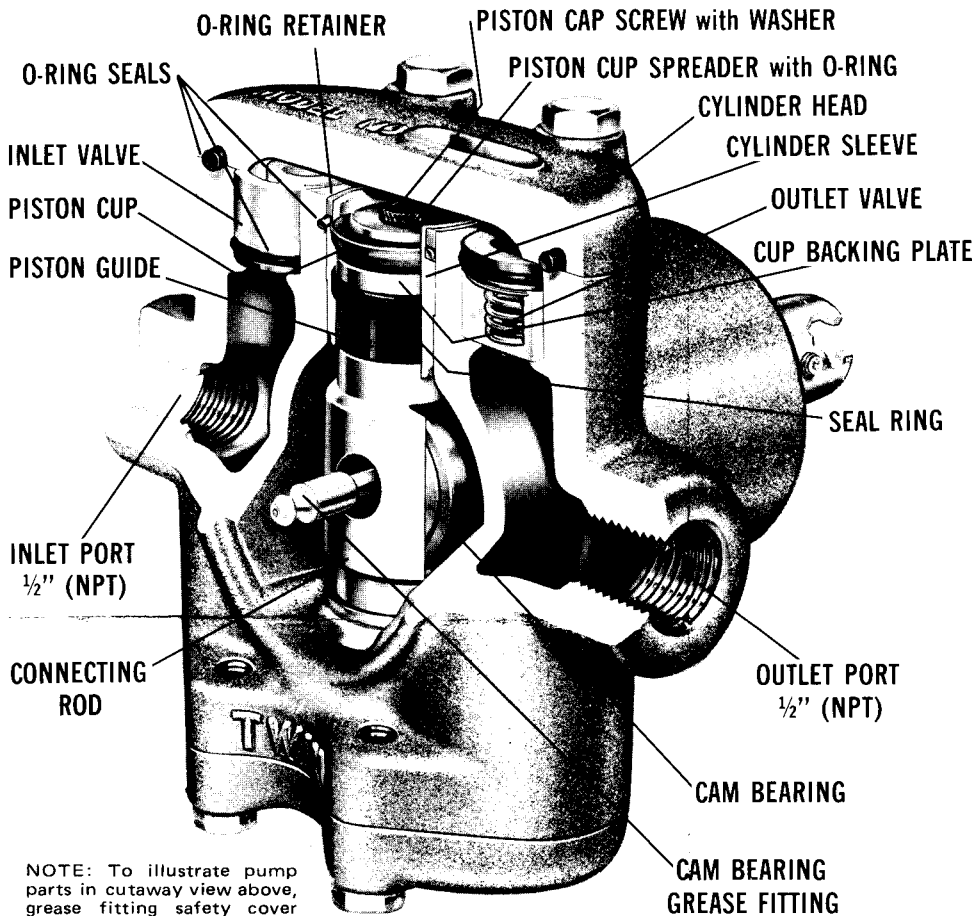


REPAIRING THE HYPRO SERIES 5300 SMALL TWIN™ PISTON PUMP

**SERIES 5300
PISTON PUMP**

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NOTE: To illustrate pump parts in cutaway view above, grease fitting safety cover has been removed. Be sure to install before operating pump.

Before disassembling the Series 5300 pump check it over carefully for external damage such as cracks in housing, especially around ports. If no noticeable damage, the performance should be checked in a test fixture for volume and pressure. Many times a pump is thought to be

defective when actually the trouble is elsewhere in the hook-up. Inspect Series 5300 pumps INTERNALLY for such causes as (1) sticking valves, (2) valves held open by solid objects, or (3) worn, or damaged parts.

A TROUBLE-SHOOTING THE SERIES 5300 PUMP

If the output or pressure of your Hypro Series 5300 Piston Pump falls below normal, the reason may be any of the following common installation causes. You may save a lot of time and work by checking these out before taking your pump apart for internal inspection.

- Air lock in pump.
- Clogged suction strainer.
- Air leaks in suction line.
- Suction hose collapsed, too small, or not in liquid.
- Unloader valve faulty, or set too low.
- Restriction in suction line (too many valves, elbows, etc.)

- Insufficient power of electric motor or gas engine. See horsepower requirements.
- Suction lift too high or too long.
- Pump not running at proper speed. Maximum speed for Series 5300 pump is 1800 rpm.
- Sticking or blocked valve. (See pump repair instructions on page 4.)
- Too much vacuum at suction port. Should not exceed 5 inches mercury.
- If pressure is down, first check the volume of pump through the tip. Nozzle orifice may be worn too large.

CRANKSHAFT DISASSEMBLY

1. Remove **GREASE FITTING** from **CAM BEARING**. Grease fitting is pressed in. Hold fitting with vise-grip pliers—put 12" screwdriver under pliers and pry fitting straight out. (Fig. 8)
2. Remove outer **RETAINER RING** at the drive end with tool (C).
3. Place pump in press—main bearing housing down—resting in a 3" x 5½" pipe. Place ½" x 3" pipe nipple on cam bearing, and press out entire bearing assembly. (Fig. 9)
4. Remove **PLASTIC SPACER** (Fig. 2—part 24) from bottom of the big main bore in pump body.
5. Check crankshaft assembly for general wear and rough or dry bearings. If the bearings show any indication of wear or damage, they should be replaced.

To disassemble crankshaft assembly, follow steps below:

6. Place two rods (tool F) between the two main bearings and press on shaft to remove **OUTER MAIN BEARING**. (Fig. 10)
7. Remove both **RETAINING RINGS** with a screwdriver. (Tool C in Fig. 3 used on old style retainer rings). If necessary, apply pressure to cam bearing (Fig. 10A) to loosen ring. Reverse assembly in press and force shaft out of bearing. Remove **PLASTIC BEARING SHIELD** (Ref. 23) from shaft.

TO REMOVE OLD CAM BEARING

1. Clamp shaft in vice and drive out **CAM RETAINER PEG** with 1/8" drift punch (Fig. 11).
2. Place solid metal rod or large dull chisel against exposed edge of cam bearing and drive out bearing with a 2-lb. hammer.
NOTE: On hollow shafts, metal rod (½" maximum diameter) can be inserted through shaft up against the cam bearing stud.
3. File burrs from shaft and carefully check for wear at key slots, bearing area and from shield turning on shaft. Check shaft for set screw nicks.

E WHILE PUMP IS APART

1. Sand both end surfaces on pump body.
2. With wire brush (Tool H) in electric drill, clean the valve and sleeve holes of the pump body. (Fig. 13)
3. If the cylinder heads have a rust deposit or burrs, sandpaper them off very lightly.
4. Check **BODY** for erosion at O-ring seals in sleeve and valve cavities. Check for wear resulting from main bearings turning in housing (Fig. 14). Sanding end surfaces (step 1 above) will usually show up any cracks or erosion.
5. Check for excessive wear in **CYLINDER HEADS** resulting from valve seat hammer.
6. Check **CRANKSHAFT ASSEMBLY** for wear under the front main bearing—near cam bearing (Fig. 15). Check inside diameter of hollow shafts for wear.
Look for signs of moisture in the **BEARINGS**. A leak here has a definite effect on life of pump. If water seeps into main bearings the grease will wash out and there is apt to be a "burn out". Keep area around your pump completely clean so if there is a pump leak it will be noticeable immediately. Neglected, the leak could become worse and the water might back up into the main bearings.
7. Check **CYLINDER SLEEVES**.

- (a) Install tool A (Fig. 3) on electric motor shaft (5/8" dia.).

