OWNER'S MANUAL

820–204 Rev. K

Supercedes Rev. G, H & J

INSTRUCTIONS

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

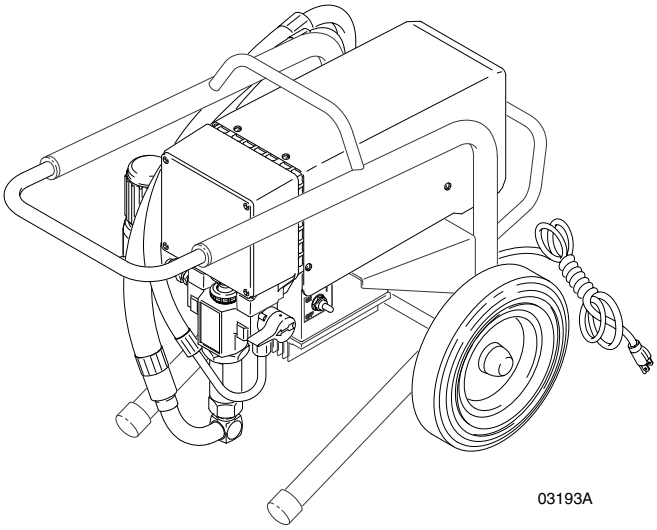
U.S. PATENT NO. 4,323,741, 4,397,610
PATENTED 1983, CANADA
AND OTHER PATENTS PENDING

ELECTRIC, 120 VAC

ULTIMATE® *Plus*+ 600 Airless Paint Sprayer

3000 psi (210 bar) Maximum Working Pressure

Model 820–206 and 820–208, Series B
Basic sprayer only



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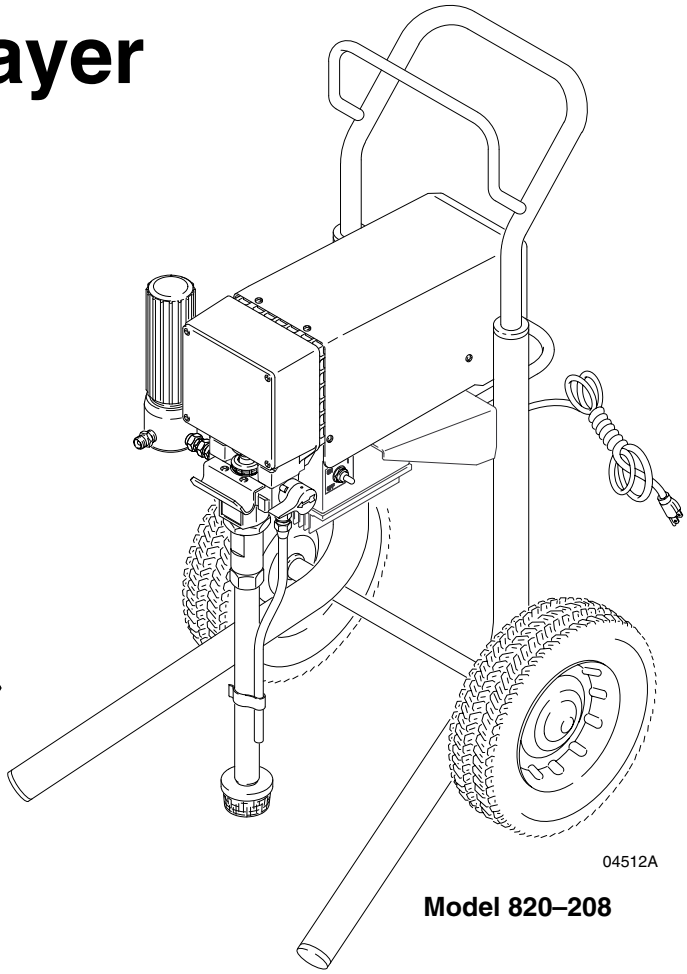
Model 820–206



04512A

Model 820–208

The SHERWIN-WILLIAMS COMPANY, CLEVELAND, OHIO 44115

Table of Contents

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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 your distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts.
- 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 39 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 is a serious injury. The injury 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 8 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

FIRE AND EXPLOSION HAZARD

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

- 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.

MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers.

- Keep clear of all moving parts when starting or operating the pump.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 8 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 39 to order.

⚠ DANGER ⚠

	**FIRE AND EXPLOSION HAZARD**		**SKIN INJECTION HAZARD**
Spray painting, flushing or cleaning equipment with flammable liquids in confined areas can result in fire or explosion. **Use outdoors or in extremely well ventilated areas. Ground equipment, hoses, containers and objects being sprayed.** **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.** **Failure to follow this warning can result in death or serious injury.**		**Liquids can be injected into the body by high pressure airless spray or leaks – especially hose leaks.** **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.** **Never spray without a tip guard.** **In case of accidental skin injection, seek immediate "Surgical Treatment".** **Failure to follow this warning can result in amputation or serious injury.**	

READ AND UNDERSTAND ALL LABELS AND INSTRUCTION MANUALS BEFORE USE

Component Function and Identification

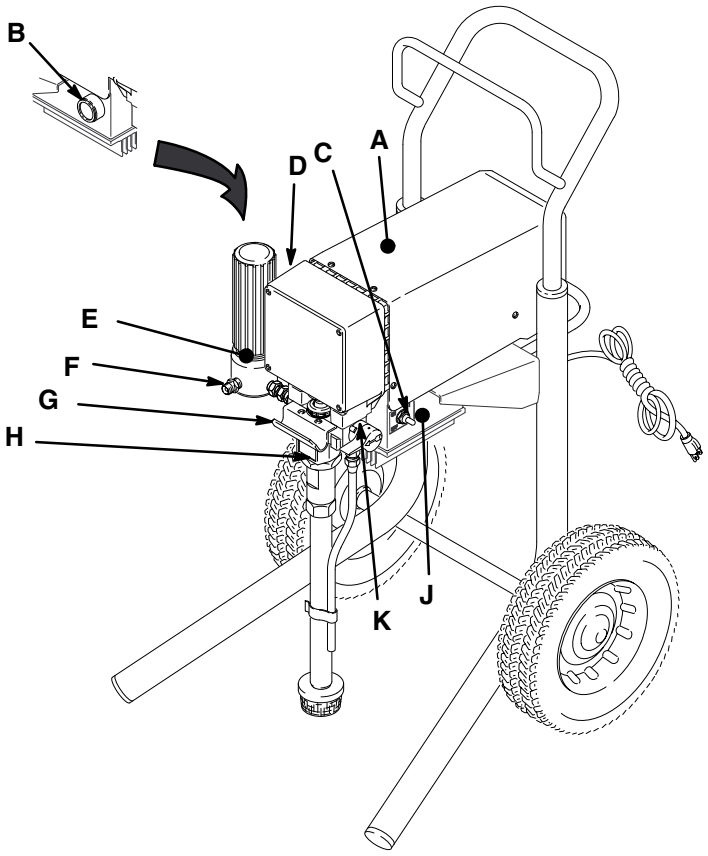


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Fig. 1

A	Motor (Under shield shown)	DC motor, 120 Vac, 15A, 1 phase
B	Pressure Adjusting Knob	Controls fluid outlet pressure
C	ON/OFF Switch	Power switch that controls 120 Vac main power to sprayer
D	Drive Assembly	Transfers power from DC motor to the displacement pump
E	Fluid Filter	Filter of fluid between source and spray gun
F	Fluid Outlet	Spray gun operation is connected here
G	Pail Hanger	Container for fluid to be sprayed may be hung here
H	Displacement Pump	Transfers fluid to be sprayed from source through spray gun
J	Pressure Drain Valve	Relieves fluid outlet pressure when open
R **K**	Pressure Control	Controls motor speed to maintain fluid outlet pressure at displacement pump outlet. Works with pressure adjusting knob.

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 (210 bar, 21 MPa) 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 pump and the hose. See Fig. 2.

4. **Connect the hose and gun** and screw it onto the outlet nipple (F). *Don't use thread sealant, and don't install the spray tip yet!*

5. **Fill the wet–cup (L).** Pry off the wet–cup seal. Fill the cup 1/3 full with Graco Throat Seal Liquid (TSL) (68) supplied. Install the seal.

6. **Check the electrical service.** Be sure it is 120 VAC, 60 Hz, 15A (minimum). Use a properly grounded outlet. Do not remove the third (grounding) prong of the power supply cord, and do not use an adapter.

   Use a 3-wire (12 AWG recommended), 15A extension cord.

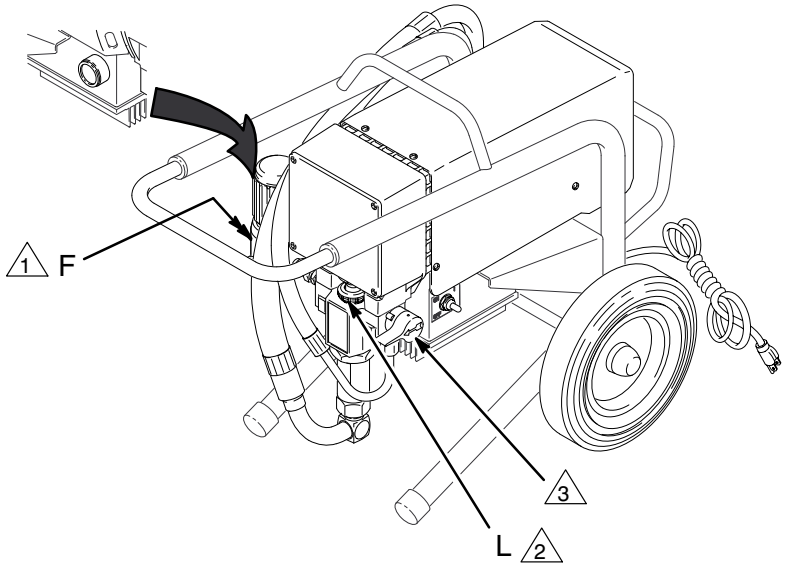
   NOTE: Long extension cord lengths affect sprayer performance.

7. **Plug in the sprayer.** Be sure the ON/OFF switch (C) is OFF. Plug the cord into a grounded outlet at least 20 ft. (6 m) away from the spray area.

⚠ 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.

continued on the next page



1 Do not install any shutoff device here.
2 Fill 1/3 full with TSL
3 Shown in closed, or spray position.

Model 820–206 Shown

03193A

Fig.2

8. **Flush the pump** to remove the oil which was left in to protect pump parts after factory testing. See page 12.

9. **Prepare the paint** according to the manufacturer's recommendations. Remove any paint skin. Stir the paint to mix pigments. Strain the paint through a fine nylon mesh bag (available at most paint dealers) to remove particles that could clog the gun filter or spray tip. This is an important step toward trouble-free paint spraying.

How to use the gun safety latch

When engaged, the gun safety latch prevents the gun from accidental triggering. See Fig. 3.

⚠ WARNING

If the gun still sprays when the gun safety latch is engaged, adjust the gun. See manual 307–614, supplied.

How to use the pressure drain valve

Use the pressure drain valve to relieve fluid pressure from the pump and to help prime the pump. If the valve senses an over-pressure condition, it opens automatically to relieve fluid pressure. If this happens, stop spraying immediately, shut off and unplug the sprayer. Determine the cause of the problem and correct it before operating the sprayer again. Refer also to the Troubleshooting Guide, page 14. See Fig. 4.

How to use the pressure control

The pressure control controls the motor operation so the sprayer maintains constant fluid pressure at the pump outlet. Turn the pressure control knob fully counterclockwise to obtain the minimum setting. Turn the knob clockwise to increase pressure. See Fig. 5.

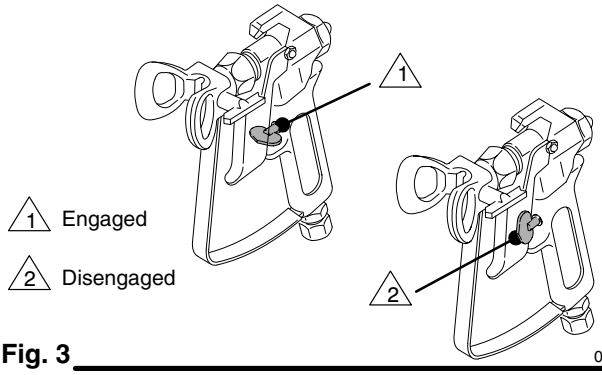


Fig. 3 01020

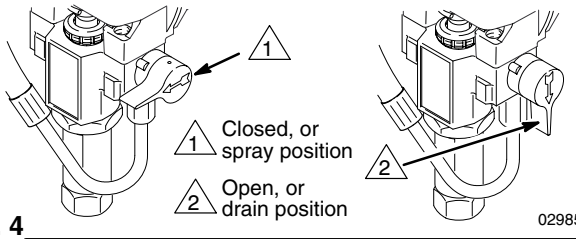


Fig. 4 02985A

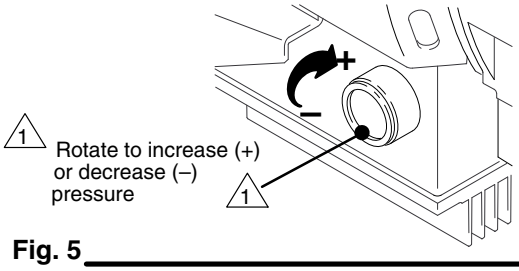


Fig. 5 02986

Setup

Pressure Relief Procedure

⚠ WARNING

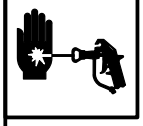
PRESSURIZED EQUIPMENT HAZARD
The equipment stays pressurized until pressure is manually relieved. To reduce the risk of serious injury from pressurized fluid, accidental spray from the gun or splashing fluid, follow this procedure whenever you:

- Are instructed to relieve pressure
- Stop spraying
- Check, clean or service any system equipment
- Install or clean fluid nozzles

1. Engage the gun safety latch.
2. Turn the ON/OFF switch of OFF.
3. Unplug the power cord.
4. Disengage the gun safety latch. Hold a metal part of the gun against a grounded metal pail and trigger the gun into the pail to relieve pressure.
5. Engage the gun safety latch.
6. Open any fluid drain valves in the system. Leave the drain valve open until you are ready to dispense again.

