SERVICE MANUAL

35 FRAME SERIES PLUNGER PUMPS

The Pumps with Nine Lives

PUMP MODEL	FLOW		PRESSURE		RPM	TEMPERATURE		SHAFT DIA.		OIL CAPACITY	
	gpm	lpm	psi	bar	Pump	˚F	˚C	in	mm	qts	l
3550	10	38	6000	414	880	140	60	1.378	35	4.2	4

IMPORTANT SAFETY INSTRUCTIONS

It is the responsibility of the user to read and understand all instructions, important safeguards, and safety precautions before operating or servicing any pump. Failure to do so may result in property damage, personal injury or death.

General Safety Information and Symbols

Pay special attention to the following signal words, safety alert symbols and statements:

⚠DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

NOTICE indicates a hazardous situation which, if not avoided, could result in property damage.

⚠ Indicates a potential personal injury hazard. Obey all safety messages that follow this symbol to avoid possible injury or death.

SERVICING THE 35 FRAME SERIES PLUNGER PUMPS

⚠WARNING

Do not service pump or electrical equipment while energized. Electricity can cause personal injury, death or property damage.

1. Adhere to "Lock Out" and "Tag Out" procedures for electrical equipment.
2. Before commencing pump service, turn power supply off.
3. Keep water away from electrical outlets and electrical devices.
4. Electrical components must be installed by a qualified electrician to avoid risk of electrocution.

SERVICING THE VALVES

NOTE: This pump requires (1) valve Kit.

Disassembly

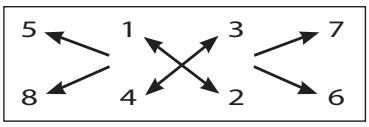
1. To remove discharge valve assembly, use a M10 allen wrench to remove the eight (8) Hex Socket Head screws (HSH) from the top of the inlet/discharge manifold. Remove eight (8) flat washers and valve cover.
2. Position two flat tip screwdrivers opposite of each other into small grooves of valve plug. Pry up to remove the valve plug with o-ring and backup-ring from each valve chamber. Use a pick to remove backup-ring and then o-ring.
3. Use needle nose pliers and reach down into valve chamber and grasp tip of spring retainer. Twist and pull up to remove discharge valve assembly from each valve chamber.
4. To remove inlet valve assembly, use a M10 allen wrench to remove the eight (8) HSH screws and flat washers from the face of the inlet/discharge manifold.
5. Pull inlet/discharge manifold away from seal manifold.
6. Place inlet/discharge manifold with crankcase side facing up.
7. Use a pick to remove the single valve retainer assembly.
8. Use needle nose pliers and reach down into valve chamber and grasp tip of spring retainer. Twist and pull up to remove inlet valve assembly from each valve chamber.
   NOTE: The valve assembly typically will stay together when removed. If the white spring retainer separates from the valve seat, then remove spring and valve. Use a reverse pliers (PN 30696) to remove valve seats.
9. To inspect individual components, separate the valve assembly by inserting a screwdriver into the side of the retainer and press on the backside of the valve to begin separation, then between the retainer and valve seat to separate competetly.
   NOTE: Examine seats, valves and springs for grooves, pitting or wear and replace with a new valve kit as needed.
   NOTE: Examine o-rings and backup-rings for cuts or wear and replace with a new valve kit as needed.

Reassembly

1. Place inlet/discharge manifold with crankcase side facing up.
2. If replacing a complete valve assembly, lubricate both the o-ring and backup-ring on each valve seat.
3. Install inlet valve assembly into valve chamber and press into place.
4. Re-install valve assembly retainers.
5. Re-position inlet/discharge manifold so the discharge valve chambers are facing up.
6. Install discharge valve assembly into valve chamber and press into place.
7. Install new backup-ring and then o-ring onto each valve plug. Lubricate both parts.
8. Place valve plug with recessed surface down into valve chamber and press into place.
9. If replacing by piece parts, install o-ring and then backup-ring to each valve seat.
10. Place valve on valve seat and then spring onto valve. Place spring retainer onto valve seat and snap together tightly. Lubricate both the o-ring and backup-ring on each valve seat.
11. Repeat steps 3, 4, 5, 6 and 7 above for all inlet and discharge valve assemblies.
12. Position inlet/discharge manifold with discharge valve chambers facing up.
13. Install flat washers onto HSH screws. Apply Loctite®242® to eight (8) threads of HSH screws.
14. Install eight (8) HSH screws with flat washers into the face of the inlet/discharge manifold and hand thread until tight.
15. Place cover plate on top of inlet/discharge manifold.
16. Install flat washers onto HSH screws. Apply Loctite®242® to threads of HSH screws.
17. Install eight (8) HSH screws with flat washers through cover plate and hand thread until tight.
18. Use a M10 allen wrench and torque in sequence to 355 in/lbs., 30 ft/lbs., or 40 Nm

Loctite and 242 are registered trademarks of Henkel Corporation.

