Instructions – Parts List

Parts

Dyna–Star ™

308390 Rev.H

FOR LUBRICATING FLUIDS ONLY

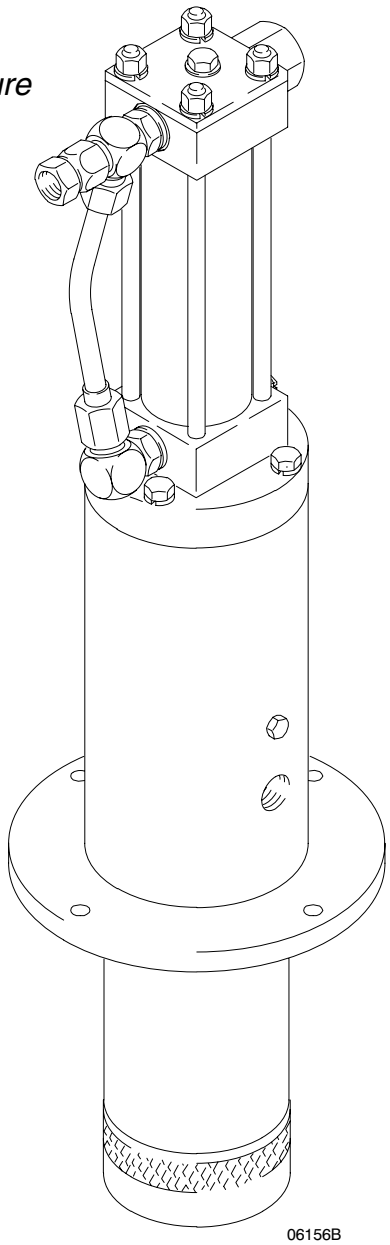
1500 psi (10 MPa, 102 bar) Maximum Hydraulic Input Pressure
375 psi (2.6 MPa, 26 bar) Maximum Fluid Outlet Pressure

1/4:1 Ratio Universal Pump and Reciprocator
Model 236753, Series C, stubby length

Reciprocator Only
Model 239884, Series A

Important Safety Instructions
Read all warnings and instructions in this manual.
Save these instructions.

See page 23 for maximum working pressures.



Model 236753 shown

⚠ WARNING

The pump is designed to dispense lube products only. Any other fluids can cause unsafe operating conditions and result in component rupture, fire or explosion which could cause serious injury, including fluid injection.

Patent No. 4,383,475
Foreign Patents Pending
Patent 1984 Canada
Brevete 1984

PROVEN QUALITY. LEADING TECHNOLOGY.

CE

GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440–1441

Table of Contents

Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the corresponding instructions.

Caution Symbol

⚠ CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the corresponding instructions.

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before you operate the equipment.
- Use the equipment only for its intended purpose. If you are not sure, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated component in your system. This equipment has a **1500 psi (10 MPa, 102 bar) maximum hydraulic input pressure and 375 psi (2.6 MPa, 26 bar) maximum fluid outlet pressure.**
- Use fluids and solvents that are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not kink or overbend hoses or use hoses to pull equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 82° C (180° F) or below –40° C (–40° F).
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

⚠ WARNING

FLUID INJECTION HAZARD

Fluid from the dispensing valve, leaks or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate surgical treatment.**
- Do not point the dispensing valve at anyone or at any part of the body.
- Do not put your hand or fingers over the end of the dispensing valve.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Use only extensions and couplers that are designed for use with your dispensing valve.
- Do not use a low pressure flexible nozzle with this equipment.
- Follow the **Pressure Relief Procedure** on page 8 if the grease fitting coupler clogs and before cleaning, checking or servicing the equipment.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn or damaged parts immediately. Do not repair high pressure couplings; you must replace the entire hose.
- Fluid hoses must have spring guards on both ends, to help protect them from rupture caused by kinks or bends near the couplings.

TOXIC FLUID HAZARD

Hazardous fluids or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state, and national guidelines.
- Always wear protective eyewear, gloves, clothing, and respirator as recommended by the fluid and solvent manufacturer.

HALOGENATED HYDROCARBON HAZARD

Never use 1,1,1–trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in aluminum pumps. Such use could result in a serious chemical reaction, with the possibility of explosion, which could cause death, serious injury, and/or substantial property damage.

Consult your fluid suppliers to ensure that the fluids used are compatible with aluminum parts.

⚠ WARNING

FIRE AND EXPLOSION HAZARD

Improper grounding, poor ventilation, open flames, or sparks can cause a hazardous condition and result in a fire or explosion and serious injury.

- Ground the equipment and the object being sprayed. Refer to **Grounding** on page 7.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop spraying immediately.** Do not use the equipment until you identify and correct the problem.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Before operating this equipment, electrically disconnect all equipment in the spray area.
- Before operating this equipment, extinguish all open flames or pilot lights in the spray area.
- Do not smoke in the spray area.
- Do not turn on or off any light switch in the spray area while spraying or while there are any fumes in the air.
- Do not operate a gasoline engine in the spray area.
- Keep a fire extinguisher in the work area.

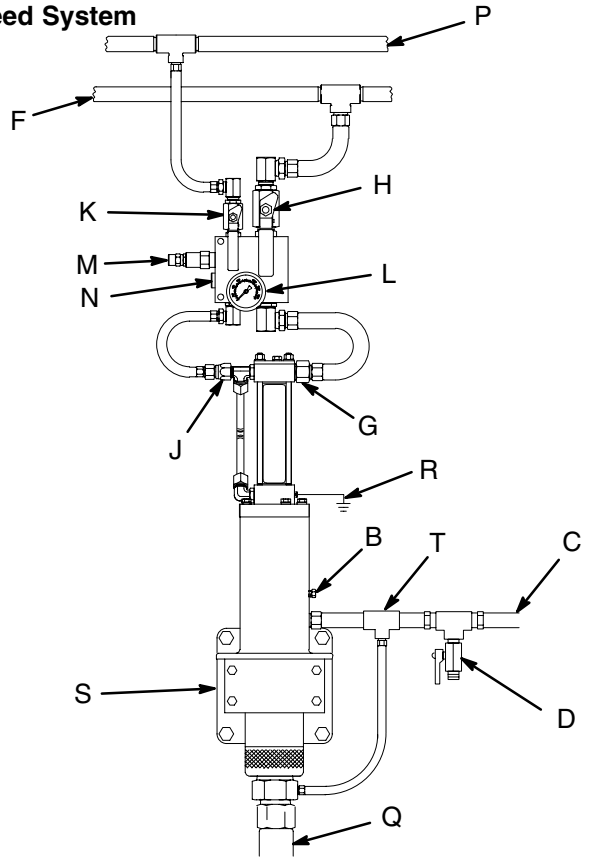
MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers.

- Keep clear of all moving parts when you start or operate the pump.
- Before you service the equipment, follow the **Pressure Relief Procedure** on page 8 to prevent the equipment from starting unexpectedly.

Installation

Typical Installation – Suction Feed System



KEY

- **B** Porous plug (weep tube optional)
- **C** Fluid dispenser outlet
- **D** Drain valve (required)
- **F** Hydraulic return line, minimum 3/4 in. I.D. (required)
- **G** Hydraulic outlet, 3/4 npt
- **H** Return line shutoff valve, minimum 3/4 in. (required)
- **J** Hydraulic inlet, 3/8 npt
- **K*** Supply line shutoff valve
- **L*** Pressure gauge
- **M*** Pressure reducing valve (required in systems over 1500 psi [10 MPa, 102 bar])
- **N*** Flow control valve (required in systems over 3 gpm [11 lpm])
- **P** Hydraulic supply line (use only graco hydraulic power supply)
- **Q** Material supply
- **R** Ground wire (required)
- **S** Wall mounting bracket 236778 (see manual 308394)
- **T** Thermal Relief Kit (required) 235998

* Included in Hydraulic Fluid Control Kit 236864, which can be ordered separately.

Fig. 1 03516B

Although the installation shown in Fig. 1 is only a guide for selecting and installing system components and accessories, some of the equipment is required, as noted in the key. For assistance in designing a system to suit your needs, contact your Graco distributor.