How to use the RAC IV tip guard

⚠ 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. See also page 3.

The tip guard alerts you to the risk of injection and helps prevent placing any part of the body close to the spray tip. The tip guard also adjusts the vertical or horizontal spray pattern. See page 10. The tip guard holds a reversing spray tip. The tip is in the spraying position when the tip handle points forward. See Fig. 6.

Clean the front of the tip frequently during the day's operation. First, follow the **Pressure Relief Procedure,** left.

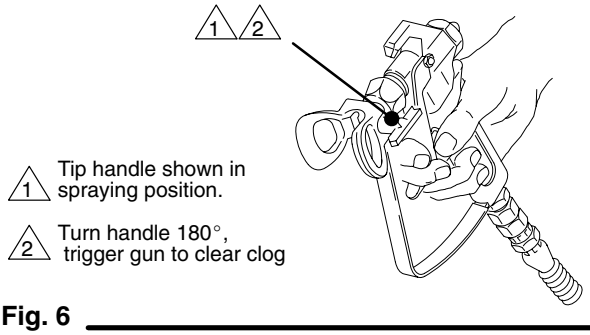


Fig. 6

How to remove a tip clog

7. Release the gun trigger. Engage the safety latch. Rotate the RAC IV tip handle 180°. See Fig. 6.
8. Disengage the safety latch. Trigger the gun into a pail or onto the ground to remove the clog.
9. Engage the safety latch. Rotate the tip handle to the spraying position.
10. If the tip is still clogged, engage the 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 308–644, supplied.

Startup

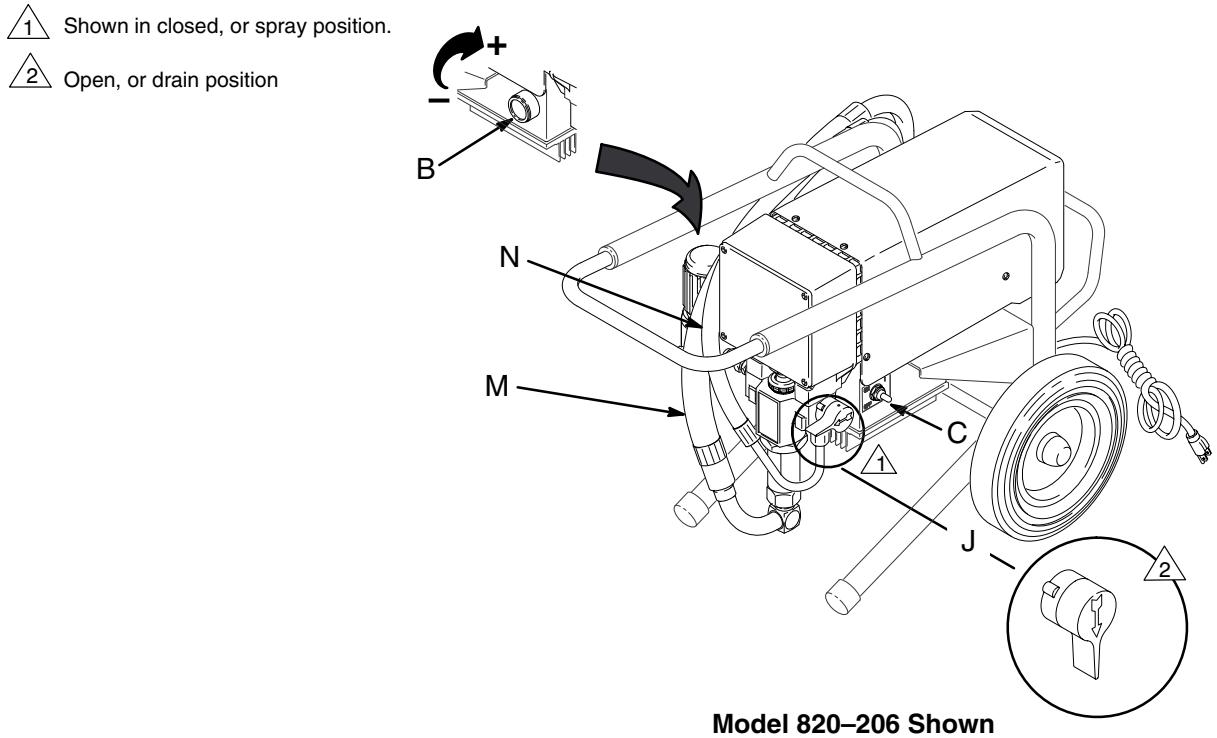


Fig. 7

Use this procedure each time you start the sprayer to help ensure the sprayer is ready to operate and that you start it safely.

NOTE: If this is a first–time startup, flush the sprayer. See page 12.

1. **Open the pressure drain valve (J).** See Fig. 7.

2. **Don't install the spray tip until the pump is primed!**

3. **Put the suction hose or tube (M) into the paint**. If you are pumping from a 1 gallon (5 liter) pail, push the drain hose (N) down below the top of the pail to avoid splashing paint when the drain valve is opened.

4. **Turn the pressure knob (B) to the minimum setting.**

5. **Disengage the gun safety latch.** See Fig. 3, page 7.

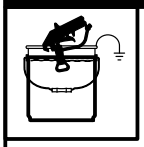
⚠ CAUTION

To reduce the risk of damage to the displacement pump packings, never run the pump without fluid in it for more than 30 seconds.

6. **To prime the pump,** turn the sprayer ON/OFF switch (C) ON. Slowly increase the pressure until the sprayer starts. When fluid comes from the pressure drain valve, close the valve.

Startup

⚠ WARNING



FIRE AND EXPLOSION HAZARD

To reduce static sparking and splashing when priming, be sure the spray tip is not installed on the gun, and hold a metal part of the gun firmly to the side of a grounded metal pail.

7. **To prime the hose**, lower the pressure to reduce splashing. Holding the gun against the pail, trigger the gun and slowly increase the pressure until the pump starts. Keep the gun triggered until all air is forced out of the system and the fluid flows freely from the gun. Release the trigger and engage the gun safety latch.
8. **Check all fluid connections for leaks**. Relieve pressure before tightening any connections.
9. **Install the spray tip.** Engage the gun safety latch first! See manual 308–644 for how to install the tip.
10. **Adjust the spray pattern**
    a. Increase the pressure just until spray from the gun is completely atomized. To avoid excessive overspray and fogging, and to extend tip and sprayer life, always use the lowest 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 and loosen the retaining nut (B). Position the tip guard horizontally for a horizontal pattern or vertically for a vertical pattern. Hold the tip guard in place while tightening the retaining nut. See Fig. 8.

NOTE: Spray patterns will change as tips wear. Change the spray tip if adjusting the pressure will not improve the spray pattern.

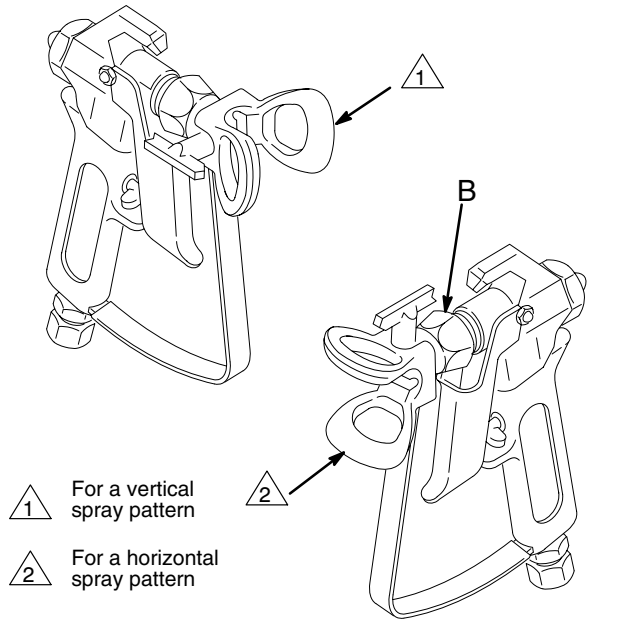


Fig. 8 01025

Shutdown and Care

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**

2. **Check the packing nut/wet-cup daily.** Keep the wet-cup 1/3 full of TSL at all times to help prevent fluid buildup on the piston rod and premature wear of packings.

3. **Tighten the packing nut/wet-cup just enough to stop leakage.** Over-tightening causes binding and excessive packing wear. Use a round punch or brass rod and a light hammer to adjust the nut. See Fig. 9.

4. **Clean the gun's fluid filter often** and whenever the gun is stored. Relieve pressure first. Refer to manual 307–614.

5. **Lubricate the bearing housing** after every 100 hours of operation. Remove the front cover. Apply several drops of SAE 10 non-detergent oil in the bearing housing cavity (B). See Fig. 10.

6. **Flush the sprayer at the end of each work day** and fill it with mineral spirits to help prevent pump corrosion and freezing. See page 12.

⚠ CAUTION

To prevent pump corrosion, and to reduce the chance of fluid freezing in the pump in cold weather, never leave water or any type of paint in the sprayer when it is not in use. Freezing can seriously damage the sprayer or result in a loss of pressure or stalling.

7. **For very short shutoff periods,** leave the suction hose in the paint, relieve pressure, and clean the spray tip.

8. **Coil the hose** when storing it, even for overnight, to help protect the hose from kinking, abrasion, coupling damage, etc.

⚠ WARNING

INJECTION HAZARD

See the warning section **INJECTION HAZARD** on page 3 for information on the hazard of using damaged hoses.

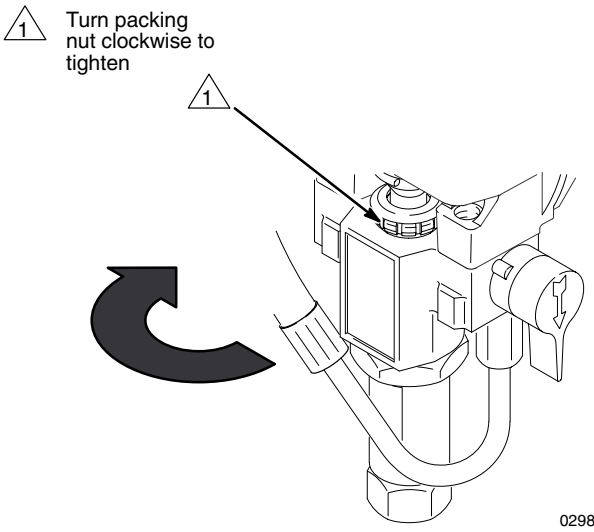


Fig. 9

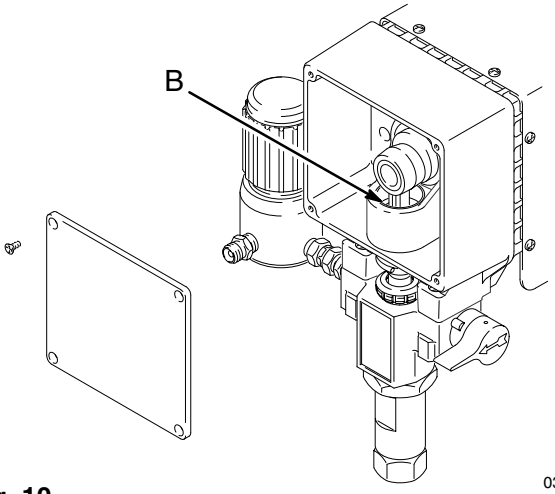


Fig. 10

Flushing

When to flush

Determine the material you are going to pump from Column 1, then flush with the material indicated in Column 2. Depending on what you plan to do next, follow the recommendations in one of the next three columns.

⚠ CAUTION

NEVER leave water or water-based fluids in the sprayer if there is a chance it could freeze. Push the water out with mineral spirits. Frozen fluid in the sprayer prevents it from starting and may cause serious damage.