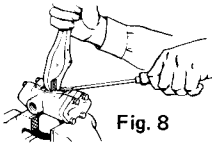


Fig. 8

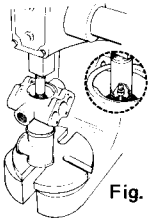


Fig. 9

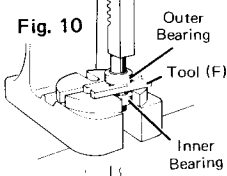


Fig. 10

Outer Bearing

Inner Bearing

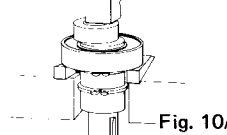


Fig. 10A

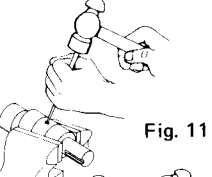


Fig. 11

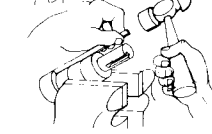


Fig. 12



Fig. 13

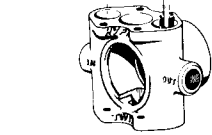


Fig. 14

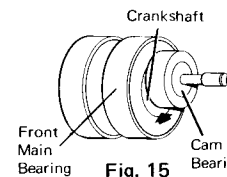
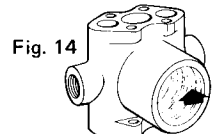


Fig. 15

- (b) Inspect cylinder sleeves for grooves and pitting. Insert cylinder sleeve into tool and polish (Fig. 16). Cylinder sleeve should be polished down not more than .005—using No. 120 grit emery cloth. Apply final finish using a fine No. 320 grit emery cloth. If pitting or scoring still shows, replace sleeve, as well as **CYLINDER SLEEVE O-RING**.

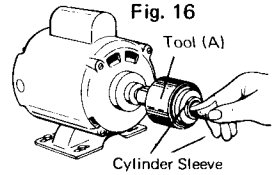


Fig. 16

Tool (A)

Cylinder Sleeve

8. Check for pitting and general wear in the **VALVES** (particularly where poppets seal against seat). Check for warped **POPPETS**.
9. Check **PISTON CAP SCREWS** for erosion at the sealing area (under the cap screw head). (Fig. 17)
10. Check **PISTON GUIDES** for chips, score marks or ridges. If possible, compare the used guide with a new one. If there is noticeable play in the old guide—make replacement.
11. Check **CONNECTING ROD** for wear. If there are visible signs of wear—or if you should find a depth more than .005" at points A and B in Figure 18, the rod should be replaced.

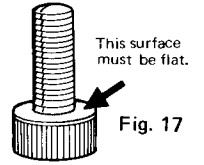


Fig. 17

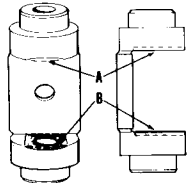


Fig. 18

INDICATIONS OF A WORN ROD: Low volume, low pressure, a hammering sound, or the pump running hot.

F TO REASSEMBLE PUMP

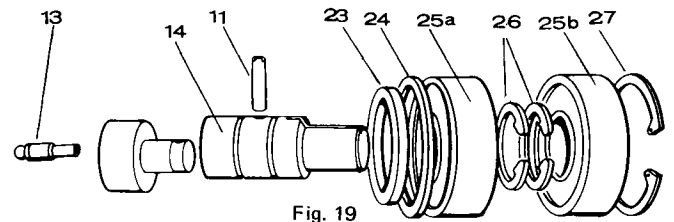


Fig. 19

MAIN BEARING AND SHAFT ASSEMBLY

1. Push **BEARING SHIELD** (Fig. 19/Ref. 23) on shaft.
2. Place **INNER MAIN BEARING** (Fig. 19/Ref. 25a) on shaft as far as it will go by hand.
3. Place bearing tool (D) on bed of press (with end marked "B" up). Place shaft in tool and press bearing onto shaft just past the inner retainer ring groove.
4. Install both **RETAINER RINGS** (Fig. 19/Ref. 26) on shaft, using tool (C).
5. Using two metal bars (Tool F) to support bearing in press, press **BEARING SHIELD** and **MAIN BEARING** back against first retainer ring (Fig. 20).
6. Apply light film of grease to inside of main bearing housing... insert nylon **SPACER** (Fig. 19/Ref. 24). Place pump body—face down—in press, position shaft with bearing assembly in pump body.
7. Place tool (D) with end marked "A" **DOWN** over shaft (resting on outer race of bearing). Press down on tool (D) until outer race presses against nylon spacer.
8. Place tool (D) on bed of press with end marked "B" up.
9. Place **SECOND MAIN BEARING** (Fig. 19/Ref. 25b) on shaft as far as it will go by hand. Then place pump on tool (D)—shaft down.
10. Place tool (E) on pump. Adjust set screw so it **JUST TOUCHES** the face of Cam Bearing (Fig. 21).
11. Bring arbor press bar down against set screw on tool (E) and press second main bearing into position against retainer ring.
12. Install **RETAINER RING** (Fig. 19/Ref. 27) with pliers (C).
13. Press **GREASE FITTING** into cam bearing.

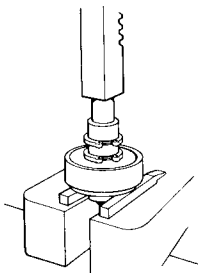


Fig. 20

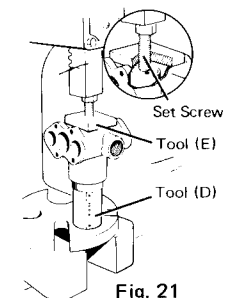
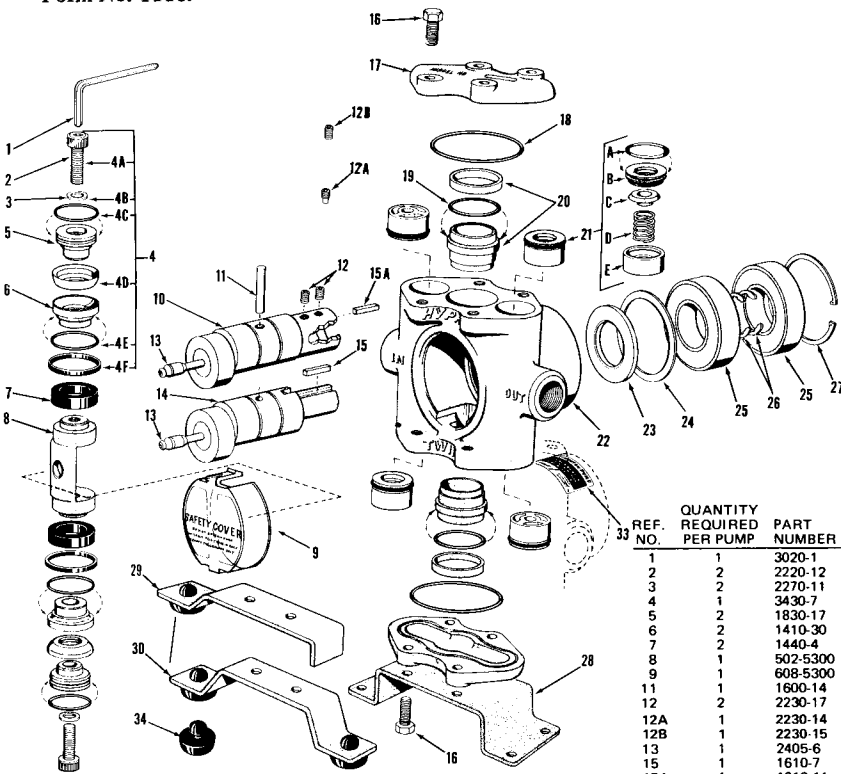


Fig. 21

B PARTS IDENTIFICATION

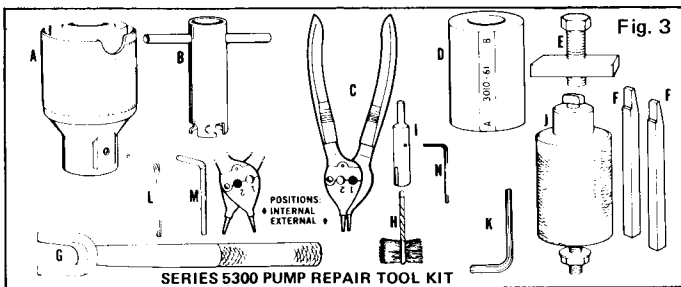
When repairing the 5300 pump you will find the exploded parts drawing and parts list below handy reference for identifying the parts and the order in which they are assembled. For a complete up-to-date list, request Form No. 1110.



