INSTRUCTIONS–PARTS LIST

308–079
Rev B
Supersedes A

This manual contains IMPORTANT WARNINGS AND INSTRUCTIONS
READ AND RETAIN FOR REFERENCE

HIGH EFFICIENCY LOW PRESSURE™ SYSTEM 2000

SEVERE–DUTY, STAINLESS STEEL
10:1 RATIO STANDARD PUMP

PAIL, WALL, AND CART MOUNT SYSTEMS

950 psi (66 bar) MAXIMUM WORKING FLUID PRESSURE
*95 psi (6.5 bar) MAXIMUM WORKING AIR PRESSURE**
*10 psi (0.7 bar) MAXIMUM OPERATING AIR PRESSURE***

Model 223–827
Pail Mount System
Includes pump, pail kit, air/fluid regulator kit, hoses, and H.E.L.P. AA2000 air–assisted airless spray gun

Model 223–828
Wall Mount System
Includes pump, wall mount kit, air/fluid regulator kit, hoses, and H.E.L.P. AA2000 air–assisted airless spray gun

Model 224–712
Cart Mount System
Includes pump, cart mount kit, air/fluid regulator kit, hoses, and H.E.L.P. AA2000 air–assisted airless spray gun

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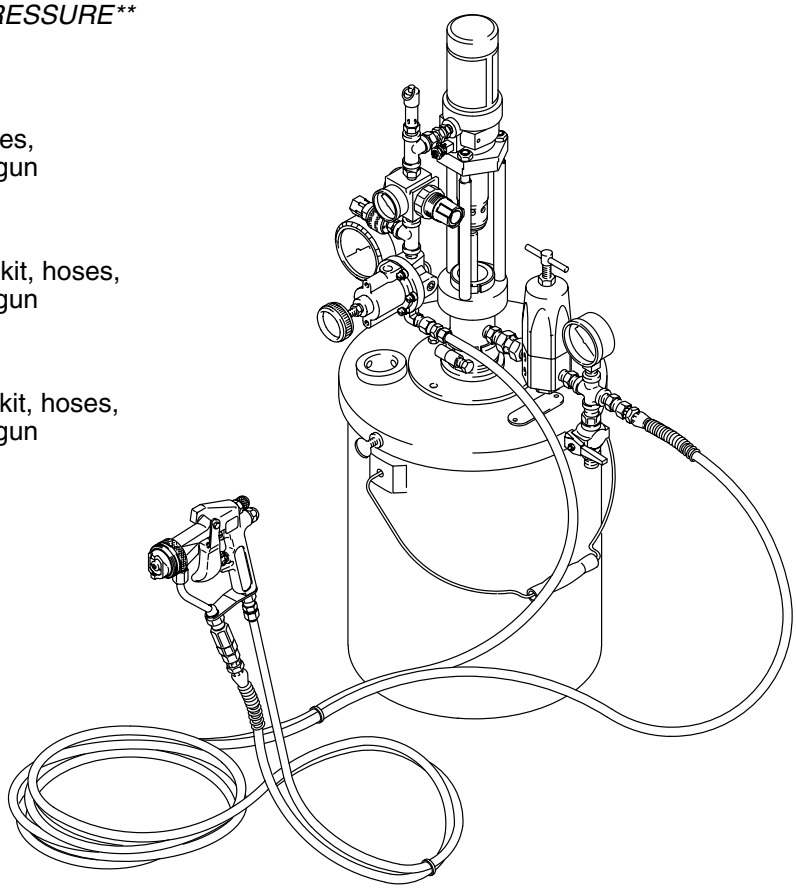

Model 223–827 shown

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* The ***MAXIMUM WORKING AIR PRESSURE*** indicates the maximum air pressure the gun was designed to operate safely under.

** The ***MAXIMUM OPERATING AIR PRESSURE*** indicates the maximum air pressure the air cap supplied with this gun was designed to operate at or below to comply with *SCAQMD Air Quality Rules 1124, 1136, 1151.* To guarantee compliance, the gun must be used with Air Regulator Part No. 110–776. This regulator limits the operating pressure to 10 psi (0.7 bar), using an air supply pressure of 95 psi (6.5 bar).

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

SAFETY WARNINGS

HIGH PRESSURE SPRAY CAN CAUSE SERIOUS INJURY.
FOR PROFESSIONAL USE ONLY. OBSERVE ALL WARNINGS
Read and understand all instruction manuals before operating equipment.

FLUID INJECTION HAZARD

General Safety

This equipment generates very high fluid pressure. Spray from the gun, leaks or ruptured components can inject fluid through your skin and into your body and cause extremely serious bodily injury, including the need for amputation. Also, fluid injected or splashed into the eyes or on the skin can cause serious damage.

NEVER point spray gun at anyone or at any part of the body.

NEVER put hand or fingers over the spray tip.

NEVER try to "blow back" paint; this is NOT an air spray gun.

ALWAYS follow the **Pressure Relief Procedure,** at right, *before* cleaning or removing the spray tip or servicing any system equipment.

NEVER try to stop or deflect leaks with your hand or body.

CHECK operation of all equipment safety devices before each use.

Medical Alert – Airless Spray Wounds

If any fluid appears to penetrate your skin, get **EMERGENCY MEDICAL CARE AT ONCE. DO NOT TREAT AS A SIMPLE CUT.** Tell the doctor exactly what fluid was injected.

Note to Physician: *Injection into the skin is a traumatic injury.* **It is important to treat the injury surgically as soon as possible.** *Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the blood stream. Consultation with a plastic surgeon or reconstructive hand surgeon may be advisable.*

Spray Gun Safety Devices

Be sure all gun safety devices are operating properly before each use. Do not remove or modify any part of the gun; this can cause a malfunction and result in serious bodily injury.

Safety Latch

Whenever you stop spraying, even for a moment, always set the gun safety latch in the closed or "safe" position, making the gun inoperative. Failure to set the safety latch can result in accidental triggering of the gun.

Diffuser

The gun diffuser breaks up spray and reduces the risk of fluid injection when the tip is not installed. Check diffuser operation regularly. Follow the **Pressure Relief Procedure**, below, then remove the spray tip. Aim the gun into a *grounded* metal pail, holding the gun firmly to the pail. Using the lowest possible pressure, trigger the gun. If the fluid emitted *is not* diffused into an irregular stream, replace the diffuser immediately.

Spray Tip Safety

Use extreme caution when cleaning or changing spray tips. If the spray tip clogs while spraying, engage the gun safety latch immediately. ALWAYS follow the **Pressure Relief Procedure,** below, and then remove the spray tip to clean it.

NEVER wipe off build–up around the spray tip or air cap until pressure is fully relieved and the gun safety latch is engaged.

Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, splashing in the eyes or on skin, or injury from moving parts, always follow this procedure whenever pump is shut off, when checking or servicing any part of system, when installing or changing spray tips and whenever you stop spraying.

1. Engage the spray gun safety latch.
2. Shut off the power to the pump.
3. Close the bleed–type master air valve (required in system).
4. Disengage the gun safety latch.
5. Hold a metal part of the gun firmly to the side of a *grounded* metal waste container and trigger the gun to relieve fluid pressure.
6. Engage the gun safety latch again.
7. Open the drain valve (required in system) to help relieve fluid pressure in the pump, hose and gun. Triggering the gun to relieve pressure may not be sufficient. Have a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray again.

*If you suspect that the spray tip or hose is completely clogged or that pressure has not been fully relieved after following the steps above, V*ERY SLOWLY loosen the hose end coupling and relieve pressure gradually, then loosen completely. Now clear the tip or hose obstruction.

EQUIPMENT MISUSE HAZARD

General Safety

Any misuse of the equipment or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in serious bodily injury, including fluid injection and splashing fluid in the eyes or on the skin, or in fire, explosion or property damage.

NEVER alter or modify any part of this equipment; doing so could cause it to malfunction.

CHECK the gun and all spray equipment regularly and repair or replace worn or damaged parts immediately.

Read and follow the fluid and solvent manufacturer's literature regarding the use of protective eyewear , gloves, clothing, respirator and other equipment.

System Pressure

The 10:1 ratio pump develops 950 psi (66 bar) MAXIMUM FLUID WORKING PRESSURE at 95 psi (6.5 bar) MAXIMUM WORKING AIR PRESSURE. The H.E.L.P. AA2000 Spray Gun has a 950 psi (66 bar) MAXIMUM FLUID WORKING PRESSURE. NEVER exceed 95 psi (6.5) air pressure to the pump or spray gun. T o guarantee compliance to *SCAQMD Air Quality Rules 1124, 1136, and 1151*, the supply air to the gun must be regulated down to 10 psi (0.7 bar) MAXIMUM OPERATING PRESSURE, using Air Regulator Part No. 1 10–776. Be sure that all spray equipment and accessories added to the sprayer are properly rated to withstand the maximum working pressure of the sprayer. DO NOT exceed the maximum working pressure of any component or accessory used with the sprayer.

Fluid Compatibility

BE SURE all fluids and solvents used are chemically compatible with the "Wetted Parts" shown in the **TECHNICAL DATA** on the back page. Always read the fluid and solvent manufacturer's literature before using the fluid/solvent in this gun.

FIRE OR EXPLOSION HAZARD

Static electricity is created by the flow of fluid through the pump and hose. If every part of the equipment is not properly grounded, sparking may occur, and the system may become hazardous. Sparks may also occur when plugging in or unplugging a power supply cord. Sparks can ignite fumes from solvents and the fluid being sprayed, dust particles and other flammable substances, whether you are pumping indoors or outdoors, and cause a fire or explosion, serious bodily injury, and property damage.Do not plug in or unplug any power supply cords in the spray area when there is any chance of igniting fumes still in the air.

If you experience any static sparking or feel even a slight shock while using this equipment, **STOP SPRAYING IMMEDIATELY**. Check for proper grounding of the entire system. Do not use the system again until the cause of the problem is identified and corrected.

1. *Pump:* use a ground wire and clamp as shown in Fig 1.
2. *Air hoses:* use only grounded air hoses.
3. *Fluid hoses:* use only grounded fluid hoses.
4. *Air compressor:* follow manufacturer's recommendations.
5. *Spray gun:* grounding is obtained through connection to a properly grounded fluid hose and pump.
6. *Fluid supply container:* according to your local code.
7. *Object being sprayed:* according to your local code.
8. *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.
9. *To maintain grounding continuity when flushing or relieving pressure*, always hold a metal part of the spray gun firmly to the side of a grounded *metal* pail, then trigger the spray gun.

To ground the pump:

To ground the pump, loosen the grounding lug locknut (W) and washer (X). Insert one end of a 1.5 mm^2 (12 ga) minimum ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. See Fig 1. Connect the other end of the wire to a true earth ground.

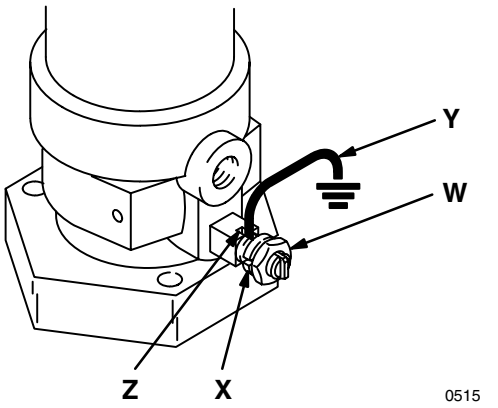

Fig 1

Flushing Safety

Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Grounding**, above. Follow the **Pressure Relief Procedure** on page 2, and remove the spray tip from the gun. Always use the lowest possible fluid pressure, and maintain firm metal–to–metal contact between the gun and the *grounded* metal pail during flushing to reduce the risk of fluid injection injury, static sparking and splashing.

Ventilate the Spray Area

To prevent hazardous concentrations of toxic and/or flammable vapors, spray only in a properly ventilated spray area.

HOSE SAFETY

High pressure fluid in the hoses can be very dangerous. If the hose develops a leak, split or rupture due to any kind of wear, damage or misuse, the high pressure spray emitted from it can cause a fluid injection injury or other serious bodily injury or property damage.

