



Rotating Mechanical Pumps

Husky Purchase Order No. _____

Data Collected By: _____ Entry Date: 02/24/2012

Parent Asset No.: _____

Equipment Class

☒ Reciprocating Pump☐ Centrifugal Pump☐ Hydraulic Skid☐ Rotary Pump☐ Controlled Volume Pump

Equipment Description: Injection Pump

Exist. Equip. ID : _____ Tag No.: _____

Unit Yard _____

Acquis Value \$ _____

Acquis Date _____

Equipment Status: ☐ In-Service Fully Utilized ☐ In Service Under-utilized ☐ Idle ☐ ScrapOwnership Status: ☐ Leased ☐ Rented ☐ Owned

Manufacturer: Cat Pumps

Year Built: 2011

Equipment Condition: _____ Model No.: 1050

Serial No.: No Designation

Construction: ☐ Skidded ☐ Packaged ☐ Housed ☐ Packaged Portable ☒ Packaged Stationary

Skid Weight: 660 lbs Skid Size: W 2 x L 2 x H 3.33 ft

Common Characteristics

Fluid Description: _____

Service: ☐ Sweet ☐ SourOrientation: ☐ H ☒ V

Design Capacity: 10 gpm

Min. Suction Head: Flooded m/ft

Driven by Belt

Pump MAWP: 2200 psig

Pump HP Rating 15 Hp

Rated Head: _____ m/ft

Rotation (Viewed from Drive End):

☐ CW ☐ CCW

Coupler Type: _____

Seal Manufacturer _____

Seal Make: _____

Seal Model: _____

of Stages _____

Max Frame Speed: 1150 RPM

Sheave Type Double Belt

Sheave Size 10" & 5.5" mm / in

Belt Size 5V mm/in

Lubrication Type: ☐ Pressurized

Lubricator Make _____

☐ Non Pressurized

Lubricator Model _____

Additional Characteristics for Reciprocating Pump

of Cylinders: 3

Plunger Size: 24 mm

Stroke: 30 mm

Valve Type: ☐ Disc ☐ Wing ☐ Double Ported ☐ Other

Plunger Type: Ceramic

Piston Action: ☒ Single ☐ Double Liquid End Lubrication: ☒ Pkg'd ☐ Lubed ☐ Flush

Valve Manufacturer: _____

Liner: ☐ Yes ☒ No

Liner Mat'l: _____

Additional Characteristics for Rotary Pump

Rotary Pump Type: ☐ Screw ☐ Lobe ☐ Vane ☐ Gear

Csg Mat'l: _____

Rotor Mount: ☐ Overhung ☐ Between Bearing ☐ Vertical

Additional Characteristics for Centrifugal Pump

Casing Type: ☐ Hort. Split ☐ Vertical Split ☐ BarrelCsg Mat'l: _____ Internal Coating: ☐ Yes ☐ No

Impeller Diameter: _____ mm / in Impeller Mat'l: _____

Rotor Mount: ☐ Overhung ☐ Between Bearing ☐ Vertical

Additional Characteristics for Controlled Volume Pump

of Cylinders: _____ Displacement _____ l/d gal/d

Plunger Mat'l _____ Diaphragm Mat'l _____

Comments

Material Transfer Information

Transfer Recorded by: _____ Date _____

From LSD _____ Sec _____ Twp _____ Rge _____ W/ _____
Transfer Yard _____To LSD _____ Sec _____ Twp _____ Rge _____ W/ _____
Facility _____ Receiving AFE: _____

Husky Energy		Rotating Mechanical Prime Movers		Husky Purchase Order No. _____	
Data Collected By: _____		Entry Date: _____			
Equipment Class	<input type="checkbox"/> Reciprocating Engine <input type="checkbox"/> Steam Turbine	<input checked="" type="checkbox"/> Electric Motor <input type="checkbox"/> Gas Turbine	Parent Asset No.: _____		
Equipment Description: _____		Baldor EM7054T		Exist. Equip. ID : _____ Tag No.: _____	
Unit Yard	_____	Acquis Value \$	_____	Acquis Date _____	
Equipment Status:	<input type="checkbox"/> In-Service Fully Utilized <input type="checkbox"/> In Service Under-utilized <input type="checkbox"/> Idle <input type="checkbox"/> Scrap				
Ownership Status:	<input type="checkbox"/> Leased <input type="checkbox"/> Rented <input type="checkbox"/> Owned				
Manufacturer:	_____		Year Built: _____		
Equipment Condition:	_____		Model No.: _____ Serial No.: _____		
Construction:	<input type="checkbox"/> Skidded <input type="checkbox"/> Packaged <input type="checkbox"/> Housed <input type="checkbox"/> Packaged Portable <input checked="" type="checkbox"/> Packaged Stationary				
Skid Weight:	_____ / Lbs	Skid Size:	W 2 _____ x L 2 _____ x H 3.33 ft		
Common Characteristics					
Power Rating:	15 hp	Rated Speed:	_____ RPM	Service: <input type="checkbox"/> Sweet <input type="checkbox"/> Sour	
Rotation (Viewed from Drive End):	<input type="checkbox"/> CW <input type="checkbox"/> CCW		_____ RPM	Shaft Size: 1-3/8 in	
Fuel Type:	_____	Lubrication Type:	<input type="checkbox"/> Pressurized <input type="checkbox"/> Non Pressurized		
Power Transmitter Type:	_____				
Additional Characteristics for Reciprocating Engine					
Aspiration Type:	<input type="checkbox"/> Natural <input type="checkbox"/> Turbocharged <input type="checkbox"/> Other: _____				
Compression Ratio:	_____	No. of Cylinders:	_____	Fuel type: _____	
Cyl. Bore:	_____ mm / in	Cyl. Stroke:	_____ mm / in	Governor Type: _____	
Starter Type:	_____	Max. Jacket Water Temperature:		_____ °C / °F	
Additional Characteristics for Electric Motor					
Motor Type:	<input checked="" type="checkbox"/> Induction <input type="checkbox"/> Synchronous <input type="checkbox"/> Other: _____				
Elec. Class:	1	Elec. Division:	_____	Elec. Group: D	
Voltage:	230/460 v	No. of Phases:	3	Frequency: 60 Hz	
Service Factor:	1	Frame:	254T	Enclosure Type: TEXP	
Insulation Class:	B	Full Load Efficiency:	92.4 %	Full Load Current: 36/18 Amps	
Additional Characteristics for Steam Turbine					
Turbine Type:	<input type="checkbox"/> Backpressure <input type="checkbox"/> Condensing <input type="checkbox"/> Induction <input type="checkbox"/> Extraction <input type="checkbox"/> Other _____				
Steam Flow (Design):	_____ kg/h / Lbs/h	Inlet Pres. (Design):	_____ kPag/Psig	Exhaust Pres. (Design): _____ kPag/Psig	
MAWP Inlet:	_____ kPag / Psig	MAWP Exhaust:	_____ kPag/Psig	No. of Nozzles: _____	
Governor Type:	_____	Governor Make:	_____	Governor Model: _____	
Additional Characteristics for Gas Turbine					
Shaft Config.:	Single Shaft <input type="checkbox"/> Two Shaft		Fuel Type: _____		
Design Speed:	_____ rpm	Power Turbine:	_____ RPM	Gas Generator: _____ RPM	
# of Stages (Power Turbine):	_____	Design Exhaust Temp.:	_____ °C/°F	Design Exhaust Pres.: _____ kPag / Psig	
Starter Type:	_____	Inlet Air Filter Type:	_____		
Comments					
Material Transfer Information					
Transfer Recorded by: _____ Date _____					
From	LSD _____	Sec _____	Twp _____	Rge _____	W/ _____
Transfer Yard _____					
To	LSD _____	Sec _____	Twp _____	Rge _____	W/ _____
Facility _____ Receiving AFE: _____					

5, 7, 15PFR PLUNGER PUMP SERVICE MANUAL



5 FRAME: 310, 340, 350, 311, 341, 351, 317, 347, 357

5 FRAME OEM: 30, 31, 34, 35, 42HS, 43HS, 45

7 FRAME: 530, 550

7 FRAME OEM: 51, 53, 55, 56, 57, 58, 59, 60, 70

15 FRAME: 650, 651, 660, 661, 1050, 1051, 1057

INSTALLATION AND START-UP INFORMATION

Optimum performance of the pump is dependent upon the entire liquid system and will be obtained only with the proper selection, installation of plumbing and operation of the pump and accessories.

SPECIFICATIONS: Maximum specifications refer to individual attributes. It is not implied that all maximums can be performed simultaneously. If more than one maximum is considered, check with your CAT PUMPS supplier to confirm the proper performance and pump selection. Refer to individual pump Data Sheets for complete specifications, parts list and exploded view.

LUBRICATION: Fill crankcase with special CAT PUMP oil per pump specifications [5PFR-18 oz., 7PFR-25 oz., 15PFR-42oz.]. DO NOT RUN PUMP WITHOUT OIL IN CRANKCASE. Change initial fill after 50 hours running period. Thereafter, change oil every 3 months or 500 hour intervals, whichever comes first.

PUMP ROTATION: Pump was designed for forward rotation to allow optimum lubrication of the crosshead area. Reverse rotation is acceptable if the crankcase oil level is increased slightly above center dot to assure adequate lubrication.

PULLEY SELECTION: Select size of motor pulley required to deliver the desired flow from Horsepower Requirement and Pulley Selection Chart (refer to Tech Bulletin 003 or individual Data Sheet).

DRIVE SELECTION: The motor or engine driving the pump must be of adequate horsepower to maintain full RPM when the pump is under load. Select the electric motor from the Horsepower Requirement Chart according to required pump discharge flow, maximum pressure at the pump and drive losses of approximately 3-5%. Consult the manufacturer of gas or diesel engine for selection of the proper engine size.

MOUNTING: Mount the pump on a rigid, horizontal surface in a manner to permit drainage of crankcase oil. An uneven mounting surface will cause extensive damage to the pump base. To minimize piping stress, use appropriate flexible hose to inlet and discharge ports. Use the correct belt; make sure pulleys are aligned. Excessive belt tension may be harmful to the bearings. Hand rotate pump before starting to be certain shaft and bearings are free moving.

LOCATION: If the pump is used in extremely dirty or humid conditions, it is recommended pump be enclosed. Do not store or operate in excessively high temperature areas or without proper ventilation.

INLET CONDITIONS: Refer to complete Inlet Condition Check-List in this manual before starting system. DO NOT STARVE THE PUMP OR RUN DRY. Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations.

C.A.T.: Installation of a C.A.T. (Captive Acceleration Tube) is recommended in applications with stressful inlet conditions such as high temperatures, booster pump feed, long inlet lines or quick closing valves.

DISCHARGE CONDITIONS: OPEN ALL VALVES BEFORE STARTING SYSTEM to avoid deadhead overpressure condition and severe damage to the pump or system.

Install a Pulsation Dampening device on the discharge head or in the discharge line as close to the head as possible. Be certain the pulsation dampener (Prrrrr-o-lator) is properly precharged for the system pressure (see individual Data Sheet).

A reliable Pressure Gauge should be installed near the discharge outlet of the high pressure manifold. This is extremely important for adjusting pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the pressure that is read at the discharge manifold of the pump, NOT AT THE GUN OR NOZZLE.

Use PTFE thread tape or pipe thread sealant (sparingly) connect accessories or plumbing. Exercise caution not to wrap tape beyond the last thread to avoid tape from becoming lodged in the pump or accessories. This condition will cause a malfunction of the pump or system.

PRESSURE REGULATION: All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). The primary pressure device must be installed on the discharge side of the pump. The function of the primary pressure regulating device is to protect the pump from over pressurization, which can be caused by a plugged or closed off discharge line. Over pressurization can severely damage the pump, other system components and can cause bodily harm. The secondary safety relief device must be installed between the primary device and pump. This will ensure pressure relief of the system if the primary regulating device fails. Failure to install such a safety device will void the warranty on the pump.

