Instructions -**Operation and Service**

HYDRA-CAT® FIXED RATIO Proportioning Pumps

Available as Bare Pumps*, Wall–Mounted*, or Free-Standing* Models *Includes Automatic Pressure Relief Valves, Check Valves, Pressure Gauges, and Regulators. ENTER CODE NUMBER ON LINE BELOW Enter Part No. ___ __ __ __ __ **NOTE:** This manual is a reference when using Configured Hydra-Cat and manual 309002. Read warnings and instructions. See page 2 for Table of Contents and Related Manuals. **Typical Free Standing Assembly Shown** 02884A

Plural Component Materials Hazard

Graco, Inc. does not manufacture or supply any of the reactive chemical materials that may be used in this equipment and is not responsible for their effects. Because of the vast number of chemicals that could be used and their varying chemical reaction, before using this equipment the buyer and user should determine all facts relating to the materials used, including any of the potential hazards involved. Particular inquiry and investigation should be made into the potential dangers relating to toxic fumes, fires, explosions, reaction times, and exposure of human beings to the individual components or their resultant mixtures. Graco assumes no responsibility for loss, damage, expense or claims for bodily injury or property damage, direct or consequential, arising from the used of such chemical components.

C E

PROVEN QUALITY. LEADING TECHNOLOGY.

GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440-1441 Copyright 1999, Graco Inc. is registered to I.S. EN ISO 9001



308986 rev.D

Table of Contents

Warnings	Sł
System Information	Tr
Typical Installation	Se
Dimensions	Se
Flushing	Gr
Operation	Gr

Shutdown and Care of the System	30
Froubleshooting	31
Service – Pneumatic Displacement pump	34
Service – Hydraulic Displacement pump	36
Graco Warranty	38
Graco Phone Number	38

Related Manuals

Manual	No.
10:1 Ratio BullDog® Pump	306821
King [®] Air Motors	309347
President [®] Air Motors	306982
BullDog [®] Air Motors	307049
Viscount [®] II Hydraulic Motors	307158
Displacement Pump	307430
Displacement Pumps	307431
Viscount [®] Hydraulic Reciprocator	307654
Displacement Pumps	307944
Configurator Product Order Form	309002
Displacement Pumps	684004

Warnings

Warning Symbol

WARNING

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

Caution Symbol

A CAUTION

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

EQUIPMENT MISUSE HAZARD
Equipment misuse can cause the equipment to rupture, malfunction, or start unexpectedly and result in serious injury.
This equipment is for professional use only.
 Read all instruction manuals, warnings, tags, and labels before operating the equipment.
 Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
 Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
 Check the equipment daily. Repair or replace worn or damaged parts immediately.
 Do not exceed the maximum working pressure of the lowest rated system component. See the Technical Data section of all the equipment manuals.
• See Configurator Product Order Form 309002 for important pressure rating information. The maxi- mum working pressure of each model is also shown on the pump identification plate. Be sure that all dispensing equipment and accessories are rated to withstand the maximum working pressure of your pump. Do not exceed the maximum working pressure of the lowest rated system component.
 Never operate the pump without the automatic pressure relief valves and drainage kits installed. These valves relieve fluid pressure through a drain port at the bottom of the valve if the displace- ment pump pressure exceeds the working pressure.
 Never exceed the recommended working pressure or the maximum air inlet pressure stated on your pump or in the Configurator Product Order Form 309002.
Do not lift pressurized equipment.
 Use only Graco approved hoses. Do not remove hose spring guards, which help protect the hose from rupture caused by kinks or bends near the couplings.
 Route the hoses away from the traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below –40°F (–40°C).
 Do not use the hoses to pull the equipment.
 Use fluids and solvents that are compatible with the equipment wetted parts. See the Technical Data section of all the equipment manuals. Read the fluid and solvent manufacturer's warnings.
• Comply with all applicable local, state and national fire, electrical and other safety regulations.

INJECTION HAZARD

Spray from the spray gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid 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 medi**cal attention.
- Do not point the gun/valve at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect fluid leaks with your hand, body, glove, or rag.
- Do not "blow back" fluid; this is not an air spray system.
- Check the gun diffuser operation weekly. Refer to the gun manual.
- Always have the trigger guard on the gun when dispensing.
- Check the gun diffuser operation weekly. Refer to the gun manual.
- Be sure the gun/valve trigger safety operates before dispensing.
- Lock the gun/valve trigger safety when you stop dispensing.
- Follow the **Pressure Relief Procedure** on page 23 if the nozzle 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, damaged, or loose 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.

FIRE, EXPLOSION AND ELECTRIC SHOCK HAZARD



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



• Ground the equipment, the object being dispensed, and all other electrically conductive objects in the dispense area. Proper grounding dissipates static electricity generated in the equipment. Refer to **System Grounding** on page 11.



- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvent or material.
- Do not use the heater with flammable liquids, such as those having flash points below 200° F (93° C).
- Extinguish all open flames or pilot lights in the dispense area.
- Do not turn on or off any light switch in the dispense area.
- Do not use this equipment with flammable liquids.
- Keep the dispense area free of debris, including solvent, rags, and gasoline.
- Do not smoke in the dispense area.
- Do not operate a gasoline engine within the spray area.
- If there is any static sparking or you feel an electric shock while using the equipment, **stop dispensing immediately**. Do not use the equipment until you have identified and corrected the problem.

	MOVING PARTS HAZARD		
	Moving parts can pinch fingers.		
	• Keep clear of all moving parts when starting or operating the equipment.		
	TOXIC FLUID HAZARD		
Ő	Hazardous fluid 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.		
	Avoid exposure to heated material fumes.		
	Provide adequate ventilation.		
	• Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.		

System Information

This manual describes pumps designed to be part of a Hydra-Cat dispensing system that will proportion, mix, and dispense two-component fluids. The fixed ratio proportioners accurately pump and proportion two– component materials by powering two or three positive displacement pump lowers from a common air motor. This assures that the stroke rate and stroke length of all pump lowers are identical, providing constant proportioning. The mix ratio is fixed by selecting compatible sets of two or three lowers (see Configurator Product Order Form 309002). The basic proportioner includes an air motor, lower displacement pumps, air controls, fluid inlet hardware, fluid outlet hoses, manifold blocks and relief valve. Additional proportioner accessories are selectable to complete the proportioner pump (see Configurator Product Order Form 309002).