Column 1	Column 2	Column 3	Column 4	Column 5
If you are going to: ▼	**Flush with: ▼**	**Prime with: ▼**	**Clean with: ▼**	**Store unit with: ▼**
Spray latex paint	Warm, soapy water, then clean water	Latex-base paint	Warm soapy water, then clean water	Mineral spirits
Spray oil paint	Mineral spirits	Oil–base paint	Mineral spirits	Mineral spirits
Change latex to oil paint	Warm, soapy water, then clean water	Mineral spirits	Mineral spirits	Mineral spirits
Change oil to latex paint	Mineral spirits, soapy water, and clean water.	Latex	Warm, soapy water, then clean water	Mineral spirits
Change colors, same base	Compatible solvent such as water or mineral spirits			

How to flush

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**
2. Remove the spray tip and clean it separately. If you are changing from water-based to oil-based paints or solvents, be sure that the tip is cleaned thoroughly.
3. Remove the filter screen and then reinstall the bowl, hand tight, without the screen. Clean the screen separately. See manual 308–249.
4. Pour one-half gallon (2 liters) of compatible solvent into a grounded metal flushing pail. Put the suction hose in the pail.
5. Open the pressure drain valve. See Fig.11.
6. **To save the paint still in the pump and hose,** follow Step 7, except put the drain hose in the paint pail. When solvent appears, close the drain valve. Put the drain hose in the flushing pail. Trigger the gun into the paint pail. When solvent appears, release the trigger. Continue with Step 7.

Flushing

⚠ 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.

7. Lower the pressure setting. Turn on the sprayer. Maintaining metal-to-metal contact, trigger the gun into the flushing pail. Slowly increase the sprayer pressure just until the pump starts. Keep the gun triggered until the solvent flows freely from the gun. Circulate the solvent to thoroughly clean the sprayer. Release the gun trigger. Engage the gun safety latch.

8. Open the drain valve and circulate the solvent through the drain hose to thoroughly clean it. Close the drain valve.

9. Remove the suction hose from the pail. Disengage the gun safety latch. Trigger the gun and run the pump a few seconds to push air into the hose. Do not run the pump dry for more than 30 seconds to avoid damaging the pump packings! Relieve pressure.

10. Reinstall the clean filter screen.

11. Remove and clean the inlet strainer. Wipe paint off the suction hose and drain hose.

12. Leave the drain valve open until you use the sprayer again.

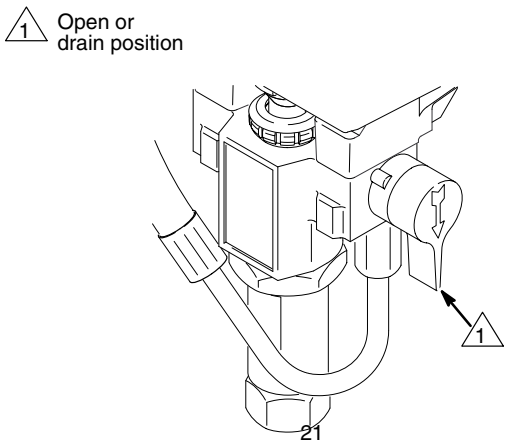


Fig. 11 02987A

Troubleshooting

⚠ WARNING

PRESSURIZED EQUIPMENT HAZARD
To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before checking or repairing any part of the sprayer.

⚠ CAUTION

Thaw sprayer if water or water-based paint has frozen in it, due to exposure to low temperatures, by placing it in a warm area. Do not try to start sprayer until it has thawed completely or damage to motor and/or control board may occur. If paint hardened (dried) in sprayer, the pump packings and/or pressure transducer must be replaced. See page 22 (pump) or 30 (pressure transducer).

Check everything in the troubleshooting tables before disassembling the sprayer.

Basic Problem Solving

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK, refer to this column*
Fluid Pressure	1. Check pressure transducer knob setting. The pump won't develop much pressure if it is at minimum setting (fully counterclockwise).	1. Slowly increase pressure setting to see if motor starts.
	2. Check for a clogged spray tip or fluid filter, if used. See page 8.	2. If tip is still clogged, relieve pressure; refer to separate gun or tip instruction manual for tip cleaning. Clean or replace filter element. See manual 308–249.
Mechanical	1. Check for frozen or hardened paint in pump (20). Using a screwdriver, carefully try to rotate fan at back of motor by hand. See page 26.	1. Thaw. After thawing, plug in sprayer and turn it on. Slowly increase pressure setting to see if motor starts. If it doesn't start, see CAUTION above.
	2. Check pump connecting rod pin (17). It must be completely pushed into connecting rod (15), and retaining spring (18) must be firmly in connecting rod groove. See Fig. 18, page 23.	2. Push pin into place and secure with spring retainer.
	3. Check for motor damage. Remove drive housing assembly (11). See page 28. Try to rotate motor fan by hand.	3. Replace motor (4) if fan won't turn. See page 26.
Electrical	1. Check electrical supply with volt meter. Meter should read 105–125 VAC.	1. Reset building circuit breaker; replace building fuse. Try another outlet.
	2. Check extension cord for visible damage. Use a voltmeter or test lamp at extension cord outlet to check.	2. Replace extension cord.
	3. Check sprayer power supply cord (50) for visible damage such as broken insulation or wires.	3. Replace power supply cord. See page 27.

Basic Problem Solving

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK, refer to this column*
Electrical *(continued)*	4. Check motor brushes for the following: a. Loose terminal screws. b. Broken or misaligned brush springs. c. Brushes binding in holders. d. Broken leads. e. Worn brushes. f. Brush leads snagged on spring clip. **NOTE:** The brushes do not wear at same rate on both sides of motor. Check both brushes.	4. Refer to page 21. a. Tighten. b. Replace broken spring and/or align spring with brush c. Clean brush holders. Remove carbon with small cleaning brush. Align brush leads with slot in brush holder to assure free vertical brush movement. d. Replace brushes e. Replace brushes if less than 0.4" (10 mm) long. f. Correctly route the wires. See page 21.
	5. Check motor armature commutator for burn spots, gouges and extreme roughness. Remove motor cover and brush inspection plates to check. See page 21.	5. Remove motor and have motor shop resurface commutator if possible. See page 26.
	6. Check motor armature for shorts using armature tester (growler) or perform motor test. See page 20.	6. Replace motor. See page 26.
	7. Check leads from pressure transducer and motor to motor control board (47) to be sure they are securely fastened and properly mated.	7. Replace loose terminals; crimp to leads. Be sure male terminal blades are straight and firmly connected to mating part.
	8. Check motor control board (47) by substituting with a good board. **CAUTION:** Do not perform this check until motor armature is determined to be good. A bad motor armature can burn out a good board.	8. Replace board. See page 27.
	9. Check power supply cord (50). Disconnect black and white power cord terminals; connect volt meter to these leads. Plug in sprayer. Meter should read 105–125 VAC. Unplug sprayer.	9. Replace power supply cord. See page 27.
	10. Check ON/OFF switch (52). Disconnect the "L" wire between motor control board (47) and switch and connect volt meter between exposed terminal switch and power cord's white wire. Plug in sprayer and turn **ON**. Meter should read 105–125 VAC. Turn off and unplug sprayer.	10. Replace ON/OFF switch. See page 27.
	11. Check motor thermal cutout switch. Connect ohmmeter between motor's red leads. Meter should read 1 ohm maximum.	11. Allow motor to cool. Correct cause of overheating. If switch remains open after motor cools, replace motor.
	12. Check the transducer (29) by replacing it with a new one.	12. Replace pressure transducer. See page 30.
	13. Check pressure adjustment potentiometer (64) by replacing it with a new one.	

Intermediate Problem Solving

TYPE OF PROBLEM	**WHAT TO CHECK** *If check is OK, go to next check*	**WHAT TO DO** *When check is not OK refer to this column*
Low Output	1. Check for worn spray tip.	1. Follow **Pressure Relief Procedure Warning** on page 8, then replace tip. See your separate gun or tip manual.
	2. Be sure pump does not continue to stroke when gun trigger is released. Plug in and turn on sprayer. Prime with paint. Trigger gun momentarily, then release and engage safety latch. Relieve pressure, turn off and unplug sprayer.	2. Service pump. See page 23.
	3. Release gun trigger. Observe resting position of pump rod (107).	3. If pump consistently comes to rest with rod (107) fully extended, the piston packings and/or piston valve may be worn. Service the pump. See page 23.
	4. Check electrical supply with volt meter. Meter should read 105–125 VAC.	4. Reset building circuit breaker; replace building fuse. Repair electrical outlet or try another outlet.
	5. Check extension cord size and length.	5. Replace with a correct, grounded extension cord. Note that long lengths and/or smaller gauges reduce performance.
	6. Check motor brushes. See Electrical – What To Check, item 4, on page 15.	6. See page .

Intermediate Problem Solving

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK, refer to this column*
Low Output *(continued)*	7. Check motor control board (47) by substituting with a good board. **CAUTION:** Do not perform this check until motor armature is determined to be good. A bad motor armature can burn out a good board.	7. Replace board. See page 27.
	8. Check motor armature for shorts by using an armature tester (growler) or perform motor test. See page 20.	8. Replace motor. See page 26 .
Drain Valve Leaks	1. Check drain valve for correct torque and/or worn parts. Check for debris trapped on seat.	1. Tighten to 185 in–lb (21 N.m). Clean valve and replace with new gasket (42a) and sealant (42e). See page 33.
No Output: Motor Runs And Pump Strokes	1. Check paint supply.	1. Refill and reprime pump.
	2. Check for clogged intake strainer.	2. Remove and clean, then reinstall.
	3. Check for loose suction tube or fittings. See page 32.	3. Tighten; use thread sealant on npt threads of inlet tube (38). Check for damaged o–ring (27).
	4. Check to see if intake valve ball and piston ball are seating properly. See page 23.	4. Remove intake valve and clean. Check ball and seat for nicks; replace as needed. See page 23. Strain paint before using to remove particles that could clog pump.
	5. Check for leaking around throat packing nut which may indicate worn or damaged packings. See page 23.	5. Replace packings. See page 23. Also check piston valve seat for hardened paint or nicks and replace if necessary. Tighten packing nut/wet-cup.
	6. Release gun trigger. Observe resting position of pump rod (107).	6. If pump consistently comes to rest with rod (107) fully extended, the piston packings and/or piston valve may be worn. Service the pump. See page 23.
No Output: Motor Runs But Pump Does Not Stroke	1. Check displacement pump connecting rod pin (17). See Fig. 18, page 23.	1. Replace pin if missing. Be sure retainer spring (18) is fully in groove all around connecting rod.
	2. Check connecting rod assembly (15) for damage. See page 28.	2. Replace connecting rod assembly. See page 28.
	3. Be sure crank in drive housing rotates; plug in sprayer and turn on briefly to check. Turn off and unplug sprayer. See page 28.	3. Check drive housing assembly for damage and replace if necessary. See page 28.
Spray Pattern Variations	1. Spray tip worn beyond sprayer pressure capability.	1. Replace spray tip. **NOTE:** A smaller size tip will provide longer life.
	2. Check motor control board by replacing it with a new one.	2. Replace board. See page 27.
	3. Check pressure adjustment potentiometer (64) by replacing it with a new one.	3. Replace pressure transducer. See page 30.

Intermediate Problem Solving

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK, refer to this column*
Spray Pattern Variations *(continued)*	4. Check pressure adjustment potentiometer (64) by replacing it with a new one.	
	5. Check Low Output section, page 16.	
Motor Is Hot and Runs Intermittently	1. Determine if sprayer was operated at high pressure with small tips, which causes excessive heat build up.	1. Decrease pressure setting or increase tip size.
	2. Be sure ambient temperature where sprayer is located is no more than 90°F (32°C) and sprayer is not located in direct sun.	2. Move sprayer to shaded, cooler area if possible.
	3. Check motor.	3. Replace motor. See page 26.
Building Circuit Breaker Opens As Soon As Sprayer Switch Is Turned On.	1. Check all electrical wiring for damaged insulation, and all terminals for loose fit or damage. Also check wires between pressure transducer and motor. See page 26.	1. Repair or replace any damaged wiring or terminals. Securely reconnect all wires.
	2. Check for missing motor brush inspection plate gasket (see page 21), bent terminal forks or other metal to metal contact points which could cause a short.	2. Correct faulty conditions.
	3. Check motor armature for shorts. Use an armature tester (growler) or perform motor test. See page 18. Inspect windings for burns.	3. Replace motor. See page 26.
	4. Check motor control board (47) by substituting with a good board. **CAUTION:** Do not perform this check until motor armature is determined to be good. A bad motor armature can burn out a good board.	4. Replace board. See page 27.
Circuit breaker opens after sprayer operates for 5 to 10 minutes.	1. Check 'Basic Problems – Electrical' on page 14.	
Building circuit breaker opens as soon as sprayer is plugged into outlet and sprayer is NOT turned on.	1. Check ON/OFF switch (52). Be sure sprayer is unplugged! Disconnect wires from switch. Check switch with ohmmeter. The reading should be infinity with ON/OFF switch OFF, and zero with switch ON. **CAUTION:** A short in motor circuit can damage switch and or motor control board (47).	1. Replace ON/OFF switch. See page 27.
	2. Check for damaged or pinched wires in junction box (59).	2. Replace damaged parts.
Unit will not run on generator but does run on AC power	1. Check the generator's "peak" voltage. This sprayer will not run if the peak voltage is above 190V or below 100V.	1. Use AC power or a different generator.

General Repair Information

⚠ WARNING

INJECTION HAZARD

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

Tool List

These service tools are required.

