

INSTRUCTIONS-PARTS LIST

820-232



INSTRUCTIONS

This manual contains important warnings and information.
READ AND KEEP FOR REFERENCE.



Rev. H
Supersedes A
and PCN F

U.S. PATENT NO. 4,323,741, 4,397,610
PATENTED 1983, CANADA
AND OTHER PATENTS PENDING

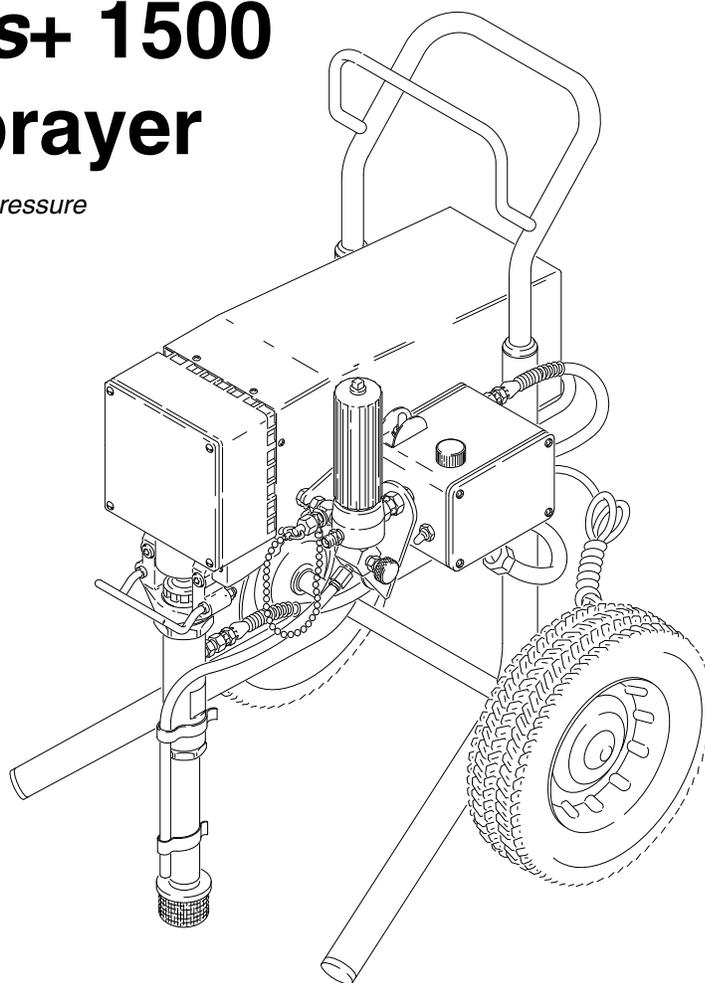
ELECTRIC, 120 VAC

ULTIMATE[®] Plus+ 1500 Airless Paint Sprayer

3000 psi (21.0 MPa, 210 bar) Maximum Working Pressure

Model 820-116, Series A (C.S.A.)

Basic sprayer on Upright cart without hose or gun



03656A

The SHERWIN-WILLIAMS COMPANY, CLEVELAND, OHIO 44115

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Table of Contents

Warnings	2	Bearing Housing & Connecting Rod	22
Setup	6	Drive Housing	23
Operation	8	Sprayer Parts Drawing	24
Flushing	10	Sprayer Parts	25
Troubleshooting	12	Displacement Pump Parts Drawing and List	26
Motor Brush	14	Technical Data	27
Displacement Pump	15	Dimensions	27
Pressure Control	20	Accessories	27
Power Supply Cord	20	Warranty and Disclaimers	28
Motor	21		

Symbols

Warning Symbol



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

Caution Symbol



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

! WARNING



INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are not sure, call Graco Technical Assistance at 1-800-543-0339.
- Do not alter or modify this equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. Refer to the **Technical Data** on page 27 for the maximum working pressure of this equipment.
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not use hoses to pull equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 82°C (180°F) or below -40°C (-40°F).
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

WARNING



INJECTION HAZARD

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

- Fluid injected into the skin may look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the tip guard and the trigger guard on the gun when spraying.
- Check the gun diffuser operation weekly. Refer to the gun manual.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 7 if the spray tip clogs and before cleaning, checking or servicing the equipment.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn or damaged parts immediately. Do not repair high pressure couplings; you must replace the entire hose.
- Fluid hoses must have spring guards on both ends, to help protect them from rupture caused by kinks or bends near the couplings.



TOXIC FLUID HAZARD

Hazardous 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.

⚠ WARNING

	<p>FIRE AND EXPLOSION HAZARD</p> <p>Improper grounding, poor ventilation, open flames or sparks can cause a hazardous condition and result in a fire or explosion and serious injury.</p> <ul style="list-style-type: none"> ● If there is any static sparking or you feel an electric shock while using this equipment, stop spraying immediately. Do not use the equipment until you identify and correct the problem. ● Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed. ● Keep the spray area free of debris, including solvent, rags, and gasoline. ● Electrically disconnect all equipment in the spray area. ● Extinguish all open flames or pilot lights in the spray area. ● Do not smoke in the spray area. ● Do not turn on or off any light switch in the spray area while operating or if fumes are present. ● Do not operate a gasoline engine in the spray area.
	<p>MOVING PARTS HAZARD</p> <p>Moving parts can pinch or amputate your fingers.</p> <ul style="list-style-type: none"> ● Keep clear of all moving parts when starting or operating the pump. ● Before servicing the equipment, follow the Pressure Relief Procedure on page 7 to prevent the equipment from starting unexpectedly.

NOTE: This is an example of the DANGER label on your sprayer. This label is available in other languages, free of charge. See page 27 to order.

⚠ DANGER ⚠	
 FIRE AND EXPLOSION HAZARD	 SKIN INJECTION HAZARD
<p>Spray painting, flushing or cleaning equipment with flammable liquids in confined areas can result in fire or explosion.</p> <p>Use outdoors or in extremely well ventilated areas. Ground equipment, hoses, containers and objects being sprayed.</p> <p>Avoid all ignition sources such as static electricity from plastic drop cloths, open flames such as pilot lights, hot objects such as cigarettes, arcs from connecting or disconnecting power cords or turning light switches on and off.</p> <p>Failure to follow this warning can result in death or serious injury.</p>	<p>Liquids can be injected into the body by high pressure airless spray or leaks – especially hose leaks.</p> <p>Keep body clear of the nozzle. Never stop leaks with any part of the body. Drain all pressure before removing parts. Avoid accidental triggering of gun by always setting safety latch when not spraying.</p> <p>Never spray without a tip guard.</p> <p>In case of accidental skin injection, seek immediate “Surgical Treatment”.</p> <p>Failure to follow this warning can result in amputation or serious injury.</p>
READ AND UNDERSTAND ALL LABELS AND INSTRUCTION MANUALS BEFORE USE	

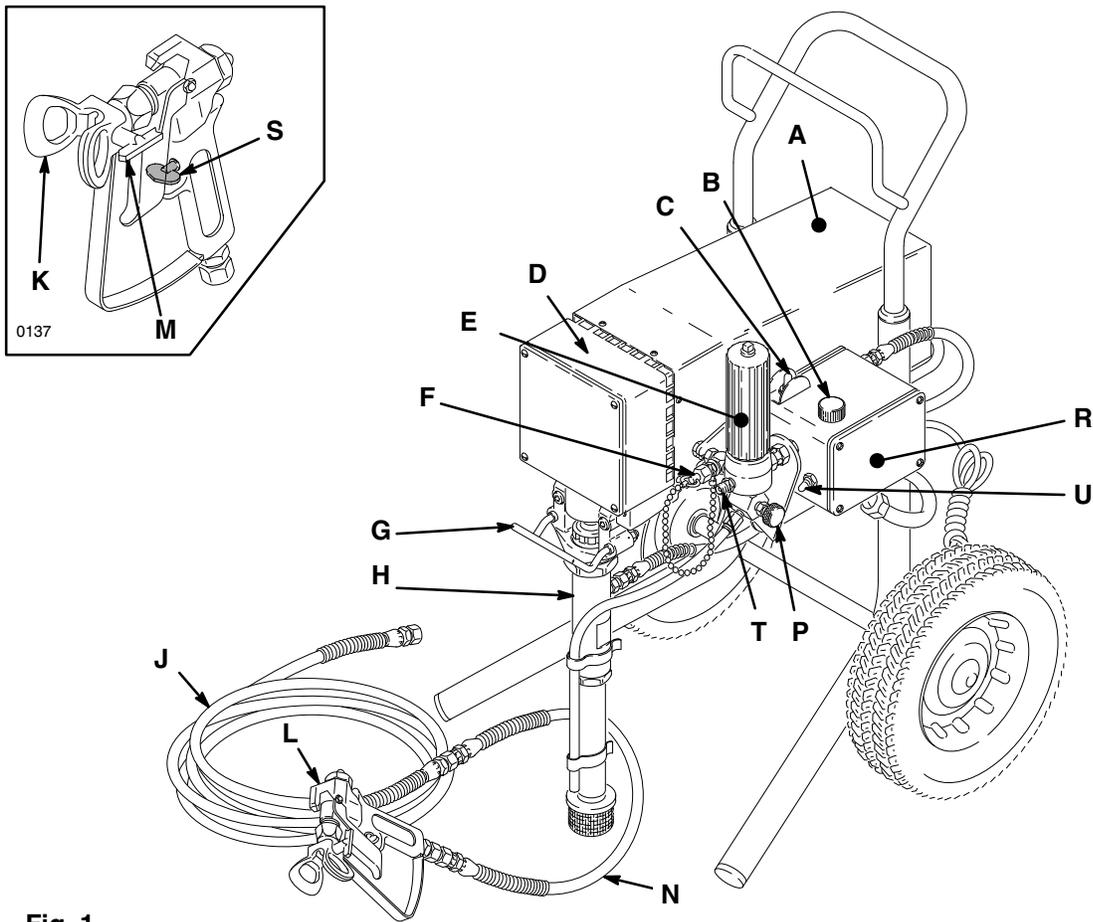


Fig. 1

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A	Motor (Under shield shown)	DC motor, 120 Vac, 18A, 1 phase
B	Pressure Adjusting Knob	Controls fluid outlet pressure
C	ON/OFF Switch, Circuit Breaker	Power switch that controls 120 Vac power to sprayer; with circuit breaker
D	Drive Assembly	Transfers power from DC motor to the displacement pump
E	Fluid Filter	Filter of fluid between source and spray gun
F	Secondary Fluid Outlet	Second hose and spray gun is connected here
G	Pail Hanger	Container of fluid to be sprayed may be hung here
H	Displacement Pump	Pressures fluid to be sprayed through spray gun
J	50 ft (15 m) Main Hose	1/4 in. ID, grounded, nylon hose with spring guards on both ends
K	RAC IV Tip Guard	Reverse-A-Clean (RAC) tip guard reduces the risk of fluid injection injury
L	Contractor Gun	High pressure spray gun with gun safety latch
M	RAC IV SwitchTip®	RAC SwitchTip atomizes fluid and removes clogs from spray tip without removing tip from spray gun
N	3 ft (0.9 m) Hose	3/16 in. ID, grounded, nylon hose used between 50 ft hose and spray gun to allow more flexibility when spraying
P	Pressure Drain Valve	Relieves fluid pressure when open
R	Pressure Control	Controls motor speed to maintain fluid pressure. Works with pressure adjusting knob.
S	Spray Gun Safety Latch	Inhibits accidental triggering of spray gun
T	Primary Fluid Outlet	Hose and spray gun is connected here
U	15/20 Amp Switch	Allows sprayer to operate on 15A service with reduced performance

Setup

⚠ WARNING

If you supply your own hoses and spray gun, be sure the hoses are electrically conductive, that the gun has a tip guard, and that each part is rated for at least *3000 psi (21.0 MPa, 210 bar) Working Pressure*. This is to reduce the risk of serious injury caused by static sparking, fluid injection or over-pressurization and rupture of the hose or gun.