ALL FLUID SPRAY HOSES MUST HAVE A SPRING GUARD ON BOTH ENDS! The spring guards help protect the hose from kinks or bends at or close to the coupling which can result in hose rupture.

TIGHTEN all fluid connections securely before each use. High pressure fluid can dislodge a loose coupling or allow high pressure spray to be emitted from the coupling.

NEVER use a damaged hose. Before each use, check the entire hose for cuts, leaks, abrasion, bulging cover, or damage or movement of the hose couplings. If any of these conditions exist, replace the hose immediately. DO NOT try to recouple high pressure hose or mend it with tape or any other device. A repaired hose cannot contain the high pressure fluid.

HANDLE AND ROUTE HOSES CAREFULLY. Do not pull on hoses to move equipment. Do not use fluids or solvents which are not compatible with the inner tube and cover of the hose. DO NOT expose Graco hose to temperatures above 180° F (82° C) or below –40° F (–40° C).

Fluid Hose Grounding Continuity

Proper hose grounding continuity is essential to maintaining a grounded spray system. Check the electrical resistance of your fluid hoses at least once a week. If your hose does not have a tag on it which specifies the maximum electrical resistance, contact the hose supplier or manufacturer for the maximum resistance limits. Use a resistance meter in the appropriate range for your hose to check the resistance. If the resistance exceeds the recommended limits, replace it immediately. An ungrounded or poorly grounded fluid hose can make your system hazardous. Also read **FIRE OR EXPLOSION HAZARD**, above.

MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers or other body parts. KEEP CLEAR of moving parts when starting or operating the pump. NEVER operate the pump with any part removed to reduce the risk of pinching or amputating your fingers on moving parts. Before checking or servicing the gun, pump, or any other system component follow the **Pressure Relief Procedure** on page 2, to prevent the pump from starting accidentally.

IMPORTANT

United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards – particularly the General Standards, Part 1910, and the Construction Standards, Part 1926 – should be consulted.

WARNING

For your safety in installing, operating and servicing this system, thoroughly read and follow all warnings and instructions given in this manual and in any other manuals supplied with this system or any accessories you add to the system. If a manual is missing or you need additional copies, they are available from Graco at no charge.

NOTE: Numbers and letters in parentheses refer to the parts lists and the callouts in the Figures.

The Typical Installations shown in Figs. 2, 3, and 4 are only examples. For assistance in designing a system to meet your particular needs, contact your Graco representative or Graco T echnical Assistance (see back page). Accessories mentioned in the text are shown on page 20.

PAIL MOUNT SYSTEM INSTALLATION (See Fig. 2)

Place the pail cover (206) on the pail (204), and secure with the three thumbscrews (207). Install the bung adapter plate (205) on the pail cover, using the two hex screws (203). Remove the bung adapter (18) from the pump and screw it tightly into the bung adapter plate.

Apply thread sealant and screw the pipe nipple (208) into the pump's intake valve. Lower the pump (201) through the bung adapter (18) into the pail, so the pump inlet is 13 mm (1/2 in.) off the bottom of the pail. Tighten the screw on the bung adapter to hold the pump in that position.

Refer to "Installation Procedure – All Models" on page 7 to complete the installation.

Typical Installation: Pail Mount Systems

KEY

A	Air Line Filter
B	Main Air Line
C	Bleed–Type Master Air Valve *(required)*
Y	Pump Ground Wire *(required)*
18	Bung Adapter
201	Pump
203	Screw
204	Pail
205	Bung Adapter Plate
206	Pail Cover
207	Thumbscrews
210	Gun Air Hose
211	Fluid Hose
212	In-line Fluid Filter
213	3/8 npt Nipple
214	Fluid Regulator
215	Spray Gun
216	1/4 npt(m) x 3/8 npsm(f) Swivel
409	Fluid Drain Valve *(required)*
503	Air Line Coupler
506	Safety Valve
507	Pump Air Regulator
513	Gun Air Regulator

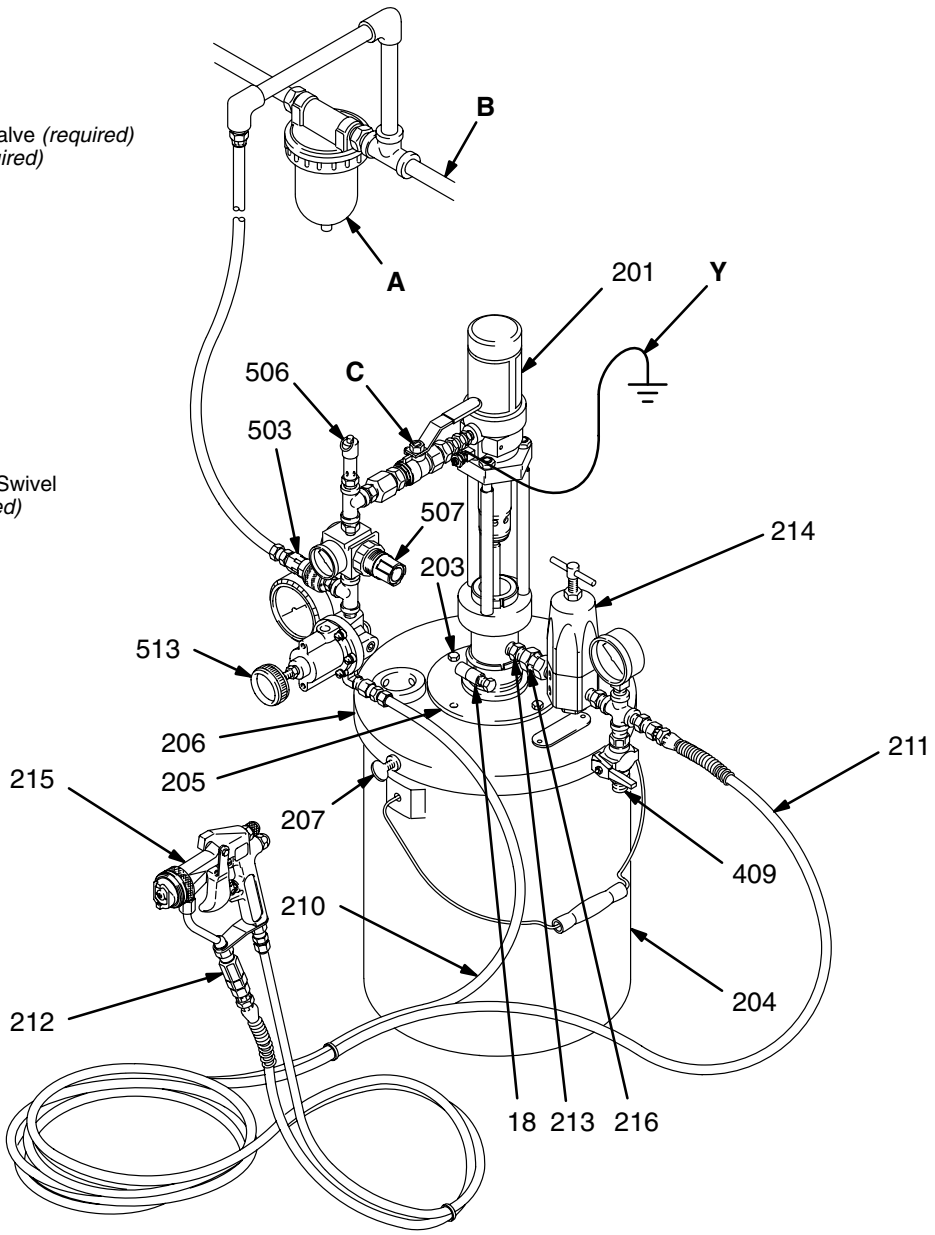

Fig. 2

WALL MOUNT SYSTEM INSTALLATION (See Fig. 3)

Install the bung adapter plate (306) on the wall bracket, using the two hex screws (303) and nuts (304).

Mount the wall bracket (305) 5 ft (1.5 m) above the floor. Refer to wall bracket manual 306–783 for instructions. Be sure the wall is strong enough to support the weight of the equipment, fluid, and hoses, and withstand the stress caused during pump operation.

Remove the bung adapter (18) from the pump and screw it tightly into the bung adapter plate (306).

Lower the pump (301) through the bung adapter. Tighten the screw on the bung adapter to hold the pump steady.

Apply thread sealant and screw the suction tube assembly (307) into the pump's fluid intake valve.

Refer to "Installation Procedure – All Models" on page 7 to complete the installation.

Typical Installation: Wall Mount Systems

KEY

A	Air Line Filter
B	Main Air Line
C	Bleed–Type Master Air Valve *(required)*
Y	Pump Ground Wire *(required)*
18	Bung Adapter
301	Pump
303	Screw
304	Nut
305	Wall Bracket
306	Bung Adapter Plate
307	Suction Tube
310	Gun Air Hose
311	Fluid Hose
312	Fluid Filter
313	3/8 npt Nipple
314	Fluid Regulator
315	Spray Gun
316	1/4 npt(m) x 3/8 npsm(f) Swivel
409	Fluid Drain Valve *(required)*
503	Air Line Coupler
506	Safety Valve
507	Pump Air Regulator
513	Gun Air Regulator

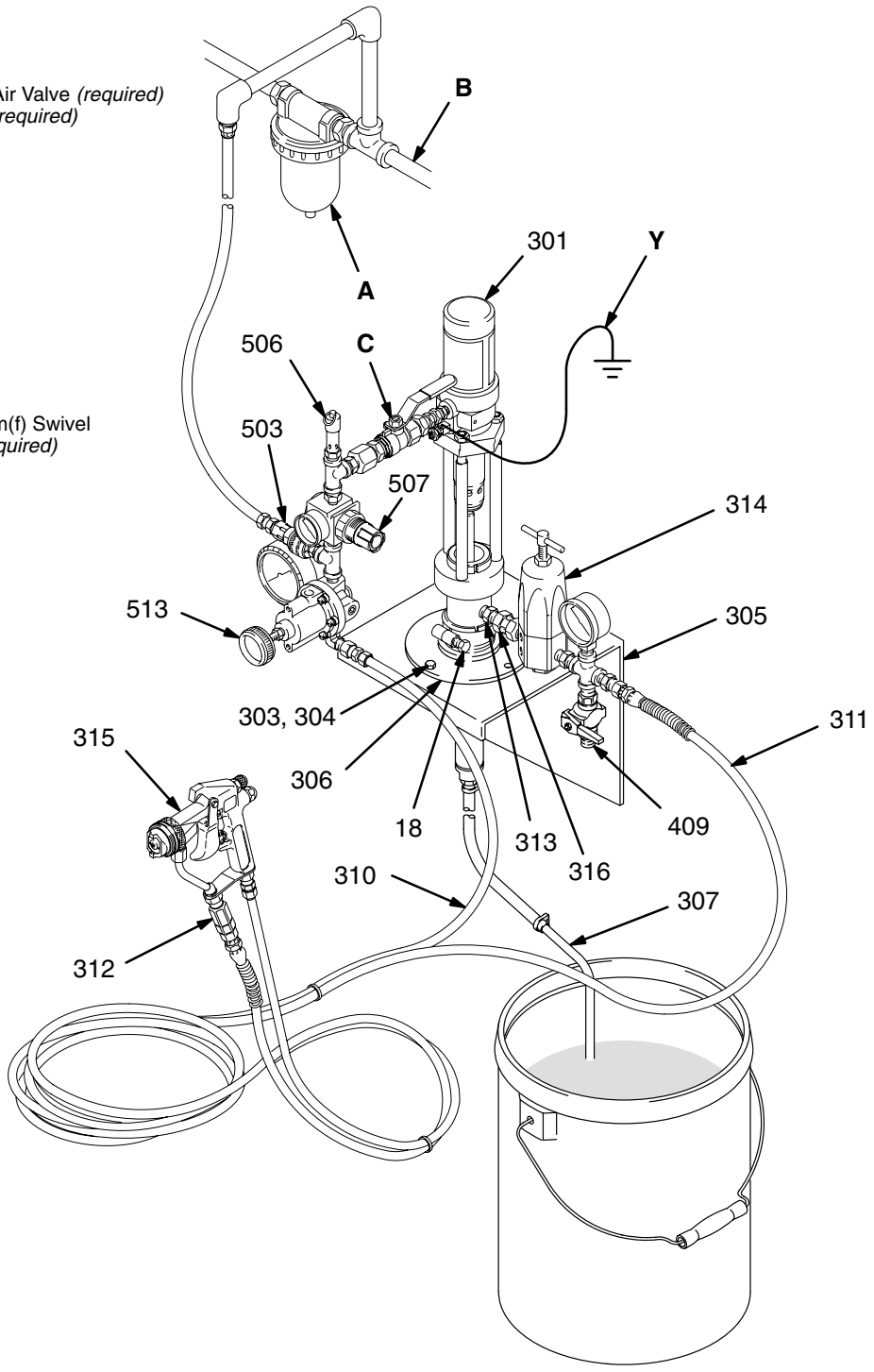

Fig. 3

CART MOUNT SYSTEM INSTALLATION (See Fig. 4)

Remove the bung adapter (18) from the pump (601) and screw it tightly into the mounting bracket of the cart (603).