TORQUE SEQUENCE



SERVICING THE SEALS

NOTE: This pump requires one (1) seal kit and requires that both the inlet and discharge manifolds to be removed.

Disassembly of V-Packings and low pressure seals

1. Use a M10 allen wrench to remove the eight (8) HSH Screws from the inlet/discharge manifold.
2. Tap the backside of the inlet/discharge manifold with a soft mallet to gradually work the inlet/discharge manifold from the seal manifold.

NOTICE

Keep the inlet/discharge manifold properly aligned with the ceramic plungers when removing to avoid damaging the plungers.

3. Place inlet/discharge manifold on a flat surface with the crankcase side facing up.
4. Remove valve spacers from seal manifold by inserting two (2) flat tip screws into groove on opposite sides just below the backup-ring and pry out.
5. Remove o-rings and backup-rings from each end of valve spacers.
6. Use a pick to remove three (3) o-rings from face of inlet manifold.
7. Use a M12 allen wrench to remove the four (4) seal manifold HSH screws.

NOTICE

Use extreme care not to damage the seal chamber walls.

8. Use a crescent wrench to rotate the crankshaft to begin separation of the seal manifold from the crankcase.
9. Tap the backside of the seal manifold with a soft mallet to gradually work the seal manifold from the pump's crankcase.
   NOTE: Place two (2) flat tip screwdrivers on opposite sides of the manifold to assist separation

NOTICE

Keep the seal manifold properly aligned with the ceramic plungers when removing to avoid damaging the ceramic plungers.

10. Use a screwdriver to remove male adapter, three (3) V-Packings and female adapter from each seal chamber.
11. Place the seal manifold down on a flat work surface with crankcase side facing up.

NOTICE

Use extreme care not to damage the seal chamber walls.

12. Use a flat tip screwdriver to remove low-pressure seal from each seal chamber.
    NOTE: Examine valve spacers, male adapters and female adapters for grooves, pitting, scale build up or wear and replace with new parts as needed.
    NOTE: Examine V-Packings, low-pressure seals, o-rings and backup-rings for cuts or wear and replace with a new seal kit as needed.

    NOTE: Examine internal bore surfaces of manifolds and manifold face surfaces for grooves, pitting, scale build up or wear and replace with new parts as needed.

    NOTE: Before replacing manifolds, the plunger retainer o-rings must be replaced Go to the **SERVICING THE PLUNGERS** section.

Reassembly of Low-pressure seals and V-Packings

1. Place crankcase side of seal manifold facing up.
2. Install low-pressure seals into seal manifold. Ensure coil spring is facing down and the low pressure seal is properly seated within seal manifold.
3. Turn seal manifold over so crankcase side is facing down.
4. Install female adapters with flat side down and groove side facing up into inlet manifold.
5. Apply liquid gasket to internal walls of inlet manifold before installing V-Packings.
6. Install three (3) V-Packings with groove side facing up into each seal chamber.
7. Install male adapters with flat side facing up in the seal manifold.
8. Rotate crankshaft by hand so the two (2) outside ceramic plungers are extended equally.
9. Lubricate the surfaces of the ceramic plungers.
10. Carefully slide the seal manifold over the ceramic plungers and press into place. Use a rubber hammer to ensure seal manifold is flush with crankcase.
11. Apply Loctite®242® to four (4) seal manifold HSH screws and hand thread in.
12. Use a M12 allen wrench and torque to 480 in/lbs., 40 ft/lbs. or 54Nm.
13. Install inlet manifold o-rings into grooves of inlet manifold.
14. nstall backup-ring and then o-ring on both ends of valve spacer.
15. Lubricate o-rings and backup-rings on valve spacers.
16. Install valve spacer with the tapered surface facing into the inlet /discharge manifold.
17. Carefully slide the inlet/discharge manifold over the ceramic plungers and press against the seal manifold and hand thread eight (8) discharge manifold HSH screws.
18. Use a M10 allen wrench and torque in sequence to 355 in/lbs., 30 ft/lbs., or 40 Nm