Mount the pump to suit the type of installation planned.

⚠ WARNING

Mount the pump securely so that it cannot move around during operation. Failure to do so could result in personal injury or equipment damage.

⚠ WARNING

Maximum Working Pressure of Accessories

To reduce the risk of serious bodily injury including fluid injection and splashing in the eyes or on the skin, which may be caused if a component ruptures, all accessories added to the reciprocator power supply side must have at least a *1500 psi (10 MPa, 102 bar) maximum working pressure* and those to the pump fluid outlet side must have at least a *375 psi (2.6 MPa, 26 bar) maximum working pressure.*

Installation

Pump Accessories

Suction Hose Kit, Part No. 236054
A suction tube kit is available for siphoning from 55-gallon containers.

Intake Tube (not shown)
To install, apply PTFE tape to the female threads at the top of the tube. Screw the tube tightly onto the intake housing of the stubby pump.

Low-level Cutoff Valve, Part No. 203688
To install, screw the low-level cutoff valve into the bottom of the pump intake tube or the suction tube. This valve closes the pump intake when the fluid level is low, causing the pump to stall to avoid running dry.

Ground Wire, Part No. 222011
A ground wire is required.

Pump Outlet Drain Valve, Part No. 210658
Install a drain valve (D) close to the pump fluid outlet to assist in relieving fluid pressure in the pump when the pump is shut off. See warning below.

Thermal Relief Kit, Part No. 235998
Install a Thermal Relief Kit (T) at the pump fluid outlet.

⚠ WARNING

Pump Outlet Drain Valve

A pump outlet drain valve (D) is required in your system. This valve helps relieve pressure in the displacement pump and hose when shutting down the system and in case of a clogged outlet hose. Install the valve close to the pump outlet.

⚠ CAUTION

Keep The Hydraulic System Clean

The hydraulic supply system must be kept clean at all times to reduce the risk of damaging the reciprocator hydraulic power supply. Blow out all hydraulic lines with air, flush thoroughly with solvent, and then blow out with air again before connecting the lines to the reciprocator.

Always plug the hydraulic inlets, outlets and lines when disconnecting them for any reason to avoid introducing dirt and other contaminants into the system.

Carefully follow the manufacturer's recommendations on reservoir and filter cleaning, and periodic changes of hydraulic fluid.

Hydraulic Power Supply

⚠ WARNING

Limit Fluid Flow to Reciprocator

To reduce the risk of overpressurizing the hydraulic reciprocator, which could cause a rupture and serious injury, including fluid injection, the hydraulic system must have a means to limit the incoming fluid flow to the reciprocator to a maximum of 3 gpm (11 lpm) and 1500 psi (10 MPa, 102 bar). See the description below.

The hydraulic power supply system must have a pressure reducing valve and a pressure-compensated flow control. A flow control valve (N) is required to limit the incoming flow to the reciprocator to a *maximum of 3 gpm (11 lpm)*.

NOTE: A supply line shut-off valve (K), pressure gauge (L), pressure reducing valve (M), and flow control valve (N) are included in the Hydraulic Fluid Control Kit 236864, which can be ordered separately.

Installation

Hydraulic Lines

NOTE: Refer to Fig. 1 to locate the parts mentioned below.

- **Shut-off valves (H and K)** are installed in the hydraulic supply and return lines. Order Part No. 108458 for 1/2 npt(f) supply lines and 108537 for 3/4 npt(f) return lines.
- **Drain Line.** Remove the plug (B) from the pump adapter, and install a 1/8–27 npt(f) tube fitting and weep tube, ending in a waste container. Monitor the weepage of hydraulic fluid. If it seems excessive or increases suddenly, the reciprocator/pump seals may need to be changed. See page 11.
- **Hoses.** Use a minimum 1/2 in. supply line (P) and minimum 3/4 in. return line (F) on the reciprocator. Contact your Graco representative for details of line sizing.
- **A pressure reducing valve (M)** circulates excess hydraulic fluid pressure back to the hydraulic power supply. Install this valve in the hydraulic supply line (P) with a drain hose teed into the hydraulic return line (F). Limit supply pressure to a maximum of 1500 psi (10 MPa, 102 bar).
- **A fluid-filled pressure gauge (L), Part No. 112567**, monitors hydraulic pressure to the reciprocator during startup. Use the gauge for initial adjustment of the reciprocator. It can be removed after adjustment is made.

NOTE: A supply line shut-off valve (K), pressure gauge (L), pressure reducing valve (M), and flow control valve (N) are included in the Hydraulic Fluid Control Kit 236864, which can be ordered separately.

Grounding

To reduce the risk of static sparking, ground the pump. Check your local electrical code for detailed grounding instructions for your area and type of equipment.

- *Pump:* Use ground wire and clamp as shown in Fig. 2. To order a Grounding Wire and Clamp Kit, order Part No. 222011.
- *Hydraulic Hoses and Fluid Outlet Hoses:* Use only electrically conductive hoses.
- *Hydraulic Power Supply:* Follow manufacturer's recommendations.
- *Any pails used when flushing:* Use only metal, grounded pails when flushing. Make firm metal-to-metal contact between the a metal part of the dispense valve and the pail. Use the lowest possible pressure.

To ground the pump, remove the ground screw (Z) and insert through the eye of the ring terminal at end of ground wire (Y). Fasten the ground screw back onto the pump and tighten securely. Connect the other end of the ground wire to a true earth ground. See Fig. 2.

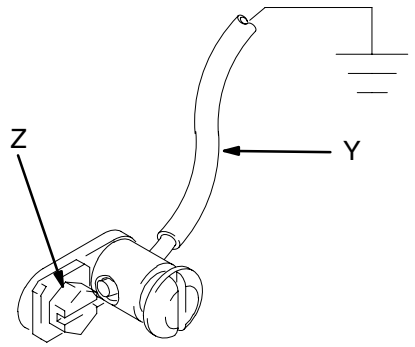


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Fig. 2

Operation

Pressure Relief Procedure

⚠ WARNING

INJECTION HAZARD
The system pressure must be manually relieved to prevent the system from starting or dispensing accidentally. Fluid under high pressure can be injected through the skin and cause serious injury. To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** whenever you

- Are instructed to relieve the pressure
- Check or service any of the system equipment
- Install or clean the nozzle

1. Shut off the hydraulic power supply.
2. Close the supply line shut-off valve (K in Fig. 1).
3. Open the dispensing valve to relieve pressure.
4. Open the pump outlet drain valve, and have a container ready to catch the drainage.
5. Close the return line shut-off valve (H).

NOTE: Leave the drain valve open until you are ready to dispense again.

If you suspect that the nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, **very slowly** loosen the hose end coupling to relieve pressure, then clear the obstruction.

⚠ WARNING

Be sure you **always** shut off the hydraulic supply line shutoff valve (K) before you close the return line shutoff valve (H). This is to prevent overpressurizing the motor or its seals. When starting up the hydraulic system, open the return line shutoff valve first.

Before You Start The Pump

⚠ CAUTION

Recommended Hydraulic Oil
Use Graco-approved Hydraulic Oil or a premium, ISO grade 46 petroleum-based hydraulic oil containing rust and oxidation inhibitors and anti-wear agents.

Before using any other type of oil in this motor, contact your Graco distributor. Unauthorized use of lesser grade oil or substitutes may void the warranty.

Hydraulic Oil Working Temperature
The recommended hydraulic oil operating temperature is 80–115° F (27–45° C). The motor seals will wear faster and leakage may occur if the pump is operated at higher oil temperatures.

If the hydraulic oil temperature approaches 130° F (54° C), check the hydraulic fluid supply cooling system, filters, etc. and clean or repair as needed.

1. *Check the hydraulic fluid level in the hydraulic power supply* before each use, and add fluid as necessary to fill the lines.
2. *Flush the pump before using it for the first time* to remove the light oil which was left in after factory testing to protect the pump from corrosion. Be sure the solvent used is compatible with the fluid to be pumped and the pump wetted parts. See **Technical Data** on page 23. Flush until clean solvent comes from the outlet hose.