Apply thread sealant and screw the intake nipple (604) into the pump's fluid intake valve. Place a pail of fluid under the cart. Lower the pump (601) through the bung adapter (18) and into the pail, so the intake nipple is 13 mm (1/2 in.) off the bottom of the pail. Tighten the screw of the bung adapter (18) to hold the pump in that position.

Refer to "Installation Procedure – All Models" on page 7 to complete the installation.

Typical Installation: Cart Mount Systems

KEY

A	Air Line Filter
B	Main Air Line
C	Bleed–Type Master Air Valve *(required)*
Y	Pump Ground Wire *(required)*
18	Bung Adapter
409	Fluid Drain Valve *(required)*
503	Air Line Coupler
506	Safety Valve
507	Pump Air Regulator
513	Gun Air Regulator
601	Pump
603	Cart
604	Intake Nipple
610	Gun Air Hose
611	Fluid Hose
612	Fluid Filter
613	3/8 npt Nipple
614	Fluid Regulator
615	Spray Gun
616	1/4 npt(m) x 3/8 npsm(f) Swivel

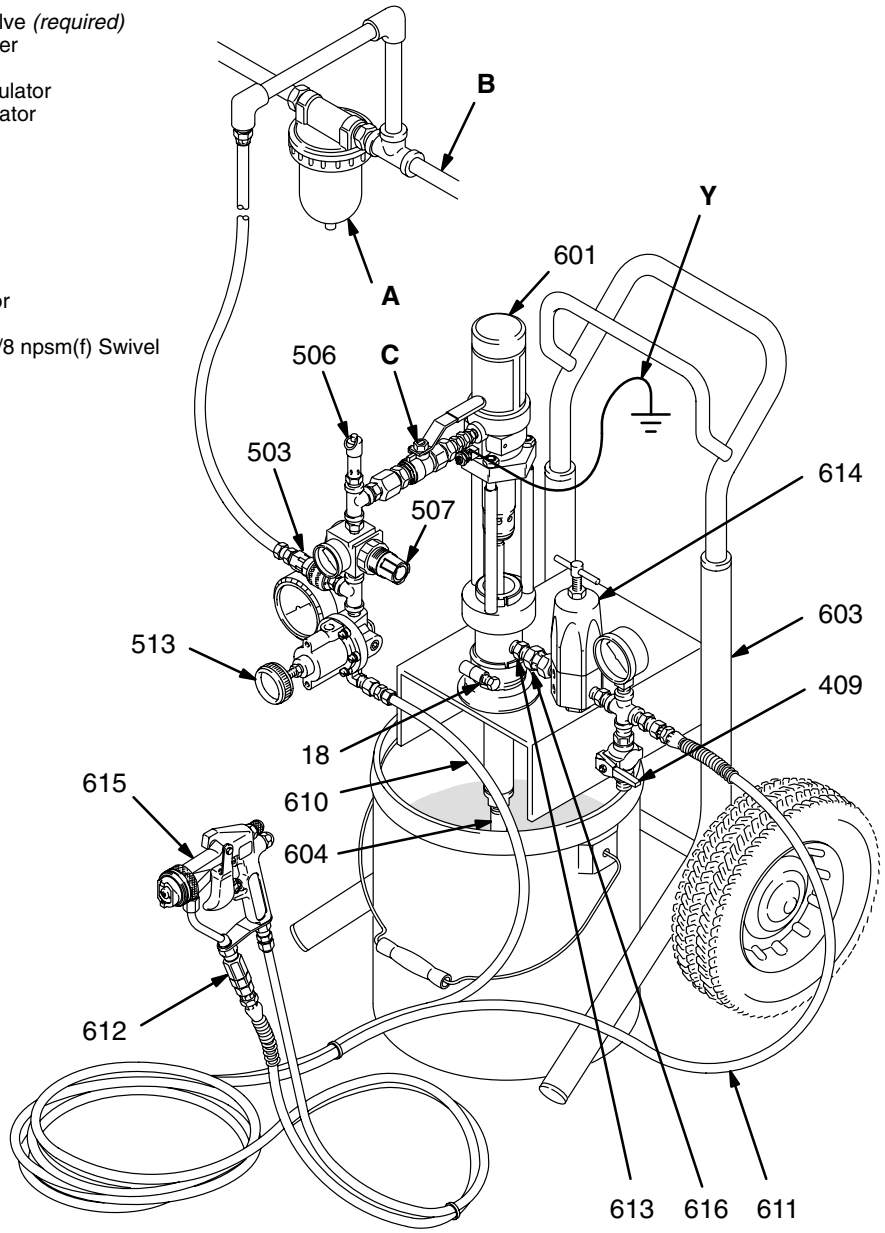

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Fig. 4

INSTALLATION PROCEDURE – ALL MODELS (Refer to Figs. 2, 3, and 4, as applicable)

WARNING

To prevent hazardous concentrations of toxic and/or flammable vapors, spray only in a properly ventilated spray booth. NEVER OPERA TE THE SPRAY GUN UNLESS VENTILA TION FANS ARE OPERATING.

Check and follow all of the National, State and Local codes regarding air exhaust velocity requirements.

Installing Fluid Regulator Kit 222–564

Assemble Fluid Regulator Kit 222–564, using only those parts shown in Fig 5 (the kit includes additional parts which are not required for these installations). Apply thread sealant to all threads.

Refer to Fig 2, 3, or 4, as applicable. T o install the fluid regulator kit on the pump, apply thread sealant to one end of the 3/8 npt nipple (213, 313, or 613) and screw it into the pump's fluid outlet. Apply thread sealant to the male end of the swivel (216, 316, or 616) and screw it into the inlet of the fluid regulator. Connect the swivel to the nipple and tighten securely; do not use thread sealant on the swivel connection.

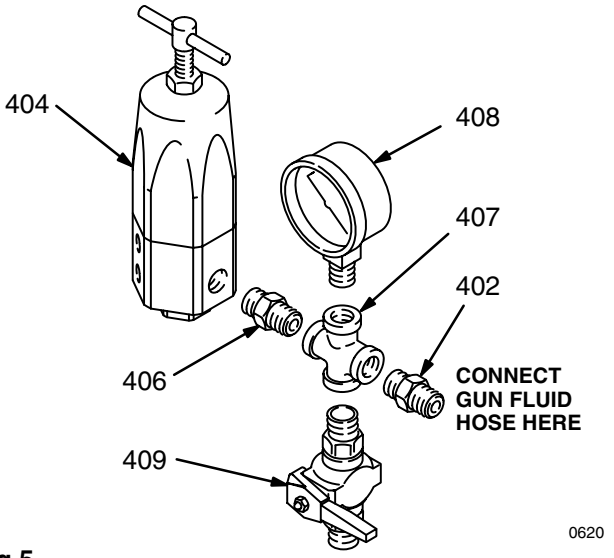


Fig 5

Installing Air/Fluid Regulator Kit 224–048
The Air/Fluid Regulator Kit is an assembled unit. It consists of the following parts:

- a pre-set safety valve (506), which prevents overpressurization of the spray gun by opening automatically if the incoming air pressure to the pump exceeds 95 psi (6.6 bar)
- one air regulator (507) to regulate the air pressure to the pump (which determines pump speed and fluid pressure), and a second regulator (513) to control the air pressure to the spray gun
- an air line fitting (502) and coupler (503), to connect the main air line to the air/fluid regulator kit
- connectors and fittings.

Connect the regulator kit to the pump's air inlet. See Figs 2, 3, or 4, as applicable.

The regulator kit's air inlet consists of a quick–disconnect coupler (503) and a pin fitting (502). Disconnect the coupler from the pin fitting and screw it onto the end of your air supply hose, but do not reconnect the coupler to the pin fitting yet.

System Accessories
Install an air line filter (A) in the main air line (B), to remove harmful dirt and moisture from the compressed air supplied to the pump and gun. Downstream from the pump air regulator (507), install a bleed-type master air valve (C), using necessary adapters.

WARNING

Two accessories are required in your system: a bleed-type master air valve (C) and a fluid drain valve (409, included with Fluid Regulator Kit 222–564). These accessories help reduce the risk of serious bodily injury including fluid injection, splashing in the eyes or on the skin, or injury from moving parts if you are adjusting or repairing the pump.

The *bleed-type master air valve* relieves air trapped between this valve and the pump after the air is shut off. Trapped air can cause the pump to cycle unexpectedly. Locate the valve close to the pump.

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

Hose and Gun Connections
Refer to Fig 2, 3, or 4, as applicable.

Connect one end of the air hose (210, 310, or 610) to the 1/4 npt(m) adapter (511) at the outlet of the gun air regulator (513), and connect the other end to the air inlet in the spray gun (215, 315, or 615) handle.

The fluid hose (211, 311, or 611) has spring guards on both ends. Connect one end of the fluid hose (211, 311, or 611) to the fluid regulator nipple (402). Screw the other end of the hose onto the in–line fluid filter (212, 312, or 612), then screw the filter's swivel end onto the fluid inlet of the gun. DO NOT install the spray tip in the gun yet.

GROUNDING

WARNING

Before operating the pump, ground the system as explained under **FIRE OR EXPLOSION HAZARD** and **Grounding** on page 3.

WARNING

Pressure Relief Procedure
To reduce the risk of serious bodily injury, including fluid injection, splashing in the eyes or on the skin, or injury from moving parts, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the spray gun safety latch.
2. Shut off the air to the pump.
3. Close the bleed-type master air valve (required in your system).
4. Disengage the spray gun safety latch.
5. Hold a metal part of the spray gun firmly to the side of a grounded metal pail, and trigger the spray gun to relieve pressure.
6. Engage the spray gun safety latch.
7. Open the drain valve (required in your system), having a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, VER Y SLOWLY loosen the air cap or hose end coupling and relieve pressure gradually , then loosen completely. Now clear the tip or hose.

WARNING

For your safety, before operating the equipment be sure all operators have read and fully understand all the warnings, cautions and instructions in this manual and all manuals supplied with each component or accessory.

Flush the Pump Before Using

Pumps are tested with lightweight oil which is left in to protect the pump parts. To prevent contamination of the fluid, flush the pump with a compatible solvent before using it.

WARNING

Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Grounding** on page 3. Follow the **Pressure Relief Procedure Warning** above, and *remove the spray tip from the gun.* Always use the lowest possible fluid pressure, and maintain firm metal-to-metal contact between the gun and the pail during flushing to reduce the risk of fluid injection, static sparking, and splashing in the eyes or on the skin.

Starting and Adjusting the Pump

Be sure the two air regulators (507 & 513) and the bleed-type master air valve (C) are closed. *DO NOT INSTALL THE SPRAY TIP YET!*

Connect the air line coupler (503) to the pin fitting (502).