⚠ CAUTION

To avoid damaging the pressure control, which may result in poor equipment performance and component damage, follow these precautions:

1. Always use a nylon spray hose at least 50 ft. (15 m) long.
2. Never use a wire braid hose as it is too rigid to act as a pulsation dampener.
3. Never install any shutoff device between the filter and the hose. See Fig. 2.

1. **Assemble the gun (106), 3 ft. whip hose (105) and 50 ft. hose (104).** Don't install the spray tip and tip guard yet.
2. **Two gun hookup.** Remove the cap (12) from the 1/4 npsm(m) secondary hose outlet and attach a minimum 50 ft. long hose. For more flexible gun movement, install a 3/16 in. ID, 3 ft. whip hose between the main hose and the gun.
3. **Fill the packing nut/wet-cup (216) 1/3 full with Throat Seal Liquid (TSL), supplied.**

⚠ WARNING



FIRE AND EXPLOSION HAZARD

Proper electrical grounding is essential to reduce the risk of fire or explosion which can result in serious injury and property damage. Also read **FIRE OR EXPLOSION HAZARD** on page 4.

4. **Check the electrical service.** Be sure the electrical service is 120 VAC, 60 Hz, 20A. Use a properly grounded outlet. Do not remove the grounding prong of the power supply cord. Do not use an adapter. Extension cords must have 3 wires of a minimum 12 gauge size. Long extension cords reduce sprayer performance. If 20A service is not available, flip the 15/20 Amp switch (U) to 15 setting to avoid nuisance tripping of circuit breakers.
5. **With the the ON/OFF switch OFF, plug the cord into a grounded electrical outlet** located at least 20 ft. (6 m) away from the spray area.
6. **Flush the pump** to remove the lightweight oil which was left in to protect pump parts after factory testing. See page 11.

⚠ Do not install any fluid shutoff device here

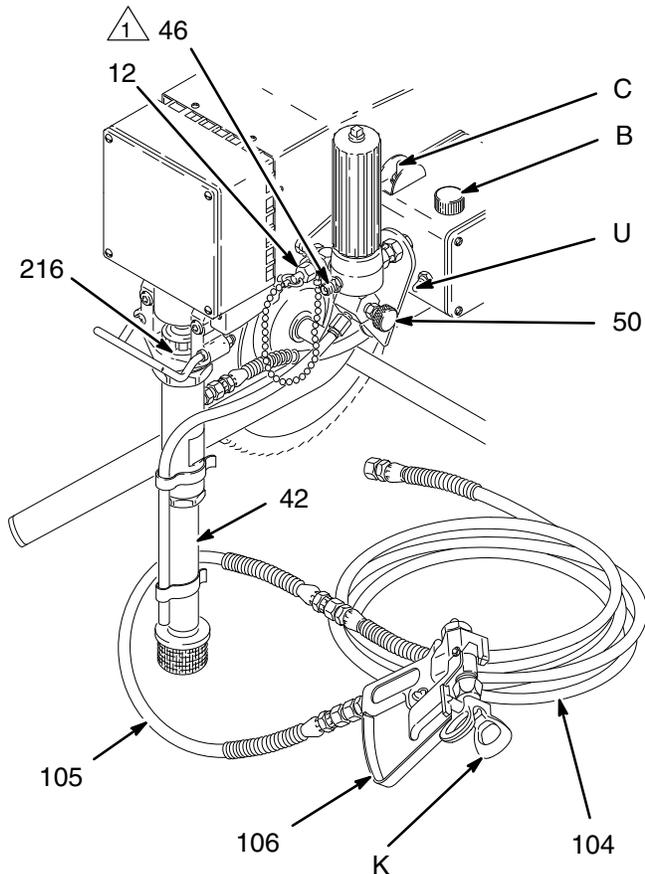


Fig. 2

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Operation

Pressure Relief Procedure

 **WARNING**

 **INJECTION HAZARD**

Fluid under high pressure can be injected through the skin and cause serious injury. To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** whenever you:

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

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the power supply cord.
4. Disengage the gun safety latch. Hold a metal part of the gun firmly to a grounded metal pail. Trigger the gun to relieve pressure.
5. Engage the gun safety latch.
6. Open the pressure drain valve. Leave the pressure drain valve open until you area 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, very slowly loosen the tip guard retaining nut or hose end coupling to relieve pressure gradually, then loosen completely. Now clear the tip or hose obstruction.

Operation

⚠ WARNING



INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

Startup (Fig. 2)

Always use this procedure to help ensure the sprayer is ready to operate and that you start it safely.

1. **For a first time startup**, flush the sprayer. See page 11.
2. **Close the pressure drain valve (50).**
3. **Don't install the spray tip and tip guard until the pump is primed!**
4. **Put the suction tube (42) into the paint container.**
5. **Lower the pressure setting** by turning the pressure adjusting knob (B) fully counterclockwise.
6. **Disengage the gun safety latch.** See Fig 3.

1 Gun safety latch shown engaged

2 Gun safety latch shown disengaged

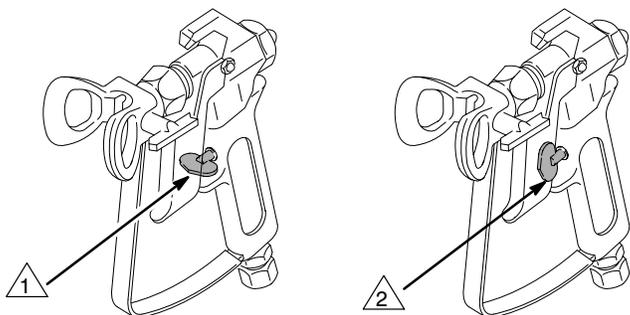


Fig. 3

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⚠ CAUTION

Do not run the sprayer dry for more than 30 seconds to avoid damaging the pump packings.

7. To prime the pump:

- a. Open the drain valve.
- b. Turn the ON/OFF (C) switch to ON.
- c. Slowly increase the pressure setting until the sprayer starts.
- d. When fluid is flowing from the valve, turn down the pressure and close the valve.
- e. Hold a metal part of the gun firmly against a grounded metal waste container. See Fig. 4.

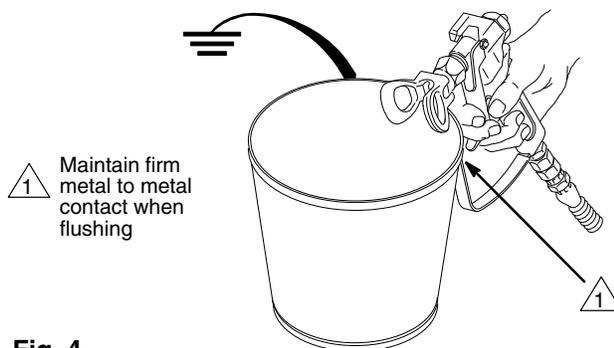


Fig. 4

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- f. Trigger the gun and slowly increase the pressure setting until the sprayer starts. Keep the gun triggered until all air is forced out of the system and the paint flows freely from the gun.
 - g. Release the trigger and engage the gun safety latch. See Fig 3.
8. **Check all fluid connections for leaks.** If any leaks are found, relieve pressure before tightening the connections.

Operation

9. **Install the spray tip and tip guard.** Engage the gun safety latch. Install the spray tip. If you are using the RAC IV tip guard, refer to manual 307–848 for installation instructions.
10. **Adjust the pressure.**
 - a. Turn the pressure adjusting knob clockwise just until spray from the gun is completely atomized. To avoid excessive overspray and fogging, and to decrease tip wear and extend the life of the sprayer, always use the lowest possible pressure needed to get the desired results.
 - b. If more coverage is needed, use a larger tip rather than increasing the pressure.
 - c. Test the spray pattern. To adjust the direction of the spray pattern: engage the gun safety latch, loosen the retaining nut, position the tip guard horizontally for a horizontal pattern or vertically for a vertical pattern and tighten the retaining nut.

Cleaning a Clogged Tip

⚠ WARNING	
	INJECTION HAZARD To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the Pressure Relief Procedure on page 7.

1. If the spray tip does clog, release the gun trigger, engage the gun safety latch, relieve pressure, and rotate the RAC IV SwitchTip 180°. See Fig. 5.
2. Disengage the gun safety latch and trigger the gun into a waste container. Engage the gun safety latch again.

- 1 SwitchTip shown in spraying position
- 2 Gun safety latch shown engaged

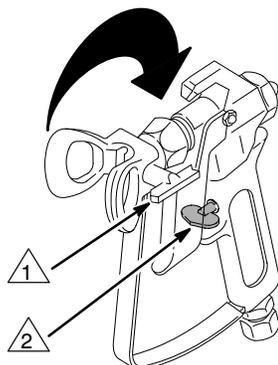


Fig. 5

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3. Return the SwitchTip to the original position, disengage the gun safety latch, and resume spraying.
4. If the tip is still clogged, engage the gun safety latch, shut off and unplug the sprayer, and open the pressure drain valve to relieve pressure. Clean the spray tip as shown in manual 307–848, supplied with the RAC IV.

