Instructions – Parts List

Parts

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

See page 26 for Maximum Working Pressures.

Dyna–Star ™

308155 Rev.M

HYDRAULIC RECIPROCATOR AND PUMP

FOR LUBRICATING FLUIDS ONLY

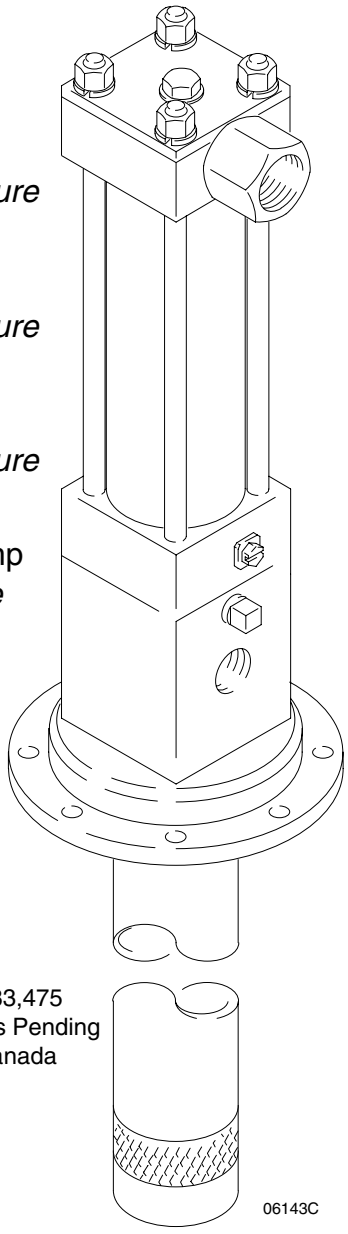
1:1 Ratio Universal Pump and Reciprocator

Model 239882, Series A, Reciprocator Only
1500 psi (10 MPa, 102 bar) Maximum Hydraulic Input Pressure
1500 psi (10 MPa, 102 bar) Maximum Fluid Outlet Pressure

Model 224741, Series C, Stubby Length
1500 psi (10 MPa, 102 bar) Maximum Hydraulic Input Pressure
1500 psi (10 MPa, 102 bar) Maximum Fluid Outlet Pressure

Model 224742, Series C, 55-Gallon Length
1500 psi (10 MPa, 102 bar) Maximum Hydraulic Input Pressure
1500 psi (10 MPa, 102 bar) Maximum Fluid Outlet Pressure

Model 237653, Series B, Stainless Steel Stubby Length Pump
1000 psi (7 MPa, 69 bar) Maximum Hydraulic Input Pressure
1000 psi (7 MPa, 69 bar) Maximum Fluid Outlet Pressure



Model 224741 shown

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

Table of Contents

PROVEN QUALITY. LEADING TECHNOLOGY.

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

CE

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. Check the **Technical Data** section on page 26 for the maximum hydraulic input pressure and the maximum fluid outlet pressure of your pump model.
- 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 9 if the grease fitting coupler clogs and before cleaning, checking, or servicing the equipment.
- Tighten all fluid connections before you operate 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.

⚠ 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 dispensed to. Refer to **Grounding** on page 8.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop dispensing 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 dispensed.
- Keep the dispense area free of debris, including solvent, rags, and gasoline.
- Do not smoke in the dispense area.
- Do not turn on or off any light switch in the dispense area while dispensing or while operating if fumes are present.
- Keep a fire extinguisher in the work area.

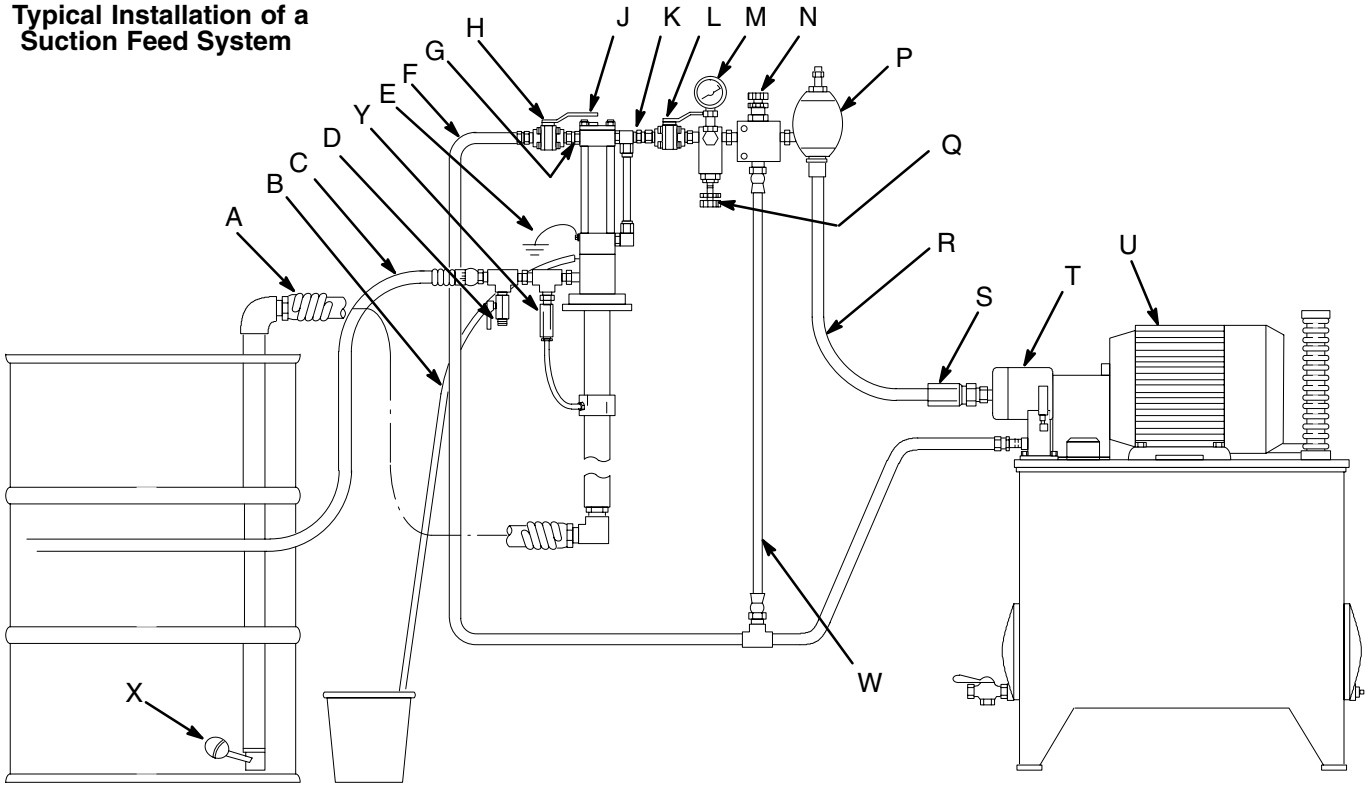
MOVING PARTS HAZARD

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 9 to prevent the equipment from starting unexpectedly.

Installation

Typical Installation of a Suction Feed System



KEY

- **A** Suction hose
- **B** Weep tube
- **C** Fluid outlet line (to gun)
- **D** Drain valve (required)
- **E** Ground wire
- **F** Hydraulic return line, minimum 3/4” I.D. (required)
- **G** Hydraulic outlet, 1/2 npt
- **H** Return line shut-off valve, minimum 3/4” (required)
- **J** Hydraulic inlet, 1/2 npt
- **K** Tee, 3/4 npt
- **L*** Supply line shut-off valve
- **M*** Pressure gauge
- **N*** Pressure reducing valve (required in systems over 1500 psi [10 MPa, 102 bar])
- **P** Accumulator
- **Q*** Flow control valve (required in systems over 3 gpm [11 lpm])
- **R** Hydraulic supply line
- **S** Check valve
- **T** Variable volume pressure compensated pump
- **U** Hydraulic power supply
- **W** Drain line, accumulator
- **X** Low-level cut-off valve
- **Y** Thermal Relief Kit (required) Part No. 237904

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

Fig. 1

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. 01843

Mount the pump to suit the type of installation planned.

Installation

⚠ 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 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 or the pump fluid outlet side must have at least a 1500 psi (10 MPa, 102 bar) maximum working pressure for models 239882, 224741, and 224742, and at least a 1000 psi (7 MPa, 69 bar) maximum working pressure for model 237653.

Pump Accessories

- **A suction hose kit (A) , Part No. 236054,** is available for siphoning from 55 gallon containers.
- **Intake tube (not shown).** To install, apply Teflon® tape to the female threads at the top of the tube. Screw the tube tightly into the intake housing of the stubby pump.
- **Low-level cut-off valve (X), Part No. 203688,** closes the pump intake when the fluid level is low, causing the pump to stall to avoid running dry. To install, screw the valve into the bottom of the pump intake tube or the suction tube.
- **A pump outlet drain valve (D), Part No. 210658,** is installed close to the pump fluid outlet to help relieve fluid pressure in the pump when the pump is shut off.
- **Thermal Relief Kit (Y), Part No. 237904.** Install 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 the system is shut down and if the outlet hose gets clogged. 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 blow out with air again before you connect the lines to the reciprocator.