Open the bleed-type master air valve (C) and the gun air regulator (513). Hold a metal part of the spray gun firmly to the side of a grounded metal pail and trigger the gun. Slowly open the pump air regulator (507) until the pump starts. **Allow the pump to cycle slowly until all the air is pushed out of the fluid lines.** Release the gun trigger and engage the safety latch; the pump will stall against the pressure.

With the pump and lines primed, and with adequate air pressure and volume supplied, the pump will start and stop as the spray gun is triggered and released.

Follow the **Pressure Relief Procedure Warning** at left, then install the spray tip in the gun.

Use the pump air regulator (507) to control the pump speed and fluid pressure. Always use the lowest pressure necessary to achieve the desired results. Higher pressures waste fluid and cause premature wear of the pump packings and spray tip.

Keep the packing nut/wet-cup (1 14) filled with Graco Throat Seal Liquid (TSL) to help prolong the packing life. Check the tightness of the packing nut weekly. The packing nut should be just tight enough to prevent leakage – no tighter. Always follow the **Pressure Relief Procedure Warning** at left before adjusting the packing nut.

Never allow the pump to run dry of the fluid being pumped. A dry pump will quickly accelerate to a high speed, possibly damaging itself. If your pump accelerates quickly, or is running too fast, stop it immediately and check the fluid supply . If the supply container is empty and air has been pumped into the lines, refill the supply container and prime the pump and lines with fluid, being sure to eliminate all air from the fluid system, or flush the pump as described in “Shutdown and Care,” below.

H.E.L.P. AA2000 Spray Gun Operation

Refer to the OPERATION section of manual 307–947, supplied, for installing the spray tip, adjusting the spray pattern and using the spray gun.

Shutdown and Care

Always follow the **Pressure Relief Procedure Warning** at left, whenever you shut off the pump. Stop the pump at the bottom of its stroke to keep fluid from drying on the exposed displacement rod and damaging the throat packings.

Always flush the pump with a compatible solvent before the fluid can dry on the displacement rod, and at the end of each day. If you are pumping water-based fluid, flush first with water and then with mineral spirits to protect the pump parts. If you are pumping oil-based fluids, flush with mineral spirits only.

Relieve pressure and leave the mineral spirits in the pump to prevent corrosion.

TROUBLESHOOTING CHART

WARNING

Pressure Relief Procedure
To reduce the risk of serious bodily injury , including fluid injection, splashing in the eyes or on the skin, or injury from moving parts, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the spray gun safety latch.
2. Shut off the air to the pump.
3. Close the bleed–type master air valve (required in your system).
4. Disengage the spray gun safety latch.
5. Hold a metal part of the spray gun firmly to the side of a grounded metal pail, and trigger the spray gun to relieve pressure.
6. Engage the spray gun safety latch.
7. Open the drain valve (required in your system), having a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, VER Y SLOWLY loosen the air cap or hose end coupling and relieve pressure gradually , then loosen completely . Now clear the tip or hose.

NOTE: Check all other possible remedies before disassembling pump.

PROBLEM	CAUSE	SOLUTION
Pump fails to operate.	Packing nut too tight.	Tighten just enough to prevent leakage – no tighter.
	Dirty or worn air motor.	Clean, service; see 307–456.
	Inadequate air supply or restricted line.	Increase or clean.
	Clogged fluid hose, gun or tip.	Clear.
	Dried fluid seizure of displacement rod.	Disassemble and clean.
Pump operates but output low on both strokes.	Clogged fluid hose, gun or tip.	Clear.
	Inadequate air supply or restricted line.	Increase or clean.
	Exhausted fluid supply.	Refill.
	Worn or damaged piston packing.	Service.
Pump operates but output low on downstroke.	Worn or damaged piston packing.	Service.
	Held open or worn fluid intake valve.	Clear, service.
Pump operates but output low on upstroke.	Worn or damaged piston packing.	Service.
	Held open or worn fluid piston valve.	Clear, service.
Erratic or accelerated operation.	Exhausted fluid supply.	Refill.
	Broken air motor compression spring.	Service; see 307–456.
	Worn or damaged piston packing.	Service.
	Held open or worn fluid intake valve.	Clear, service.
	Held open or worn fluid piston valve.	Clear, service.
	Loose suction tube or intake nipple	Apply thread sealant and tighten.

REPAIR NOTES

1. To service the air motor, disconnect it from the displacement pump as explained below, and refer to the air motor manual 307–456.
2. Packing Repair Kit 222–344 is available. Parts included in the kit are designated with an asterisk, for example, (103*). For best results, use all of the parts in the kit, even if the old parts look good. Lubricate the packings before installing.

DISPLACEMENT PUMP SERVICE (See Figs. 6 & 7)

1. Flush the pump and stop it at the bottom of its stroke.
2. Before repairing the pump, follow the **Pressure Relief Procedure Warning** on page 9.
3. Disconnect the air and fluid hoses. Unscrew the bung adapter (18) and remove the pump from its mounting. Loosen the screw (16) and remove the bung adapter from the pump.
4. Remove the three locknuts (4) from the tie rods (3). Remove the spring clip (6) and pin (5) holding the coupling (115) in the air motor (1). Unscrew the coupling from the air motor. Pull the air motor (1) off the displacement pump (2). See Fig. 6.
5. Unscrew the tie rods (3) from the displacement pump (2).
6. Hold the pump upside down and unscrew the intake valve (102) from the pump cylinder (101). See Fig. 7. Remove the ball guide (105), ball (104), and ball stop pin (106) from the cylinder, being careful that they do not fall out. Remove the gasket (103). Clean all parts and inspect for wear or damage. Check the ball and seat for nicks.
7. Loosen, but do not remove the packing nut (114). Unscrew the coupling (115) from the displacement rod (107) and push the rod down until it clears the bottom of the cylinder (101). Pull the displacement rod out the bottom of the cylinder.
8. Unscrew the piston stud (108) from the displacement rod (107). Remove the piston nut (1 11) and piston packing (121). Drive the pin (109) out of the piston and remove the ball (110). Clean and inspect all parts for wear or damage.
9. Unscrew the cylinder (101) from the outlet housing (113). Inspect the inner surface of the cylinder and the outer surface of the displacement rod (107) for scoring which can damage the throat packings. Remove and inspect the o–ring (112).
10. Unscrew the packing nut (114) and remove the throat packings from the outlet housing (113). Clean and inspect all parts for wear or damage.

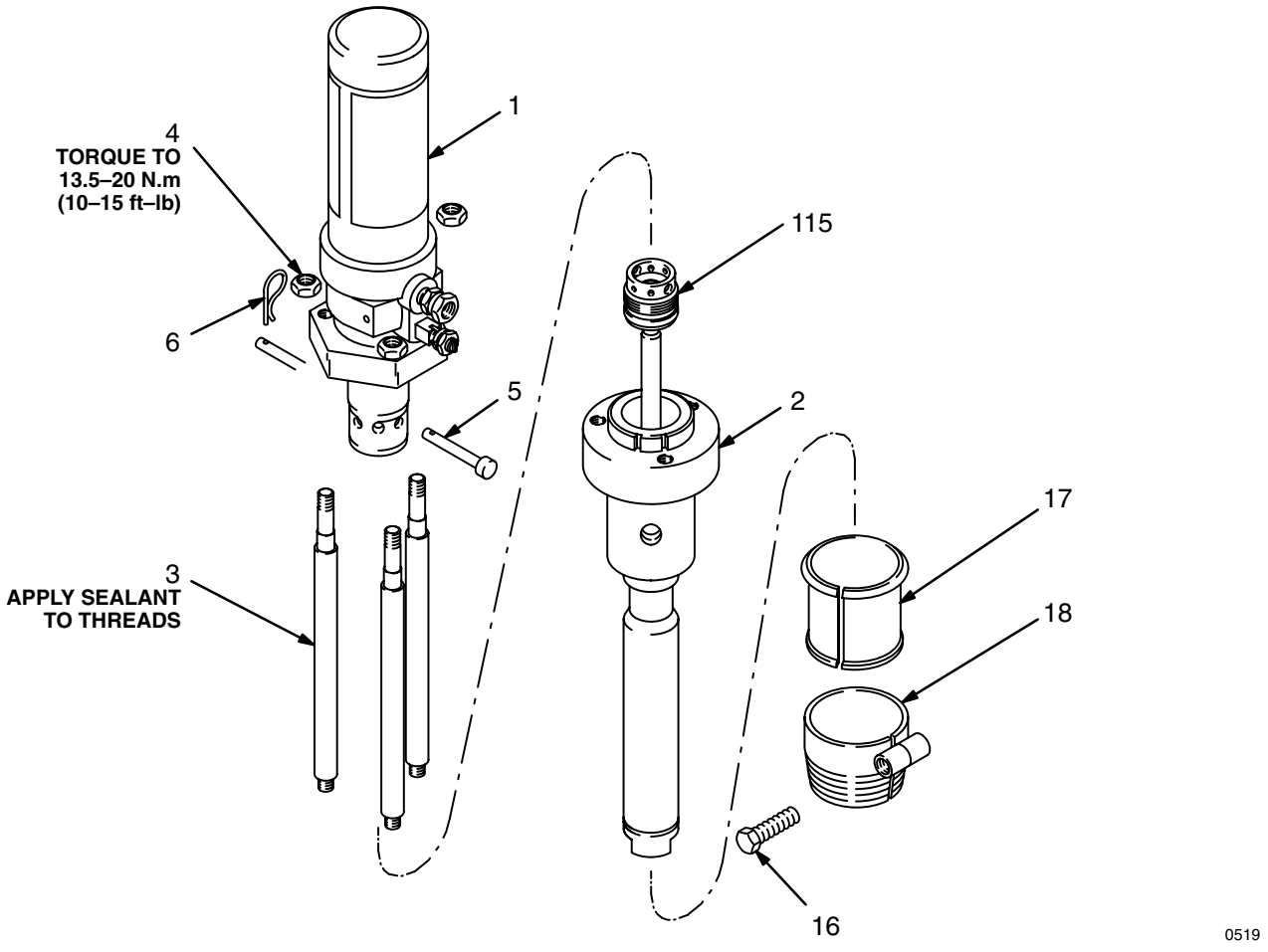


Fig. 6

11. Lubricate the throat packings and install them in the outlet housing (113) one at a time as follows, *with the lips of the v–packings facing down:* male gland (118*), one UHMWPE v–packing (120*), the PTFE v–packing (119*), the other UHMWPE v–packing (120*), and the female gland (1 17*). Lubricate the threads of the packing nut (114) and loosely install in the outlet housing. See Fig. 7.

12. Install the ball (110) in the piston stud (108). Press fit the ball stop pin (109) in the hole of the piston stud so it is flush with or below the stud' s surface. Apply thread sealant to the displacement rod (107) threads and screw the piston stud (108) onto the rod. Torque to 20.3–27 N.m (15–20 ft–lb).

13. Install the piston packing (121*) on the piston stud (108). Apply sealant to the threads of the piston stud (108) and screw the piston nut (1 11) onto the stud. Torque to 20.3–27 N.m (15–20 ft–lb).

14. Lubricate the o–ring (112) and install it in the outlet housing (113). Lubricate the threads of the cylinder (101) and screw it into the outlet housing. Torque to 34–40 N.m (25–30 ft–lb). Push the displacement rod (107) up into the pump cylinder from the bottom until it clears the packing nut (114).

15. Apply sealant to the threads of the displacement rod (107) and screw the coupling (1 15) onto the rod. Torque to 20.3–27 N.m (15–20 ft–lb).

16. Torque the packing nut (114) to 7.0–9.5 N.m (5–7 ft–lb).

17. Install the pin (106) in the ball guide (105). Insert the ball guide into the pump cylinder (101) so the pin (106) is toward the top of the pump.

18. Install the gasket (103*) on the intake valve (102). Place the ball (104) on the seat of the intake valve, and screw the valve into the cylinder . Torque to 34–40 N.m (25–30 ft–lb).