REF. NO.	QUANTITY REQUIRED PER PUMP	PART NUMBER
1	1	3020-1
2	2	2220-12
3	2	2270-11
4	1	3430-7
5	2	1830-17
6	2	1410-30
7	2	1440-4
8	1	502-5300
9	1	608-5300
11	1	1600-14
12	2	2230-17
12A	1	2230-14
12B	1	2230-15
13	1	2405-6
15	1	1610-7
15A	1	1610-11
16	8	2210-6
17	2	200-C5300
18	2	1720-38
19	2	1720-79
20	2	3550-19
21	4	3400-49
22	1	100-C5300
23	1	2130-7
24	1	2130-8
25	2	2008-1
26	2	1810-13
27	1	1820-6
28	1	1510-22
29	1	2820-27
30	1	2820-28
33	1	6031-9
34	1	1450-3

C REPAIR TOOLS

Tools shown here were especially designed for repairing the 5300 piston pump. They are available, packed in a convenient tool box, under Hypro Part No. 3011-8. These tools are referred to throughout these instructions by the reference letters shown here. **Cam bearing aligning tools**, (Fig. 3A) are not included in the above kit - but are available under Hypro No. 3010-80. Their use is described on Page 4.



SERIES 5300 PUMP REPAIR TOOL KIT

In addition to the repair tools shown above, the following equipment is needed for a first-rate pump repair job:

1. Adequate arbor press, with press bar travel of 10".
2. A good bench vise - 4" or more.
3. 1/4" Electric Drill.
4. Ordinary bench tools - hammer, pliers, screwdrivers, wrenches, etc.
5. Penetrating Oil.
6. 3" x 5 1/2" Pipe Section.
7. 1/2" dia. x 3" Pipe Nipple.

CRANKPIN BEARING ALIGNING TOOLS

Hypro Tool Kit No. 3010-80 includes cam bearing aligner tool (Ref. O), and two crankshaft aligner tools (Ref. P). Shaft aligner tools are stamped to show use with 2 GPM or 3 GPM pumps.

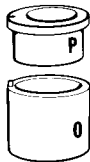


Fig. 3A

PISTON CUP REPAIR KITS

Rubber Cup Repair Kit 3430-9 consists of two each of following parts: No. 2220-12 Piston Cap Screw (Ref. No. 4A), No. 2270-11 Washer Gasket (Ref. No. 4B), No. 1720-29 Cup Spreader O-Ring (Ref. No. 4C), No. 2150-5 Rubber Cup (Ref. No. 4D), No. 1720-39 Backing Plate O-Ring (Ref. No. 4E), and No. 1440-8 Seal Ring (Ref. No. 4F).

Teflon Cup Repair Kit 3430-30: Same as above Kit 3430-9 except with 2 No. 2150-11 teflon cups.

Leather Cup Repair Kit 3430-7: Same as above Kits except with 2 No. 2150-2 leather cups.

PISTON CUP AND GUIDE REPAIR KITS

Rubber Cup and Piston Guide Kit 3430-10: consists of Rubber Cup Kit No. 3430-9 plus two No. 1440-4 Piston Guides (Ref. No. 7).

Teflon Cup and Piston Guide Kit 3430-46: consists of Teflon Cup Kit No. 3430-30 plus two No. 1440-4 Piston Guides.

Leather Cup and Piston Guide Kit 3430-8: consists of Leather Cup Kit No. 3430-7 plus two No. 1440-4 Piston Guides.

CRANKSHAFT ASSEMBLIES

Crankshaft Sub-Assembly PART NO.	Complete Assembly PART NO.	Pump Model No.
- with 5/8" (I.D.) Hollow Shaft (Ref. No. 10)		
560-5-5315	560-4-5315	5315H
560-5-5320	560-4-5320	5320H
560-5-5325	560-4-5325	5325H
560-5-5330	560-4-5330	5330H
- with 3/8" Solid Shaft (Ref. No. 14)		
510-3-5315	510-2-5315	5315
510-3-5320	510-2-5320	5320
510-3-5325	510-2-5325	5325
510-3-5330	510-2-5330	5330

SUB-ASSEMBLIES include shaft (Ref. No. 10 or 14) with crankpin bearing, grease fitting (Ref. 13), retainer peg (Ref. 11), spline key, and set screws (with hollow shaft).

COMPLETE ASSEMBLIES include the sub-assembly plus parts identified by Reference Numbers 23 thru 26.

REF. NO.	QUANTITY REQUIRED PER PUMP	PART NUMBER	PART DESCRIPTION
			WRENCH (FURNISHED EXTRA)
			PISTON CAP SCREW
			WASHER GASKET
			PISTON REPAIR KIT (Leather Cups) (3430-9) Rubber Cups (3430-30) Teflon Cups
			PISTON CUP SPREADER
			CUP BACKING PLATE
			PISTON GUIDE
			CONNECTING ROD (REPLACES 501-5300 CONNECTING ROD)
			GREASE FITTING SAFETY COVER
			CRANKPIN RETAINER PEG
			SET SCREW (FINE THREAD) FOR HOLLOW KEYED SHAFT: WITH 2 SET SCREW HOLES
			SET SCREW FOR HOLLOW SHAFT WITH NO KEYWAY
			SET SCREW FOR HOLLOW KEYED SHAFT WITH ONE SET SCREW HOLE
			GREASE FITTING ASSEMBLY
			SPLINE KEY
			SPLINE KEY FOR HOLLOW KEYED SHAFT
			HEADBOLT
			CYLINDER HEAD - CAST-IRON
			O-RING FOR CYLINDER HEAD
			O-RING FOR CYLINDER SLEEVE
			CYLINDER SLEEVE (NI-RESIST) ASSEMBLY
			UNITIZED VALVE (STAINLESS STEEL POPPET, SPRING & VALVE SEAT)
			BODY - CAST-IRON
			BEARING SHIELD
			MAIN BEARING SPACER
			MAIN BEARING (BALL BEARING)
			BEARING RETAINER RING (SHAFT)
			BEARING RETAINER RING (HOUSING)
			MOUNTING BASE
			TORQUE ARM - FOR ELECTRIC MOTOR MOUNTING
			TORQUE ARM - FOR GAS ENGINE MOUNTING
			INSTRUCTION LABEL
			BUMPER (1 REQUIRED FOR TORQUE ARM 2820-27 (REF. NO. 29) (2 REQUIRED FOR TORQUE ARM 2820-28 (REF. NO. 30))

D DISASSEMBLY OF PUMP

NOTE: Use Tool G if necessary to pry pump off motor/engine shaft.

VALVE/PISTON DISASSEMBLY

1. Remove grease fitting Safety Cover. Place pump in vise and remove both **CYLINDER HEADS**.
2. Remove both **PISTON CAP SCREWS** (Fig. 4).
3. With care tap out both **CYLINDER SLEEVES** (Fig. 5) including **PISTON ASSEMBLIES** (Fig. 24).
4. Remove **CONNECTING ROD**.
5. Remove all four **VALVE ASSEMBLIES** (Fig. 6-7) using tools B and J as shown.

To remove **VALVE CAGE** (Fig. 6) hook prongs of tool (B) under 3 webs of cage and pull up with a twisting motion. To remove **VALVE SEAT** (Fig. 7) hook tool (J) under seat and pull up.