1/4” Allen wrench: *filter plug*
3/8” Allen wrench: *pump manifold*
3/16” Allen wrench: *gear housing, legs, handle*
5/64” Allen wrench: *pressure adjustment knob*
#1 Phillips® screwdriver: *junction box, front cover, motor shield*
3/8” socket wrench: *motor mount*
5/8” socket wrench: *drain valve, on/off switch boot, piston*
5/8” open end wrench: *outlet fittings*
13/16” socket wrench: *drain valve*
1-1/4” socket wrench: *pump inlet valve*
1/2” open end wrench: *pump rod*
11/16” open end wrench: *piston jam nut*
15/16” open end wrench: *flats of inlet tube*
1-3/4” open end wrench: *pump jam nut*
5/64” drive pin: *drain valve pin*
3” needle nose pliers: *wiring, on/off switch*
Hammer & punch: *packing nut*
Torque wrenches: *various fasteners*
Pipe wrench: *suction tube*

⚠ CAUTION

To reduce the risk of a pressure transducer malfunction, properly mate connectors and never pull on a wire to disconnect it.

1. **When disconnecting wires**, use needle nose pliers to separate mating connectors.

2. **When reconnecting wires**, center the flat blade of the male connector in the blade of the female connector.

3. **Route wires carefully** and avoid pinching any wires between covers.

⚠ CAUTION

Improper wire routing can result in poor sprayer performance or damage to the pressure transducer.

4. **Keep all screws, nuts, washers, gaskets, and electrical fittings** removed during repair procedures.

5. **Test your repair before regular operation** to be sure the problem is corrected.

6. **If the sprayer does not operate properly**, verify that everything was done correctly. Also refer to the Troubleshooting Guide, page 14, to help identify other possible problems and solutions.

⚠ WARNING

MOVING PARTS HAZARD

To reduce the risk of serious injury, including electric shock, DO NOT touch any moving parts or electrical parts with your fingers or a tool while inspecting the sprayer.

Shut off the sprayer and unplug it as soon as you complete the inspection.

Reinstall all covers, gaskets, screws and washers before operating the sprayer.

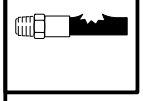
⚠ WARNING

FIRE HAZARD

During operation, the motor and drive housing become very hot and could burn your skin if touched. Flammable materials spilled on the hot, bare motor could cause a fire or explosion.

Motor Test

⚠ WARNING



INJECTION HAZARD
To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before doing this procedure. Unplug the sprayer!

For checking armature, motor winding and brush electrical continuity.

Setup

Remove the drive housing. See page 28. This is to ensure that any resistance you notice in the armature test is due to the motor and not to worn gears in the drive housing.

Remove the motor brush inspection covers (A). See Fig. 12.

Remove the screws (56,75). Lower the control board (47). Disconnect the two leads (C) from the motor to the board. See Fig.13.

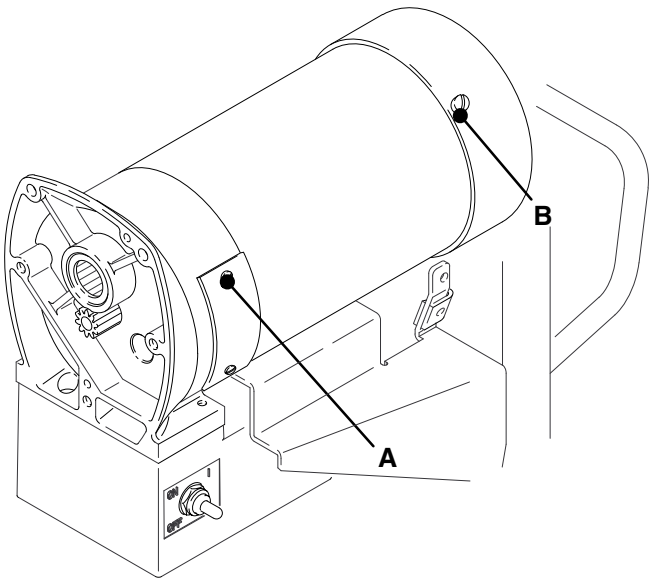


Fig. 12 02991

Armature Short Circuit Test

Remove the fan cover (B). See Fig.12.

Spin the motor fan by hand. If there are no shorts, the motor will coast two or three revolutions before coming to a complete stop. If the motor does not spin freely, the armature is shorted and the motor must be replaced. See page 26.

Armature, Brushes, and Motor Wiring Open Circuit Test (Continuity)

Connect the two black motor leads (C) together with a test lead. Turn the motor fan by hand at about two revolutions per second. See Fig. 13.

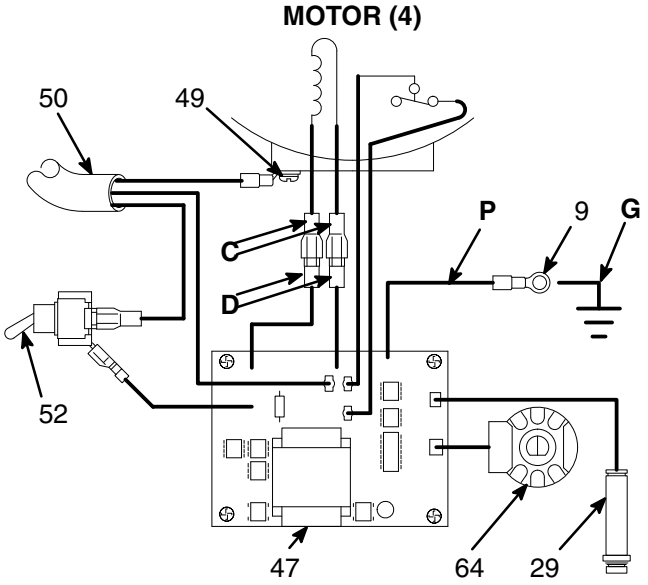


Fig. 13 03000

When turning the fan on a DC motor, normally you sense an even, pulsing resistance. If there is irregular turning resistance, or no turning resistance, check and repair the following as needed: broken brush springs, brush leads, motor leads; loose brush terminal screws or motor lead terminals; worn brushes. See page 21.

If there is still uneven or no turning resistance, replace the motor. See page 26.

Motor Brushes

NOTE: Replace brushes when worn to about 12.5 mm (0.5 in.) . Always check both brushes. Brush Repair Kit 236–967 is available for motors manufactured by Pacific Scientific. Consult Rev. A of this manual for repair kit and instructions if your unit has a Leeson motor.

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 with no load as instructed in this procedure.

⚠ WARNING

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** in your sprayer instruction manual before doing this procedure. Unplug the sprayer!

1. Remove both inspection covers (A) and their gaskets. See Fig.14.

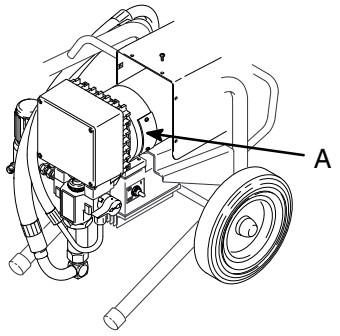


Fig. 14

2. Push in the spring clip (F) and release its hooks (G) from the brush holder (B). Pull out the spring clip. See Fig. 15.
3. 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 or arc excessively. See Step 8.d., also.
4. Repeat for the other side.
5. Place a new brush (C) in the holder (B) so the ramp (H) faces the spring. See Fig. 15.
6. Holding the spring clip (F) at a slight angle, slide the spring clip into the brush holder and hook it over the end of the holder. See Fig. 16. Pull on the spring clip to be sure it stays in place. Connect the brush lead to the blade connector (E).
7. Repeat for the other side.
8. **Test the brushes.**
   a. Remove the pump connecting rod pin (17).
   b. With the sprayer OFF, turn the pressure control knob fully counterclockwise to minimum pressure. Plug in the sprayer.
   c. Turn the sprayer ON. Slowly increase the pressure until the motor is at full speed.
   d. Inspect the brush and commutator contact area for excessive arcing. Arcs should not trail or circle around the commutator surface.

⚠ WARNING

Do not touch the brushes, leads, springs or brush holders while the sprayer is plugged in to reduce the risk of electric shock and serious bodily injury.

9. Install the brush inspection covers and gaskets.
10. **Break in the brushes.** Operate the sprayer for at least one hour with no load. Install the pump connecting rod pin.

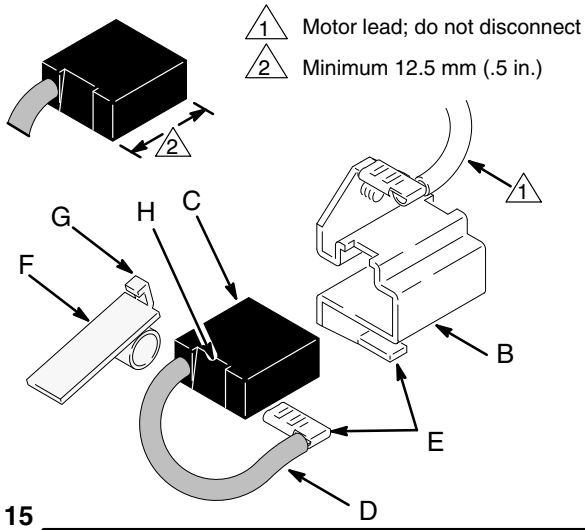


Fig. 15

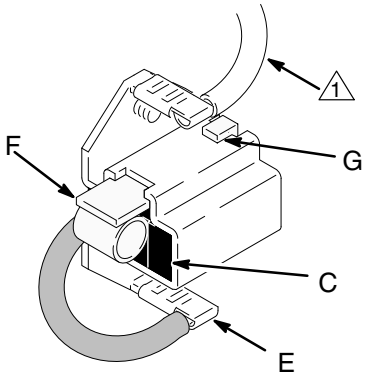


Fig. 16

Displacement Pump

NOTE: Packing Repair Kit 235–703 is available. Reference numbers of parts included in the kit are marked with an asterisk, i.e., (121*).

NOTE: To minimize down time, and for the best sprayer performance, check the motor brushes (see page 21) and clean the transducer (see page 30) whenever you repack the pump. Replace these parts as needed.

Removing the pump (See Fig.17)

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**

2. Flush the pump, if possible. Relieve pressure. Stop the pump with the piston rod (107) in its lowest position, if possible. To lower the piston rod manually, rotate the motor fan blades.

3. Remove the filter (85).

4. **Models 820–206.** While pulling upward on the suction hose (32), unscrew the hose from the inlet tube (38). Unscrew the drain hose (33) from the displacement pump nipple (36).

5. **Models 820–208.** Remove the suction tube (32). Unscrew the drain tube (33) from the displacement pump nipple (36).

NOTE: If repairing only the intake valve assembly, go to **intake valve repair,** on page 23.

6. Use a screwdriver to push the retaining spring (18) up and push out the pin (17).

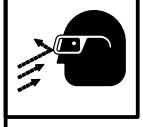
7. Loosen the screws (21). Remove the pump (20).

Installing the pump (See Fig. 17 and 18)

1. Lightly grease or oil the transducer (29). See Fig. 29. Guide the pump over the alignment pins and pressure transducer. Tap it into position with a soft hammer. Tighten the screws (21) to 50 ft-lb (68 N.m).

2. Align the hole in the rod (107) with the connecting rod assembly (15). Use a screwdriver to push the retaining spring (18) up and push in the pin (17). Push the retaining spring (18) into place around the connecting rod.

⚠ WARNING



MOVING PARTS HAZARD

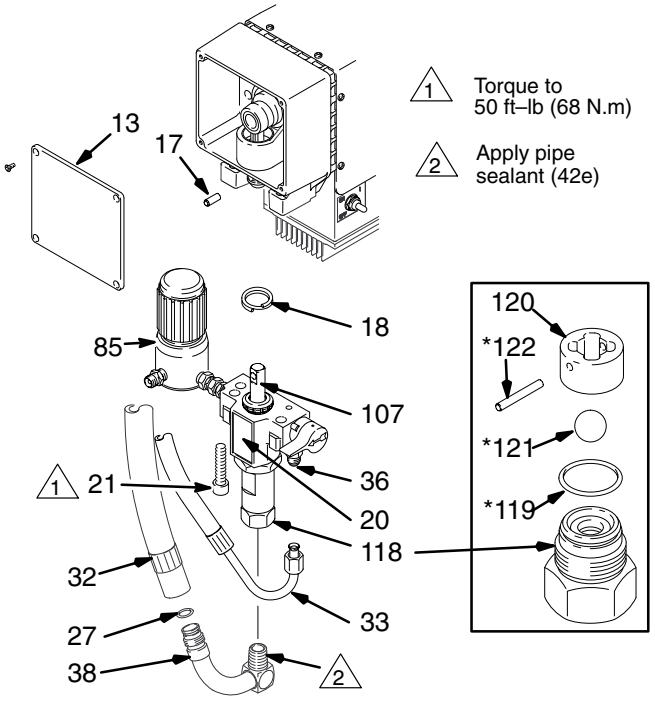
Be sure the retaining spring (18) is firmly in the groove all the way around, to prevent the pin (17) from working loose due to vibration. See Fig. 18.