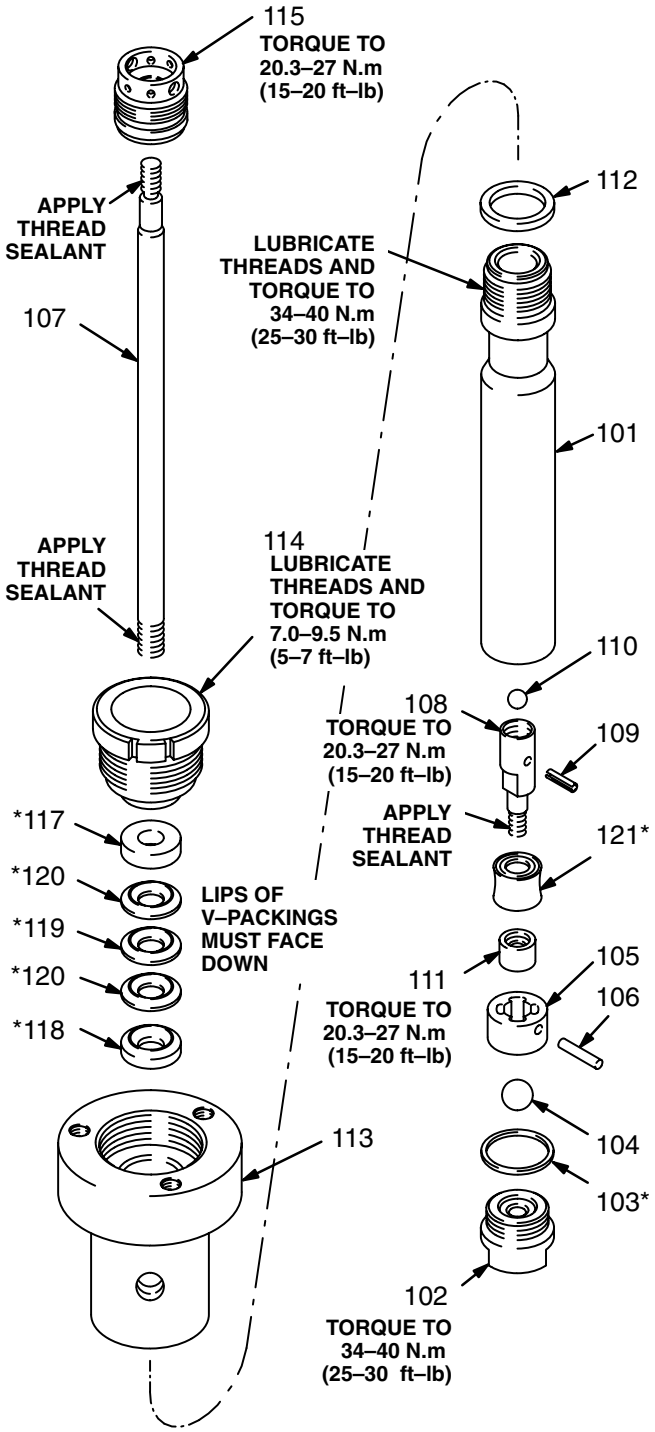
19. Screw the coupling (115) into the air motor (1). Line up the holes and secure with the pin (5) and spring clip (6). See Fig. 6.

20. Apply sealant to the threads of the tie rods (3) and screw the rods into the outlet housing (1 13). Mount the air motor (1) on the tie rods (3). Screw the locknuts (4) onto the tie rods loosely, then torque evenly to 13.5–20 N.m (10–15 ft–lb).

21. Screw the bung adapter (18) tightly into the pump mounting. Lower the pump through the bung adapter. Adjust the pump to the desired position and tighten the bung adapter screw (16) to hold it steady.

22. Reconnect the air and fluid hoses to the pump. Reconnect the grounding wire if it was disconnected during service.

23. Run the pump slowly to check for proper operation.



0520

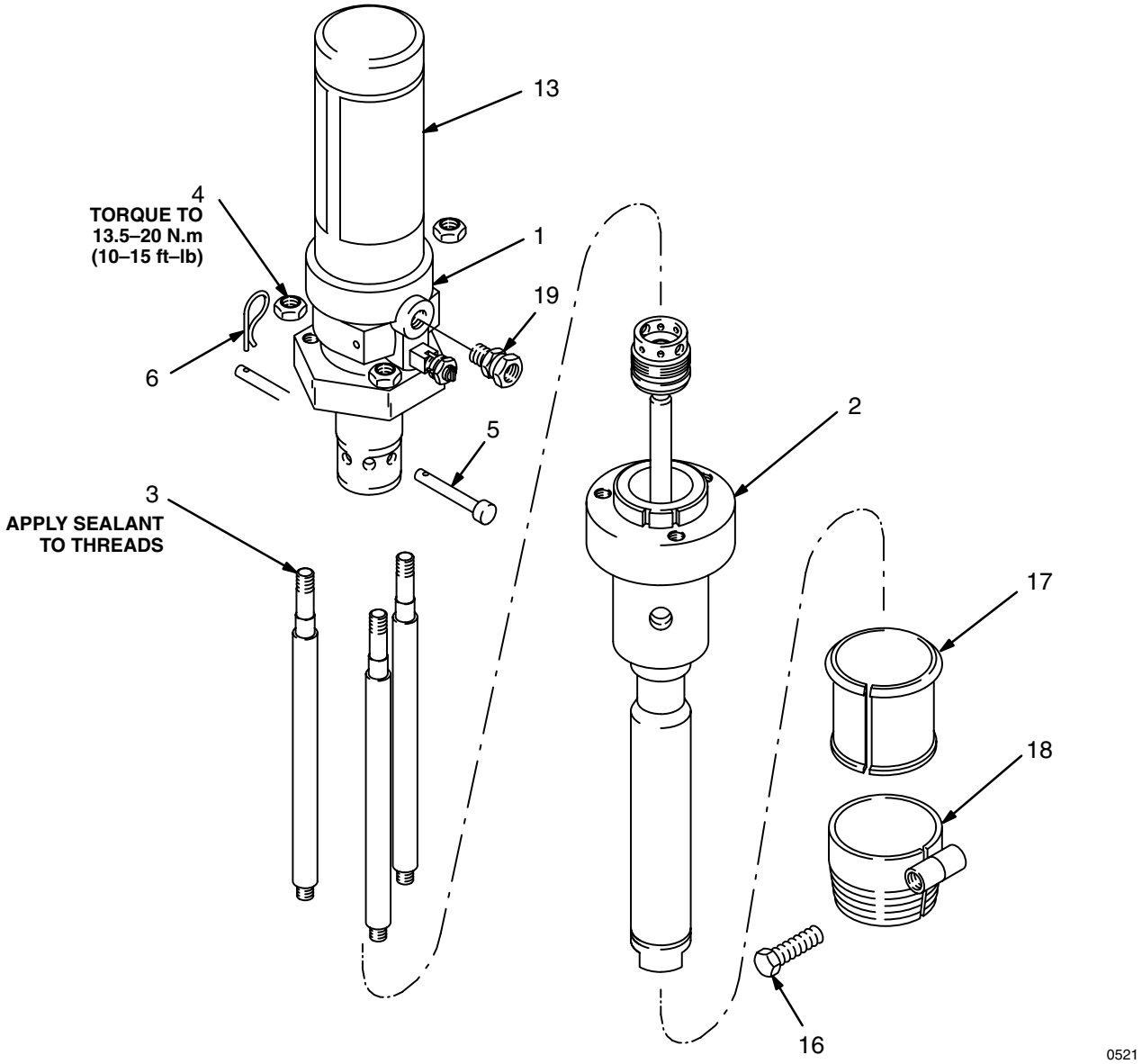
Fig. 7

NOTES:

PARTS DRAWINGS
AND
PARTS LISTS

PARTS DRAWING AND LIST

Model 224–522, Series A
Basic Pump
Includes items 1–19

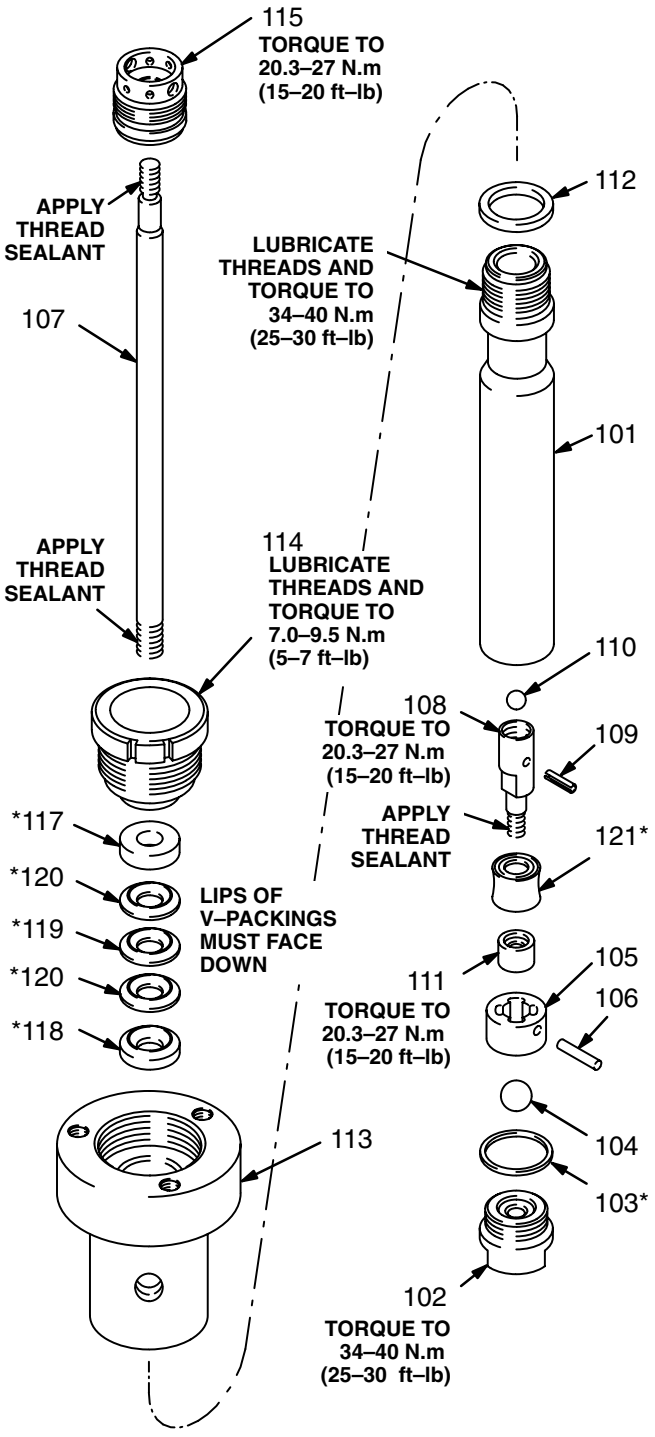


REF NO.	PART NO.	DESCRIPTION	QTY
1	224–520	AIR MOTOR KIT Includes items 13 and 19 See 307–456 for parts	1
2	224–521	DISPLACEMENT PUMP See page 15 for parts	1
3	185–031	ROD, tie	3
4	104–541	NUT, lock; w/nylon insert; M8 x 1.25	3
5	178–923	PIN, clevis	1
6	180–166	CLIP, spring	1
9	172–477	TAG (not shown)	1
13	187–208	LABEL, warning	1
16	104–587	CAPSCREW, hex hd; M8 x 1.25; 35 mm long	1
17	172–405	BUSHING, bung adapter	1
18	210–877	ADAPTER, bung	1
19	156–823	ADAPTER; 1/4 npt(m) x 1/4 npsm(f) swivel	1

Refer to "How to Order Parts" on page 15.