SERVICING THE PLUNGERS

Disassembly

1. Remove rear seal retainer and adapter with wicks from crankcase.
2. Use a M14 hex tool to loosen plunger retainer 4 to 5 turns. Push ceramic plunger towards crankcase until the plunger retainer pops out.
3. Unscrew plunger retainer with gasket, o-ring and backup-ring.
4. Remove ceramic plungers.
5. Remove keyhole washers and barrier slingers.
6. Remove backup-ring, o-ring and copper gasket from plunger retainer.
   NOTE: Examine seal retainer, adapter, wicks, gaskets, ceramic plungers, keyhole washers and barrier slingers for damage, wear, pitting, cracks and replace with new parts as needed.
   NOTE: Examine o-rings and backup-rings for cuts or wear and replace with a new seal kit as needed.

Reassembly of plungers

1. Install barrier slingers over plunger rod with dish side facing away from crankcase.
2. Install keyhole washers over plunger rod, the slot can be facing any direction.
3. Install copper gasket onto plunger retainer.
4. Install new o-ring and then backup-ring into groove of plunger retainer.
5. Lubricate both o-ring and backup-ring on each plunger retainer and insert into ceramic plunger.
   NOTE: Plunger retainer fits into the deeper end of the ceramic plunger.
6. Apply Loctite®242® to threads of plunger rod and then hand thread ceramic plunger assembly onto plunger rod.
7. Use a M14 hex tool and torque to 90 in/lbs., 7.5ft/lbs. or 10Nm.
8. Install new wick into seal retainer with long tail down.
9. Slide seal retainers with long tail wick down over plunger rods and ensure long tail is in oil pan.
10. Go back to **Reassembly of low-pressure seals and V-Packings.**

SERVICING THE CRANKCASE SECTION

1. While manifolds, plungers and seal retainers are removed examine crankcase oil seals for leaking and wear.
2. Check for signs of leaking at Bearing Covers, Rear Cover, Drain Plug, and Bubble Oil Gauge.
3. Check oil level and for evidence of water in oil. Change crankcase oil on a regular schedule. See Preventative Maintenance Check-List.
4. Rotate Crankshaft by hand to feel for smooth bearing movement.
5. Examine Crankshaft Oil Seals externally for drying, cracking or leaking.
6. Contact Cat Pumps or your local distributor if crankcase service is required. See Tech Bulletin 035.

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					1	
Valve Change						2
Accessories					x	

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

1. Every system operates under different conditions. Past performance and maintenance history are the best indicators of future performance. **If system performance degrades or changes, check seals and valves immediately. Service as required to restore system performance.** Depending upon operating conditions, maintenance intervals for seals kits range between 1,500 and 8,000 hours.

2. Pump valves typically require changing every other seal change. Depending upon operating conditions, maintenance intervals for valve kits range between 3,000 and 16,000 hours.

TORQUE CHART

Pump Item	Thread	Tool Size [Part Number]	Torque In Lbs	Torque Ft Lbs	Torque Nm
Plunger Retainer	M7	M14 Hex	90	7.5	0
Seal Manifold Screws	M14	M12 Allen [33048]	480	40.0	54
Inlet/Discharge Manifold Screws	M12	M10 Allen [33047]	355	30.0	40
Rear Cover	M8	M13 Hex [25324]	115	9.58	13
Bearing Cover Screws	M10	M17 Hex [25083]	220	180.0	24
Connecting Rod Screws	M10	M17 Hex [25083]	395	33.0	45
Bubble Oil Gauge	M28	Oil Gauge Tool [44050]	45	3.7	5
Direct Mount Screws	M14	M22 Hex	570	47.5	64

GENERAL SAFETY INFORMATION AND SYMBOLS

⚠ DANGER

A. FLAMMABLE OR EXPLOSIVE LIQUID HAZARD

Do not operate pump with flammable or explosive liquids unless extraordinary safety precautions are observed. Leaks of flammable or explosive liquids, if exposed to elevated temperatures, static electricity, sparks or other hazards, will result in flame or possible explosion, causing serious personal injury, death or property damage.