Typical Installation

About Typical Installations

The typical installations shown below and on pages 8 and 9 are only guidelines to setting up a complete proportioning system. For clarity, various components are shown in the correct order but may not be shown in the exact position of the installed system. For assistance in designing your system, contact your nearest Graco representative.

Two Displacement Pumps, with Feed Pumps

KEY

- A Bleed-type master air valve
- B Air filter
- C Air lubricator
- D Pump runaway valve
- E Pump air regulator
- F Feed pump
- G Ground wire
- H Proportioning pump
- J Fluid pressure gauge
- K Check valve
- L Automatic pressure relief valve
- M Fluid filter (Optional)
- N Mixer manifold
- Fluid drain valve
- Q Fluid shutoff valve

Р

- R Static mixer
- S Dispense valve
- T Fluid regulator U Solvent pump
- U Solvent pump V Fluid strainer

NOTE: When pressure feeding the proportioning pump, mount fluid pressure gauges (J) at the proportioning pump inlets to monitor proper adjustment of the feed pump pressures. **Never exceed 400 psi on the inbound fluid pressure and never exceed 25% of the Hydra-Cat pump outbound fluid pressure on the feed supply.**

- 1 See note above



Typical Installation

About Typical Installations

The typical installation shown below, and on pages 7 and 9, are only a guidelines to setting up a complete proportioning system. For clarity, various components are shown in the correct order but may not be shown in the exact position of the installed system. For assistance in designing your system, contact your nearest Graco representative.

Heavy Viscosity Heated Feed System with **Three Displacement Pumps**

J

Q

KEY

- А Bleed-type master air valve
- В Air filter С
 - Air lubricator
- D Pump runaway valve
- Е Pump air regulator
- F Feed pump
- G Ground wire
- Н Proportioning pump
- κ Check valve L Automatic pressure
- relief valve М
- Fluid filter (Optional) Ν Mixer manifold
- Р Fluid drain valve

Fluid pressure gauge

- Fluid shutoff valve
- R Static mixer

feed supply.

- S Dispense valve Т
- Fluid regulator
- U Solvent pump V Fluid strainer
- W
- Flow control valve Х
- Ζ
- See note above Connect to drain bottle. See Fig. 6, page 13

NOTE: When pressure feeding the proportioning pump, mount fluid pressure gauges (J) at the propor-

feed pump pressures. Never exceed 25% of the

Hydra-Cat pump outbound fluid pressure on the

tioning pump inlets to monitor proper adjustment of the





Typical Installation

About Typical Installations

The typical installation shown below, and on pages 7 and 8, are only a guidelines to setting up a complete proportioning system. For clarity, various components are shown in the correct order but may not be shown in the exact position of the installed system. For assistance in designing your system, contact your nearest Graco representative.

Hydraulic Pump

KEY

- A Hydraulic Pump
- B Mounting Stand
- C Hydraulic Supply Line
- D Hydraulic Return Line
- **E** Drain Line (from pressure reducing valve)
- F Pressure Gauge
- G Flow Control Valve
- H Pressure Reducing Valve
- J Accumulator

- K Feed Pumps
- P Hydraulic Supply Line Shutoff Valve
- R Hydraulic Return Line Shutoff Valve
- S Hydraulic Return Line Filter
- U Hydraulic Power Supply
- V Fluid Hose
- W Fluid Supply Line
- Y Pump Ground Wire (required; see page 11 for installation instructions)



Fig. 3 _

Bare Pumps

Bare pumps, with relief valves and inlet kits but without stands, are available for those installations which require a highly customized system. For a safe and efficient system, Graco recommends that the air and fluid components supplied with the Wall Mount and Stand models also be used in customized systems. In addition, the accessories shown in the Typical Installation drawings and discussed in the following pages of this manual should be used.

Be sure all accessories are sized properly for the air and fluid requirements of your system.

Read all instructions in the Installation section for further details.

NOTES:

- 1. Models with three displacement pumps always use the two outer displacement pumps to supply the resin and the middle displacement pump to supply the hardener.
- 2. Label all pumps, hoses, fluid regulators, etc. to indicate whether they are for the resin side or hardener side of the system.

Mounting the Pump

Mount the pump to suit your installation. The bare pump can be mounted on a wall bracket or on a stand. See the Mounting Hole Layout on page 19.

For a wall mount, be sure the bracket and wall are strong enough to support the pump, accessories, plumbing and stress caused by pump operation. Locate the bracket about 5 ft (1.5 m) above the floor.

Grounding



FIRE AND EXPLOSION HAZARD Improper grounding could cause static sparking, which could cause a fire or explosion. To reduce the risk of property

damage or serious injury, follow the grounding instructions below.

The following grounding instructions are minimum requirements for a system. Your system may include other equipment or objects which must be grounded. Check your local electrical code for detailed grounding instructions for your area and type of equipment. Your system must be connected to a true earth ground.

1. Pump:

- a. Loosen the grounding lug locknut (Fig. 4, Item BB) and washer (AA).
- b. Insert one end of a 14 ga. (1.5 mm²) minimum ground wire (G) into the slot in lug (CC) and tighten the locknut securely.
- c. Connect the other end of the ground wire to a true earth ground.



Available Accessories (must be purchased separately)

- 1. **Air hoses:** use only grounded hoses with a maximum of 500 feet (150 m) combined hose length to ensure grounding continuity.
- 2. Air and Paint Line Filters: locate all filters and learn all filter cleaning procedures before operating the system. Optional filters are available to meet particular system needs. Be sure all filters are checked and cleaned every day.
- 3. **Filters:** be sure your hydraulic power supply (U) is equipped with a suction filter to the hydraulic pump and a system return line filter (S) of 10 micron size.

Carefully follow the manufacturer's recommendations on reservoir and filter cleaning, and periodic changes of hydraulic fluid. Use only Graco approved hydraulic oil. Order Part No. 169236, 5 gallon (19 liter) or 207428, 1 gallon (3.8 liter).

4. **Hydraulic Line Accessories:** on the hydraulic supply line (Item C, Fig. 3), install the following accessories in the order shown in Fig. 3, using adapters as necessary.

A CAUTION

It is very important to keep the hydraulic supply system clean at all times. Be sure that all hydraulic fluid lines are absolutely clean. Blow out the lines with air and flush thoroughly with solvent before connecting to the hydraulic motor, to avoid introducing harmful contaminants into the motor.