PARTS DRAWING AND LIST

Model 224–521, Series A
Displacement Pump
Includes items 101–121



REF NO.	PART NO.	DESCRIPTION	QTY
101	185–005	CYLINDER, pump	1
102	187–187	VALVE, intake	1
103	103–341*	GASKET; PTFE	1
104	105–445**	BALL; 13 mm (1/2”) dia.; sst	1
105	176–760	GUIDE, ball	1
106	176–759	PIN, stop, ball	1
107	185–011	ROD, displacement	1
108	185–007	STUD, piston	1
109	110–038	PIN, spring, straight	1
110	101–823**	BALL; 8 mm (5/16”) dia.; sst	1
111	185–006	NUT, piston	1
112	107–571**	O–RING; Viton®	1
113	222–257	HOUSING, outlet	1
114	185–009	NUT, packing	1
115	185–010	COUPLING, rod	1
117	185–014*	GLAND, female	1
118	185–015*	GLAND, male	1
119	110–040*	V–PACKING;PTFE	1
120	110–042*	V–PACKING; UHMWPE	2
121	110–257*	PACKING, piston; UHMWPE	1

* *Included in repair kit 222–344.*

***Recommended spare parts. Keep on hand to reduce downtime.*

222–344 Packing Repair Kit
(Must be purchased separately)
Consists of:

Ref. No.	Qty
103	1
117	1
118	1
119	1
120	2
121	1

HOW TO ORDER PARTS

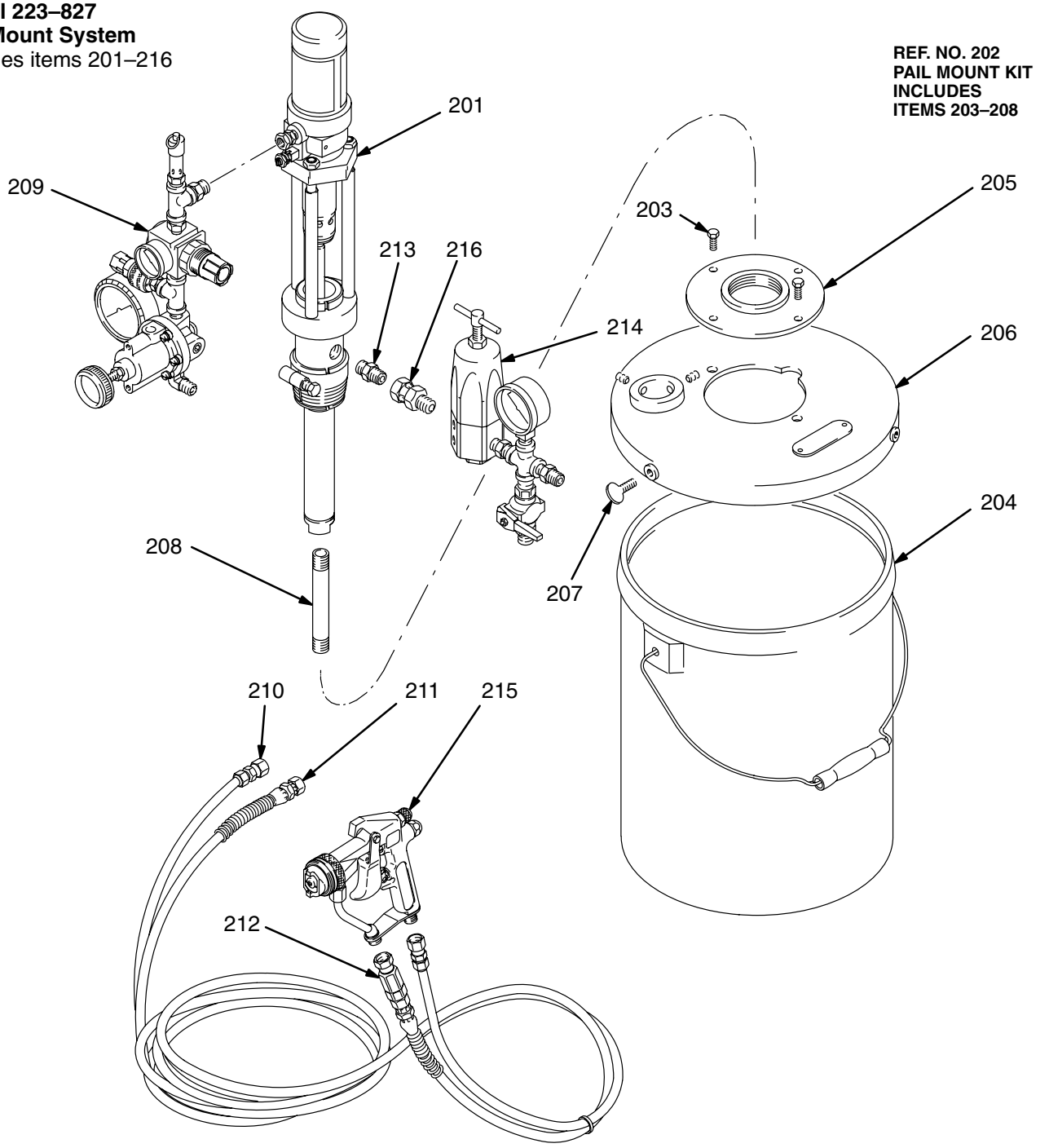
1 To be sure you receive the correct replacement parts, kits or accessories, always give all of the information requested in the chart below.
2. Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
3. Order all parts from your nearest Graco distributor.

6 digit Part Number	Qty	Part Description

0520

PARTS DRAWING AND LIST

Model 223–827
Pail Mount System
Includes items 201–216

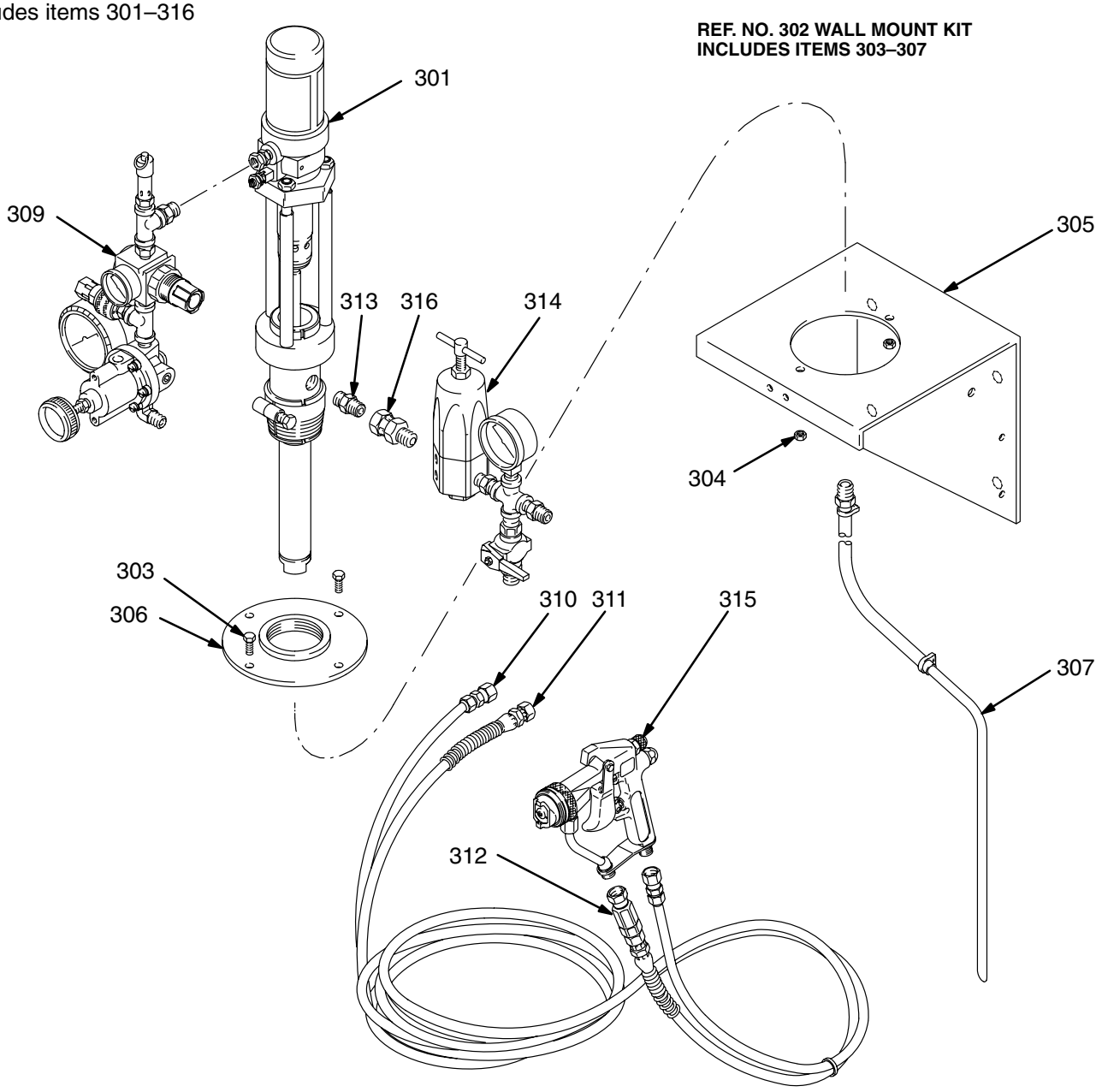


0614

REF NO.	PART NO.	DESCRIPTION	QTY
201	224–522	PUMP; See page 14 for parts	1
202	222–250	KIT, pail mount Includes items 203 to 208	1
203	100–270	. CAPSCREW, hex hd; 1/4–20 UNC x 5/8" (16 mm) long	2
204	101–108	. PAIL; 5 gal. (19 liter)	1
205	160–754	. PLATE, adapter, bung	1
206	205–786	. COVER, pail	1
207	100–220	. THUMBSCREW; 5/16 UNC x 1" (25 mm) long	3
208	110–044	. NIPPLE, pipe; 3/8 npt; 5" (127 mm) long	1
209	224–048	KIT, air/fluid regulator See page 19 for parts	1
210	185–353	HOSE, air; 3/8" ID; nitrile blend; cpld 1/4 npsm(f); 25' (7.6 m) long	1
211	214–698	HOSE, fluid; 3/16" ID; nylon; cpld 1/4 npsm (fbe) swivel; 25' (7.6 m) long	1
212	210–500	FILTER, fluid; in-line; 100 mesh; 1/4 npsm(m x f) swivel	1
213	156–849	NIPPLE; 3/8 npt	1
214	222–564	KIT, fluid regulator; See page 19 for parts	1
215	222–615	H.E.L.P. AA2000 SPRAY GUN; See 307–947 for parts	1
216	157–705	ADAPTER, swivel; 1/4 npt(m) x 3/8 npsm(f)	1

Refer to "How to Order Parts" on page 15.