When the high pressure system is left running with the trigger gun off, the by-pass liquid can be routed to drain or to the pump inlet. If routed to the pump inlet, the by-pass liquid can quickly develop excessive heat and result in damage to the pump. A THERMO VALVE installed in the by-pass line is recommended to protect the pump. An AUTO SHUT-OFF ASSEMBLY may also be used.

NOZZLES: A worn nozzle will result in loss of pressure. Do not adjust pressure regulating device to compensate. Replace nozzle and reset regulating device to system pressure.

PUMPED LIQUIDS: Some Liquids may require a flush between operations or before storing. For pumping liquids other than water, contact your CAT PUMPS supplier.

STORING: For extended storing or between use in cold climates, drain all pumped liquids from pump and flush with antifreeze solution to prevent freezing and damage to the pump. DO NOT RUN PUMP WITH FROZEN LIQUID (refer to Tech Bulletin 083).

⚠ WARNING

All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). Failure to install such relief devices could result in personal injury or damage to the pump or to system components. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

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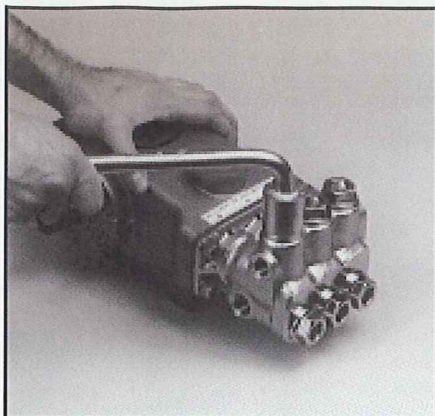
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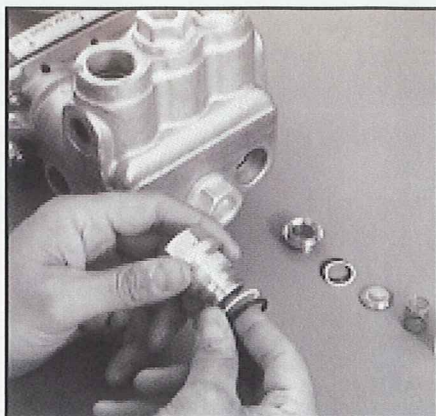
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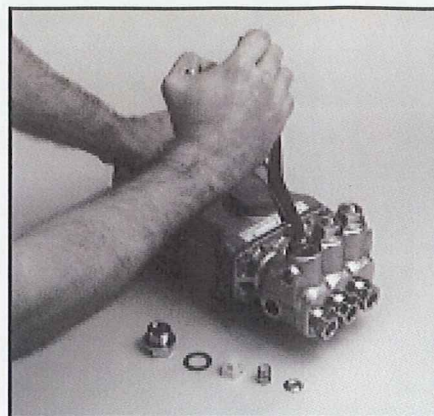
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Removal of Valve Plugs



Examination of O-Ring and Back-up-Ring on Valve Plug



Removal of Valve Assembly

CAUTION: Before commencing with service, shut off drive (electric motor, gas or diesel engine) and turn off water supply to pump. Relieve all discharge line pressure by triggering gun or opening valve in discharge line.

After servicing is completed, turn on water supply to pump, start drive, reset pressure regulating device and secondary valve, read system pressure on the gauge at the pump head. Check for any leaks, vibration or pressure fluctuations and resume operation.

SERVICING THE VALVES

Disassembly

NOTE: Usually the valve assembly will remain together while being removed.

1. Remove the hex Valve Plugs (top discharge, bottom inlet).
2. Examine the O-Ring under the Valve Plug for cuts or distortion and replace if worn. Lubricate new O-Rings before installing.

NOTE: On Models 43HS, 45, 56, 57, 59, 60, 70 there is an extended Valve Plug with O-Ring and Back-up-Ring. Install the Back-up-Ring, then the O-Ring into the groove at the end of the Valve Plug (refer to Tech Bulletin 058).

3. Grasp Spring Retainer by tab at the top with pliers and remove from valve chamber.
4. To separate the valve assembly, insert a screwdriver into the side of the Retainer and press on the back side of the Valve to begin separation, then between the Retainer and Valve Seat to separate completely.
5. If the valve assembly separates during removal, remove the Spring and Valve with a needle nose pliers.
6. Using a reverse pliers, remove the Valve Seat from the manifold chamber.

Reassembly

1. Examine Spring Retainers for internal wear or breaks in the structure and replace as needed.
2. Examine Springs for fatigue or breaks and replace as needed.
3. Examine Valves and Seats for grooves, pitting or wear and replace as needed.
4. Examine Seat and Valve Plug O-Rings for cuts or wear and replace as needed. Lubricate and install new O-Ring onto outside diameter of Seat and Valve Plugs.

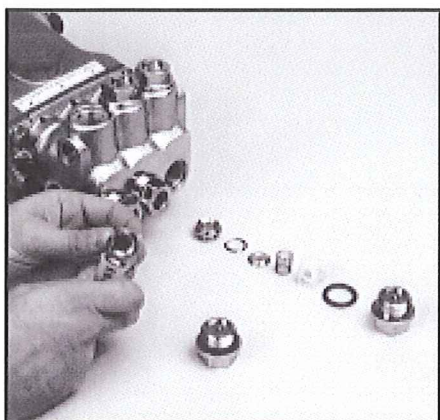
NOTE: Inlet and discharge valve parts are interchangeable. Two Valve Kits are needed for complete valve change.

5. Grasp new Valve Assembly by tab at top with pliers and push into valve chamber. Be certain Valve Assembly is completely seated in valve chamber.

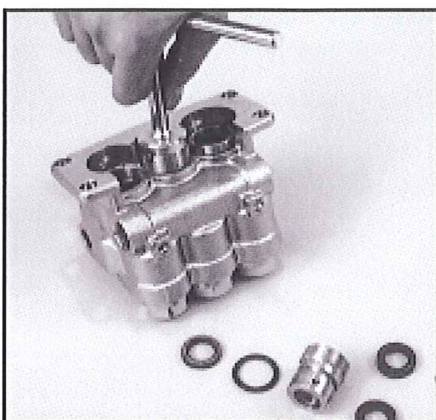
NOTE: For certain applications apply liquid gasket to the O-Ring crevices and seal surfaces (refer to Tech Bulletin 053).

NOTE: For Corrosion Resistant Models remember to install the Coil Spring between the Valve Plug and Retainer (refer to Tech Bulletin 046).

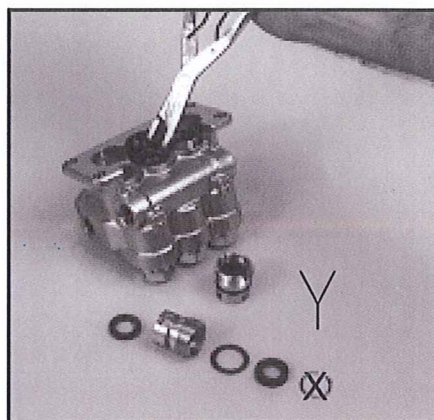
6. Apply Loctite 242 to the threads of the Valve Plug, thread into manifold port and torque per chart.



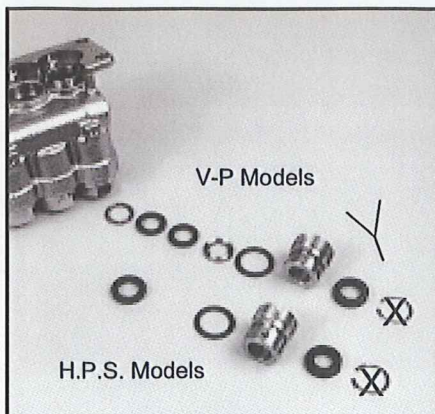
Order of parts in Valve Assembly



Removal of Seal Cases from Manifold Head



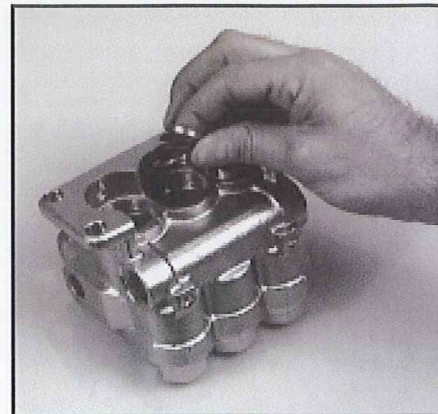
Removal of High Pressure Seals



Seal and V-Packing Arrangement



Installation of Male Adapter



Order of Packings [MA, VP, FA]

SERVICING THE SEALS

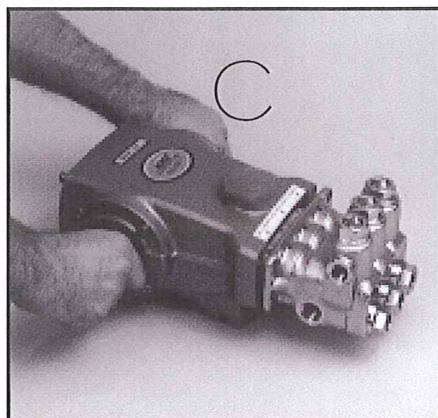
Disassembly

1. Remove the Manifold Head as described in **SERVICING THE PLUNGERS** section.
2. Place Manifold Head on work surface **with crankcase side up**.
3. On 5PFR and 7PFR plunger pumps prior to May of 1989, remove Snap Ring and Lo-Pressure Seal from each Seal Case. Discard Snap Rings (refer to Tech Bulletin 054).
4. On 5PFR and 7PFR plunger pumps after May of 1989, remove Lo-Pressure Seal from each Seal Case.
5. On 15PFR plunger pumps, remove Snap Ring and Lo-Pressure Seal from each Seal Case.
6. Remove Seal Case from each seal chamber. Remove O-Ring from outside diameter of Seal Case.
7. **Hi-Pressure Seal Models:** The Hi-Pressure Seal is generally easily removed from the manifold without any tools. If extremely worn a reverse pliers may be used.
8. **V-Packing Models:** The Female Adapter, V-Packings and Male Adapter are easily removed from manifold without any tools. If extremely worn a reverse pliers may be used.

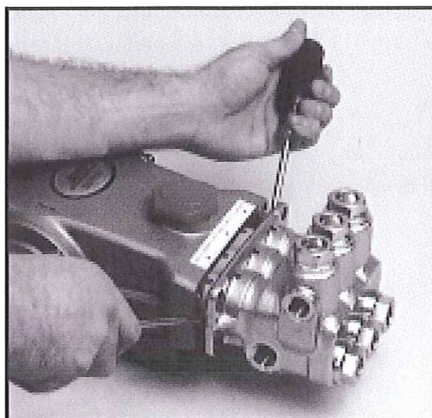
Reassembly

V-Packing Models:

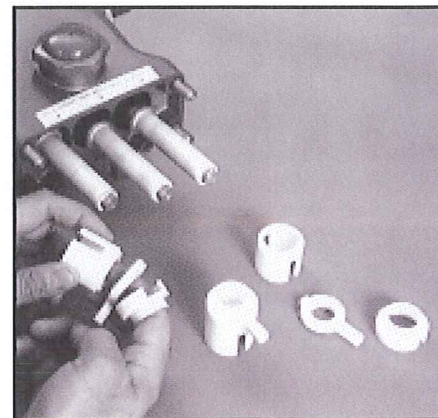
1. Lubricate seal chamber in the manifold.
- NOTE: For certain applications apply liquid gasket to the O-Ring crevices and seal surfaces (refer to Tech Bulletin 053).**
2. Insert Male Adapter **with notches down and "v" side up** and press completely into chamber by hand.
 3. Lubricate V-Packings and install one at a time with **grooved side down**.
 4. Install Female Adapter with **grooved side down**.
 5. Examine Seal Case O-Ring and replace if worn. Lubricate new O-Rings before installing.
 6. Thread Seal Case into manifold and tighten with special seal case tool. Torque per chart.