Operation

Starting the Pump

⚠ WARNING

Maximum Working Pressures
To reduce the risk of serious bodily injury including fluid injection and splashing in the eyes or on the skin, which may be caused if a component ruptures:

Never exceed *1500 psi (10 MPa, 102 bar) Maximum Hydraulic Pressure* to the reciprocator.

Never exceed *375 psi (2.6 MPa, 26 bar) Maximum Outlet Pressure* from the displacement pump.

Be sure all accessories added to the reciprocator power supply side are capable of at least a 1500 psi (10 MPa, 102 bar) maximum working pressure and all of those for the pump fluid outlet side have at least a 375 psi (2.6 MPa, 26 bar) maximum working pressure.

The maximum working pressure of the displacement pump is directly proportional to the pressure at which the reciprocator is operated. Therefore, if the fluid supplied to the reciprocator is 1000 psi (7 MPa, 69 bar), the pump fluid outlet pressure will be 250 psi (1.8 Mpa, 18 bar).

1. Turn on the hydraulic power supply.
2. Open the return line shutoff valve (H), and slowly open the hydraulic supply line shutoff valve (K).
3. Adjust the flow control valve (N) to limit the hydraulic flow to no more than 3 gpm (11 lpm), which is approximately 60 cycles per minute.

   NOTE: If Graco Part No. 236864 hydraulic fluid control is used, no adjustment is necessary.
4. By adjusting the pressure reducing valve control adjustment (M), increase the hydraulic inlet pressure from 500–1500 psi (3.4–10 MPa, 34–102 bar). Increasing the inlet pressure increases the outlet pressure. Decreasing the inlet pressure decreases the outlet pressure.
5. Always use the lowest pressure possible to obtain the desired results. This reduces pump wear.

⚠ CAUTION

Never allow a pump to run dry of the fluid being pumped. A dry pump quickly speeds up and can damage itself. If it speeds up, shut off the power supply to the reciprocator immediately. Refill the supply container, and prime the pump to eliminate air.

To prevent the pump from running dry, use a low-level cutoff valve.

If the Reciprocator Leaks at the Fluid Fittings

Tighten the fittings (16, 17, 25), which are self-sealing and have replaceable o-rings. If leaking persists, change the o-rings. See Fig. 3.

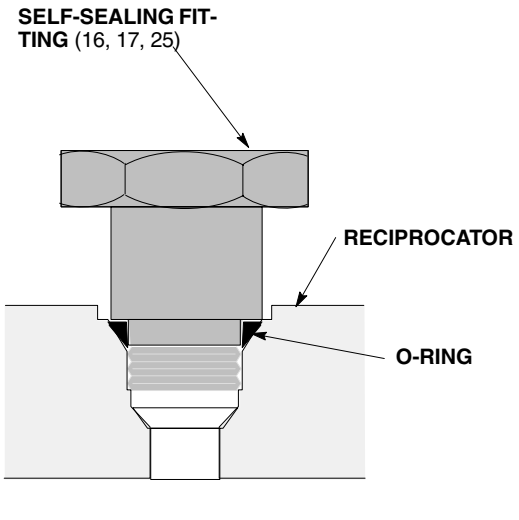


Fig. 3

Shutdown

Relieve the pressure whenever you shut down.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

Troubleshooting

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

Note: Check all possible problems and solutions before disassembling the pump or reciprocator.

PROBLEM	CAUSE	SOLUTION
Pump will not run.	Closed dispense valve.	Pump only runs with valve open.
	Pressure too low.	Increase supply pressure using the pressure adjusting valve.
	Insufficient hydraulic fluid supply.	Check hydraulic supply. Adjust to a maximum of 3 gpm (11 lpm) flow.
	Clogged fluid outlet line, intake valve, dispense valve, suction line.	Relieve pressure. Check; clear obstructions.
	Reciprocator damaged.	Repair. See page 14 or 17.
Pump speeds up or runs erratically.	Pump piston and/or intake valve worn.	Relieve pressure. Check and repair. See page 18.
	Empty supply container.	Refill and reprime. Do not allow pump to run dry. Monitor closely or use a low-level cutoff valve.
Pump runs, but output low on up and/or down stroke.	Pump piston and/or intake valve worn.	Relieve pressure. Check and repair. See page 18.
Pump runs but output low on both strokes.	Insufficient hydraulic fluid supply.	Check hydraulic supply.
	Pressure too low.	Increase supply pressure using the pressure adjustment on the control.
	Clogged fluid outlet line, intake valve, dispense valve, suction line.	Relieve pressure. Check; clear obstructions.
Excessive weepage from porous plug (B).	Worn throat seals..	Repair. See page 12.
Hydraulic oil leaks from fittings in the upper or lower reciprocator blocks (53, 47).	Fittings (16,17,25) are loose, or their o-rings are worn or damaged.	Tighten the self-sealing fittings. If leaking persists, change the o-rings.

Replacing the Throat Seals

See Fig. 4.

NOTE: Replace these seals if fluid leaks excessively through the porous plug (107), see Fig. 5. This procedure can be done without disassembling the entire reciprocator.

1. **Relieve the pressure.**

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. Disconnect the reciprocator from the pump as explained in the next section.
3. Remove the four capscrews (24) and washers (12) from the bottom of the retainer housing (56). Tap the retainer housing to loosen it and pull it off the bottom cap (47).
4. Remove the seal (22) and sleeve bearing (34) from the top of the retainer housing (56).

   NOTE: Item 22 is included in the Repair Kit, 236861.
5. Lubricate the sleeve bearing (34) and install the seal and sleeve bearing in the retainer housing (56) in the order shown in Fig. 4**.**
6. Reassemble. Torque the capscrews (24) to 28–32 ft-lb (38–43 N•m). Install the displacement pump. Follow Step 22, page 17.

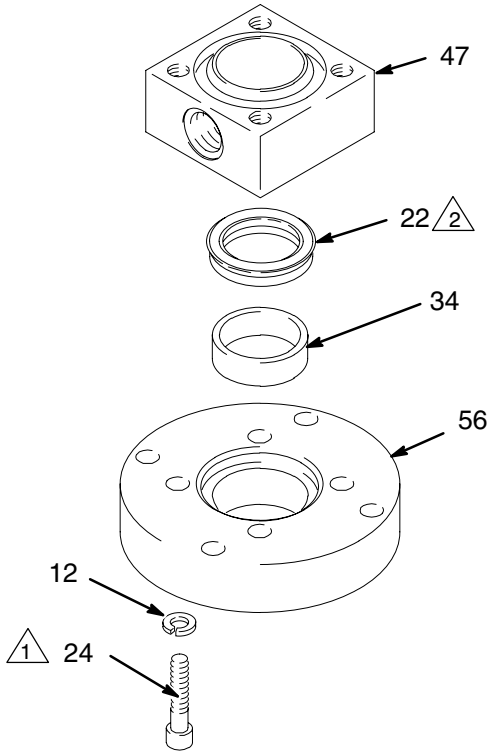


Fig. 4

Service

Disconnecting Reciprocator and Displacement Pump and Replacing Throat Seals.

See Fig. 5.

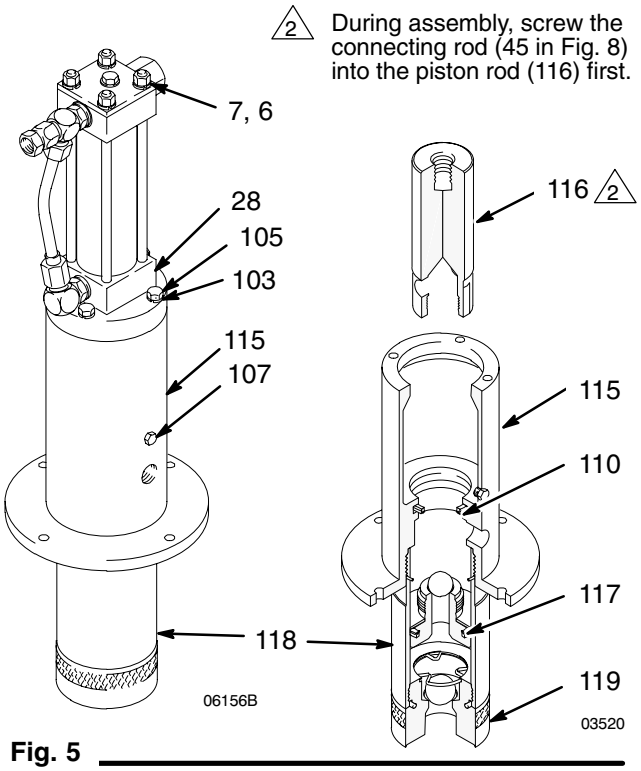


Fig. 5

⚠ CAUTION

Keep The Hydraulic System Clean

It is essential to keep the hydraulic oil system clean and free of contaminants to reduce the risk of damaging the hydraulic reciprocator. Always install a plug in each tube fitting and on each hose end whenever fluid lines are disconnected to prevent contamination.

