type elements, as it generally looks identical to a filter assembly using paper elements.
- (4) Since every additional foot of suction piping adds to the oil flow resistance and raises the vacuum reading, the suction piping should be kept as short and free of bends as possible. If the suction piping or hose has to be longer than 10 feet or so, a 3" I.D. hose or pipe is highly recommended. Where hose is to be used, a suction type hose with wire reinforcement will be needed to prevent it from collapsing especially in areas where there might be a bend in the hose. All connections in the suction should be taped and made up tight to eliminate air from being drawn in.

#### The Oil Reservoir:

A well designed oil reservoir or sump tank not only serves as a place to store oil but also: (1) gives foreign particles such as dirt and cuttings a place to settle out of the oil, (2) allows the oil to cool down more effectively, (3) allows small air bubbles to purge themselves from the oil and, (4) in this case should compensate for the slow gravity return of the heavy gear oil to the tank without the suction intake becoming exposed.

The reservoir should have a 90 gallon capacity with an additional 10% air space above and should be built as deep as possible to cut down on the possibility of the suction intake becoming exposed (some mobile applications may not have room for a 90 gallon tank but in these cases, the reservoir must not be less than 60 gallons capacity. The reservoir should have a large weatherproof breather/filler cap with a built-in strainer and a sight glass or dipstick which are easily accessible. If the suction strainer is to be mounted in the tank, it should be mounted as low as possible and in such a way that it can be easily removed for periodic cleaning. A suction line fitting no smaller than 3" and a return fitting no smaller than 4" should be installed. The tank should also have a drain fitting no smaller than 1" and a cleanout opening, which are easily accessible. If possible, a baffle should be installed which will force the oil to flow around the outside walls of the tank in order to reach the suction inlet. This will allow more time for particles to settle and air bubbles to be purged plus at the same time will allow more oil to come in contact with the cool outer walls.

In many cases, a sump heater may be required to keep the oil warm and if so, there should be a fitting installed of the right size and in the appropriate location. A fitting for a removable magnet can also be installed.

#### The Filter Assembly:

Selecting the right filter for the pressure side of the lube system becomes a little tricky because of the heavy gear oil but is an item that should not be overlooked, again, because of the bronze rod bearings in this triplex pump. Foreign particles such as dirt will not imbed in the bronze such, as they will with Babbitt. An ineffective filter will allow scoring of the crankshaft and rod bearings, which will obviously shorten the life of the triplex. A dual element filter rated at 90 GPM and 150 PSI working pressure and having a 20 PSI built-in relief valve will be the minimum acceptable arrangement that will perform with any degree of satisfaction. This is due to the fact that even this filter will become clogged to the extent that it starts to bypass after only 30 to 50 hours. One of these filters can be used with this short time between element change intervals or two

such filter assemblies could be use thereby decreasing the amount of maintenance required and putting it more in line with maintenance intervals on engines, etc. Filter elements with a micron rating of 33 to 75 are preferred and a 25-micron element is the smallest that should be used.

#### The Pressure Line Piping:

Due to the positive displacement design of the gear pump and an allowable 15 feet per second flow velocity, the pressure line pipe or hose carrying the oil to the triplex may be 1" on short to medium distance runs or 1-1/4" on runs of 15 feet or more. Either Sch. 40 pipe or single wire braided hose will be adequate.

#### The Relief Valve:

A relief valve is necessary in the lube system for the most part only to protect the filter assembly as all hoses, etc., in the triplex are capable of withstanding several hundred pounds pressure. A non-Chattering type relief valve with a spring pressure rating no less than 100 PSI should be used. The relief valve should be installed on the triplex lube tube on the opposite side from the lube oil inlet. This location of the relief valve will assure that it dumps excess lube oil only when the true oil pressure in the triplex requires it. The relief valve should be set for 100 – 125 PSI on a cool startup with the engine running at maximum RPM. The return line from the relief valve should dump into the triplex. If the oil pressure reaches an alarming level in some part of the lube system, it means that the equipment in that part of the system is not functioning as it should and the problem should be corrected rather than installing a relief valve.

#### Gauge and Warning Devices:

The triplex should have a liquid-filled oil pressure gauge with a pressure range of 0-150 PSI installed at the lube inlet. Any other sensors for a warning device or remote gauge should also be installed directly at the triplex lube inlet so that the true pressure in the

triplex is sensed. Since the vacuum at the lube pump inlet is the only reliable way of determining when it is safe to operate the pump in cold weather, a liquid-filled vacuum gauge should also be installed directly at the lube pump inlet and should have a vacuum range of 0-30" Hg. In cold weather, the gear oil's viscosity will become so high that even though the pressure gauge shows sufficient pressure, the bypass is most likely dumping much of the oil into the reservoir. A vacuum gauge will detect when the oil begins to thin and flow better and the triplex could safely begin operating when the vacuum falls to 8" - 10" Hg at full engine speed.

A temperature gauge will also be helpful, and if used, should also be installed at the triplex lube tube on the opposite side from the lube inlet. The temperature gauge's sensor should be installed in such a way that it is in the flow path of the oil for a more true reading.

Some type of warning device to monitor at least the oil pressure and temperature is highly recommended. As this triplex operates at maximum with 200,000 lbs. Load on each rod bearing, an early warning of lube system problems is up to operate according to the following operating limits: (1) minimum oil pressure – 40 PSI, (2) maximum oil temperature - 175° F or 80° C, (3) maximum lube system vacuum at lube pump inlet – 10"Hg or 5 PSI.

#### Oil Cooler:

An oil cooler may be required in many warm weather areas for successful continuous or intermittent operation of this triplex depending on operating conditions. Even though the maximum allowable oil temperature has been established at 175°, a more favorable oil viscosity and resulting oil pressure will be experienced with an oil temperature not exceeding 150° F. Operating conditions and cooler results will vary considerably but the following recommendations will serve as a general guideline for cooler selection and installation, the cooler should be rated at no less than 300,000 BTU/Hr., no less than 60 GPM flow capacity, no less than 200 PSI working pressure and, have inlet and outlet

fittings no smaller than 1" NPT or #16 JIC. The cooler should be plumbed into the lube system downstream from the oil filter so that the warmer thinner oil will flow through the filter better. If the cooler is used with a radiator and fan already present, it should be mounted upwind of the radiator for best results, the plumbing should be installed with a ball valve and 100 PSI relief valve to route the oil around the cooler during cold weather.

#### Heat Exchanger and Sump Heater:

A heat exchanger and preferably a sump heater both will be required for those triplex pumps which will be operating in frequent cold weather areas and exposed to the cold. This will be necessary because the only other means of thinning the oil sufficiently is from the heat generated by the rod bearings under pressure, which obviously will damage the bearings before sufficient oil flow is obtained. Operating conditions and the resulting time it will take to heat the oil before the triplex can be engaged will vary but the following recommendations for selection and installation should be used. The heat exchanger should be a single pass type, should have a diameter no less than 6" and an effective heating area length no shorter than 20", a tube minimum working pressure of 150 PSI, and a minimum 300,000 BTU/Hr. rating with oil/water use. When used, the heat exchanger must be plumbed into the lube system with a ball valve and 100 PSI relief valve to route the oil around the exchanger after it heats sufficiently so that the engine water doesn't eventually overheat the oil. This manner of plumbing will also protect the exchanger tubes from bursting when the oil is extremely cold and viscous. For the best results, the flow of the engine water through the exchanger should be in the opposite direction as the flow of oil. The heat exchanger should be plumbed into the lube system upstream from filter so that the heated oil will begin to flow through the filter elements sooner.

Sump heaters, when used, should have a switch or thermostat to prevent overheating the oil. Two basic types of sump heaters are available the circulating type heater (approximately 10 watts per square inch) can be used only while the oil is circulating, and

the non-circulating (approximately 4 watts per square inch) may be left on overnight for example, as long as it has a thermostat to prevent overheating. The use of sump heater will be especially beneficial for preventing damage to lube pump from cavitations on a cold startup.

Plunger Lubrication:

All plunger fluid ends must be equipped with an air over oil operated plunger lube device. Oil should be pumped through a check valve into the 1/4" port above each plunger at the rate of approximately one pint per plunger per hour while operating. DO NOT EXCEED 26 PSI air pressure.

## MISCELLANEOUS LUBE SYSTEM INFORMATION

Minimum oil pressure at operating temperature ----- 25 PSI or 1.7 bar

Minimum oil pressure on cold startup ----- 100 PSI or 7 bar

Maximum lube temperature (w/90 wt. oil only) ----- 175° F or 80° C

Maximum lube system vacuum at lube pump inlet  
at full operating speed ----- 10" HG or 5 PSI

Minimum lube oil viscosity at operating temperature  
(based on minimum standards for gear and  
bearing protection) ----- 150 SSU or 32

CST

Additional vacuum created by height of lube pump  
Section inlet above oil level in reservoir  
(based on oil weight of .4 PSI) ----- .4 PSI or .8" Hg  
for each additional inch above oil level

\*Loss at lube pump suction from altitudes higher than sea level:

1,000 ft. -----	1" Hg or .5 PSI
2,000 ft. -----	2.2" Hg or 1.1 PSI
4,000 ft. -----	4.2" Hg or 2.1 PSI
6,000 ft. -----	6.0" Hg or 3.1 PSI
8,000 ft. -----	7.8" Hg or 3.9 PSI
10,000 ft. -----	9.5" Hg or 4.8 PSI

\* This will not show up as a higher reading on the vacuum gauge, but that the lube pump will begin to cavitate or starve for oil this much sooner than the 10" Hg maximum allowable vacuum at sea level.

The formula for determining the flow velocity of oil in a pipe:

Flow rate (in GPM) x .3208 divided by the area of the inside of the pipe (in square inches)

Oil viscosity comparisons:

- 150 SSU – 90 wt. gear oil at 175° F
- 1,000 SSU – 90 wt. gear oil at 100° F
- 5,000 SSU – 90 wt. gear oil at room temperature
- 100,000 SSU – The maximum thickness at which oil will flow through the lube system or, for example, a 90 wt. gear oil at 20° F

## RECOMMENDED LUBE OILS FOR GENERAL SERVICE

Note: The following oils are recommended where ambient temperatures range from 0° F to 95°F. The triplex pumps safe operating temperature must not exceed 175° F with use of these oils. These oils must be an extreme pressure lubricant which meets or exceeds U.S. Mil. Spec. MIL-L-21058 and has a Timken test rating no lower than 85 SSU at 210° F. These oils are generally classified as an SAE 90 or an AGME #5EP. The following examples are the automotive and industrial type gear oils marketed by each oil company.

Shell -----	Omala 71 Spirax HD 90
Texaco -----	Meropa 220 Multigear EP 90
Exxon -----	Spartan EP 220 Gear Oil GX 90
Gulf-----	EP Lubricant S-100 Transgear EP 90
Mobil -----	Mobilgear 630 Mobilube HD 90
Phillips -----	All Purpose Gear oil SAE 90 SMP Gear Oil 85W – 90
Atlantic Richfield -----	Pemant NL S-1000 Arco HD Gear Oil 90
Cities Service -----	Citgo EP #3 Ex. Duty Circulating oil, Gr. 85
Amoco -----	Amogear EP #3 Amoco MP Gear Lube #90
Sun Oil Company -----	Sunep 1070 Sunfleet GL-5 90 wt.
Standard Oil (Chevron) -----	NL Gear Compound 220
Pennzoil -----	Maxol EP Gear Oil #3
Conoco -----	Conoco DN600 Gear Oil

**RECOMMENDED LUBE OILS  
FOR EXTREME WARM WEATHER SERVICE**

Note: The following oils are recommended for service where ambient temperatures range as high as 100° F or more and seldom fall below freezing. These oils are also recommended for tropical areas where condensation causes increased lubrication problems. In such areas the use of an oil cooler with these oils may also be required especially in continuous service applications. The triplex pumps safe operating temperature must not exceed 200° F with use of these oils. These oils must be an extreme pressure gear lubricant, which meets or exceeds U.S. Mil. Spec. MIL-L-2105B and has Timken test rating no lower than 45 lbs. These oils must have a pour point no higher than 10°F and a viscosity no lower than 140 SSU at 210°F. These oils generally are classified as an SAE 140 or an AGMA #7EP.

Shell -----	Omala 77
Texaco -----	Multigear EP 140
Exxon -----	Gear Oil GX 140
Mobil -----	Mobilube SHC 634
Standard Oil (Chevron)-----	Universal Gear Lubricant 85W - 140
Amoco -----	Permagear EP 140
Conoco -----	DN 600 Gear Oil

**RECOMMENDED LUBE OIL  
FOR EXTREME COLD WEATHER SERVICE**

Note: The following oils are recommended for service only when ambient temperatures remain below 9°F for extended periods of time and the triplex pump is exposed to such temperatures. The triplex pumps safe operating temperature must not exceed 130°F with use of these oils. In some cases, even these oils may require the use of a heat exchanger to warm and thin the oil on a cold startup. In such cases, the lube system should be designed so that the lube oil can be bypassed around the heat exchanger after the oil starts circulating sufficiently. These oils must be an extreme pressure gear lubricant, which meets or exceeds U.S. Mil. Spec. MIL-L-2105B and has a Timken test rating no lower than 45 lbs. These oils must have a pour point no higher than -25°F and a viscosity no lower than 55 SSU at 210°F. These oils generally are classified as an SAE 80 or an AGMA #3EP.

Shell -----	Spirax HD 80
Texaco -----	Multigear EP 80W
Exxon -----	Gear Oil GX 80
Mobil -----	Mobilube SHC 626
Standard Oil (Chevron) -----	Universal Gear Lubricant 80W 90
*Conoco -----	Conoco DN600 Gear Oil

\*Most highly recommended for cold weather service.

## **PUMP INSTALLATION INFORMATION**

The following recommendations should serve as a general guideline to the installation of a new pump on mobil or skid mounted units.

All Information in the LUBRICATION SYSTEM Section of this manual should be read and adhered to closely. All of the lubrication information given is vital to the life of this pump as used on an otherwise well-designed pumping unit.

Power end mounting brackets normally are not furnished with the pump due to the varying applications and mounting arrangements. The power end should have at least one bracket welded to each corner of the power end for rigid bolting of the power end to its skid. Where possible, a mounting bracket or jackscrew device assembled under the fluid end will extend the life of the power end to fluid end stay bolts.

The power input to the pinion shaft may be means of a driveline or a non-rigid coupling. A coupling is generally not recommended because of eventual misalignment due to twisting of the frame. Where a coupling is used, it should be aligned very closely and should allow enough room for at least 1/8" end float of the pinion shaft. Those pumps utilizing a chain or belt drive will require the use of a separate jackshaft assembly coupled to the pumps pinion shaft since the pinion shaft itself will not tolerate the high side load experienced. The direction of rotation of the pinion shaft must always be so that the top of the pinion shaft rotates toward the rear of the power end. If the pump drive is equipped with a torque converter, the pump drive should be equipped with some type of brake to prevent creeping.

A centrifugal charge pump will be required to pre-charge the fluid end suction. The centrifugal should be sized according to the volume to be pumped with the triplex so that there is no less than 20 PSI pre-charge when the triplex is operating at maximum volume. A suction dampener is recommended for reducing shock loads and cavitations, which can severely damage the pump.

## NEW PUMP RUN-IN PROCEDURES

The following inspection and run-in procedures have been established as a general guideline for maintenance personnel during the critical break-in process during the first several hours of pump operation. The first few hours of the run-in pertaining to pressure testing are normally done at the OFM Pump, Inc. plant, but because the wearing-in process may continue for 80 to 100 hours, the bulk of the break-in maintenance will be the responsibility of each user. As virtually all-moving parts of the pump go through this wearing-in process, particles of bronze and steel will be emitted into the lube oil. The contamination of the lube system with those particles, especially the filters and suction strainers, may cause serious problems if not attended to on a frequent basis during this period.

- (1) Fill the lube oil reservoir with the correct grade of gear oil according to climate (See RECOMMENDED LUBE OILS Section in this manual). Also fill the plunger lube reservoir with the proper fluid. Prime the lube pump and others as needed. Check to see that all drain plugs and fittings are tight and not leaking.
- (2) Remove the inspection covers from the power end so that oil flow to all parts of the pump can be observed. With the pump drive locked, start the engine and check to see that all crossheads thrust seats, main bearings, rod bearings and gear oilers are oiling. (On those pumps equipped with a lube pump driven off of the pinion shaft, follow a similar process with the pump drive engaged, but no pressure on the fluid end.)
- (3) Rev. the engine up to full RPM and check for acceptable vacuum reading of less than 10" Hg at the lube pump suction inlet. Providing the vacuum reading is acceptable, check for an oil pressure reading of at least 100 PSI. With the engine still revved up, check the entire lube system for leaks. adjust the relief valve at the triplex lube manifold to obtain 100 to 125 PSI oil pressure if necessary. Temporary gauges at other points throughout the system might also be checked at this time to see that all components are functioning, as they should. Only slightly

higher pressures should be present at points further toward the lube pump. Kill the engine and after a few minutes check to see if the oil reservoir needs topping off. Check to see that the oil flow from the triplex back to the reservoir is satisfactory.

- (4) With the charge pump operating, bleed any trapped air from the fluid end. Start the plunger lube and check to see that it is adjusted properly. Run the pump at 80 to 90 strokes per minute and 20% of its rated pressure for approximately one-half hour (see the performance data charts at the end of this section). During this time, observe closely the oil pressure, oil temperature and lube pump vacuum. If, during this procedure or any of the following, the lube pump vacuum starts to rise, it probably is an indication that the suction strainer should be cleaned. As the oil temperature begins to rise and the oil thins, check cover gaskets, etc., for any new oil leaks.
- (5) Run the pump at 80 to 90 strokes per minute for approximately one-half hour each at 40%, 60%, 80% and 100% of its rated pressure observing closely the oil pressure, oil temperature and lube pump vacuum. During this time, the oil pressure normally will not fall below 50 PSI.
- (6) On those pumps equipped with a transmission, run the pump for one-half hour each in the higher gear ranges pulling full horsepower in each gear and observe closely the oil pressure, oil temperature and lube pump vacuum.
- (7) Shut the pump down and let it cool thoroughly before starting normal operations with it. All filter elements should be changed and the suction strainer should be cleaned. The lube oil should be changed and the reservoir cleaned to get rid of the metal particles now present in the oil. This will help prevent the suction strainer from becoming clogged during “on the job” pumping operations.
- (8) During the next several hours of operating, the filters and strainer will require maintenance as often as every 10 to 15 hours until it is apparent that the wearing in process has about stopped. After approximately 100 hours the lube oil should be changed again as well as changing the filters and cleaning the strainer. After this length of time the strainer should not need cleaning but once every 80 to 100 hours. Depending on the type of filters being used. The filters may still have to be changed as often as every 20 hours

## **PUMP DATA FORMULAS**

### To Find Fluid Displacement

Diameter of piston x itself x .785 x length of stroke x 3 divided by 231 = GPR

GPR x RPM = GPM

GPM divided by 42 = BPM

Formula above based on 100% volumetric efficiency.

### To Find Hydraulic Horsepower of Fluid Displacement

GPM x PSI divided by 1714 = HHP of fluid output

BPM x PSI x .0245 = HHP of fluid output

Formula above based on 100% volumetric and mechanical efficiency

Approximately 15% loss in efficiency will occur in the pump itself due to friction and gearing. Approximately 5% will be lost to any other gearing in the pump drive. Loss through a torque converter can run from 20% to 50%.

GPM x PSI divided by 1457 = input horsepower required (based on 85% mechanical efficiency).

### To Find Rod Load

Diameter of piston x itself x .785 x PSI = rod load

### Notes

GPR = gallons per revolution

RPM = revolutions per minute

GPM = gallons per minute

BPM = barrels per minute

HHP = hydraulic horsepower

PSI = pounds per square inch

231 cubic inches = one gallon

42 gallons = one barrel

## PERIODIC ROUTINE MAINTENANCE

The most economical and trouble-free service will be obtained from this pump only if a certain amount of routine maintenance is performed on it. It is highly recommended that the customer establish a maintenance program at time of purchase. Special emphasis should be placed on lube system maintenance. Because maintenance on this pump is required more frequently than on massive pumps usually associated with a 2000 HP rating, the operator or maintenance personnel should be familiarized with the maintenance requirements before the pump is put into service. The following items should serve as a guideline for establishing a maintenance program:

### Check Daily While Operating:

- (1) Check the oil level in the oil reservoir
- (2) Check the oil pressure – 50 to 60 PSI at operating temperature is normal (25 PSI is the danger point at which the pump should be shut down).
- (3) Check the oil temperature - 175°F maximum with a 90 wt. oil (130°F maximum with a 75 wt. winter oil, 200°F maximum with a 140 wt summer oil).
- (4) Check the lube pump vacuum – any reading higher than 10" Hg or 5 PSI indicates that the suction strainer must be cleaned as soon as the pump can be shut down for a short period.
- (5) During the first 100 hours of operation, the filter elements will require changing every 10 to 15 hours due to the high amount of foreign particles present during break-in.
- (6) Check for any abnormal noise or rough operation, which might indicate the need for fluid end maintenance such as changing valves or seats. Due to the higher pressures usually associated with a triplex pump, worn valves and seats should be changed as soon as possible to prevent washing through into the fluid end seat deck.
- (7) Check the plunger lube device to see that it is operating properly.