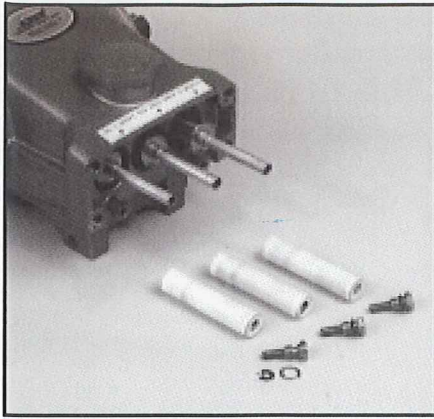
Separating Manifold Head from Crankcase



Removal of Manifold Head from Crankcase



Removal of Seal Retainers and Wicks



Ceramic Plunger and Retainer Arrangement



Proper Alignment of Ceramic Plungers for reassembly

Hi-Pressure Seal Models:

1. Lubricate seal chamber in manifold.

NOTE: For certain applications apply liquid gasket to the O-Ring crevices and seal surfaces (refer to Tech Bulletin 053).

2. Carefully square Hi-Pressure Seal into position by hand with the **grooved side down** (metal back facing out).

NOTE: When alternate materials, the fit of the special materials may be snug and require gently driving the LPS into position with a cylinder of the same diameter to assure a square seating and no damage to the LPS.

3. Examine Seal Case O-Ring and replace if worn. Lubricate new O-Ring before installing.
4. Secure Hi-Pressure Seal into position by threading Seal Case into manifold. Tighten Seal Case with special seal case tool. Torque per chart.

Lo-Pressure Seal - All Models:

1. Examine Lo-Pressure Seals for wear or broken springs and replace if necessary.
2. Install Lo-Pressure Seal into each seal case with **garter spring down**.
3. On 5PFR and 7PFR plunger pumps **do not use Snap Ring** (refer to Tech Bulletin 054).
4. On 15PFR plunger pumps **install Snap Ring** into each Seal Case.
5. Install the Seal Retainer with new Wick onto each plunger rod **with tab down and wick out**.
6. Rotate Crankshaft by hand so the two outside plungers are extended equally.
7. Lightly lubricate the Ceramic Plunger, then carefully slide the Manifold Head over the Ceramic Plunger, supporting it from the underside to avoid damage to the plungers or seals. Press the Manifold Head into the Crankcase until flush.
8. Replace two (2) Lockwashers, two (2) Socket Head Screws for (4) Flange Nuts and torque per chart.

SERVICING THE PLUNGERS

Disassembly

1. Using an M8 allen wrench on the 5PFR pumps, a M14 hex tool on the 7PFR pumps, or a M17 hex tool on the 15PFR pumps, remove the two (2) Socket Head Screws, and two (2) Lockwashers or four (4) Flanged Nuts.
2. Rotate Crankshaft by hand to start separation of Manifold head from Crankcase.
3. Insert two flat head screwdrivers on opposite sides to further separate Manifold Head from Crankcase or support the underside of the Manifold Head and tap lightly with a mallet on the backside of the Manifold Head.

CAUTION: KEEP MANIFOLD PROPERLY ALIGNED WITH CERAMIC PLUNGERS WHEN REMOVING TO AVOID DAMAGE TO EITHER PLUNGERS OR SEALS.

4. Remove Oil Pan and slide out Seal Retainer with Wick.
5. Using an M12 hex tool on the 5, 7 and 15PFR pumps, or an M11 hex tool on the OEM 5, and 7PFR pumps, loosen the Plunger Retainer about three to four turns.
6. Push the Ceramic Plunger back towards the Crankcase to separate it from the Plunger Retainer and proceed with unthreading the Plunger Retainer by hand.
7. Remove the Plunger Retainer, O-Ring, Back-up-Ring and Gasket. Stud may stay on Plunger Rod or come off with Plunger Retainers.
8. Remove the Ceramic Plunger, Keyhole Washer and Barrier Slinger from Plunger Rod.

Reassembly

1. Visually inspect Crankcase Oil Seals for deterioration or leaks. Contact CAT PUMPS for assistance with replacement. See SERVICING THE CRANKCASE section.
2. Examine Barrier Slings and Keyhole Washers for damage. Slide onto Plunger Rod **with concave side away from Crankcase**.
3. Examine Ceramic Plunger for scoring, scale build-up, chips or cracks and replace as needed.
4. Slide Ceramic Plunger over each Plunger Rod.

NOTE: Ceramic Plunger can only be installed in one direction (front to back). Do not force onto rod.

5. Examine O-Ring and Back-up-Ring on Plunger Retainer and replace if cut or worn. Lubricate O-Rings for ease of installation and to avoid damage to the O-Rings.

6. Install new Gasket, then O-Ring, then Back-up-Ring onto each Plunger Retainer.

NOTE: OEM models have a longer Plunger Retainer Stud.

7. Apply Loctite 242 to exposed threads of Stud and thread Plunger Retainer onto Plunger Rod. Torque per chart.
8. Install the seal Retainer with NEW Wick onto each rod with tab down and wick out.

NOTE: Do not lubricate wicks at initial start-up. Operate for 10 to 15 minutes to allow grease from LPS to penetrate the plunger surface, then lubricate as needed.

9. Rotate Crankshaft by hand so the two outside plungers are extended equally.
10. Lightly lubricate the Ceramic Plungers, then carefully slide the Manifold Head over the Ceramic Plungers supporting it from the underside to avoid damage to the Ceramic Plungers or Seals. On the high pressure V-Packing models or larger manifolds, it may be necessary to gently tap with a soft mallet until the manifold is flush with the crankcase.
11. Replace two (2) Lockwashers, two (2) Socket Head Screws or four (4) Flanged Nuts and torque per chart.

SERVICING THE CRANKCASE SECTION

1. While Manifold, Plungers and Seal Retainers are removed, examine Crankcase Oil Seals for leaking and wear.
2. Check for any signs of leaking at Bearing Covers, Rear Cover, Drain Plug or Bubble Gauge.
3. Check oil level and for evidence of water in oil.
4. Rotate Crankshaft by hand to feel for smooth bearing movement.
5. Examine Crankshaft Oil Seals externally for drying, cracking or leaking.
6. Consult CAT PUMPS or your local distributor if crankcase service is evidenced.

See Section I of the Plunger Pump Service Video for additional information.

PREVENTATIVE MAINTENANCE CHECK-LIST

Check	Daily	Weekly	50 hrs.	500 hrs.*	1500 hrs.**	3000 hrs.**
Clean Filters	x					
Oil Level/Quality	x					
Oil Leaks	x					
Water Leaks	x					
Belts, Pulley		x				
Plumbing		x				
Initial Oil Change			x			
Oil Change				x		
Seal Change					x	
Valve Change						x
Accessories					x	

* If other than CAT PUMPS special multi-viscosity ISO68 oil is used, change cycle should be every 300 hours.

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 hours until wear is observed. Valves typically require changing every other seal change.

Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear parts and service cycle.

** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation. Refer to video for additional assistance.

TECHNICAL BULLETIN REFERENCE CHART

No.	Subject	Models
003	Power Unit Drive Packages	3PFR - 68PFR, 10FR - 60FR
024	Lubrication of Lo-Pressure Seals	All Models
027	Spring Retainer	5PFR, 7PFR, 15PFR
032	Shaft Extension and Manifold Port	310, 317, 323, 530, 550
035	Servicing Crankcase Section	7PFR - 60PFR
036	Cylinder and Plunger Reference Chart	All Models
043	LPS and HPS Servicing	All Plunger Models
045	One-Piece S.S. Plunger Retainer w/Stud	5PFR, 7PFR, 15PFR
046	Valve Plug with Coil Spring	317, 347, 357, 1057
047	Blind Bearing Shaft Cover	Gearbox Plunger Pumps
048	Extended Valve Plug	7PFR and 15PFR
049	Stainless Steel Hardware	3PFR7, 5PFR7, 15PFR7
051	M10 Manifold and Crankcase	7PFR and OEM
052	Plunger Rod and Stud	3PFR, 5PFR, 15PFR, 35PFR, 60PFR
053	Liquid Gasket	All Plunger NAB-S.S. Models
054	2 Piece Seal Retainer	5PFR and 7PFR
058	Forged Manifold and Extended Valve Plugs	56, 57, 59, 60
060	Baffle Assembly	34170
061	Installation and Adjustment Procedure	8100
062	Manifold and Seal Case	650 and 651
064	By-Pass Hose Sizing	All Unloaders/Regulators
067	S.S. Plunger Retainer	3PFR, 5PFR, 7PFR
072	Manifold Head and V-Packing	1050, 1051, 1057
073	Hi-Temp HPS	3PFR, 5PFR, 2SF
074	Torque Chart	Piston and Plunger Pumps
077	Oil Drain Kit	All Models (except 2SF/4SF)
083	Winterizing a Pump	All Models

TORQUE CHART

Pump Item			Torque		
Pump Model	Thread	Tool Size [P/N]	in.lbs.	ft.lbs.	Nm
PLUNGER RETAINER					
OEM Models	M6	M11 Hex [44044]	55	4.4	6
All Standard Models	M6	M12 Hex	55	4.4	6
MANIFOLD HEAD BOLTS					
5PFR 30, 31, 34, 35	M10	M8 Allen [25052]	220	18.1	25
310, 340, 350					
311, 341, 351					
317, 347, 357					
5PFR 42HS, 43HS, 45	M10	M8 Allen [33046]	220	18.1	25
7PFR 510, 530, 550	M10	M14 Hex [25053]	220	18.1	25
56, 57, 58, 59, 60, 70					
15PFR 650, 651, 660, 661	M10	M17 Hex [25083]	220	18.1	25
1050, 1051, 1057					
VALVE PLUGS					
5PFR 30, 31, 34, 35	M22	M24 Hex [44046]	870	72.3	98
310, 311, 317					
340, 341, 347					
350, 351, 357					
42HS					
5PFR 43HS, 45	M25	M24 Hex [44046]	520	43.4	59
7PFR 530, 550	3/4" SPT	M27 Hex [44045]	870	72.3	98
51, 55, 56, 57, 58					
59, 60, 70					
15PFR 650, 651, 660, 661	3/4" SPT	M27 Hex [44045]	870	72.3	98
1050, 1051, 1057					
CRANKCASE COVER/BEARING COVER SCREWS					
5PFR 30, 31, 34, 35	M6	M10 Hex/Phil. [25082]	50	4.0	6
310, 340, 350					
317, 347, 357					
311, 341, 351					
5PFR 42HS, 43HS, 45	M6	M10 Hex/Phil. [25082]	50	4.0	6
.....	M8	M13 Hex [25324]	115	9.4	13
7PFR 51, 53, 55, 56, 57,	M6	M10 Hex [25082]	115	9.4	13
59, 60, 70					
15PFR 650, 1050	M6	M10 Hex [25082]	50	4.0	5.7
SEAL CASE					
5PFR 30, 31, 34, 35	N/A	1/2" Soc. Drive [33004]	354	29.5	40
310, 311, 317					
340, 341, 347					
350, 351, 357					
42HS, 43HS, 45	N/A	1/2" Soc. Drive [33005]	354	29.5	40
7PFR 51, 53, 55, 56,	N/A	1/2" Soc. Drive [33005]	354	29.5	40
57, 58, 59, 60, 70					
530, 550					
15PFR 650, 651, 660, 661	N/A	1/2" Soc. Drive [33006]	346	28.8	39
1050, 1051, 1057	N/A	1/2" Soc. Drive [33006]	390	32.5	44
BUBBLE OIL GAUGE					
All Models	M28	Oil Gauge Tool [44050]	45	3.6	5
MOUNTING BOLTS					
5PFR, 7PFR	M8	M13 Hex [25324]	115	9.4	13
15PFR	M10	M17 Hex [25083]	240	19.7	29

INLET CONDITION CHECK-LIST

Review Before Start-Up

Inadequate inlet conditions can cause serious malfunctions in the best designed pump. Surprisingly, the simplest of things can cause the most severe problems or go unnoticed to the unfamiliar or untrained eye. **REVIEW THIS CHECK-LIST BEFORE OPERATION OF ANY SYSTEM.** Remember, no two systems are alike, so there can be no **ONE** best way to set-up a system. All factors must be carefully considered.