If the pin works loose, parts could be projected into the air and cause serious injury or property damage, including the pump connecting rod or bearing housing.

3. Replace the o-ring (27) if it is worn or damaged. See page 32. Reconnect the suction and drain hoses (32,33). Install the front cover (13).

4. Tighten the packing nut (102) just enough to stop leakage, but no tighter. Fill the packing nut/wet-cup 1/3 full with Graco TSL. Push the plug (123) into the wet-cup.

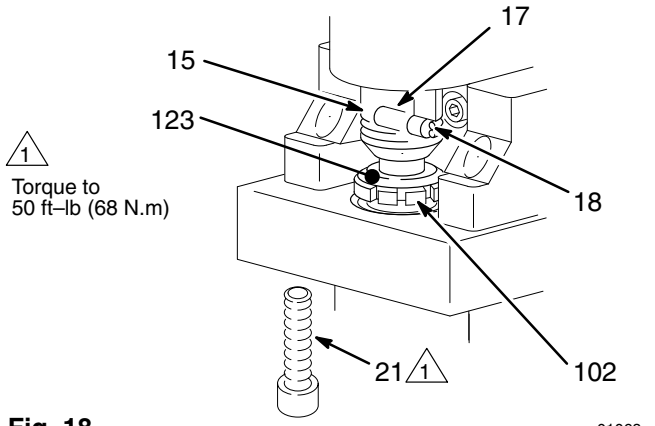
Displacement Pump



820–206 shown

03200A

Fig. 17



01068

Fig. 18

Intake valve repair (See Fig. 17)

1. Remove the suction hose or tube. See Step 4 and 5, **Removing the pump.**

2. Unscrew the intake valve (118). Remove the o-ring (119*), ball guide (120), stop pin (122*) and ball (121*) from the valve.

3. Clean and inspect the parts for wear or damage. Replace parts as needed. Use a new o–ring (119*). If no further service is needed, reassemble the pump.

Disassembling the pump (See Fig. 19)

1. Remove the intake valve (118).

2. Loosen the packing nut (102) and plug (123).

3. Use a plastic mallet to tap the piston rod (107) down, and then pull the rod out through the bottom of the cylinder.

4. Remove the packing nut (102) and throat packings.

5. Loosen the jam nut (117). Remove the cylinder (115) and the o-ring (116*).

6. Clamp the flats of the piston rod in a smooth jaw vise. Use an open-end wrench to loosen the nut (110) and then unscrew the piston valve (108).

7. Remove all parts from the piston valve (108).

Reassembling the pump

⚠ CAUTION

Incorrect installation of the packings damages the packings and causes pump leaks.

NOTE: Alternate the plastic and leather packings. See Fig. 19. The lips of the throat V-packings face down. The lips of the piston V-packings face up. The lips of seal (125*) face down.

NOTE: Soak the leather packings in oil before reassembling the pump.

1. Check the outside of the piston rod (107) and the inside of the cylinder (115) for wear. Replace worn parts to ensure a good seal with the new packings.

2. Stack these parts onto the piston valve (108) one at a time: the backup washer (126*) and u–cup (125*), the female gland (114*), alternately three plastic (112*) with two leather packings (113*), and the male gland (111*). See Fig. 20.

3. Tighten the nut (110) onto the piston valve (108) to 2 in-lb (0.23 N.m). See Fig. 21.

Note the alignment of the piston (108) to the nut (110). Maintain this alignment through Step 8.

4. Clean all residue from the piston valve threads. Apply one strip of adhesive, supplied, to the threads.

5. Place the ball (109*) on the piston valve (108). See Fig. 20.

Displacement Pump

⚠ CAUTION

Step 8, tightening the piston valve into the rod, is critical. Follow the procedure carefully to avoid damaging the packings by overtightening.

6. Hand tighten the valve into the piston rod just until the nut (110) contacts the rod. See Fig. 21.

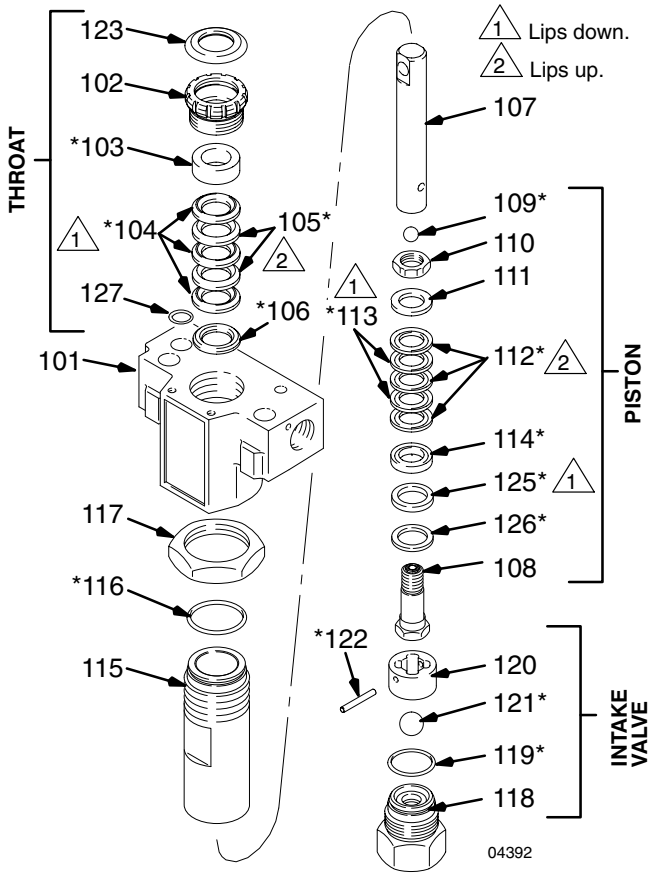


Fig. 19 03149

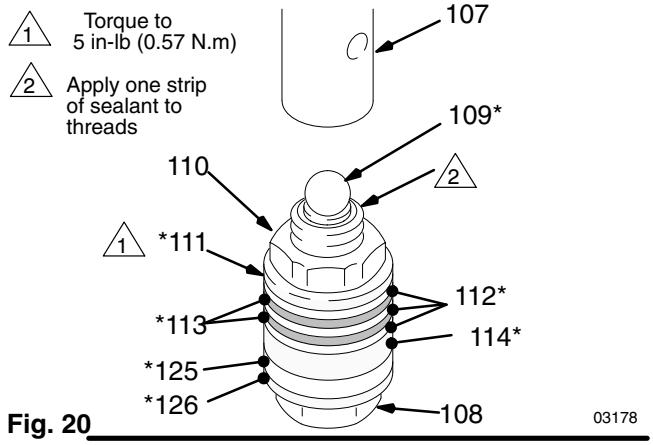


Fig. 20 03178

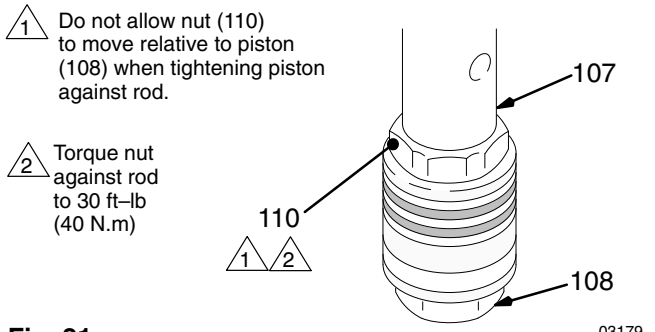


Fig. 21 03179

7. Place the flats of the rod (107) in a smooth jaw vise.

8. Carefully tighten the nut (110) against the piston rod to 30 ft-lb (40 N.m). See Fig. 21.

   Use two wrenches to maintain the alignment mentioned in Fig. 21.

9. Stack these parts one at a time into the top of the manifold (101): the male gland (106*), alternately three plastic packings (104*) with two leather packings (105*), and then the female gland (103*). See Fig. 23.

10. Install the packing nut (102) and plug (124), but leave loose for now. See Fig. 23.

11. Place a new o–ring (116*) firmly in the cylinder groove. See Fig. 22.

12. Coat the piston rod and packings with oil. Carefully slide the assembly into the top of the cylinder (115). See Fig. 22.

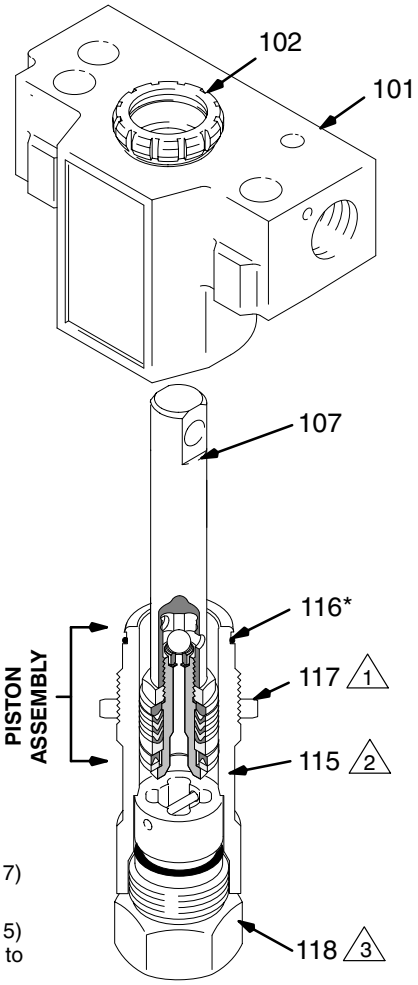
13. Put the manifold in a vise. Fully thread the jam nut (117) onto the cylinder (115). Guide the rod/ cylinder assembly down through the manifold (101). Screw the cylinder (115) into the manifold. See Fig. 22.

14. Place the ball guide (120), stop pin (122) and ball (121*) in the cylinder (115). Screw the intake valve into the cylinder and torque to 53 ft-lb (71 N.m). This will also properly torque the cylinder into the manifold. See Fig. 22.

15. Torque the cylinder jam nut (117) to 73 ft–lb (98 N.m). See Fig. 22.

16. Install the pump. See page 22.

Displacement Pump

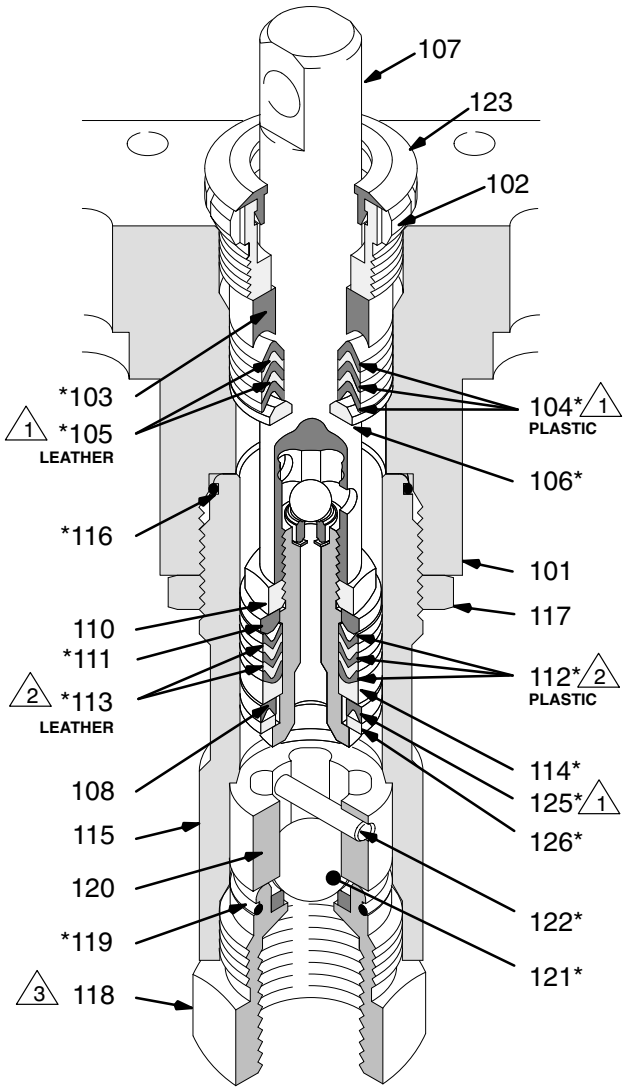


1 Torque jam nut (117) 73 ft-lb (98 N.m)

2 Torque cylinder (115) into manifold (101) to 53 ft-lb (71 N.m)

3 Torque intake valve (118) into cylinder (115) to 53 ft-lb (71 N.m)

Fig. 22 01072A



1 Lips face down.

2 Lips face up.

3 Torque to 53 ft-lb (71 N.m)

Fig. 23 03147

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 8.

NOTE: See Fig. 26 except where noted.