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

Carefully follow the manufacturer's recommendations on cleaning the reservoir and filter and periodically changing the 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 (U) must have a pressure reducing valve and a pressure-compensated flow control. A flow control valve (Q) 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 (L), pressure gauge (M), pressure reducing valve (N), and a flow control valve (Q) 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 L)** 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 (59) from the pump adapter, and install a 1/8–27 npt(f) tube fitting and weep tube (B), 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 Fig. 2.

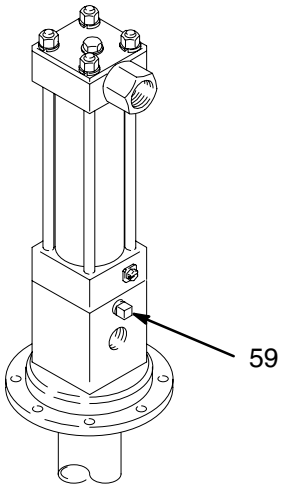


Fig. 2

- **Hoses.** Use a minimum 1/2” supply line (R) and minimum 3/4” return line (F) on the reciprocator. Contact your Graco representative for details of line sizing.
- **A pressure reducing valve (N)** circulates excess hydraulic fluid pressure back to the hydraulic power supply. Install this valve (N) in the hydraulic supply line with a drain hose (W) teed into the hydraulic return line (F). Limit supply pressure to a maximum of 1500 psi (10 MPa, 102 bar).
- **An accumulator (P)** reduces the hammering effect caused by the motor when it reverses direction.
- **A fluid-filled pressure gauge (M), Part No. 112567**, monitors hydraulic pressure to the reciprocator during startup. See Fig. 1. Use the gauge for initial adjustment of the reciprocator. It can be removed after adjustment is made.

Installation

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. 3.to the right. 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. 3. *To order a ground wire and clamp, order Part No. 222011.*

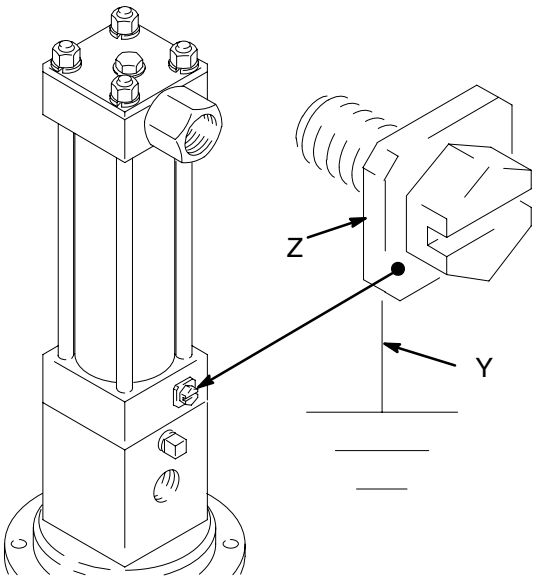


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Fig. 3

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 (L 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.

Before You Start the Pump

1. *Check the hydraulic fluid level in the hydraulic power supply* before each use, and add fluid as necessary to fill the lines.

⚠ CAUTION

Always use Graco approved hydraulic oil or equivalent, Part Numbers 169236 (5 gallon) or 207428 (1 gallon). Do not substitute lower grade oil.

2. *Flush the pump before you use it for the first time* to remove the light oil that 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 26. Flush until clean solvent comes from the outlet hose.

To Start the Pump

1. Turn on the hydraulic power supply.
2. Open the return line shut-off valve (H), and slowly open the hydraulic supply shut-off valve (L).
3. Adjust the flow control valve (Q) 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 (N), adjust the hydraulic inlet pressure from 50 to 1500 psi (0.34 to 10 MPa, 3.4 to 102 bar) for models 239882, 224741, and 224742. Increasing the inlet pressure increases the outlet pressure. Decreasing the inlet pressure decreases the outlet pressure.

   NOTE: For model 237653, adjust the hydraulic inlet pressure from 50 to 1000 psi (0.34 to 7 MPa, 3.4 to 69 bar).
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 (X). See Fig.1 on page 5.

⚠ CAUTION

Maximum Working Temperature
Do not exceed 130° F (54° C) hydraulic oil temperature. The reciprocator seals will wear faster and leakage may occur if the pump is operated at higher oil temperatures.

Operation

⚠ WARNING

Maximum Working Pressures

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

- For models 239882, 224741, and 224742, never exceed 1500 psi (10 MPa, 102 bar) Maximum Hydraulic Pressure to the reciprocator or Maximum Outlet Pressure from the displacement pump.
- For model 237653, never exceed 1000 psi (7 MPa, 69 bar) Maximum Hydraulic Pressure to the reciprocator or Maximum Outlet Pressure from the displacement pump.
- Be sure all accessories added to the reciprocator power supply side or the pump fluid outlet side have at least a 1500 psi (10 MPa, 102 bar) Maximum Working Pressure for models 239882, 224741, and 224742*;* and at least a 1000 psi (7 MPa, 69 bar) Maximum Working Pressure for model 237653.
- 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 also be 1000 psi (7 MPa, 69 bar).

Shutdown

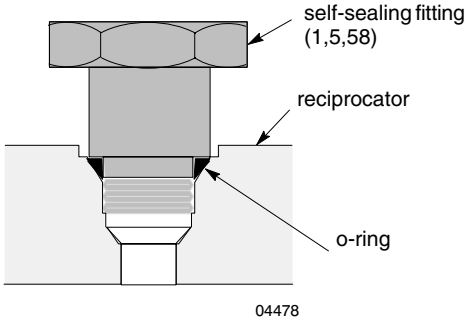
Relieve the pressure whenever you shut down.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

If the Pump Leaks at the Fluid Fittings

Models 239882, 224741, and 224742: Tighten the fittings (1, 5, 58), which are self-sealing and have replaceable o-rings. If leaking persists, change the o-rings.



Model 237653: Tighten the fittings (B or K). These fittings are self sealing and have replaceable o-rings. If leaking persists, change the o-rings.

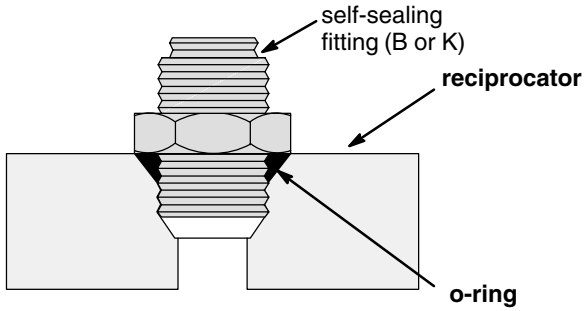


Fig. 4

Troubleshooting

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

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

Problem	Cause	Solution
Pump won't run.	Closed dispense valve.	Pump only runs with valve open.
	Pressure too low.	Increase supply pressure using a 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.
Pump speeds up or runs erratically.	Pump piston and/or intake valve worn.	Relieve pressure. Check and repair. See page 20.
	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 20.
Pump runs but output low on both strokes.	Insufficient hydraulic fluid supply.	Check hydraulic supply. Adjust to maximum 3 gpm (11 lpm) flow.
	Pressure too low.	Increase supply pressure using a pressure adjusting valve.
	Clogged fluid outlet line, intake valve, dispense valve, suction line.	Relieve pressure. Check; clear obstructions.
Excessive weepage from weep tube (B).	Worn throat packings.	Repair. See page 12.
Hydraulic oil leaks from fittings in the upper or lower reciprocator blocks (31, 32).	Fittings (1,5,58) are loose, or their o-rings are worn or damaged.	Tighten the self-sealing fittings. If leaking persists, change the o-rings.

Service

Replacing the Throat Seals

See Fig. 5.

NOTE: Replace these seals if fluid leaks excessively through the weep tube (B). This procedure can be done without disassembling the entire reciprocator.

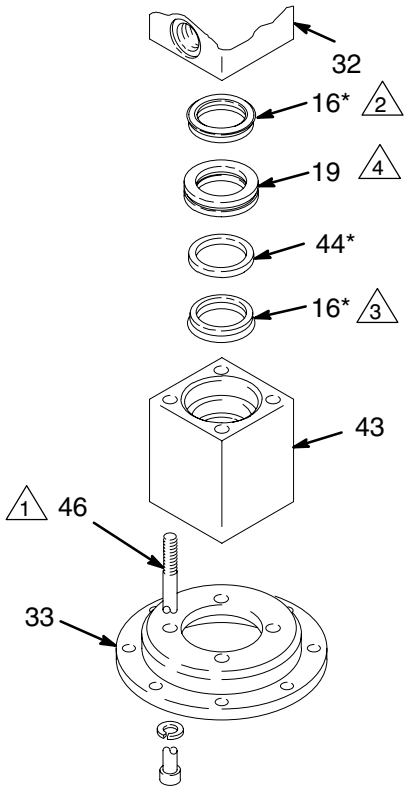
⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

1. Relieve the pressure.
2. Disconnect the reciprocator from the pump. See the procedure on page 13.
3. Remove the four capscrews (46) from the bottom of the adapter (43). Tap the adapter to loosen it, and pull it off the bottom cap (32).
4. Remove the seals (16*,44*) and guide (19) from the top of the adapter (43).

NOTE: Items 16 and 44 are included in the Reciprocator Repair Kit, 223426.

5. Lubricate the guide (19), and install the seals and guide in the adapter (43) one at a time in the order shown in Fig. 5**.**
6. Reassemble. Torque the capscrews (46) to 28 to 32 ft-lb (38 to 43 N.m). Install the displacement pump. Follow Step 24, page 17.