INLET SUPPLY should exceed the maximum flow being delivered by the pump to assure proper performance.

- ☐ Open inlet shut-off valve and turn on water supply to avoid starving the pump. **DO NOT RUN PUMP DRY.**
- ☐ Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations.
- ☐ Avoid closed loop systems especially with high temperature, ultra-high pressure or large volumes. Conditions vary with regulating/unloader valve.
- ☐ Low vapor pressure liquids, such as solvents, require a booster pump and C.A.T. to maintain adequate inlet supply.
- ☐ Higher viscosity liquids require a positive head and a C.A.T. to assure adequate inlet supply.
- ☐ Higher temperature liquids tend to vaporize and require positive heads and C.A.T. to assure adequate inlet supply.
- ☐ When using an inlet supply reservoir, size it to provide adequate liquids to accommodate the maximum output of the pump, generally a minimum of 6-10 times the GPM (however, a combination of system factors can change this requirement); provide adequate baffling in the tank to eliminate air bubbles and turbulence; install diffusers on all return lines to the tank.

INLET LINE SIZE should be adequate to avoid starving the pump.

- ☐ Line size must be a minimum of one size larger than the pump inlet fitting. Avoid tees, 90 degree elbows or valves in the inlet line of the pump to reduce the risk of flow restriction and cavitation.
- ☐ The line **MUST** be a FLEXIBLE hose, NOT a rigid pipe, and reinforced on SUCTION systems to avoid collapsing.
- ☐ The simpler the inlet plumbing the less the potential for problems. Keep the length to a minimum, the number of elbows and joints to a minimum (ideally no elbows) and the inlet accessories to a minimum.
- ☐ Use pipe sealant to assure air-tight, positive sealing pipe joints.

INLET PRESSURE should fall within the specifications of the pump.

- ☐ Acceleration loss of liquids may be increased by high RPM, high temperatures, low vapor pressures or high viscosity and may require pressurized inlet and C.A.T. to maintain adequate inlet supply. **DO NOT USE C.A.T. WITH SUCTION INLET.**
- ☐ Optimum pump performance is obtained with +20 PSI (1.4 BAR) inlet pressure and a C.A.T. for certain applications. With adequate inlet plumbing, most pumps will perform with flooded suction. Maximum inlet pressure is 60 PSI (4 BAR).
- ☐ After prolonged storage, pump should be rotated by hand and purged of air to facilitate priming. Disconnect the discharge port and allow liquid to pass through pump and measure flow.

INLET ACCESSORIES are designed to protect against overpressurization, control inlet flow, contamination or temperature and provide ease of servicing.

- ☐ A shut-off valve is recommended to facilitate maintenance.
- ☐ Installation of a C.A.T. is essential in applications with stressful conditions such as high temperatures, booster pump feed or long inlet lines. **Do not use C.A.T. with negative inlet pressure.**
- ☐ A stand pipe can be used in some applications to help maintain a positive head at the pump inlet.
- ☐ Inspect and clean inlet filters on a regular schedule to avoid flow restriction.
- ☐ A pressure transducer is necessary to accurately read inlet pressure. (**Short term, intermittent cavitation will not register on a standard gauge.**)
- ☐ All accessories should be sized to avoid restricting the inlet flow.
- ☐ All accessories should be compatible with the solution being pumped to prevent premature failure or malfunction.
- ☐ Optional inlet protection can be achieved by installing a pressure cutoff switch between the inlet filter and the pump to shut off pump when there is no positive inlet pressure.

BY-PASS TO INLET Care should be exercised when deciding the method of by-pass from control valves.

- ☐ It is recommended the by-pass be directed to a baffled reservoir tank, with at least one baffle between the by-pass line and the inlet line to the pump.
- ☐ Although not recommended, by-pass liquid may be returned to the inlet line of the pump if the system is properly designed to protect your pump. A **PRESSURE REDUCING VALVE** must be installed on the inlet line (**BETWEEN THE BY-PASS CONNECTION AND THE INLET TO THE PUMP**) to avoid excessive pressure to the inlet of the pump. It is also recommended that a **THERMO VALVE** be used in the by-pass line to monitor the temperature build-up in the by-pass loop to avoid premature seal failure.
- ☐ A low-pressure, flexible cloth braid (not metal braid) hose should be used from the by-pass connection to the inlet of the pump.
- ☐ Caution should be exercised not to undersize the by-pass hose diameter and length. Refer to Technical Bulletin 64 for additional information on the size and length of the by-pass line.
- ☐ Check the pressure in the by-pass line to avoid overpressurizing the inlet.
- ☐ The by-pass line should be connected to the pump inlet line at a gentle angle of 45° or less and no closer than 10 times the pump inlet port diameter e.g. 1-1/2" port size = 15" distance from pump inlet port.

HOSE FRICTION LOSS

Water* Flow Gal/Min	PRESSURE DROP IN PSI PER 100 FT OF HOSE WITH TYPICAL WATER FLOW RATES Hose Inside Diameters, Inches						
	1/4	5/16	3/8	1/2	5/8	3/4	1"
0.5	16	5	2				
1	54	20	7	2			
2	180	60	25	6	2		
3	380	120	50	13	4	2	
4		220	90	24	7	3	
5		320	130	34	10	4	
6			220	52	16	7	1
8			300	80	25	10	2
10			450	120	38	14	3
15			900	250	80	30	7
20			1600	400	121	50	12
25				650	200	76	19
30					250	96	24
40					410	162	42
50					600	235	62
60						370	93

*At a fixed flow rate with a given size hose, the pressure drop across a given hose length will be directly proportional. A 50 ft. hose will exhibit one-half the pressure drop of a 100 ft. hose. Above values shown are valid at all pressure levels.

WATER LINE PRESSURE LOSS PRESSURE DROP IN PSI PER 100 FEET

Water GPM	Steel Pipe—Nominal Dia.						Brass Pipe—Nominal Dia.						Copper Tubing O.D. Type L					
	1/4	3/8	1/2	3/4	1	1 1/4	1 1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1/4	3/8	1/2	5/8	3/4
1	8.5 1.9						6.0 1.6						120 13 2.9 1.0					
2	30 7.0 2.1						20 5.6 1.8						400 45 10 3.4 1.3					
3	60 14 4.5 1.1						40 11 3.6						94 20 6.7 2.6					
5	150 36 12 2.8						100 28 9.0 2.2						230 50 17 6.1 3.0					
8	330 86 28 6.7 1.9						220 62 21 5.2 1.6						500 120 40 15 6.5					
10	520 130 43 10 3.0						320 90 30 7.8 2.4						180 56 22 10					
15	270 90 21 6.2 1.6						190 62 16 5.0 1.5						120 44 20					
25	670 240 56 16 4.2 2.0						470 150 40 12 3.8 1.7						330 110 50					
40	66 17 8.0						39 11 5.0						550 200 88					
60	37 17						23 11											
80	52 29						40 19											
100	210 107 48						61 28											

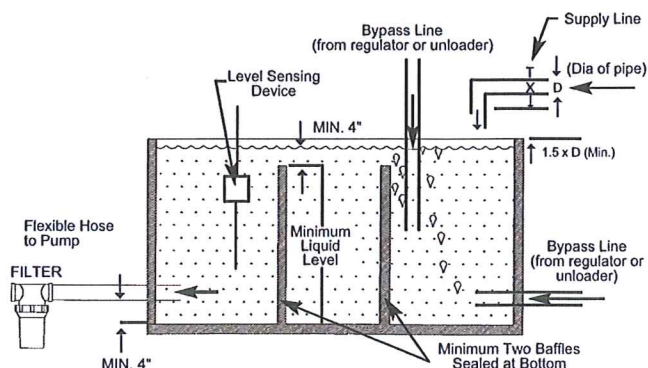
RESISTANCE OF VALVES AND FITTINGS

Nominal Pipe Size Inches	Inside Diameter Inches	Equivalent Length of Standard Pipe in Feet							
		Gate Valve	Globe Valve	Angle Valve	45° Elbow	90° Elbow	180° Close Ret	Tee Thru Run	Tee Thru Branch
1/2	0.622	0.41	18.5	9.3	0.78	1.67	3.71	0.93	3.33
3/4	0.824	0.54	24.5	12.3	1.03	2.21	4.90	1.23	4.41
1	1.049	0.69	31.2	15.6	1.31	2.81	6.25	1.56	5.62
1 1/4	1.380	0.90	41.0	20.5	1.73	3.70	8.22	2.06	7.40
1 1/2	1.610	1.05	48.0	24.0	2.15	4.31	9.59	2.40	8.63
2	2.067	1.35	61.5	30.8	2.59	5.55	12.30	3.08	11.60
2 1/2	2.469	1.62	73.5	36.8	3.09	6.61	14.70	3.68	13.20
3	3.068	2.01	91.5	45.8	3.84	8.23	18.20	4.57	16.40
4	4.026	2.64	120.0	60.0	5.03	10.80	23.90	6.00	21.60

Arriving at a total line pressure loss, consideration should then be given to pressure loss created by valves, fittings and elevation of lines.

If a sufficient number of valves and fittings are incorporated in the system to materially affect the total line loss, add to the total line length, the equivalent length of line of each valve or fitting.

TYPICAL RESERVOIR TANK RECOMMENDED 6 TO 10 TIMES SYSTEM CAPACITY



Handy Formulas to Help You

Q. How can I find the RPM needed to get specific GPM (Gallons Per Minute) I want?

A. $\text{Desired RPM} = \text{Desired GPM} \times \frac{\text{Rated RPM}}{\text{Rated GPM}}$

Q. I have to run my pump at a certain RPM. How do I figure the GPM I'll get?

A. $\text{Desired GPM} = \text{Desired RPM} \times \frac{\text{Rated GPM}}{\text{Rated RPM}}$

Q. Is there a simple way to find the approximate horsepower I'll need to run the pump?

A. $\text{Electric Brake Horsepower Required} = \frac{\text{GPM} \times \text{PSI}}{1460} \quad (\text{Standard 85\% Mech. Efficiency})$

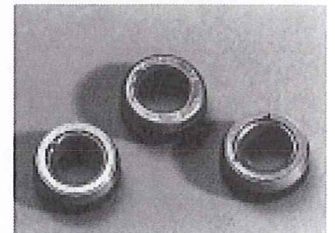
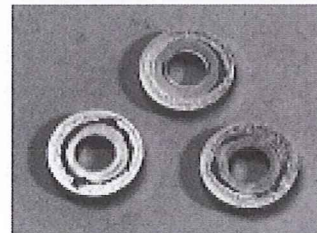
Q. What size motor pulley should I use?

A. $\text{Pump Pulley (Outer Diameter)} \times \frac{\text{Pump RPM}}{\text{Motor/Engine RPM}} \quad (\text{Consult Engine Mfr.})$

Q. How do I calculate the torque for my hydraulic drive system?

A. $\text{Torque (ft. lbs.)} = 3.6 \left(\frac{\text{GPM} \times \text{PSI}}{\text{RPM}} \right)$

Avoid Cavitation Damage



One or several of the conditions shown in the chart below may contribute to cavitation in a system resulting in premature wear, system downtime and unnecessary operating costs.