1. Flush the pump if possible, and stop it with the piston rod in the lowest position.
2. **Relieve the pressure.**

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

3. Disconnect the outlet hose from the displacement pump.
4. Slowly loosen the hydraulic hoses to the supply (26) and return (25) fittings to relieve any pressure, and then remove the hoses. Install plugs on the tube fittings and in the hose ends. Check the o-ring (13) on the fitting, and replace if worn or damaged. *See Fig. 4 and the Parts Drawing.*
5. Using a strap wrench on the pump cylinder (118), screw it out of the base (115) and remove it.
6. Place the piston (117) in a vise, and loosen the piston rod (116).
7. Remove bolts (105) and washers (103).

⚠ CAUTION

Be careful not to scratch the outside of the piston rod.

8. Push the piston rod (116) up through the base (115), and remove it.
9. Remove the throat seal (110). Apply fresh grease to the new seal and groove. Install the new throat seal.

Assembly after Replacing Throat Seals

See Fig. 5.

1. Apply fresh grease to new throat seal (110) and mating groove in base (115). Install new throat seal.

⚠ CAUTION

Be careful not to scratch the outside of the piston rod.

2. Push the piston rod (116) down through the base (115), and install.
3. Install the bolts (105) and washers (103). Torque to 20–25 ft-lb (27–34 N•m).
4. Apply Loctite® 609 to the threads on the piston (117). Install the ball (104). Screw the piston into the piston rod (116).
5. Place the piston (117) in a vise, and tighten the piston rod (116). Torque to 155–175 ft-lb (210–237 N•m).
6. Apply fresh grease and install a new o-ring (112) on the pump cylinder (118).
7. Using a strap wrench on the pump cylinder (118), screw it tightly into the base (115).

Reciprocator Repair

NOTES

- Clean and inspect all parts for wear or damage. Replace parts as needed. For the best results, always replace all the o-rings and seals when you disassemble the pump. Repair kit 236861 is available. Parts included in the kit are marked with an asterisk on the parts lists.
- Assembly tool 189305 is required for reassembling the reciprocator.
- For Step 9 and 10, *Loctite® 242* thread sealant and *Loctite® Primer T* **OR** *Perma-Loc® 115* thread sealant and *Perma-Bond®* surface conditioner are required. Be sure their shelf life is within the manufacturer's recommendations.

Before you begin, drain the oil out of the reciprocator as follows: Place the reciprocator in a drain pan, push the piston all the way up/in, then all the way down/out.

1. Loosen both nuts on the inlet tube (57). Use a wrench to rotate the tube fittings (16, 17) to the side, and then remove the tube (57). Install plugs in the fittings to prevent contamination. *See the* ***Parts Drawing*** *on page 20.*
2. Remove the capscrew (14), nuts (7) and lock washers (6) on top of the reciprocator. *See Fig. 6.*

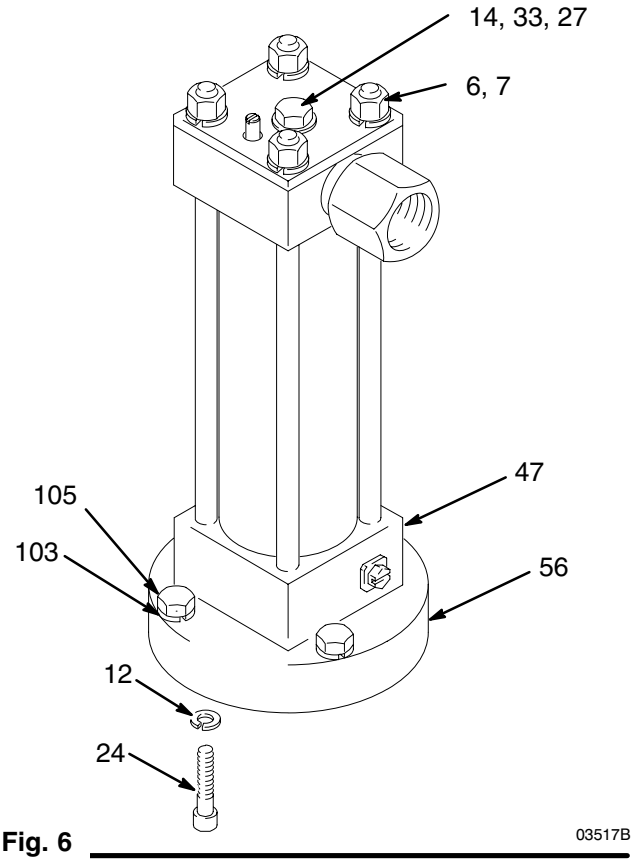


Fig. 6

3. Remove the four capscrews (24) and the retainer housing (56). Tap the retainer housing with a plastic mallet to loosen it and pull it off the bottom cap (47). *See Fig. 6.* If needed, replace the throat seals as described on page 11.

See Fig. 8 for Steps 4–13, except where noted.

4. Tap on the bottom of displacement rod (54) with a plastic mallet to loosen the motor cylinder (39).
5. Grasp the valve spool (31) and pull it off the cylinder and tie rods (49). Pull the cylinder and piston off the bottom cap (47). It is not necessary to remove the tie rods from the bottom cap.
6. Lay the assembly on its side. Place a clean rag around the yoke (43) to prevent losing the detent balls. Slide the yoke (43) sideways off the valve sleeve (32) while holding the balls (5) and spring (20) in place.
7. Slide the cylinder (39) off the displacement rod (54). Hold the hex end of the displacement rod in a vise and use a spanner wrench in the pin holes of the piston (35) to screw it off the rod.

⚠ CAUTION

Be careful not to scratch the outside of the displacement rod or the inside of the cylinder.

8. Visually inspect the spring (36). If there is wear or damage, proceed with this step. Remove the nut (19), spring (36), and retainers (55) from the trip rod (40). Reassemble with a retainer (55) on each end of the new spring (36). You must thread the nut onto the rod until it runs out of thread, so that it bottoms out on the shoulder of the rod. See Fig. 7.