1 Torque to 28 to 32 ft-lb (38 to 43 N.m).
2 Lips face up.
3 Lips face down.
4 Lubricate.

01660

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.

Service

Disconnecting the Reciprocator and Displacement Pump

Models 239882, 224741, and 224742

1. Flush the pump if possible, and stop it with the displacement rod in the lowest position.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

2. **Relieve the pressure**.
3. Disconnect the outlet hose from the displacement pump.
4. Slowly loosen the hydraulic supply (58) and return (5) fittings to relieve any pressure, and remove the hoses. Install plugs on the tube fittings and in the hose ends. Check the o-rings (5a, 58a) on the fittings, and replace them if they are worn or damaged. See Fig. 4 and the **Parts Drawing**.
5. Using a strap wrench on the displacement cylinder (108), screw it out of the pump adapter (43), and pull it off the pump.
6. Pull the connecting rod (117) down as far as it will go. Remove the cotter pin (118) from the bottom of the displacement rod assembly (34), and unscrew the connecting rod until it is free.

Model 237653

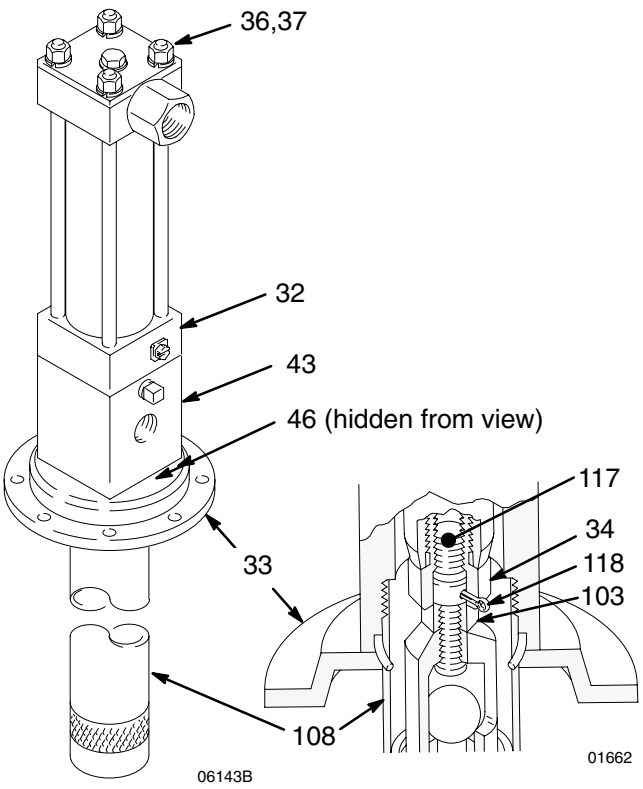
1. Flush the pump if possible, and stop it with the displacement rod in the lowest position.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

2. **Relieve the pressure**.
3. If you remove the pump from its mounting, disconnect the hydraulic hoses, and plug all hydraulic connections and lines to prevent contamination.
4. Remove the cotter pin (A) from the top of the displacement rod (B).
5. Loosen and remove the three locknuts (C), and pull the displacement pump down and away from the motor.
6. Unscrew the displacement rod (B) from the reciprocator connecting rod (D).

Models 239882, 224741, and 224742



Model 237653

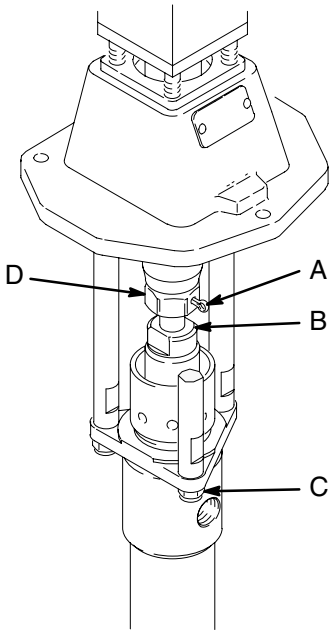


Fig. 6

Service

Reciprocator Repair

NOTES

- The following reciprocator repair instructions are for Models 239882, 224741, and 224742. *For Model 237653 instructions, see accompanying manual 307654.*
- 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 223426** is available. Parts included in the kit are marked with one asterisk, for example (23*), in the text and drawings. Always replace the seals (23*, 24*) and the seals (16*, 44*) together.
- **Assembly Tool 189305** is required for reassembling the reciprocator.
- Loctite® 242 thread sealant and Loctite® Primer T **or** Perma-Loc® 115 thread sealant and Perma-Bond® Surface Conditioner I are required. Be sure their shelf life is within the manufacturer's recommendations.
  Note: Use Loctite® 609 on yoke (9) and rod (12) on page 15, step 9 only. Use Loctite® 242 or Perma-Loc® 115 on other threaded surfaces as required.

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. Place the adapter (43) in a vise. Remove the four capscrews (46) and the base (33). Pull the bottom cap (32) off of the adapter. See Fig. 7. If needed, replace the seals as described on page 12.
2. Remove the capscrew (3), nuts (36), and lockwashers (37) on top of the reciprocator. See Fig. 7.
3. Loosen both nuts on the fluid tube (45). Use a wrench to rotate the tube fittings (1,58) to the side, and remove the tube (45). Check the o-rings (1a,58a) on the fittings, and replace them if they are worn or damaged. Install plugs in the fittings to prevent contamination. See Fig. 4 and the **Parts Drawing**.

See Fig. 9 for Steps 4 to 13, except where noted.

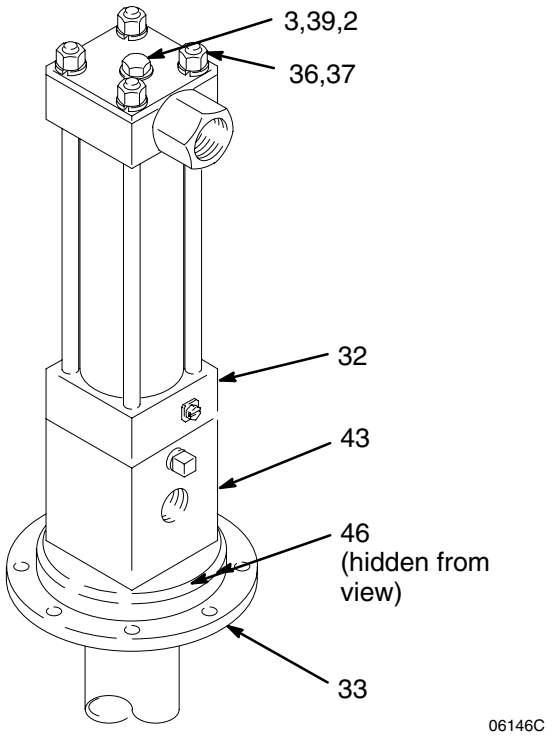


Fig. 7

4. Tap on the bottom of the displacement rod (34) with a plastic mallet to loosen the cylinder (25).
5. Grasp the spool valve assembly (31), and pull it off the cylinder and tie rods (38). Pull the cylinder and piston off the bottom cap (32). 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 (9) to prevent losing the detent balls. Slide the yoke sideways off the valve sleeve (29) while holding the balls (7) and spring (6) in place.
7. Slide the cylinder (25) off the displacement rod (34). Hold the hex end of the displacement rod in a vise, and use a spanner wrench in the pin holes of the piston (22) 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 (21). If there is wear or damage, proceed with this step. Remove the nut (18), spring (21), and retainers (20) from the trip rod (12). Reassemble with a retainer (20) on each end of the new spring (21). 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. 8.

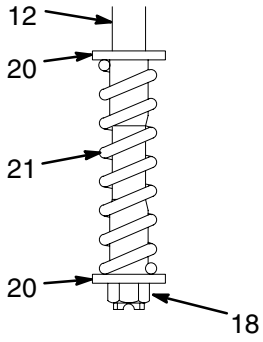


Fig. 8

NOTE: If you are re-using or reassembling any parts, 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 (9).

NOTE: Thread sealant and primer are required. See **Reciprocator Repair Notes** on page 14 for specifications. Loctite® 609 is used only in step below.

9. Apply fresh Loctite® 609 thread sealant to the first two or three internal threads of the yoke (9). Apply primer to the external thread of the rod (12). Let dry for three or four minutes. Assemble, torquing the screw to 54 to 56 in-lb (6.1 to 6.3 N-m). Remove excess sealant. *Allow 24 hours to cure before operating 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 (31). **If you removed the capscrew (51)**, apply primer to its external threads, let it dry for four minutes, and torque the capscrew to 42 to 45 in-lb (4.7 to 5.1 N-m). Remove excess sealant. *Allow 24 hours for the thread sealant to cure before you operate the reciprocator.*
11. Remove the o-ring (13*) from the bottom of the spool valve assembly (31), and replace it with a new o-ring.
12. Use a spanner wrench to screw the piston (22) onto the displacement rod (34). Torque to 30 to 40 ft-lb (41 to 54 N.m).