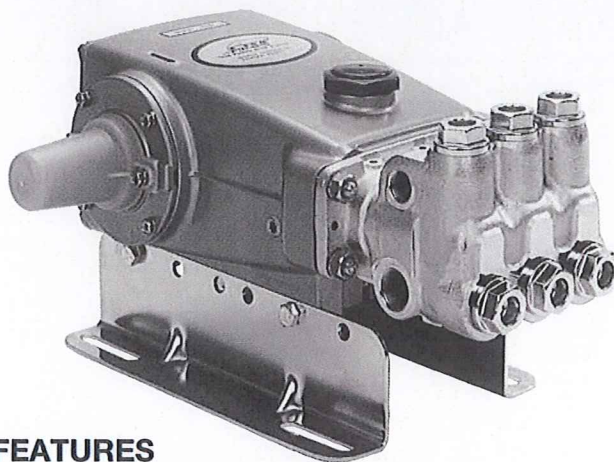
CONDITION	SOLUTION
Inadequate inlet line size	• Increase line size to the inlet port or one size larger
Water hammering liquid acceleration/deacceleration	• Install C.A.T. Tube • Move pump closer to liquid supply
Rigid Inlet Plumbing	• Use flexible wire reinforced hose to absorb pulsation and pressure spikes
Excessive Elbows in Inlet Plumbing	• Keep elbows to a minimum and less than 90°
Excessive liquid Temperature	• Use Thermo Valve in bypass line • Do not exceed pump temperature specifications • Substitute closed loop with baffled holding tank • Adequately size tank for frequent or high volume bypass • Pressure feed high temperature liquids • Properly ventilate cabinets and rooms
Air Leaks in Plumbing	• Check all connections • Use PTFE thread tape or pipe thread sealant
Agitation in Supply Tank	• Size tank according to pump output — Minimum 6-10 times system GPM • Baffle tank to purge air from liquid and separate inlet from discharge
High Viscosity Liquids	• Verify viscosity against pump specifications before operation • Elevate liquid temperature enough to reduce viscosity • Lower RPM of pump • Pressure feed pump • Increase inlet line size
Clogged Filters	• Perform regular maintenance or use clean filters to monitor build up • Use adequate mesh size for liquid and pump specifications

DIAGNOSIS AND MAINTENANCE

One of the most important steps in a high pressure system is to establish a regular maintenance program. This will vary slightly with each system and is determined by various elements such as the duty cycle, the liquid being pumped, the actual specifications vs rated specifications of the pump, the ambient conditions, the inlet conditions and the accessories in the system. A careful review of the necessary inlet conditions and protection devices required before the system is installed will eliminate many potential problems.

CAT PUMPS are very easy pumps to service and require far less frequent service than most pumps. Typically, only common tools are required, making in-field service convenient, however, there are a few custom tools, special to certain models, that do simplify the process. This service manual is designed to assist you with the disassembly and reassembly of your pump. The following guide will assist in determining the cause and remedy to various operating conditions. You can also review our **FAQ** or **SERVICE** sections on our **WEB SITE** for more facts or contact CAT PUMPS directly.

PROBLEM	PROBABLE CAUSE	SOLUTION
Low pressure	<ul style="list-style-type: none"> •Worn nozzle. •Belt slippage. •Air leak in inlet plumbing. •Pressure gauge inoperative or not registering accurately. •Relief valve stuck, partially plugged or improperly adjusted. •Inlet suction strainer (filter) clogged or improperly sized. •Abrasives in pumped liquid. •Leaky discharge hose. •Inadequate liquid supply. •Severe cavitation. •Worn seals. •Worn or dirty inlet/discharge valves. 	<ul style="list-style-type: none"> •Replace with properly sized nozzle. •Tighten belt(s) or install new belt(s). •Tighten fittings and hoses. Use PTFE liquid or tape. •Check with new gauge. Replace worn or damaged gauge. •Clean/adjust relief valve. Replace worn seats/valves and o-rings. •Clean filter. Use adequate size filter. Check more frequently. •Install proper filter. •Replace discharge hose with proper rating for system. •Pressurize inlet and install C.A.T. •Check inlet conditions. •Install new seal kit. Increase frequency of service. •Clean inlet/discharge valves or install new valve kit.
Pulsation	<ul style="list-style-type: none"> •Faulty Pulsation Dampener. •Foreign material trapped in inlet/discharge valves. 	<ul style="list-style-type: none"> •Check precharge. If low, recharge, or install a new dampener. •Clean inlet/discharge valves or install new valve kit.
Water leak		
•Under the manifold	<ul style="list-style-type: none"> •Worn V-Packings, Hi-Pressure or Lo-Pressure Seals. •Worn adapter o-rings. 	<ul style="list-style-type: none"> •Install new seal kit. Increase frequency of service. •Install new o-rings.
•Into the crankcase	<ul style="list-style-type: none"> •Humid air condensing into water inside the crankcase. •Excessive wear to seals and V-Packings. 	<ul style="list-style-type: none"> •Install oil cap protector. Change oil every 3 months or 500 hours. •Install new seal kit. Increase frequency of service.
Knocking noise		
•Inlet supply	<ul style="list-style-type: none"> •Inadequate inlet liquid supply. 	<ul style="list-style-type: none"> •Check liquid supply. Increase line size, pressurize or install C.A.T.
•Bearing	<ul style="list-style-type: none"> •Broken or worn bearing. 	<ul style="list-style-type: none"> •Replace bearing.
•Pulley	<ul style="list-style-type: none"> •Loose pulley on crankshaft 	<ul style="list-style-type: none"> •Check key and tighten set screw.
Oil leak		
•Crankcase oil seals.	<ul style="list-style-type: none"> •Worn crankcase oil seals. 	<ul style="list-style-type: none"> •Replace crankcase oil seals.
•Crankshaft oil seals and o-rings.	<ul style="list-style-type: none"> •Worn crankshaft oil seals or o-rings on bearing cover. 	<ul style="list-style-type: none"> •Remove bearing cover and replace o-rings and/or oil seals.
•Drain plug	<ul style="list-style-type: none"> •Loose drain plug or worn drain plug o-ring. 	<ul style="list-style-type: none"> •Tighten drain plug or replace o-ring.
•Bubble gauge	<ul style="list-style-type: none"> •Loose bubble gauge or worn bubble gauge gasket. 	<ul style="list-style-type: none"> •Tighten bubble gauge or replace gasket.
•Rear cover	<ul style="list-style-type: none"> •Loose rear cover or worn rear cover o-ring. 	<ul style="list-style-type: none"> •Tighten rear cover or replace o-ring.
•Filler cap	<ul style="list-style-type: none"> •Loose filler cap or excessive oil in crankcase. 	<ul style="list-style-type: none"> •Tighten filler cap. Fill crankcase to specified capacity.
Pump runs extremely rough		
•Inlet conditions	<ul style="list-style-type: none"> •Restricted inlet or air entering the inlet plumbing 	<ul style="list-style-type: none"> •Correct inlet size plumbing. Check for air tight seal.
•Pump valves	<ul style="list-style-type: none"> •Stuck inlet/discharge valves. 	<ul style="list-style-type: none"> •Clean out foreign material or install new valve kit.
•Pump seals	<ul style="list-style-type: none"> •Leaking V-Packings, Hi-Pressure or Lo-Pressure seals. 	<ul style="list-style-type: none"> •Install new seal kit. Increase frequency of service.
Premature seal failure	<ul style="list-style-type: none"> •Scored plungers. •Over pressure to inlet manifold. •Abrasive material in the liquid being pumped. •Excessive pressure and/or temperature of pumped liquid. •Running pump dry. •Starving pump of adequate liquid. •Eroded manifold. 	<ul style="list-style-type: none"> •Replace plungers. •Reduce inlet pressure per specifications. •Install proper filtration at pump inlet and clean regularly. •Check pressure and inlet liquid temperature. •DO NOT RUN PUMP WITHOUT LIQUID. •Increase hose one size larger than inlet port size. Pressurize and install C.A.T. •Replace manifold. Check liquid compatibility.



FEATURES

Superior Design

- Triplex plunger design provides smoother liquid flow.
- V-Packings are completely lubricated and cooled by the liquid being pumped.
- Special ported inlet manifold permits an external flush liquid providing cooling for hi-temp liquids and lubrication for low lubricity liquids.
- Lubricated Lo-Pressure Seals provide double protection against external leakage.
- Oil bath crankcase assures optimum lubrication.
- Close tolerance concentricity of the ceramic plunger offers perfect alignment and maximizes seal life.

Quality Materials

- Precision design 304 and 316 stainless steel valves and seats are hardened and polished for ultimate seating and extended valve life.
- Brass, Stainless Steel, Duplex SS or Nickel Aluminum Bronze manifolds for strength and corrosion resistance.
- Special concentric, high-density, polished, solid ceramic plungers provide a true wear surface and extended seal life.
- Specially formulated, CAT PUMP exclusive, V-Packings offers unmatched performance and seal life.
- Die cast aluminum crankcase provides high strength, minimum weight and precision tolerance control.
- Chrome-moly crankshaft gives unmatched strength and surface hardness.
- Oversized crankshaft bearings with greater loading capacity mean longer bearing life.

Easy Maintenance

- Wet-end easily serviced without entering crankcase.
- Valve assemblies are accessible without disturbing piping.
- Interchangeable inlet and discharge valve assemblies.
- Preset seals require no packing adjustment.

CAUTIONS AND WARNINGS

All High Pressure Systems require a primary pressure regulating device (i.e. regulator, unloader) and a secondary pressure relief device (i.e. pop-off valve, relief valve). Failure to install such relief devices could result in personal injury or damage to pump or property. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high pressure system. The CAUTIONS and WARNINGS are included in each service manual and with each Data sheet. CAUTIONS and WARNINGS can also be viewed online at www.catpumps.com/cautions-warnings or can be requested directly from CAT PUMPS.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/warranty.

15 Frame Plunger Pumps

Standard Model

Stainless Steel Model

SS Flushed Model

Duplex SS Model

Nickel Aluminum Bronze Model

1050
1051
1051C
1051D
1057

SPECIFICATIONS

U.S. Measure

Metric Measure

STANDARD SPECIFICATIONS

Flow	10 gpm	(38 l/m)
Pressure Range	100 to 2200 psi	(7 to 155 bar)
RPM	958 RPM	(958 RPM)
Inlet Pressure Range	-5 to 60 psi	(-0.35 to 4 bar)
Maximum Liquid Temperature	160°F	(70°C)

Above 130°F call CAT PUMPS for inlet conditions and elastomer recommendations.

ALTERNATE SPECIFICATIONS - MODEL 1050 ONLY

Flow*	12 gpm	(45 l/m)
Pressure Range*	100 to 1800 psi	(7 to 125 bar)
RPM*	1150 RPM	(1150 RPM)
Inlet Pressure Range*	20 to 60 psi	(1.4 to 4 bar)
Maximum Liquid Temperature*	100°F	(38°C)

*C.A.T. Required

COMMON SPECIFICATIONS

Bore	0.945"	(24 mm)
Stroke	1.180"	(30 mm)
Crankcase Capacity	42 oz.	(1.26 l)
Inlet Ports (2)	3/4" NPTF	(3/4" NPTF)
Flushing Ports (2) (1051C)	1/8" NPTF	(1/8" NPTF)
Discharge Ports (2)	1/2" NPTF	(1/2" NPTF)
Pulley Mounting	Either Side	(Either Side)
Shaft Diameter	1.181"	(30 mm)
Weight	44 lbs.	(20 kg)
Dimensions	16.28 x 12.99 x 6.44"	(414 x 330 x 164 mm)

ELECTRIC HORSEPOWER REQUIREMENTS

FLOW		PRESSURE			MOTOR PULLEY SIZE	
		psi 1800	psi 2000	psi 2200	Using 1725 RPM Motor & Std. 10" Pump Pulley	
U.S. gpm	l/m	bar 125	bar 140	bar 155	RPM	Pulley O.D.
12.0	45	14.8	N/A	N/A	1150	6.5
10.0	38	12.4	13.7	15.1	958	5.4
9.0	34	11.1	12.4	13.6	836	4.9

**DETERMINING
THE PUMP R.P.M.**

Rated G.P.M.
Rated R.P.M.

= "Desired" G.P.M.
"Desired" R.P.M.

**DETERMINING
THE REQUIRED H.P.**

GPM x psi
1460

= Electric Brake
H. P. Required

**DETERMINING
MOTOR PULLEY SIZE**

Motor Pulley O.D.
Pump R.P.M.

= Pump Pulley O.D.
Motor R.P.M.