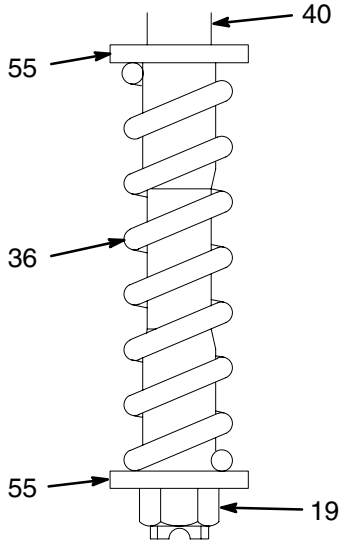
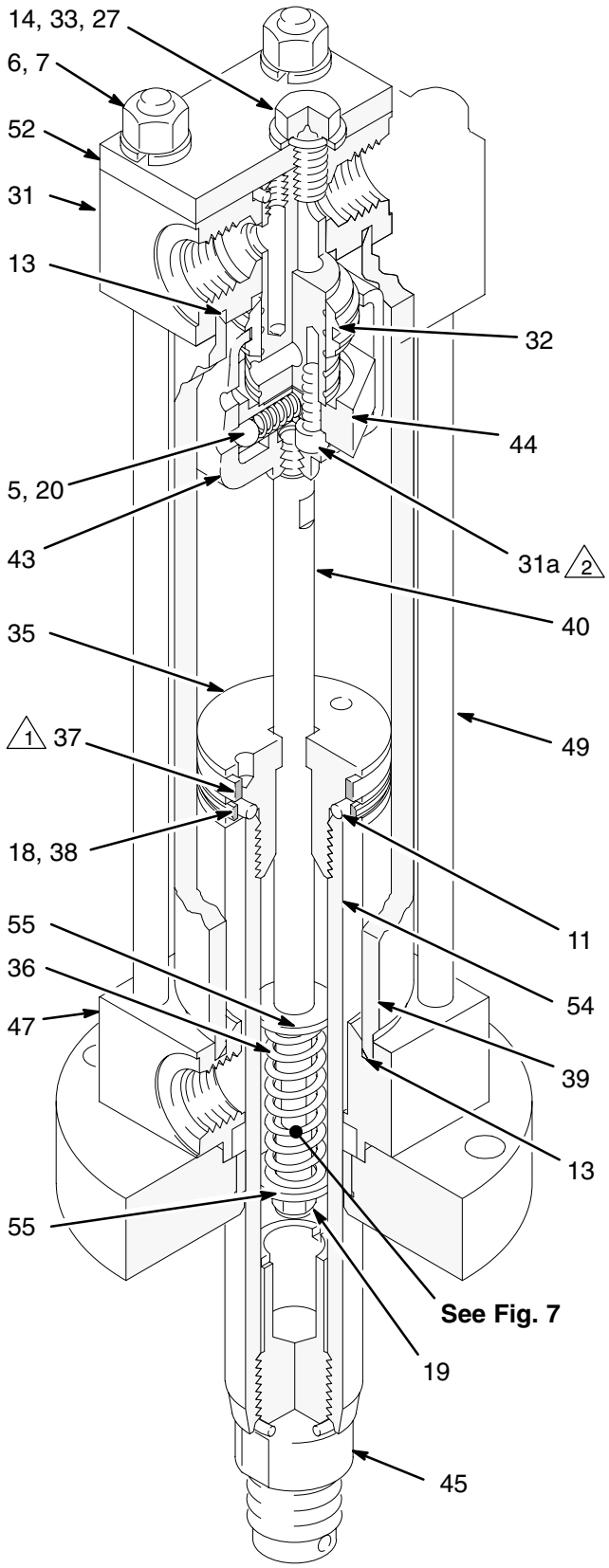


Fig. 7

Reciprocator Repair



1 Torque to 30–40 ft-lb (41–54 N•m).

2 Apply thread adhesive, and torque to 42–45 in-lb (4.7–5.1 N•m).

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Fig. 8

NOTES

- If any of these parts are being reused, use a surface cleaner such as chlorinated solvent on the threads and blow with compressed air. A 1/4–28 UNF–2A tap can be used to remove adhesive from the internal threads of the yoke (43).
- Thread sealant and primer are required. See the third bulleted note on page 14 for specifications.

9. Apply fresh thread sealant to the first two or three internal threads of the yoke (43). Apply primer to the external thread of the rod (40). Let dry for three or four minutes. Assemble, and torque the rod to 54–56 in-lb (6.1–6.3 N•m). Remove excess sealant. *Allow 24 hours for the primer to cure before you operate the reciprocator.*
10. Clean all sealant from the threads of any part you are reusing, and apply thread sealant to the first two or three internal threads of the valve assembly (44). **If you removed the capscrew (31a)**, apply primer to its external threads, let it dry for four minutes, and torque the capscrew to 42–45 in-lb (4.7–5.1 N•m). Remove excess sealant. *Allow 24 hours for the thread sealant to cure before you operate the reciprocator.*
11. Use a spanner wrench to screw the piston (35) onto the displacement rod (54). Torque to 30–40 ft-lb (41–54 N•m).
12. Install the o-ring (18*) in the deep lower groove of the piston (35) and install the seal (38*) over the o-ring. Install the piston bearing (37*) around the upper groove of the piston. Holding the piston bearing in place to avoid damage, slide the cylinder over the piston and press it down.

⚠ CAUTION

When inserting the piston into the cylinder, carefully guide the piston seal (38*) and bearing (37*) to prevent damaging these parts.

Reciprocator Repair

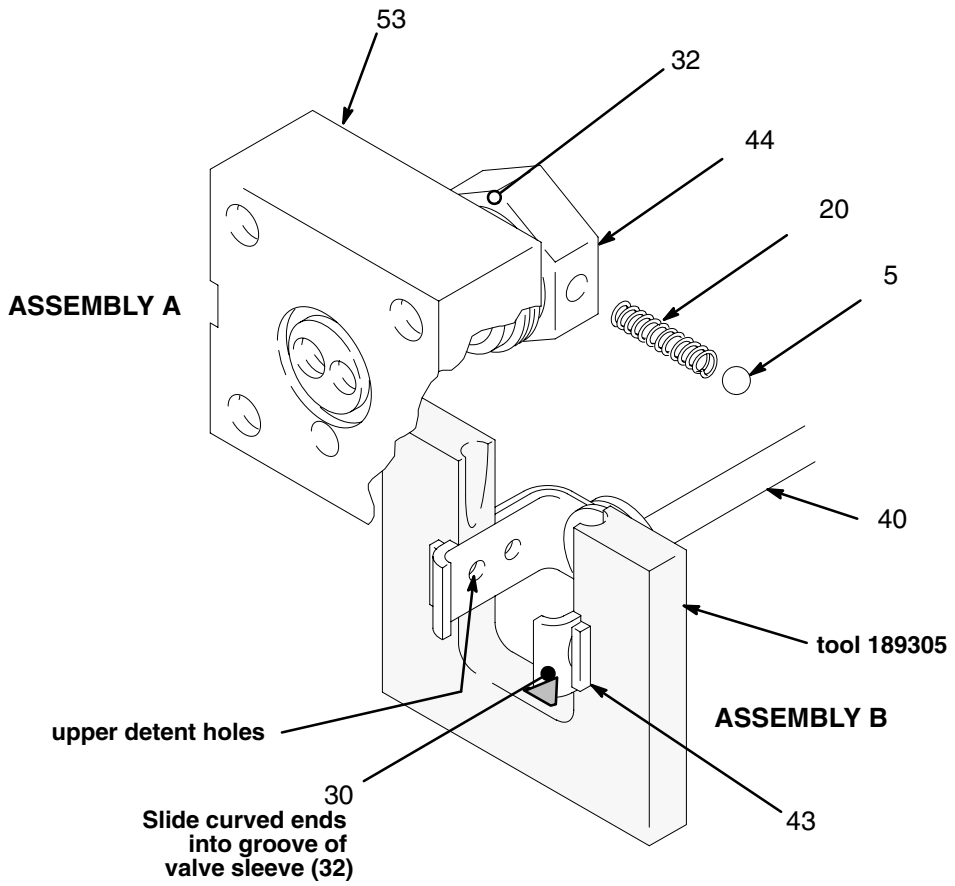


Fig. 9

13. See Fig. 9. Lay Assembly A and Assembly B on the workbench.
14. Slide Assembly B into the center of the tool. Align the upper detent holes of the guide yoke (43) with the center line of the tool. See Fig. 9.
15. Insert the spring (20) and one ball (5) into the valve stop (44) of Assembly A. Tilt the valve stop and start guiding it into the tool, making sure the ball is sliding into the rounded slot in the tool. Place the other ball at the other end of the spring and push it in with your thumb while rotating the valve stop (44) until the spring is horizontal and the balls are in place. Continue holding this assembly together. See Fig. 9.
16. Slide the valve stop assembly down into the tool. Make sure the balls (5) snap into the upper set of holes in the yoke (43), and the curved ends of the guide clamp have engaged the valve sleeve (32) groove. See Fig. 9. Slide the tool back over the rod (40) to remove it.

Refer to Fig. 10 for Steps 17–23.