Shutdown and Care

1. **Check the packing nut/wet-cup (216) daily.** Relieve the pressure. Keep the packing nut/wet-cup 1/3 full with TSL at all times to help prevent fluid buildup on the piston rod and premature wear of packings. Tighten the packing nut just enough to stop leakage. Overtightening may cause binding and excessive packing wear. Use a screwdriver and light hammer to adjust the nut. See Fig. 6.
2. **Clean the fluid filter (48) often** and whenever the sprayer is stored. First relieve pressure. See manual 307–273 for the cleaning procedure.
3. **Fill the connecting rod cavity (A) with motor oil** every 100 hours of operation. Relieve pressure first. See Fig. 6.

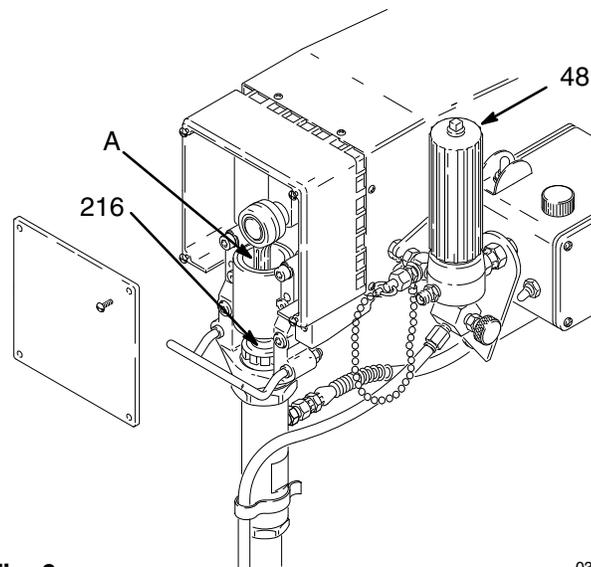


Fig. 6

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4. **For very short shutoff periods,** leave the suction tube in the paint, relieve pressure, and clean the spray tip.
5. **Coil the hose and hang it on the hose rack** when storing it, even for overnight, to help protect the hose from kinking, abrasion, coupling damage, etc.

Flushing

WARNING



INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief**

Procedure on page 7.

4. **Changing from oil–base to water–base paint.** Flush with mineral spirits, then warm, soapy water, and then clean water.
5. **Storage.** Flush as indicated below, shut off the sprayer, open the pressure drain valve to relieve pressure and leave it open.

Water–base paint: flush with water, then mineral spirits. Leave the system filled with mineral spirits.

Oil–base paint: flush with mineral spirits.

When to Flush

1. **New Sprayer.** The sprayer was factory tested in lightweight oil which was left in to protect pump parts.

Before using water–base paint, flush with mineral spirits, then warm, soapy water, and then clean water.

Before using oil–base paint, flush with mineral spirits.

2. **Changing Colors.** Flush with a compatible solvent.
3. **Changing water–base to oil–base paint.** Flush with warm, soapy water, then mineral spirits.

CAUTION

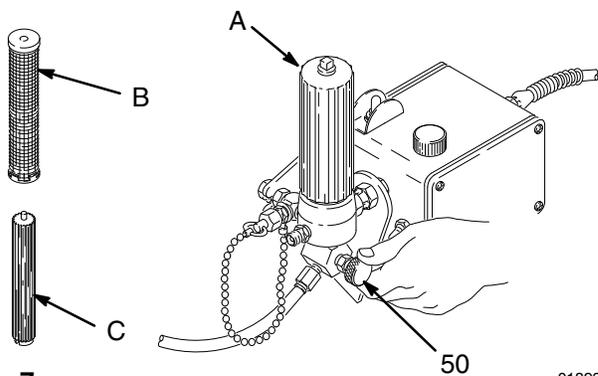
Never allow water to freeze in the pressure control. Doing so prevents the sprayer from being started and causes serious damage to the pressure control. Push the water out with mineral spirits.

6. **Startup after storage.** Before using water–base paint, flush out the mineral spirits with soapy water and then clean water. When using oil–base paint, flush out the mineral spirits with the paint to be sprayed.

Flushing

⚠ WARNING	
	INJECTION HAZARD To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the Pressure Relief Procedure on page 7.

How to Flush



1. Relieve pressure.
2. Remove the filter bowl (A), support (C) and screen (B); see manual 307-273. Install the bowl and support. Clean the screen separately and install after flushing. See Fig 7.
3. Close the pressure drain valve.
4. Pour one-half gallon of compatible solvent into a grounded metal pail. Put the suction tube in the pail.

5. Remove the spray tip from the gun, if it is installed.
6. Turn the pressure adjusting knob all the way counterclockwise to lower the pressure setting.
7. Open the drain valve. Turn on the sprayer and increase the pressure until the sprayer starts. When fluid comes from the valve, close it. Hold a metal part of the gun firmly against a metal waste container. Trigger the gun until all air is forced out of the system and the solvent flows freely from the gun. Release the trigger and engage the gun safety latch.

⚠ WARNING	
	FIRE AND EXPLOSION HAZARD To reduce static sparking and splashing, always remove the spray tip from the gun, and hold a metal part of the gun firmly to the side of a grounded metal pail when flushing.

8. Remove the suction tube from the pail. Disengage the gun safety latch and trigger the gun to force solvent from the hose. Do not run the pump dry for more than 30 seconds to avoid damaging the pump packings! Relieve pressure.
9. Leave the pressure drain valve open until you are ready to use the sprayer again. If the screen was removed, unscrew the filter bowl and reinstall the clean screen. Reinstall the bowl, hand tight only.
10. If you flushed with mineral spirits and are going to use a water-base paint, flush with soapy water and then clean water. Relieve pressure.

Troubleshooting

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 7.

Before servicing this equipment always make sure to **Relieve the Pressure**.

Check all possible problems and solutions before disassembling the unit.

TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
Building circuit breaker opens	Check all electrical wiring for damaged insulation.	Replace any damaged wiring.
	Check for other electrical appliances on circuit.	Shutdown other electrical appliances on circuit.
	Check position of 15–20 (Lo-High) amp switch.	Put switch in 15 amp (LO) position.
Sprayer circuit breaker opens	Check for locked motor rotor. Unplug cord and try to turn fan blades with a screwdriver.	Repair gear train or pump, if damaged. Thaw the sprayer, if frozen; See NOTE 1. Replace the pressure control, if damaged.
	Check for shorted motor. Use ohmmeter to check for shorts between motor leads or between motor leads and motor frame.	Inspect for damage to motor brush leads. Replace motor, if necessary.
	Check electrical supply with voltmeter. Meter should read 105–125 VAC.	Connect to outlet of correct voltage.
Sprayer will not run	Check pressure control knob setting. Motor will not run if it is at minimum setting (fully counterclockwise).	Slowly increase pressure setting to see if motor starts.
	Check for a clogged spray tip. Refer to separate gun or tip instruction manual.	Relieve pressure. Refer to separate gun or tip instruction manual for tip cleaning.
	Check extension cord for visible damage. Use a volt meter or test lamp at extension cord outlet to check.	Replace extension cord.
	Check sprayer power supply cord for visible damage such as broken insulation or wires.	Replace power supply cord.
	Check electrical supply with volt meter. Meter should read 105–125 VAC.	Reset building circuit breaker; replace building fuse. Try another outlet.
	Check for motor damage. Remove drive housing assembly. See page 23. Try to rotate fan by hand.	Replace motor (1) if fan won't turn.
Poor spray pattern	Check for worn spray tip.	Relieve pressure and then replace the tip. See the separate gun or tip manual.

Troubleshooting

TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
Motor runs and pump strokes, but output is low or there is no output.	Check extension cord size and length.	Replace cord with a larger size, grounding type extension cord.
	Check paint supply.	Refill and reprime pump.
	Check for clogged intake strainer.	Remove and clean strainer and reinstall.
	Check for loose suction tube or loose fittings.	Tighten; use thread sealant or sealing tape on threads, if necessary.
	Check for worn spray tip.	Follow Pressure Relief Procedure Warning , then replace tip. See your separate gun or tip manual.
	Check motor brushes; check for loose leads and terminals, minimum 1/2" brush length, broken or misaligned springs, or brushes binding in holders. See page 14.	Replace parts as needed. See page 14.
	Check motor armature for shorts by using an armature tester (growler).	Replace motor. See page 21.
	Check to see if pump continues to stroke when gun trigger is released. With pump on and primed, trigger gun momentarily, then release and engage safety latch. Relieve pressure, turn off and unplug sprayer.	Service pump. See page 15.
	Check to see if intake valve ball and piston ball are seating properly.	Remove intake valve and clean. Check balls and seats for nicks; replace if necessary. See page 16. Strain paint before using to remove particles that could clog the pump.
	Check for leaking around throat packing nut which may indicate worn or damaged packings.	Replace packings. See page 15. Also check piston valve seat for hardened paint or nicks and replace if necessary. Tighten the packing nut/wetcup.
Motor runs but pump does not stroke.	Check displacement pump connecting rod pin (20). See page 19.	Replace pin, if missing. Be sure retainer spring (35) is fully in groove all around connecting rod. See Fig. 38, page 19.
	Check for frozen or hardened paint in the pump (39).	Thaw. See NOTE 1. Plug in sprayer and turn on. Slowly increase pressure setting to see if motor starts.
	Be sure crank in drive housing rotates; plug in sprayer and turn on briefly to check. Turn off and unplug sprayer.	Check drive housing assembly for damage and replace if necessary. See page 23.
Motor is hot and runs intermittently.	Determine if sprayer was operated at high pressure with small tips, which causes low motor RPM and excessive heat build up.	Decrease pressure setting or increase tip size.
	Be sure ambient temperature where sprayer is located is no more than 90°F and sprayer is not located in direct sun.	Move sprayer to shaded, cooler area, if possible.
	Determine if sprayer was turned on, pressurized, but not operating for long periods of time.	Turn off sprayer whenever you stop spraying for a while and relieve fluid pressure.

NOTE 1: Thaw the sprayer if water or water-based paint has frozen in it, by placing it in a warm area. Do not try to start the sprayer until it has thawed completely. If paint hardened (dried) in the sprayer, replace the pump packings. See page 15.

Motor Brush

NOTE: Replace the brushes when they have worn to about 0.4 in (10 mm). Always check both brushes and replace them together. A Brush Repair Kit, 820-536, and the spring clip, 820-594, are available. Order separately.