For optimum pump performance, keep the temperature of the hydraulic oil below $130^{\circ}F$ ($54^{\circ}C$).

- a. Shutoff valve (P): to isolate the pump for servicing.
- Fluid pressure gauge (F): to monitor hydraulic oil pressure to the motor and to avoid overpressurizing the motor or displacement pumps.
- c. Pressure and temperature-compensated flow control valve (G): to prevent the motor from running too fast and possibly damaging itself.
- d. Pressure reducing valve (H) with drain line (E): running directly into the hydraulic return line (D).
- e. Accumulator (J): to reduce the hammering effect caused by the motor reversing direction. 308986 11

Available Accessories (Cont'd)

On the hydraulic return line (D), install the following accessories in the order shown in Fig. 3, using adapters as necessary.

- f. shutoff valve (R): to isolate the pump for servicing.
- g. Filter (S): 10 micron size.

Install the following accessories in the order shown in Fig. 3, using adapters as necessary.

A fluid drain valve (L) is required in both fluid lines to the gun, to help reduce the risk of serious injury, including splashing of fluid in the eyes or on the skin.

The fluid drain valve assists in relieving fluid pressure in the displacement pump, hose, and spray gun. Triggering the gun to relieve pressure may not be sufficient.

- h. Fluid drain valves (L): are required in your system to relieve fluid pressure in the hose and gun (see the **WARNING** above).
- 5. Fluid hoses: use only grounded fluid hoses.

- 6. **Hydraulic Power Supply or Air compressor:** follow manufacturer's recommendations.
- 7. **Spray gun or dispensing valve:** grounding is obtained through connection to a properly grounded fluid hose and pump.
- 8. Fluid supply container: according to local code.
- 9. **Object being sprayed:** according to your local code.
- 10. All solvent pails used when flushing, according to local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts the grounding continuity.
- 11. To maintain grounding continuity when flushing or relieving pressure, always hold a metal part of the dispensing unit firmly to the side of a grounded metal pail, then trigger the dispensing unit.

Air Control Accessories

Install the accessories in the order shown in Fig. 5. Mount only the air regulator (E) and a master air valve (A) at the pump. Mount all other accessories on separate wall brackets to reduce stress on the pump inlet. Note that one air filter (B) can serve multiple pumps by using an air manifold downstream from the air filter.

INJECTION HAZARD

Bleed-type master air valves (A) are required in the system in the positions shown in the Typical Installation drawings. These valves are used during system pressure relief to relieve air trapped in the air line. Trapped air can cause the pump to cycle unexpectedly and result in serious injury from moving parts, fluid injection, or fluid splashing.



NOTE: Installation of pump runaway valve (D):

 For Bulldog Air Motors: install runaway valve (D) before the air regulator (E) and air motor (F).

 For Monark and President Air Motors: install runaway valve (D) between the air regulator (E) and air motor (F).

02887

Fig. 5 _

- 1. Install a bleed-type master air valve (A) in the pump air inlet.
- 2. Install an air regulator and gauge (E) to control pump outlet pressure.

- Install a pump runaway valve (D) for each feed pump to automatically shut off the air to the pump if the pump accelerates beyond the pre-adjusted setting. A pump which runs too fast can be seriously damaged.
- 4. Install an air line lubricator (C) for automatic air motor lubrication.
- 5. Install an air filter (B) to remove harmful dirt and moisture from the compressed air supply.

Automatic Pressure Relief Valves

See Fig. 6.

WARNING

COMPONENT RUPTURE HAZARD

To reduce the risk of component rupture, which could cause serious injury and property damage, the appropriate auto-

matic pressure relief valve (A) is **required** for each fluid on a plural component pump.

These valves automatically relieve fluid pressure if the pump output pressure exceeds the valve's preset pressure. Over-pressurization may occur if there is a fluid line clog upstream from the valve or if any other condition exists that causes one of the pumps to cavitate and direct all fluid pressure to the other pump(s).

See Configurator Product Order Form 309002 to determine the preset pressure in your system.



Automatic Pressure Relief Valves (continued)

Fig. 6. Two drain bottle kits (B) are included with the stand mount models to catch the drainage if the automatic pressure relief valves (A) open.

WARNING

INJECTION HAZARD

Be sure to use the drain bottles and drain lines provided. If system pressure is exceeded, fluid emitted from the automatic pressure drain valves may be at pressures over 3000 psi (21 MPa, 207 bar). To reduce the risk of serious injury from fluid injection or fluid splashing, make sure the drain bottles are securely fastened to the frame or wall so that they can handle a sudden discharge of pressurized fluid. Discharged fluid on floors can also cause a slipping hazard if not collected.

Connect Fluid Supply Hoses

NOTE: If you mount the pump on a wall, turn the displacement pump inlet assemblies (CC) to face forward, rather than backwards as shown in Fig. 7.

Two Displacement Pump Models

- Connect the resin supply hose (EE) to the 3/4 npt swivel inlet (37B) for the resin displacement pump. See Fig. 7.
- Connect the hardener supply hose (DD) to the 3/4 npt swivel inlet (37A) for the hardener displacement pump. See Fig. 7.

Three Displacement Pump Models

- Connect the resin supply hose (EE) to the 3/4 npt swivel inlet (37B) for the resin displacement pumps. See Fig. 8.
- Connect the hardener supply hose (DD) to the 3/4 npt swivel inlet (37) for the center (hardener) displacement pump. See Fig. 8.

Additional System Components

Install and connect the feed pumps, solvent pump, heaters, etc. Refer to the Typical Installations (pages 7, 8 and 9) for parts information.

Use a dry air kit or a nitrogen regulator kit to protect the fluid in the supply containers from moisture that can crystallize the fluid and cause the ball checks to malfunction. See Accessories in Configurator Product Order Form 309002.





Installation – Optional Fluid Heaters



WARNING

INJECTION HAZARD To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 23 before installing the heaters.

All Models

- 1. See Fig. 9. Mount a heater to each side of the mounting bracket using the three screws (201a) and lockwashers (201b) supplied with each heater.
- 2. Connect a swivel union (202) to the outlet of each heater.
- 3. Connect a swivel union (203) to the inlet of each heater.

Use heaters for unmixed material only. Heating mixed material will cause the mixture to solidify in the heater making the heater unusable.

Heaters can be used to heat separate material components before mixing. Material can also be heated in a circulation feed system or between the outlet of the material pump and the mix manifold.