17. If the tie rods (49) were removed, reinstall them with the short threaded end up. The other end should be screwed about 9/16 in. into the bottom cylinder cap (47).

NOTE: When reinstalling the cylinder (39) (Step 18), be sure the “P” port in the valve spool (31) and the port in the bottom cylinder cap (47) are in line with each other. Be sure the o-rings (13) are in place in both cylinder caps.

18. Slide the cylinder (39) with the piston/displacement rod already installed in it, into the groove in the bottom cylinder cap (47). Position the spool valve (31) over the cylinder and press down firmly.
19. Install the capscrew (14), o-ring (33) and washer (27). Install the lockwashers (6), nuts (7). Torque the nuts to 28–32 ft-lb (36–43 N•m).

Reciprocator Repair

⚠ CAUTION

Never install the fluid tube (57) before torquing the tie rods. Doing so could cause misalignment and damage the reciprocator when it is operated.

20. Reinstall the fluid tube (57) and fittings (17,16). Torque the fittings to 25–35 ft-lb (34–48 N•m). See the Parts Drawing on page 20.
21. Pull the displacement rod (54) in and out to be sure it moves easily with only a little resistance from the rod seal.
22. To reconnect the reciprocator and pump, screw the connecting rod (45) into the piston rod (116) and torque to 75–85 ft-lb (102–115 N•m). Push the connected assembly down through the base (115). Clean piston (117) threads and apply Loctite® 242. Install ball (104). Screw piston (117) into piston rod (116). Place assembly in a vise and torque to 155–175 ft-lb (210–237 N•m). Make sure the o-ring (112*) in the outside groove of the pump cylinder (118) is in good condition. Push the cylinder up into the adapter and engage the threads. Screw in the pump, using a strap wrench for the final tightening.
23. Connect the hydraulic supply hose to fitting (26) and return hose to fitting (25).

⚠ WARNING

To reduce the risk of static sparking be sure to re-connect the ground wire before operating the pump.

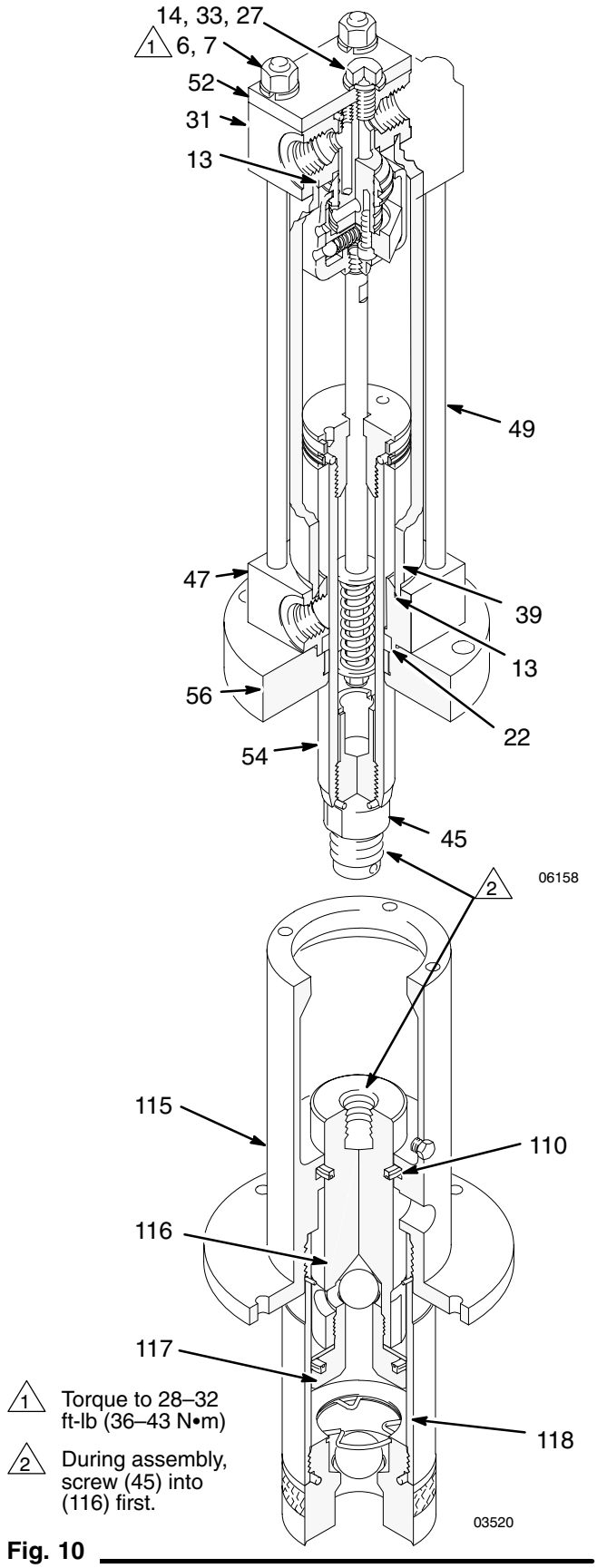


Fig. 10

Displacement Pump Repair

Intake Valve. *See Fig. 11.*

1. If possible, flush the pump.
2. **Relieve the pressure.**

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

3. Unscrew the valve body (119). Remove the o-ring (108), ball (106), and retainer (120).
4. Inspect the parts for wear or damage. If the ball is nicked, replace it. Reassemble, using grease on the male threads.

Displacement Pump. *See Fig. 11.*

NOTE: Clean and inspect all parts for wear or damage as you disassemble them. Replace parts as needed. For the best results, always replace all the o-rings and packings when you disassemble the pump. The parts list on page 19 gives the recommended parts to keep on hand.

1. If possible, flush the pump.
2. **Relieve the pressure.**

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

3. Follow **Disconnecting the Reciprocator and Displacement Pump** on page 9. Remove the intake valve.
4. Carefully inspect the smooth, inner surface of the cylinder (118) for scoring or irregular surfaces. Such damage causes premature seal wear and leaking, so replace the part if needed.
5. Grease the new piston seal and install with the lips facing up as shown in Fig. 11. Place the washer (121) and ball (104) on the piston.
6. Reconnect reciprocator and displacement pump per steps 1 through 6 of **Assembly after Replacing Throat Seals** on page 13.