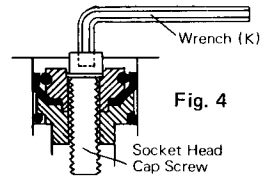


Fig. 4

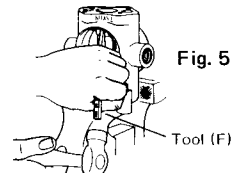


Fig. 5

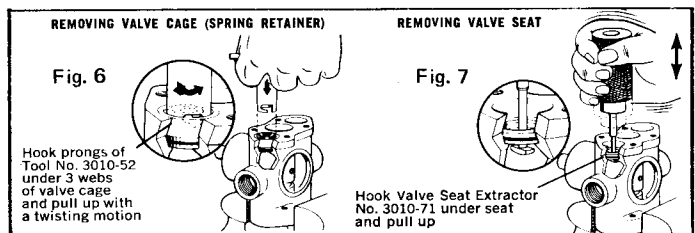


Fig. 6

Fig. 7

Hook prongs of Tool No. 3010-52 under 3 webs of valve cage and pull up with a twisting motion

Hook Valve Seat Extractor No. 3010-71 under seat and pull up

CRANKSHAFT DISASSEMBLY

1. Remove **GREASE FITTING** from **CAM BEARING**. Grease fitting is pressed in. Hold fitting with vise-grip pliers—put 12" screwdriver under pliers and pry fitting straight out. (Fig. 8)
2. Remove outer **RETAINER RING** at the drive end with tool (C).
3. Place pump in press—main bearing housing down—resting in a 3" x 5½" pipe. Place ½" x 3" pipe nipple on cam bearing, and press out entire bearing assembly. (Fig. 9)
4. Remove **PLASTIC SPACER** (Fig. 2—part 24) from bottom of the big main bore in pump body.
5. Check crankshaft assembly for general wear and rough or dry bearings. If the bearings show any indication of wear or damage, they should be replaced.

To disassemble crankshaft assembly, follow steps below:

6. Place two rods (tool F) between the two main bearings and press on shaft to remove **OUTER MAIN BEARING**. (Fig. 10)
7. Remove both **RETAINING RINGS** with a screwdriver. (Tool C in Fig. 3 used on old style retainers rings). If necessary, apply pressure to cam bearing (Fig. 10A) to loosen ring. Reverse assembly in press and force shaft out of bearing. Remove **PLASTIC BEARING SHIELD** (Ref. 23) from shaft.

TO REMOVE OLD CAM BEARING

1. Clamp shaft in vice and drive out **CAM RETAINER PEG** with 1/8" drift punch (Fig. 11).
 2. Place solid metal rod or large dull chisel against exposed edge of cam bearing and drive out bearing with a 2-lb. hammer.
- NOTE: On hollow shafts, metal rod (½" maximum diameter) can be inserted through shaft up against the cam bearing stud.
3. File burrs from shaft and carefully check for wear at key slots, bearing area and from shield turning on shaft. Check shaft for set screw nicks.

E WHILE PUMP IS APART

1. Sand both end surfaces on pump body.
2. With wire brush (Tool H) in electric drill, clean the valve and sleeve holes of the pump body. (Fig. 13)
3. If the cylinder heads have a rust deposit or burrs, sandpaper them off very lightly.
4. Check **BODY** for erosion at O-ring seals in sleeve and valve cavities. Check for wear resulting from main bearings turning in housing (Fig. 14). Sanding end surfaces (step 1 above) will usually show up any cracks or erosion.

5. Check for excessive wear in **CYLINDER HEADS** resulting from valve seat hammer.
6. Check **CRANKSHAFT ASSEMBLY** for wear under the front main bearing—near cam bearing (Fig. 15). Check inside diameter of hollow shafts for wear.

Look for signs of moisture in the **BEARINGS**. A leak here has a definite effect on life of pump. If water seeps into main bearings the grease will wash out and there is apt to be a "burn out". Keep area around your pump completely clean so if there is a pump leak it will be noticeable immediately. Neglected, the leak could become worse and the water might back up into the main bearings.

7. Check **CYLINDER SLEEVES**.

(a) Install tool A (Fig. 3) on electric motor shaft (5/8" dia.).

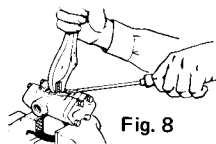


Fig. 8

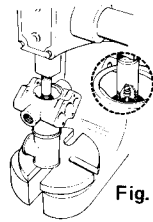


Fig. 9

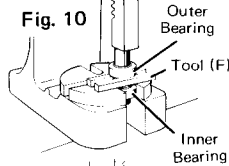


Fig. 10

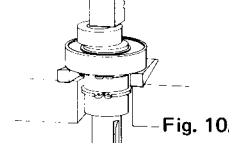


Fig. 10A

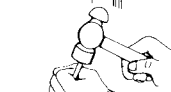


Fig. 11



Fig. 12



Fig. 13

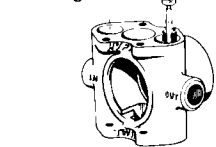


Fig. 14

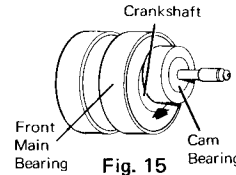
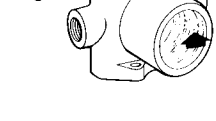


Fig. 15

- (b) Inspect cylinder sleeves for grooves and pitting. Insert cylinder sleeve into tool and polish (Fig. 16). Cylinder sleeve should be polished down not more than .005—using No. 120 grit emery cloth. Apply final finish using a fine No. 320 grit emery cloth. If pitting or scoring still shows, replace sleeve, as well as **CYLINDER SLEEVE O-RING**.

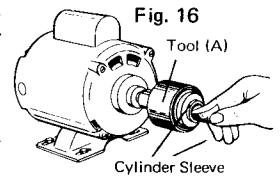
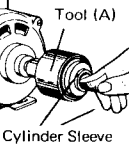


Fig. 16



8. Check for pitting and general wear in the **VALVES** (particularly where poppets seal against seat). Check for warped **POPPETS**.
9. Check **PISTON CAP SCREWS** for erosion at the sealing area (under the cap screw head). (Fig. 17)
10. Check **PISTON GUIDES** for chips, score marks or ridges. If possible, compare the used guide with a new one. If there is noticeable play in the old guide—make replacement.
11. Check **CONNECTING ROD** for wear. If there are visible signs of wear—or if you should find a depth more than .005" at points A and B in Figure 18, the rod should be replaced.

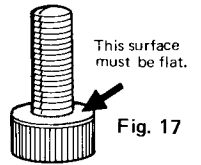


Fig. 17

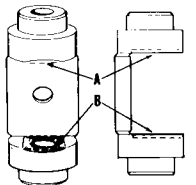


Fig. 18

INDICATIONS OF A WORN ROD: Low volume, low pressure, a hammering sound, or the pump running hot.

F TO REASSEMBLE PUMP

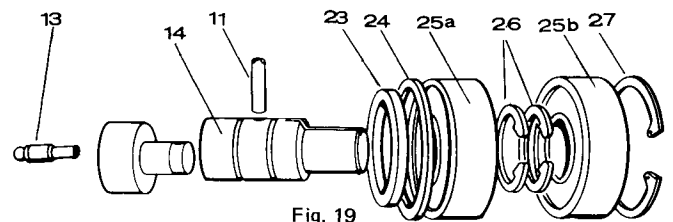


Fig. 19

MAIN BEARING AND SHAFT ASSEMBLY

1. Push **BEARING SHIELD** (Fig. 19/Ref. 23) on shaft.
2. Place **INNER MAIN BEARING** (Fig. 19/Ref. 25a) on shaft as far as it will go by hand.
3. Place bearing tool (D) on bed of press with end marked "B" up. Place shaft in tool and press bearing onto shaft just past the inner retainer ring groove.
4. Install both **RETAINER RINGS** (Fig. 19/Ref. 26) on shaft, using tool (C).
5. Using two metal bars (Tool F) to support bearing in press, press **BEARING SHIELD** and **MAIN BEARING** back against first retainer ring (Fig. 20).
6. Apply light film of grease to inside of main bearing housing... insert nylon **SPACER** (Fig. 19/Ref. 24). Place pump body—face down—in press, position shaft with bearing assembly in pump body.
7. Place tool (D) with end marked "A" **DOWN** over shaft (resting on outer race of bearing). Press down on tool (D) until outer race presses against nylon spacer.
8. Place tool (D) on bed of press with end marked "B" up.
9. Place **SECOND MAIN BEARING** (Fig. 19/Ref. 25b) on shaft as far as it will go by hand. Then place pump on tool (D)—shaft down.
10. Place tool (E) on pump. Adjust set screw so it **JUST TOUCHES** the face of Cam Bearing (Fig. 21).
11. Bring arbor press bar down against set screw on tool (E) and press second main bearing into position against retainer ring.
12. Install **RETAINER RING** (Fig. 19/Ref. 27) with pliers (C).
13. Press **GREASE FITTING** into cam bearing.