Installation – Optional Fluid Heaters

Two Displacement Pump Models

- 1. See Figs. 10 and 11. Loosen swivels of unions (17A and 17B) to remove elbows (16A and 16B) on each side of mixer manifold (23). Turn unions (17A and 17B) so outlets faces up.
- 2. Connect new hardener fluid hose (204B) between union (17B) and swivel (203B) at heater inlet.
- 3. Install another hardener fluid hose (FB) between heater outlet elbow (202B) and hardener side of mixer manifold (23).
- 4. Repeat Steps 1 to 3 for resin side of system ("A" side).

See Three Displacement Pump Models on next page.





Installation – Optional Fluid Heaters





Three Displacement Pump Models

- 1. Loosen the swivel of the unions (17A, 17B) to remove the elbow (16A, 16B) on each side of the mixer manifold (23). Turn the unions (17A, 17B) so the outlet faces up. See Figs. 12 and 13.
- 2. Connect a new hardener fluid hose (204B) between the union (17B) and the swivel (203B) at the heater inlet. See Fig. 12.
- 3. Install another hardener fluid hose (FB) between the heater outlet elbow (202B) and the hardener side of the mixer manifold (23). See Fig. 12.
- 4. Repeat Steps 1 to 3 for the resin side of the system (the "A" side).



Installation – Optional Solvent Pump

NOTE: The optional solvent pump is not offered as a kit; order parts as needed. These instructions assume that the pump is being mounted to the back of the stand offered in this manual. The Typical Installations on pages 7 and 9 shows an alternate installation. Adjust your installation according to your specific needs.

- 1. Mount the solvent pump bracket (310) on the back of the stand.
- 2. Mount the pump (306) to the bracket using the hardware supplied with the pump.
- 3. Use the existing proportioning pump air regulator (5) to supply air to the solvent pump. Remove the plug from the back of the swivel union (3) and install the adapter (301). Rotate the regulator gauge elbow (4) so the gauge is facing the operator.

- 4. Couple the hose (303) and couplings (302). Connect the hose (303) to the adapter (301).
- 5. Install the other adapter (301), needle valve (304) and adapter (305) to the pump inlet.
- 6. Connect the adapter (307), elbow (308) and fluid hose (309) to the pump outlet.
- 7. Install a fluid shutoff valve (311) at the mixer manifold swivel union (15). This valve is used to prevent resin or hardener from backing up into the solvent system, and to isolate the solvent system for service. Connect the solvent inlet hose (309).
- 8. Connect the suction hose assembly (312) to the pump intake.









Dimensions



Flushing

When to Flush the System

- Flush the system before its first use to remove the light oil which was left in after factory testing.
- Flush the manifold mixer (N), using the solvent pump, as frequently during the day as necessary to avoid exceeding the pot life limit of the material being pumped.
- Flush frequently enough during regular operation to prevent clogged passages due to material being overheated or dried out in any part of the system. Clogged passages in the heater can be very difficult to clean and can reduce heating efficiency, flow rate and pressure.
- Flush the entire system when the system is shut down for a long period of time. Keep in mind that some moisture may get into the lines, which could contaminate the hardener, so flush again before restarting the system.

KEY

- A Bleed-type master air valve
 - A1 Hardener feed pump
 - A2 Resin feed pump
 - A3 Proportioning pump
 - A4 Solvent pump
 - A5 Feed and Proportioning pump master air valve

A5

A6 Solvent pump master air valve

How to Operate the Mixer Manifold

Push handle (KK) down to open or up to close the mixer manifold fluid valves (LL) . See Fig. 15.



Flushing

How to Flush the System

WARNING

HOT SURFACE HAZARD

If your system is equipped with heaters, always shut off the main power to the heaters just prior to completing spraying. Shut off heater 10 minutes prior to shutdown to cool the fluid and the heater. This reduces the risk of serious injury from burns. Flush system immediately after shutdown.

For flushing oil from a new system. . .

NOTE: For flushing the first time, we recommend using mineral spirits to flush out the oil. Next, flush again using a solvent that is compatible with the fluid you will be dispensing. However, be sure the mineral spirits is compatible with the material you will be pumping. If it is not compatible, check with your fluid supplier to determine an appropriate solvent for flushing out the light oil.

NOTE: The proportioning pump does not need to to be running to clean oil from the system. Feed pump pressure is adequate to flush the system with solvent.

 Place each feed pump intake into a separate 5 gallon grounded pail, containing about 3 gallons (12 liters) of solvent.

To flush or prime . . .

- 2. Be sure both of the fluid shutoff valves (Q1) are open. See Fig. 16.
- 3. Place a container under the drain valves (P1,P2) of the mixer manifold (N). See Fig. 15.
- 4. Be sure the feed pump air regulators (E1,E2) are at minimum pressure. See Fig. 15.
- 5. Open the main master air valve (A5). See Fig. 16.
- 6. Open the hardener pump master air valve (A1). See Fig. 16.

- 7. Open the hardener side drain valve (P1). Open the mixer manifold handle (KK). See Fig. 15.
- 8. Slowly increase the air regulator (E1) setting until the pump is running slowly.
- 9. When the hardener lines are flushed, close the mixer manifold handle and close the drain valve (P1). Close the air valve (A1). See Fig. 16.
- Repeat Steps 6 to 9 for the resin feed pump. The resin sides uses these parts: regulator (E2), air valve (A2), drain valve (P2).

To flush the solvent valves . . .

- 11. Open the hardener solvent flush valve (N1) on the mixer manifold (N). See Fig. 15.
 - a. Be sure the solvent pump air regulator (E4) is at minimum pressure. See Fig. 16.
 - b. Open the solvent pump main master air valve (A6) and then open the pump air valve (A4). See Fig. 16.
 - c. Release the dispensing valve safety latch. Hold the dispensing valve firmly against a grounded pail and trigger it while slowly opening the solvent pump air regulator (E4). Operate the pump slowly until the dispense line is flushed. Release the dispensing valve trigger and engage its safety latch. Close the hardener solvent flush valve (N1).
 - d. Open the resin solvent flush valve (N2) and repeat Step c., above. See Fig. 15.
 - e. Close the solvent line shutoff valve (Q2). See Fig. 16.

Always close the solvent line fluid shutoff valve (Q2) after the flushing procedure has been completed. This will prevent the other fluids from leaking into the flushing line.

Flushing

If this is a first time flush . . .