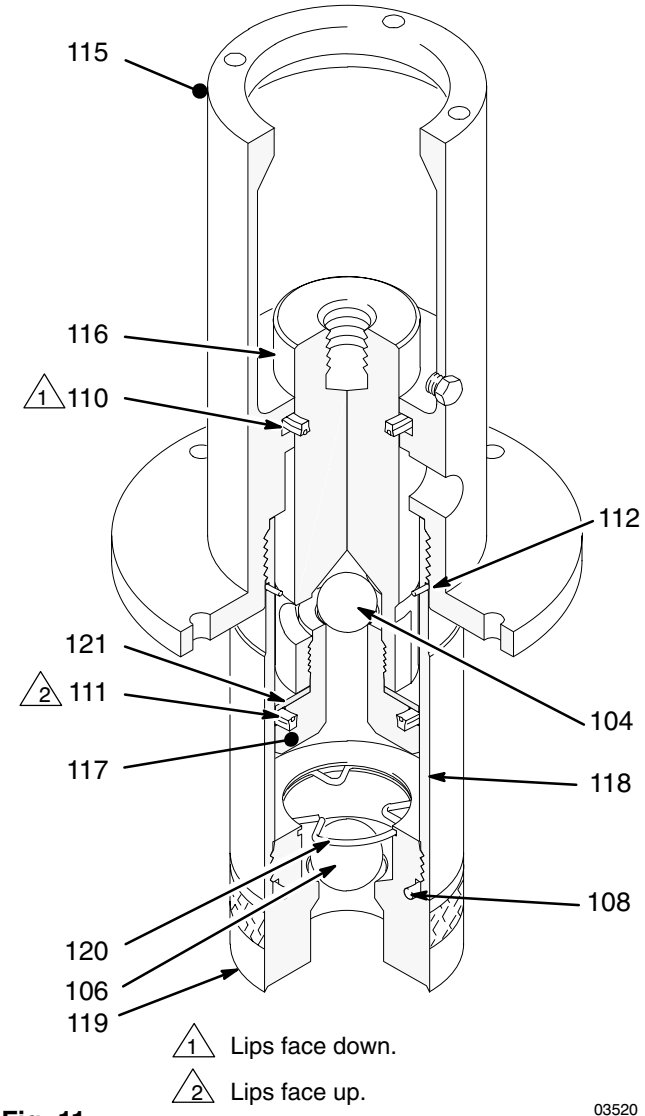


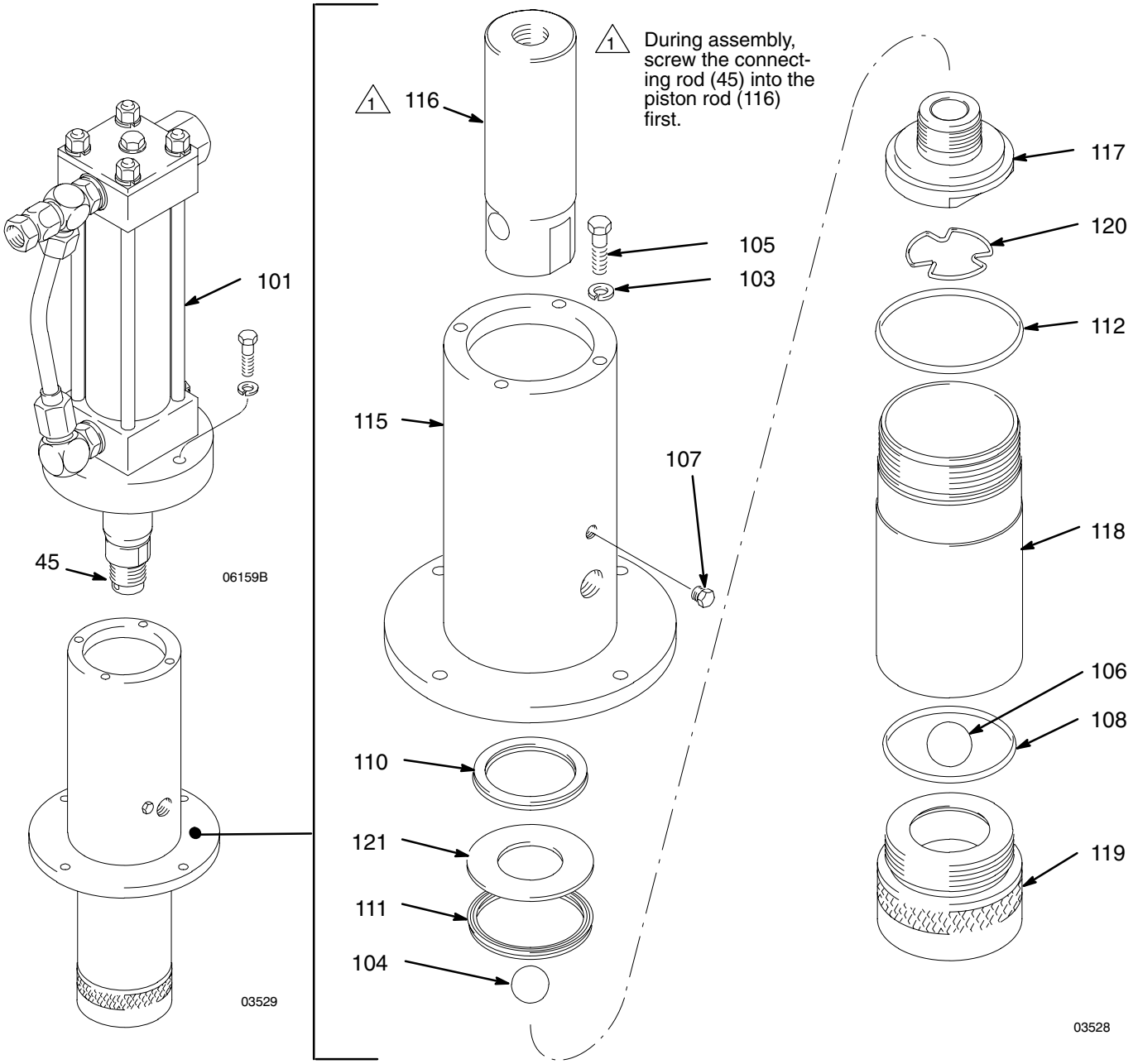
Fig. 11

1/4:1 Ratio Pump Parts

Model 236753, Series C

Ref No.	Part No.	Description	Qty
101	239884	RECIPROCATOR, Dyna-Star	1
		see parts on page 20	
103	100133	WASHER, lock; 3/8	4
104	101178*	BALL, metallic	1
105	102637	SCREW, cap hex hd; 3/8–16 x 1–1/2	4
106	108001*	BALL, metallic, sst	1
107	110064	PLUG, pipe, vented; 1/8–27 npt(f)	1
108	110828*	PACKING, o-ring	1
110	112130*	SEAL, block vee	1
111	112565*	SEAL, block vee	1
112	166071*	PACKING, o-ring	1
115	189705	BASE, motor, hydraulic	1
116	189706	ROD, piston	1
117	189707	SEAT, valve	1
118	189708	CYLINDER, pump	1
119	189709	VALVE, housing	1
120	189710	RETAINER, ball	1
121	189711	WASHER, piston	1