NOTE: Replacement brushes may last only half as long as the original ones. To maximize brush life, break in new brushes by operating the sprayer for at least one hour with no load (remove the pump connecting rod pin).

⚠ WARNING



INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

1. Remove the motor cover (14) and both inspection covers (A). See Fig 8.
2. Push in the spring clip (D) to unhook it, and then pull it out. See Fig 9.
3. *Loosen* the terminal screw (F). Pull the brush lead (G) away, leaving the motor lead in place. Remove the brush (C) and spring (B). See Fig 10.
4. Inspect the commutator for excessive pitting, burning or gouging. A black color on the commutator is normal. Have the commutator resurfaced by a qualified motor repair shop if the brushes seem to wear too fast.
5. Install the new brush (C) so its lead is in the long slot (K) of the holder (H). Slide the terminal (E) under the terminal screw (F) washer. Make sure the motor lead terminal (G) is still connected at the screw. Tighten the screw. See Fig 11.
6. Place the spring (B) on the brush (C) as shown in Fig 11.
7. Push in and hook the spring clip (D). See Fig 11.
8. Repeat for the other side.

⚠ CAUTION

Do not run the sprayer dry for more than 30 seconds while checking the brushes to avoid damaging the displacement pump.

9. Reinstall the remaining parts.

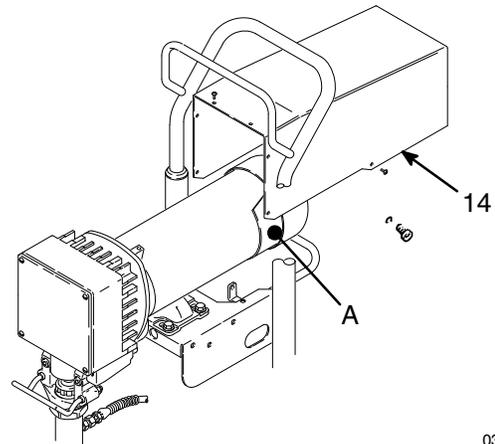


Fig. 8

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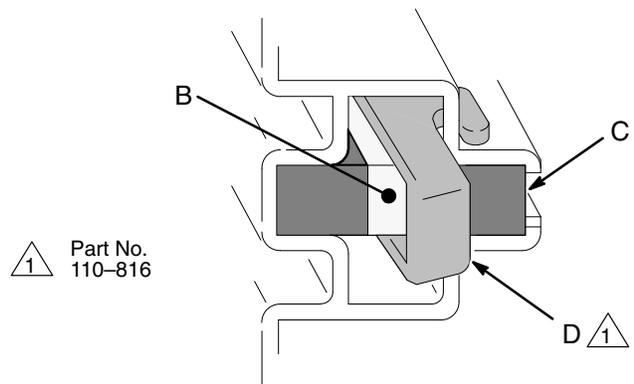


Fig. 9

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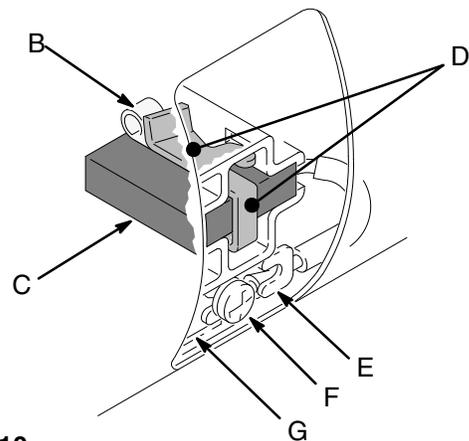


Fig. 10

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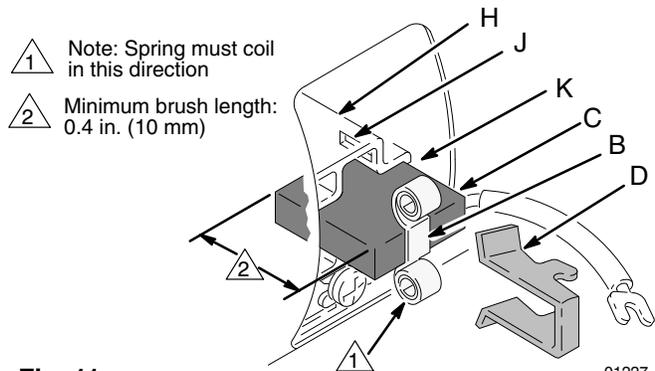


Fig. 11

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Displacement Pump

Removing the Pump

⚠ WARNING	
	INJECTION HAZARD To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the Pressure Relief Procedure on page 7.

⚠ WARNING	
	INJECTION HAZARD Always use the special sleeve removal tool to remove the sleeve. Other removal methods could cause the pump to rupture, resulting in serious bodily injury. If the sleeve cannot be removed easily using the tool, return the sleeve and cylinder to your Graco distributor for removal.

1. Flush the pump, if possible, and relieve pressure again. Stop the pump with the piston rod in its lowest position, if possible.
2. Remove the hose (47), clips and drain tube (101). Remove the suction tube (42); hold the wrench on the pump intake valve (223) to keep the pump from loosening. See Fig. 12.
3. Push the retaining spring (35) up. See Fig. 13.
4. Push out the pin (20). See Fig. 14.
5. Loosen the locknut (38) and unscrew the pump from the bearing housing (27). See Fig. 15.

Tools Needed for Pump Repair

Repair Kit, 820-672

Sleeve Removal Tool, 224-788

Heavy duty vise

1-1/16" open end wrench for Pump 220-872

2-1/4" adjustable, open-end wrench

Plastic mallet

Small screwdriver

Throat Seal Liquid

Thread Sealant

NOTE: Soak leather packings in oil before installing.

Cleaning and Inspecting Parts

Clean and inspect the parts. Pay particular attention to the ball seat in the intake valve, which should have no nicks or wear, and to the inside of the sleeve and the outside of the piston rod, which should not be worn or scratched. Replace worn or damaged parts.

Remove and clean the sleeve when you are repacking the pump. A special sleeve removal tool is available. See the chart, above, for the tool number for your pump.

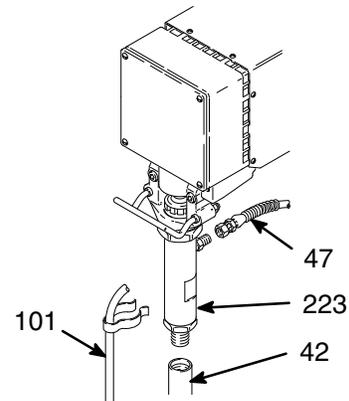


Fig. 12

04585

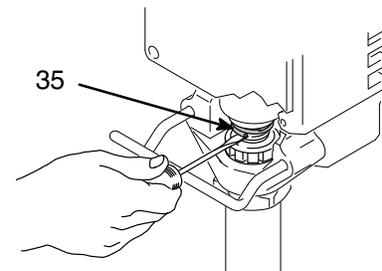


Fig. 13

04586

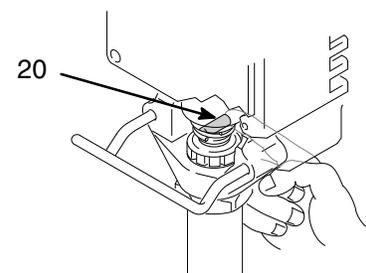


Fig. 14

04587

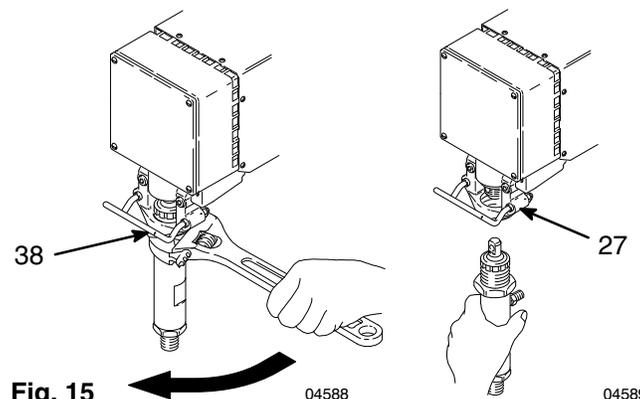


Fig. 15

04588

04589

Displacement Pump

Disassembly

NOTE: Parts included in the Packing Repair Kit, 820–672, are marked with an asterisk (*) in the text and drawings. Use all the new parts in the kit.

1. Loosen the packing nut (216) and remove plug (205). Unscrew the cylinder from the intake valve. See Fig. 16.
2. Disassemble the intake valve. Use a pick to remove the old gasket (202). Clean and inspect the parts. See Fig. 17.
3. Reassemble the intake valve using a new gasket (*202*), ball (*204*) and pin (*221*). See Fig. 17.
4. Tap the piston rod (224) out of the cylinder. See Fig. 18.
5. Screw the sleeve removal tool's large nut (A) into the top of the cylinder. Screw down the rod to push the sleeve out. See Fig. 19. Remove the tool. Clean and inspect the parts.
6. Clamp the piston rod (224) in a vise. Loosen the retaining nut (211). Unscrew the piston valve (222). See Fig. 20.
7. Disassemble the piston and discard the packings and glands. See Fig. 21.
8. Remove and discard the throat packings and glands from pump cylinder. See Fig. 22.