Model 223–828
Wall Mount System
Includes items 301–316



0616

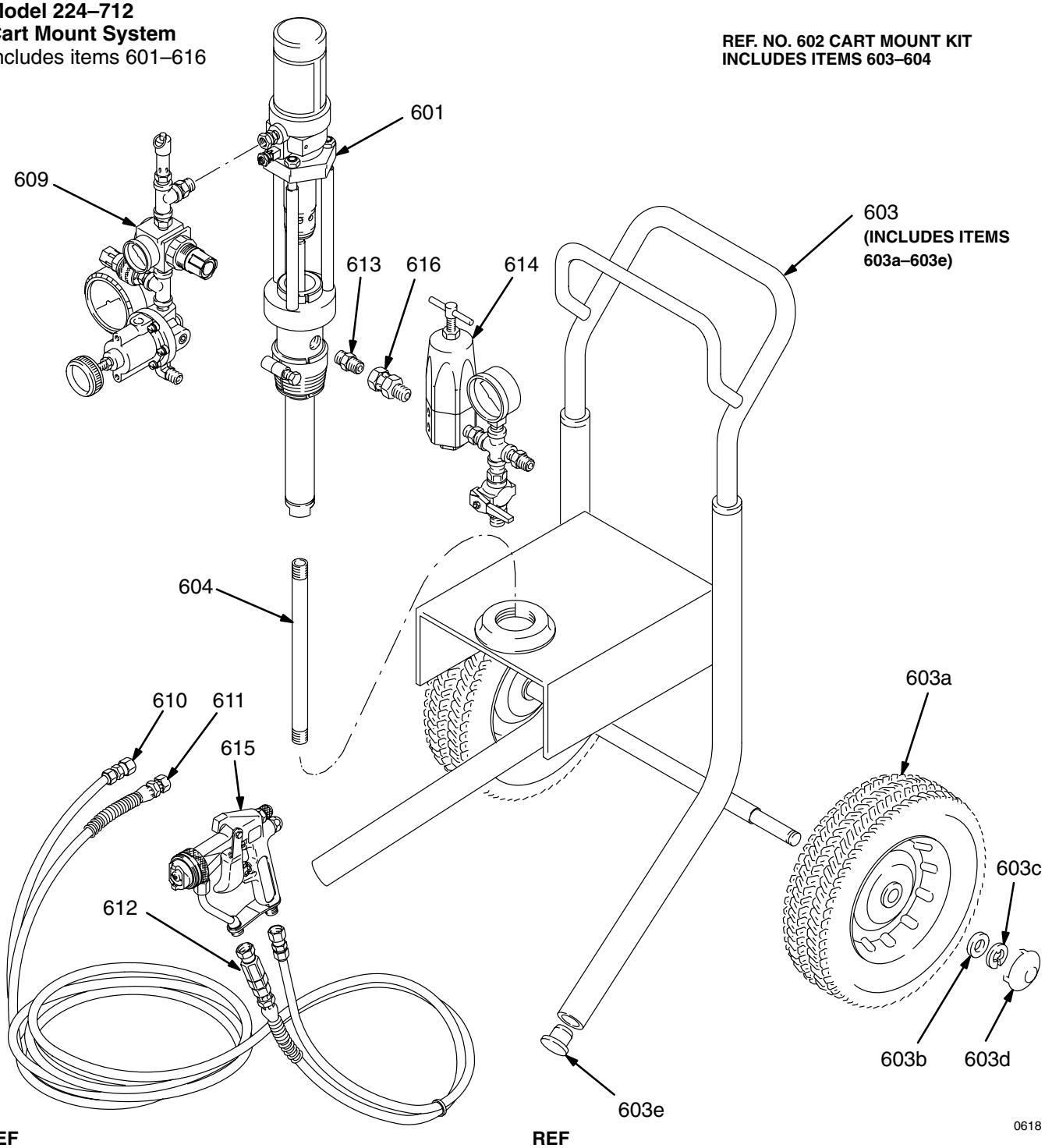
REF NO.	PART NO.	DESCRIPTION	QTY
301	224–522	PUMP; See page 14 for parts	1
302	222–251	KIT, wall mount; Includes items 303 to 307	1
303	100–270	. CAPSCREW, hex hd; 1/4–20 UNC x 5/8" (16 mm) long	2
304	102–025	. NUT, hex; 1/4–20	2
305	207–365	. BRACKET, mounting; See 306–783 for parts	1
306	160–754	. PLATE, adapter, bung	1
307	222–395	. TUBE, suction; 3/8 npt(m)	1
309	224–048	KIT, air/fluid regulator; See page 19 for parts	1
310	185–353	HOSE, air; 3/8" ID; nitrile blend; cpld 1/4 npsm(f); 25' (7.6 m) long	1
311	214–698	HOSE, fluid; 3/16" ID; nylon; coupled 1/4 npsm (fbe) swivel; 25' (7.6 m) long	1
312	210–500	FILTER, fluid; in-line; 100 mesh; 1/4 npsm(m x f) swivel	1
313	156–849	NIPPLE; 3/8 npt	1
314	222–564	KIT, fluid regulator; See page 19 for parts	1
315	222–615	H.E.L.P. AA2000 SPRAY GUN; See 307–947 for parts	1
316	157–705	ADAPTER, swivel; 1/4 npt(m) x 3/8 npsm(f)	1

Refer to "How to Order Parts" on page 15.

PARTS DRAWING AND LIST

Model 224–712
Cart Mount System
Includes items 601–616

REF. NO. 602 CART MOUNT KIT
INCLUDES ITEMS 603–604



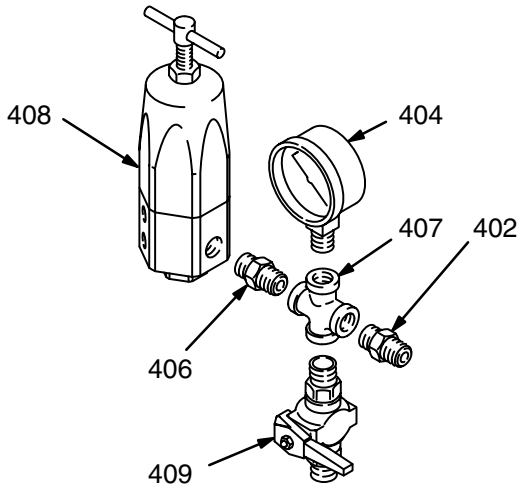
0618

REF NO.	PART NO.	DESCRIPTION	QTY
601	224–522	PUMP (see page 14 for parts)	1
602	224–713	KIT, cart mount Includes items 603–604	1
603	224–480	. CART Includes items 603a–603e	1
603a	106–062	. . TIRE, semi–pneumatic	2
603b	176–884	. . WASHER; 16 mm (5/8"); Delrin®	2
603c	101–242	. . RING, retaining	2
603d	104–811	. . CAP, hub	2
603e	107–310	. . PLUG, tube	2
604	111–478	. NIPPLE, intake; 3/8 npt; 238 mm (9.37 in.) long; sst	1
609	224–048	KIT, air/fluid regulator; See page 19 for parts	1
610	185–353	HOSE, air; 3/8" ID; nitrile blend; cpld 1/4 npsm(f); 25' (7.6 m) long	1
611	214–698	HOSE, fluid; 3/16" ID; nylon; coupled 1/4 npsm (fbe) swivel; 25' (7.6 m) long	1
612	210–500	FILTER, fluid; in-line; 100 mesh; 1/4 npsm(m x f) swivel	1
613	156–849	NIPPLE; 3/8 npt	1
614	222–564	KIT, fluid regulator; See page 19 for parts	1
615	222–615	H.E.L.P. AA2000 SPRAY GUN; See 307–947 for parts	1
616	157–705	ADAPTER, swivel; 1/4 npt(m) x 3/8 npsm(f)	1

Refer to "How to Order Parts" on page 15.

PARTS DRAWING AND LIST

222–564 Fluid Regulator Kit
Includes items 402–409



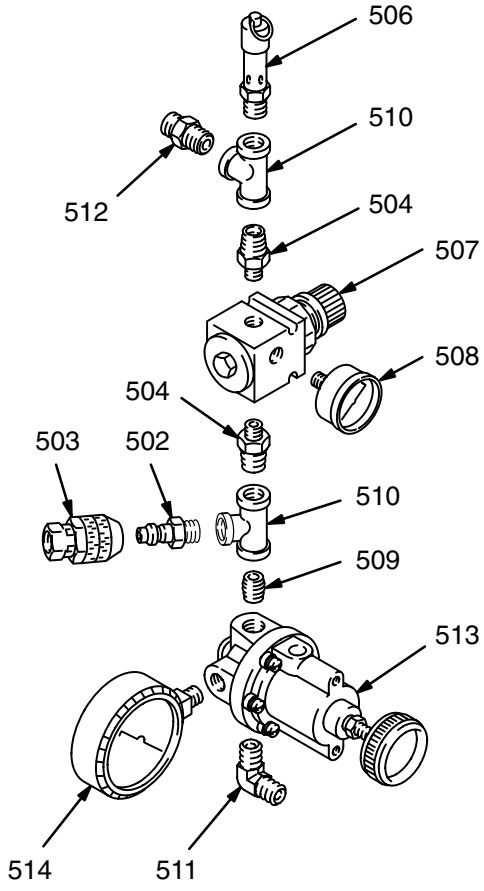
0620

REF NO.	PART NO.	DESCRIPTION	QTY
402	162–453	NIPPLE, 1/4 npsm x 1/4 npt	1
404	222–121	REGULATOR, fluid pressure; See Manual 307–886 for parts	1
406	156–971	NIPPLE, short; 1/4 npt x 1–3/8" long	1
407	102–959	CROSS, pipe; 1/4 npt	1
408	101–696	GAUGE, pressure, fluid; 0–1000 psi (0–69 bar) range	1
409	224–449	VALVE, ball	1

NOTE: *This kit includes several parts which are not required for these units. Those parts are not listed or shown in the parts drawing.*

Refer to "How to Order Parts" on page 15.

224–048 Air/Fluid Regulator Kit
Includes items 502–514



0619

REF NO.	PART NO.	DESCRIPTION	QTY
502	169–970	FITTING, air; 1/4 npt(m)	1
503	208–536	COUPLER, quick disconnect	1
504	151–519	NIPPLE; 1/4 npt x 1/8 npt	2
506	103–347	VALVE, safety	1
507	110–341	REGULATOR, air; 0–100 psi (0–7 bar) adjustment range; 1/8 npt(f) inlet and outlet	1
508	108–190	GAUGE, pressure; 0–100 psi (0–7 bar)	1
509	100–606	PIPE, close; 1/4 npt	1
510	100–574	TEE; 1/4 npt(f)	2
511	110–249	ADAPTER, male, 90°; 1/4 npt(m)	1
512	162–453	NIPPLE; 1/4 npsm x 1/4 npt	1
513	110–776	REGULATOR, air; 0–10 psi (0–0.7 bar) adjustment range; 3/8 npt(f) inlet and outlet; See Manual 308–024	1
514	185–350	GAUGE, pressure; 0–15 psi (0–1 bar)	1

Refer to "How to Order Parts" on page 15.

SERVICE INFORMATION

Listed below by the assembly changed are OLD, NEW, and ADDED parts.

Assembly Changed	Status	Ref No.	Part No.	Name
223–827	OLD		222–252	Pump
Pail Mount	NEW	201	224–522	Pump
System	OLD		164–672	Nipple
	NEW	213	156–849	Nipple
	ADDED	216	157–705	Swivel
223–828	OLD		222–252	Pump
Wall Mount	NEW	301	224–522	Pump
System	OLD		164–672	Nipple
	NEW	313	156–849	Nipple
	ADDED	316	157–705	Swivel

INTERCHANGEABILITY NOTE: NEW parts replace the OLD parts listed directly above them.

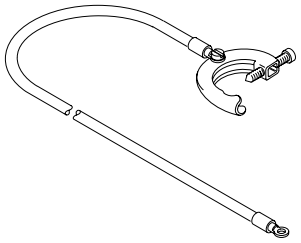
OBSOLETE AND NEW MODELS: Pump Model 222–252 is obsolete, replaced by 224–522. Displacement Pump 222–253 is obsolete, replaced by 224–521. Cart Mount System 224–712 is added to the manual.

ACCESSORIES

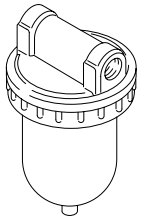
USE GENUINE GRACO PARTS AND ACCESSORIES

Must be purchased separately.

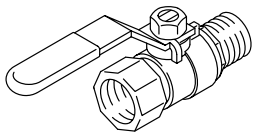
GROUNDING CLAMP 103–538
GROUND WIRE 208–950
25 ft (7.6 m) long, 12 gauge (1.5 mm2)



AIR LINE FILTER
250 psi (17.5 bar) MAXIMUM WORKING PRESSURE
106–149 1/2 npt inlet and outlet
106–150 3/4 npt inlet and outlet



BLEED–TYPE MASTER AIR VALVE 107–142
300 psi (21 bar) MAXIMUM WORKING PRESSURE
Relieves air trapped in the air line between the pump air inlet and this valve when closed. 1/2 npt (m x f) inlet and outlet.



PLUMBING FOR BLEED VALVE
159–842 Adapter; 1/4 npt(m) x 1/2 npt(f)
100–206 Bushing; 1/2 npt(m) x 1/4 npt(f)
162–453 Nipple; 1/4 npt x 1/4 npsm

GRACO THROAT SEAL LIQUID
Non–evaporating liquid for wet cup

206–995 1 quart (0.95 liter)
206–996 1 gallon (3.8 liter)

WARNING: Not for use in rubber packed or food pumps, air line lubricators or air motors.