1. Try to stop the pump with the piston rod (107) in its lowest position. To lower the piston rod manually, remove the shroud (4) and rotate the motor fan blades. Use a screwdriver to push the retaining spring (18) up and push out the pin (17). See Fig. 24.
2. **Relieve pressure.**
3. Remove the motor shield (4).
4. Lift the connecting rod. Remove the screws (56,75) and lower the control card (47). Disconnect the motor wires and the pressure transducer wire (A) from the motor control board. Remove the control card (47), screws (71), and junction box (59). Refer to Fig. 26.
5. Remove the drive housing cover (13).
6. Turn the displacement pump rod (107) so the pin hole aligns with the bottom drive housing screw (19). See Fig. 25. Remove the three drive housing screws and lockwashers (19,6). See Fig. 25 and 26.
7. Remove the two motor screws and lockwashers (5,6).
8. Tap the lower rear of the drive housing (11) with a plastic mallet to loosen the motor. Pull the drive housing straight off the motor while guiding the harness (A) from the motor. Do not allow the gear (16) to fall. Read the CAUTION on page 28.
9. Remove the two screws (46) and lift the motor off the cart (1).
10. Align the new motor with the cart and reinstall the screws (46).
11. Assemble the drive housing to the motor. Follow steps 9 to 15 on page 28. Install the junction box.
12. Connect the wires to the control card. Refer to Fig. 13. Install the control card.
13. Connect the piston rod (107) to the drive housing; see page 22, **Installing the Pump**, Step 2 and the WARNING following it.
14. Install the shroud (4) and drive housing cover (13).

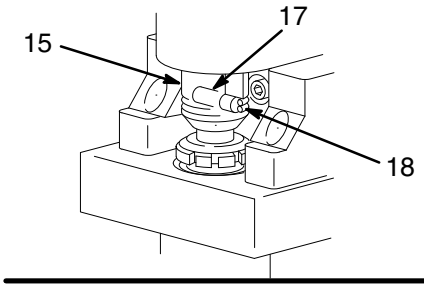


Fig. 24 01068

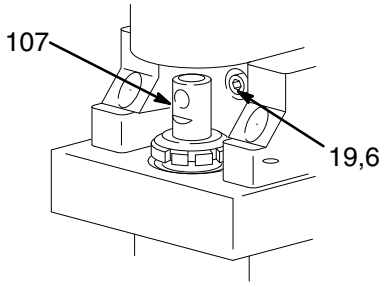
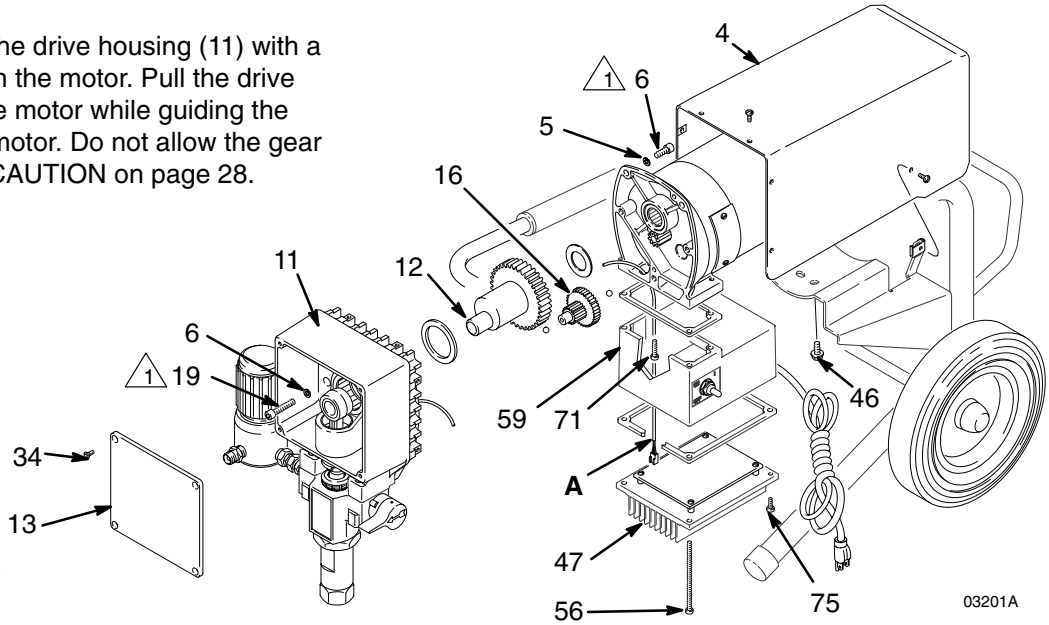


Fig. 25 01074



1 Torque to 80 in–lb (9 N.m)

Fig. 26

Motor Control Board

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**
2. Remove the screws (56,75) and lower the control card (47). See Fig. 26.
3. Disconnect the motor wires (C) and the two connectors (D) from the motor control board (47). Observe where connections are made. See Fig. 13 on page 20.
4. Remove the screw (9) from the ground wire (G) and remove the board.
5. Install the new motor control board. Reconnect all wires and secure it to the junction box (59).

⚠ CAUTION

To reduce the risk of a malfunction:

- Be sure the flat blade of the insulated male connector is centered in the wrap–around blade of the female connector when the connections are made.
- Route all wires carefully to avoid interference with the motor control board or junction box.

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 8.

1. **Relieve pressure.**
2. Remove the screws (56, 75) and lower the control card (47). See Fig. 26.
3. Disconnect the power supply cord leads (P), including the green wire to the grounding screw (9). See Fig. 13 on page 20.
4. Loosen the strain relief bushing (51). Remove the power supply cord (50).
5. Install the new cord (50) in the reverse order of disassembly.
6. Install the control card. Be sure no leads are pinched between the card and other components.

On/Off Switch

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**
2. Remove the screws (56,75) and lower the control card (47). See Fig. 28.
3. Remove the rubber boot (55). See page 34.
4. Disconnect the black wires from the ON/OFF switch (52) and remove the switch. See Fig. 13 on page 20.
5. Install the switch so the internal tab of the anti–rotation ring (54) engages with the vertical groove in the threads of the switch, and the external tab engages with the slot of the junction box. See page 34.
6. Powder the inside of the rubber boot (55) with talcum, then shake the excess out of the boot. Install the nut and rubber boot and tighten.
7. Reconnect the ON/OFF switch black wires.
8. Install the control card. Be sure no leads are pinched between the motor control board or other components.

Drive Housing, Connecting Rod, Crankshaft

⚠ WARNING

INJECTION HAZARD

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

⚠ CAUTION

Do not allow the gear (16) to fall; it may stay attached to the drive housing or to the motor.

Do not lose the thrust balls (11a or 4a) or let them fall between the gears, which will damage the drive housing if not removed. The balls, which are heavily covered with grease, usually stay in the gear recesses, but could be dislodged. If the balls are not in place, the bearings will wear prematurely.

NOTE: Inspect parts as they are removed. Replace parts that are worn or damaged.

1. **Relieve pressure.**
2. Remove the displacement pump. See page 22.
3. Remove the shroud (4).
4. Lower the control card (47) and remove the pressure transducer (29). See page 30.

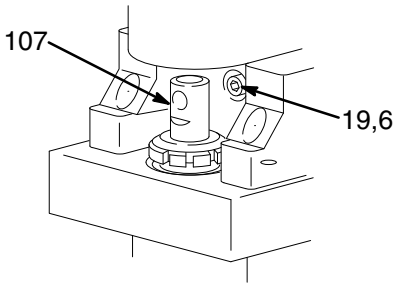


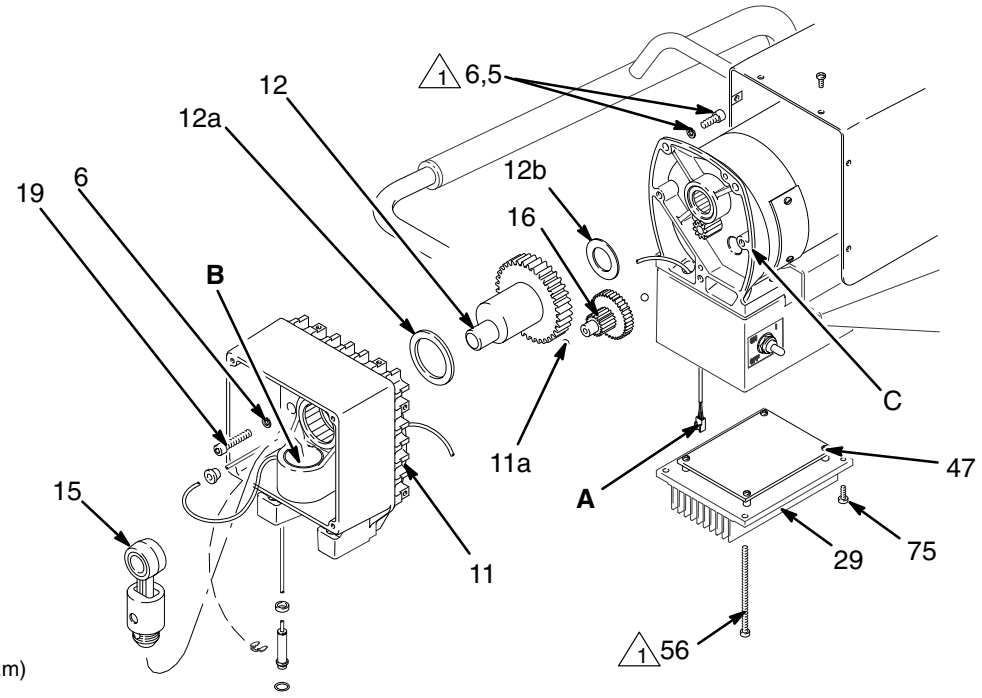
Fig. 27 01074

5. Remove the three drive housing screws and lockwashers (19,6). Also see Fig. 28.
6. Remove the two motor screws and lockwashers (5,6). See Fig. 28.
7. Tap the lower rear of the drive housing (11) with a plastic mallet to loosen the motor. Pull the drive housing straight off the motor.
8. Remove and inspect the crankshaft (12) and the connecting rod (15). Replace all damaged or worn parts.
9. Install the connecting rod.
10. Lubricate the inside of the connecting rod bearing with SAE non-detergent oil. Pack the roller bearing and gears with the grease supplied.

NOTE: The gears and bearings between the drive housing (11) and motor front end bell (C) should contain a total of 3 fl oz (29 cc) of grease.

11. Place the large washer (12a) and then the small washer (12b) on the crankshaft (12).
12. Rotate the crank to the top of the stroke and insert crankshaft (12). Align the gears and push the drive housing (11) straight onto the motor and the locating pins. Install the screws (19, 5) and their lockwashers (6). Torque to 80 in–lb (9 N.m).
13. Plug in the pressure transducer. See page 30.
14. Install the displacement pump. See page 22.
15. Install the front cover (13).
16. Replace the shroud (4).
17. Replace the control card (47).

Drive Housing, Connecting Rod, Crankshaft



Note: Filter not shown

1 Torque to 80 in–lb (9 N.m)

02995

Fig. 28

Pressure Transducer

NOTE: See Fig. 28 and 29 for this procedure.

NOTE: The pressure transducer (29) cannot be repaired or adjusted. If it malfunctions, replace it.

Removal

⚠ WARNING

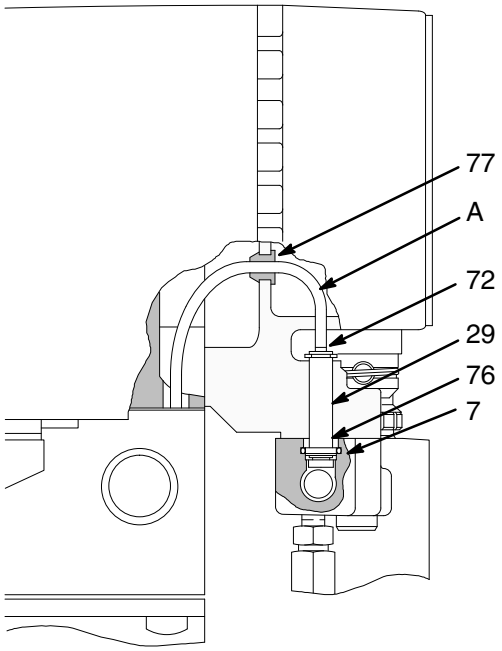
INJECTION HAZARD

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

1. **Relieve pressure.**
2. Remove the displacement pump (20). See page 22.
3. Remove the front cover (13). Remove the screws (56,75). Lower the motor control card.
4. Disconnect the harness connector from the motor control board (47). Remove grommet (77).
5. Remove the retaining ring (72). Pull the pressure transducer down and out past the drive housing (11).
6. Guide the harness (A) through the motor and drive housing and remove the pressure transducer.
7. Inspect the spacer (76) and seal (7) for damage. Replace the seal (7) only if it is cut, nicked, or if leakage occurred. See page 31.

Installation

1. Using a small piece of solid copper or mild steel wire (approximately 12 in.), form a small hook and place it in the passage of the bottom of the motor. Guide it up and out the hole in the drive housing.
2. Pass a spacer (76) over the harness connector (A) and down into position at the bottom of the transducer (29).
3. Guide the harness up through the leg and notch of the drive housing (11). Secure the guide wire over the connector.
4. While pulling the guide wire out through the bottom of the motor, guide the harness through the drive housing and motor castings.
5. Place the grommet (77) over the harness and push into position in the drive housing hole.
6. Feed the excess harness cable through the grommet and fully seat the transducer body into the hole in the drive housing leg. Secure it with the retaining ring (72).
7. Attach the connector to the control board. Replace the cover (13) and board (47) taking care not to pinch any wires between the components.