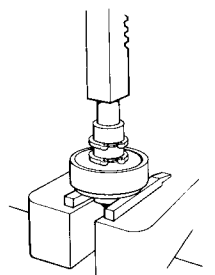


Fig. 20

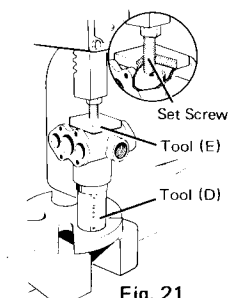


Fig. 21

VALVE/PISTON ASSEMBLY

- SEE FIGURE 22. Following parts should have light film of oil when assembling: **guide ring** (Ref. 7) **cylinder sleeve O-ring** (Ref. 19) **cylinder sleeve** - inside (Ref. 20) and **unitized valve** (Ref. 21). Also coat inside of cylinder sleeve and valve cavities in pump housing with a light film of oil.
- Place pump in vise. Then place **CONNECTING ROD** in position - over cam bearing.
- Place O-ring (Fig. 22/Ref. 19) on **CYLINDER SLEEVE**.
- Insert **CYLINDER SLEEVE** into pump housing and push into place . . . making sure top of sleeve is flush with casting.
- Place **O-RING RETAINER** (Fig. 22/Ref. 20) around cylinder sleeve, over O-Ring. Retainer will be pushed down flush with casting when cylinder head is tightened, compressing O-Ring. (Fig. 23).
- Place **PISTON GUIDE** (Fig. 22/Ref. 7) over connecting rod.
- Place **SEAL RING** (Fig. 22/Ref. 4F) inside of cylinder sleeve, pressing into position flat against piston guide, using a rubber roller (Hypro Roller Pump Part No. 1052-5) or a 1" diameter piece of plastic bar, as shown (Fig. 24). **REMOVE CUP BACKING PLATE**.
- Press **BACKING PLATE O-RING** in position on cup backing plate (Fig. 22/Ref. 4E) with finger . . . then place in cylinder sleeve on top of seal ring.
- Install O-Ring on **PISTON CUP SPREADER** (Fig. 22/Ref. 5) and with thumb, press assembly into position inside piston cup.
- Place a **new COPPER WASHER GASKET** (Fig. 22/Ref. 3) on **PISTON CAP SCREW**, and tighten entire piston assembly securely together with wrench (K).
- Oil outer surface of valve sets (*) and inner surface of valve ports. Insert valves into valve ports. (**IMPORTANT: In discharge port, install valve with spring retainer down. In the suction port, the valve should be in the reverse position, with retainer up. Be careful not to cut valve seat O-Rings.**)

PISTON ASSEMBLY

Fig. 22

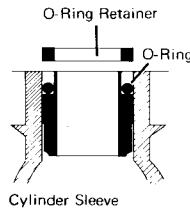
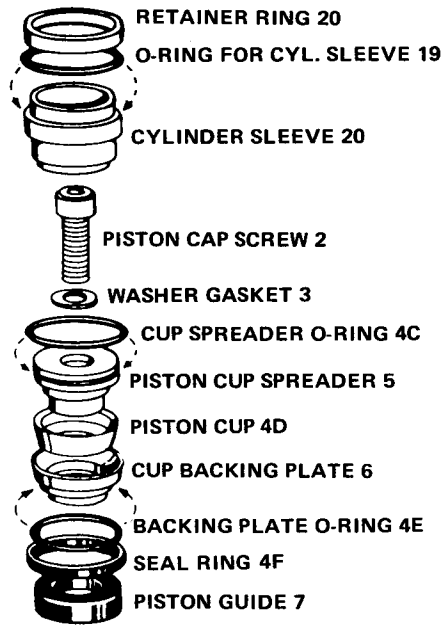
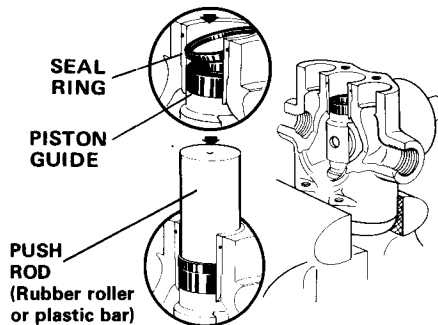


Fig. 23

INSTALLING SEAL RING

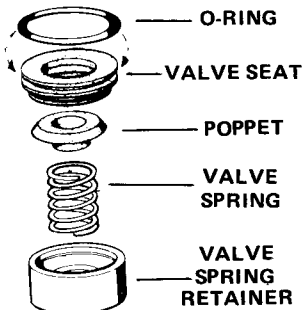
Fig. 24



- Replace **CYLINDER HEAD O-RING** (Fig. 2/Ref. 18). Replace cylinder head.
- Repeat procedure for opposite end of pump.
- Grease pump before testing. See Lubrication Instructions at right.
- Test pump—then follow procedure of **PUMP CARE AFTER EACH USE**, Form No. 1284.

* TO ASSEMBLE VALVE SETS:

Center the spring in guide of spring retainer. Place poppet on spring, raised center portion down, inside spring. Put seat over poppet - beveled side down to mate with bevel in poppet. Press seat down until it snaps into place in retainer. Replace O-Ring in valve seat groove.



REPLACING CAM BEARING

Fig. 25

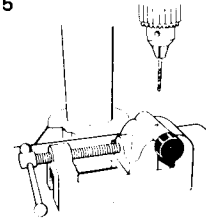
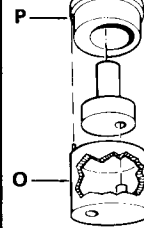


Fig. 26

TO REMOVE OLD CAM BEARING

1. Clamp shaft in vise and drive out **CAM RETAINER PEG** with 1/8" drift punch (Fig. 11).

2. Place solid metal rod or large dull chisel against exposed edge of cam bearing and drive out bearing with a 2-lb. hammer.

NOTE: On hollow shafts, metal rod (1/2" maximum diameter) can be inserted through shaft up against the cam bearing stud.

INSTALLING NEW CAM BEARING

Using Aligning Tools (O) and (P)

- Insert new cam bearing in aligner tool (O). Rotate bearing until grease fitting hole drops into position over peg in bottom of tool (O).
- Install and rotate shaft aligner tool (P) so that hole in rim goes over pin on rim of tool (O). See Fig. 25.
- Be sure pump shaft (Fig. 19/Ref. 14) is free of burrs and is completely smooth. Insert into tool (P) over cam bearing stud, and rotate until it drops into position over stud. Push down on shaft.
- Press shaft down over cam bearing in arbor press. Be careful not to disturb position of parts when transferring to press.
- Clamp assembly in drill press vise (Fig. 26) and drill through shaft guide hole with 1/8" drill. Insert cam retainer peg.

LUBRICATION

Lubricate cam bearing with lithium base grease No. 2 (auto chassis grease) every 100 hours of operation or monthly. **EXCEPTION:** In applications where FDA approval is required, use one of these greases: Chevron FM#2, Mobil FM2 or Keystone (Pennwalt Corp.) Nevastane SP Medium, and lubricate every 50 hours or monthly.

Use a push-type, hand-operated grease gun as shown below. Do not use air-powered or lever-operated hand grease guns; they develop too much pressure and will blow out bearing grease seals.



IMPORTANT: With a screwdriver or flat instrument apply a generous dab of grease to outer diameter surface of cam bearing at top and opposite bottom side—where the bearing contacts the connecting rod. Wipe out excess dirty grease from pump cavity. (Do not wash out).

Main bearings are factory-lubricated and do not require further greasing.