12. Repeat the flushing procedure using a solvent compatible with the fluid you are going to dispense.

When you are done flushing ...

13. Remove the solvent supply from the feed pumps. Operate the pumps slowly to push all the solvent out of the lines, then stop the pumps.

If you are not going to use the system . . .

14. Close all air regulators, master air valves and fluid shutoff valves. Follow the **Pressure Relief Procedure** on page 23.

MARNING

INJECTION HAZARD

To reduce the risk of serious injury from fluid injection or fluid splashing, always close the air valve (A4) to the solvent pump before opening the fluid drain valves (P2) to relieve system pressure. This will reduce the risk of excessive pressure buildup in the opposite component hose and fittings.

How to Flush a Hydraulic Operated System

MARNING



FIRE AND EXPLOSION HAZARD Before flushing, read the section FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD on page 4. Be sure the entire system and flushing pails are properly grounded. Refer to Grounding on page page 11.

Flush the pump:

- Before the first use
- When changing fluids
- Before storing the pump.

Flush with a fluid that is compatible with the fluid you are pumping and with the wetted parts in your system. Check with your fluid manufacturer or supplier for recommended flushing fluids and flushing frequency.

Never leave water or water-base fluid in the pump overnight. If you are pumping water-base fluid, flush with water first, then with a rust inhibitor such as mineral spirits. Relieve the pressure, but leave the rust inhibitor in the pump to protect the parts from corrosion.

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 24.

- 1. Relieve the pressure.
- 2. Hold a metal part of the gun firmly to the side of a grounded *metal* pail.
- 3. Start the pump. Always use the lowest possible fluid pressure when flushing.
- 4. Trigger the gun.
- 5. Flush the system until clear solvent flows from the gun.
- 6. Relieve the pressure.

Pneumatic Pressure Relief Procedure



INJECTION HAZARD

 The system pressure must be manually
 relieved to prevent the system from starting or spraying 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** if the spray tip/nozzle clogs and whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment,
- or install or clean the spray tip.
- 1. Engage the dispensing valve safety latch.
- 2. Shut off the feed pump and proportioning pump air regulators and bleed-type master air valves.

If material is left in the heaters without fluid movement, the material could "cook" and ruin the coating as well as plug the heater. The heaters have a large mass and take several minutes to cool.

- 3. If the system has heaters, turn the power off to the heaters 10 minutes prior to the completion of the application.
- 4. Flush the system immediately after completion of the application.
- 5. Disengage the dispensing valve safety latch.
- 6. Hold a metal part of the dispensing valve firmly to the side of a grounded metal pail, and trigger the dispensing valve to relieve pressure.
- 7. Engage the safety latch.
- 8. Open the mixer manifold drain valves, having a container ready to catch the drainage. Close the valves immediately.
- 9. Use the solvent pump to flush the mixer manifold solvent valves and fluid line(s) to the applicator.

- 10. Ensure pump air pressure and main air valve are closed.
- 11. If you suspect that the nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above:
 - a. Remove and clean tip from spray gun.
 - b. Direct the gun into a grounded container and slowly trigger the gun.
 - c. If system is still plugged, very slowly loosen the fitting at the mix manifold 1/4 turn, allow liquid to run out until pressure is relieved.
 - d. Remove and clean or replace plugged component.
 - e. Tighten any loosened fittings.
 - f. Very slowly loosen the nozzle or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the nozzle or hose.

Handling Plural Component Fluid

WARNING



PLURAL COMPONENT FLUID HAZARD

Be extremely cautious when handling plural component materials and solvents used with them. Some are extremely

toxic. See the **Toxic Fluid Hazard** warnings on page 5. Read and follow the coating and solvent manufacturer's safety precautions and warnings.

Wear the proper protective clothing, eye protection, gloves, and clean air breathing apparatus as prescribed by the fluid manufacturers recommendations, O.S.H.A. regulations and as approved by N.O.I.S.H. for the chemicals being used.

Observe the Pot (Workable) Life Limit

Flush the mixed fluid out of the mixer, dispensing lines and equipment before it hardens. Flush the complete system when necessary to prevent the fluids from hardening in the equipment and hoses. Check the fluid manufacturer's instructions for fluid shelf life, and flush the entire system before this time is reached. Flush the system with a compatible solvent as explained on page 21.

Hydraulic Pressure Relief Procedure

A WARNING

INJECTION HAZARD

To reduce the risk of serious injury, including fluid injection, splashing in the eyes or on the skin, or moving parts,

always follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve the pressure,
- shut off the pump,
- stop spraying,
- check or service any of the system equipment,
- or install or clean the spray tip/nozzle.
- 1. Lock the gun trigger safety.
- 2. Shut off power to the feed pumps.
- 3. Shut off the hydraulic power supply.
- 4. Close the supply line shutoff valve (P), then the return line shutoff valve (R).
- 5. Close the gun manifold needle valves. Unlock the gun trigger safety.
- 6. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
- 7. Lock the gun trigger safety.
- 8. Open the drain valves (L, required in your system), having a container ready to catch the drainage.
- 9. Leave the drain valves open until you are ready to dispense again.

If you suspect that the spray tip/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 and relieve pressure gradually, then loosen completely. Now clear the tip/nozzle or hose.

Check the Hydraulic Fluid

Before starting the hydraulic power supply, check the hydraulic fluid level. Add fluid as necessary to fill lines to replace the amount used. Use only Graco approved hydraulic oil. Order Part No. 169236, 5 gallon (19 liter) or 207428, 1 gallon (3.8 liter).

Flush the Pump Before First Use

The pump is tested with lightweight oil, which is left in to protect the pump parts. If the fluid you are using may be contaminated by the oil, flush it out with a compatible solvent. See **Flushing** on page 22.

Fill Throat Packing Nuts

Keep each displacement pump throat packing nut (JJ) filled with Graco ISO Pump Oil to help prevent fluid from drying on the displacement rod and damaging the pump packings. See Fig. 17.

Verify compatibility of the pump oil with the fluids being used in the pumps. During operation very small amounts of this fluid are dragged past the seals and into the pump.



Check Drainage Bottles and Hoses

MARNING

INJECTION HAZARD

To reduce the risk of serious injury and property damage, regularly check and clean the drain hose and bottle for the automatic pressure relief valve.

If material is allowed to dry in and clog the drain hose, the automatic pressure relief valve may not fully release the fluid pressure if it opens or may cause the drain hose to burst.