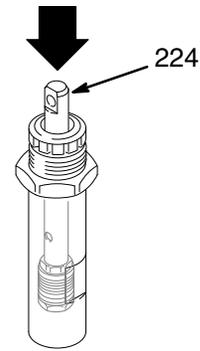


Fig. 18

02561

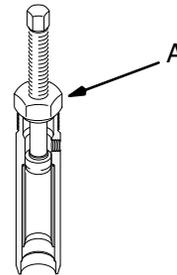


Fig. 19

02562

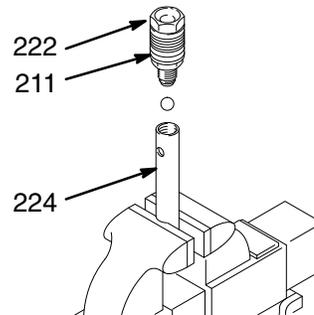


Fig. 20

02563

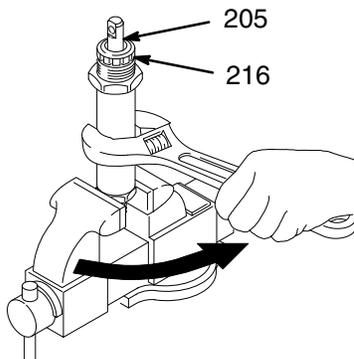


Fig. 16

02558A

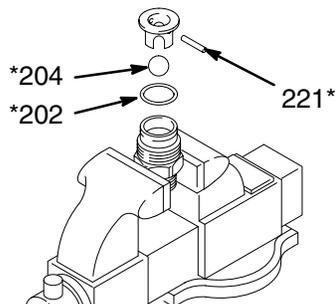


Fig. 17

02559

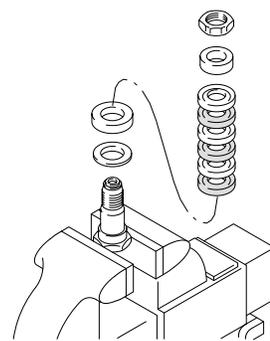


Fig. 21

02564

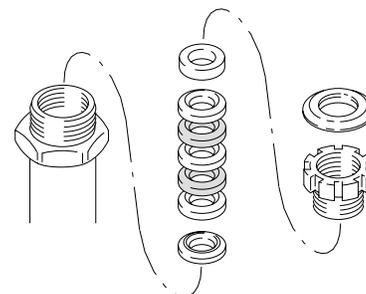


Fig. 22

02565

Displacement Pump

Pump Reassembly

1. Clean the piston valve threads. One at a time, stack the backup washer (203*), seal (215*) (with lips facing down), and female gland (214*) on the piston. Alternately stack the polyethylene (212*) and leather (206*) packings (lips facing up) on the piston. Then install the male gland (210*). See Fig. 23.
2. Place the flats of the piston valve in a vise. Tighten the packing retaining nut against the piston valve to 4 in-lb (0.35 N.m). See Fig. 24.

Note the alignment of the piston to the packing retainer nut. Maintain this alignment through Steps 4 and 5.

3. Apply one drop of Loctite to the threads. Place the ball (225*) on the piston valve. See Fig. 25.
4. While maintaining the alignment, thread the piston valve assembly into the piston rod just until the piston valve nut contacts the rod. See Fig. 26.
5. Place the flats of the rod in a vise. Carefully tighten the piston valve nut (211) against the piston rod to 19 ft-lb (27 N.m). Use two wrenches to maintain the alignment. See Fig. 27.
6. Place the male gland (208*) in the cylinder. Alternately stack the polyethylene (213*) and leather packings (207*) (lips facing down). Then place the female gland (209*) in the top of the cylinder. Seat the packings. See Fig. 28.

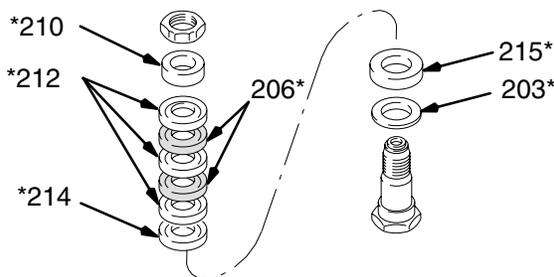


Fig. 23 02566

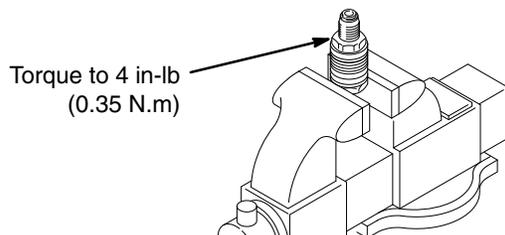


Fig. 24 02567

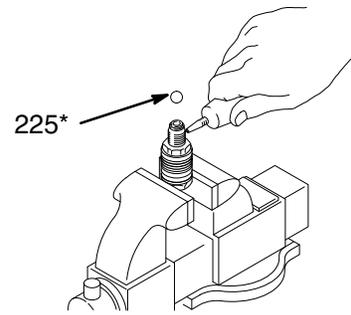


Fig. 25 02568

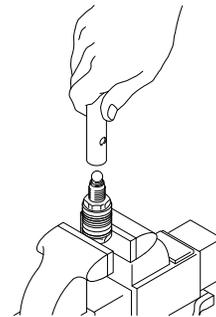


Fig. 26 02569

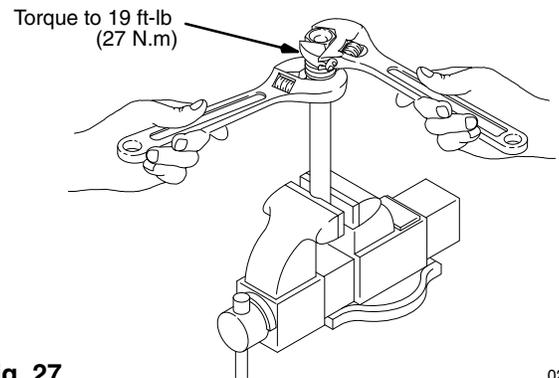


Fig. 27 02570A

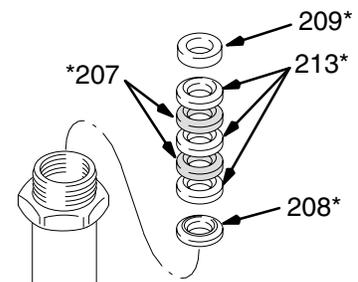


Fig. 28 02571

Displacement Pump

- Loosely install the packing nut (216) and plug (205). See Fig. 29.
- Place a o-ring (217*) in the cylinder. Slide the sleeve in to the cylinder to seat the o-ring. See Fig. 30. Remove the sleeve.
- Grease the piston packings and the top edge of the sleeve. See Fig. 31.
- Carefully slide the piston assembly into the top of the sleeve. See Fig. 32.
- Slide the sleeve/piston rod assembly into the bottom of the cylinder. See Fig. 33.
- Grease the intake valve o-ring with non-silicon grease. Screw the pump cylinder into the intake valve. Torque to 70 ft-lb (95 N.m). See Fig. 34.
- Tighten the packing nut (216) hand tight. Screw the cylinder locknut (A) down to the bottom of the external cylinder threads. See Fig. 35.

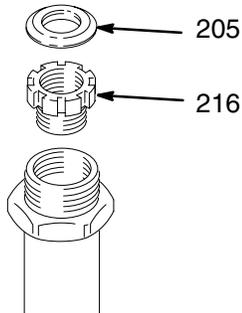


Fig. 29

02572

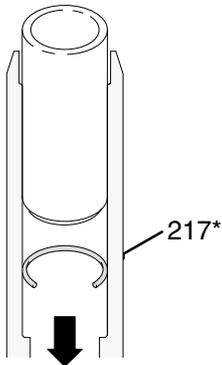


Fig. 30

02573A

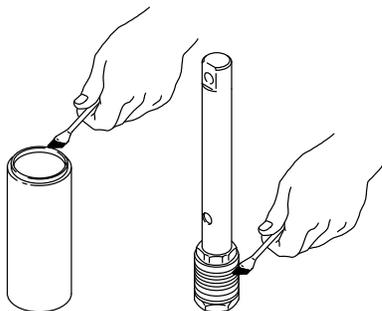


Fig. 31

02574A

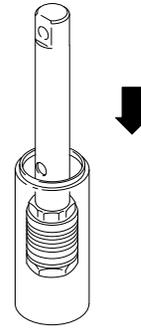


Fig. 32

02575

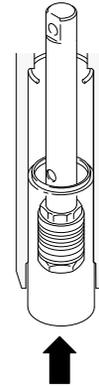


Fig. 33

02576

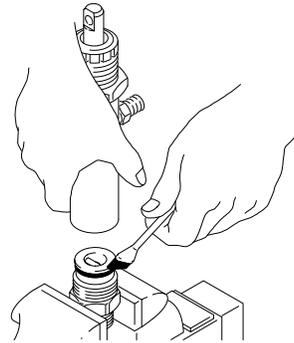


Fig. 34

02577A

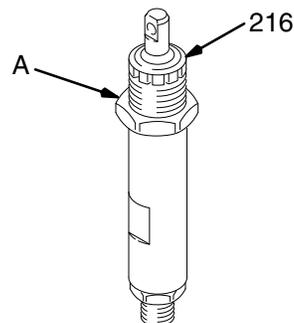


Fig. 35

02578

Displacement Pump

Installing the Pump

1. Screw the displacement pump into the bearing housing (27) until the pin holes align. See Fig. 36.
2. Install the pin (221*). See Fig. 37.
3. Continue to screw the pump into the bearing housing until the top threads of the pump cylinder are flush with the face of the bearing housing and the outlet nipple is straight back. Push the retaining spring (35) into the groove all the way around the connecting rod to prevent it from working loose due to vibration. See Fig. 38.

⚠ WARNING	
	<p>MOVING PARTS HAZARD</p> <p>If the pin works loose, it or other parts could break off due to the force of the pumping action. These parts could be projected through the air and result in serious bodily injury or property damage, including damage to the pump, connecting rod or bearing housing.</p>

4. Tighten the locknut (38) to 70 ft-lb (97 N.m). See Fig. 39.

⚠ CAUTION	
<p>If the locknut (38) loosens during operation, the threads of the bearing housing (29) will be damaged. Be sure to tighten the locknut firmly.</p>	

5. Tighten the packing nut/ wet-cup just enough to stop leakage, but no tighter. Fill the wet-cup/packing nut 1/3 full with Graco TSL. See Fig. 40.