Hypro



A DIVISION OF LEAR SIEGLER, INC.

375 Fifth Avenue N. W., New Brighton
SAINT PAUL, MINNESOTA 55112

PRINTED IN U.S.A. (CP)

INSTALLING and OPERATING

Hypro® Piston Pumps

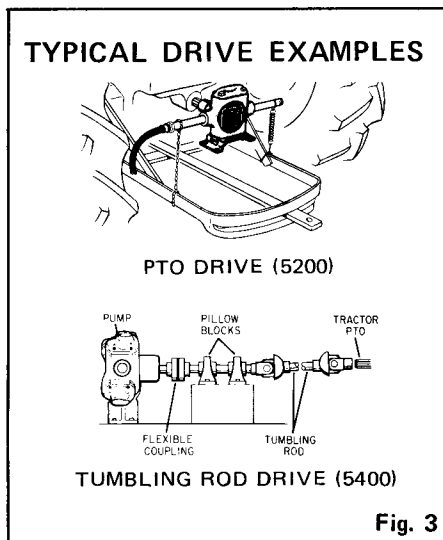
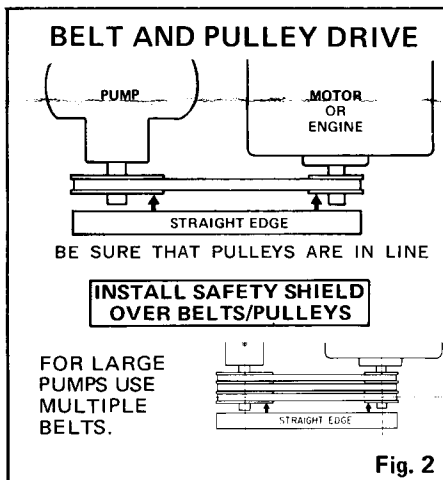
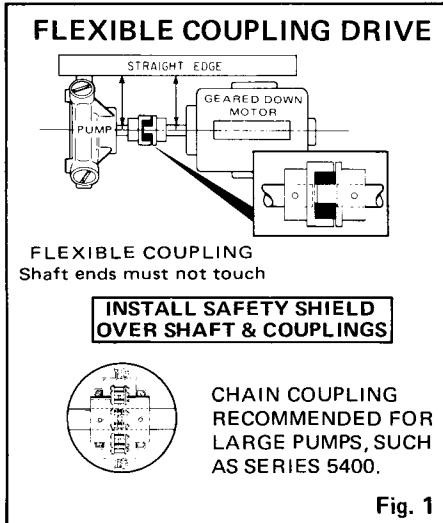
Maximum Operating Temperature = 140° Fahrenheit

Except Series 5000 (Model 5041AC) — 180°F

SERIES — 5000, 5200, 5300,
5400 and 5500.

INSTALLATION

SEE PUMP MOUNTING DIMENSIONS INSIDE



FLEXIBLE COUPLING DRIVE

First—slide coupling ends onto motor/engine and pump shafts as far as possible. (Fig. 1) Mount motor/engine and pump onto base—shimming pump or power unit so that shafts are aligned. Leave enough space between ends of shafts to allow coupling disc to be inserted. When alignment is made, slide coupling ends over coupling disc. Leave clearance between coupling ends and center disc. Tighten screws in both coupling ends. For electric motor drive, use couplings rated at least twice the horsepower required to operate pump. For gas engine drive, select couplings rated at three times the required pump horsepower. NOTE: Chain coupling recommended for Series 5400 pumps. (Fig. 1) CAUTION: For safety, install a shield over rotating shafts and couplings.

BELT AND PULLEY DRIVE

Use when reduction of speed is desired (as in the case of pumping liquids heavier than water). Do not belt drive hollow shaft models — use solid shaft models designed for belt and pulley or flexible coupling drive. Mount pulleys as close to pump and motor engine shaft bearings as possible. Make sure that belt has proper tension (belt

too tight will cause bearing wear, belt too loose will cause slippage). Multiple V-belt drive is recommended for large pumps such as the Series 5400. Check with belt and pulley supply sources for specific recommendations.

To figure proper diameter of pump pulley: Multiply motor/engine RPM by diameter of the motor/engine pulley and divide that figure by desired pump speed.

DIRECT DRIVE

Hollow shaft models mount directly on power shaft — motor or engine shaft, truck or tractor PTO shaft. (Fig. 3) Adapters are available to convert some solid shaft models for direct shaft mounting. After mounting pump, always turn it by hand to make sure pump is operating freely. Do not apply power to pump that appears to be stuck.

IMPORTANT: Use a torque arm to keep pump from rotating with the shaft. If necessary, secure torque arm with a chain or flexible fastener tied to frame or base directly below or in line with torque arm. Pump must be allowed to "float" on the shaft. See figure 3 for examples.

NOTE: Series 5400 pump not recommended for direct PTO shaft mounting. Use "tumbling rod" connection as shown in figure 3.

DO NOT PUMP chlorine, acids or abrasive solutions such as copper salts, soluble copper sulphate, chlorides of mercury or liquids containing sand or other sharp grit suspensions. Harsh abrasives will cause rapid wear of pistons and/or piston cups. For viscous liquids or special chemicals, consult factory. See chart on page four for recommendations on liquids that can be pumped with different piston (cup type) pumps (Series 5200, 5300, 5400 and 5900). For plunger pumps (Series 5000 and 5500) consider equivalent to rubber piston cup type. In most instances, the above liquids can be handled satisfactorily downstream of the pump. Consult factory for such system information.

HOSE

Selection of the right size and type of hose is vital to good performance. Be sure to hook up to proper ports on pump (note markings "IN" and "OUT" on pump castings).

larger size hose. Keep suction hose as short as possible and restrictions such as elbows, check valves, etc. at a minimum.

SUCTION HOSE

Always use genuine suction hose of at least the same inside diameter as pump ports. For example, use 3/4" (ID) hose for a Series 5200 pump or 1 1/2" (ID) hose for a Series 5400 pump. If suction hose is over 4 feet long on Series 5200, 5300, or over 10 feet long on Series 5400 and 5500, use next

DISCHARGE HOSE

High pressure pumps require the use of special high pressure discharge hose (2 rayon braid or equivalent). Use a hose rated at least 50% greater than the highest operating pressure required of pump. Example: If required pump pressure is 200 psi, use discharge hose rated at minimum of 300 psi working pressure.

OPERATING INSTRUCTIONS

PRIMING

If liquid is below level of pump, some means should be provided in installation to prime pump — such as a **Riser Pipe**. If there is a suction lift use a **Foot Valve** or **Check Valve** to hold prime. In general, keep suction lift to minimum and avoid unnecessary bends in suction line. Before starting pump, make sure air bleeder valve or spray gun is open — or unloader valve is adjusted to its lowest pressure. After starting pump, open and close gun several times if necessary to aid priming the pump. If pump does not prime within a few seconds, stop motor and inspect installation for suction line leaks or obstructions. Make sure that strainer is not clogged. Be sure that suction line is not obstructed, kinked or blocked (Fig. 6).

To further aid priming of the pump, install a **bleeder valve** (Hypro Part No. 3340-4) near pump discharge to bleed off air (Fig. 7). Valve is built into top of Series 5500 pump. Open bleeder valve by turning clockwise. When liquid flows from bleeder valve, pump is primed. Close bleeder valve. After pump is running adjust unloader valve to desired pressure.

If pump is to operate several hours at a time, check frequently for (1) **adequate liquid supply**. (Pump must not run dry for more than 30 seconds). (2) **Temperature rise**. Over heating is harmful to bearings and piston cups.