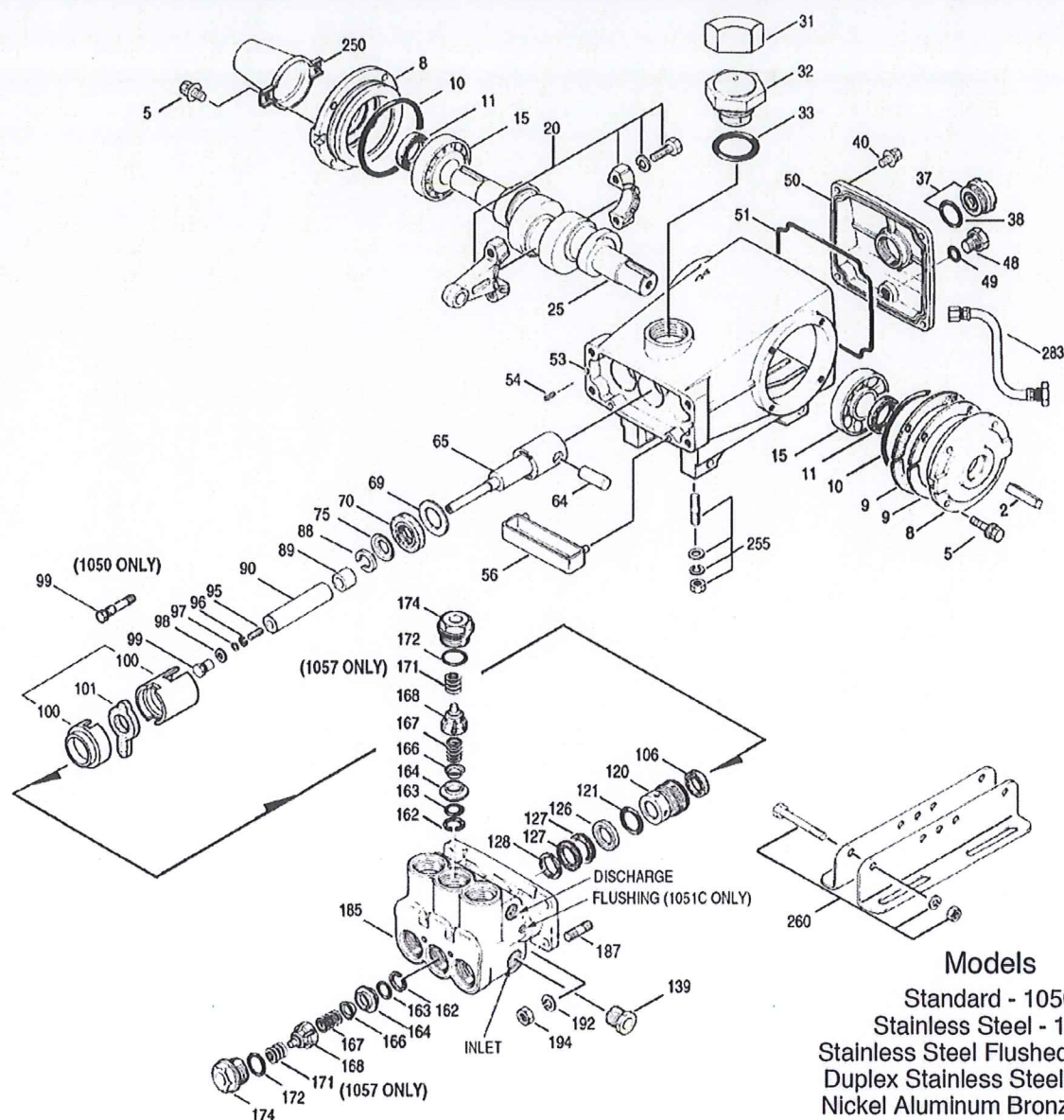
See complete Drive Packages [Includes: Pulleys, Belts, Hubs, Key] Tech Bulletin 003.
Refer to pump Service Manual for repair procedure and additional technical information.

"Customer confidence is our greatest asset"

PARTS LIST

ITEM	1050	MATL	1051/C/D	MATL	1057	MATL	DESCRIPTION	QTY
2	30067	STL	30067	STL	30067	STL	Key (M8x7.5x25))	1
5	92519	STZP	92538	S	92538	S	Screw, HHC Sems (M6x16)	8
	125824	STCP R	—	—	—	—	Screw, HHC, Sems (M6x16)	8
8	43496	AL	43496	AL	43496	AL	Cover, Bearing	2
9	815281	FBR	815281	FBR	815281	FBR	Shim, Split, Bearing Cover 2-Pc	2/4
	814800	S	814800	S	814800	S	Shim, Split, Bearing Cover 2-Pc	0/4
10	11340	NBR	11340	NBR	11340	NBR	O-Ring, Bearing Cover - 70D	2
11	43495	NBR	43495	NBR	43495	NBR	Seal, Oil, Crankshaft - 70D	2
15	39060	STL	39060	STL	39060	STL	Bearing, Roller	2
20	48600	TNM	48600	TNM	48600	TNM	Rod, Connecting Assembly [10/01]	3
25	43494	FCM	43494	FCM	43494	FCM	Crankshaft, Dual End	1
31	828710	—	828710	—	828710	—	Protector, Oil Cap w/Foam Gasket	1
32	43211	ABS	43211	ABS	43211	ABS	Cap, Oil Filler	1
33	14177	NBR	14177	NBR	14177	NBR	O-Ring, Filler Cap - 70D	1
37	92241	—	92241	—	92241	—	Gauge, Oil, Bubble w/Gasket - 80D	1
38	44428	NBR	44428	NBR	44428	NBR	Gasket, Flat, Oil Gauge - 80D	1
40	92520	STZP	92542	S	92542	S	Screw, HHC Sems (M6x20)	4
	126541	STCP R	—	—	—	—	Screw, HHC, Sems (M6x20)	4
48	25625	STCP	25625	STCP	25625	STCP	Plug, Drain (1/4"x19BSP)	1
49	23170	NBR	23170	NBR	23170	NBR	O-Ring, Drain Plug - 70D	1
50	43491	AL	43491	AL	43491	AL	Cover, Rear	1
51	44834	NBR	44834	NBR	44834	NBR	O-Ring, Rear Cover - 70D	1
53	115471	AL	115471	AL	115471	AL	Crankcase w/Guide Pins	1
54	27488	S	27488	S	27488	S	Pin, Guide	2
56	44664	POP	44664	POP	44664	POP	Pan, Oil	1
64	43507	CM	43507	CM	43507	CM	Pin, Crosshead	3
65	43501	SSZ	45258	SSZZ	45258	SSZZ	Rod, Plunger	3
69	126592	STCP R	126592	STCP R	126592	STCP R	Washer, Oil Seal	3
70	43500	NBR	43500	NBR	43500	NBR	Seal, Oil, Crankcase - 80D	3
75	43506	S	43506	S	43506	S	Slinger, Barrier	3
88	45675	S	45675	S	45675	S	Washer, Keyhole	3
89	43553	BB	45879	SS	45879	SS	Collar, Spacer	3
90	43552	CC	43552	CC	43552	CC	Plunger (M24x77)	3
95	—	SS	89651	SS	89651	SS	Stud, Plunger Retainer (M6x70)	3
96	43235	PTFE	43235	PTFE	43235	PTFE	Back-up-Ring, Plunger Retainer	3
97	17399	NBR	17399	NBR	17399	NBR	O-Ring, Plunger Retainer - 80D	3
	14160	FPM	14160	FPM	14160	FPM	O-Ring, Plunger Retainer - 80D	3
	◆ 46204	EPDM	◆ 46204	EPDM	◆ 46204	EPDM	O-Ring, Plunger Retainer - 70D	3
98	44041	SS	44041	SS	44041	SS	Gasket, Plunger Retainer	3
99	—	—	44031	SS	44031	SS	Retainer, Plunger (M6)	3
	104360	S	—	—	—	—	Retainer w/Stud	3
100	855001	POP	855001	POP	855001	POP	Retainer, Seal 2-Pc [07/05] (See Tech Bulletin 098)	3
101	43554	—	43554	—	43554	—	Wick, Long Tab	3
106	44035	NBR	44035	NBR	44035	NBR	Seal, LPS w/SS-Spg	3
	44388	FPM	44388	FPM	44388	FPM	Seal, LPS w/SS-Spg	3
	◆ 46208	EPDM	◆ 46208	EPDM	◆ 46208	EPDM	Seal, LPS w/SS-Spg	3
	76035	ST	76035	ST	—	—	Seal, LPS	3
120	49290	BB	49286	SSNP	49286	SSNP	Case, Seal [07/05]	3
121	14762	NBR	14762	NBR	14762	NBR	O-Ring, Seal Case - 70D	3
	11737	FPM	11737	FPM	11737	FPM	O-Ring, Seal Case - 75D	3
	◆ 46205	EPDM	◆ 46205	EPDM	◆ 46205	EPDM	O-Ring, Seal Case	3
126	43558	BB	48389	D	48389	D	Adapter, Female (See Tech Bulletin 087-1051 and 1057 only)	3
	—	—	45073	SS	45073	SS	Adapter, Female	3
127	43559	SNG	† 103692	STG*	103692	STG*	V-Packing	6
128	43560	BB	45074	SS	45074	SS	Adapter, Male	3
139	20326	BBCP	44382	SS	44562	NAB	Plug, Inlet (3/4" NPT)	1
162	43248	PTFE	43248	PTFE	43248	PTFE	Back-up-Ring, Valve Seat	6
163	43249	NBR	43249	NBR	43249	NBR	O-Ring, Seat - 80D	6
	44383	FPM	44383	FPM	44383	FPM	O-Ring, Seat - 70D	6
	◆ 46206	EPDM	◆ 46206	EPDM	◆ 46206	EPDM	O-Ring, Seat - 70D	6
164	44718	S	44037	SS	44037	SS	Seat	6
166	43721	S	48793	SS	48793	SS	Valve	6
167	43751	S	44039	SS	44039	SS	Spring, Valve	6
168	44564	PVDF	44564	PVDF	44564	PVDF	Retainer, Spring	6
171	—	—	—	—	44832	S	Coil Spring, Valve Plug	6
172	17617	NBR	17617	NBR	17617	NBR	O-Ring, Valve Plug - 90D	6
	11691	FPM	11691	FPM	11691	FPM	O-Ring, Valve Plug - 90D	6
	◆ 46207	EPDM	◆ 46207	EPDM	◆ 46207	EPDM	O-Ring, Valve Plug - 70D	6
174	43851	BBCP	49293	SS	44831	NAB	Plug, Valve	6
185	46704	BBCP	48726	SS	46706	NAB	Head, Manifold [9/00]	1
	—	—	49188	SS	—	—	Head, Manifold, Flushed (1/8" Flushed Port) 1051C ONLY	1
	—	—	124230	DSS	—	—	Head, Manifold (1051D only)	1
187	126545	STCP R	44005	S	44005	S	Stud, Manifold (M10x45)	4
192	126231	STCP	15847	S	15847	S	Lockwasher (M10)	4
194	126522	STCP R	81258	S	81258	S	Nut, Hex (M10)	4
250	30764	NY	30764	NY	30764	NY	Protector, Shaft w/Two Screws	1
	30764S	NY	30764S	NY	30764S	NY	Protector, Shaft w/Two SS Screws	1
255	30264	STZP	30264	STZP	30264	STZP	Mounting, Direct	1
260	30613	STZP	30613	STZP	30613	STZP	Mount, Rail, Assy	1
265	30661	—	30661	—	30661	—	Mount, Assy, (Includes: 30613, 30206, 30059, 30067, 30764)	1
269	30206	F	30206	F	30206	F	Pulley (10") AB [See Drive Packages, Tech Bulletin 003]	1
274	30059	STL	30059	STL	30059	STL	Hub, "H", M30 (Keyway M8) [See Drive Packages, Tech Bulletin 003]	1
283	34334	—	34334	—	34334	—	Kit, Oil Drain (3/8" x 24") (See Tech Bulletin 077)	1

EXPLODED VIEW



Models

Standard - 1050
 Stainless Steel - 1051
 Stainless Steel Flushed - 1051C
 Duplex Stainless Steel - 1051D
 Nickel Aluminum Bronze - 1057