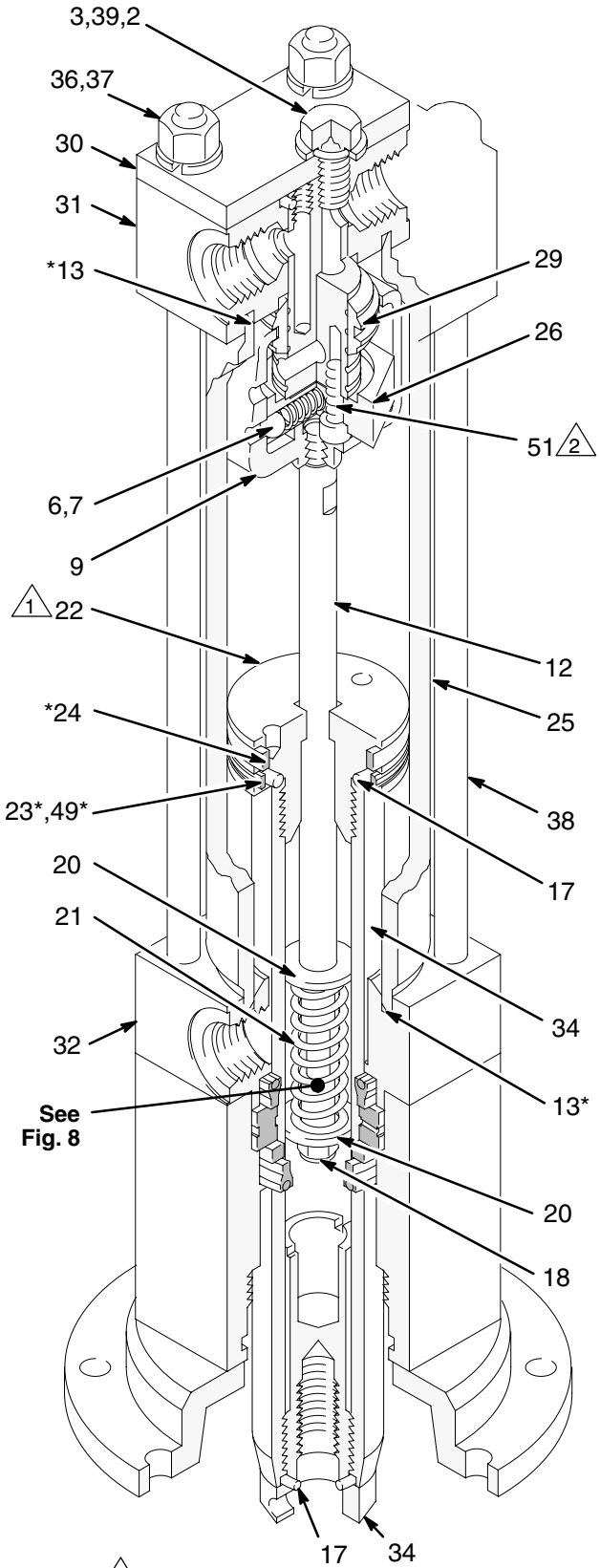


Fig. 9

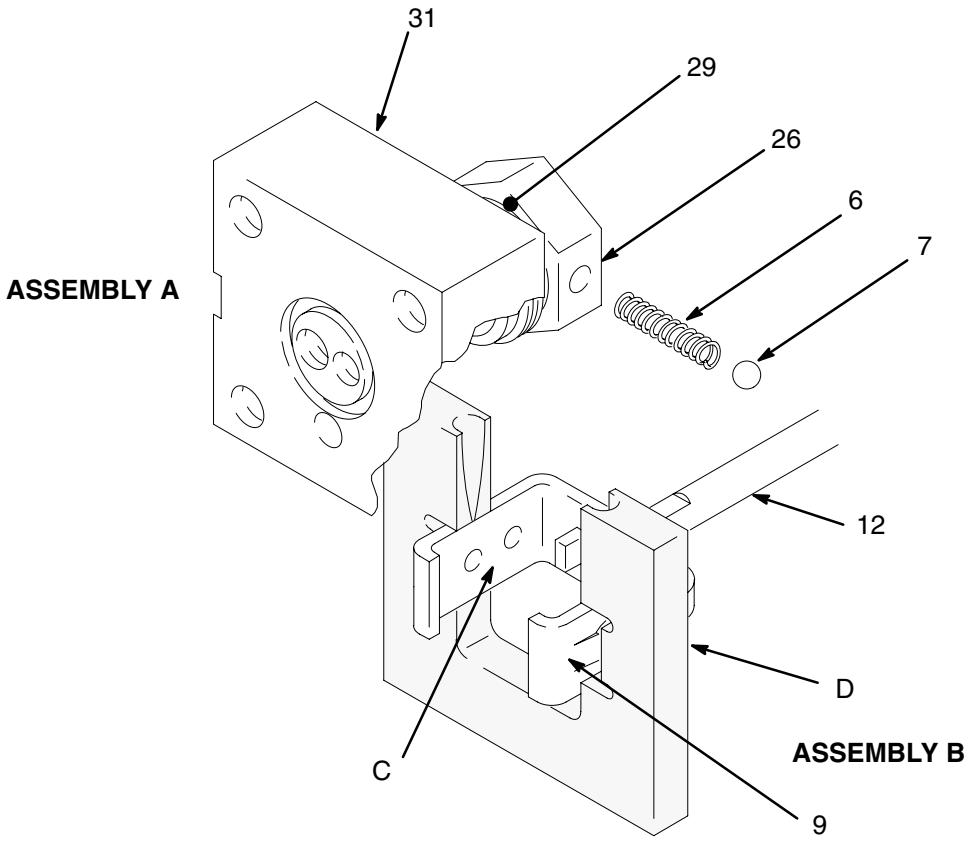


Fig. 10

13. Lay Assembly A and Assembly B on the workbench.
14. Slide Assembly B into the center of the tool (D), Part No. 189305. Align the upper detent holes (C) of the guide yoke (9) with the center line of the tool (D). See Fig. 10.
15. Insert the spring (6) and one ball (7) into the valve stop (26) of Assembly A. Tilt the valve stop, and start guiding it into the tool (D), making sure the ball is sliding into the rounded slot in the tool (D). Place the other ball at the other end of the spring, and push it in with your thumb while rotating the valve stop (26) until the spring is horizontal and the balls are in place. Continue holding this assembly together. See Fig. 10.
16. Slide the valve stop assembly down onto the tool. Make sure the balls (7) snap into the upper set of holes (C) in the guide yoke (9), and the curved ends of the guide clamp have engaged the valve sleeve (29) groove. See Fig. 10. Slide the tool (D) back over the rod (12) to remove it.

In steps 18 through 26, see Fig. 11.

17. Place the adapter (43) in a vise, and install the seals as described on page 12. Install the cylinder cap (32).
18. If the tie rods (38) were removed, reinstall them with the short threaded end up. The other end should be screwed about 9/16” into the bottom cylinder cap (32).
19. Install the o-ring (49*) in the deep lower groove of the piston (22), and install the seal (23*) over the o-ring. Install the piston bearing (24*) 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 you insert the piston into the cylinder, carefully guide the piston seal (23*) and bearing (24*) to prevent damaging them.

20. Place the cylinder (25) on the cylinder cap (32). Install the piston (22) and valve assembly (31).

NOTE: When you reinstall the cylinder (25), be sure the “P” port in the top cylinder cap of the spool valve assembly (31) and the port in the bottom cylinder cap (32) are in line with each other. Be sure the o-rings (13*) are in place in the valve spool assembly (31) and cylinder cap.

21. Install the capscrew (3), o-ring (39), and washer (2). Install the lockwashers (37) and nuts (36). Torque the nuts to 28 to 32 ft-lb (36 to 43 N.m).

⚠ CAUTION

Never install the fluid tube (45) before you torque the tie rods. Doing so could cause misalignment and damage the reciprocator when it is operated.

22. Reinstall the fluid tube (45) and fittings (1). Torque the fittings to 25 to 35 ft-lb (34 to 48 N.m). See the **Parts Drawing** on page 18.
23. Pull the displacement rod (34) in and out to be sure it moves easily
24. Grease the inside top of the displacement cylinder (108) opening. Thread the guide collar, Part No. 168085, onto the displacement cylinder. Slide the packing assembly into the collar/cylinder. See Fig. 14. Remove the guide collar.
25. To reconnect the reciprocator and pump, screw the connecting rod (117) into the displacement rod (34). Install the cotter pin (118). Make sure the o-ring (119) in the bottom of the adapter (43) 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. See Fig. 12.
26. Connect the hydraulic supply and return hoses to the fittings (5, 60).