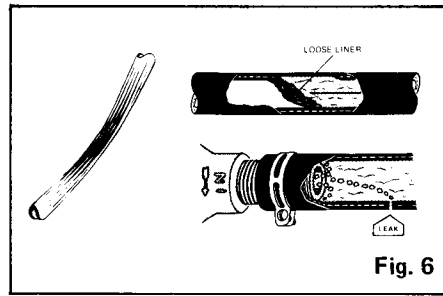


Fig. 6

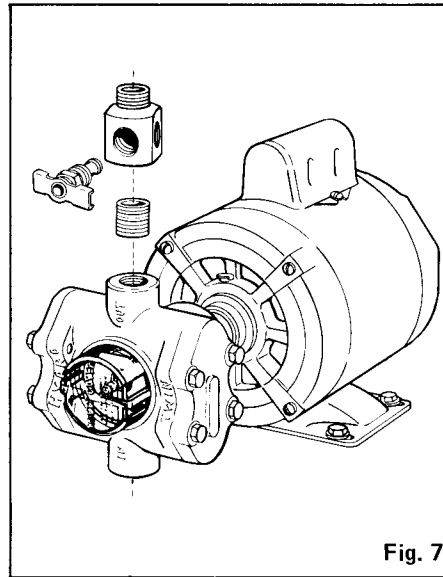


Fig. 7

CARE OF PUMP

Your pump will last longer and give best performance when properly taken care of. Proper pump care depends a lot on the liquid being pumped and when pump will be used again. In the normal car wash or detergent cleaning installation (where each application is followed by a clear water rinse) the pump will be kept clean.

Generally, after each use, flush pump with a neutralizing solution for the liquid just pumped. Follow with a clear water rinse. This is especially important for corrosive chemicals. Then flush out pump with a 50% solution of automotive radiator anti-freeze (ethylene glycol type such as Prestone, Zerex, etc.) containing a rust inhibitor . . . or use a commercial rust-inhibitor such as **FLUID FILM**.

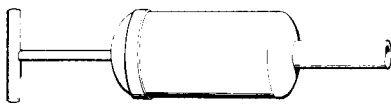
While this flushing is not absolutely necessary for short periods of idleness (as over night) it is good practice to clean the pump **after each use** to prevent deposits from forming and damaging the pump. The anti-freeze not only coats the interior of the pump with an inhibitor, but acts as a lubricant as well, keeping valves from sticking — and protecting against any remaining moisture freezing in cold weather.

For infrequent use and before long periods of storage, drain pump thoroughly. Open any drain plugs, remove suction hose from liquid and run pump "dry" from 20 to 30 seconds (not longer). Then, plug both ports to keep out air until pump is used again.

LUBRICATION SCHEDULE

Use a small, low-cost push type gun such as illustrated in figure 10 to grease Hypro Series 5200, 5300, 5400 and 5500 Piston Pumps. (Trimline-Series 5000 is crankcase lubrication.) **DO NOT USE AIR-POWERED OR HAND LEVER OPERATED GREASE GUNS** as they develop too much pressure.

Location of greasing points and lubrication schedules vary. Refer to the table below for information concerning your pump.



SERIES 5000 (TRIMLINE) LUBRICATION

Fill crankcase with 12 fluid ounces of good grade automatic transmission oil. Pour oil into hole provided for oil level gauge (dipstick). Check regularly and add oil as necessary to keep level between the two marks (steps) on the gauge. Change oil every 500 hours of operation or six months, whichever comes first.

CAUTION: Check for excessive leakage from weep holes in side of pump. Excessive leakage can cause contamination of the crankcase. Weep holes must be kept open. If they should become clogged or plugged, water can work its way into the crankcase.

If water trickles from the weep holes more often than every 15 seconds, excessive leakage is indicated and piston seals should be replaced.

The automatic transmission fluid in the crankcase should always appear clear and pink on the dipstick. If the lubricant appears cloudy or milky with a pink color, the crankcase is contaminated with water. This indicates piston seal leakage and seals should be replaced as well as the lubricant.

LUBRICATION CHART — SERIES 5200, 5300, 5400, 5500

Pump Series	Grease Points	Where Located	How Often	Type of Grease *	Other Information
5200	1	Grease fitting on cam bearing.	Every 100 hours* of use or monthly — whichever comes first.	Moly-Lithium No. 2 wheel bearing grease.	With a screwdriver or flat tool apply a generous dab of grease to outer diameter surface of cam bearing at top and bottom — where bearing contacts connecting rod. Do not grease excessively. Check periodically and scrape out (do not WASH out) any excess grease from pump cavity.
5300	1	Grease fitting on cam bearing.	Every 100 hours* of use or monthly — whichever comes first.	Moly-Lithium No. 2 wheel bearing grease.	
5400	2	(1) Grease fitting on cam bearing.	Daily	Moly-Lithium No. 2 wheel bearing grease.	
		(2) Grease fitting on main bearing housing.	Weekly	Moly-Lithium No. 2 wheel bearing grease.	
5500	1	Grease fitting on cam bearing.	Daily	Moly-Lithium No. 2 wheel bearing grease.	

*EXCEPTION: In applications where FDA approval is required, use one of these greases: Chevron FM#2, Mobile FM#2, Keystone (Penwalt Corp.) Nevastane SP Medium. Lubricate every 50 hours or monthly.

PISTON PUMP INSTALLATION

Accessories should be installed with **solid piping** and be mounted as close to the pump as possible. Hose must be used right after accessories. **NOTE:** If remaining installation is solid piping, a two to four foot length of hose must be installed between accessories and solid piping.

UNLOADER VALVE

The unloader has a very important safety function in your piston pump hook-up. The unloader valve protects the pump by unloading pressure when gun is shut off or discharge is otherwise blocked. This saves pump and power because the liquid is by-passed at a very low pressure.

STRAINERS

Use a suction line strainer with at least 3 to 5 times the suction port area. For example — an area of approximately 2-1/3 to 4 square inches for a 1" suction port. Be sure the screen is suitable for the liquid being pumped. **Keep filter clean . . .** a clogged strainer will cause cavitation, which usually leads to poor performance and wear of pump parts.

VACUUM GAUGE (Optional)

Pump should not be subjected to high suction line vacuums. To check on this, install a vacuum gauge at pump inlet. Generally, it should not read over 5 inches of mercury. High vacuum readings can indicate the following problems:

- 1) *Strainer is clogged.*
- 2) *Screen is too fine for liquid being pumped.*
- 3) *Suction line is restricted.*
- 4) *Suction line has collapsed, or inside diameter is too small.*
- 5) *Suction line is too long.*
- 6) *Pump is being operated too fast for the viscosity of liquid being pumped.*
- 7) *Pump is too high above liquid source.*

SUCTION LINE SHUT-OFF

As shown in the top hook-up diagram at right, this suction line accessory is generally used where there is pressure feed. Be sure valve is open before starting pump.

PULSATION DAMPER

This device absorbs the shock and smooths out the pump discharge pulsations, providing smoother operation. Install immediately after the unloader valve in discharge line.

PRESSURE REGULATOR

For best operation, limit incoming pressure to 20 psi. Use a Pressure Regulator if necessary. This 20 psi limit is especially important for consistent operation when a liquid injector is used. Volume, pressure and horsepower figures in pump performance tables do not apply when incoming pressure exceeds 40 psi.

PRESSURE GAUGE/DAMPER

Use gauge capable of reading double the pump working pressure. Use a gauge damper. It protects the gauge needle against pressure surges and provides easier reading.

RECOMMENDED INSTALLATION FOR HYPRO LOW CAPACITY PISTON PUMPS TO 4 GPM . . .

HYPRO SERIES 5500 (to 4 GPM) IS SHOWN. BASIC INSTALLATION ALSO APPLIES TO SERIES 5000 AND 5300.