PORTABLE BASE 205–054
Caster base makes pail mount system portable.

PAIL AGITATOR 204–536
1/4 HP, air powered. Requires the following mounting parts (must be ordered separately):

160–023 Air Hose; buna–N; 1/4" ID; 1/8 npt (mbe); 18" (0.45 m) long
100–547 Tee; 1/4 npt(f)
100–030 Reducing Bushing; 1/4 npt(m) x 1/8 npt(f)
156–971 Nipple; 1/4 npt

PUMP EXTENSION PIPE 185–190
Screw into the pump intake to increase pump length for use with 55 gal. (200 liter) drums.

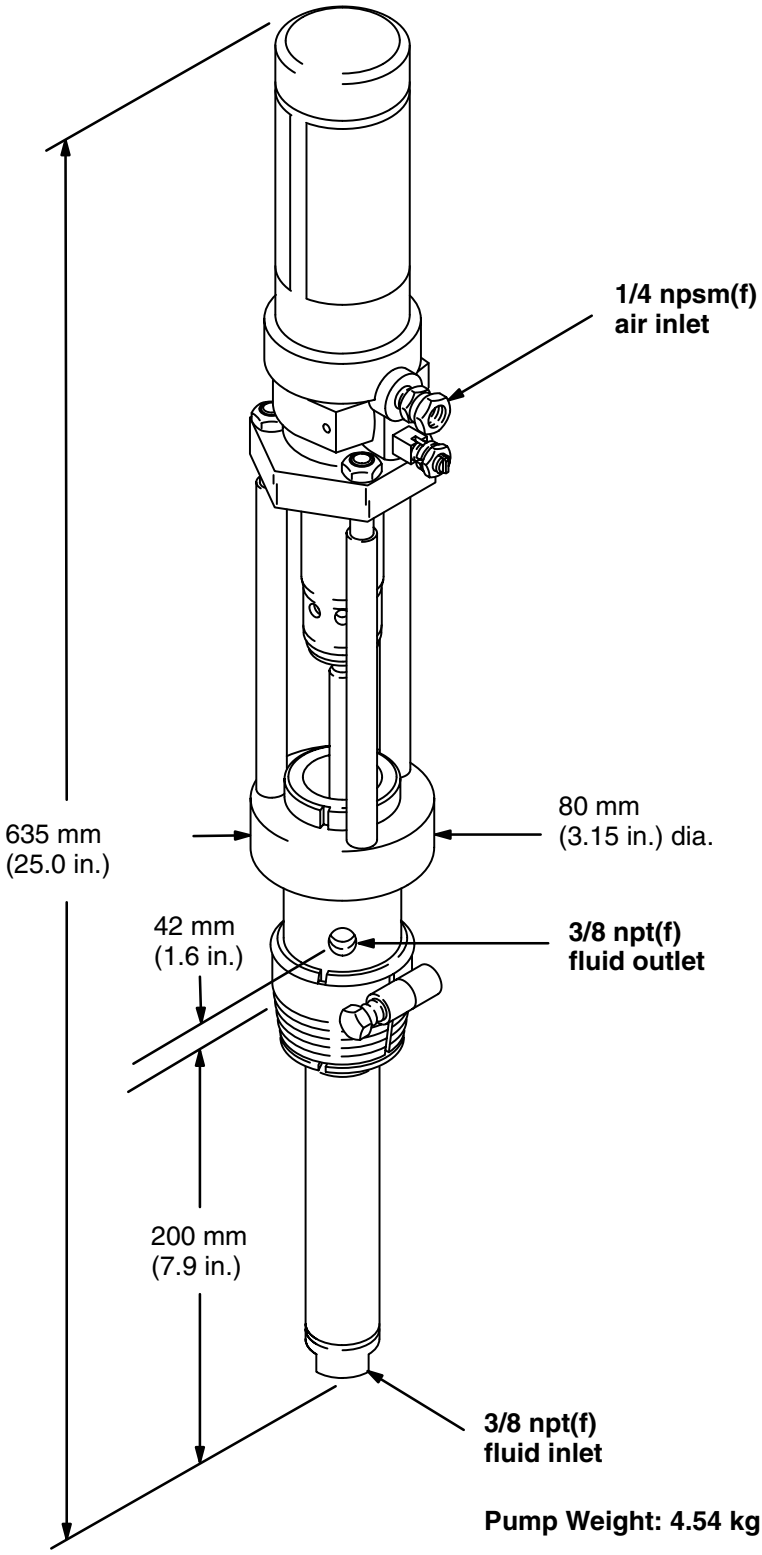
DRUM BUNG UNIT
To mount the pump in a bung hole of a 55 gal. (200 liter) drum, order the following parts:

224–522 10:1 Standard Pump
185–190 Extension Pipe
224–048 Air/Fluid Regulator Kit
185–353 Air Hose
214–698 Fluid Hose
210–500 In–Line Fluid Filter
164–672 Nipple
222–564 Fluid Regulator Kit
222–615 H.E.L.P. AA2000 Spray Gun

DRUM COVER UNIT
To mount the pump on a 55 gal. (200 liter) drum, order the following parts:

224–522 10:1 Standard Pump
200–326 Drum Cover
160–754 Flange Adapter
100–270 Capscrews (2)
185–190 Extension Pipe
224–048 Air/Fluid Regulator Kit
185–353 Air Hose
214–698 Fluid Hose
210–500 In–Line Fluid Filter
164–672 Nipple
222–564 Fluid Regulator Kit
222–615 H.E.L.P. AA2000 Spray Gun

DIMENSIONAL DRAWING



Pump Weight: 4.54 kg (10 lb)

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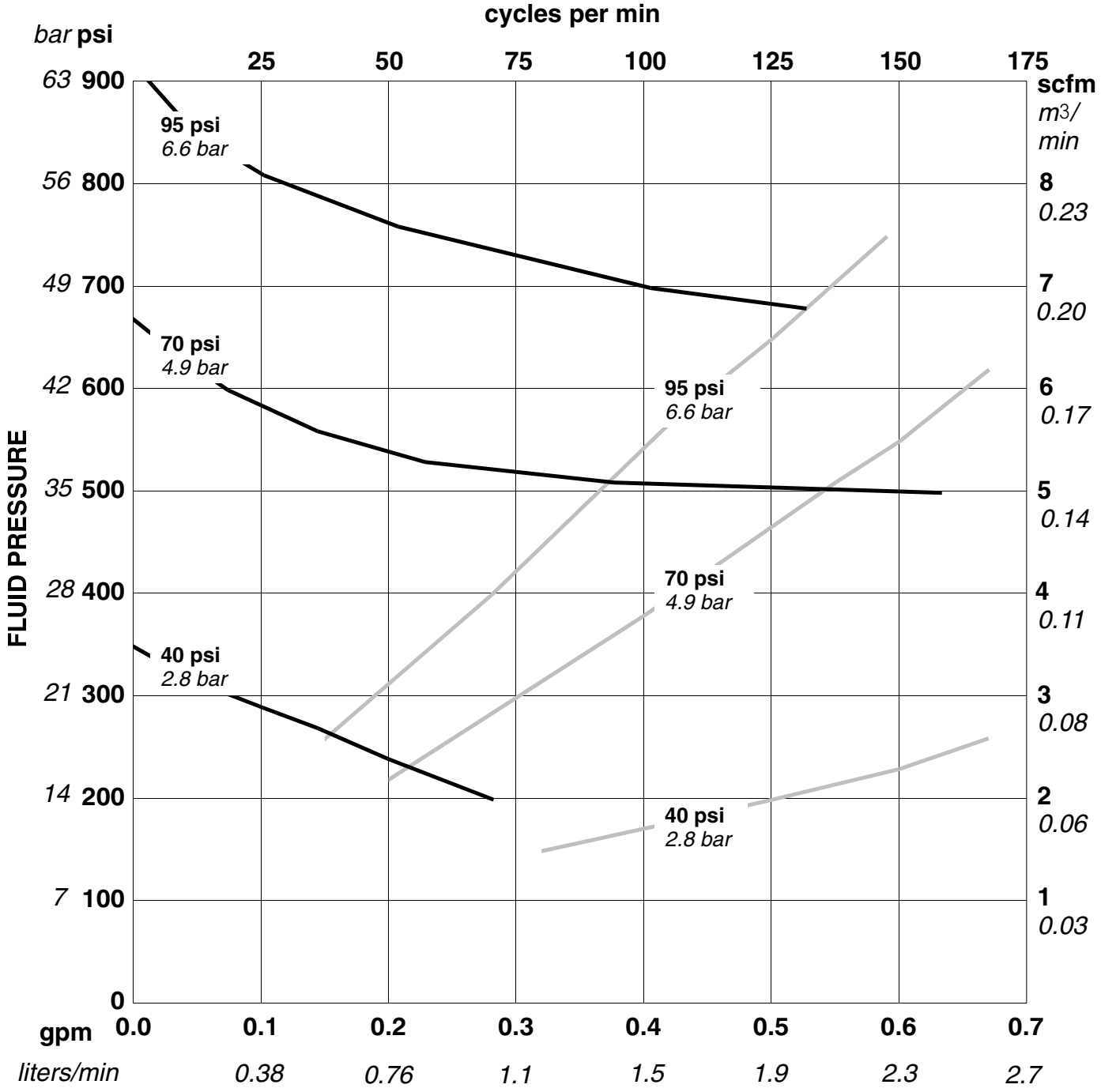
PERFORMANCE CHART

KEY:
FLUID OUTLET PRESSURE – BLACK CURVES
AIR CONSUMPTION – GRAY CURVES



FLUID FLOW (TEST FLUID: NO. 10 MOTOR OIL)

To find Fluid Outlet Pressure (bar/psi) at a specific fluid flow (lpm/gpm) and operating air pressure (bar/psi):
1. Locate desired flow along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve (black). Follow left to scale and read fluid outlet pressure.

To find Pump Air Consumption (m#/min or scfm) at a specific fluid flow (lpm/gpm) and air pressure (bar/psi):
1. Locate desired flow along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve (gray). Follow right to scale to read air consumption.

NOTES:

TECHNICAL DATA

Maximum working fluid pressure	950 psi (66 bar)
Maximum incoming air pressure	95 psi (6.5 bar)
Minimum incoming air pressure	25 psi (1.7 bar)
Maximum operating air pressure	10 psi (0.7 bar)
Ratio	10:1
Maximum recommended pump speed	100 cpm (0.4 gpm [1.5 liters/min])
Air consumption	See Performance Chart on page 22
Air inlet	1/4 npsm(f) swivel
Fluid inlet	3/8 npt(f)
Fluid outlet	3/8 npt(f)
Pump wetted parts*	303, 316, 440, and 17–4 PH Stainless Steel, Chrome Plating, PTFE, Viton®, Ultra–High Molecular Weight Polyethylene

Delrin® and Viton®

**See the gun and fluid filters' separate instruction manuals for their wetted parts.*

THE GRACO WARRANTY AND DISCLAIMERS

WARRANTY

Graco warrants all equipment manufactured by it 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. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment proven 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, 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 with Graco equipment of 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 claim. 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.

DISCLAIMERS AND LIMITATIONS

THE TERMS OF THIS WARRANTY CONSTITUTE PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND ARE IN LIEU OF ANY OTHER WARRANTIES (EXPRESS OR IMPLIED), INCLUDING WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY NON–CONTRACTUAL LIABILITIES, INCLUDING PRODUCT LIABILITIES, BASED ON NEGLIGENCE OR STRICT LIABILITY. EVERY FORM OF LIABILITY FOR DIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS IS EXPRESSLY EXCLUDED AND DENIED. IN NO CASE SHALL GRACO'S LIABILITY EXCEED THE AMOUNT OF THE PURCHASE PRICE. ANY ACTION FOR BREACH OF WARRANTY MUST BE BROUGHT WITHIN TWO (2) YEARS OF THE DATE OF SALE.

EQUIPMENT NOT COVERED BY GRACO WARRANTY

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

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