	1050	MATL	1051C/D	MATL	1057	MATL		
290	—	—	6124	—	6124	—	Gasket, Liquid (3 oz.)	1
299	814560	BBCP	816771	SS	815261	NAB	Head, Complete [9/00]	1
	—	—	818333	SS	—	—	Head, Complete - C (1051C only)	1
	—	—	818442	DSS	—	—	Head, Complete (1051D only)	1
300	30913	NBR	33916	NBR*	33916	NBR*	Kit, Seal (Incls: 97, 100, 106, 121, 127)	1
	30986	FPM*	30986	FPM*	30986	FPM*	Kit, Seal (Incls: 97, 100, 106, 121, 127)	1
	♦ 33913	EPDM*	♦ 33913	EPDM*	♦ 33913	EPDM*	Kit, Seal (Incls: 97, 100, 106, 121, 127)	1
310	34920	NBR	34387	NBR	34387	NBR	Kit, Valve Preassembled (Incls: 162, 163, 164, 166, 167, 168, 172)	2
	31256	FPM	30987	FPM	30987	FPM	Kit, Valve Preassembled (Incls: 162, 163, 164, 166, 167, 168, 172)	2
	♦ 31253	EPDM	♦ 31258	EPDM	♦ 31258	EPDM	Kit, Valve Preassembled (Incls: 162, 163, 164, 166, 167, 168, 172)	2
350	30696	STZP	30696	STZP	30696	STZP	Plier, Reverse	1
351	43523	STZP	43523	STZP	43523	STZP	Tool, Seal Case Removal	1
390	711500	SS	711500	SS	711500	SS	C.A.T. (Inlet pressure stabilizer for RO and boosted inlet applications)	1
391	711503	SS	711503	SS	711503	SS	Adapter (2 per C.A.T.) (See Data Sheet for complete selection)	2
392	701818	SS	701818	SS	701818	SS	Elbow Assy used w/Adapter Assy 711503	1
—	6575	—	6575	—	6575	—	Plunger Pump Service DVD	1
—	6107	—	6107	—	6107	—	Oil, Bottle (21 oz) ISO 68 Hydraulic	2
—	—	—	6119	—	—	—	(Fill to specified crankcase capacity prior to start-up)	
—	—	—	—	—	—	—	Lubricant, Antiseize (1 oz.) (See Tech Bulletin 095)	1

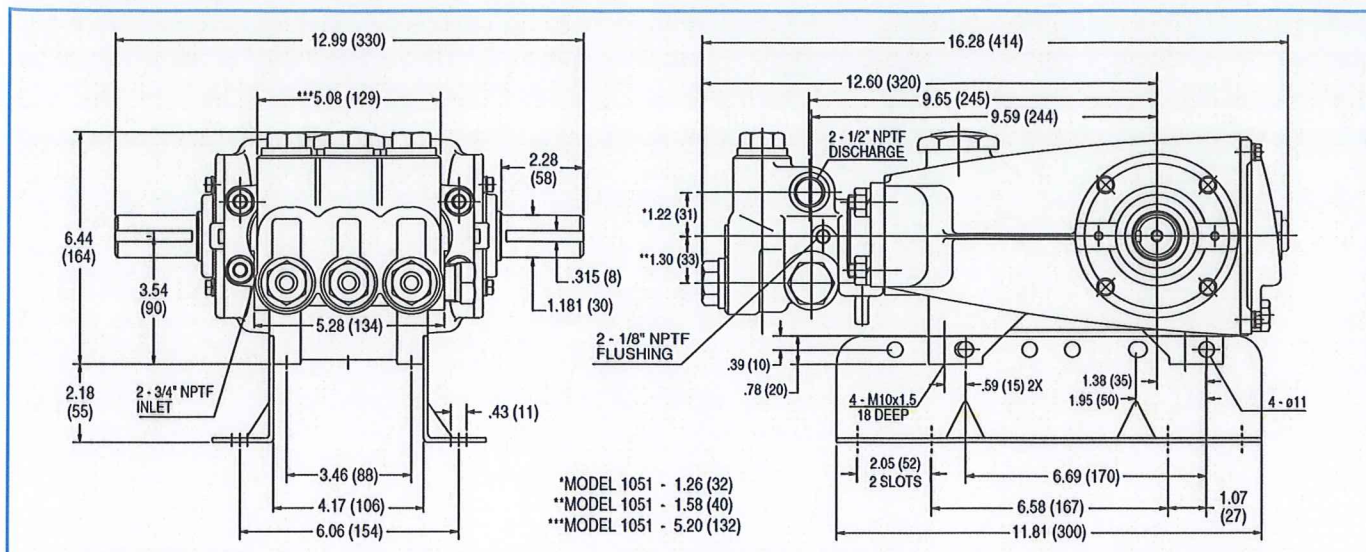
Bold print part numbers are unique to a particular pump model. Italics are optional items. [] Date of latest production change.

♦ Silicone oil/grease required. = Production parts are different than service parts. R components comply with RoHS Directive.

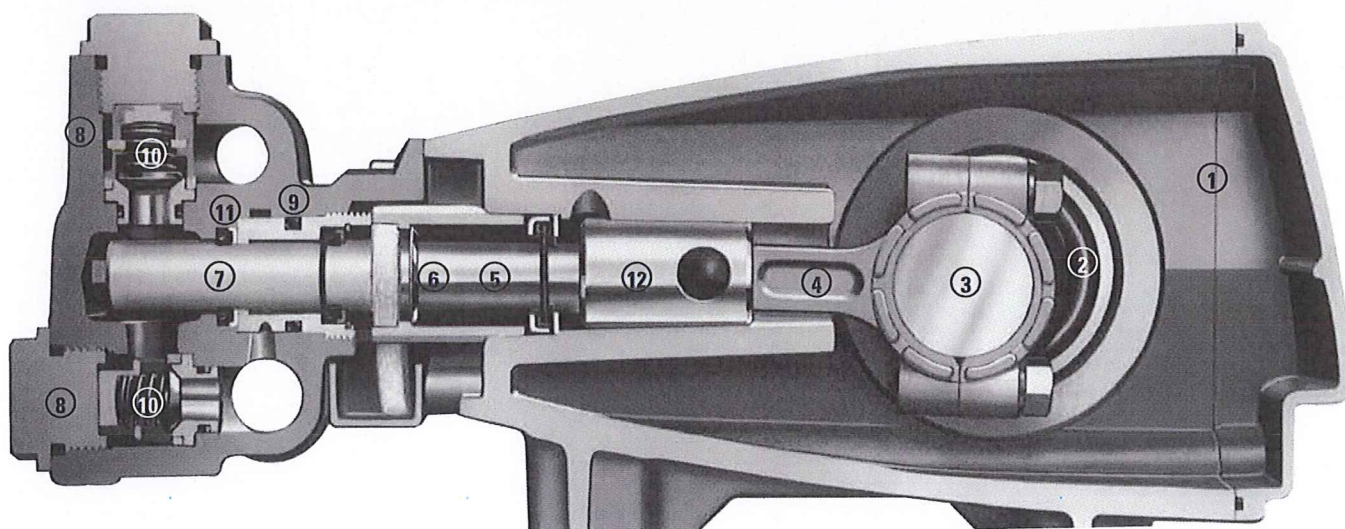
*Review individual parts in each kit for material code identification.

View Tech Bulletins 002, 003, 024, 027, 035, 036, 043, 045, 046, 048, 049, 052, 053, 072, 074, 077, 083, 087, 089 and 098 for additional information.

MATERIAL CODES (Not Part of Part Number): ABS=ABS Plastic AL=Aluminum BB=Brass BBCP=Brass/Chrome Plated CC=Ceramic CM=Chrome-moly D=Acetal DSS= Duplex SS EPDM=Ethylene Propylene Diene Monomer F=Cast Iron FBR=Fiber FCM=Forged Chrome-moly FPM=Fluorocarbon NAB=Nickel Aluminum Bronze NBR=Medium Nitrile (Buna-N) NY=Nylon POP=Polypropylene PTFE=Pure Polytetrafluoroethylene PVDF=Polyvinylidene Fluoride S=304SS SNG=SpecialBlend (Buna) STG=Special Blend PTFE White SS=316SS SSZZ=316SS/Zamak STCP=Steel/Chrome Plated SSNP=316SS/Nickel Plated ST= Polyetheretherketon STL=Steel STZP=Steel/Zinc Plated SZZ=304SS/Zamak TNM=Special High Strength



Models 1050, 1051, 1051C, 1051D, 1057



- 1 Die cast aluminum **crankcase** means high strength, lightweight, and excellent tolerance control.
- 2 Oversized crankshaft **bearings** provide extended bearing life and pump performance.
- 3 Chrome-moly **crankshaft** provides unmatched strength and surface hardness for long life.
- 4 Matched oversized TNM **connecting rods** noted for superior tensile strength and bearing quality.
- 5 High strength **plunger rods** for highload bearing and longevity.
- 6 The stainless steel **slinger** provides back-up protection for the crankcase seal, keeping pumped liquids out of the crankcase.
- 7 Special concentric, high-density, polished, solid ceramic **plungers** provide a true wear surface and extended seal life
- 8 **Manifolds** are a high tensile strength forged brass, stainless steel, duplex SS or nickel aluminum bronze for long term, continuous duty.
- 9 100% wet seal design adds to service life by allowing pumped liquids to cool and lubricate on both sides.
- 10 Stainless steel **valves, seats and springs** provide corrosion-resistance, ultimate seating and extended life.
- 11 Specially formulated, CAT PUMP exclusive, **V-Packings** offer unmatched performance and seal life.
- 12 **Crossheads** are 360° supported for uncompromising alignment.
- 13 Special flushed inlet manifold permits external flush for added cooling with high temperature liquids and lubrication with low lubricity liquids.

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FEATURES

- Nitrogen precharged to eliminate moisture and bladder deterioration.
- Broader bladder design provides greater pulsation reduction for smoother performance and longer system component life.
- Optional 316 Stainless Steel and FPM construction for critical applications.
- New sealed style operates over full range of system pressures without precharge adjustment.

SHIPMENT REGULATIONS

- Pre-charged Prrrrr-O-Lators are defined as hazardous articles. Uncharged Prrrrr-O-Lators requires no special handling and can be shipped via standard shipping methods.
- All domestic shipments of hazardous articles must follow Department of Transportation CFR 49, parts 100 to 185 regulations (DOT).
- International shipments of hazardous articles must follow either International Air Transport Association regulation (IATA) or International Maritime Dangerous Goods Codes (IMDG).

⚠ CAUTIONS AND WARNINGS

All High Pressure Systems require a primary pressure regulating device (i.e. regulator, unloader) and a secondary pressure relief device (i.e. pop-off valve, relief valve). Failure to install such relief devices could result in personal injury or damage to pump or property. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high pressure system. The CAUTIONS and WARNINGS are included in each service manual and with each Data sheet. CAUTIONS and WARNINGS can also be viewed online at www.catpumps.com/cautions-warnings or can be requested directly from CAT PUMPS.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/warranty.

Prrrrr-O-Lator Pulsation Dampeners

ORDERING INFORMATION

Use base part number for sealed models 6026 or 6028.

Use base part number for rechargeable models 6029, 6030, or 6031 if factory pre-charge is desired.

Add .800 to base part number for rechargeable models (i.e. 6029.800) for:

1. No pre-charge (remove factory pressure)
2. A pre-charge different from factory (indicate desired pre-charge on purchase order)

Note: A handling charge will apply.

MODELS 6026 and 6028 - Sealed

	U.S. Measure	Metric Measure
Maximum Flow	15 GPM	(57 L/M)
Working Pressure Range (6026)	300-600 PSI*	(20-41 BAR)
Working Pressure Range (6028)	600-1000 PSI*	(41-70 BAR)
Precharge (6026 Sealed)	250 PSI	(17 BAR)
Precharge (6028 Sealed)	450 PSI	(32 BAR)
Operating Temperature Range	+5 to 180°F	(-20 to 82°C)
Volume	10 cu. in.	(0.16 L)
Safety Factor	4/1	(4/1)
Bladder Construction	NBR	(NBR)
Port Size	1/2" NPTM	(1/2" NPTM)
Diameter	2.93"	(74.5 mm)
Length	4.67"	(118.7 mm)
Weight	1.81 lbs.	(0.84 kg)

*Optimum pulsation dampening at stated PSI. If full dampening is not critical, performance is acceptable up to 3000 PSI system pressure.