03202

Fig. 29

Pressure Transducer Seal

NOTE: The PTFE seal is unaffected by most solvents and materials. Replacement of the seal is recommended only when leakage has occurred.

Removal

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**
2. Remove the displacement pump (20). See page 22.
3. Using a wooden or plastic probe (such as a toothpick), dislodge the packing (7) from its recess in the manifold (101).
4. Remove the packing and clean the manifold recess with solvent and cloth or cotton swabs. Inspect for nicks or scratches in the o–ring area.

Installation

1. Lightly coat the cleaned packing recess in the manifold with a light grease or oil.
2. Heat the packing (7) in hot water for several minutes.

⚠ CAUTION

Excess pressure from the probes or fingernails will damage the packing and cause subsequent leakage.

3. Using fingertips or a blunt wooden or plastic probe, install the packing into the recess. Be careful not to cause kinks or bends in the packing during installation.
4. Lightly grease or oil the transducer (29) and install the pump (20). See page 22.

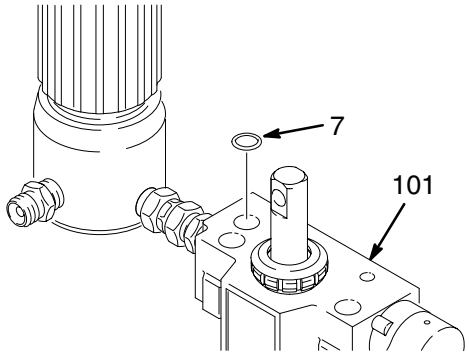


Fig. 30 02997A

Suction Hose

(Model 820–206)

⚠ WARNING

INJECTION HAZARD

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

⚠ CAUTION

Misalignment or cross-threading will damage the parts and/or create shavings which can cause the o-ring (27) to leak.

1. **Relieve pressure.**
2. Remove the drain hose (33) from the clip.
3. Pull upward on the suction hose (32) while unscrewing it from the inlet tube (38). The hose coupling (A) threads will engage and the hose will separate from the tube.
4. Replace the o-ring (27) if it is worn or damaged.
5. Lubricate the o-ring (27) and the inlet tube (38) threads with light grease.
6. Align the suction hose coupling (A) with the threads of the inlet tube (38). Tighten the hose onto the tube at least 4 turns to ensure that the threads have disengaged and can function as a swivel joint.

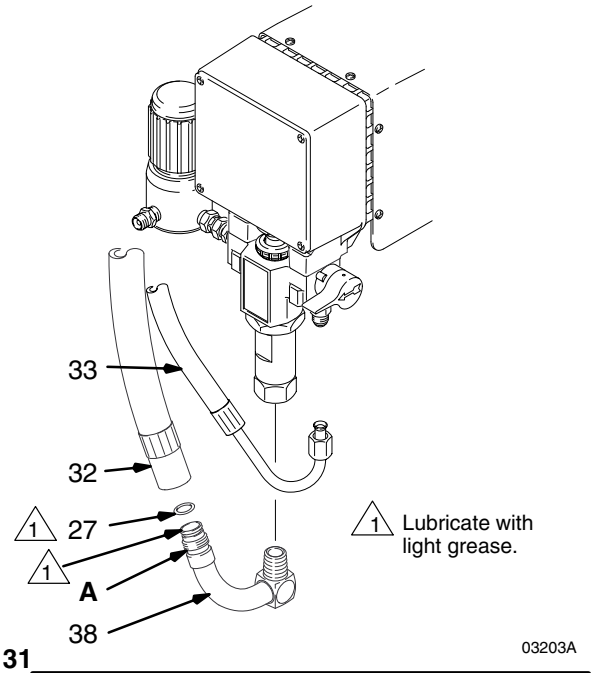


Fig. 31

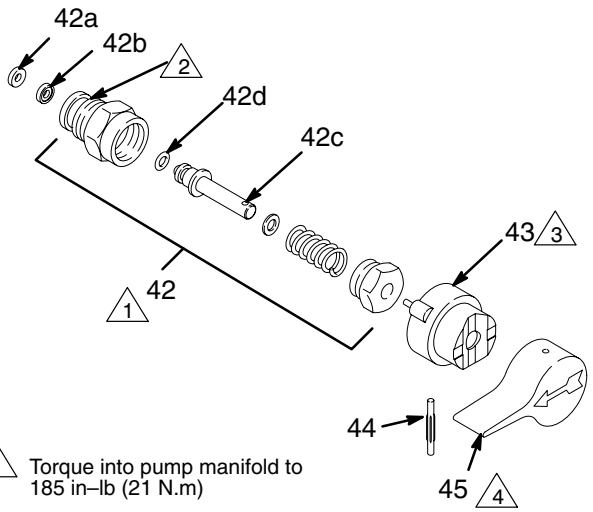
Drain Valve

⚠ WARNING

INJECTION HAZARD

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

1. **Relieve pressure.**
2. Turn the handle (45) to the closed position. Drive out the pin (44). Remove the handle.
3. Remove the base (43).
4. Unscrew the drain valve (42). The gasket (42a) and seat (42b) will stay in the valve.



1 Torque into pump manifold to 185 in–lb (21 N.m)

2 Apply thread sealant

3 Apply grease to face of base

4 Handle shown in closed position

Fig. 32 02819

Repair

1. Unscrew the spring retainer from the valve body. Remove the spring, washers and stem/ball. Clean any debris from the ball or seat area.
2. If replacing the gasket (42a) or seat (42b), pry out the gasket.

NOTE: Whenever the gasket (42a) is removed, replace it with a new one.

1. Coat the o–ring (42d) with grease. Press the stem (42c) into the valve body. Install the spring, washers and spring retainer into the valve body.
2. Place the seat (42b) in the valve body so the lapped side is toward the ball. Apply a small amount of grease to the new gasket (42a) and install it in the valve body.

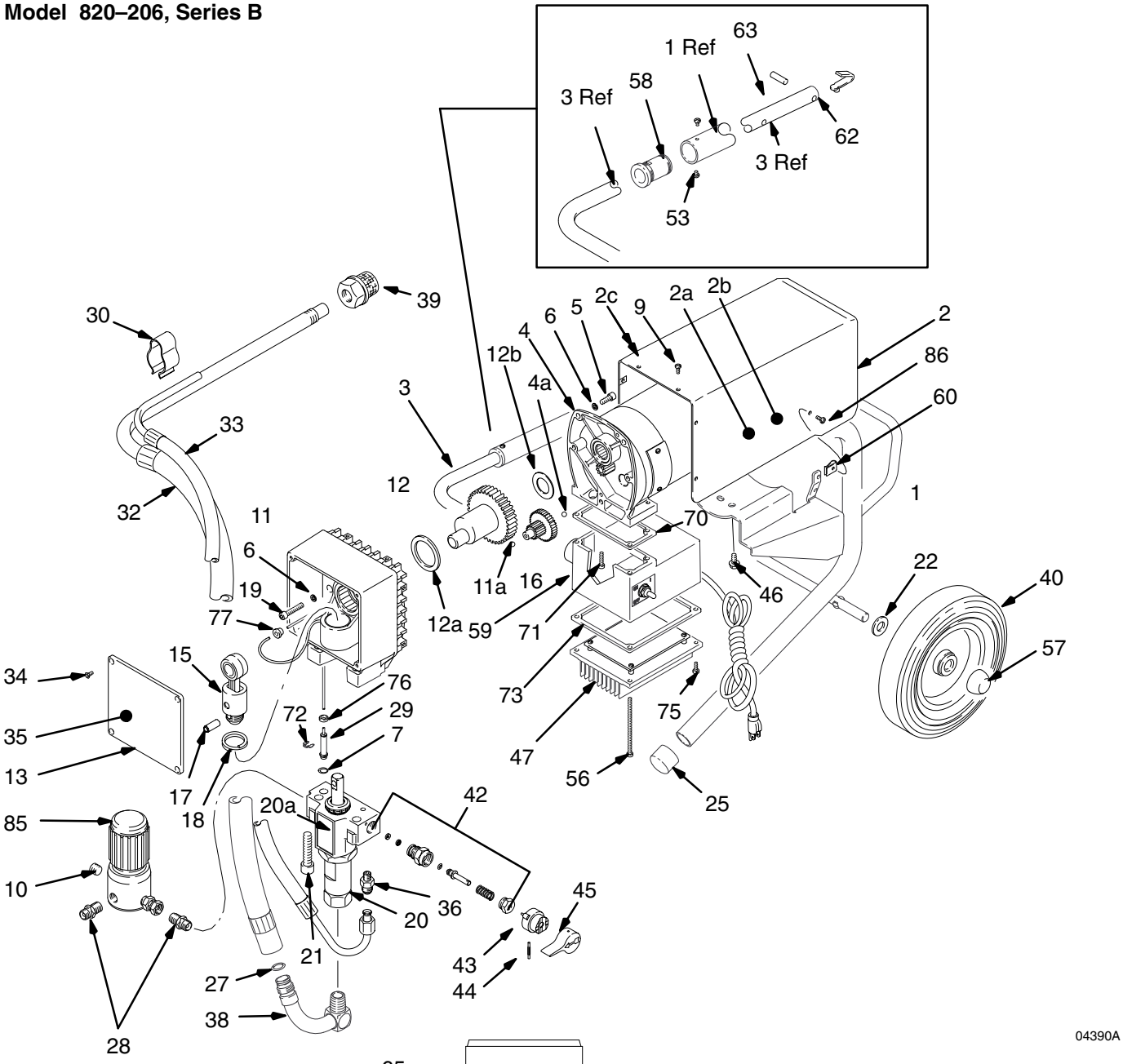
NOTE: The gasket will protrude from the end of the valve until the valve is tightened into pump, which correctly seats the gasket.

Replacement

1. Apply a small amount of thread sealant (42e) onto the valve (42) threads. Tighten the valve into the pump manifold to 185 in–lb (21 N.m).
2. Lightly grease the face of the base (43) and install the base. Turn the stem so the pin hole is vertical.
3. Securely install the handle (45) and drive the pin (44).

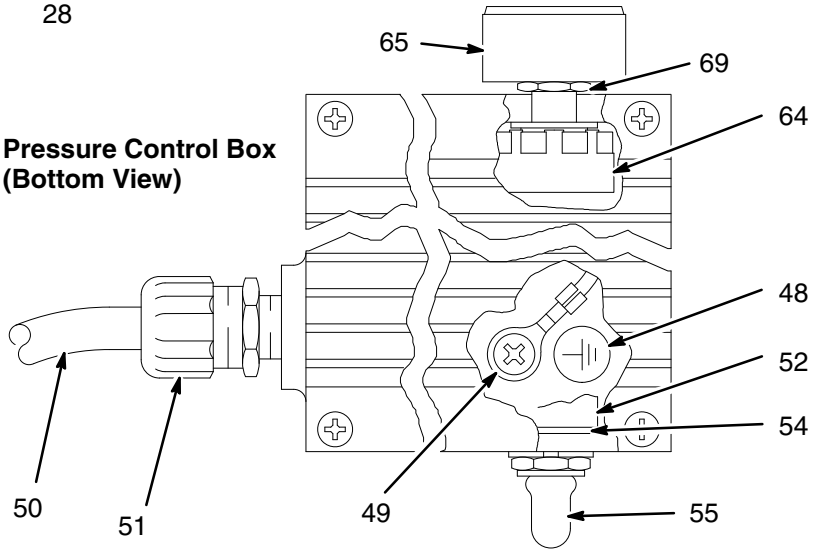
Complete Sprayer Parts

Model 820–206, Series B



04390A

Pressure Control Box (Bottom View)