⚠ WARNING

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

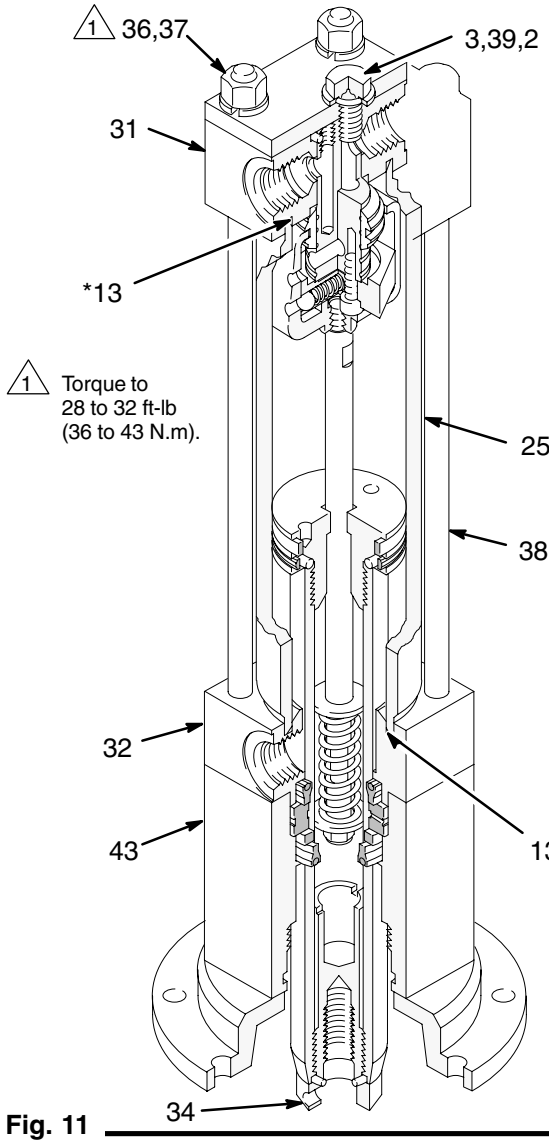


Fig. 11

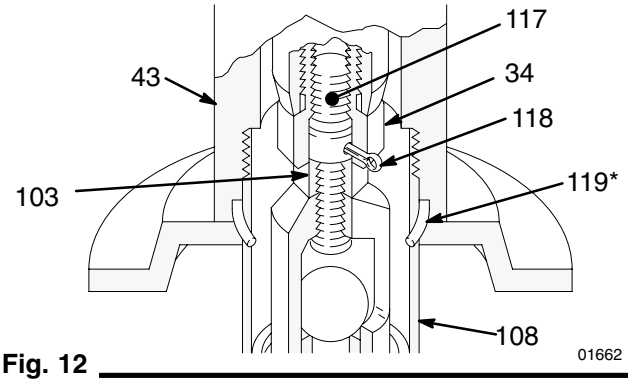
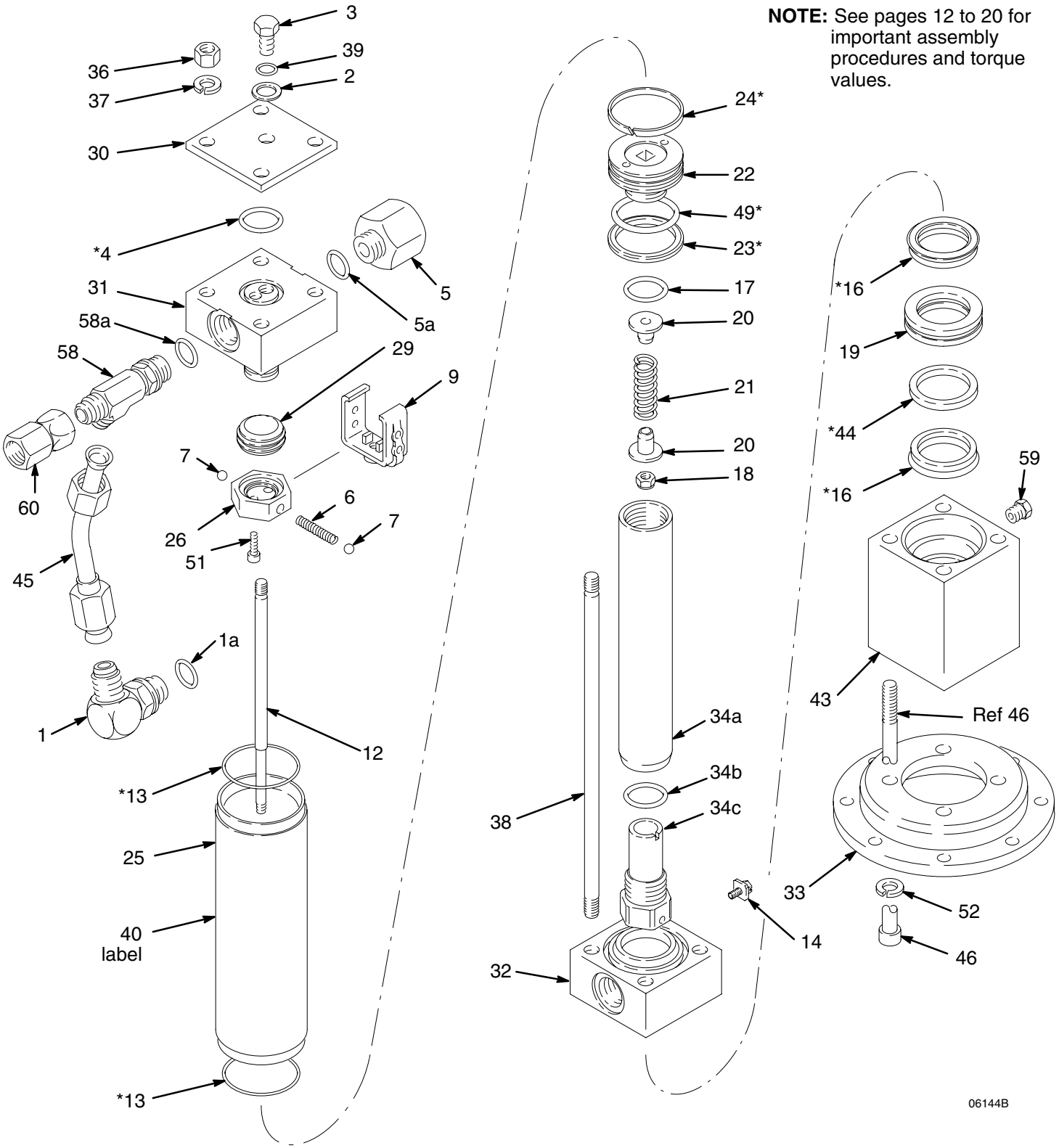


Fig. 12

Reciprocator Parts Drawing

Model 239882, Series A, Hydraulic Reciprocator



NOTE: See pages 12 to 20 for important assembly procedures and torque values.

Reciprocator Parts List

Model 239882, Series A, Hydraulic Reciprocator

Ref. No.	Part No.	Description	Qty.
1	106470	ELBOW, straight thread, 3/4–16 unf–2a x 3/4–16 unf–2a, 37° flare *includes item 1a*	1
1a✓	110987	.O-RING	1
2	178179	WASHER, sealing	1
3	106276	CAPSCREW, hex hd, 3/8–24 x 5/8”	1
4*	104093	O-RING, nitrile rubber	1
5	112568	ADAPTER, pipe,3/4 npt(f)	1
6	108437	SPRING, compression, steeL	1
7	100069	BALL, 1/4” dia. steel	2
9	189077	YOKE, valve	1
12	192657	ROD, stop, cs	1
13*	106274	O-RING, buna–N	2
14	116343	SCREW, grounding	1
16*	108952	PACKING, v-block	2
17	105765	O-RING	1
18	114231	LOCKNUT, hex, 1/4–28 unf–3b steel & nylon	1
19	183531	GUIDE, rod, bronze	1
20	192655	RETAINER, spring, cs	2
21✓	178189	SPRING, compression, steel	1
22	192656	PISTON, cs	1
23*	178226	SEAL, piston glass-filled Teflon®	1
24*	178207	BEARING, piston bronze-filled Teflon®	1
25	178229	CYLINDER, motor, cs	1
26	192654	STOP, valve, cs	1
29	192654	SLEEVE, valve, steel	1
30	178181	PLATE, cap	1
31	239874	SPOOL VALVE ASSEMBLY	1
32	186225	CAP, cylinder, bottom, cs	1
33	183833	BASE, aluminum	1
34	222301	DISPLACEMENT ROD ASSY. *Contains 34a to 34c*	
34a	188078	ROD, displacement	1
34b	105765	PACKING, o-ring	1
34c	178232	STOP, displacement rod	1
36	100307	NUT, full, hex, 3/8–16 unc–2b	4
37	100133	LOCKWASHER, 3/8”	4
38	187405	ROD, tie, 8.5” shoulder to shoulder, 3/8–16 unc–2a,cs	4
39	155685	O-RING	
40▲	179885	LABEL, Warning	1
43	183533	ADAPTER, pump, cs	1
44*	108951	SEAL, polyester elastomer	1
45	217221	TUBE, inlet	1
46	108986	CAPSCREW, sch; 3/18–16 unc–2a x 4.5”	4
49*	108014	O-RING, buna–N	1
51	104092	CAPSCREW, sch; 10–24 unrc–3a x 5/8”	2
52	106115	LOCKWASHER, spring, 3/8”	4
58	107197	TEE Includes item 58a	1
58a✓	110987	.O-RING	1
59	110064	PLUG, pipe, vented, 1/8–27 nptf	1
60	112569	UNION, swivel; steel	1

* *These parts are included in Repair Kit 223426, which may be purchased separately. The Repair Kit also includes item No. 119, shown on page 22.*

✓ *Keep these spare parts on hand to reduce downtime.*

▲ *Replacement Danger and Warning labels, tags, and cards are available at no cost.*

Assembly Tool 189305 *required for repairing the reciprocator.*

Displacement Pump Repair (Models 239882, 224741, and 224742)

Intake Valve. See Fig. 13.

⚠ WARNING

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

1. If possible, flush the pump. Relieve the pressure.
2. Unscrew the valve body (110). Remove the o-ring (111), ball (109), and retainer (112).
3. Inspect the parts for wear or damage. If the ball is nicked, replace it. Reassemble, using liquid thread sealant on the male threads.

Displacement Pump. See Fig. 13.

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 22 gives the recommended parts to keep on hand.

A guide collar is required for installing the piston in the displacement cylinder. Order **Guide Collar Tool, Part No.168085,** or make a collar using shim stock having a 0.016 in. (0.41 mm) maximum thickness.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 9.