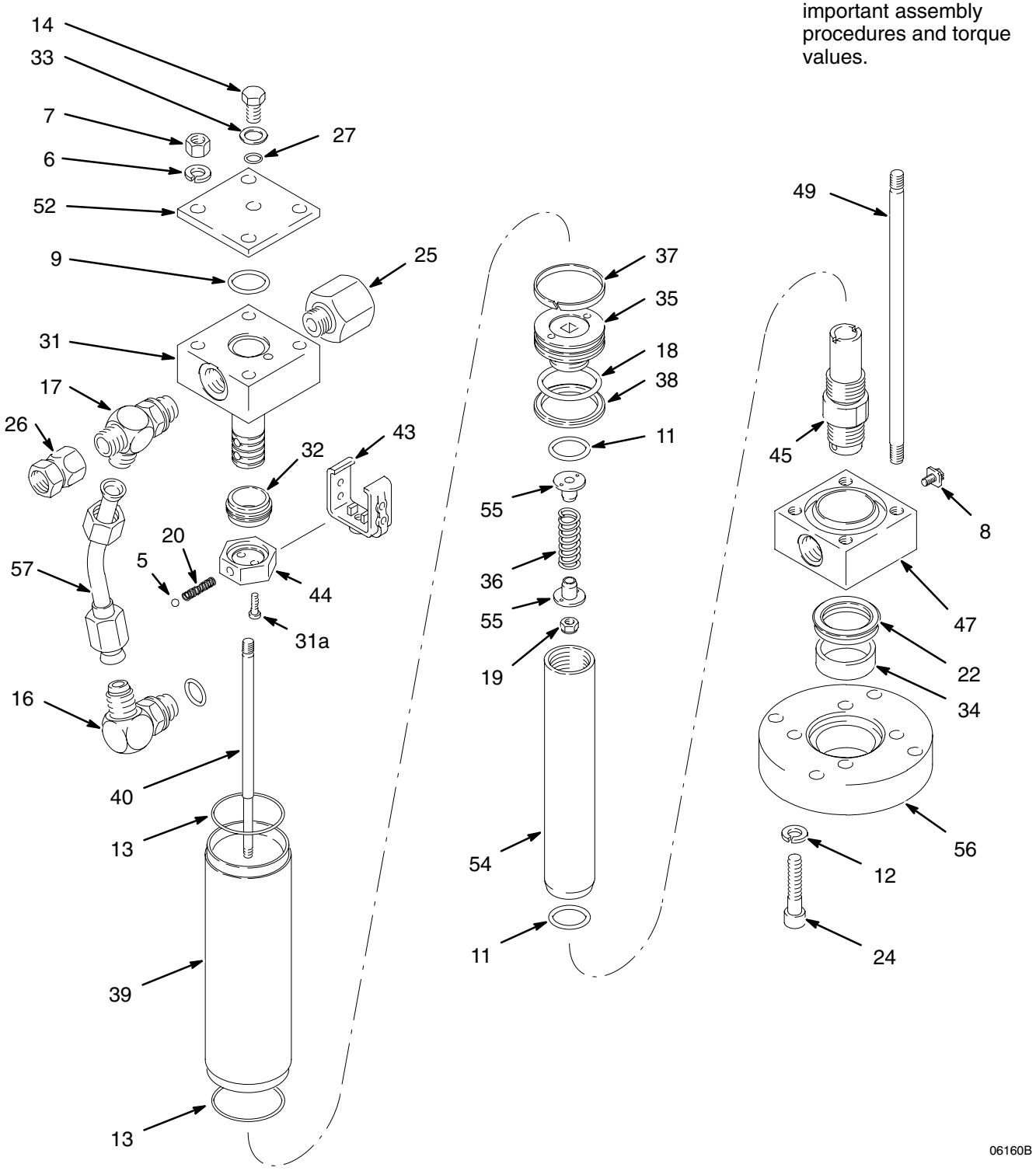
* *Included in Repair Kit 236861.*



Hydraulic Reciprocator Parts

MODEL 239884, Series A
Hydraulic Reciprocator
Includes items 5–57

NOTE: See pages 11–17 for important assembly procedures and torque values.



Hydraulic Reciprocator Parts

Model 239884, Series A
Hydraulic Reciprocator

Ref. No.	Part No.	Description	Qty
5	100069	BALL	2
6	100133	WASHER, lock	4
7	100307	NUT, full , hex; 3/8–16 unc-2b	4
8	116343	SCREW, ground	1
9	104093*	PACKING, o-ring	1
11	105765*	PACKING, o-ring.	2
12	106115	WASHER, lock, spring	4
13	106274*	PACKING, o-ring	2
14	106276	SCREW, cap, hex; 3/8–24 unf-2a	1
16	106470	ELBOW, str thd, 37° flare	1
17	107197	TEE, run, str thd, 37° flare	1
18	108014*	PACKING, o-ring, buna–N	1
19	114231	NUT, lock, hex	1
20	108437	SPRING, compression	1
22	108952*	PACKING, block, v	1
24	112566	SCREW, cap, socket hd	4
25	112568	ADAPTER, pipe, female	1
26	112569	UNION, swivel	1
27	155685*	PACKING, o-ring	1
31	239874	VALVE SPOOL ASSY *Includes item 31a*	1
31a	104092	CAPSCREW, sch; 10–24 unrc–3a x 5/8 in.	2
32	189072	SLEEVE, valve	1
33	178179	WASHER, sealing	2
34	178185*	BEARING, sleeve	1
35	192656	PISTON	1
36	178189	SPRING, compression	1
37	178207*	BEARING, piston	1
38	178226*	SEAL, piston	1
39	178229	CYLINDER, motor	1
40	192657	ROD, trip	1
41	179885†	LABEL, warning (not shown)	1
43	189077	YOKE, valve	1
44	192654	STOP, valve	1
45	183671	ROD, connecting	1
47	186225	CAP, cylinder, bottom	1
49	187405	ROD, tie	4
52	178181	PLATE, cap	1
54	188078	ROD, displacement	1
55	192655	RETAINER, spring	1
56	189712	RETAINER, housing	1
57	217221	TUBE, inlet	1

* *Included in Repair Kit 236861.*

† *Replacement Warning labels available at no charge.*

Assembly tool 189305 required for repairing the reciprocator.

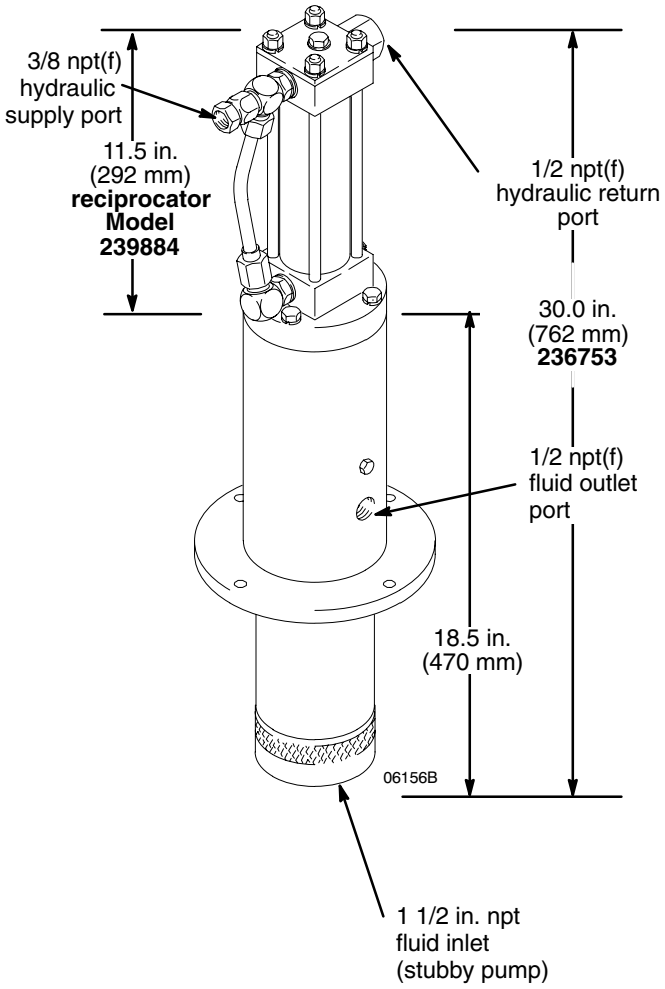
Notes

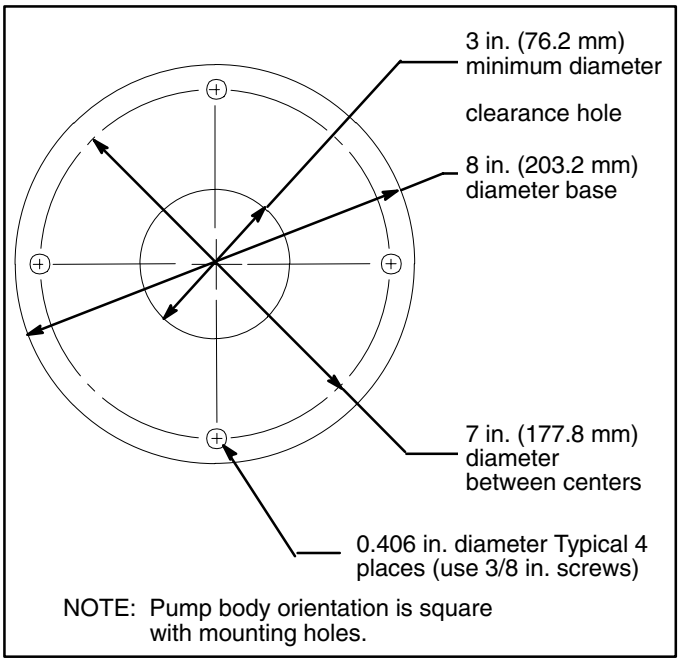
Technical Data

Fluid ratio	1/4:1
Output flow (max)	10.0 gpm (45.42 lpm)
Output pressure (max)	375 psi (2.6 MPa, 26 bar)
Maximum input flow	3 gpm (11.4 lpm)
Maximum hydraulic input pressure	1500 psi (10 MPa, 102 bar)
Maximum fluid outlet pressure	375 psi (2.6 MPa, 26 bar)
Maximum input fluid temperature	130° F (55° C)
Maximum suction lift	13 feet (4 m)
Weight	48 lb (22 kg)
Rod seals	nitrile
Piston seals	polyurethane
Displacement pump wetted parts	aluminum, steel, nitrile, polyurethane
Sound pressure*	77 dB(A)

* *Sound pressure reading taken with pump operating at 66 cycles per minute. Sound pressure measured per CAGI-PNEUROP, 1971.*

Dimensions and Mounting Hole Layout





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