### Check Monthly:

- (1) Change or clean the filter elements.
- (2) Change the lube oil and clean the reservoir thoroughly after the first 100 hours of break-in operation.
- (3) Clean the lube system suction strainer unless the vacuum reading during the operation remains below 8" Hg.
- (4) Check for any new oil leaks and eliminate any that are found.
- (5) Check all fluid end expendables such as valves and seats for wear and replace them as needed.
- (6) Check the fluid end support device to see that it is not loose.
- (7) Check the pony rod seals for leakage and replace if necessary.

### Check Every Three to Four Months:

- (1) Change the lube oil and clean the reservoir thoroughly.
- (2) Clean the lube system suction strainer.
- (3) Check to see that all fluid end to power end stay rod nuts are tight. Check for any cracked or broken stay rods and replace if needed.
- (4) Check mounting bolts for tightness.
- (5) Clean or replace the breather cap.
- (6) Check supplies on hand needed for frequent maintenance such as lube oil, filter elements, o-rings, seals, packing, valves and seats, and maintenance tools.
- (7) Check all pressure, vacuum and temperature gauges and replace if found defective.
- (8) Check the lube system alarm device by some artificial method to assure that it is still operational.

## **GENERAL MAINTENANCE PROCEDURES**

### **FLUID END**

#### To Remove Fluid End from Power End:

- (1) Disconnect suction and discharge lines and any accessories such as stroke counter or pressure gauge.
- (2) Remove plunger from pony rod and shove into fluid end a short distance to protect it.
- (3) Connect hoist to fluid end and tighten the line until it is snug only. Do not pull the line too tight as the stay rods may be damaged.
- (4) Remove all twelve (12) 1-3/4" stay rod nuts from the fluid end flange with a 2-3/4" hammer wrench.
- (5) Pull the fluid end straight away from the power end until it is completely off of and away from the stay rods before raising or lowering.
- (6) When the fluid end is replaced, check to be sure that all stay rod nuts are torque to 2600 ft. lbs. When possible, it is much easier to tighten the stay rod nuts with the power end raised up off of the skid. Also, check to be sure the fluid end support jackscrews have been readjusted before running the pump.

#### To Remove Plungers and Packing:

- (1) Remove the suction cover retainer nut with the hex wrench provided with the pump. Remove the suction cover with a threaded knocker puller.
- (2) Using a 3/8" Allen wrench, remove the two cap screws holding the pony rod clamp together.
- (3) Loosen the packing nut and remove the plunger through the front of the fluid end being careful not to damage the clamp end of the plunger.
- (4) Remove the packing nut, packing and brass being careful not to damage the packing brass or packing bore.

- (5) Before repacking the pump, check the plunger and packing brass for excessive wear or nicks and burrs. Also, clean and grease the packing bore in the fluid end.
- (6) Install packing and brass in the fluid end with the packing lips facing the front of the fluid end. See the packing diagrams included in this manual for a detailed view of the packing ring sequence.
- (7) Install the packing nut and tighten slightly to align the packing, and then loosen to permit installation of the plunger. Slide the plunger through the suction cover bore and into the packing. It may be necessary to bump the plunger through the packing with a hammer handle or some other soft object. Tighten packing nut.
- (8) Making certain that the mating surfaces of the pony rod and plunger are clean, install the clamp on them and tighten the packing nut.
- (9) Replace the suction cover, with new o-rings if necessary, and install the suction cover nut. Do not hammer the retainer nut excessively after it is tight, as this may eventually cause the threads to start cracking out.
- (10) Reinstall the plunger oiler line to the packing bore before operating the pump.

To Remove Wing Guided Valves and Seats:

- (1) Remove the discharge cover retainer nut with the hex wrench provided with the pump. Remove the discharge cover with a knocker puller. Remove the valve spring and valve.
- (2) The valve seat should be removed with a seat puller and seat puller jack. Do not remove a seat by heating and quenching or welding on it as heat adversely affects the alloy steel, which the fluid end is made of. A seat puller and jack are available through OFM Pump, Inc., for each type and size fluid end.
- (3) If the seat to be removed is a suction seat, it will not be necessary to remove the discharge seat, as the puller rod will pass through it. Remove the suction cover and its retainer nut.

- (4) Remove the suction spring retainer cage using the suction valve spring compressor tool and the suction spring retainer puller. Remove the suction spring retainer, spring, and valve.
- (5) The suction seat should also be removed with a puller and jack. If your seat puller is made of a plate, which fits below the seat, it may be necessary to remove the suction connection at one end of the manifold in order to place the plate under the seat. A seat puller is available through OFM Pump, Inc., with which this is not necessary.
- (6) Before replacing the assembly, clean the seat deck bore thoroughly. Snap the seat into the taper by hand and check to see that it is snug. Place the valve on top of the seat and use a heavy bar to bump the into the taper two or three times until it is tight.
- (7) Should a new suction valve retainer or discharge cover be installed, check to see that the valve clearance is approximately 1/2".
- (8) When replacing the covers and their retainer nuts, do not hammer the nuts excessively after they are tight as this may eventually cause the threads to crack.
- (9) Run the pump to maximum discharge pressure with water in order to seat the valve seats prior to pumping "dirty" fluids.

## **POWER ENDS**

### To Remove a Stay Rod:

- (1) The fluid end must always be removed to change a stay rod. Never torch cut and weld a stay rod that is to be changed.
- (2) After removing the fluid end and stay rod to be changed, clean and oil the threads in the power end and on the new stay rod. The power end. Fluid end and stay rod mating faces must be free of nicks and burrs to assure proper alignment of the power end and fluid end. This will also prolong the life of all the stay rods. The stay rods should be torqued to 1000 ft. lbs. (200 lbs. With 5 ft. cheater).
- (3) Once the fluid end is replaced, the fluid end support jackscrews should be readjusted to prevent further premature failure of stay rods.

### To Remove a pony Rod:

- (1) Remove the plunger and push it into the fluid end and out of the way. Remove the pony rod seal retainer.
- (2) Remove the pony rod, which is held by a six 3/4" cap screws. Remove the pony rod through the space between the stay rods at the side of the pump. If the pony rod to be changed is the center one, the pump may have to be rotated until the outer pony rod is out of the way.
- (3) Before replacing the seal retainer, check the double lip seal for wear and replace if needed.
- (4) Check to see that the pony rod and plunger mating cafes are free of nicks and burrs which can cause misalignment and premature failure and excessive wear to packing or liners.
- (5) Replace the plunger, checking to be sure that it is tight before operating the pump.

### To Remove a Rod Bearing:

- (1) Disconnect the pump drive in some way to prevent personal injuries or damage to the pump should it accidentally be put in gear while disassembled.
- (2) Remove the three top and rear covers from the power end.
- (3) Remove the four cap screws from each rod cap to be removed. Remove the rod cap noting that it and the other half are match-marked for correct reassembly. While removing the rod cap, take care not to lose the two 5/16" dowel pins, which align the two halves.
- (4) Using a rubber hammer or wooden hammer handle, tap on one edge of the bearing to work it around in the housing and out.
- (5) Clean the bearings and housings thoroughly before replacing the bearings or installing new bearings.
- (6) When replacing the rod cap, check to see that both 5/16" dowels are in place and that the marks on the cap and base match.
- (7) When tightening the rod cap bolts, 350 ft. lbs. Of torque should be used. If a torque wrench is not available, tighten the rod cap bolts with a 3/4"breakover and no more than a two foot cheater.
- (8) Before operating the pump again, move the rod bearing housing from side to side with a large screwdriver to make sure that it is free on the crankshaft. If new bearings have been installed, refer to the RUN-IN PROCEDURE included in this manual before operating the pump.

### To Remove a Connecting Rod and Crosshead:

- (1) Disconnect the pump drive in some way to prevent personal injuries or damage to the pump should it accidentally be put in gear while disassembled.
- (2) Remove the fluid end, three top and rear covers, pony rod seal retainer and pony rod.
- (3) Rotate the crankshaft until the rod bearing housing of the connecting rod to be removed is in the highest position. With a 1-1/8" socket on a 1/2" impact wrench, slip the impact wrench underneath and forward of the rod bearing housing. Raise the impact wrench and pull it back onto the self-locking nut holding the connecting rod to the rod bearing housing. Keeping the impact wrench pulled back against the nut, loosen it and the other two nuts on the bottom of the connecting rod.
- (4) Loosen the three nuts on the top of the connecting rod with an impact wrench and socket. After all six nuts have been removed; pull the connecting rod away from the rod bearing housing.
- (5) Remove the crosshead and connecting rod assembly through the front of the power end.
- (6) Remove the wrist pin snap ring from the wrist pin and the wrist pin from the crosshead. The connecting rod can now be removed from the the crosshead, exposing the bronze thrust seat inside the crosshead. The bronze thrust seat can be removed by removing four 1/2" Allen head cap screws from the thrust seat keepers with a 3/8" Allen wrench.
- (7) Clean and inspect all parts for wear before replacing. Any time a new wrist pin installed, a new bronze thrust seat should be installed also, since they work as one unit to accept the rod load.
- (8) When replacing the wrist pin, make sure it slides easily through the crosshead, pivot end and to crosshead bushings..

- (9) When replacing the connecting rod and crosshead assembly in the power end, make sure the oil groove in the crosshead is on top.
- (10) To tighten the connecting rod up to the rod bearing housing, tighten the nuts on the bottom first and then the top nuts. Be sure the connecting rod flange is pulled up tight.
- (11) Do not replace the rear covers until the power end is rotated slowly and you can see that all parts are operating and oiling properly.

To Remove the crankshaft:

- (1) Remove the pump from its skid and place it in an open area where it can eventually be turned over on its side. Remove the fluid end, the three top covers, lubr liners, rear covers and pony rod seal retainers.
- (2) Unbolt the connecting rods from the rod bearing housings. Slide the connecting rods forward until their flanges are resting in the bronze guide sleeve bore. This will permit the rod bearing housings to be pulled out intact on the crankshaft for easier disassembly and inspection later.
- (3) Remove the drive coupling from the pinion shaft noting where it is located on the shaft. If the pump has a double extended pinion, remove any sprocket, sheave or coupling from it noting where it is located.
- (4) Remove the pinion seal retainer, gear oiler and crankshaft rotary union adapter before removing the gear covers.
- (5) After removing both gear covers, remove both of the bull gears on the side of the pump. To remove the bull gear, the 1-1/4" key and its set screw must be removed along with the four 1-1/4" cap screws. the gear will then be loose on the crankshaft and should not be heated to removed. The gear will have to sprial somewhat as it comes off due to the helical form of the teeth. A large C-clamp can be attached to the outer hub of the gear to remove it.

- (6) Turn the power end over on it's side and block it up as level as possible. Also turn the rod bearing housings so they will not clear the main bearing bore, to keep the crankshaft from sliding out the bottom of the case.
- (7) See pinion shaft removal.
- (8) The crankshaft can now be removed by using the two 1-1/4" eyebolts in the end of the crankshaft. Using a chain and hoist, or some type of lifting device, pick the crankshaft up just enough to turn the connecting rods bearing housing so they are turned toward the center of the crankshaft. They must be turned this way so they will slip through the main bearing races. Slowly start turning the crankshaft and lifting at the same time. Check to be sure the rod bearing housings will clear and repeat until the crankshaft is removed.

Note: Although this pump can be completely disassembled in the field, it generally would not be advisable to install new bull gears, pinion gears, crankshaft or pinion shaft in the field. In order to install any of these new parts, new keyways have to be cut in the bull gears upon assembly in order to keep the gear timing correct.

- (9) If the main roller bearings are to be replaced, it will be necessary to heat them slightly to remove them from the crankshaft. When heating the new bearings for installation on the crankshaft, care should be taken to not heat around the outside of the bearing as this may melt the bronze cage around the rollers. When replacing the main roller bearings and their races in this

pump, it is also very important that the snap rings be brazed in three places before the pump is reassembled. Failure to do so may eventually let the snap rings and bearing work loose causing considerable damage. Do not braze the snap rings to the crankshaft, bearing races or power end housing.

- (10) Before reinstalling the crankshaft in the power end, the crankshaft oil ways should be flushed out to remove any dirt or foreign particles, which might otherwise damage the rod bearings and crankshaft. The rod bearings and their housings should also be reinstalled on the crankshaft at this time. The rod bearing housings again should be turned toward the center of the crankshaft in order to clear main bearing races as the crankshaft is installed.
- (11) Install the crankshaft in the power end housing with a block underneath to keep the crankshaft from slipping too far out on the bottom side.
- (12) After installing the crankshaft in the power end, turn the rod bearing housing so that they will not clear the main bearing bore. This will keep the crankshaft from falling through and causing damage to the crankshaft. Turn the power end upright, again being careful not to let the crankshaft slip out of the bearing races
- (13) See Pinion Shaft Removal.
- (14) After checking the bronze thrust ring and its mating surface on the power end housing for nicks and burrs, install the bull gear on the crankshaft. Install the 1-1/4" key, its setscrew and the four 1-1/4" key cap screws that hold the gear.
- (15) Again, after checking the bronze thrust ring and its mating surface on the power end housing for nicks and burrs, install the remaining bull gear on the crankshaft. Due to the spiral action of the helical gears as the bull gear is being installed; the keyways in the gear and crankshaft should not be lined up as the gear starts on the crankshaft. The top of the bull gear will rotate to the front as the bull gear is slid onto the crankshaft. Install the key, its setscrew and the cap screws, which hold the gear. With both gears tight on the crankshaft, the crankshaft should have .040" to .060" end play.

- (16) Bolt the connecting rods onto the rod bearing housings. After checking to see that the rod bearing housing caps are tightened sufficiently, check the rod bearing housing with a large screwdriver to see that it moves from side to side freely.
- (17) Before installing the gear covers, check the crankshaft rotary union adapter o-ring for wear and replace if necessary. Install both gear covers but do not tighten until both oiler nipples and pinion seal retainers have been installed.
- (18) Install the gear oilers and pony rod seal retainers. Install the new pinion seals.
- (19) Install all oil lines to the main bearing bore and to the crosshead.
- (20) Install the fluid end on the power end, and the complete pump on its skid after all stay rod nuts have been tightened thoroughly. Do not replace the rear covers until the pump is rotating and oiling properly.

To Remove the Pinion Shaft:

- (1) Remove the pump from its skid and place in an open area. Remove any sheaves, sprockets or couplings, which might be used on the pinion extensions.
- (2) Remove the pinion seal retainers, gear oilers and crankshaft rotary union adapters. Remove both gear covers and bull gears.
- (3) The pinion shaft may be removed from either side of the pump. Remove both pinion bearing housings from around the bearings. Care should be taken to keep the bearing housing shims with the housing. They are used with and match-mark the bearing housings to the power end housing. Some of the bearing housing cap screws are counter sunk.
- (4) To remove the pinion bearing, tilt the outer race and pick the rollers only from the pinion bearing on the opposite side of the pump; from the side the shaft will be removed from. While removing the shaft, care should be taken not to damage the exposed bearing race; if it is to be reused. If the

pinion bearings are to be replaced with new ones, the remaining outer race and warm the inner races to remove them from the shaft.

- (5) To reinstall the pinion, install the pinion bearing and it's housing only on the side of the shaft that will go into the pump last. Check to see that the same housing and set of shims are used that were removed from this side. Insert the pinion shaft through the power end housing till the pinion bearing housing is in its bore. On both ratio pumps, the countersunk holes in the pinion bearing housing should be located where the bull gear crosses the housing. Install the cap screws, which hold this housing.
- (6) Warm the bearing for the opposite side and install it on the pinion shaft. After the bearing has cooled, use two long 3/4" bolts to align the pinion bearing housing with the bearing and tap the housing into place around the bearing. With the countersunk holes located correctly, install the cap screws, which hold these housings are spaced correctly and not binding.
- (7) Reinstall the bull gears on each side of the crankshaft. Reinstall the gear covers, gear oilers and crankshaft rotary union adapters. Reinstall the pinion seal retainer with a new seal.

Note: Although the pinion shaft can be removed and disassembled in the field, it generally would not be advisable to install a new pinion shaft or pinion gears in the field. In order to install these new parts, new keyways have to be cut in the bull gears upon assembly in order to keep the gear timing correct.

## TORQUE SPECIFICATIONS

	<u>Size</u>	<u>Torque</u>
<u>Fluid End:</u>		
1) Discharge Flange Nuts	1" – 8UNC	400 ft. lbs.
2) Suction Manifold Cap Screws	7/8"-9UNC x 1-1/2" Lg. Gr. 5	250 ft. lbs.
3) Stay Rod Nuts	1-3/4"-8UN	2600 ft. lbs.
4) Plunger Clamp Cap Screws	1/2" –13UNC x 1-1/2" Lg. Hex. Soc. Head	45 ft. lbs.
 <u>Power End:</u>		
1) Stay Rods	1-3/4" –8UN	1000 ft. lbs.
2) Pony Rod Cap Screws	3/4" –10UNC x 1-1/2" Lg. Hex. Soc. Head	160 ft. lbs.
3) Thrust Seat Keeper Cap Screws	1/2" –13UNC x 1" Lg. Hex. Soc. Head	50 ft. lbs.
4) Connecting Rod Lock Nut	3/4" –10UNC	180 ft. lbs.
5) Connecting Rod Bearing Housing Cap Screw	1" –8UNC x 3-1/2" Lg. Gr. 8	350 ft. lbs.
6) Gear Cap Screw	1-1/4" –7UNC x 3" Lg. Gr. 8	930 ft. lbs.
7) Pinion Bearing Housing Cap Screw	3/4" –10UNC x 1" Lg. Gr. 5	160 ft. lg.