1. If possible, flush the pump. Relieve the pressure.
2. Remove the intake valve. Follow **Disconnecting the Reciprocator and Displacement Pump** procedure on page 13.
3. Carefully inspect the smooth, inner surface of the cylinder (108) for scoring or irregular surfaces. Such damage causes premature packing wear and leaking, so replace the part if needed.
4. Place the piston housing (104) in a vise. Unscrew the piston seat (107), and remove the packings.
5. Grease the new piston packings, and stack them one at a time on the piston seat (107), making sure all parts face the way shown in Fig. 13. Install the ball (116). Apply liquid sealant to the male threads of the seat (107), and screw on the piston housing (104).
6. Remove the ball retainer (112) from the intake housing assembly by grabbing the open leg and pulling it toward the center of the housing. Inspect the ball (109) and seat, and replace as needed.

Displacement Pump Repair (Models 239882, 224741, and 224742)

Intake Valve Reassembly

7. Grease the inside top of the displacement cylinder (108) opening. Thread the guide collar, Part No. 168085, onto the displacement cylinder. Slide the packing assembly into the collar/cylinder. See Fig. 14. Remove the guide collar.

   NOTE: If you removed or turned the hex nut (103), check the ball travel. It should be 0.2” (5 mm), as shown in Fig. 13.

8. To reconnect the reciprocator and pump, screw the connecting rod (117) into the displacement rod (34). Install the cotter pin (118). Make sure the o-ring (119) in the bottom of the adapter (43) 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. See Fig. 13.

9. Reinstall the intake valve assembly by doing the reverse of step 6 on page 20.

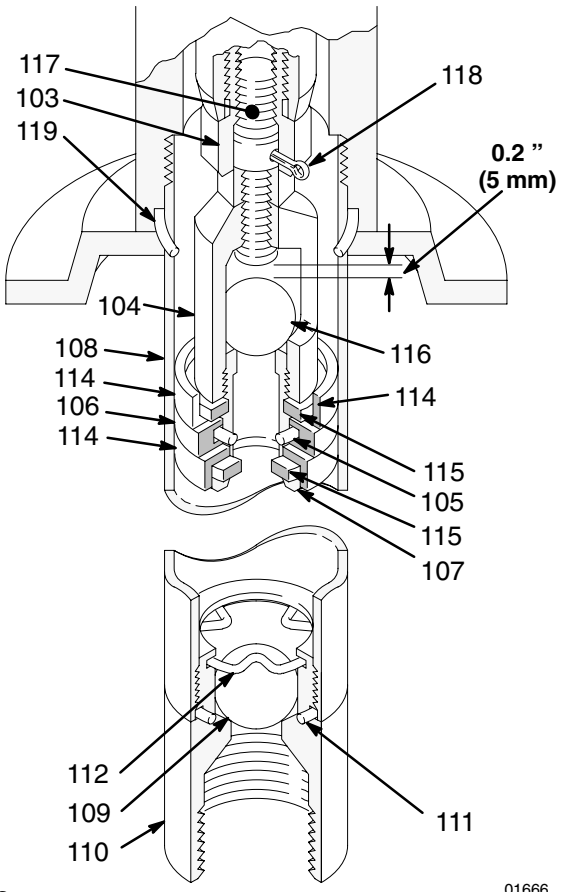


Fig. 13

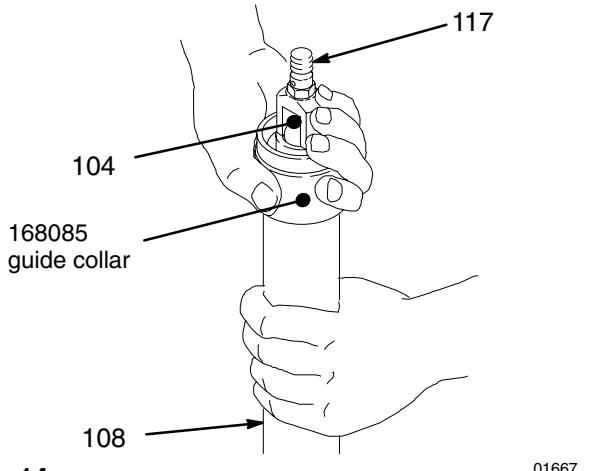


Fig. 14

Displacement Pump Parts Drawing and List

Model 224741, Series C, Universal 1:1 Ratio Pump, Includes items 101 to 120

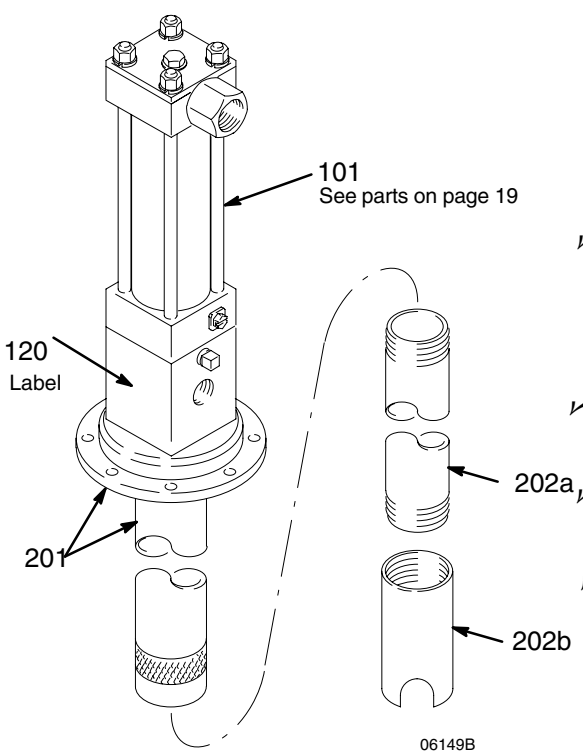
Model 224742, Series C, Hydraulic Reciprocator, Includes items 201 and 202

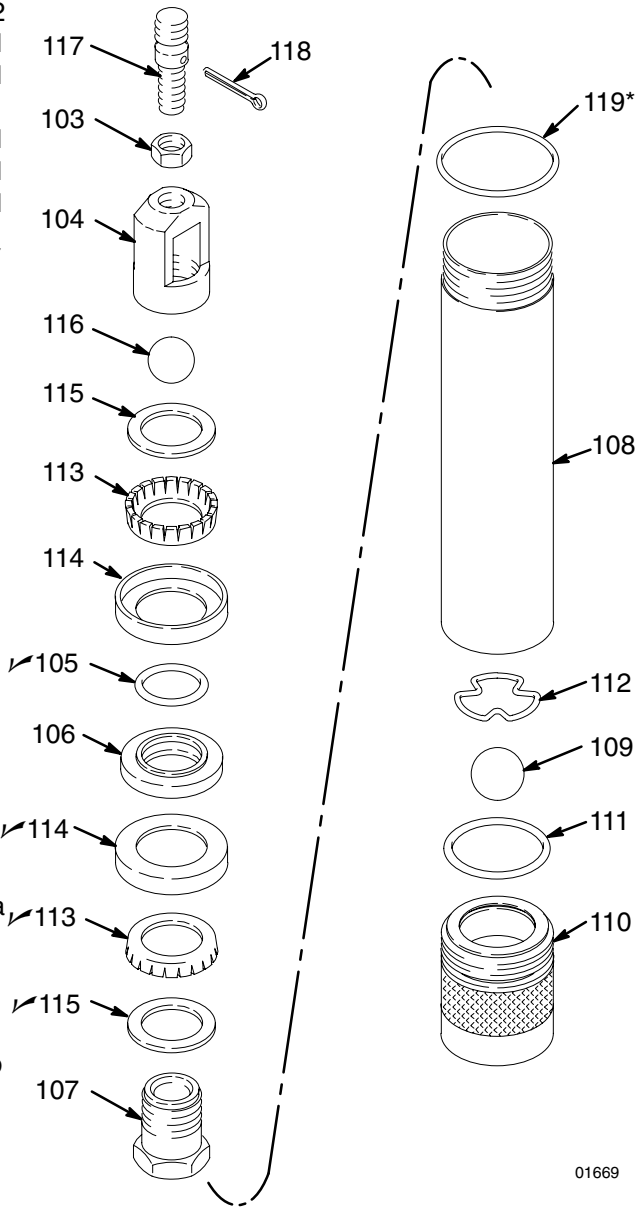
Ref. No.	Part No.	Description	Qty.
101	239882	HYDRAULIC RECIPROCATOR See parts on page 19	1
103	100111	NUT, hex jam, 1/2–20	1
104	157184	HOUSING, piston	1
105✓	154662	O-RING, buna–N	1
106	158857	SPACER, fluid piston packing	1
107	156989	SEAT, piston	1
108	183010	CYLINDER, displacement	1
109	101190	BALL, steel, 1” (25 mm) dia	1
110	183009	BODY, valve	1
111	156633	O-RING, nitrile rubber	1
112	157182	RETAINER, ball	1
113✓	171590	WASHER, spreader	2
114✓	158402	PACKING, leather cup	2
115✓	171594	WASHER, back-up	2
116	100279	BALL, steel 0.88” (22.2 mm) dia	1
117	183529	ROD, connecting	1
118	100103	PIN, cotter, 0.125” (3.2 mm) dia, 1.5” (38 mm) long	1
119*	108993	O-RING, buna–N	1
120	183741	LABEL	1

Ref. No.	Part No.	Description	Qty.
201	224741	1:1 RATIO DYNA-STAR RECIPROCATOR & PUMP See parts list to left	1
202	222346	DROP TUBE Includes items 202a and 202b	1
202a	185151	TUBE	1
202b	110127	.SPACER, foot	1

* *These parts are included in Repair Kit 223426, which may be purchased separately. See page 19.*

✓ *Keep these spare parts on hand to reduce downtime.*





Displacement Pump Repair (Model 237653)

Disassembly

When disassembling the pump, lay out all removed parts in sequence, to ease reassembly. See **Parts Drawing** on page 25.