1. Before operating pump with flammable or explosive liquids, ensure proper maintenance has been performed.
2. Do not operate pump with flammable or explosive liquids if leaks are detected.
3. Only pump flammable or explosive liquids that are compatible with pump component materials.
4. Do not operate pump with flammable or explosive liquids without safeguards or safety systems to detect leaks, elevated temperatures, spark prevention or any other hazards defined by the NFPA systems.
5. Do not remove Flammable Liquids Product Suitability Hang Tag to assure proper safety.
6. Follow ATEX guidelines for potentially explosive atmospheres.

⚠ WARNING

A. ELECTRICAL SHOCK HAZARD

Do not service pump or electrical equipment while energized. Electricity can cause personal injury, death or property damage.

1. Adhere to "Lock Out" and "Tag Out" procedures for electrical equipment.
2. Before commencing pump service, turn power supply off.
3. Keep water away from electrical outlets and electrical devices.
4. Electrical components must be installed by a qualified electrician to avoid risk of electrocution.

B. ROTATING PARTS HAZARD

Do not service pump while energized. Moving, rotating or reciprocating parts can crush and cut, causing personal injury, death or property damage.

1. Adhere to "Lock Out" and "Tag Out" procedures for electrical equipment.
2. Before commencing pump service, turn power supply off, turn water supply off, squeeze trigger on gun to relieve system pressure.
3. For mobile equipment, be sure engines and hydraulics are turned off and secured to avoid accidental start.
4. Do not operate with safety guards removed.
5. Always use safety guards on all belt drives, couplings and shafts.

C. HOT SURFACE HAZARD

Do not touch pump, accessories or drive system while operating and until cool down is complete. Touching hot surface areas of the pump, accessories or drive system can cause severe burns or personal injury.

D. SKIN PUNCTURE HAZARD

Do not allow spray to contact any part of the body or animals. Pumped liquids under high pressure can pierce skin and underlying tissue or can deflect debris leading to serious personal injury or death.

1. Relieve all line pressure in the inlet line to the pump and discharge line from the pump before performing any maintenance on the pump.
2. When high pressure gun is not in use, set safety trigger lock (safety latch) to avoid accidental high pressure operation and personal injury or property damage.
3. Do not check for leaks with hand. Use a piece of cardboard to check for leaks.
4. Review cleaning procedures to minimize heavy back blasting.
5. Wear adequate safety equipment and clothing when operating high pressure sprayer.
   Never use high pressure spray with bare feet or exposed skin, and always wear safety glasses.

E. PUMPING LIQUIDS HAZARD

Do not operate pump with hot water, chemicals, or other hazardous liquids unless extraordinary safety precautions are observed. Pumping hot water, chemicals, or other hazardous liquids can expose personnel to serious injury.

1. Provide guards or shields around equipment to protect personnel.
2. Wear mask, goggles or eye protection while operating high pressure equipment.
3. Obtain a Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) and take appropriate safety measures for the liquid being handled.

F. OVER PRESSURIZATION HAZARD

Do not operate high pressure pumping system unless extraordinary safety precautions are observed. A high pressure pumping system can deadhead or over pressurize causing serious personal injury and property damage.

1. All high pressure systems require a primary pressure regulating device (i.e., regulator or unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve, rupture disc) to assure proper pressure setting and overpressure protection.
2. All high pressure systems require a pressure gauge to monitor pressure settings and avoid overpressure of equipment or personal harm.
3. Install primary pressure relief device on the discharge side of the pump.
4. Install secondary pressure relief device between the primary device and pump.
5. Install pressure gauge onto the discharge manifold or in the discharge line near the manifold.
6. Open all valves on discharge side of plumbing before operation.

G. OXYGEN HAZARD

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.

H. FALL HAZARD

Do not operate pressure washer while standing on slippery or unstable surface unless extraordinary safety precautions are observed. Pressure washing may create slippery surface on which a person may slip and fall causing personal injury or death.

1. Wear suitable footwear to maintain a good grip on wet surfaces.
2. Do not stand on ladders or scaffolding.
3. Do not over reach or stand on unstable supports.
4. Keep good footing and balance and hold gun with both hands to control kick back.

⚠ CAUTION

A. IMPROPER USE OF FITTINGS HAZARD

Do not operate the pump with improperly connected, sized, worn or loose fittings, pipes or hoses. Operating the pump under these conditions could result in personal injury and property damage.