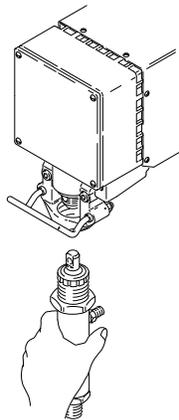


Fig. 36

04589

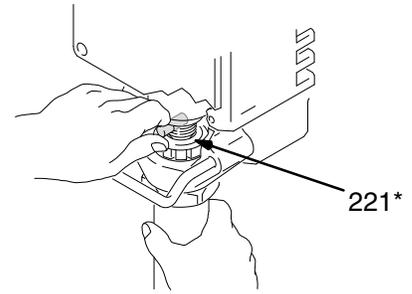


Fig. 37

04590

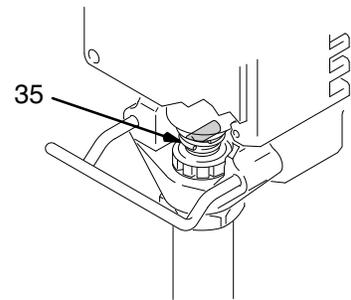


Fig. 38

03043

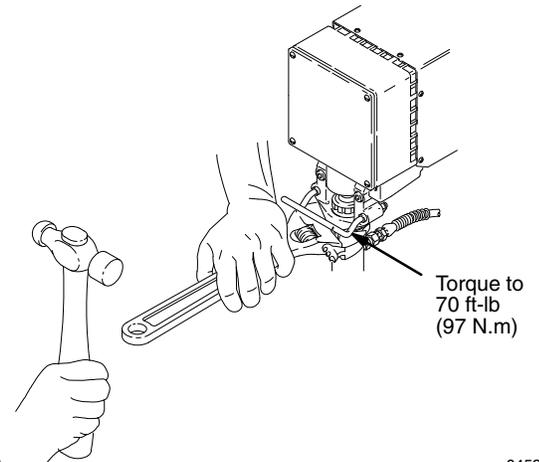


Fig. 39

04591

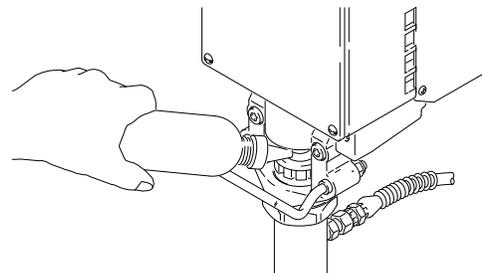


Fig. 40

04592

Pressure Control

! WARNING

INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

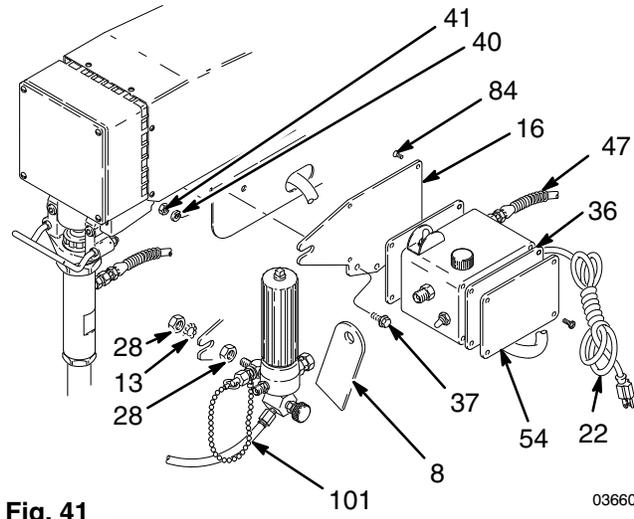


Fig. 41

03660

NOTE: Refer to Fig. 41 except where noted.

1. Disconnect the hose (47).
2. Disconnect the drain tube (101) from the drain valve.
3. Loosen the outside filter bracket nut (28). Unscrew the fitting (8) and remove the filter.
4. Remove the pressure control cover (36). Disconnect the four motor leads. See Fig. 42.
5. Unscrew the connector (54). Pull the wires out of the pressure control.
6. Remove the pressure control mounting screws (37). Remove the pressure control. Install the connector (54) on the new pressure control.
7. Install the new pressure control. Place the seal (103) around the motor leads and push the seal into the connector (54).

Power Supply Cord

! WARNING

INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

NOTE: Refer to Fig. 41 except where noted.

1. **Relieve pressure.**
2. Remove the back pressure control plate (16).
3. Remove the pressure control cover. Disconnect the power supply cord leads. See Fig. 42.
4. Loosen the strain relief bushing (B). Remove the power supply cord (23).

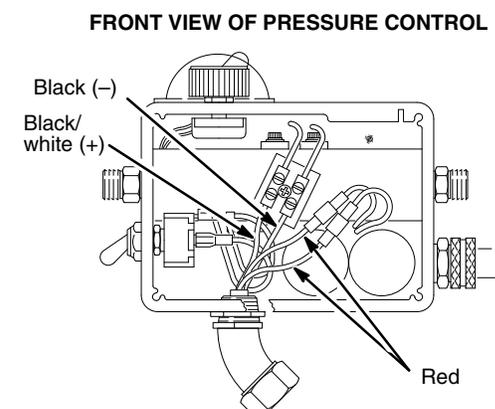
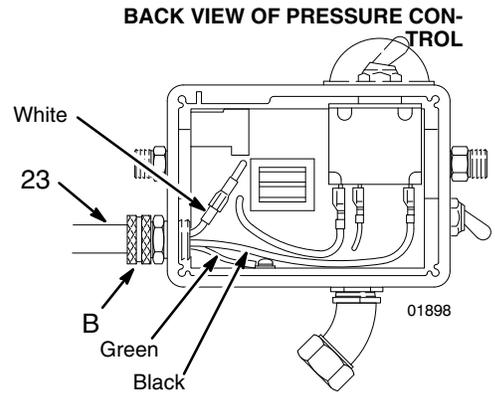


Fig. 42

01897

5. Install the new cord.

Motor

⚠ WARNING



INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

Procedure on page 7.

⚠ CAUTION

To avoid damage to the drive housing:

- Do not drop the gear cluster (9), which may stay engaged in the motor bell or in the drive housing.
- Do not lose the thrust balls (10) or drop them between gears. The balls usually stay in the shaft recesses, but could be dislodged. If the balls are not in place, the bearings will wear prematurely.

1. Remove the motor shield (14). Remove the front cover (31). Disconnect the hose (47).
2. Remove the pressure control cover (36). Disconnect the four motor leads.
3. Unscrew the connector (54) from the pressure control. Pull the wires through the connector.
4. Unscrew the connector (54) from the motor and remove the conduit (22).
5. Remove the screws (51) from the recess of the drive housing.
6. Remove the screws (21 and 30) from the the motor bell (F).
7. Use a plastic mallet to tap the displacement pump (39) from the rear to loosen the drive housing (18) from the motor bell (F). Pull off the drive housing.
8. Remove the screws (37) holding the motor to the frame. Lift off the motor.
9. Mount the new motor on the frame.
10. Slide a connector (54) over the conduit (22) of the new motor and screw two or three threads of it into the motor. Tighten the locknut up to the motor.
11. Liberally grease the gear cluster (9) and pinion gear (G) and pack all bearings in the motor bell. Be sure the thrust balls (10) are in place. (One ball is included with a replacement drive housing.)
12. Place the bronze-colored washer (18b) and THEN the silver-colored washer (18a) on the shaft protruding from the big gear in the drive housing (18).
13. Align the gears and push the drive housing (18) straight onto the motor bell (F) and locating pins.
14. Continue to reassemble the sprayer.

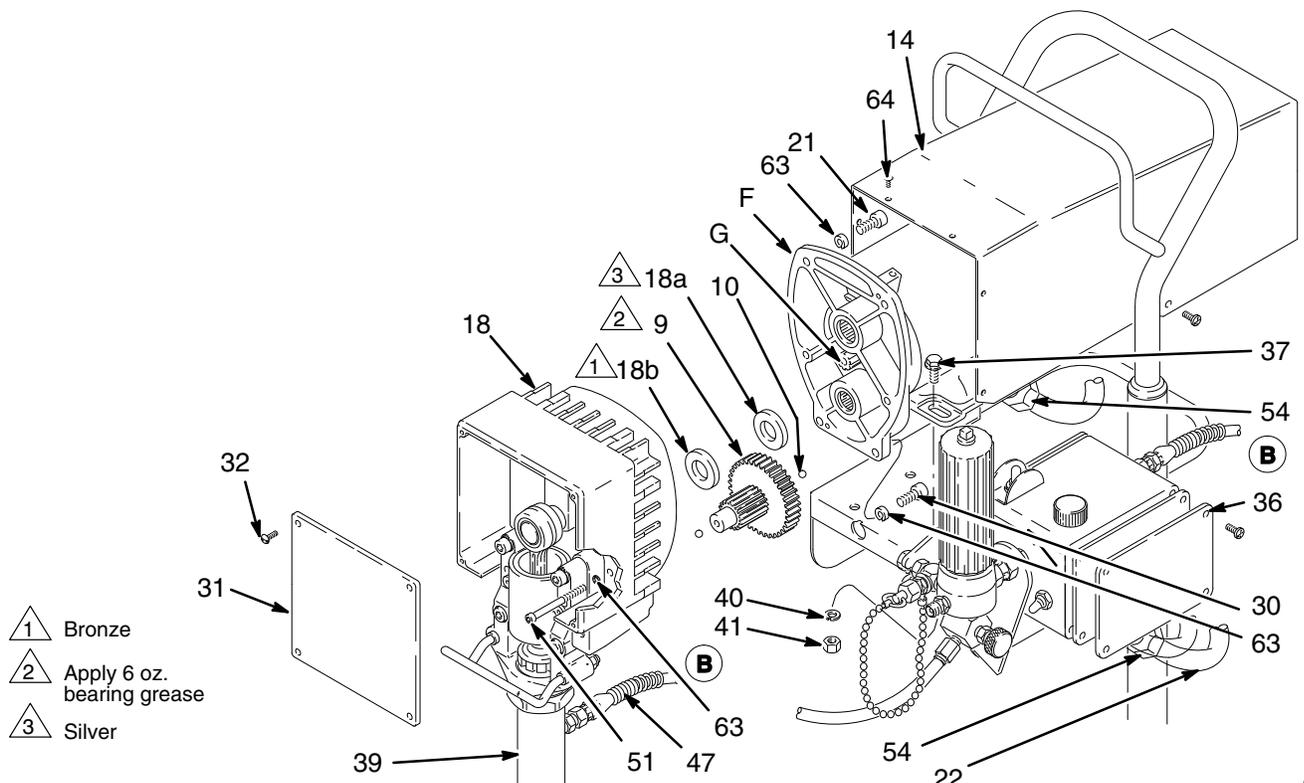


Fig. 43

03663A

Bearing Housing & Connecting Rod

⚠ WARNING



INJECTION HAZARD

To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.

NOTE: Stop the sprayer at the bottom of its stroke to get the crank (H) in its lowest position. To lower the crank manually, rotate the blades of the motor fan with a screwdriver.

1. Remove the pump. See page 15.
2. Remove the front cover (31). Remove the bearing housing screws (33).
3. Tap the lower rear of the bearing housing (27) with a plastic mallet to loosen it from the drive housing (18). Pull the bearing housing and the connecting rod (29) straight off the drive housing.
4. Remove the pail bracket assembly (L) and reinstall it on the new bearing housing.
5. Inspect the crank (H) for excessive wear and replace parts as needed.
6. Evenly lubricate the inside of the bronze bearing (K) with motor oil. Liberally pack the roller bearing (J) with bearing grease.
7. Assemble the connecting rod (29) and bearing housing (27).
8. Clean the mating surfaces of the bearing and drive housings.
9. Align the connecting rod with the crank (H) and align the locating pins in the drive housing with the holes in the bearing housing (27). Push the bearing housing onto the drive housing or tap it into place with a plastic mallet.
10. Install the bearing housing screws (33). Torque evenly to 175 in-lb (19 N.m).
11. Reinstall all parts. See page 19 to install the pump.