NOTE: Clean all the parts thoroughly when disassembling. Check them carefully for damage or wear, replacing parts as needed.

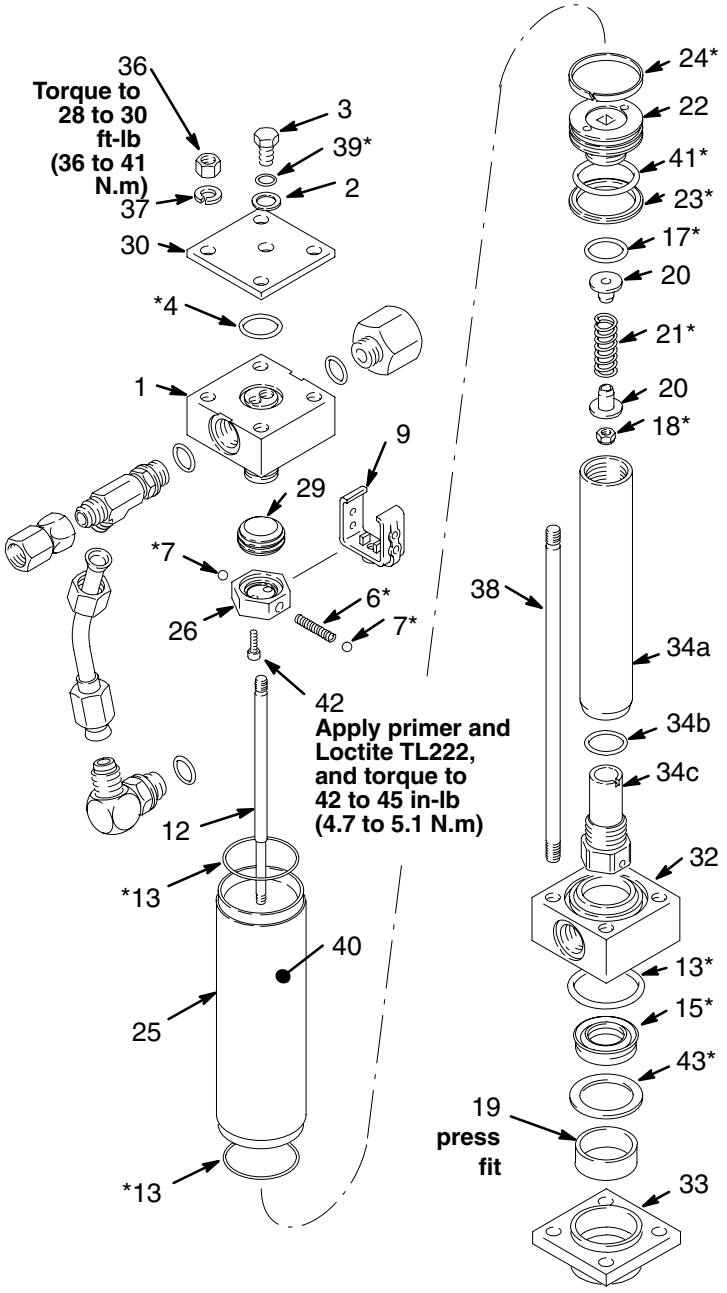
1. Remove the displacement pump from the reciprocator as explained on page 13.
2. Unscrew the locking ring (17) from the cylinder (11). Remove the intake valve housing (13).
3. Remove the o-ring (12), ball stop pin (5), ball guide (22) and ball (2) from the intake valve housing (13).
4. Loosen the packing nut (15). Push the displacement rod (7) down as far as possible, then pull it out the bottom of the cylinder (11).
5. Secure the flats of the piston (14) in a vise. Using a wrench on the flats of the piston mounting stud (28), screw the piston stud off the piston.
6. Remove the piston packings (25, 26), glands (24, 27), shim (29), and washer (23).
7. Remove the packing nut (15), throat packings (9, 19) and glands (6, 8) from the outlet housing (16).
8. Inspect all parts for damage. Clean all parts and threads with a compatible solvent before reassembling. Inspect the polished surfaces of the displacement rod (7) and cylinder (11) for scratches, scoring or other damage, which can cause premature packing wear and leaking. To check, run a finger over the surface or hold the part up to the light at an angle. Be sure the ball seats of the piston (14) and intake valve housing (13) are not chipped or nicked. Replace any worn or damaged parts.

Reassembly

1. Lubricate the throat packings and install them in the outlet housing (16) one at a time as follows, *with the lips of the v-packings facing down:* the male gland (6*), two neoprene v-packings (9*), one UHMWPE v-packing (19*), and the female gland (8*). Apply thread lubricant and install the packing nut (15) loosely.
2. Lubricate the piston packings and install them onto the piston stud (14) one at a time in the following order, *with the lips of the v-packings facing up:* the female gland (27*), one UHMWPE v-packing (25*), one neoprene v-packing (26*), one UHMWPE v-packing (25*), the male gland (24*), the shim (30), and the washer (23*).
3. Place the flats of the displacement rod (7) in a vise, screw the piston stud (14) onto the displacement rod, and torque to 50–70 ft–lb (68–95 N.m).
4. Slide the ball stop pin (10*) into the desired set of holes, and secure with the new cotter pins (1*). Install the piston ball (2*) in the piston mounting stud.
5. Screw the piston stud (14) onto the piston mounting stud (28), and torque to 50–70 ft–lb (68–95 N.m).
6. Insert the displacement rod (7) into the top of the cylinder (11), being careful not to scratch the cylinder. Insert only until the packings are in the cylinder.
7. Lubricate the o-ring, and apply thread lubricant to the cylinder, then reinstall the cylinder in the outlet housing (16).
8. Install the ball (2*), guide (22), o-ring (12), and ball stop pin (5*) in the intake valve housing (13). Place the intake valve assembly in the cylinder (11). Apply thread lubricant to the locking ring and cylinder (11), and screw the ring onto the cylinder.
9. Reconnect the displacement pump to the reciprocator by performing the reverse of the disassembly procedure on page 13 (see Fig. 6 on page 13).

Reciprocator Parts Drawing and List

Model 237653, Series B



NOTE: Reciprocator/pump Model 237653, Series B, has reciprocator Model 217222, Series J, which is shown here.

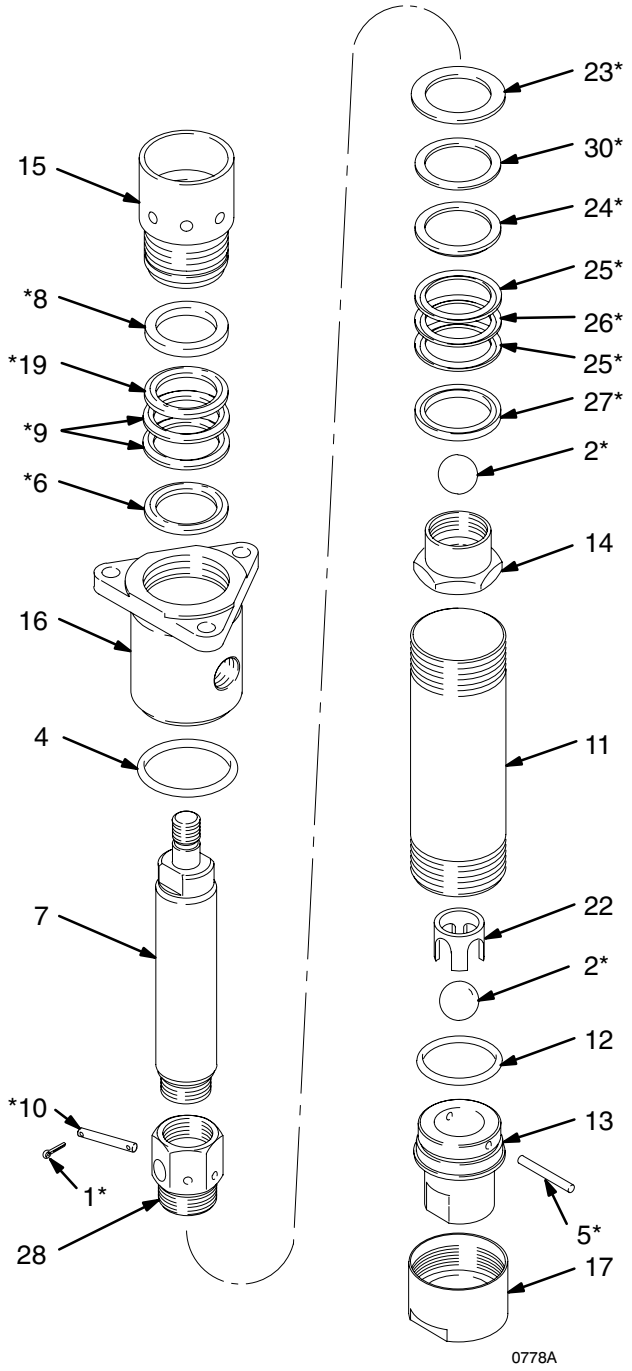
Ref No.	Part No.	Description	Qty
1	239874	CYLINDER CAP ASSY, upper	1
2	178179	WASHER, sealing	1
3	106276	CAPSCREW, hex hd; 3/8” thd x 0.625” long	1
4*	104093	O-RING; nitrile rubber	1
6*	108437	SPRING, compression; steel	1
7*	100069	BALL; steel; 1/4” dia.	2
9	189077	YOKE, valve	1
12	192657	ROD, trip	1
13*	106274	O-RING; buna-N	3
15*	109194	V-PACKING, block	1
17*	105765	O-RING; buna-N	2
18*	114231	LOCKNUT, hex, 1/4–28 UNF–3B; steel/nylon	1
19	178185	BEARING, sleeve	1
20	192655	RETAINER, spring, cs	2
21*	178189	SPRING, compression; steel	1
22	192656	PISTON; cs	1
23*	178226	SEAL, piston; glass-filled Teflon®	1
24*	178207	BEARING, piston; bronze-filled Teflon®	1
25	178229	CYLINDER, motor; cs	1
26	192654	STOP VALVE, cs	1
29	189072	SLEEVE, valve; steel	1
30	178181	PLATE, cap	1
32	178235	CAP, cylinder, bottom	1
33	178233	RETAINER, housing	1
34	222301	DISPLACEMENT ROD ASSY. *Contains 34a to 34c*	
34a	188078	ROD, displacement	1
34b	105765	PACKING, o-ring	1
34c	178232	STOP, displacement rod	1
36	106292	NUT, hex; 3/8” thread	4
37	100133	WASHER, lock; 3/8”	4
38	178228	ROD, tie; 12.28” (312 mm); cs	4
39*	155685	O-RING; buna-N	1
40▲	179885	LABEL, warning	1
41*	108014	O-RING; buna-N	1
42		CAPSCREW, sch; 10–24 unrc–3a x 5/8” *Not an orderable part*	1
43*	183915	WASHER	1