MODELS 6029 and 6030 - Rechargeable

	U.S. Measure	Metric Measure
Maximum Flow	15 GPM	(57 L/M)
Working Pressure Range	100-3000 PSI	(7-210 BAR)
Precharge (Rechargeable)	450 PSI	(32 BAR)
Operating Temperature Range	+5 to 180°F	(-20 to 82°C)
Volume	10 cu. in.	(0.16 L)
Safety Factor	4/1	(4/1)
Stainless Steel Lower Body	SS	SS
Bladder Construction (6029)	NBR	(NBR)
Bladder Construction (6030)	FPM	(FPM)
Port Size	1/2" NPTM	(1/2" NPTM)
Diameter	2.93"	(74.5 mm)
Length	5.51"	(140 mm)
Weight	2.18 lbs.	(1.02 kg)

MODEL 6031 - Rechargeable

	U.S. Measure	Metric Measure
Maximum Flow	15 GPM	(57 L/M)
Working Pressure Range	100-2400 PSI	(7-168 BAR)
Precharge (Rechargeable)	450 PSI	(32 BAR)
Operating Temperature Range	+5 to 180°F	(-20 to 82°C)
Volume	10 cu. in.	(0.16 L)
Safety Factor	4/1	(4/1)
All Stainless Steel	SS	SS
Bladder Construction	NBR	(NBR)
Port Size	1/2" NPTM	(1/2" NPTM)
Diameter	2.93"	(74.5 mm)
Length	5.51"	(140 mm)
Weight	2.18 lbs.	(1.02 kg)

"Customer confidence is our greatest asset"

INSTALLATION INSTRUCTIONS

⚠ WARNING

Do not charge Prrrrr-O-Lators (Pulsation Dampeners) with oxygen. Oxygen may cause an explosion causing personal injury, death or property damage.

1. Use nitrogen only when charging pulsation dampeners, DO NOT USE OXYGEN.
2. Use proper charging tools to charge pulsation dampeners.
3. Charge pulsation dampener within specifications stated on data sheet to assure proper pulsation dampening and prevent failure of bladder.

SELECTION: The Prrrrr-O-Lator should be selected to match the flow and pressure requirements of the system and satisfy the liquid compatibility.

INSTALLATION: The Prrrrr-O-Lator should be mounted directly onto the pump discharge manifold for optimum pulsation dampening and to avoid system vibration damage.

OPERATION: The Prrrrr-O-Lator should be precharged with **dry Nitrogen only**.

The standard Prrrrr-O-Lator is precharged to 450 PSI, however, it may be adjusted to offer a more precise control of pulsation in critical applications such as reverse osmosis.

"Sealed" Prrrrr-O-Lators are preset at 250 or 450 PSI and are designed to operate over the full range of system pressures from 600 to 1000 PSI.

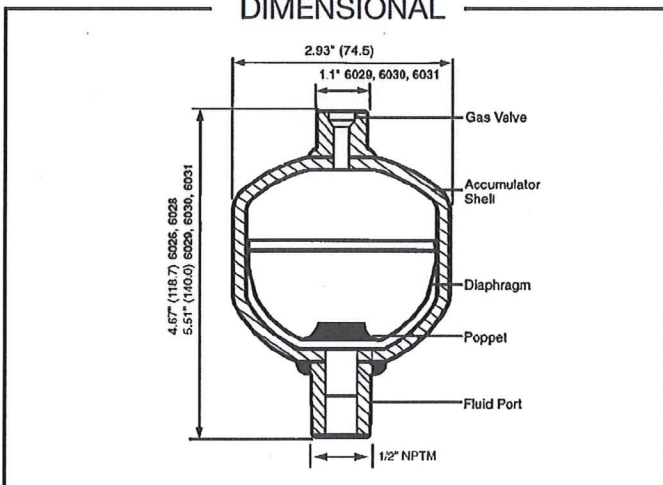
At a standard temperature of 70°F, optimum accumulator performance is obtained when the precharge is calibrated at 50% of the system operating pressure.

NOTE: When operating at the lower temperatures, precharge should be 15% higher or 65% of system pressure. When operating at higher temperatures, precharge should be 15% lower or 35% of system pressure.

This precharge should be checked every 12 months for normal operation and more frequently for continuous-duty operation.

NOTE: Up to 50 PSI precharge pressure can be lost during the checking of your precharge.

DIMENSIONAL



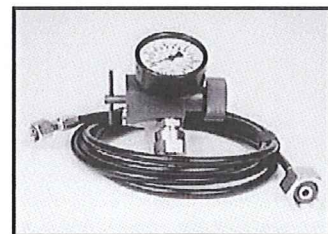
FILLING AND GAUGING INSTRUCTIONS

The following are the steps in both checking the precharge of the Prrrrr-O-Lator and recharging if there should be a loss of pressure or a need for adjustment.

NOTE: A gas regulator must be mounted between the nitrogen tank and the hose connection from the Filling and Gauging Assembly to enable you to regulate the precharge and to prevent excessive pressure being transmitted directly to the Prrrrr-O-Lator. OVER PRESSURIZATION WILL VOID THE WARRANTY.

1. Before checking your precharge, **system pressure should be at zero. TURN SYSTEM OFF.**
2. SLIGHTLY loosen the sealed valve at the top of the Prrrrr-O-Lator using a 6mm long handled allen wrench. Thread on the Filling and Gauging Assembly hand tight.
3. Be certain the SIDE BLEED VALVE on the gauging assembly is CLOSED.
4. Slowly open the LARGE "T" VALVE at the top of the gauging assembly until completely open. The gauge on the assembly will read the precharge on the Prrrrr-O-Lator.
5. Completely back off (CLOSE) the valve on the gas regulator, open the nitrogen tank valve and read the nitrogen tank pressure on the first gauge.
6. If the reading on the gauge assembly is 50% of the system pressure, close the top "T" valve and proceed to step 9.
7. If the precharge is too high, keep the top "T" valve open and slowly open the small "T" valve on the side of the gauging assembly to bleed of pressure.
8. If the pressure is less than 50% of the system pressure, slowly open the gas regulator valve until the desired precharge is reached on the second gauge.
9. When the gauge reads the required precharge, close the "T" valve on the top of the gauging assembly to lock the precharge in the Prrrrr-O-Lator.
10. Back off (CLOSE) the gas regulator.
11. Proceed with opening the small side "T" valve on the gauging assembly to relieve (bleed-off) pressure in the assembly and on the second gauge on the gas regulator.
12. Close the side "T" valve on the gauging assembly and remove the assembly from the Prrrrr-O-Lator.
13. Tighten the Prrrrr-O-Lator sealed valve and resume operation.

- 30940 Complete Filling and Gauging Assembly (Optional)
- 30941 Allen Wrench (Included in Assembly)
- 6099 Pressure Gauge (Included in Assembly)



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BALDOR • RELIANCE

Product Information Packet

EM7054T-I

15//10HP, 1765//1470RPM, 3PH, 60//50HZ, 254T

Part Detail									
Revision:	A	Status:	PRD/A	Change #:		Proprietary:	No		
Type:	AC	Prod. Type:	0942M	Elec. Spec:	09WGW980	CD Diagram:			
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	09F369	Layout:			
Frame:	254T	Mounting:	F1	Poles:	04	Created Date:	06-15-2010		
Base:	RG	Rotation:	R	Insulation:	F	Eff. Date:	06-24-2011		
Leads:	9#12	Literature:		Elec. Diagram:		Replaced By:			
Nameplate NP0977XP									
NO.				TEMP CODE	T3C				
SPEC.		09F369W980G2		DE BRG	6309				
CAT.NO.		EM7054T-I		ODE BRG	6208				
HP		15//10		GREASE	POLYREX EM				
VOLTS		230/460//190/380		MOTOR WEIGHT	370				
AMPS		36/18//28.8/14.4		NEMA-NOM-EFF	92.4				
RPM		1765//1470		FL PF	84				
CYCLE		60//50		PH	3	CL	F	FRAME	254T
SER.F.		1.15		DES	B	CODE	H	CC	010A
SER.									
RATING		40C AMB-CONT							
USABLE AT 208V		37							

Parts List			Quantity
Part Number	Description		
SA198801	SA 09F369W980G2		1.000 EA
RA186157	RA 09F369W980G2		1.000 EA
MJ5000A01	SEALANT, CHICO A COMPOUND		0.050 LB
09CB1003A01	CONDUIT BOX MACH. GROUP C MTRS		1.000 EA
10XN3118K24	5/16-18 X 1.50" HEX HD, GRADE 5		4.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT .591 OD, .319 I		4.000 EA
WD1000B25	BURNDY TERMINAL L125HP		1.000 EA
10XN3118K12	5/16-18 X .75 GRADE 5, ZINC PLATED		1.000 EA
HW1001A31	LOCKWASHER 5/16, ZINC PLT .591 OD, .319 I		1.000 EA
09EP1700A33P	FR ENDPLATE, MACH, XPFC W/DRN HW4505A02		1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN		1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5		4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I		4.000 EA
HW5100A08	W3118-035 WVY WSHR (WB)		1.000 EA
10XN2520K36	1/4-20 X 2.25" HX HD SCRWGRADE 5, ZINC P		4.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I		4.000 EA
09EP1707A16P	PU E.P., MACH. W/DRAIN HW4505A02 W/PRIME		1.000 EA
HW3023E06	.125 X .625 SPIRAL SPRING PIN		1.000 EA
10XN3816K28	3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5		4.000 EA
HW1001A38	LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I		4.000 EA
09FH1004A03	FAN COVER, MACH		1.000 EA
10XN2520K12	1/4-20 X .75 GRD 5		3.000 EA
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I		3.000 EA
HA2066A01	SLINGER, ALUM (AUTO)		1.000 EA

Parts List (continued)		
Part Number	Description	Quantity
80XN1032A07	SET SCREW, HEX XOCK, ZN	1.000 EA
09CB1502A01	CONDUIT BOX LID MACH. GROUP C MTRS	1.000 EA
84XN5013J24	1/2-13 X 1-1/2 HEX SOCKET HD CAP SCREW	6.000 EA
HW1001A50	LOCKWASHER 1/2, ZINC PLT., 879 OD, .509 I	6.000 EA
HW2501G25	KEY, 3/8 SQ X 2.875	1.000 EA
LB1115	LABEL, LIFTING DEVICE	1.000 EA
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
HW4505A02	BREATHER/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON	0.080 LB
HW4500A20	1/8NPT SL PIPE PLUG	2.000 EA
HW4505A02	BREATHER/DRAIN-EXP PROOF-.250-18 PTF AIS	1.000 EA
09FN3001D01	EXTERNAL FAN, PLASTIC	1.000 EA
HW2500A25	WOODRUFF KEY USA #1008 #BLOW CARBON STEE	1.000 EA
51XB1214A20	12-14X1.25 HXWSSLD SERTYB	1.000 EA
MG1025G05	PAINT 789.201 (WILCO) DARK GRAY METALLIC	0.050 GA
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000 EA
LB1081	LABEL CSA XPROOF	1.000 EA
LB5040	INSTRUCTION TAG, AC & DC	1.000 EA
LB1119	WARNING LABEL	1.000 EA
LB1125C02	SUPER-E (STOCK CTN LABEL SUPER-E WITH FL	4.000 EA
LB1357	ENERGY GUIDE LABEL (BOX LABEL)	1.000 SH
LC0145B01	CONNECTION LABEL	1.000 EA
NP0977XP	UL/CSA, CLI GP-C&D, CC	1.000 EA
40PA1005	PACKAGING GROUP, 09 STD	1.000 EA