# TROUBLE SYMPTOMS

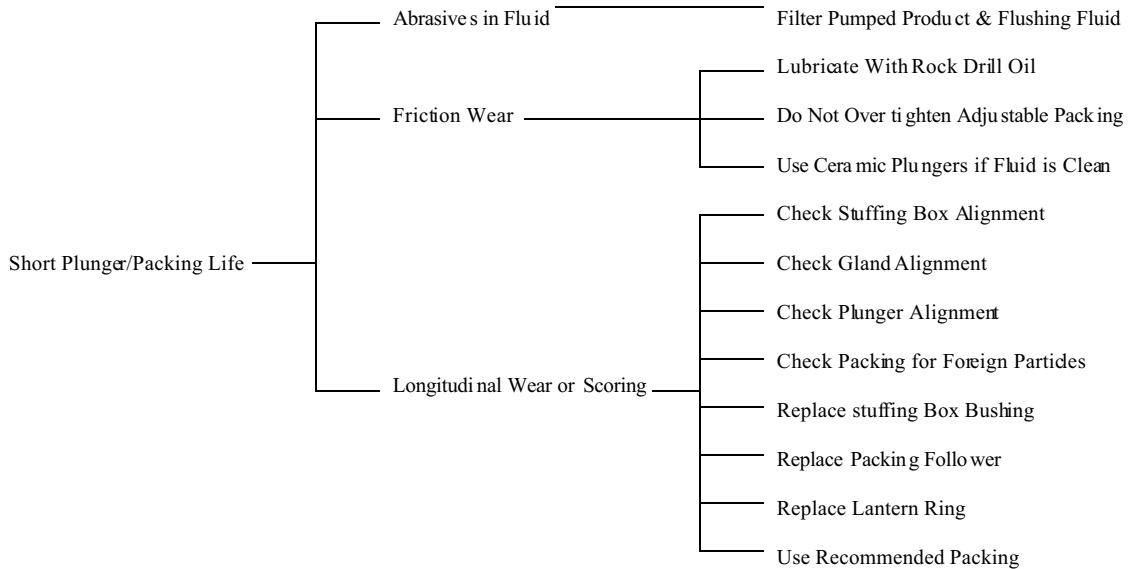
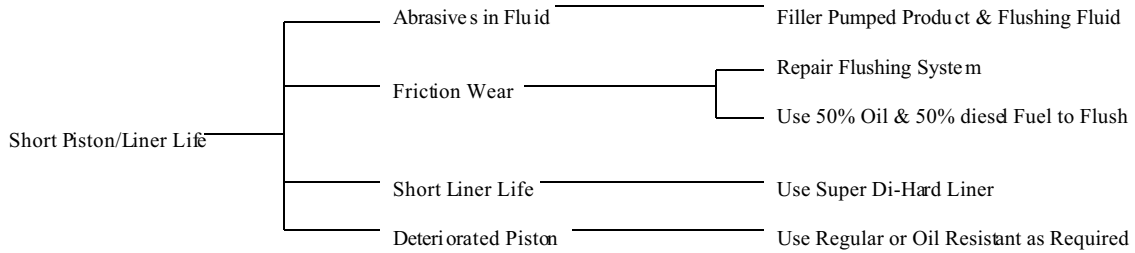
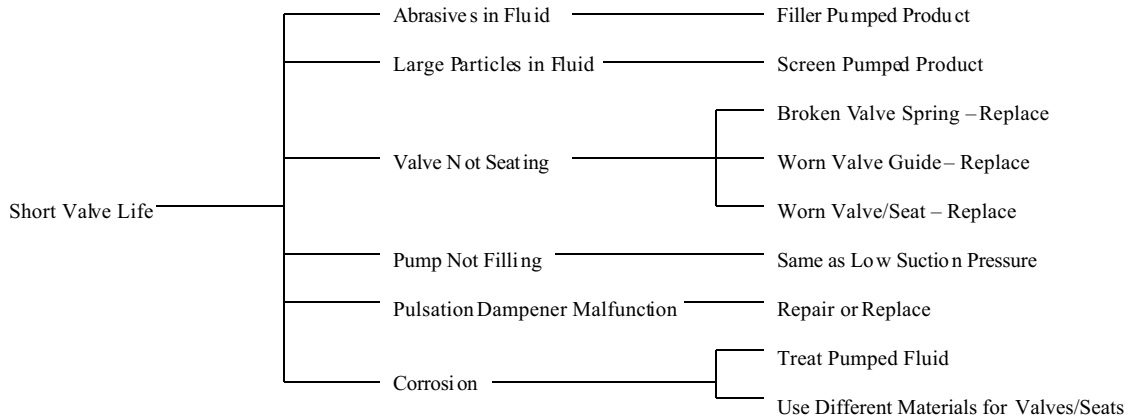
<u>OBSERVATION</u>	<u>PROBABLE SOURCE</u>	<u>ADJUSTMENTS</u>
Low Discharge Pressure	Worn or Fluid Cut Valve Assembly	Replace Valve Assembly
	Valve Propped Open	Remove Propping Agent
	Improper Filling	Remove Restrictions from Suction Line
		Increase Level of Fluid Supply
		Increase Charging Pump Speed
		Decrease Pump Speed
Prime Fluid Chambers		
Fluid Slippage	Replace Piston/Liner or Plunger/Packing	
Erroneous Gauge Reading	Recalibrate or Replace Gauge	
Low Suction Pressure	Low Head	Increase Level of Fluid Supply
	Charging Pump Capacity	Increase Charging Pump Speed
	Retarded Fluid Flow	Remove Restrictions from Suction Line
	Erroneous Gauge Reading	Recalibrate or Replace Gauge
Fluid Knock or Hammer	Air Entering Suction Line	Repair Suction Line
	Air Entering Charging Pump	Tighten or Replace Shaft Packing or Seal
	Air Entering Suction Stabilizer	Repair and Re-balance
	Air/Gas in Pumped Fluid	Impose Vacuum on Supply Tank
		Allow More Settling Time
		Reduce Pump Speed
Adjust Suction Stabilizer		
Same as Low Discharge Pressure	Same as Low Discharge Pressure	
Discharge Line Vibration	Discharge Pulsation Dampener	Repair and Recharge or Replace
	Unsupported Discharge Line	Provide Supports or Hangers
	Same as Low Discharge Pressure	Same as Low Discharge Pressure
	Same as Low Suction Pressure	Same as Low Suction Pressure
	Same as Fluid Knock or Hammer	Same as Fluid Knock or Hammer
Tattle-Tale Leakage	Loose Valve Cover/Cylinder Head	Tighten Valve Cover/Cylinder Head
	Worn Damaged Gasket	Replace Gasket
	Damaged Gasket Surface	Replace Valve Cover/Cylinder Head
Repair Fluid End		

# TROUBLE SYMPTOMS

OBSERVATION

PROBABLE SOURCE

ADJUSTMENT



# TROUBLE SYMPTOMS

<u>OBSERVATION</u>	<u>PROBABLE SOURCE</u>	<u>ADJUSTMENT</u>
Diaphragm Leakage	Worn or Damaged Extension Rod	Replace Extension Rod
	Corroded Extension Rod	Clean and Polish or Replace Extension Rod
	Worn Wiper Rings	Replace Wiper Rings
	Wiper Rings Improperly Sealing	<ul style="list-style-type: none"> <li>Check Installation Directions</li> <li>Clean and Polish Diaphragm Bore</li> </ul>
	Worn Lantern Ring	Replace Lantern Ring
	Oil Baffle Misplaced	Check Installation Directions
	Reservoir in Diaphragm Housing	<ul style="list-style-type: none"> <li>Install Drain Hole at Bottom</li> <li>Clean Drain Hole</li> </ul>
	Pressure in Crankcase	Clean or Replace Air Breather
Oil Seal Leakage	Worn Sealing Lip	Replace Seal
	Damaged Sealing Lip	Replace Seal
	O.D. Not Sealed	Clean and Polish Bore of Oil Seal Housing
	Foreign Material at Seal Point	<ul style="list-style-type: none"> <li>Clean and Polish Shaft</li> <li>Clean and Polish or Replace Shaft Sleeve</li> </ul>
	Pressure in Crankcase	Clean or Replace Air Breather
Low Oil Pressure	Lower Oil Level	Check and Add Oil If Necessary
	High Oil Temperature	See Observation "High Oil Temperature"
	Contaminated Lubricant	Change Oil
	Relief Valve Maladjusted	Check and Reset
	Leakage in Piping system	Repair All Leaks
	Choke Washers Misplaced	Check Installation Directions
	Oil Pump Worn	Repair or Replace Oil Pump
	Clogged Suction Screen	Clean Screen and Change Oil
	Worn Oil Pressure Ring	Replace Ring and Housing
	Erroneous Gauge Reading	Recalibrate or Replace Gauge

# TROUBLE SYMPTOMS

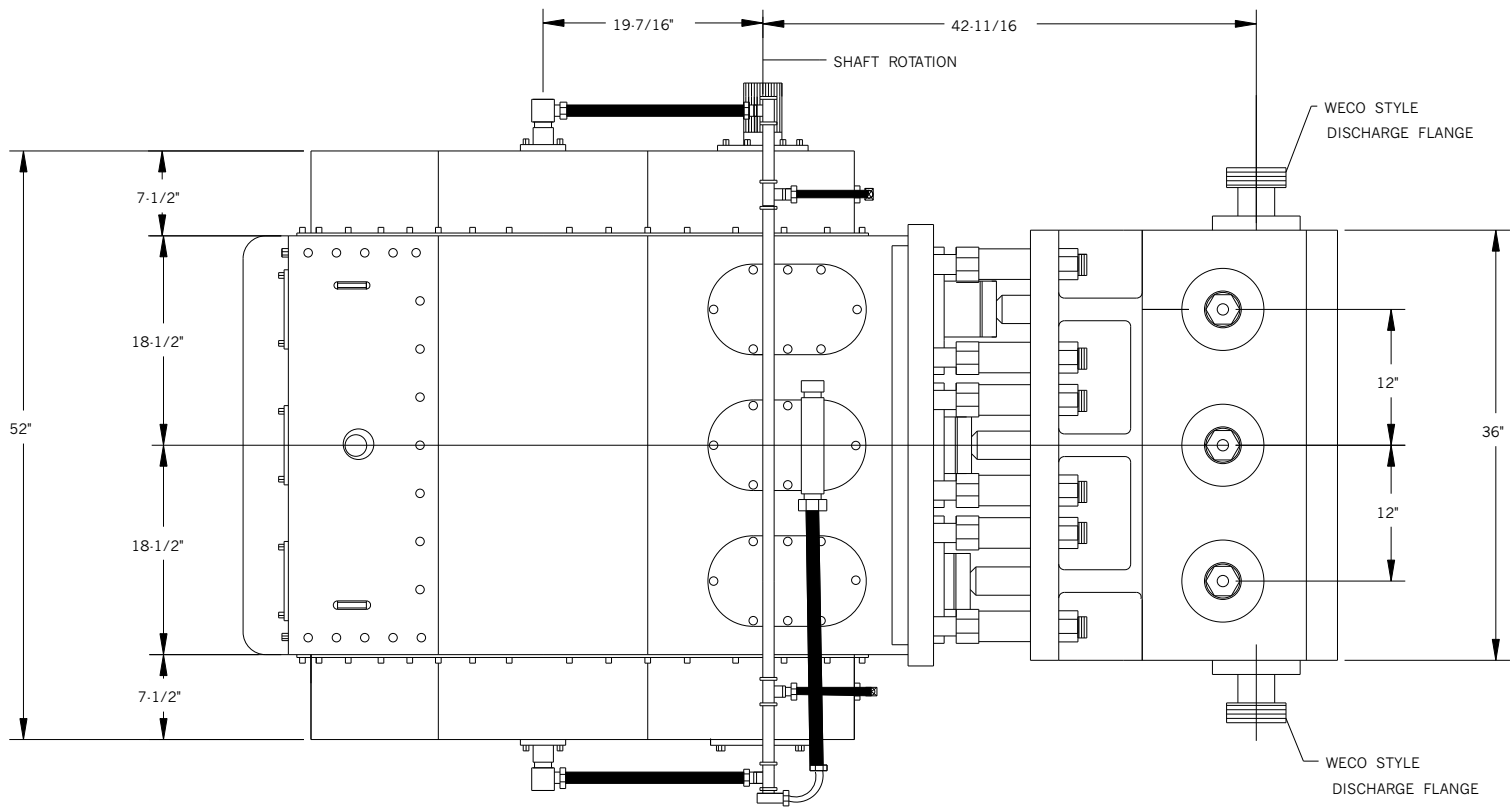
<u>OBSERVATION</u>	<u>PROBABLE SOURCE</u>	<u>ADJUSTMENT</u>
High Oil Pressure	Contaminated Oil	Change Oil
	Relief Valve Maladjusted	Check and Reset
	Oil Filter Clogged	Change Filter Cartridge
	Restrictions in Passageways	Clean Passageways
	Erroneous Gauge Reading	Recalibrate or Replace Gauge
High Oil Temperature	Heat Exchanger Malfunction	<div style="border-left: 1px solid black; padding-left: 10px;">                     Clean Tubes and Shell                      Regulate Coolant Rate                 </div>
	Improper Bearing Adjustment	Check and Adjust Clearances
	Improper Crosshead Adjustment	Check and Adjust Clearances
Knock in Power End	Incorrect Pump Rotation	Check Installation Directions
	Loose Piston/Rod Plunger	<div style="border-left: 1px solid black; padding-left: 10px;">                     Check and Tighten                 </div>
	Loose Extension	
	Loose Connecting Rod Clamp	
	Loose Bearing Housing/Covers	
	Worn Crosshead Pin	<div style="border-left: 1px solid black; padding-left: 10px;">                     Replace                 </div>
	Worn Crosshead Pin Bushing	
	Worn Crank Pin Bearing	<div style="border-left: 1px solid black; padding-left: 10px;">                     Chrome Plate &amp; Grind/Replace                      Adjust Shoes &amp; Grind/Replace                      Adjust or Replace                 </div>
	Worn Crankshaft	
	Worn Crosshead	
Worn Main or back-Up Bearing	Adjust or Replace	

# **OFM PUMP, INC.**

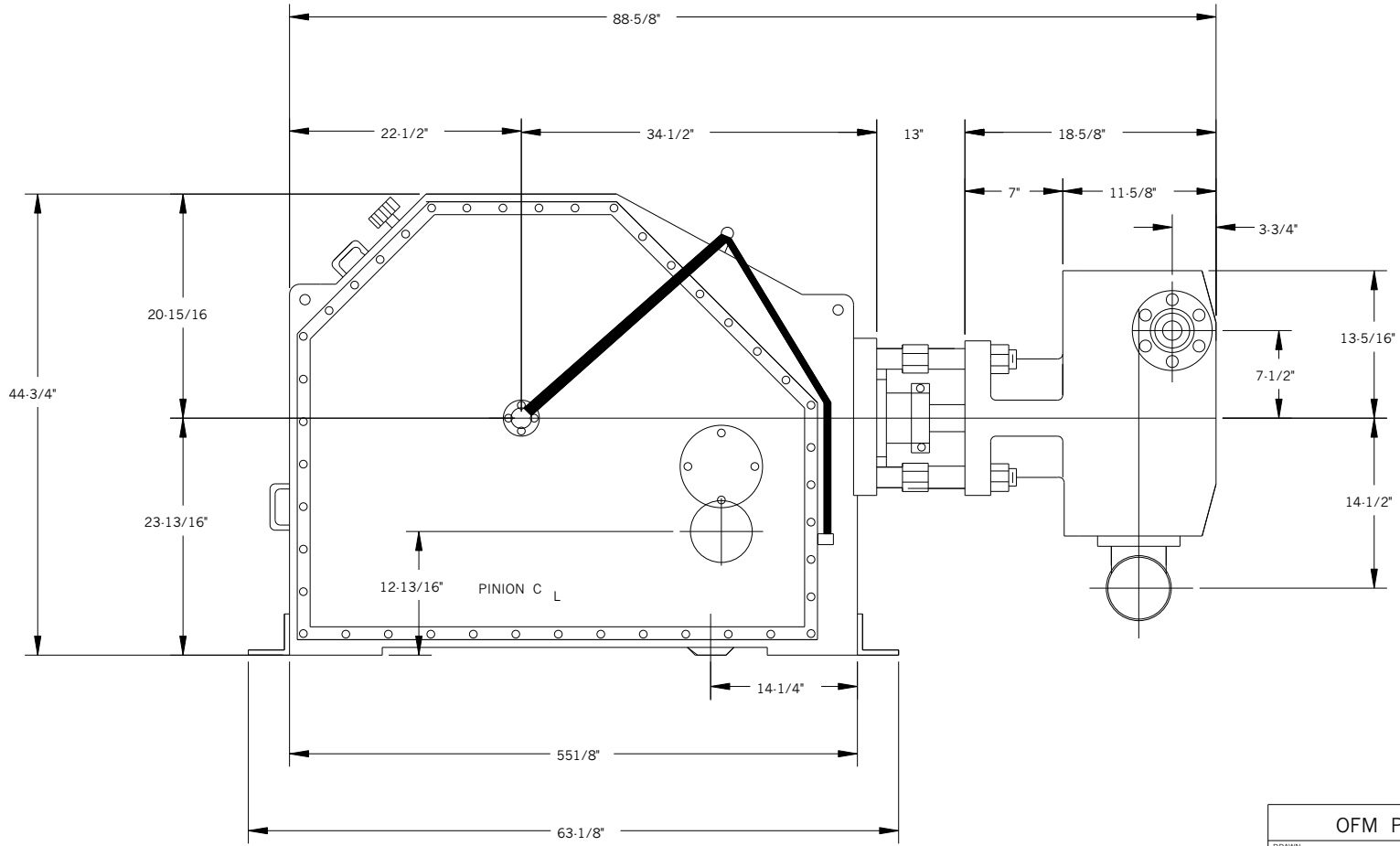
## **2000 HP DRAWINGS**

**P.O. Box 12192  
Odessa, TX. 79768**

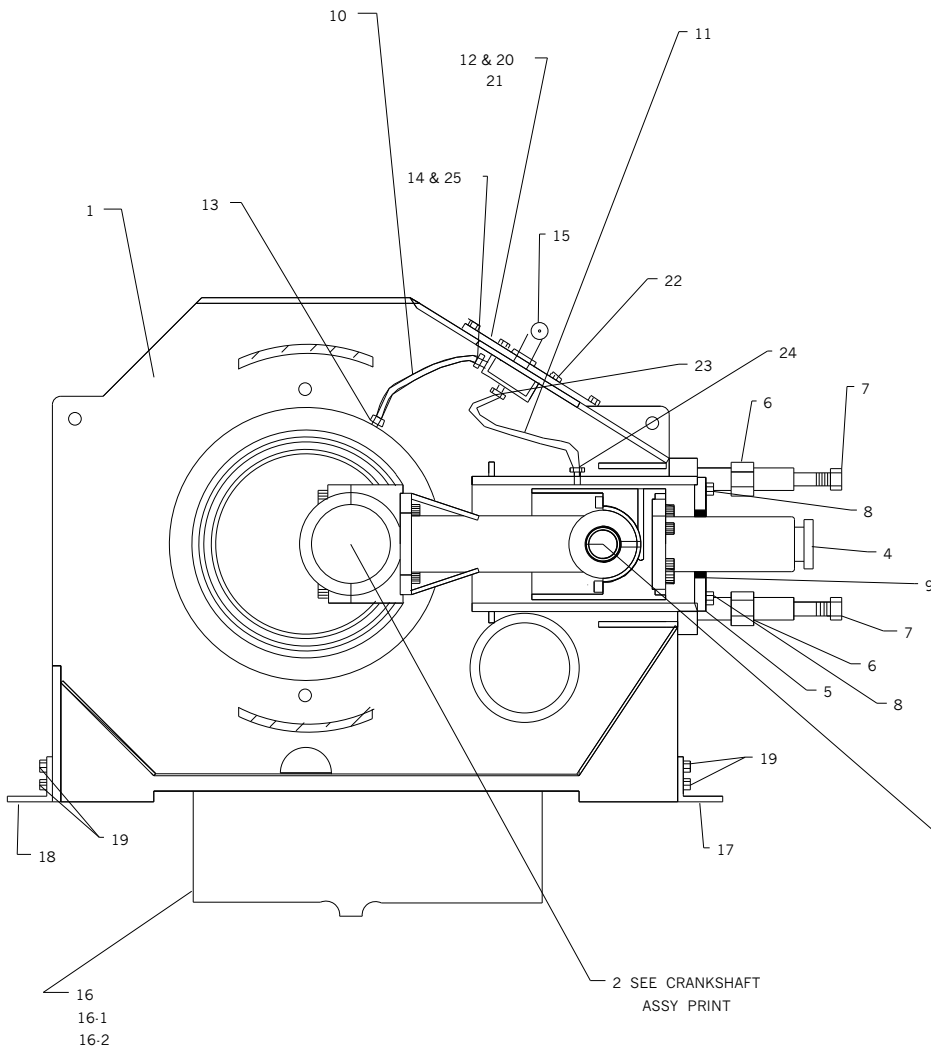
**(432) 381-7390  
(877) 381-7390  
(432) 385- 1205 Fax**



<b>OFM PUMP INC.</b>			
DRAWN	Name	LG	INSTALLATION
			DETAIL
			OFM 2000 P.E.
			SIZE DWG NUMBER
			B I D 2000-1
SCALE	1 : 10	REV	SHEET 1 OF 1



OFM PUMP INC.			
DRAWN Name	LG	INSTALLATION DETAIL OFM 2000	
APPROVED Name	B	SIZE D	DWG NUMBER 2000 P E.
SCALE 1 : 10	REV	SHEET	1 OF 1