1. Ensure all fittings, pipes and hoses are properly rated for the maximum pressure rating and flow of the pump.
2. Check all fittings and pipes for cracks or damaged threads.
3. Check all hoses for cuts, wear, leaks, kinks or collapse before each use.
4. Ensure all connections are tight and secure.
5. Use PTFE thread tape or pipe thread sealant (sparingly) to reconnect plumbing. Do not wrap tape beyond the last thread, this will prevent tape from becoming lodged in the pump or accessories.
6. Apply proper sealants to assure secure fit or easy disassembly when servicing.

B. FROZEN LIQUID HAZARD

Do not operate the pump with frozen liquid. Operating the pump under this condition could over pressurize and jettison the manifold from the crankcase causing personal injury and property damage.

1. Store pump or pumping system in an environmentally controlled room protected from freezing temperatures.
2. Follow procedures in TECH BULLETIN 083 to winterize pump.

C. CLEANING PUMP HAZARD

Do not use solvents that are flammable and toxic to clean or degrease equipment. Use of these solvents could result in personal injury and property damage.

1. Follow safety instructions as found in MSDS or SDS or on packaging of each liquid.
2. Clean equipment in a well ventilated area.
3. Disposal of solvents to be in accordance with local, state and federal regulations.

D. OPERATING BEYOND SPECIFICATIONS HAZARD

Do not operate the pump outside the specifications of individual pump data sheet or service manual. Operating the pump under these conditions could result in personal injury and property damage.

1. Do not operate the pump faster than the maximum recommended rpm.
2. Do not operate the pump at pressures higher than the maximum recommended pressure.
3. Do not operate the pump at temperatures higher than the maximum recommended temperatures.
4. Do not use accessories that are not compatible or rated for the pump.

E. LIFTING DEVICE HAZARD

Do not lift pump with unsuitable lifting devices. Use of unsuitable lifting devices may cause pump to fall resulting in personal injury, damage to pump and/or pump with drive/base plate.

1. Lifting eyes installed on the pump must be used only to lift the pump.
2. Special lifting eyes should be installed on the base for lifting the pumping system (i.e. base, drive and accessories)
3. If slings or chains are used for lifting, they must be safely and securely attached to properly balance the weight of the unit.
4. Inspect slings and chains prior to use and replace worn and damaged slings and chains.

NOTICE

A. OIL HAZARD

Use only genuine Cat Pumps custom-blend, premium grade, petroleum-based hydraulic oil. Use of other oil may not provide proper lubrication of drive-end components and may result in damage to the crankcase of the pump.

1. Cat Pumps custom-blend oil is available worldwide in 21 oz. bottles, cases, or 5 gallon twin packs. Use of other oils may void the warranty.
2. Fill pump crankcase to specific capacity indicated on data sheet or service manual prior to startup.

B. ROTATION OF PUMP HAZARD

Do not rotate pump crankshaft in reverse direction. Rotation of pump crankshaft in reverse direction may not provide proper lubrication and may result in damage to the drive-end components.

1. Forward rotation is the top of the crankshaft turning towards the manifold head of the pump.
2. Ensure oil is filled to the center red dot on sight gauge for forward rotation.
3. Ensure oil is filled to slightly above center red dot on sight gauge for reverse rotation.

C. BELT TENSION HAZARD

Do not operate pump with excessive belt tension. Excessive belt tension may damage the pumps bearings or reduce horsepower.

1. Rotate pump crankshaft before starting to ensure shaft and bearings are moving freely.
2. Ensure pulleys are properly sized.
3. Periodically replace belts to assure full horsepower transmission.
4. Ensure center distance dimensions between pulleys is correct.

D. BY-PASS OPERATION HAZARD

Do not operate the pump in by-pass for extended lengths of time. Operating the pump under this condition can quickly cause heat build-up resulting in damage to the pump.

1. Route by-pass line to supply reservoir to dissipate heated by-pass liquid into a large reservoir of cool water to reduce excessive temperature build-up.
2. Route by-pass line to inlet of pump using a thermo valve in the by-pass line or auto shut-off assembly that will sense temperature rise and either by-pass or shut down system before damage occurs.

E. DRY OPERATION HAZARD

Do not operate the pump without water or liquid. Operating pump under these conditions could result in damage to the pump.