Check the drain hose and bottle (38) at the start of each shift, and whenever there is an imbalance of material, to see if the automatic pressure drain valve has released material into the bottles. Clean the hose and bottle as needed. Regularly check the drain hose for cuts, leaks, or bulges and replace damaged components before using the system. See Fig. 18.



Monitor Material Supply

Monitor system material supply regularly based on system usage.

Establish a rigid system for monitoring the material supply to prevent the pumps from running dry. A sudden lack of material in one pump may cause many system problems, including air entrapment, spitting of the fluids, fluid "crossovers", pump damage, downtime, and added system stresses.

Never allow the feed pump or solvent pump containers to run dry. A dry container allows air to be pumped into the system and causes incorrect proportioning. A dry pump will quickly accelerate to a high speed, and may damage itself and the other displacement pump because it causes a pressure rise in the other pump. If a supply container becomes dry, stop the pump immediately, refill the container, and prime the system again. Be sure to eliminate all the air from the system before continuing the application.

NOTE: The pump runaway valve mentioned on page 13 of the Installation section shuts off the pump if the pump speed accelerates guickly.

Pneumatic Startup

WARNING

INJECTION HAZARD

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 23 whenever you are instructed to relieve the pressure.

Never exceed the maximum air and fluid working pressure of the lowest rated component in your system. See **Equipment Misuse Hazard**, page 3.

1. Install full containers of resin and hardener at feed pumps.

Prime System as follows:

- 1. Open material valves (W).
- Start feed pumps (B) by opening feed pump air valves (A1,A2). Adjust air regulators (E!,E2) just enough to start pumps operating slowly. Set air pressure to feed pumps at no more than 25% of proportional pressure at fluid outlets Use gauges (J1) to monitor pressure. Higher pressures may prevent proportioning pump inlet ball checks from seating properly.

F

KEY

- A Bleed-type master air valve
 A1 Hardener feed pump
 A2 Resin feed pump
- A3 Proportioning pump
- B Feed pumpsC Heaters

E2 Resin feed pump E3 Proportioning pump Fluid pressure gauge

E1 Hardener feed pump

J1 Proportioning pump intake

Pump air regulator

J2 Proportioning pump outlet

- 3. Open mix manifold valve (KK). Handle down.
- 4. Open drain valves (P) until material flows from both sides. Increase feed pressure up to 100 psi, if needed, to get material to flow.
- 5. When material begins to flow through drain valves (P), close valves.
- 6. Turn power on to heaters, if used, and wait 5 minutes for heaters to warm up.
- 7. Open proportioning pump air valve (A3) and slowly open regulator (E3) to start proportioning pump.
- 8. Trigger dispense valve (S), with tip removed, into waste container until material flows smoothly with no air pockets.
- 9. Close dispense valve and set safety latch.
- 10. Place tip on dispense valve.
- 11. Release trigger safety and spray test pattern.
- Increase main proportioner pressure and spray test pattern again. Repeat until acceptable pattern is achieved. Set air pressure to proportioning pump (H) to obtain required fluid pressure. Refer to Configurator Manual 309002.
- H Proportioning pump
- N Mixer manifold
- S Dispense valve
- V Fluid strainer



Pneumatic Startup (Cont'd)

13. Note pressures while spraying and material temperatures if heaters are used. While triggering dispense valve (S), check fluid outlet pressure gauges (J2) and make note of pressures indicated. Check the gauges frequently during operation. Note material temperatures if heaters are used. These notes will help to analyze any problems that may occur. Change in displacement pump performance will be indicated by change in pressure gauge readings.

NOTE: A quick pressure drop does occur during pump stroke changeover, but should remain steady if the dispense valve is not triggered. Pressure loss in a static state indicates a packing or check valve leak and should be repaired.

14. Flush mixer manifold (N) frequently during day's operation. Follow Step 11 on page 21.

Checking Mix Ratio

WARNING



INJECTION HAZARD To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 23 whenever you are instructed to relieve the pressure.

NOTE: Since this is a fixed ratio system, you typically do not have to check the mix ratio.

If the mixed fluid does not cure or harden properly, check the ratio of resin to hardener.

- 1. Flush the mixer manifold; see Step 11, page 21.
- 2. Follow the Pressure Relief Procedure, page 23.
- 3. Open the mixer manifold (N), handle (KK) up.
- 4. Set the operating pressure for the pumps. See Step 2 on page 26.
- 5. Release the dispensing valve trigger and engage the safety latch.
- 6. Close the mixer manifold (N), handle (KK) down.
- Open the hardener side drain valve (P2) about three turns. Open the resin side drain valve (P1) about 1 turn. This prevents the pressure from building up on the hardener pump, which would cause the automatic pressure relief valve to open.
- 8. Place a grounded metal pail under the drain valves.
- 9. Open the mixer manifold.

 While observing the pump outlet gauges (J2), adjust the resin and hardener drain valves (P1,P2) until the gauges show your normal operating pressure.

NOTE: The pressure must be within 20% of the original spraying pressure to get a usable test.

- 11. Close the mixer manifold. Put a separate sampling container under each drain valve.
- 12. Open the mixer manifold to draw a sufficient sample.
- 13. As you close the mixer manifold, check the pump outlet gauges (J2) again to make sure they are at your normal operating pressure.
- 14. If the fluid pressure is not within 20% of the normal operating pressure, flush the mixer manifold again and take another sample. If the sample ratio is incorrect, refer to the Troubleshooting chart on page 31. If the ratio is correct, the problem is with other system component.
- 15. Close the drain valves (P1,P2).



Hydraulic Startup – Prime the Pump

- 1. See Fig. 3. Check the hydraulic fluid level before each use, and add fluid as necessary.
- 2. Close the supply line shutoff valve (P) and the return line shutoff valve (R).
- 3. Start the hydraulic power supply.
- 4. Hold a metal part of the gun firmly to the side of a grounded metal pail and hold the trigger open.
- 5. Open the return line shutoff valve (R) first, then slowly open the supply line shutoff valve (P).
- 6. Run the pump slowly until all air is pushed out and the system is fully primed. Always use the lowest pressure necessary to get the desired results. Higher pressures cause premature pump wear.
- 7. Release the gun trigger and lock the trigger safety. With adequate hydraulic volume supplied to the motor, the pump will start and stop as you open and close the gun.

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 23.