1. Torque to 175 in-lb (19 N.m)
2. Lubricate with motor oil
3. Liberally pack roller bearing with bearing grease

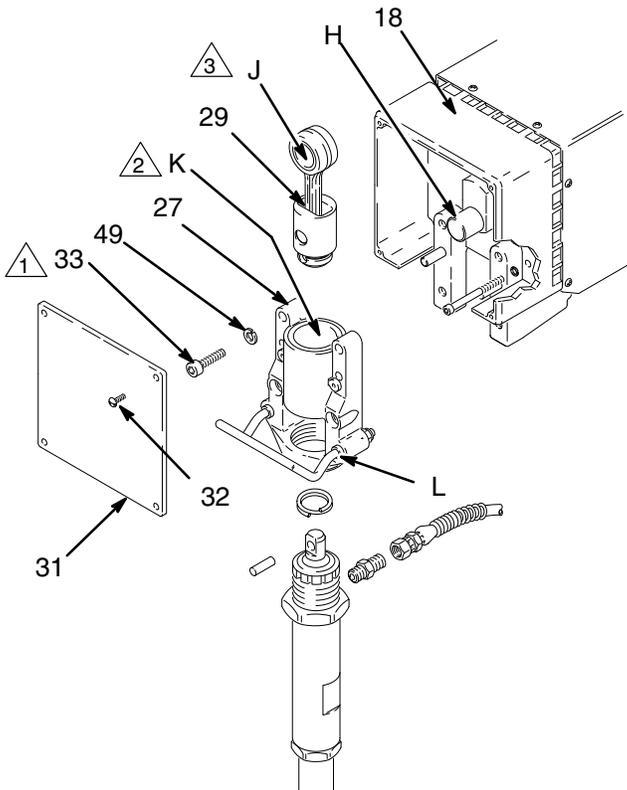


Fig. 44

03661

Drive Housing

⚠ WARNING

INJECTION HAZARD
To reduce the risk of serious injury, whenever you are instructed to relieve pressure, follow the **Pressure Relief Procedure** on page 7.



NOTE: Stop the sprayer at the bottom of its stroke to get the crank (H) in its lowest position. To lower it manually, carefully rotate the blades of the fan with a screwdriver.

1. Remove the front cover (31). Remove the motor shield (14).
2. Disconnect the pump outlet hose (47).
3. Remove the screws (33) from the bearing housing.
4. Lightly tap the lower rear of the bearing housing (27) with a plastic mallet to loosen it from the drive housing (18). Pull the bearing housing and connecting rod assembly straight off the drive housing.
5. Remove the screws (51) from the recess of the drive housing.
6. Remove the screws (30 and 21) from the motor bell (F).

7. Tap the drive housing (18) with a plastic mallet to loosen it from the motor bell, then pull it straight off.

⚠ CAUTION

To avoid damage to the drive housing:

- Do not drop the gear cluster (9), which may stay engaged in the motor bell or in the drive housing.
- Do not lose the thrust balls (10) or drop them between gears. The balls usually stay in the shaft recesses, but could be dislodged. If the balls are not in place, the bearings will wear prematurely.

8. Use approximately 6 oz. of the bearing grease supplied with the drive housing replacement kit to grease the gear cluster (9). Check to be sure the thrust balls (10) are in place.
9. Place the bronze-colored washer (18b) and THEN the silver-colored washer (18a) on the shaft protruding from the big gear in the drive housing (18).
10. Align the gears and push the new drive housing straight onto the motor bell and locating pins.
11. Continue to reassemble the sprayer. Torque the screws (33) to 175 in-lb (19 N.m).

1 Torque to 175 in-lb (19 N.m)

2 Bronze

3 Apply 6 oz. bearing grease

4 Silver

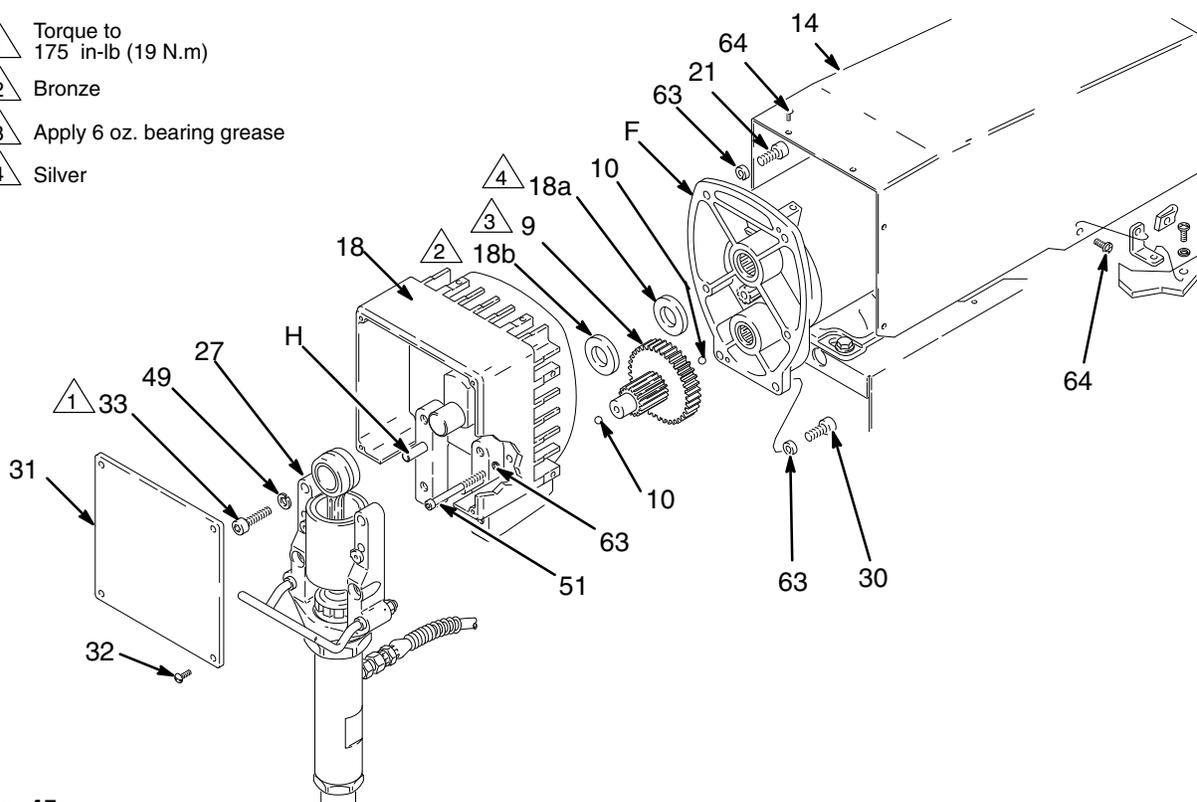
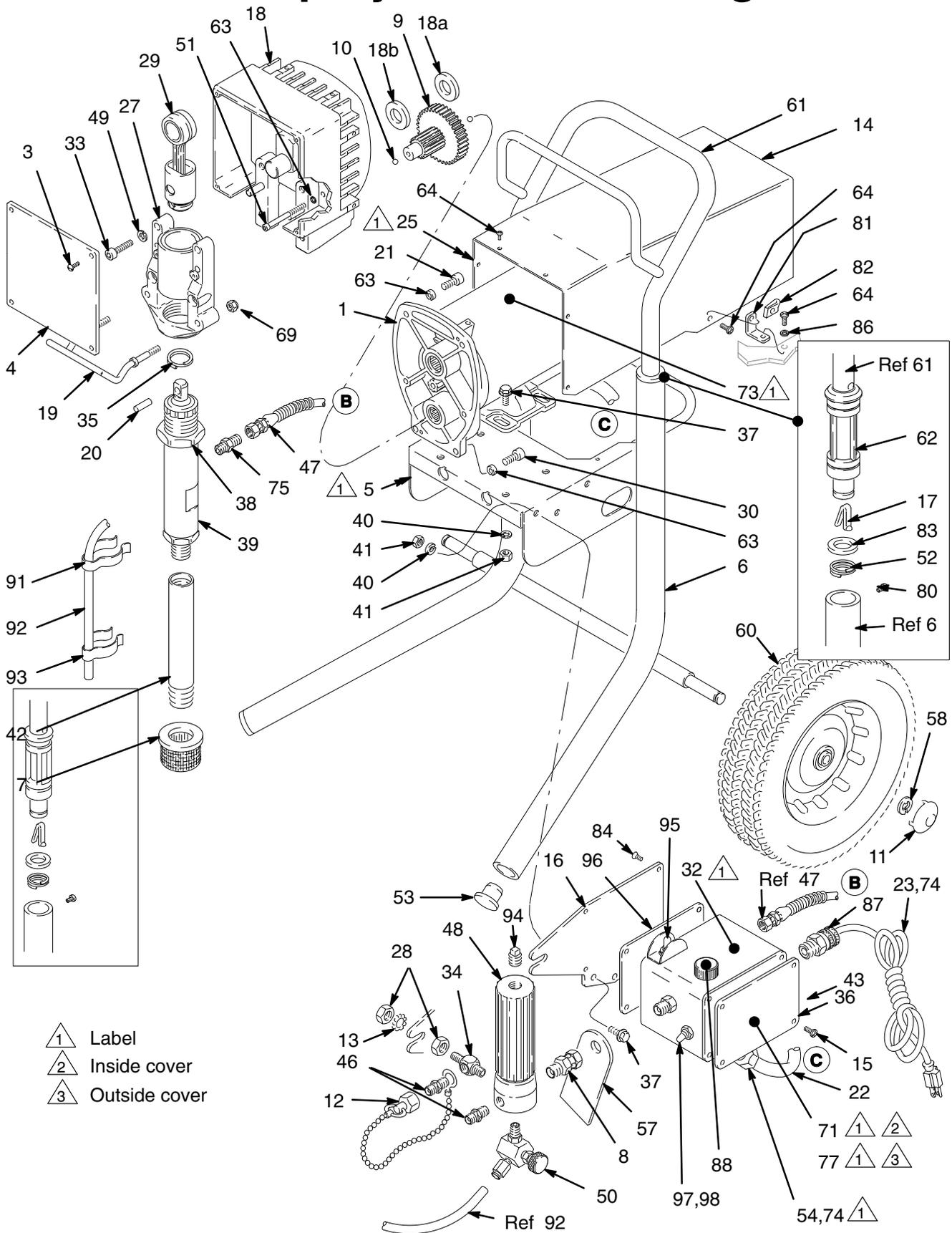