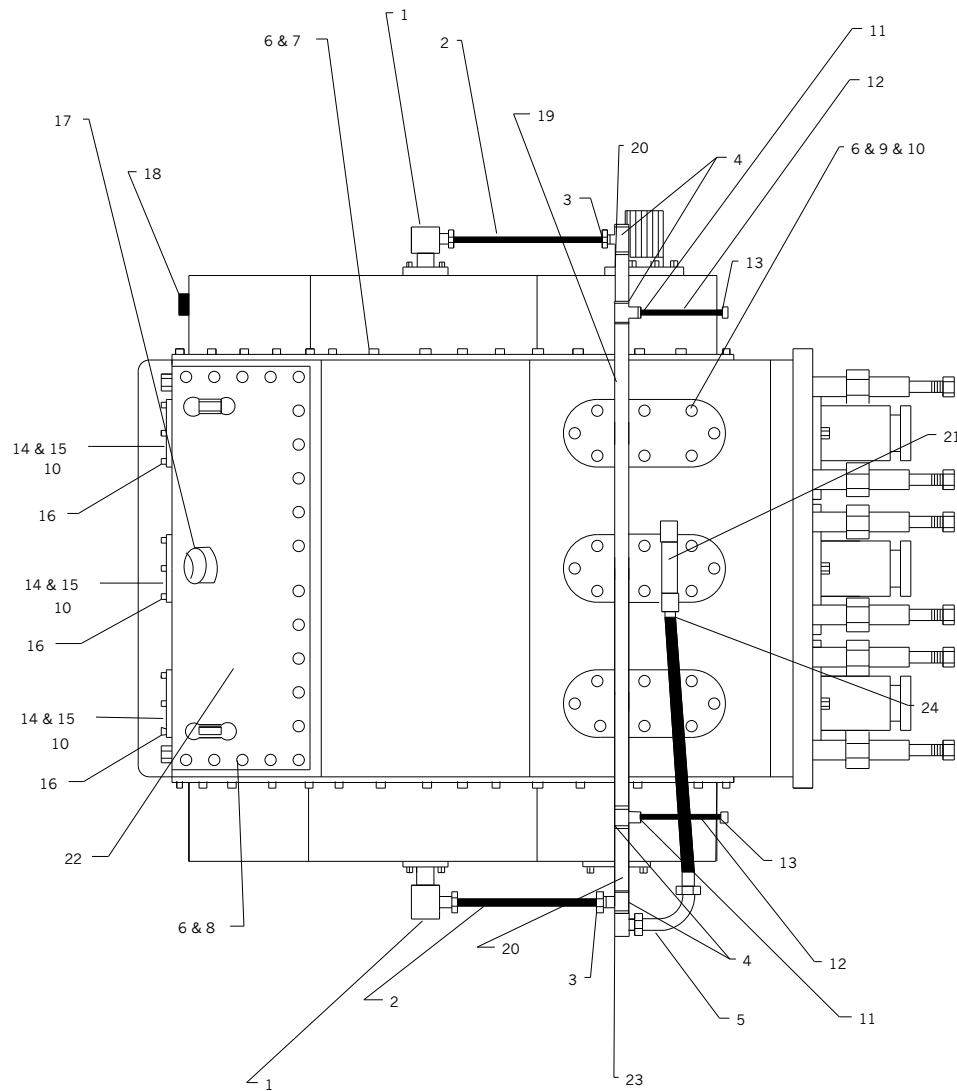
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	330PN05	1	POWER FRAME HOUSING
2	80AD03	1	CRANKSHAFT ASSY SEE 80AD03 ASSY PRINT
3	100AD01	3	CROSSHEAD ASSY SEE 100AD01 ASSY PRINT
4	286PN005	3	PONY ROD , CLAMP TYPE
5	342-A-27	3	PONY ROD SEAL RETAINER
6	453PN012	12	STAY ROD , 13" LONG WITH 2-3/4" HEX
7	458VP006-005	12	HEX NUT , HEAVY 1.3/4" -8UNC -2B
8	454VP005-014	18	CAPSCREW , HEX HEAD , 5/8" - 11UNC X 1-1/2" LG
9	901SH02-12	3	SEAL , PONY ROD
10	916VP002-210	4	HOSE , TEFLON , #6 J.I.C. FEMALE
11	916VP002-170	3	HOSE , TEFLON , #6 J.I.C. FEMALE
12	581PN014	2	COVER , INSPECTION TOP
13	968VP003-011	4	HOSE ADAPTER #6 J.I.C. MALE X 1/4" NPT
14	968VP003-012	4	HOSE ADAPTER 90° #6 J.I.C. X 3/8" NPT
15	574PN010	1	MANIFOLD , LUBE
16	.....		NO LUBE SUMP
16-1	342-C-10	1	10" LUBE SUMP , BOLT ON TYPE
16-2	342-C-10A	1	14" LUBE SUMP , BOLT ON TYPE
17	351WD040	2	MOUNTING BRACKET , FRONT
18	351WD041	1	MOUNTING BRACKET , BACK
19	454VP007-020	8	CAPSCREW , HEX HEAD , 7/8" -9UNC X 2" LG.
20	565PN100	3	GASKET , TOP COVER
21	581PN13	1	COVER , TOP MIDDLE
22	454VP003-006	24	CAPSCREW , HEX HEAD 3/8" .16 UNC X 3/4" LG.
23	968VP001-012	3	HOSE ADAPTER , MALE #6 J.I.C. X 3/8" NPT
24	968VP003-011	3	HOSE ADAPTER , MALE 90° #6 J.I.C. X 1/4" NPT
25	971VP002-003	2	PIPE PLUG 3/8" NPT ( NOT SHOWN )

3 SEE CROSSHEAD ASSY PRINT

2 SEE CRANKSHAFT ASSY PRINT

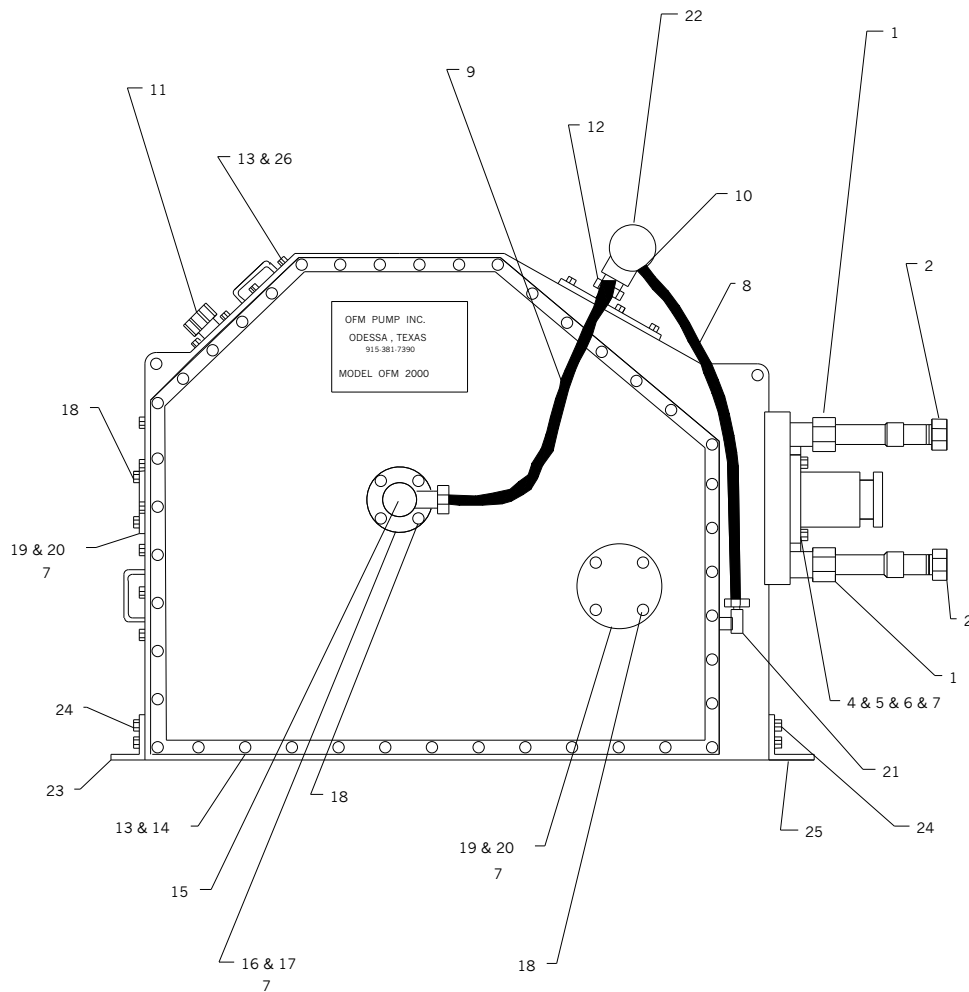
16  
16-1  
16-2

OFM PUMP INC.			
DRAWN Name	LG	OFM 2000 POWER END ASSY	
APPROVED Name	1-1-97	SIZE B	DWG NUMBER P E ASSY-5
SCALE 1:10	REV .	SHEET	1 OF 1



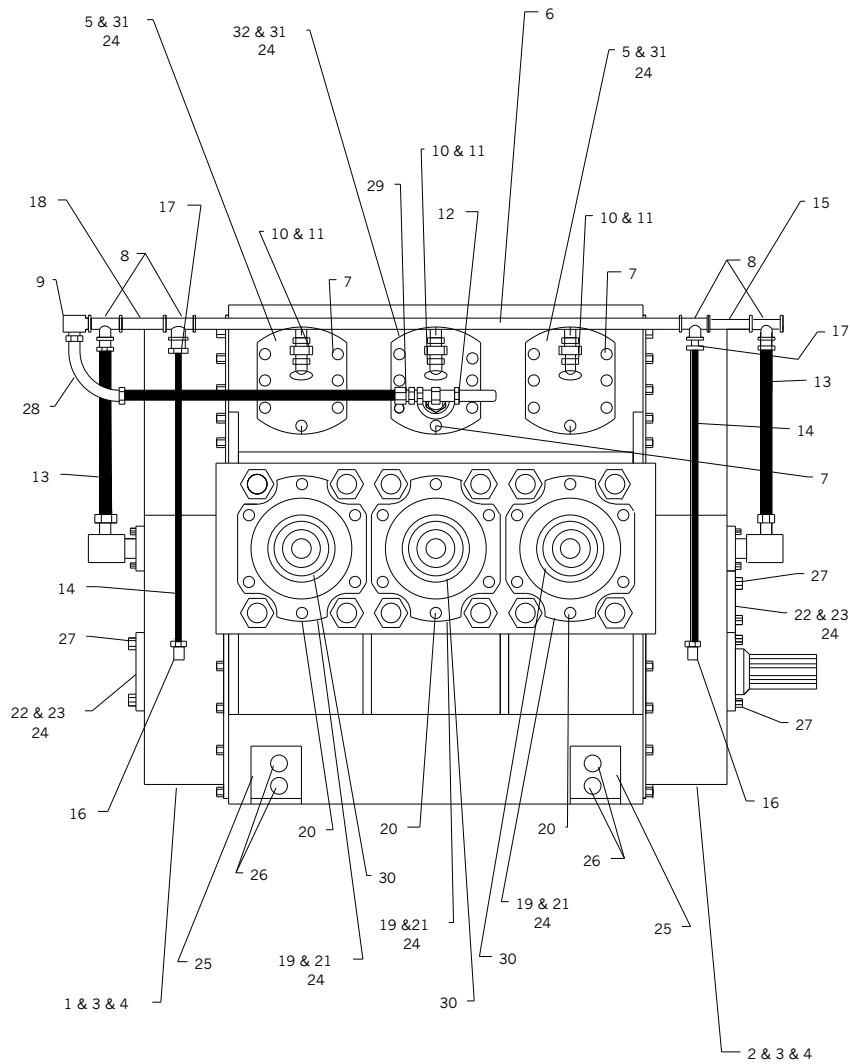
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	922VP001	2	ROTARY UNION
2	916PN018-280	2	HOSE TEFLON , #8 FEMALE J.I.C. X 1/2" MALE NPT
3	968VP007-010	2	ADAPTER MALE CONNECTOR #8 J.I.C. X 1/2" NPT
4	971VP020-010	4	PIPE FITTING , TEE 1" X 1" X 1/2"
5	916PN024-270	1	HOSE , RUBBER #16 J.I.C. FE X 90° TUBE ELBOW
6	454VP003-006	158	CAPSCREW , HEX HEAD 3/8" .16UNC X 3/4" LG.
7	565PN034	2	GASKET , GEAR COVER
8	565PN036	1	GASKRT , REAR COVER
9	565PN100	3	GASKET , TOP COVER
10	5090000000	AR	RTV SILICONE , RED, ZEP FAST GASKET
11	968VP001-006	2	HOSE , ADAPTER MALE #4 J.I.C. X 1/2" NPT
12	916VP001-270	2	HOSE , TEFLON # 4 FEMALE J.I.C.
13	968VP003-004	2	HOSE, ADAPTER , 90° # 4 FEMALE J.I.C. X 1/4" NPT
14	342-A-09	5	COVER INSPECTION
15	565PN032	5	GASKET , INSPECTION COVER
16	454VP003-010	20	CAPSCREW , HEX HEAD 3/8" .16UNC X 1" LG
17	910PN05	1	BREATHER CAP
18	550-5	1	5" FLUID LEVEL SIGHT GAUGE , LENZ
19	574PN010	1	LUBE MANIFOLD
20	971PN026-080	2	PIPE , FITTING , NIPPLE 1" X 8" LONG
21	927VP02	1	VALVE , BYPASS 1" X 1" NPT
22	580WD046	1	COVER , REAR
23	968VP003-029	1	HOSE , ADAPTER , 90° # 16 J.I.C. X 1" MALE
24	968VP001-030	1	HOSE , ADAPTER , MALE #16 J.I.C. X 1" NPT

OFM PUMP INC.			
DRAWN Name	LG	OFM 2000 POWER END ASSEMBLY	
APPROVED Name	1-1-97	SIZE B	DWG NUMBER P E ASSY-6
SCALE 1:10	REV -	SHEET 1 OF 1	



ITEM	PART NO.	QTY.	DESCRIPTION
1	453PN012	12	STAY ROD, 13" LONG WITH 2-3/4" HEX
2	458VP006-005	12	HEX NUT, HEAVY 1-3/4" -8UNC -2B
3	286PN005	3	PONY ROD, CLAMP TYPE
4	342-A-27	3	PONY ROD SEAL RETAINER
5	454VP005-014	18	CAPSCREW, HEX HEAD, 5/8" -11UNC X 1-1/2" LG
6	565PN033	3	GASKET, PONY ROD SEAL RETAINER
7	5090000000	AR	RTV SILICONE, RED, ZEP FAST GASKET
8	916VP001-270	2	HOSE, TEFLON # 4 FEMALE J.I.C.
9	916VP018-280	2	HOSE, TEFLON # 8 J.I.C. FEMALE X 1/2" MALE NPT
10	968VP001-006	2	HOSE ADAPTER, MALE # 4 J.I.C. X 1/2" NPT
11	910PN05	1	BREATHER, CAP
12	968VP007-010	2	ADAPTER MALE CONNECTOR #8J.I.C. X 1/2" NPT
13	454VP003-006	158	CAPSCREW, HEX HEAD 3/8" -16UNC X 3/4" LG
14	565PN034	2	GASKET, GEAR COVER
15	922VP001	2	ROTARY UNION
16	342-A-74	2	ROTARY UNION SEAL CARRIER
17	565PN031	2	GASKET, SEAL CARRIER - ROTARY UNION
18	454VP003-010	34	CAPSCREW, HEX HEAD 3/8" -16UNC X 1" LG
19	342-A-09	5	COVER, INSPECTION
20	565PN032	5	GASKET, INSPECTION COVER
21	968VP003-004	2	HOSE ADAPTER, 90° #4 FEMALE J.I.C. X 1/4" NPT
22	574PN010	1	LUBE MANIFOLD
23	351WD041	1	MOUNTING BRACKET, BACK
24	454VP007-020	8	CAPSCREW, HEX HEAD 7/8" -9UNC X 2" LONG
25	351WD040	2	MOUNTING BRACKET, FRONT
26	565PN036	1	GASKET, REAR COVER

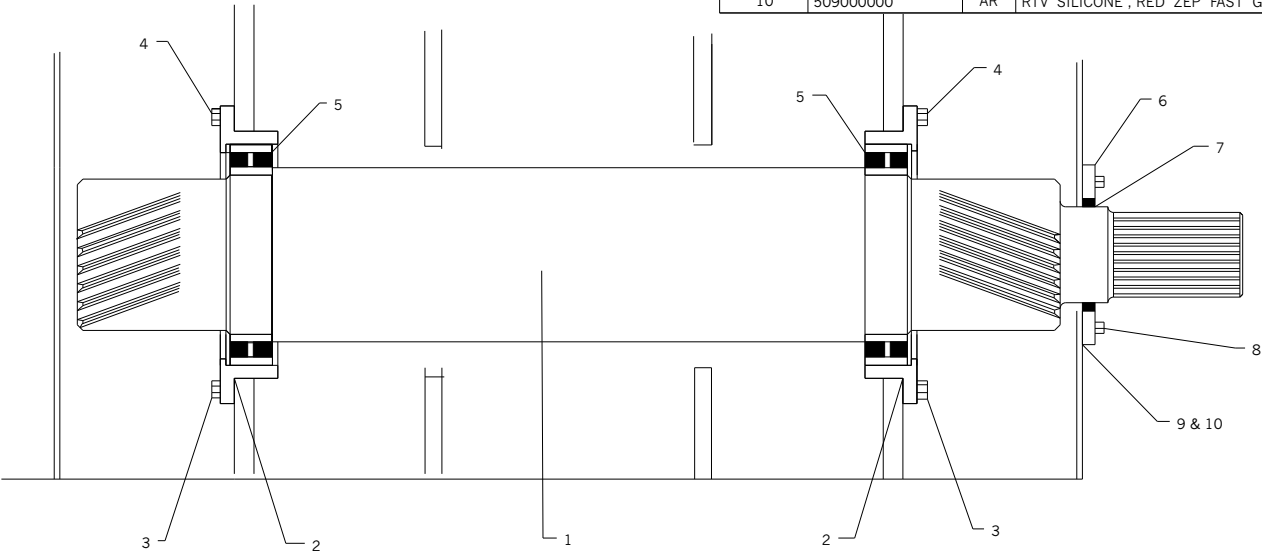
OFM PUMP INC.			
DRAWN Name	LG	OFM 2000 POWER END ASSEMBLY	
APPROVED Name	B	SIZE P E	DWG NUMBER ASSY:7
SCALE	1:10	REV	SHEET 1 OF 1



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	582PN17	1	GEAR COVER, RIGHT HAND
2	582PN022	1	GEAR COVER, LEFT HAND WITH OIL LEVEL GAUGE
3	565PN034	2	GASKET, GEAR COVER
4	634VP003-006	4	DOWEL PIN 1/4" DIA. X 3/4" LONG
5	581PN014	2	COVER, INSPECTION TOP
6	574PN010	1	MANIFOLD, LUBE
7	454VP003-006	24	CAPSCREW, HEX HEAD 3/8" .16UNC X 3/4" LONG
8	971VP020-010	4	PIPE FITTING, TEE, 1" X 1" X 1/2"
9	968VP003-029	1	HOSE ADAPTER, 90° #16 J.I.C. X 1" MALE NPT
10	968VP001-045	3	ADAPTER, HOSE 3/8" NPT TO # 16 J.I.C. MALE
11	968VP002-025	3	ADAPTER, HOSE 1" NPT TO # 16 J.I.C. FEMALE
12	927VP02	1	VALVE, BYPASS 1" X 1" NPT
13	916PN018-280	2	HOSE TEFLON #8 J.I.C. FEMALE X 1/2" MALE NPT
14	916VP001-270	2	HOSE, TEFLON #4 FEMALE J.I.C.
15	971PN026-080	1	PIPE FITTING, NIPPLE 1" X 8" LONG
16	968VP003-004	2	HOSE ADAPTER, 90° #4 J.I.C. X 1/4" NPT
17	968VP001-006	2	HOSE, ADAPTER, MALE CONNECTOR, #4 J.I.C. X 1/2" NPT
18	971PN026-040	1	PIPE FITTING, NIPPLE 1" X 4" LONG
19	342-A-27	3	PONY ROD SEAL RETAINER
20	454VP005-014	18	5/8" .11UNC X 1-1/2" LG. HEX HEAD CAPSCREW
21	565PN033	3	GASKET, PONY ROD SEAL RETAINER
22	342-A-09	1	COVER, INSPECTION
23	565PN032	5	GASKET, INSPECTION COVER
24	509000000	AR	RTV SILICONE, RED, ZEP FAST GASKET
25	351WD040	2	MOUNTING, BRACKET, FRONT
26	454VP007-020	4	CAPSCREW, HEX HEAD 7/8" .9UNC X 2" LG.
27	454VP003-010	14	CAPSCREW, HEX HEAD 3/8" .16UNC X 1" LG.
28	916PN024-270	1	HOSE, RUBBER #16 J.I.C. FEMALE X 90° TUBE ELBOW
29	968VP001-030	1	HOSE ADAPTER, MALE CONNECTOR #16 J.I.C. X 1" NPT
30	901SH02-12	3	SEAL, PONY ROD
31	565PN100	3	GASKET, TOP COVER
32	581PN13	1	COVER, TOP, MIDDLE