1. Open all valves on inlet side of pump before starting operation to prevent starving the pump.
2. Do not exceed inlet suction pressure limit specified in pump data sheet.
3. Ensure inlet feed exceeds the maximum flow being delivered by the pump.
4. Ensure all fittings, pipes and hoses are properly sized for the pump to avoid restricted flow.
5. Review and implement all other recommendations appropriate for your system from the Inlet Condition Check-List.

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	• Worn nozzle.	• Replace with proper size nozzle.
	• Air leak in inlet plumbing.	• Tighten fittings and hoses. Use PTFE liquid or tape.
	• Pressure gauge inoperative or not registering accurately.	• Check with new gauge. Replace worn or damaged gauge.
	• Relief valve stuck, partially plugged or improperly adjusted.	• Clean/adjust relief valve. Replace worn seats/valves and o-rings.
	• Inlet suction strainer (filter) clogged or improperly sized.	• Clean filter. Use adequate size filter. Check more frequently.
	• Abrasives in pumped liquid.	• Install proper filter.
	• Leaky discharge hose.	• Replace discharge hose with proper rating for system.
	• Inadequate liquid supply.	• Pressurize inlet and install inlet stabilizer.
	• Severe cavitation.	• Check inlet conditions.
	• Worn seals.	• Install new seal kit. Increase frequency of service.
	• Worn or dirty inlet/discharge valves.	• Clean inlet/discharge valves or install new valve kit.
Pulsation	• Foreign material trapped in inlet/discharge valves.	• Clean inlet/discharge valves or install new valve kit.
Water leak		
• Under the manifold	• Worn High-Pressure or Lo-Pressure Seals.	• Install new seal kit. Increase frequency of service.
• Into the crankcase	• Humid air condensing into water inside the crankcase.	• Install new oil cap protector. Change oil every 3 months or 500 hours.
	• Excessive wear to High-Pressure and Lo-Pressure seals.	• Install new seal kit. Increase frequency of service.
Knocking noise		
• Inlet supply	• Inadequate inlet liquid supply.	• Check liquid supply. Increase line size, pressurize or install inlet stabilizer.
• Bearing	• Broken or worn bearing.	• Replace bearing.
Oil leak		
• Crankcase oil seal	• Worn crankcase oil seal.	• Replace crankcase oil seal.
• Crankshaft oil seal and o-ring	• Worn crankshaft oil seal or o-ring on bearing cover.	• Remove bearing cover and replace o-ring and/or oil seal.
• Drain plug	• Loose drain plug or worn drain plug o-ring.	• Tighten drain plug or replace o-ring.
• Bubble gauge	• Loose bubble gauge or worn bubble gauge gasket.	• Tighten bubble gauge or replace gasket.
• Bearing cover	• Loose bearing cover or worn bearing cover o-ring.	• Tighten bearing cover or replace o-ring.
• Filler cap	• Loose filler cap or excessive oil in crankcase.	• Tighten filler cap. Fill crankcase to specified capacity.
Pump runs extremely rough		
• Inlet conditions	• Restricted inlet or air entering the inlet plumbing	• Correct inlet size plumbing. Check for air tight seal.
• Pump valves	• Stuck inlet/discharge valves.	• Clean out foreign material or install new valve kit.
• Pump seals	• Leaking High-Pressure or Lo-Pressure seals.	• Install new seal kit. Increase frequency of service.
Premature seal failure	• Scored plunger.	• Replace plunger.
	• Over pressure to inlet manifold.	• Reduce inlet pressure per specifications.
	• Abrasive material in the liquid being pumped.	• Install proper filtration at pump inlet and clean regularly.
	• Excessive pressure and/or temperature of pumped liquid.	• Check pressure and inlet liquid temperature.
	• Running pump dry.	• DO NOT RUN PUMP WITHOUT LIQUID.
	• Starving pump of adequate liquid.	• Increase hose one size larger than inlet port size or pressurize.
	• Eroded manifold.	• Replace manifold. Check liquid compatibility.

The Pumps with Nine Lives

CAT PUMPS
1681 - 94TH LANE N.E. MINNEAPOLIS, MN 55449-4324
PHONE (763) 780-5440 — FAX (763) 780-2958
e-mail: techsupport@catpumps.com
www.catpumps.com

For International Inquiries go to www.catpumps.com and navigate to the "Contact Us" link.

PN 99MAN003 Rev A 19281 11/19