* *Included in repair kit 218210.*

▲ *Replacement warning labels available at no charge.*

Displacement Pump Parts Drawing and List

Model 237653, Series B



NOTE: Reciprocator/pump Model 237653, Series B, has displacement pump Model 224344, Series F, which is shown here.

Ref No.	Part No.	Description	Qty
1*	100063	PIN, cotter; 1/16” x 1/2”; sst	2
2*	101917	BALL, 0.875” (22 mm); sst	2
4	164782	O-RING; Teflon®	1
5*	162947	PIN, ball stop, intake; sst	1
6*	186987	GLAND, throat, male; sst	1
7	186997	ROD, displacement; sst	1
8*	186988	GLAND, throat, female; sst	1
9*	166133	V-PACKING, throat; neoprene	2
10*	176637	PIN, ball stop, piston; sst	1
11	186994	CYLINDER; sst	1
12	164846	O-RING; Teflon®	1
13	186992	HOUSING, valve, intake; sst	1
14	186993	STUD, piston; sst	1
15	186995	PACKING NUT/WET-CUP; sst	1
16	205999	HOUSING, outlet; sst	1
17	164630	RING, locking; sst	1
19*	170625	V-PACKING, throat; UHMWPE	1
22	164679	GUIDE, ball, intake; sst	1
23*	176634	WASHER, piston; sst	1
24*	186990	GLAND, piston, male; sst	1
25*	176638	V-PACKING, piston; UHMWPE	2
26*	111293	V-PACKING, piston; neoprene	1
27*	186989	GLAND, piston, female; sst	1
28	176644	STUD, mounting, piston; sst	1
30*	111790	SHIM; sst	1

* *Included in Repair Kit 224402 (neoprene and UHMWPE packings), which may be purchased separately.*

Technical Data

Maximum hydraulic fluid input pressure and maximum fluid output pressure	
Models 239882, 224741, and 224742	1500 psi (10 MPa, 102 bar)
Model 237653	1000 psi (7 MPa, 69 bar)
Maximum hydraulic fluid input volume	3 gpm (11.7 lpm)
Fluid consumption rate	6.5 ounces (0.195 liter) per cycle or 1 gallon per 19.5 cycles
Maximum fluid temperature	130° F (55° C)
Pressure reducing valve adjustment range	50 to 1500 psi (0.34 to 10 MPa, 3.4 to 102 bar)
Effective piston area	1.48 sq in. (9.55 cm^2)
Piston rod diameter	1.375 in. (34.9 mm)
Output per cycle	0.55 gpm with No. 30 oil at 60 cpm
Stroke	4 in. (101.6 mm)
Thrust at 1000 psi (7 MPa, 69 bar)	1480 lb (673 kg)
Maximum suction lift	13 feet (4 m)
Displacement pump wetted parts	steel, copper, leather
Weight	24 lb (11 kg)
Sound pressure*	77 dB(A)

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

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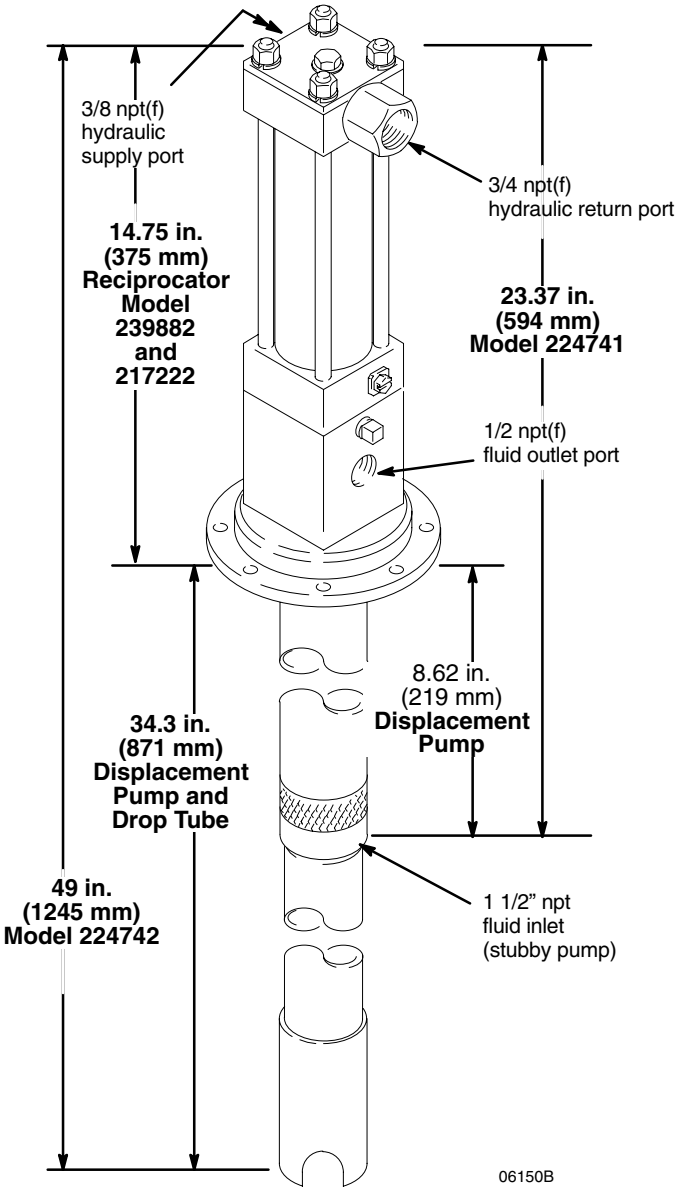
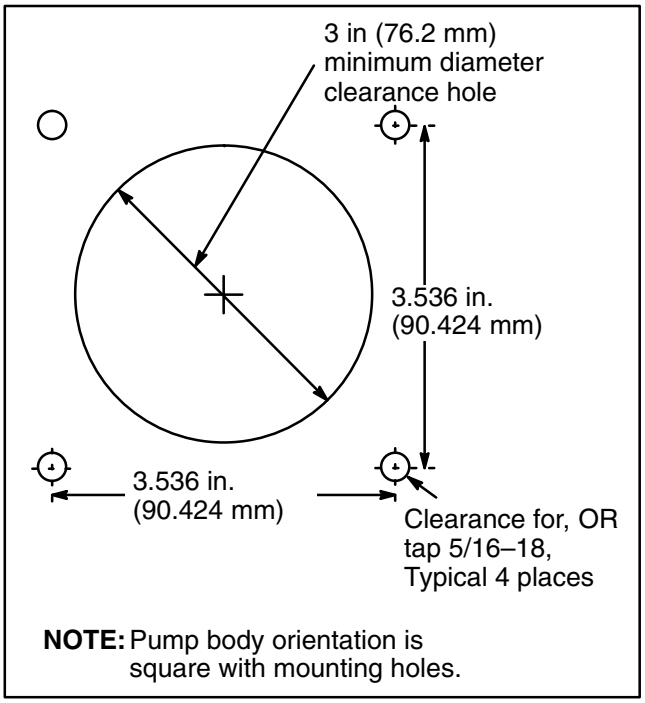
Teflon® is a registered trademark of the DuPont Company.

Dimensions and Mounting Hole Layout





NOTE: Pump body orientation is square with mounting holes.

Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non–Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS
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Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call one of the following numbers to identify the distributor closest to you:

1–800–328–0211 Toll Free
612–623–6921
612–378–3505 Fax

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