8. Relieve the pressure. Install the nozzle in the gun, as explained in the gun manual.

WARNING

COMPONENT RUPTURE HAZARD

To prevent overpressurizing the hydraulic motor or its seals, *always* shut off the supply line valve (P) *first*, then shut off the return line valve (R).

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

9. Use the fluid pressure gauge (F) and pressurereducing valve (H) to control pump outlet pressure and pump speed. Always use the lowest hydraulic flow and pressure necessary to get the desired results. Higher pressure causes premature pump wear.

A CAUTION

Do not allow the pump to run dry. It will quickly accelerate to a high speed, causing damage. If your pump is running too fast, stop it immediately and check the fluid supply. If the container is empty and air has been pumped into the lines, refill the container and prime the pump and the lines, or flush and leave it filled with a compatible solvent. Eliminate all air from the fluid system.

Shutdown and Care of the System

A WARNING



To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 23 whenever you are instructed to relieve the pressure.

System Shutdown

To shut the system down, shut off the air to all pumps, trigger the dispensing valve into a grounded metal waste container. Close the mixer manifold valves. Flush all the mixed fluid out of the mixer manifold, hoses and dispensing equipment. See page 21. Then follow the **Pressure Relief Procedure**, page 23.

Pump Inlet Strainer Cleaning

If the fluid pressure from the feed pump to the proportioning pump cannot be maintained on the proportioning pump intake gauge (J1), check and clean the strainer (V). See Fig. 19, page 26.

- 1. Relieve all feed pump pressures.
- 2. Remove "Y" strainer, clean, and replace.
- 3. Restart feed pumps and check for open inlet feed lines.

Clean Static Mixer

Visually inspect the static mixer (G) **weekly**. Replace the static mixer if clogged or damaged. See Fig. 21.

- 1. Follow the Pressure Relief Procedure on page 23.
- 2. Remove the hose (H) from the static mixer (G).
- 3. Unscrew the static mixer (G) from the mix manifold.
- 4. Push the mixer element out of the static mixer by inserting a wooden dowel at the adapter (I) end. Clean all parts with a compatible solvent, and reassemble.
- 5. Install the static mixer (G). The arrow on the static mixer must point down. Apply tape and sealant to the threads of the static mixer.



Arrow must point down.

 \geq Apply tape and sealant to threads.





Pump Throat Packing Nuts or Cup Care

Keep the throat packing nuts or cup (JJ) filled with appropriate lubricant and check the tightness of the packing nut weekly. See Fig. 22.

Always follow the **Pressure Relief Procedure**, page 23, before adjusting the packing nut. The packing nut should be tight enough to prevent leakage; no tighter. Too tight an adjustment causes the packings to bind or wear prematurely and leak.



Troubleshooting

A WARNING



INJECTION HAZARD

To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the Pressure Relief Proce-

dure on page 23 if the spray tip/nozzle clogs and whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment, •
- or install or clean the spray tip.



MOVING PARTS HAZARD

To reduce the risk of serious injury, including amputation, from moving parts inside the air motor housing, never operate the pump with the air motor plate removed.

The chart below is specific to the air motor and pump. Refer to the other instruction manuals included with the system to troubleshoot individual components.

This chart uses the proportioner gauges to determine pump malfunctions.

Faulty manifold check valves can mask pump cylinder problems. Always keep these valves operating properly.

Observe the gauge readings during the stroke direction indicated by the bold arrow, and immediately after closing the manifold.

Flush and clean the filter screens.

Trigger the applicator and stop the proportioner in the up position.

If gauges hold equal pressure, this side of the system is operating properly.

If pressure falls faster on one gauge, service on that side is required. Repair/Replace ball check or piston packing or throat packing of the pump.

Trigger the applicator and stop the proportioner in the down position.

If pressure falls faster on one gauge, service on that side is required. Repair/Replace throat packing or inlet foot valve of the pump.











Troubleshooting

Problem	Cause	Solution
System will not run or	Air pressure or volume too low.	Increase, check air compressor.
stops while running.	Closed or restricted air line or air valve.	Open or clean as required.
	Fluid valves closed.	Open fluid valves.
	Clogged fluid hose.	Replace fluid hose.
	Air motor worn or damaged.	Service air motor. <i>See instructions in separate manual 306982.</i>
	Displacement pump stuck.	Service pump. <i>See instructions in sepa-</i> rate manual 307944 or 684004.
Pump fails to operate. (Hydraulic Pump)	Restricted line or inadequate hydraulic supply.	Clear; increase hydraulic supply.
	Insufficient hydraulic pressure – closed or clogged valves, etc.	Open, clean
	Dirty or damaged hydraulic motor.	Service motor (see 307158).
System speeds up or	Fluid containers are empty.**	Check often – keep filled.
runs erratically.	Air in fluid lines.**	Purge, check connections.
	Displacement pump parts worn or dam- aged.	Service pump. <i>See instructions in sepa-</i> rate manual 307944 or 684004.
Pump operates but resin output pressure drops	Dirty, worn or damaged resin pump pis- ton valve.	Clean, service pump. See instructions in separate manual.
during upstroke.*	Worn or damaged resin pump piston packings.	Replace.
Pump operates but resin output pressure drops dur- ing downstroke.	Dirty, worn or damaged resin pump intake valve.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i>
Pump operates but resin output pressure drops	Dirty, worn or damaged resin pump pis- ton valve.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i>
during both strokes.*		Clear; increase hydraulic supply.
	Restricted line or inadequate hydraulic supply	Open, clean
	Insufficient hydraulic pressure – closed or clogged valves, etc.	
	Fluid supply low.**	Refill or change container.
Pump operates but hard- ener output pressure	Dirty, worn or damaged resin pump in- take valve.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i>
	Worn or damaged hardener pump pis- ton packings.	Replace.

Troubleshooting

Problem	Cause	Solution
Pump operates but hard- ener output pressure drops during downstroke.*	Dirty, worn or damaged hardener pump intake valve.	Clean, service pump. See instructions in separate manual 307944 or 684004.
Pump operates but hard- ener output pressure drops during both strokes.	Dirty, worn or damaged hardener pump intake valve. Fluid supply low.**	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i> Refill or change container.
Fluid leaks around fluid pump packing nut.	Loose packing nut or worn throat pack- ings.	Tighten, replace.
Relief valve opens too soon or will not close.	Relief valve needs adjusting or is dam- aged.	Adjust, service pump. <i>See instructions in separate manual 307944 or 684004.</i>

* Fluid ratio will be wrong.