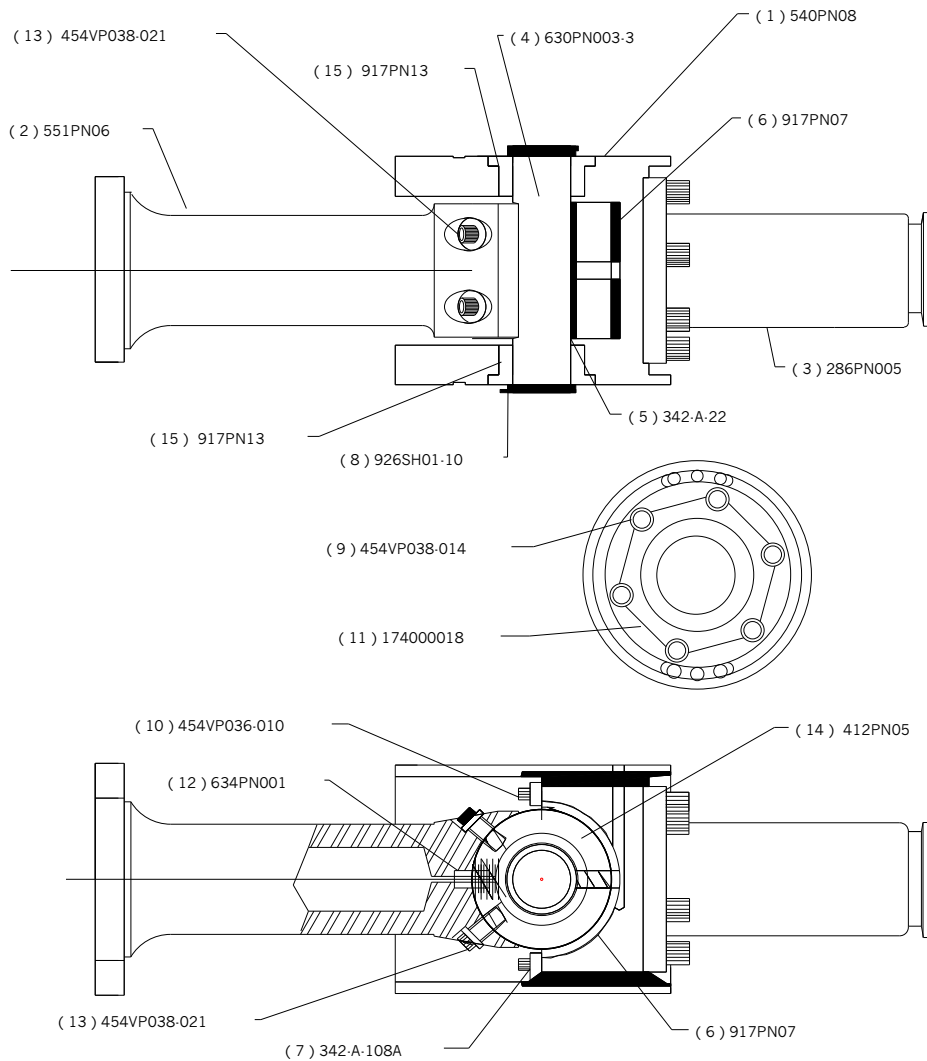
OFM PUMP INC.			
DRAWN Name	LG	OFM 2000 POWER END ASSEMBLY	
APPROVED Name	B	SIZE	DWG NUMBER
SCALE 1:10	REV	P E ASSY-8	
		SHEET	1 OF 1

ITEM NO	PART NO	QTY	DESCRIPTION
1	557PN10	1	PINION SHAFT , SPLINED
2	611PN01	2	PINION BEARING HOUSING
3	454VP017-014	6	CAPSCREW , HEX HEAD 3/4" -10UNC X 1-1/2" LG
4	454VP017-010	6	CAPSCREW , HEX HEAD 3/4" -10UNC X 1" LG
5	925SH01-13	2	BEARING , PINION
6	342-A-60	1	PINION SEAL RETAINER
7	901SH02-5	1	SEAL , PINION
8	454VP003-010	6	CAPSCREW , HEX HEAD 3/8" -16UNC X 1" LG
9	565PNO30	1	GASKET , PINION SEAL RETAINER
10	509000000	AR	RTV SILICONE , RED ZEP FAST GASKET



OFM 2000 PINION SHAFT ASSEMBLY

OFM PUMP INC.			
DRAWN Name	LG	2000 OFM PINION SHAFT ASSEMBLY	
APPROVED Name	B	SIZE P S	DWG NUMBER ASSY-1
SCALE 1 : 5	REV	SHEET	1 OF 1



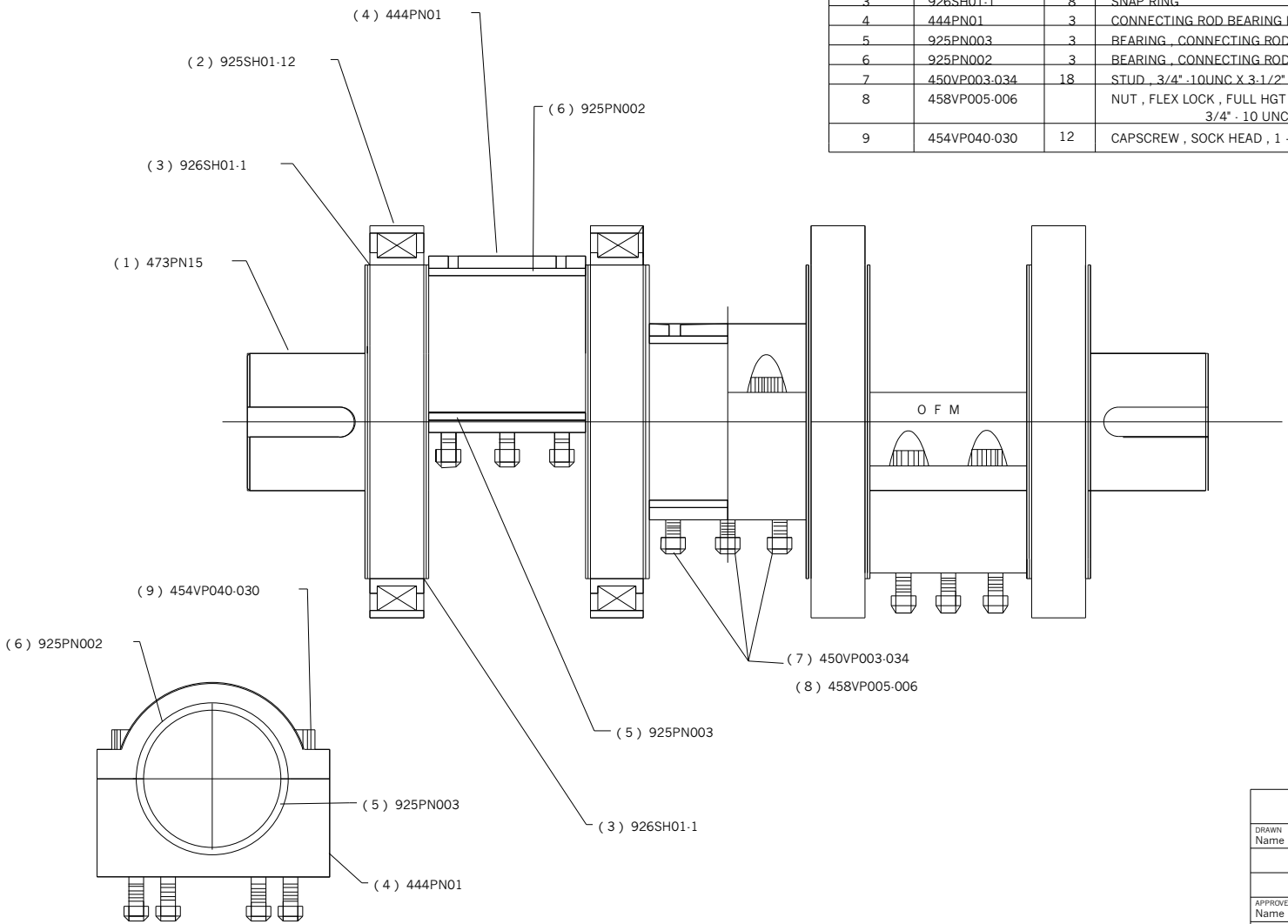
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	540PN08	1	CROSSHEAD
2	551PN06	1	CONNECTIND ROD
3	286PN005	1	PONY ROD
4	630PN003-3	1	WRIST PIN
5	342-A-22	1	WRIST PIN BUSHING
6	917PN07	1	THRUST SEAT
7	342-A-108A	2	THRUST SEAT KEEPER
8	926SH01-10	2	SNAP RING
9	454VP038-014	6	CAPSCREW, SOCKET HEAD 3/4" - 10 UNC X 1-1/2" LONG
10	454VP036-010	8	CAPSCREW, SOCKET HEAD 1/2" - 13 UNC X 1" LONG
11	174000018	AR	SAFETY WIRE, A-36, 18 GAUGE
12	634PN001	2	DOWELL PIN 3/4" X 1-1/2" LONG
13	454VP069-014	4	FERRY HEAD, BOLT 3/4" ~ 10 UNC X 1-1/2" LONG
14	412PN05	1	PIVOT END
15	917PN13	2	CROSSHEAD BUSHING

NOTE:

OIL GROOVE AND OIL HOLES MUST BE  
ON TOP WHEN INSTALLED

OFM PUMP INC.			
DRAWN Name	LG	OFM 2000 CROSSHEAD ASSEMBLY	
APPROVED Name	7/29/03	SIZE B	DWG NUMBER 100AD01-2
SCALE	1 : 5	REV	SHEET 1 OF 1

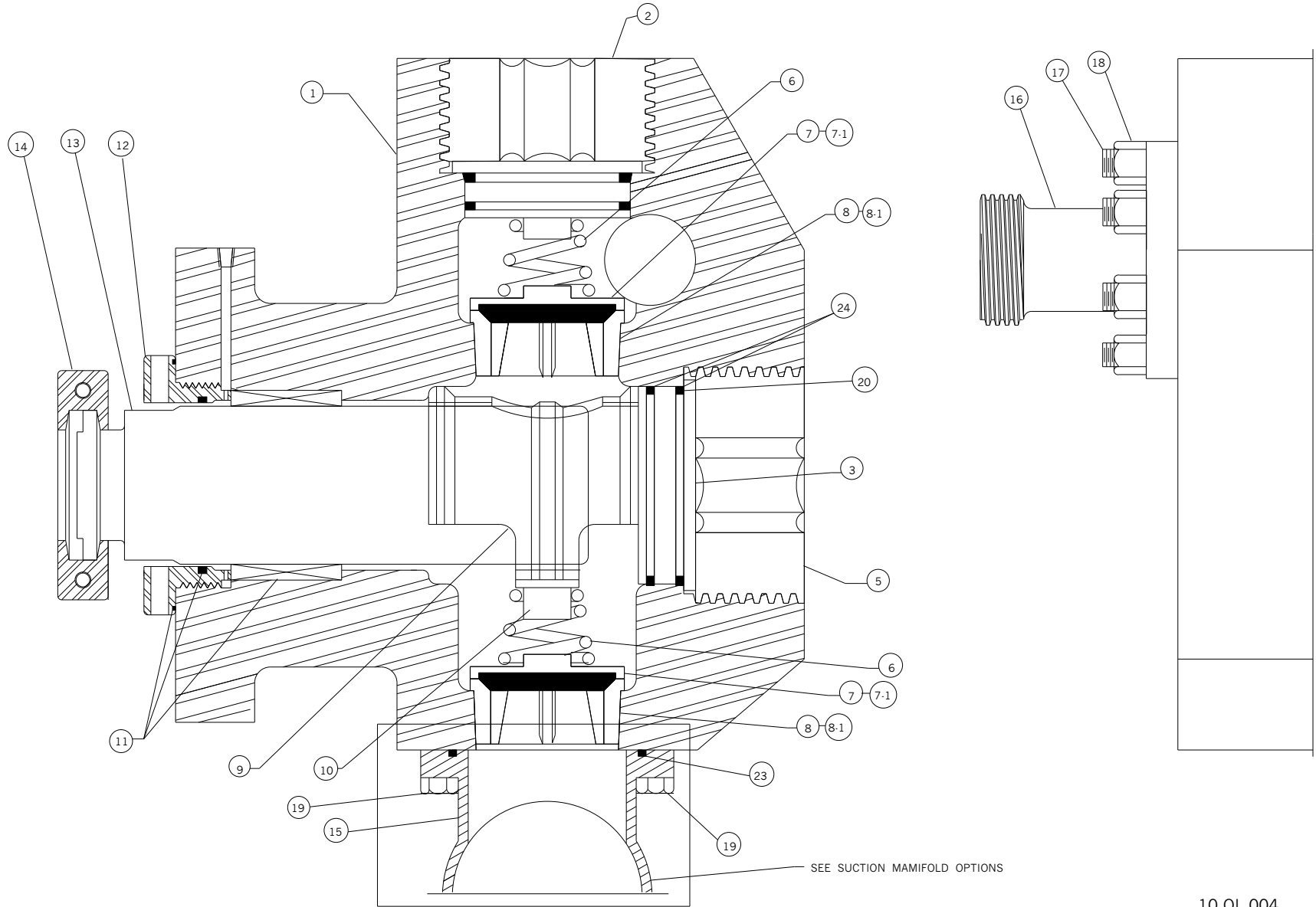
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	473PN15	1	CRANKSHAFT
2	925SH01-12	4	ROLLER BEARING
3	926SH01-1	8	SNAP RING
4	444PN01	3	CONNECTING ROD BEARING HOUSING
5	925PN003	3	BEARING ,CONNECTING ROD , BASE HALF
6	925PN002	3	BEARING ,CONNECTING ROD , CAP HALF
7	450VP003-034	18	STUD , 3/4" -10UNC X 3-1/2" LONG
8	458VP005-006		NUT , FLEX LOCK , FULL HGT , HEAVY DUTY 3/4" - 10 UNC
9	454VP040-030	12	CAPSCREW , SOCK HEAD , 1 - 8UNC X 3" LONG



<b>OFM PUMP INC.</b>			
DRAWN Name	LG	2000 O F M CRANKSHAFT ASSEMBLY	
APPROVED Name	B	SIZE B	DWG NUMBER 80AD03
SCALE 1:5	REV	SHEET	1 OF 1

2000 OFM FLUID END ASSEMBLY

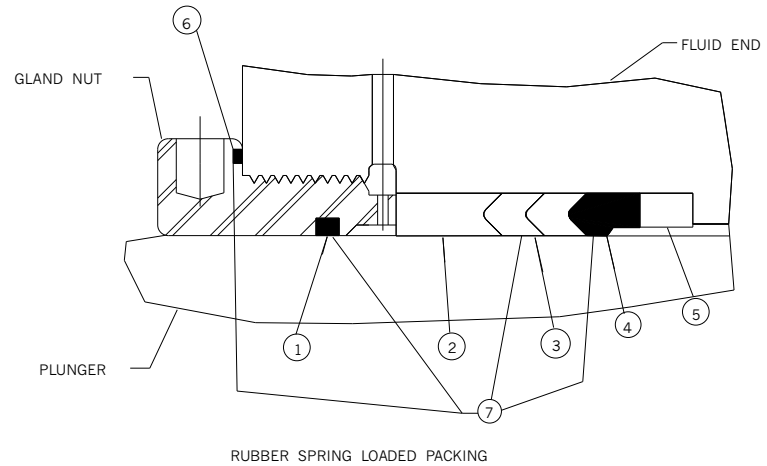
10 OL 004



10 OL 004

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN06	1	FLUID · CYLINDER BLOCK 3-3/4"
2	0710L005	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	86PN03	3	SUCTION COVER
4	_____	_____	
5	342-A-70	3	SUCTION RETAINER NUT
6	918PN01	6	VALVE SPRING
7	NF-4-V1	6	VALVE ( WITH INSERT )
7.1	NF-4-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-4-S1	6	VALVE SEAT
8.1	901SH05-153	6	VALVE SEAT " O " RING
9	131PN05	3	VALVE RETAINER CAGE
10	130PN07	3	VALVE SPRING RETAINER
11	208AD016	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN09	3	GLAND NUT
13.1	157PN003	3	PLUNGER , TYPE A , 16" LONG 3-3/4" DIA.
13.2	157PN020	3	PLUNGER , TYPE A , 18" LONG 3-3/4" DIA.
14	342-C-78	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L004	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	901PN017-005	3	SEAL , " O " RING BACK · UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-427	6	SUCTION COVER " O " RING
25	115PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

3-3/4" PLUNGER

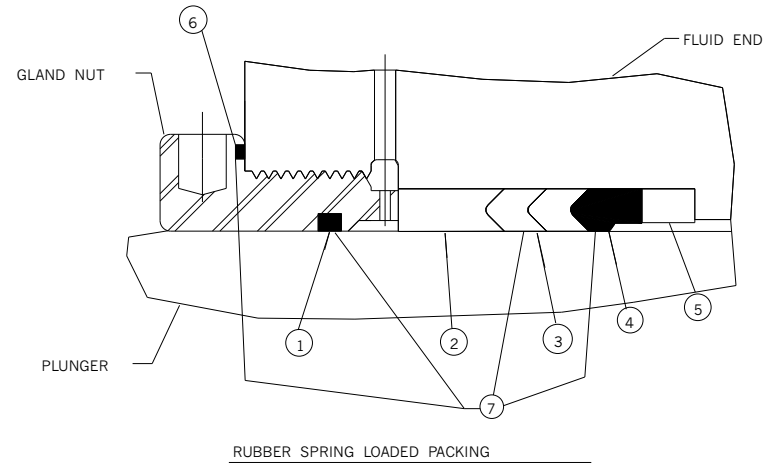


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD016		PACKING ASSEMBLY 3-3/4" X 4-3/4"
	INCLUDES		
1	901SH01-4	1	ROD WIPER
2	203PN001-002	1	PACKING ADAPTER , TOP
3	901VP002-004	2	SEAL , PRESSURE RING
4	901VP014-004	1	SEAL , HEADER RING
5	199PN001-004	1	PACKING ADAPTER , SPACER
6	901SH05-256	1	" O " RING
* 7	OFM1067-375SS475		PACKING SEAL SET 3-3/4" X 4-3/4"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	3-3/4" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 - 3750
SCALE 1 : 1	REV -	SHEET 1 OF 1	

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN04	1	FLUID - CYLINDER BLOCK 4"
2	0710L005	REF	DISCHARGE COVER ASSY , SEE OPTION LIST
3	86PN03	3	SUCTION COVER
4	_____	_____	
5	342-A-70	3	SUCTION RETAINER NUT
6	918PN01	6	VALVE SPRING
7	NF-4-V1	6	VALVE ( WITH INSERT )
7-1	NF-4-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-4-S1	6	VALVE SEAT
8-1	901SH05-153	6	VALVE SEAT " O " RING
9	131PN05	3	VALVE RETAINER CAGE
10	130PN07	3	VALVE SPRING RETAINER
11	208AD005	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN08	3	GLAND NUT
13-1	157PN009	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN011	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-78	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	265OL004	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC - 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC - 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC - 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	901PN017-005	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-.258	3	SUCTION MANIFOLD " O " RING
24	901SH05-427	6	SUCTION COVER " O " RING
25	115PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