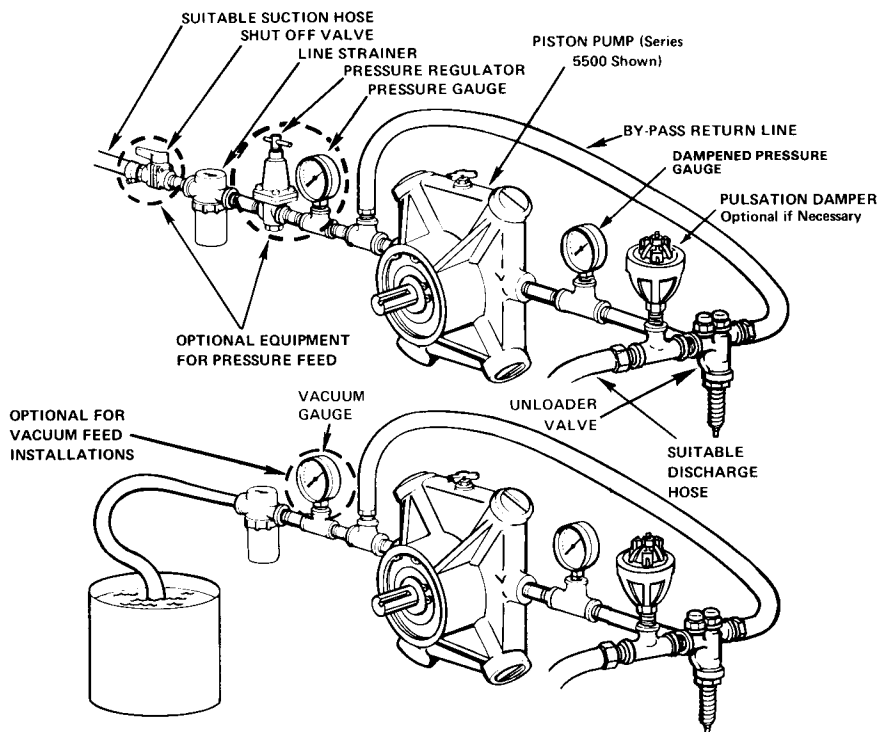


Fig. 4

RECOMMENDED INSTALLATION FOR HYPRO HIGH VOLUME PISTON PUMPS TO 25 GPM . . .

HYPRO SERIES 5400 (to 25 GPM) IS SHOWN. BASIC INSTALLATION ALSO APPLIES TO SERIES 5200 PISTON PUMP (10 GPM)

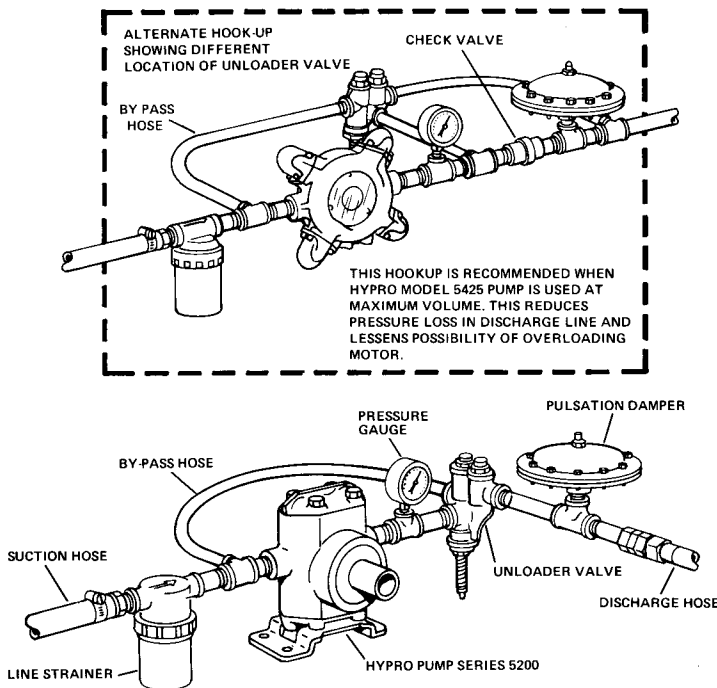


Fig. 5

Performance — piston pumps

DIMENSIONS (In Inches)

Series	Model	RPM	100 PSI		200		400		500		600		800		1000		1200		Length	Width	Height	Shaft Height	Shaft Diameter	Port. Size NPT*	
			GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP	GPM	HP							
5000	B5041	1825	4.18	.23	4.15	.57	4.09	1.05	4.06	1.28	4.04	1.52	4.0	2.0	3.97	2.48			8 ⁵ / ₁₆	6	9 ⁵ / ₃₂	2 ⁷ / ₁₆	1	½ NPT	
5200	5206	600	5.84	.60	5.83	.90	5.80	1.78										5 ¹¹ / ₁₆	6 ³ / ₈	7 ¹¹ / ₁₆	4 ¹ / ₁₆	1	¾ NPT		
	5210	600	10.55	1.19	10.41	1.59	10.18	2.83										6 ⁵ / ₁₆	6 ³ / ₈	7 ¹¹ / ₁₆	4 ¹ / ₁₆	PTO	¾ NPT		
5300	5315	1800	1.61	.23	1.60	.34	1.55	.57	1.51	.67															
	5320	1800	2.26	.32	2.25	.44	2.21	.66	2.20	.79															
	5321	1750	2.23	.33	2.22	.49	2.22	.77	2.22	.88	2.20	1.04	2.20	1.32	2.15	1.53									
	5325	1800	2.62	.35	2.60	.46	2.56	.67	2.55	.79															
	5330	1800	3.26	.46	3.22	.63	3.12	.94	3.10	1.10															
5400	D5412R	600	11.0	1.32	11.0	1.80	11.0	3.17	11.0	3.94	11.0	4.71	11.0	6.30	11.0	7.71	11.0	8.95	11 ¹ / ₁₆	11	13 ³ / ₂	8	1 ¹ / ₄	1 ¹ / ₄ NPT	
	5425	600	26.3	3.2	26.3	4.8	26.3	8	26.3	9.6	26.3	11.1							11 ¹ / ₁₆	11 ¹ / ₄	13 ³ / ₈	8	1 ¹ / ₄	1 ¹ / ₄ NPT	
5500	5540	900	2.1	.28	2.1	.42	2	.68	2	.82	2	.95	2	1.2											
		1200	2.8	.41	2.8	.56	2.8	.90	2.8	1.1	2.8	1.2	2.8	1.6											
		1450	3.4	.50	3.4	.67	3.3	1.1	3.3	1.3	3.3	1.5	3.3	2.0											
		1800	4.1	.68	4.1	.85	4.1	1.4	4.0	1.6	4.0	1.8	4.0	2.3											
5900	5920	600	20.0	1.95	19.5	3.30	18.5	5.70	18.5	6.75								7 ¹³ / ₁₆	9 ³ / ₈	11	5 ¹¹ / ₁₆	1 ¹ / ₄	1 ¹ / ₄ NPT		

PISTON CUPS TO USE WHEN PUMPING THESE LIQUIDS:

Liquid	Rubber Piston Cup	Leather Piston Cup
Insecticides		X
Herbicides		X
Fungicides		X
Aromatic Solvents		X
Water	X	
Soaps	X	
Detergent Solutions	X	

For special applications, consult factory.

TABLE FOR DETERMINING SYSTEM PRESSURE LOSS								
Flow Rate (Pump output)	2 gal./min. pump				3 gal./min. pump			
Nominal Size of Pipe or Hose	½"	¾"	1"	1½"	½"	¾"	1"	1½"
(a) Multiply number of elbows by	26	6.4	1.4	.4	57	14	3	.9
(b) Multiply number of feet of pipe by	1.3	.32	.07	.02	2.8	.69	.15	.045
(c) Multiply number of feet of hose by	—	1.8	.24	.06	—	3.8	.5	.12
<p>Find values of (a), (b) and (c) for your installation and add them together. This will give you the total pressure drop through the system when it is discharging the full output of the pump (two or three gallons per minute).</p> <p>For example: (Pump with two gallons per minute flow) Pressure drop in six ¼" elbows = 6 x 6.4 = 38.4 lbs./sq. in. Pressure drop in 40 ft. ¼" pipe = 40 x .32 = 12.8 lbs./sq. in. Pressure drop in 20 ft. ¼" hose = 20 x 1.8 = 36.0 lbs./sq. in. Total pressure drop in system = 87.2 lbs./sq. in. (between pump and nozzle)</p> <p>Notice that number of pipe elbows and length and size of the hose are often more important than the pipe length in determining the overall pressure drop.</p>								