** Purge all air out of the system before proportioning the fluids.

Service – Pneumatic System Displacement Pump

WARNING

INJECTION HAZARD

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 23 whenever you are instructed to relieve the pressure.

Removal and Replacement

Thoroughly flush the system with a solvent which is compatible to the fluid being pumped, then follow the **Pressure Relief Procedure** on page 23. The Flushing procedure is on page 21.

NOTE: Try to always stop the pump at the bottom of the stroke after flushing, before any maintenance, or at any extended shutdown with the material in the pumps.

Stop the pump at the bottom of its stroke.

If you are changing to a different type of fluid, completely clean all of the equipment and hoses, making sure that no fluid remains in any part of the system.

Remove the fluid outlet hoses from the displacement pumps.

 Two Displacement Pump Models Only Unscrew the swivel unions (33) from the bottom of the displacement pumps. See Fig. 23. Three Displacement Pump Models Only Unscrew the swivel union (33) from the bottom of the center displacement pump. Unscrew the swivel unions (126) from the outer displacement pumps. Remove the supply manifold (125) from the outer pumps. Unscrew the straight union (39) from the center displacement pump. See Fig. 24.







Service – Pneumatic System Displacement Pump

Disassembly

 Remove the locknuts (113) from the top of the yoke (114) of the two outer displacement rods. See Fig. 25. Unscrew the outer locknuts (122) from the top of the tie plate (121) on the two displacement pumps. Use a screwdriver and hammer to loosen.

NOTE: The tie rods (111) shown in Fig. 25 are removed from the tie plate (121) for clarity only and do not require removal.

- 2. Remove the two outer pumps from the tie plate. Remove the washers (115) from the rods of each pump.
- 3. Three Displacement Pump Models Only. Using a wrench on the flats of the center pump's displacement rod, screw the rod out of the yoke (114). See Detail B in Fig. 25. Remove the pump from the yoke (114) then the washer (115) from the rod on the pump.
- 4. Refer to the appropriate instruction manual for servicing the displacement pump.

Reassembly

- Three Displacement Pump Models Only Slide the center displacement pump rod through the tie plate (121), center locknut (123), and washer (115). Thread the displacement rod into the yoke (114) by turning the complete cylinder. Use a wrench on the flats of the displacement rod for final tightening. Torque to 53–67 ft-lb (72–91 N•m). Push the cylinder up into place in the tie plate and install the center locknut (123).
- 2. All pumps

Slide the outer two displacement pump rods through the tie plate (121), outer locknuts (122), and washers (115). Install the locknuts (113) loosely on the displacement rods. Push the cylinders up into place in the tie plate and install the outer locknuts (122).



- Move the air motor to the bottom of its stroke. Check for movement of the air motor yoke at each displacement rod. With the rods centered, tighten the locknuts (113) securely and torque to 53–67 ftlbs (72–91 N•m).
- 4. Tighten the throat packing nut just enough to prevent leakage, no tighter.
- 5. Reconnect the swivel unions to the pumps. Hold the intake valve (C) steady with a wrench to prevent it from turning.

Service – Hydraulic System Displacement Pump

Disconnecting the Displacement Pumps

NOTE: For displacement pump repair instructions, refer to the separate displacement pump manual 307430, supplied.

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 23.

- 1. Flush the pump if possible. Stop the pump at the bottom of its stroke. Relieve the pressure.
- 2. Relieve pressure in the accumulator, if used. Disconnect the hydraulic supply, return, and drain lines from the motor. Disconnect all hoses from the pump.
- 3. Plug all hydraulic connections to avoid contamination.
- 4. Take note of the orientation of the pump fluid outlets to the hydraulic fluid inlet of the motor.
- 5. Unscrew the tie rod locknuts (23) and the extension rod locknuts (14). Slide the displacement pumps down off the tie rods (5). See Fig. 26.
- 6. Remove the screws (12) and lockwashers (13) from the tie plate (6). Pull the tie plate off the displacement pumps (7).
- Remove the cotter pins (11). Unscrew the rod extensions (10) from the displacement rods (R). Inspect the o-rings (24).
- 8. If you are servicing the hydraulic motor (1), remove the tie rods (5), yoke (4), gasket (3), and coupler (2).

NOTE: For hydraulic motor repair instructions, refer to the separate motor manual 307158, supplied.

Reconnecting the Displacement Pumps

- Apply thread sealant to the threads of the coupler (2) and screw it onto the hydraulic motor. Place the gasket (3) on the yoke (4). Apply sealant to the threads of the yoke and screw it into the coupler. See Fig. 26.
- 2. Apply thread sealant to the top threads of the tie rods (5). (The top is the end with short threads, and without flats.) Screw the rods into the base of the hydraulic motor (1).
- 3. Lubricate the o-rings (24) and install them on the displacement rods (R). Lubricate the threads of the rods.
- 4. Screw the extension rods (10) onto the displacement rods (R). Align the holes in the rods and insert the cotter pins (11).
- Attach the tie plate (6) to the displacement pumps (7), using the six screws (12) and lockwashers (13). Orient the fluid outlets of the displacement pumps as was noted in step 4 under Disconnecting the Displacement Pumps.
- Slide the tie plate (6) onto the tie rods (5) until the threads of the extension rods (10) protrude from the yoke (4). Screw the locknuts (14) onto the extension rods. Torque to 40–50 ft-lb (53–68 N•m).
- Screw the tie rod locknuts (23) onto the tie rods (5). Torque to 40–50 ft-lb (53–68 N•m).
- 8. Remount the pump and connect all hoses.
- 9. Reconnect the ground wire if it was disconnected during repair.
- 10. Turn on the hydraulic power to the motor and run the pump slowly, to make sure it is operating properly.
- 11. Fill the packing nut/wet-cup 1/3 full of ISO pump lube.



7355A

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

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procedures concernées.

Graco Phone Numbers

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

1-800-367-4023 Toll Free 612-623-6921 612-378-3505 Fax

All written and visual data contained in this document reflects the latest product information available at the time of publication. Graco reserves the right to make changes at any time without notice.

> Sales Offices: Minneapolis, Detroit International Offices: Belgium, Korea, Hong Kong, Japan

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

www.graco.com

PRINTED IN USA 308986 March 1999, Revised October 2001