4" PLUNGER

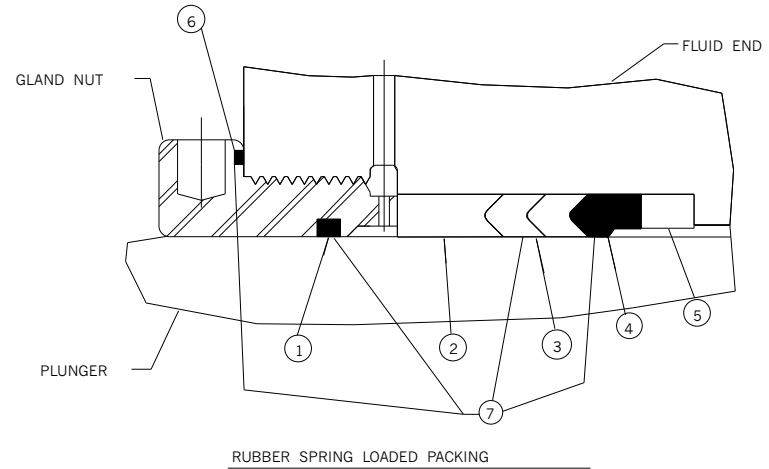


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD005		PACKING ASSEMBLY 4" X 5"
	INCLUDES		
1	901SH01-5	1	ROD WIPER
2	203PN001-003	1	PACKING ADAPTER , TOP
3	901VP002-005	2	SEAL , PRESSURE RING
4	901VP014-005	1	SEAL , HEADER RING
5	199PN001-005	1	PACKING ADAPTER , SPACER
6	901SH05-256	1	" O " RING
* 7	OFM1067-400SS500		PACKING SEAL SET 4" X 5"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	4" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 - 4000
SCALE 1 : 1	REV .	SHEET	1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN02	1	FLUID - CYLINDER BLOCK 4-1/2"
2	0710L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	86PN01	3	SUCTION COVER
4	_____	_____	
5	51PN02	3	SUCTION RETAINER NUT
6	918PN05	6	VALVE SPRING
7	NF-5-V1	6	VALVE ( WITH INSERT )
7-1	NF-5-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-5-S1	6	VALVE SEAT
8-1	901SH05-245	6	VALVE SEAT * O * RING
9	131PN02	3	VALVE RETAINER CAGE
10	130PN03	3	VALVE SPRING RETAINER
11	208AD017	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN02	3	GLAND NUT
13-1	157PN002	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN012	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-76	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L004	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC - 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC - 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC - 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	901PN017-006	3	SEAL , * O * RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD * O * RING
24	901SH05-432	6	SUCTION COVER * O * RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

4-1/2" PLUNGER

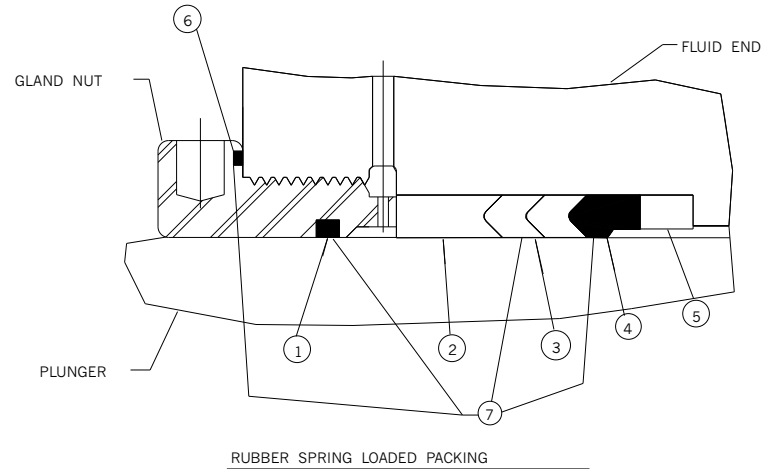


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD017		PACKING ASSEMBLY 4-1/2" X 5-1/2"
	INCLUDES		
1	901SH01-6	1	ROD WIPER
2	203PN001-005	1	PACKING ADAPTER , TOP
3	901VP002-014	2	SEAL , PRESSURE RING
4	901VP014-014	1	SEAL , HEADER RING
5	199PN001-006	1	PACKING ADAPTER , SPACER
6	901SH05-259	1	* O * RING
* 7	OFM1067-450SS550		PACKING SEAL SET 4-1/2" X 5-1/2"

OFM PUMP , INC.			
DRAWN	LDG	9/09/02	4-1/2" PLUNGER FLUID END PARTS LIST
APPROVED	FCF	9/09/02	SIZE C
SCALE	1 : 1	REV	DWG NUMBER 2000 - 4500
			SHEET 1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN10	1	FLUID · CYLINDER BLOCK 5"
2	0710L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	86PN08	3	SUCTION COVER
4	_____	_____	
5	51PN03	3	SUCTION RETAINER NUT
6	918PN05	6	VALVE SPRING
7	NF-5-V1	6	VALVE ( WITH INSERT )
7.1	NF-5-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-5-S1	6	VALVE SEAT
8.1	901SH05-245	6	VALVE SEAT " O " RING
9	131PN10	3	VALVE RETAINER CAGE
10	130PN03	3	VALVE SPRING RETAINER
11	208AD009	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN18	3	GLAND NUT
13.1	157PN007	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13.2	157PN016	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L004	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	901PN017-005	3	SEAL , " O " RING BACK · UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-435	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

5" PLUNGER

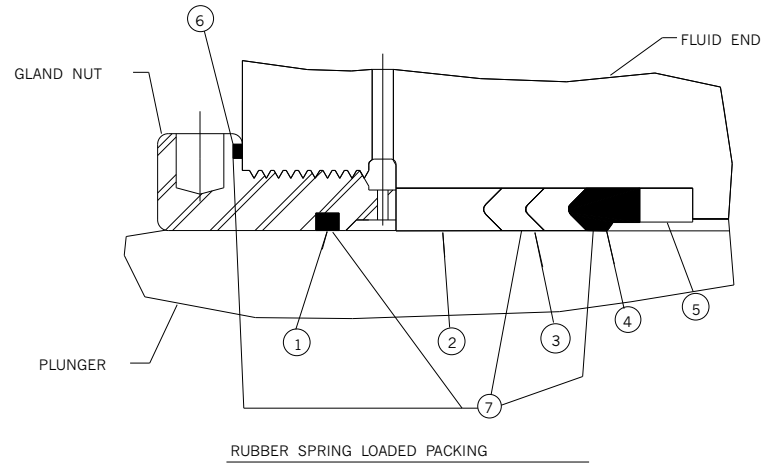


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD009		PACKING ASSEMBLY 5" X 6"
	INCLUDES		
1	901SH01-7	1	ROD WIPER
2	203PN001-006	1	PACKING ADAPTER , TOP
3	901VP002-009	2	SEAL , PRESSURE RING
4	901VP014-009	1	SEAL , HEADER RING
5	199PN001-007	1	PACKING ADAPTER , SPACER
6	901SH05-261	1	" O " RING
* 7	OFM1067-500SS600		PACKING SEAL SET 5" X 6"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	5" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 · 5000
SCALE 1 : 1	REV .	SHEET	1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN09	1	FLUID - CYLINDER BLOCK 5-1/2"
2	0700L002	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	85PN05	3	SUCTION COVER
4	_____	_____	
5	342-A-34	3	SUCTION RETAINER NUT
6	918PN13	6	VALVE SPRING
7	NF-6-V1	6	VALVE ( WITH INSERT )
7.1	NF-6-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-6-S3	6	VALVE SEAT
8.1	901SH05-248	6	VALVE SEAT " O " RING
9	131PN09	3	VALVE RETAINER CAGE
10	130PN10	3	VALVE SPRING RETAINER
11	208AD007	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN16	3	GLAND NUT
13.1	157PN005	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13.2	157PN014	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC - 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC - 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC - 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-438	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

5-1/2" PLUNGER

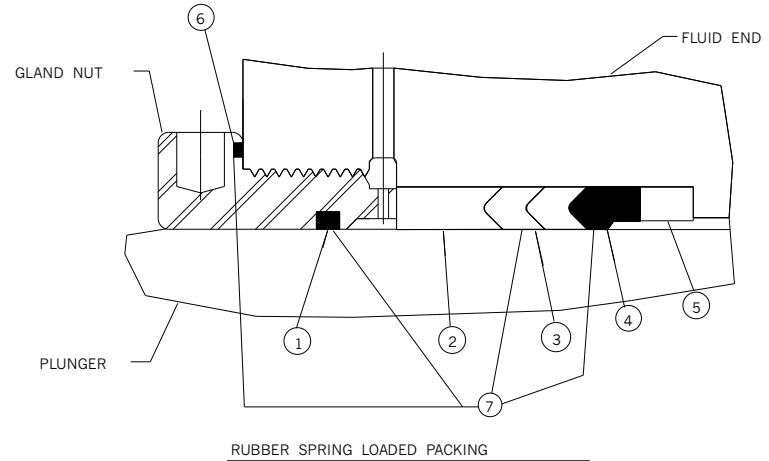


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD007		PACKING ASSEMBLY 5-1/2" X 6-1/2"
	INCLUDES		
1	901SH01-11	1	ROD WIPER
2	203PN001-012	1	PACKING ADAPTER , TOP
3	901VP002-008	2	SEAL , PRESSURE RING
4	901VP014-008	1	SEAL , HEADER RING
5	199PN001-008	1	PACKING ADAPTER , SPACER
6	901SH05-263	1	" O " RING
* 7	OFM1067-550SS650		PACKING SEAL SET 5-1/2" X 6-1/2"

OFM PUMP , INC.			
DRAWN	LDG	9/09/02	5-1/2" PLUNGER FLUID END PARTS LIST
APPROVED	FCF	9/09/02	SIZE C
SCALE	1 : 1	REV	DWG NUMBER 2000 - 5500
			SHEET 1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN07	1	FLUID - CYLINDER BLOCK 5-3/4"
2	0700L002	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	86PN07	3	SUCTION COVER
4	_____	_____	
5	50PN12	3	SUCTION RETAINER NUT
6	918PN13	6	VALVE SPRING
7	NF-6-V1	6	VALVE ( WITH INSERT )
7-1	NF-6-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-6-S3	6	VALVE SEAT
8-1	901SH05-248	6	VALVE SEAT " O " RING
9	131PN08	3	VALVE RETAINER CAGE
10	130PN10	3	VALVE SPRING RETAINER
11	208AD006	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN15	3	GLAND NUT
13-1	157PN004	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN013	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK · UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-440	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

5-3/4" PLUNGER

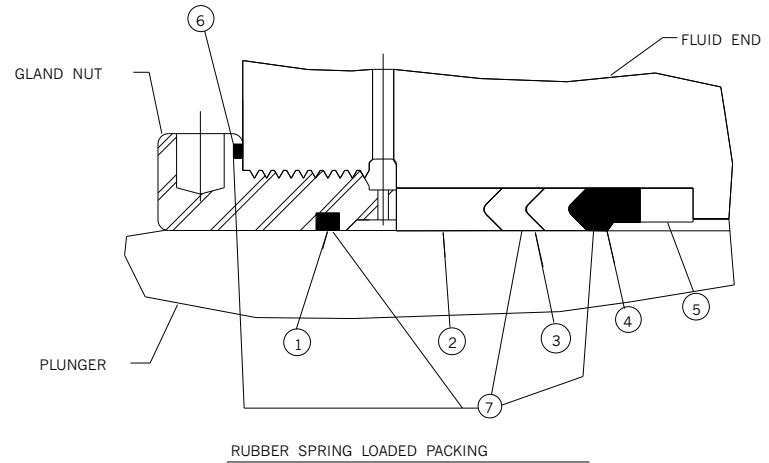


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD006		PACKING ASSEMBLY 5-3/4" X 6-3/4"
	INCLUDES		
1	901SH01-9	1	ROD WIPER
2	203PN001-010	1	PACKING ADAPTER , TOP
3	901VP002-006	2	SEAL , PRESSURE RING
4	901VP014-006	1	SEAL , HEADER RING
5	199PN001-009	1	PACKING ADAPTER , SPACER
6	901SH05-265	1	" O " RING
* 7	OFM1067-575SS675		PACKING SEAL SET 5-3/4" X 6-3/4"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	5-3/4" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 - 5750
SCALE 1 : 1	REV -	SHEET 1 OF 1	

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN08	1	FLUID - CYLINDER BLOCK 6"
2	0700L002	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	86PN07	3	SUCTION COVER
4	_____	_____	
5	50PN12	3	SUCTION RETAINER NUT
6	918PN13	6	VALVE SPRING
7	NF-6-V1	6	VALVE ( WITH INSERT )
7.1	NF-6-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-6-S3	6	VALVE SEAT
8.1	901SH05-248	6	VALVE SEAT " O " RING
9	131PN08	3	VALVE RETAINER CAGE
10	130PN10	3	VALVE SPRING RETAINER
11	208AD008	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN17	3	GLAND NUT
13-1	157PN006	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN015	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC - 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC - 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC - 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-440	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

6" PLUNGER

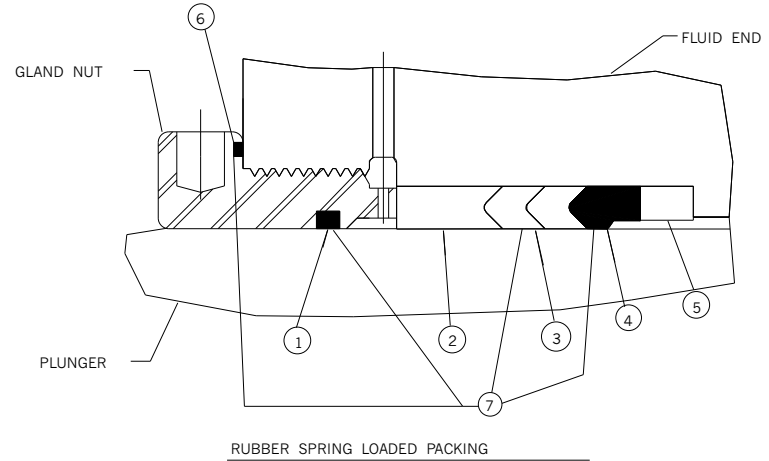


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD008		PACKING ASSEMBLY 6" X 7"
	INCLUDES		
1	901SH01-10	1	ROD WIPER
2	203PN001-011	1	PACKING ADAPTER , TOP
3	901VP002-007	2	SEAL , PRESSURE RING
4	901VP014-007	1	SEAL , HEADER RING
5	199PN001-010	1	PACKING ADAPTER , SPACER
6	901SH05-265	1	" O " RING
* 7	OFM1067-600SS700		PACKING SEAL SET 6" X 7"

OFM PUMP , INC.			
DRAWN	LDG	9/09/02	6" PLUNGER FLUID END PARTS LIST
APPROVED	FCF	9/09/02	
SCALE	1 : 1	REV	-
SIZE		C	DWG NUMBER
			2000 - 6000
		SHEET	1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN01	1	FLUID - CYLINDER BLOCK 6-1/2"
2	0700L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	85PN03	3	SUCTION COVER
4	_____	_____	
5	342-A-116	3	SUCTION RETAINER NUT
6	918PN15	6	VALVE SPRING
7	NF-7-V1	6	VALVE ( WITH INSERT )
7.1	NF-7-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-7-S1	6	VALVE SEAT
8.1	901SH05-256	6	VALVE SEAT " O " RING
9	131PN01	3	VALVE RETAINER CAGE
10	130PN02	3	VALVE SPRING RETAINER
11	208AD018	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN001	3	GLAND NUT
13.1	157PN001	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13.2	157PN018	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-440	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

6-1/2" PLUNGER

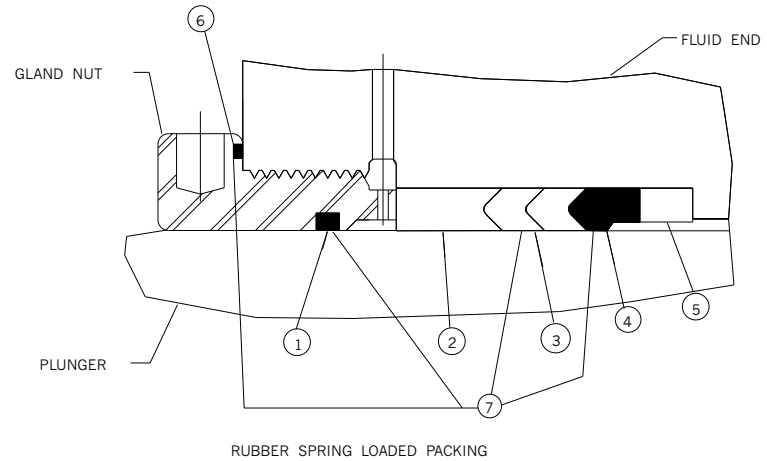


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD008		PACKING ASSEMBLY 6-1/2" X 7-1/2"
	INCLUDES		
1	901SH01-8	1	ROD WIPER
2	203PN001-004	1	PACKING ADAPTER , TOP
3	901VP002-015	2	SEAL , PRESSURE RING
4	901VP014-015	1	SEAL , HEADER RING
5	199PN001-011	1	PACKING ADAPTER , SPACER
6	901SH05-267	1	" O " RING
* 7	OFM1067-650SS750		PACKING SEAL SET 6-1/2" X 7-1/2"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	6-1/2" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 - 6500
SCALE 1 : 1	REV -	SHEET 1 OF 1	

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN11	1	FLUID - CYLINDER BLOCK 6-3/4"
2	0700L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	85PN15	3	SUCTION COVER
4	_____	_____	
5	342-A-116	3	SUCTION RETAINER NUT
6	918PN15	6	VALVE SPRING
7	NF-7-V1	6	VALVE (WITH INSERT)
7.1	NF-7-I	_____	VALVE INSERT (REPLACEMENT , 1 EACH VALVE )
8	NF-7-S1	6	VALVE SEAT
8.1	901SH05-256	6	VALVE SEAT " O " RING
9	131PN11	3	VALVE RETAINER CAGE
10	130PN02	3	VALVE SPRING RETAINER
11	208AD010	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN19	3	GLAND NUT
13.1	157PN008	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13.2	157PN017	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-443	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

6-3/4" PLUNGER

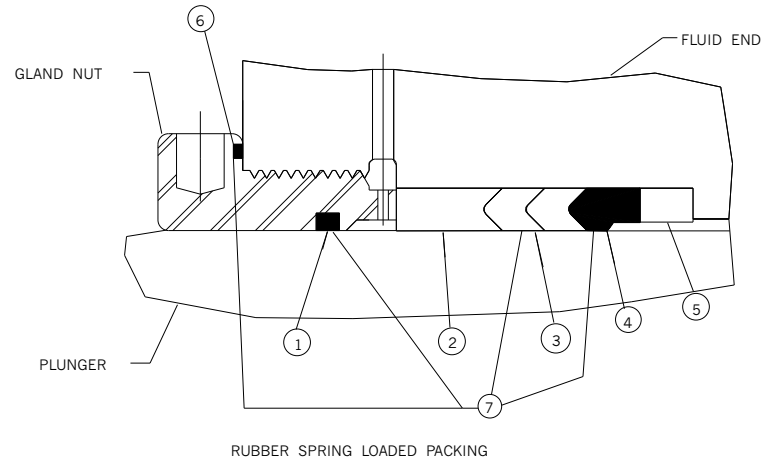


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD010		PACKING ASSEMBLY 6-3/4" X 7-3/4"
	INCLUDES		
1	901SH01-8	1	ROD WIPER
2	203PN001-008	1	PACKING ADAPTER , TOP
3	901VP002-011	2	SEAL , PRESSURE RING
4	901VP014-011	1	SEAL , HEADER RING
5	199PN001-012	1	PACKING ADAPTER , SPACER
6	901SH05-268	1	" O " RING
* 7	OFM1067-675SS775		PACKING SEAL SET 6-3/4" X 7-3/4"

OFM PUMP , INC.			
DRAWN LDG	9/09/02	6-3/4" PLUNGER FLUID END PARTS LIST	
APPROVED FCF	9/09/02	SIZE C	DWG NUMBER 2000 - 6750
SCALE 1 : 1	REV .	SHEET 1 OF 1	

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN020	1	FLUID - CYLINDER BLOCK 7"
2	0700L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	85PN16	3	SUCTION COVER
4	_____	_____	
5	50PN020	3	SUCTION RETAINER NUT
6	918PN15	6	VALVE SPRING
7	NF-7-V1	6	VALVE ( WITH INSERT )
7.1	NF-7-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-7-S1	6	VALVE SEAT
8.1	901SH05-256	6	VALVE SEAT " O " RING
9	131PN14	3	VALVE RETAINER CAGE
10	130PN02	3	VALVE SPRING RETAINER
11	208AD022	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN024	3	GLAND NUT
13-1	157PN024	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN025	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK · UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-369	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