Fig. 45

03662

Sprayer Parts Drawing



03665A

Sprayer Parts List

Model 820-116, Series A (C.S.A)

Includes items 1-98

Basic Sprayer

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
1	220-854	MOTOR KIT	1	43	224-018	PRESSURE CONTROL KIT <i>NEW</i>	
2	108-982	CONNECTOR	1			Includes items 13, 16, 23, 28(2), 34, 84(4), and 87	1
3	100-259	SCREW, mach, 8-32 x 3/8	4	46	162-453	NIPPLE, hex; 1/4 npsm x 1/4 npt, 1-3/16" long	2
4	824-011	COVER, front, u-1500	1	47	220-849	HOSE, 3/8 npsm(f) x 14.5"	1
5	185-955▲	LABEL, DANGER, French	1	48	214-570	FLUID FILTER	
6	220-636	CART	1			<i>see manual 307-273 for parts includes one each of item 46 and 94</i>	1
7	181-072	STRAINER	1	49	106-115	LOCKWASHER, spring; 3/8"	4
8	155-665	UNION, adapter; 3/8" npsm x 3/8 npt(m)	1	50	221-077	PRESSURE DRAIN VALVE	1
9	220-637	GEAR REDUCER	1	51	108-849	CAPSCREW, sch; 1/4-20 x 3"	2
10	100-069	BALL, steel; 1/4" dia.	2	52	110-243	RING, retaining	2
11	104-811	HUBCAP	2	53	108-961	PLUG, tubing	2
12	220-285	CAP, for secondary hose outlet	1	54	108-460	CONNECTOR	2
13	100-322	LOCKWASHER, ext. tooth, 7/16"	1	57▲	178-034	TAG, WARNING	1
14	820-096	MOTOR SHIELD KIT	1	58	101-242	RING, retaining	2
15	110-037	SCREW, mach, pnh; 10-24 type C x 0.5"	4	59	206-994	THROAT SEAL LIQUID	
16	185-539	BRACKET, mounting	1			8 oz. (0.27 liter)	1
17	179-777	BUTTON, snap	2	60	179-811	WHEEL	2
18	820-097	DRIVE HOUSING KIT	1	61	220-633	HANDLE, CART	1
		<i>includes items 18a and 18b</i>	1	62	192-027	SLEEVE, cart handle	2
18a	106-227	.BEARING, thrust	1	63	105-510	LOCKWASHER, spring, 1/4"	6
18b	183-209	.SPACER	1	64	108-865	SCREW, mach, pnh; 8-32 x .375"	10
19	189-918	HANGER, pail	1	69	112-746	NUT, retainer	2
20	183-210	PIN, straight, 3/8 x 1.125"	1	71▲	177-762	LABEL, WARNING	1
21	100-644	SCREW, socket head, no. 1/4-20 x 75"	2	73▲	185-951	LABEL, DANGER, English	1
22	065-312	CONDUIT, electrical, 13 in.	1	74▲	110-619	LABEL, WARNING	1
23	223-933	POWER SUPPLY CORD	1	75	183-461	ADAPTER; 3/8 npsm x 1/4 npt	1
24	107-264	TERMINAL, female	2	77	820-215	LABEL, designation	1
		<i>inside pressure control</i>	2	79	107-447	SEAL, conduit	2
25▲	185-953	LABEL, DANGER	1	80	109-032	SCREW, mach, pnh; 10-24 x .25"	3
26	154-636	WASHER, wheel	2	81	186-253	BRACKET	2
27	220-639	BEARING HOUSING KIT	1	82	110-240	NUT	2
28	150-513	NUT, jam; 7/16"	2	83	183-350	WASHER, flat; 7/8" ID	2
29	220-640	CONNECTING ROD KIT	1	84	106-075	SCREW, flat hd; 10-24 x .375"	4
30	100-643	SCREW, socket head, no. 1/4-20 x 1"	2	86	100-020	LOCKWASHER, #10	2
32▲	178-035	LABEL, WARNING	1	87	106-170	BUSHING, strain relief	1
33	110-141	CAPSCREW, sch; 3/8-16 x 1.5"	4	88	185-565	LABEL, control knob	1
34	186-374	ADAPTER, elbow, special; 1/4-18 npt(m x f)	1	89	100-035	SCREW, mach, pnh; 8-32 x .312"	
35	183-169	SPRING, retaining	1			<i>inside pressure control</i>	1
36	185-002	COVER, pressure control	1	90	157-021	LOCKWASHER, internal, No. 8	
37	110-963	SCREW, hex head, 5/16-18 x .75, with washer	7			<i>inside pressure control</i>	1
38	189-969	NUT, HEX, 1-13/16 unc-2b	1	91	186-490	CLIP, spring	1
39	220-872	DISPLACEMENT PUMP	1	92	178-391	HOSE, return	1
		<i>see parts on page 24</i>	1	93	181-102	CLIP, spring	1
40	100-214	LOCKWASHER, spring; 5/16"	7	94	100-040	PLUG	1
41	100-188	NUT, heavy hex; 5/16-18 unc-2a	7	95	112-152	CIRCUIT BREAKER, 120V	1
42	183-423	TUBE, suction	1	96	820-015	GASKET, pressure control	1
				97	105-679	SWITCH, toggle	1
				98	105-659	BOOT, toggle	1

▲ Extra warning tags and labels available free.

Displacement Pump Parts Drawing and List

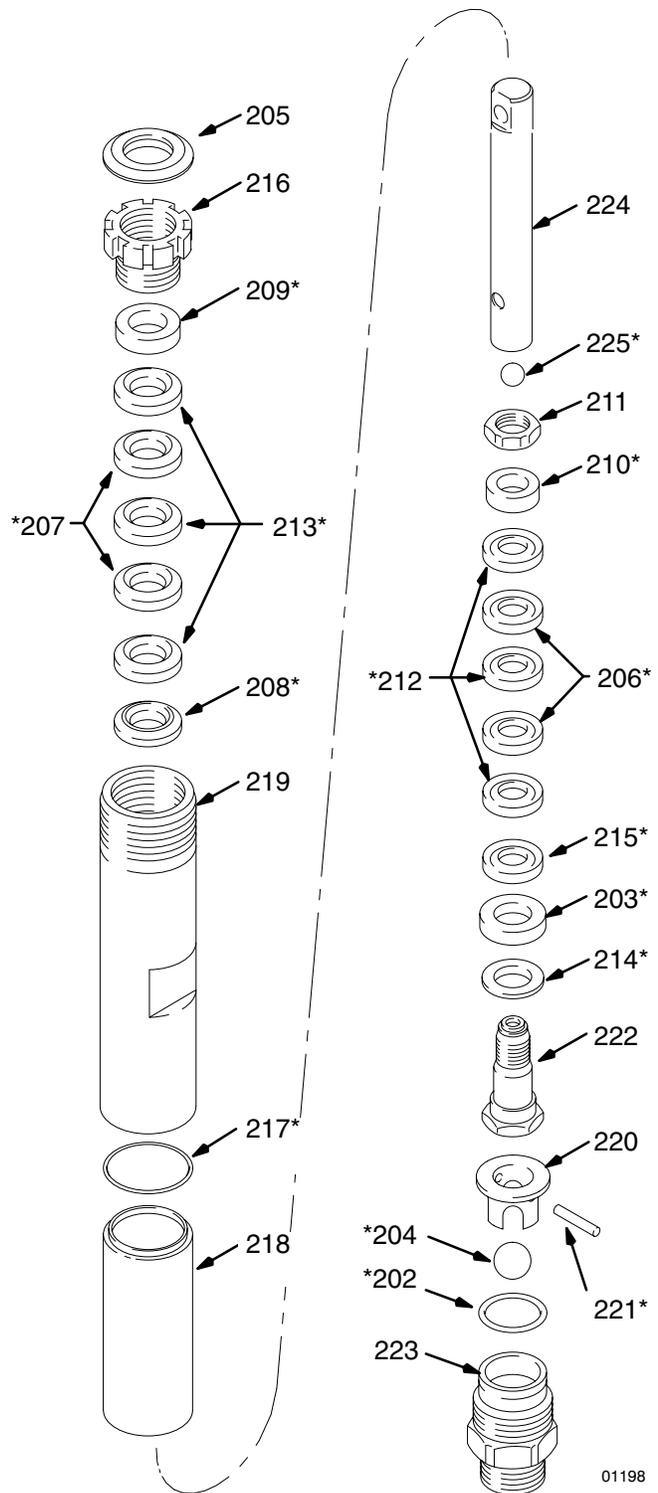
Model 220-872 Series A Sleeved Displacement Pump

Includes items 202 to 225

REF NO.	PART NO.	DESCRIPTION	QTY
202*	107-098	SEAL, sleeve	1
203*	108-690	SEAL, u-cup, polyurethane	1
204*	108-775	BALL; sst	1
205	183-171	PLUG 1	
206*	183-174	V-PACKING, leather	2
207*	183-175	V-PACKING, leather	2
208*	183-176	GLAND, male	1
209*	183-177	GLAND, female	1
210*	183-178	GLAND, male	1
211	183-179	NUT, hex, retaining	1
212*	183-182	V-PACKING, polyethylene	3
213*	183-183	V-PACKING, polyethylene	3
214*	186-653	WASHER, backup	1
215*	183-185	GLAND, female	1
216	183-186	NUT, packing	1
217*	183-172	O-RING, PTFE	1
218	183-361	SLEEVE, cylinder	1
219	183-181	CYLINDER	1
220	183-180	GUIDE, ball	1
221*	183-173	PIN, ball stop	1
222	220-631	VALVE, piston	1
223	220-629	VALVE, intake	1
224	220-630	ROD, piston	1
225*	101-947	BALL	1

***Supplied in Repair Kit 820-672.**
Must be purchased separately.

Sleeve Removal Tool 224-788
Required for removing a pump sleeve.
Must be purchased separately.



01198

Sherwin-Williams 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.

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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.

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ADDITIONAL WARRANTY COVERAGE

Graco does provide extended warranty and wear warranty for products described in the "Graco Contractor Equipment Warranty Program".

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