7" PLUNGER

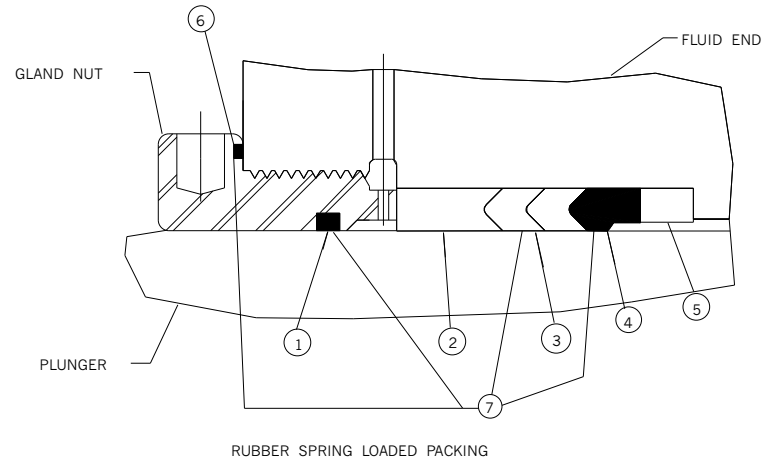


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD022		PACKING ASSEMBLY 7" X 8"
	INCLUDES		
1	901SH01-13	1	ROD WIPER
2	203PN001-014	1	PACKING ADAPTER , TOP
3	901VP002-017	2	SEAL , PRESSURE RING
4	901VP014-017	1	SEAL , HEADER RING
5	199PN001-014	1	PACKING ADAPTER , SPACER
6	901SH05-269	1	" O " RING
* 7	OFM1067-700SS800		PACKING SEAL SET 7" X 8"

OFM PUMP , INC.			
DRAWN	LDG	9/09/02	7" PLUNGER FLUID END PARTS LIST
APPROVED	FCF	9/09/02	SIZE C
SCALE	1 : 1	REV	DWG NUMBER 2000 - 7000
			SHEET 1 OF 1

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	12PN12	1	FLUID - CYLINDER BLOCK 7-1/2"
2	0700L003	REF	DISCHARGE COVER ASSY, SEE OPTION LIST
3	87PN01	3	SUCTION COVER
4	_____	_____	
5	50PN16	3	SUCTION RETAINER NUT
6	918PN15	6	VALVE SPRING
7	NF-7-V1	6	VALVE ( WITH INSERT )
7.1	NF-7-I	_____	VALVE INSERT ( REPLACEMENT , 1 EACH VALVE )
8	NF-7-S1	6	VALVE SEAT
8.1	901SH05-256	6	VALVE SEAT " O " RING
9	131PN12	3	VALVE RETAINER CAGE
10	130PN02	3	VALVE SPRING RETAINER
11	208AD019	3	RUBBER SPRING LOADED PACKING ASSY.
12	182PN22	3	GLAND NUT
13-1	157PN010	3	PLUNGER , TYPE A , 16" LONG 4" DIA.
13-2	157PN019	3	PLUNGER , TYPE A , 18" LONG 4" DIA.
14	342-C-77	3	PONY ROD TO PLUNGER CLAMP
15	117PN008	1	SUCTION MANIFOLD , 6" RUN WITH 12" CENTERS
16	2650L005	REF	DISCHARGE FLANGE , SEE OPTION LIST
17	450VP005-034	12	STUD , 1"-8UNC · 2A X 3-1/2" LONG
18	458VP012-008	12	1"- 8 UNC · 2B , HEX HUT , HVY , GRADE 5
19	454VP007-014	12	7/8"- 9 UNC · 2A X 1-1/2" , CAPSCREW, HEX HEAD
20	NOT USED	3	SEAL , " O " RING BACK - UP
21	_____	_____	
22	_____	_____	
23	901SH05-258	3	SUCTION MANIFOLD " O " RING
24	901SH05-371	6	SUCTION COVER " O " RING
25	116PN001	1	SUCTION MANIFOLD , VALVE LIFTER COUPLING , 6" RUN 12" CENTERS ( OPTION TO ITEM 15 )
26	210AD01	3	SUCTION VALVE LIFTER ASSY. ( FOR ABOVE MANIFOLD )

7-1/2" PLUNGER

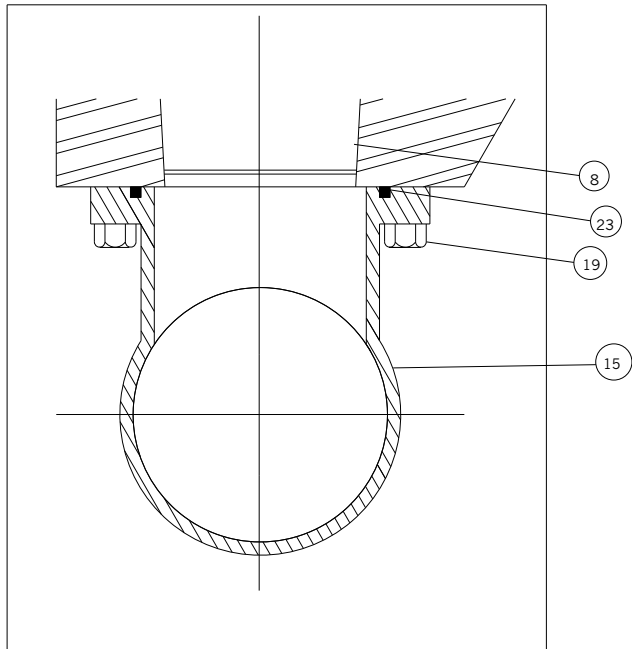


ITEM NO.	PART NO.	QTY.	DESCRIPTION
*****	208AD019		PACKING ASSEMBLY 7-1/2" X 8-1/2"
	INCLUDES		
1	901SH01-14	1	ROD WIPER
2	203PN001-013	1	PACKING ADAPTER , TOP
3	901VP002-016	2	SEAL , PRESSURE RING
4	901VP014-016	1	SEAL , HEADER RING
5	199PN001-013	1	PACKING ADAPTER , SPACER
6	901SH05-271	1	" O " RING
* 7	OFM1067-750SS850		PACKING SEAL SET 7-1/2" X 8-1/2"

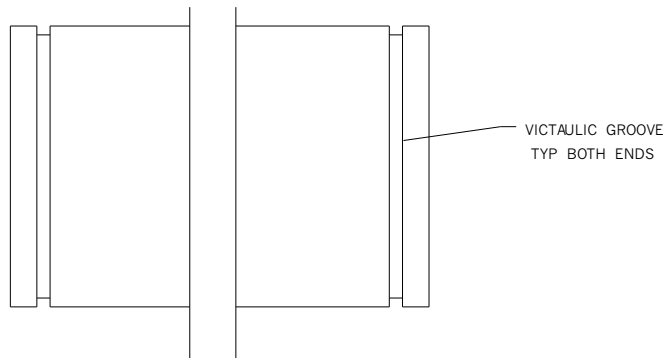
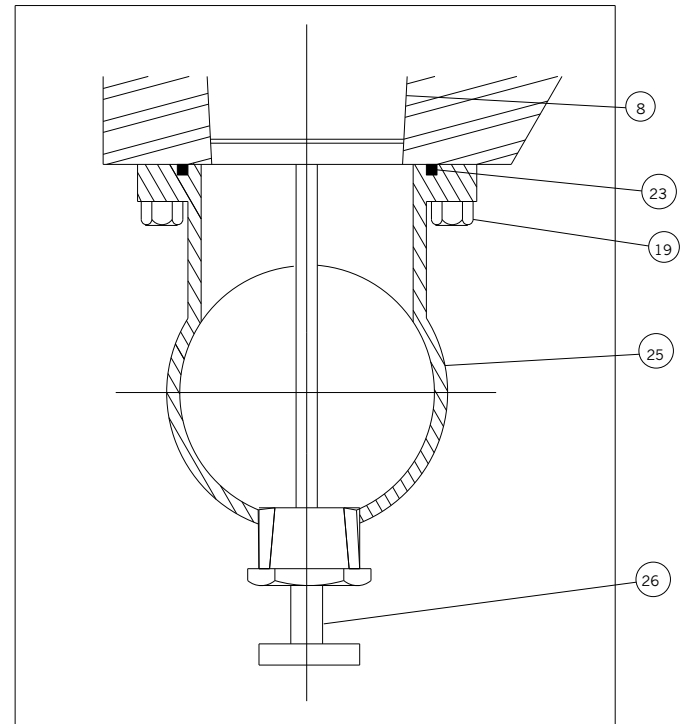
OFM PUMP , INC.			
DRAWN	LDG	9/09/02	7-1/2" PLUNGER FLUID END PARTS LIST
APPROVED	FCF	9/09/02	SIZE C
SCALE	1 : 1	REV	DWG NUMBER 2000 - 7500
			SHEET 1 OF 1

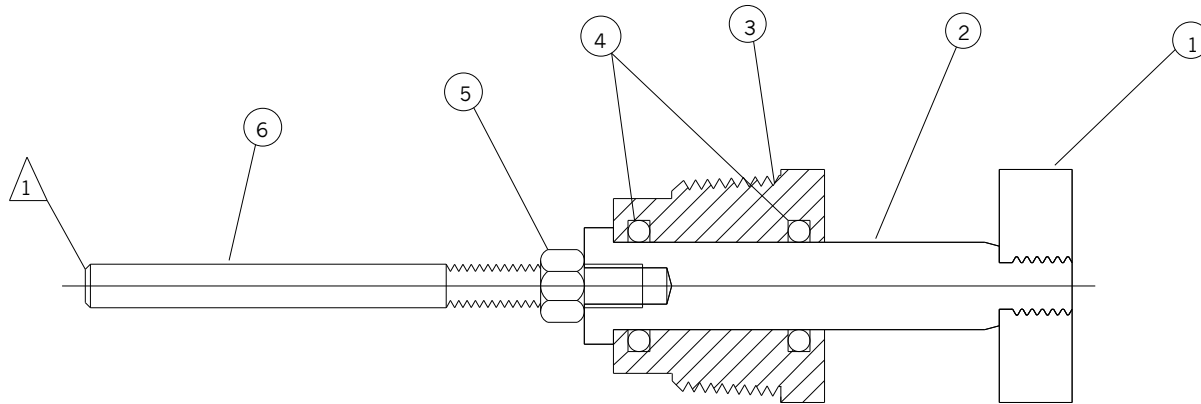
10 OL 004 - 1

SUCTION MANIFOLD PART NO. 117PN008  
(STANDARD)



SUCTION MANIFOLD PART NO. 116PN001  
(OPTION)





ITEM NO.	PART NO.	QTY	DESCRIPTION
1	595PN001	1	LIFTER DISC
2	595PN002	1	SHAFT
3	595PN003	1	COUPLING
4	901SH05-210	2	" O " RING
5	458VP002-003	1	NUT 3/8" ~ 16 UNC
6	595PN004	1	PUSH ROD

NOTE :

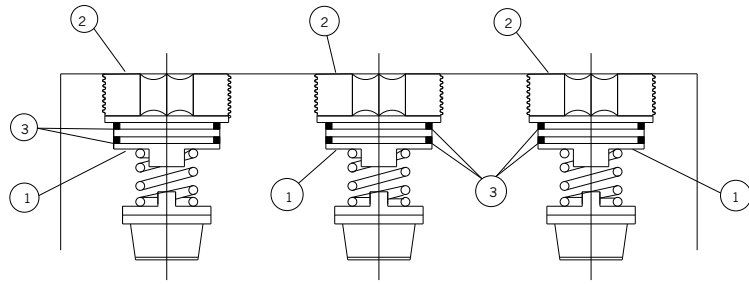


CUT LENGTH OF ITEM 6 TO HAVE APPROXIMATELY  
1/2' CLEARANCE BETWEEN THE SUCTION VALVE  
BOTTOM AND THE PUSH ROD TOP

OFM PUMP ,INC.			
DRAWN LDG	10/02/02	SUCTION VALVE LIFTER ASSEMBLY	
		SIZE B	DWG NUMBER 210AD01
APPROVED FCF	10/02/02	REV	SHEET 1 OF 1
SCALE 1:1			

DISCHARGE COVER ASSEMBLY - LOW PRESSURE

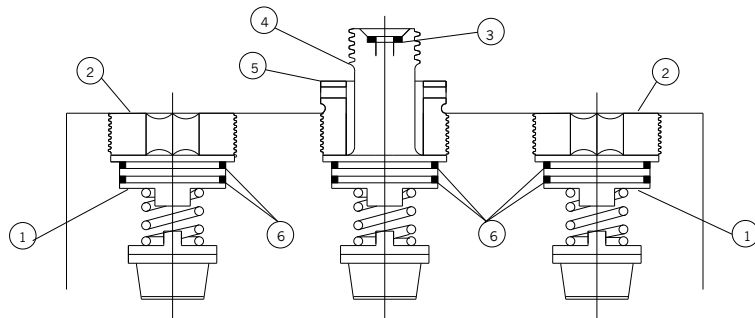
070AD002



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN07	3	DISCHARGE COVER
2	50PN13	3	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH05-432	6	* O * RING

DISCHARGE COVER ASSEMBLY W / GAUGE CONNECTION

072AD002 - LOW PRESSURE



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN07	2	DISCHARGE COVER
2	50PN13	2	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	1	SEAL RING, 2" 1002 / 1502
4	72PN014	1	DISCHARGE COVER W / 2" 1502 GAUGE CONNECTION
5	54PN01	1	RETAINER NUT FOR GAUGE CONNECTION
6	901SH05-432	6	* O * RING

1000 THRU 2000 DISCHARGE COVER OPTION

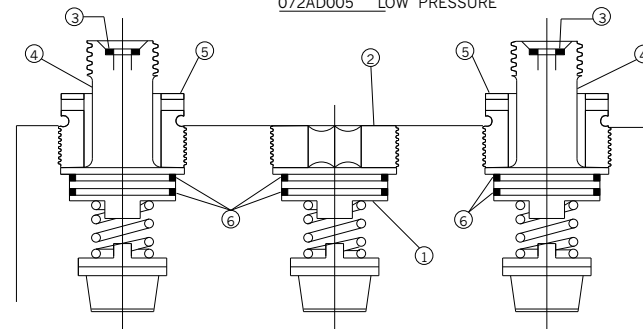
070 OL 002

\* NOTE ;

THIS OPTION FOR USE WITH  
5-1/2" , 5-3/4" , & 6" INCH FLUID ENDS

DISCHARGE COVER ASSEMBLY , GAUGE CONNECTION

072AD005 - LOW PRESSURE



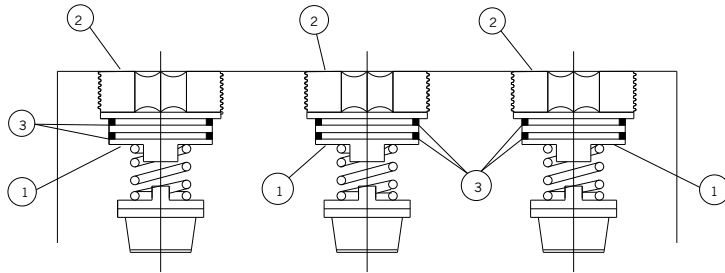
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN07	1	DISCHARGE COVER
2	50PN13	1	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	2	SEAL RING, 2" 1002 / 1502
4	72PN014	2	DISCHARGE COVER , GAUGE CONNECTION , 2" 1502
5	54PN01	2	RETAINER NUT , GAUGE CONNECTION
6	901SH05-432	6	* O * RING

OFM PUMP , INC.

DRAWN LDG	9/16/02	1000 THRU 2000 DISCH. COVER OPTION
OPTIONS FOR 5-1/2" , 5-3/4" , 6"	SIZE	
FLUID ENDS	SCALE	DWG NUMBER
APPROVED FCF	9/16/02	C
SCALE 1 : 5	REV .	SHEET 1 OF 1

DISCHARGE COVER ASSEMBLY - LOW PRESSURE

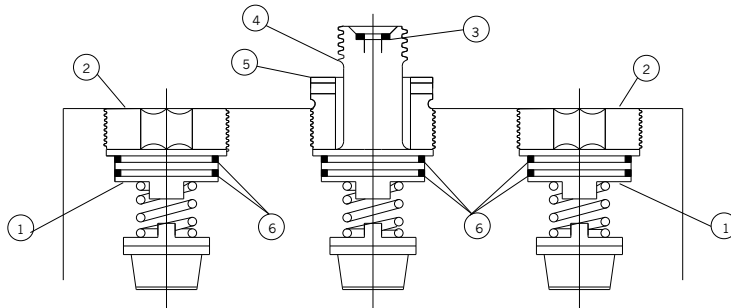
070AD003



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	70PN03	3	DISCHARGE COVER
2	342-A-92	3	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH05-362	6	* O * RING

DISCHARGE COVER ASSEMBLY W / GAUGE CONNECTION

072AD003 - LOW PRESSURE



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	70PN03	2	DISCHARGE COVER
2	342-A-92	2	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	1	SEAL RING, 2" 1002 / 1502
4	72PN013	1	DISCHARGE COVER W / 2" 1502 GAUGE CONNECTION
5	342-A-53	1	RETAINER NUT FOR GAUGE CONNECTION
6	901SH05-362	6	* O * RING

1000 THRU 2000 DISCHARGE COVER OPTION

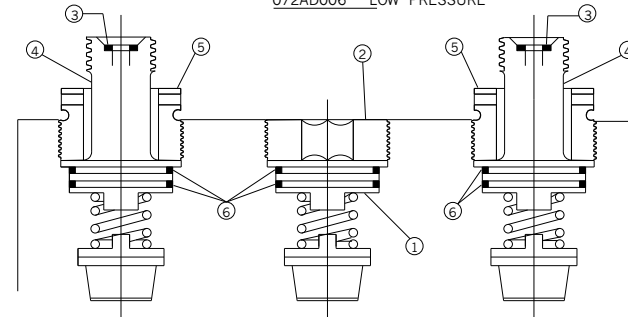
070 OL 003

\* NOTE ;

THIS OPTION FOR USE WITH  
6-1/2" , 6-3/4" , 7" , & 7-1/2" INCH FLUID ENDS.

DISCHARGE COVER ASSEMBLY , GAUGE CONNECTION

072AD006 LOW PRESSURE



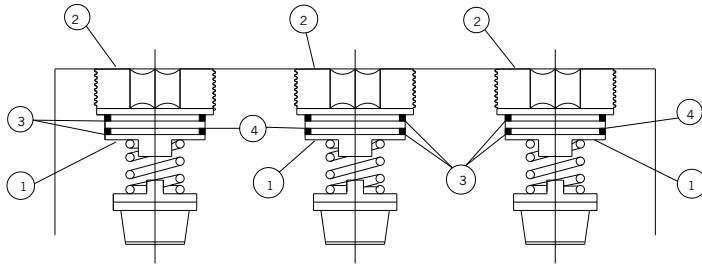
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	70PN03	1	DISCHARGE COVER
2	342-A-92	1	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	2	SEAL RING, 2" 1002 / 1502
4	72PN013	2	DISCHARGE COVER, GAUGE CONNECTION, 2" 1502
5	342-A-53	2	RETAINER NUT, GAUGE CONNECTION
6	901SH05-362	6	* O * RING

OFM PUMP , INC.

DRAWN LDG	9/16/02	1000 THRU 2000 DISCH. COVER OPTION	
OPTIONS FOR 6-1/2" , 6-3/4" , 7" , & 7-1/2"		FLUID ENDS	
APPROVED FCF	9/16/02	SIZE C	DWG NUMBER 0700L003
SCALE 1 : 5	REV -	SHEET 1 OF 1	

DISCHARGE COVER ASSEMBLY - HIGH PRESSURE

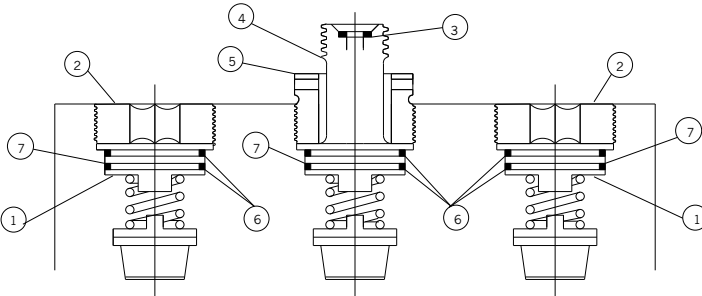
071AD003



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN01	3	DISCHARGE COVER
2	342-A-70	3	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH05-427	6	* O * RING
4	901PN017-005	3	SEAL , * O * RING BACK UP

DISCHARGE COVER ASSEMBLY W / GAUGE CONNECTION

073AD003 - HIGH PRESSURE



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN01	2	DISCHARGE COVER
2	342-A-70	2	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	1	SEAL RING , 2" 1002 / 1502
4	72PN012	1	DISCHARGE COVER W / 2" 1502 GAUGE CONNECTION
5	342-A-28	1	RETAINER NUT FOR GAUGE CONNECTION
6	901SH05-427	6	* O * RING
7	901PN017-005	3	SEAL , * O * RING BACK UP

1000 THRU 2000 DISCHARGE COVER OPTION

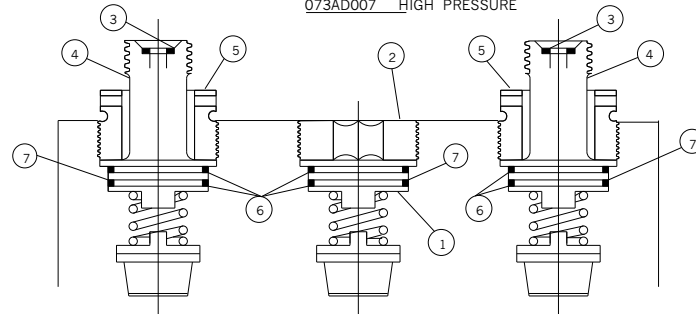
071 OL 003

\* NOTE ;

THIS OPTION FOR USE WITH  
4-1/2" & 5" INCH FLUID ENDS.

DISCHARGE COVER ASSEMBLY , GAUGE CONNECTION

073AD007 HIGH PRESSURE



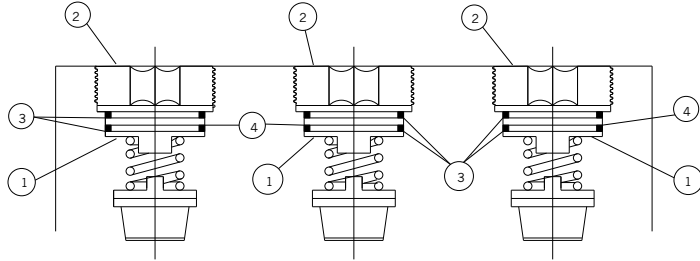
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN01	1	DISCHARGE COVER
2	342-A-70	1	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH06-1	2	SEAL RING , 2" 1002 / 1502
4	72PN012	2	DISCHARGE COVER , GAUGE CONNECTION , 2" 1502
5	342-A-28	2	RETAINER NUT , GAUGE CONNECTION
6	901SH05-427	6	* O * RING
7	901PN017-005	3	SEAL , * RING BACK UP

OFM PUMP , INC.

DRAWN LDG	9/16/02	1000 THRU 2000 DISCH. COVER OPTION	
OPTIONS FOR 4-1/2" & 5" INCH FLUID ENDS		SIZE	DWG NUMBER
APPROVED FCF	9/16/02	C	071OL003
SCALE 1:5		REV .	SHEET 1 OF 1

DISCHARGE COVER ASSEMBLY - HIGH PRESSURE

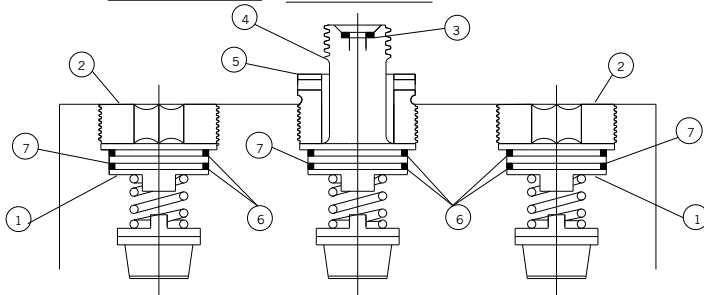
071AD002



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN03	3	DISCHARGE COVER
2	342-A-70	3	DISCHARGE RETAINER NUT, INTERNAL HEX
3	901SH05-425	6	* O * RING
4	901PN017-004	3	SEAL, * O * RING BACK UP

DISCHARGE COVER ASSEMBLY W / GAUGE CONNECTION

(.1) 073AD009 (.2) 073AD003 - HIGH PRESSURE



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN03	2	DISCHARGE COVER
2	342-A-70	2	DISCHARGE RETAINER NUT, INTERNAL HEX
3-1	901SH06-4	1	SEAL RING, 2" 2002
-2	901SH06-1	1	SEAL RING, 2" 1002 / 1502
4-1	73PN002	1	DISCHARGE COVER, GAUGE CONNECTION, 2" 2002
-2	73PN004	1	DISCHARGE COVER, GAUGE CONNECTION, 2" 1502
5	342-A-28	1	RETAINER NUT, GAUGE CONNECTION
6	901SH05-425	6	* O * RING
7	901PN017-004	3	SEAL, * O * RING BACK UP

1000 THRU 2000 DISCHARGE COVER OPTION

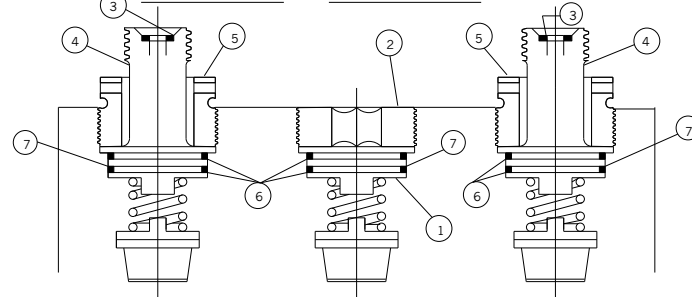
071 OL 005

\* NOTE ;

THIS OPTION FOR USE WITH  
3-3/4" & 4" INCH FLUID ENDS.

DISCHARGE COVER ASSEMBLY, GAUGE CONNECTION

(.1) 073AD010 (.2) 073AD006 HIGH PRESSURE



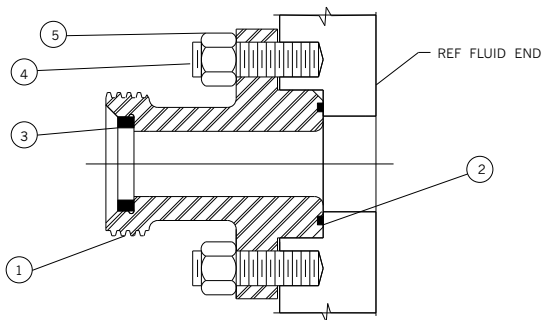
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	71PN03	1	DISCHARGE COVER
2	342-A-70	1	DISCHARGE RETAINER NUT, INTERNAL HEX
3-1	901SH06-4	2	SEAL RING, 2" 2002
-2	901SH06-1	2	SEAL, RING 2" 1002 / 1502
4-1	73PN002	2	DISCHARGE COVER, GAUGE CONNECTION 2" 2002
-2	72PN04	2	DISCHARGE COVER, GAUGE CONNECTION 2" 1502
5	342-A-28	2	RETAINER NUT, GAUGE CONNECTION
6	901SH05-425	6	* O * RING
7	901PN017-004	3	SEAL, * O * RING BACK UP

OFM PUMP, INC.

DRAWN LDG	9/16/02	1000 THRU 2000 DISCH. COVER OPTION	
OPTIONS FOR 3-3/4" & 4" INCH FLUID ENDS		SIZE C	DWG NUMBER 0710L005
APPROVED FCF	9/16/02	REV	SHEET 1 OF 1
SCALE 1:5			

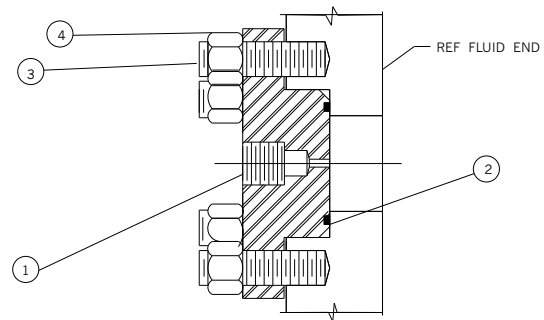
USE WITH 3-3/4" TO 5" INCH FLUID END

2" 1502 HAMMER UNION DISCHARGE FLANGE ( 267AD009 )



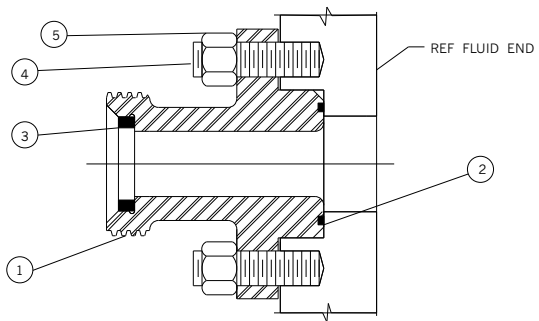
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	267PN09	1	DISCHARGE FLANGE , HAMMER UNION 2" 1502
2	901SH05-338	1	" O " RING
3	901SH06-1	1	SEAL RING
4	450VP005-034	6	STUD
5	458VP012-008	6	HEX NUT , HEAVY

20,000" PSI BLEEDOFF DISCHARGE FLANGE ( 267AD002 )



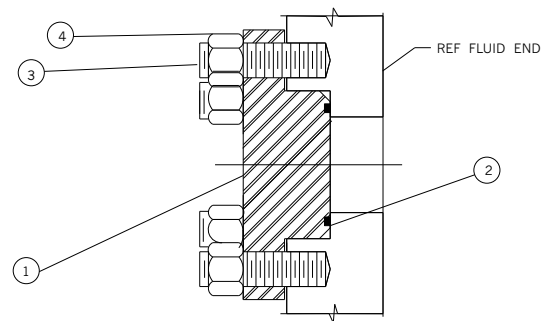
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	268PN02	1	DISCHARGE FLANGE , BLEEDOFF VALVE , 20,000 PSI
2	901SH05-338	1	" O " RING
3	450VP005-034	6	STUD
4	458VP012-008	6	HEX NUT , HEAVY

3" 1502 HAMMER UNION DISCHARGE FLANGE ( 267AD010 )



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	267PN10	1	DISCHARGE FLANGE , HAMMER UNION 3" 1502
2	901SH05-338	1	" O " RING
3	901SH06-2	1	SEAL RING
4	450VP005-034	6	STUD
5	458VP012-008	6	HEX NUT , HEAVY

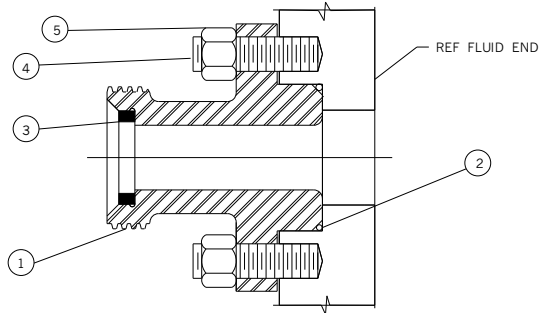
20,000" PSI BLIND DISCHARGE FLANGE ( 267AD003 )



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	265PN03	1	DISCHARGE FLANGE , BLIND 20,000 PSI
2	901SH05-338	1	" O " RING
3	450VP005-034	6	STUD
4	458VP012-008	6	HEX NUT , HEAVY

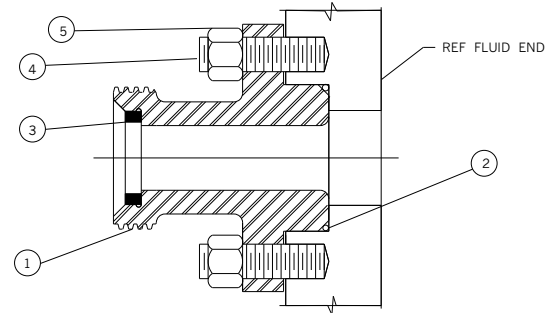
USE WITH 5-1/2" TO 7-1/2" INCH FLUID END

2" 1502 HAMMER UNION DISCHARGE FLANGE ( 267AD023 )



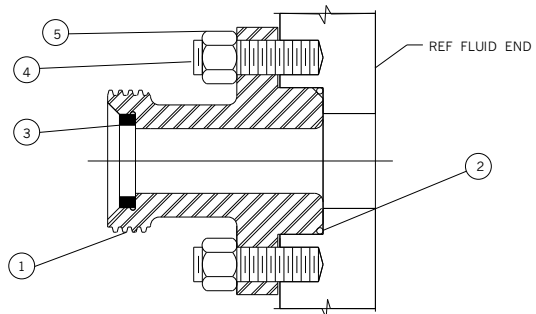
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	342-C-82	1	DISCHARGE FLANGE , HAMMER UNION 2" 1502
2	901SH05-344	1	* O * RING
3	901SH06-1	1	SEAL RING
4	450VP005-034	6	STUD
5	458VP012-008	6	HEX NUT , HEAVY

3" 1002 HAMMER UNION DISCHARGE FLANGE ( 267AD022 )



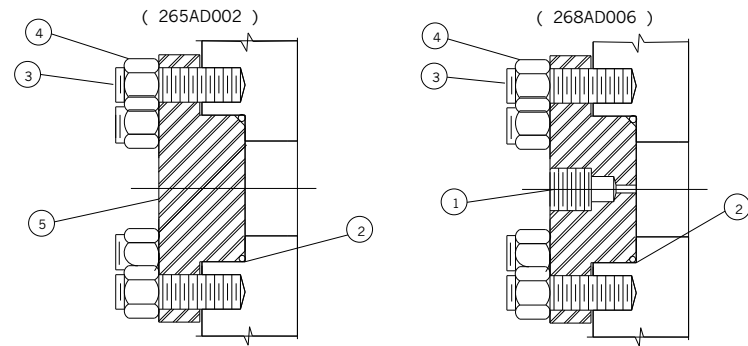
ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	342-B-14	1	DISCHARGE FLANGE , HAMMER UNION 3" 1002
2	901SH05-344	1	* O * RING
3	901SH06-2	1	SEAL RING
4	450VP005-034	6	STUD
5	458VP012-008	6	HEX NUT , HEAVY

3" 1502 HAMMER UNION DISCHARGE FLANGE ( 267AD016 )



ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	342-C-52	1	DISCHARGE FLANGE , HAMMER UNION 3" 1502
2	901SH05-344	1	* O * RING
3	901SH06-2	1	SEAL RING
4	450VP005-034	6	STUD
5	458VP012-008	6	HEX NUT , HEAVY

10,000" PSI BLIND AND BLRRDOFF DISCHARGE FLANGE

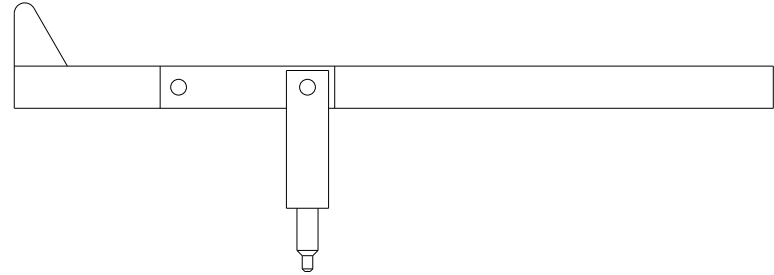


ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	342-C-79	1	DISCHARGE FLANGE , BLIND 10,000 PSI
2	901SH05-344	1	* O * RING
3	450VP005-034	6	STUD
4	458VP012-008	6	HEX NUT , HEAVY
5	342-C-71	1	DISCHARGE FLANGE , BLIND 10,000 PSI

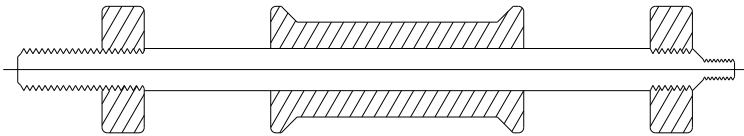


3" HEX WRENCH  
PART NO. 342-A-89

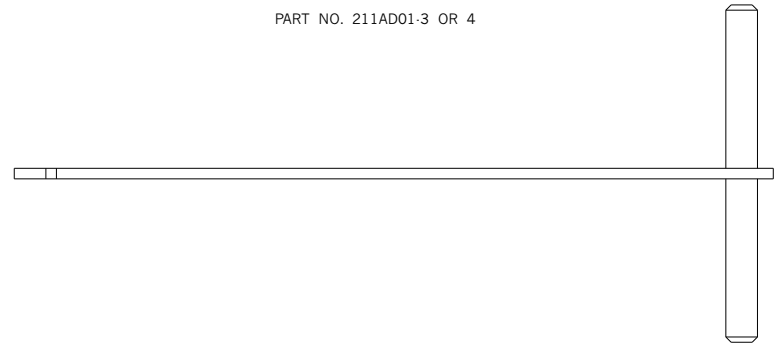
2" HEX WRENCH  
PART NO. P - A - 02



SUCTION VALVE SPRING COMPRESSOR ASSY.  
PART NO. 211AD01-3 OR 4



VALVE COVER PULLER  
PART NO. 590PN006



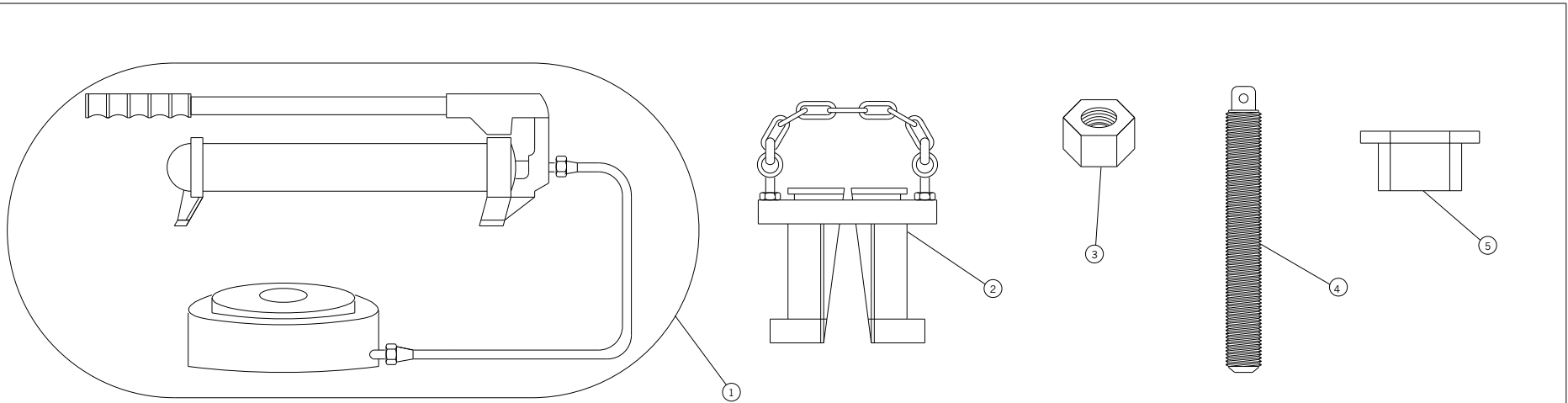
SUCTION SPRING RETAINER PULLER  
PART NO. 590PN01



PACKING NUT WRENCH  
PART NO. 608PN01

MAINTENANCE TOOLS

<b>OFM PUMP , INC.</b>			
DRAWN LDG	11/01/02	MAINTENANCE TOOLS FOR 2000 FLUID END	
APPROVED FCF	11/01/02	SIZE C	DWG NUMBER 2000MT001
SCALE 1 : 2	REV -	SHEET	1 OF 1



VALVE SEAT PULLER (OPTIONAL)

	①	②	③	④	⑤	
PLUNGER SIZE	COMPLETE ASSEMBLY W / METAL TOOL BOX	VALVE SEAT PULLER NO.	PULLER HEAD NO.	HEX NUT NO.	CENTER STEM STUD NO.	CENTER STEM BUSHING NO.
2-3/4" - 3" YELLOW	590AD014	590AD004	590VP005-005	458VP006-002	450VP014-001	145VP002-001
3-3/4" - 4" GREEN	590AD015	590AD004	590VP005-003	458VP004-012	450VP014-002	145VP002-002
4-1/2" - 5" RED	590AD016	590AD004	590VP005-001	458VP004-014	450VP014-003	N / R
5-1/2" - 6" BLUE	590AD017	590AD004	590VP005-004	458VP004-014	450VP014-003	N / R
6-1/2" - 7-1/2" BROWN	590AD018	590AD004	590VP005-006	458VP001-014	450VP014-003	N / R

PANCAKE JACK	PART NO. 953SH01-1
HAND PUMP	PART NO. 954VP001

OFM PUMP, INC.			
DRAWN L. GORRELL	10/31/03	VALVE SEAT PULLER ASSEMBLY	
APPROVED C. FRY	10/31/03	SIZE D	DWG NUMBER 590SD001
SCALE 1:2	REV .	SHEET 1 OF 1	