03020

Complete Sprayer Parts

Model 820–206, Series B

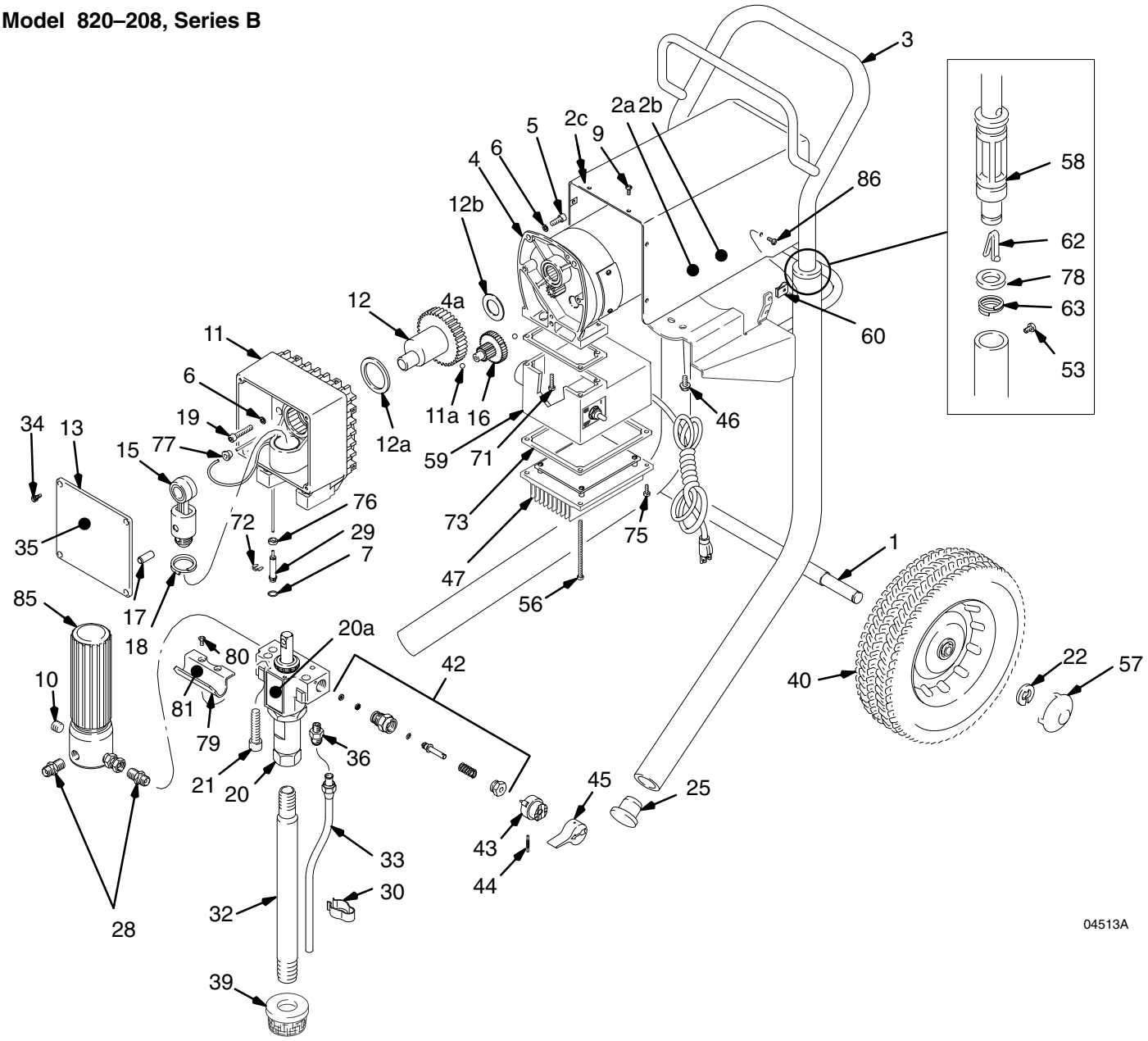
Ref. No.	Part No.	Description	Qty.
1	236–367	FRAME,cart	1
2	236–510	KIT, shield, motor	1
2a▲	187–791	LABEL, DANGER, English	1
2b▲	187–975	LABEL, WARNING, elec shock	1
2c▲	187–784	LABEL, DANGER, French	1
3	189–934	HANDLE, cart	1
4	238–682	KIT, motor, electric, DC	1
4a	100–069	BALL, thrust	1
4b	107–265	TERMINAL, 3/16” (M) QC, 16 AWG	1
4c	107–504	TERMINAL, 3/16”, (F), QC, 18 AWG	1
4e▲	187–784	LABEL, DANGER, French	
4f▲	187–791	LABEL, DANGER, English	1
4g▲	187–975	LABEL, WARNING, elec shock	1
5	101–682	SCREW, sch, 1/4–20 x .625	2
6	105–510	LOCKWASHER, 1/4 hi–collar	5
7	104–319	PACKING, o–ring, PTFE	1
8	189–270	BRACKET, shield	1
9	108–865	SCREW, panh	5
10	100–721	PLUG, pipe, 1/4 npt, headless	1
11	236–511	KIT, housing, drive	1
11a	100–069	BALL, thrust	1
12	218–242	CRANKSHAFT	1
12a	107–434	BEARING, thrust, front	1
12b	180–131	BEARING, thrust, rear	1
13	236–366	KIT, cover, front, U–600	1
15	218–359	CONNECTING, rod assy	1
16	218–364	GEAR, assy, 2nd stage	1
17	176–818	PIN, straight	1
18	176–817	SPRING, retaining	1
19	103–345	SCREW, sch, 1/4–20 x 1.25	3
20	237–662	KIT, pump, displacement	1
20a	188–663*	LABEL, WARNING	1
21	111–706	SCREW, mach, sch, 7/16 x 1.75	2
22	109–570	WASHER, plain 1/2”	2
25	112–759	CAP, tubing	2
27■	104–938	PACKING, o–ring	1
28	162–453	NIPPLE, 1/4 npt x 1/4 npsm	2
29	236–364	KIT, transducer, pressure control	1
30	113–478	CLIP, spring	1
32	187–624	HOSE, suction, swivel	1
33	238–345	HOSE, assy drain	1
34	107–209	SCREW, filh, 8–32 x 1.0	4
35	190–099	LABEL, cover, front	1
36	111–612	ADAPTER, tube	1
38	192–167	TUBE, inlet, swivel	1
39	235–004	STRAINER, 3/4 unf	1
40	112–607	WHEEL, semi–pneumatic	2
42	235–014	VALVE, drain	1
42a	111–699	GASKET, seat valve	1
42b	187–615	SEAT, valve, lapped	1
42c	224–968	STEM, drain valve	1
42d■	168–110	O–RING, stem	1
42e	110–110	SEALANT, pipe (not shown)	1
43	224–807	VALVE, base	1
44	111–600	PIN, grooved	1
45	187–625	HANDLE, drain valve	1
46	110–997	SCREWS, 1/4–20 x .625	2
47	237–659	KIT, motor control board	1
48▲	186–620	LABEL, ground terminal	1
49	110–037	SCREW, mach, pnh, 10–24 x .500	1
50	236–354	CORD, power set	1
51	108–295	BUSHING, strain relief	1
52	105–679	SWITCH, toggle	1
53	112–620	SCREW, 6–32 x 0.187	4
54	105–658	RING, locking	1
55	105–659	BOOT, toggle	1
56	112–381	SCREW, panh, 10–24 x 3.5	2
57	112–612	CAP, hub	2
58	280–290	BUSHING, cart	2
59	189–105	HOUSING, junction box	1
60	114–052	NUT, self–retaining	2
61	112–373	KNOB, pressure adjustment	1
62	178–565	BUTTON, spring	1
63	109–567	PIN, dowel	2
64	236–352	POTENTIOMETER, pressure adj	1
65	185–565	LABEL, knob	1
68	206–994	LIQUID, throat seal (not shown)	1
69	112–382	NUT, shaft sealing	1
70	112–158	GASKET, motor	1
71	112–379	SCREW, filh, 10–24 x 0.75	2
72	112–396	RING, external retaining	1
73	112–159	GASKET, heatsink	1
75	112–380	SCREW, panh, 8–32 x 0.5	2
76	189–269	SPACER, transducer	1
77	189–483	GROMMET, cable	1
85	239–447	FILTER, fluid (see manual 308–249)	1
86	114–053	SCREW, trusshead, 8–32	2

▲Extra Warning Labels available free

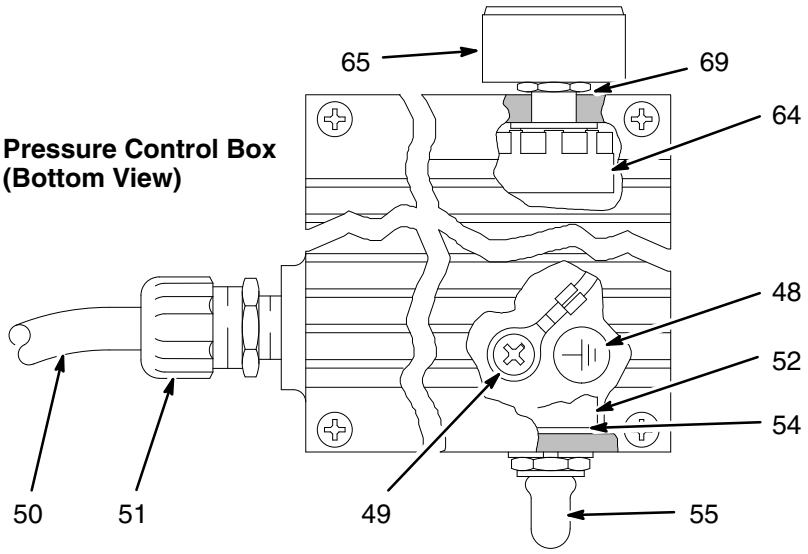
■ Replace Ref. No. 27 with 114–048 and Ref. No. 42d with 112–319 if using severe solvents such as lacquer thinner and acetone.

Complete Sprayer Parts

Model 820–208, Series B



Pressure Control Box (Bottom View)



Complete Sprayer Parts

Model 820–208, Series B

Ref. No.	Part No.	Description	Qty.
1	236–961	FRAME,cart	1
2	236–510	KIT, shield, motor	1
2a▲	187–791	LABEL, DANGER, English	1
2b▲	187–975	LABEL, WARNING, elec shock	1
2c▲	187–784	LABEL, DANGER, French	1
3	222–554	HANDLE, cart	1
4	238–682	KIT, motor, electric, DC	1
4a	100–069	BALL, thrust	1
4b	107–265	TERMINAL, 3/16” (M) QC, 16 AWG	1
4c	107–504	TERMINAL, 3/16”, (F), QC, 18 AWG	1
4e▲	187–784	LABEL, DANGER, French	
4f▲	187–791	LABEL, DANGER, English	1
4g▲	187–975	LABEL, WARNING, elec shock	1
5	101–682	SCREW, sch, 1/4–20 x .625	2
6	105–510	LOCKWASHER, 1/4 hi–collar	5
7	104–319	PACKING, o–ring, PTFE	1
8	189–270	BRACKET, shield	1
9	108–865	SCREW, panh	5
10	100–721	PLUG, pipe, 1/4 npt, headless	1
11	236–511	KIT, housing, drive	1
11a	100–069	BALL, thrust	1
12	218–242	CRANKSHAFT	1
12a	107–434	BEARING, thrust, front	1
12b	180–131	BEARING, thrust, rear	1
13	820–222	KIT, cover, front	1
15	218–359	CONNECTING, rod assy	1
16	218–364	GEAR, assy, 2nd stage	1
17	176–818	PIN, straight	1
18	176–817	SPRING, retaining	1
19	103–345	SCREW, sch, 1/4–20 x 1.25	3
20	237–662	KIT, pump, displacement	1
20a▲	188–663	LABEL, WARNING	1
21	111–706	SCREW, mach, sch, 7/16 x 1.75	2
22	101–242	RING, retaining, wheel	2
25	108–691	PLUG, tube	2
28	162–453	NIPPLE, 1/4 npt x 1/4 npsm	2
29	236–364	KIT, transducer, pressure control	1
30	186–245	CLIP, spring	1
32	192–169	TUBE, suction	1
33	189–087	TUBE, drain	1
34	107–209	SCREW, filh, 8–32 x 1.0	4
35	190–099	LABEL, cover, front	1
36	111–612	ADAPTER, tube	1
39	183–770	STRAINER, 1/2 npsm	1
40	106–062	WHEEL, semi–pneumatic	2
42	235–014	VALVE, drain	1
42a	111–699	GASKET, seat valve	1
42b	187–615	SEAT, valve, lapped	1
42c	224–968	STEM, drain valve	1
42d■	168–110	O–RING, stem	1
42e	110–110	SEALANT, pipe (not shown)	1
43	224–807	VALVE, base	1
44	111–600	PIN, grooved	1
45	187–625	HANDLE, drain valve	1
46	110–997	SCREWS, 1/4–20 x .625	2
47	237–659	KIT, motor control board	1
48▲	186–620	LABEL, ground terminal	1
49	110–037	SCREW, mach, pnh, 10–24 x .500	1
50	236–354	CORD, power set	1
51	108–295	BUSHING, strain relief	1
52	105–679	SWITCH, toggle	1
53	109–032	SCREW, 10–24 x 0.250	4
54	105–658	RING, locking	1
55	105–659	BOOT, toggle	1
56	112–381	SCREW, panh, 10–24 x 3.5	2
57	104–811	CAP, hub	2
58	192–027	BUSHING, cart	2
59	189–105	HOUSING, junction box	1
60	114–052	NUT, self–retaining	2
61	112–373	KNOB, pressure adjustment	1
62	111–590	BUTTON, spring	2
63	110–243	RING, retaining, handle	2
64	236–352	POTENTIOMETER, pressure adj	1
65	185–565	LABEL, knob	1
68	206–994	LIQUID, throat seal (not shown)	1
69	112–382	NUT, shaft sealing	1
70	112–158	GASKET, motor	1
71	112–379	SCREW, filh, 10–24 x 0.75	2
72	112–396	RING, external retaining	1
73	112–159	GASKET, heatsink	1
75	112–380	SCREW, panh, 8–32 x 0.5	2
76	189–269	SPACER, transducer	1
77	189–483	GROMMET, cable	1
78	183–350	WASHER, flat	2
79	190–321	HANGER, pail	1
80	112–777	SCREW, 8–32 x 38	2
81▲	290–061	LABEL, warning	1
85	239–425	FILTER, fluid (see manual 308–249)	1
86	114–053	SCREW, truss head, 8–32	2

▲Extra Warning Labels available free

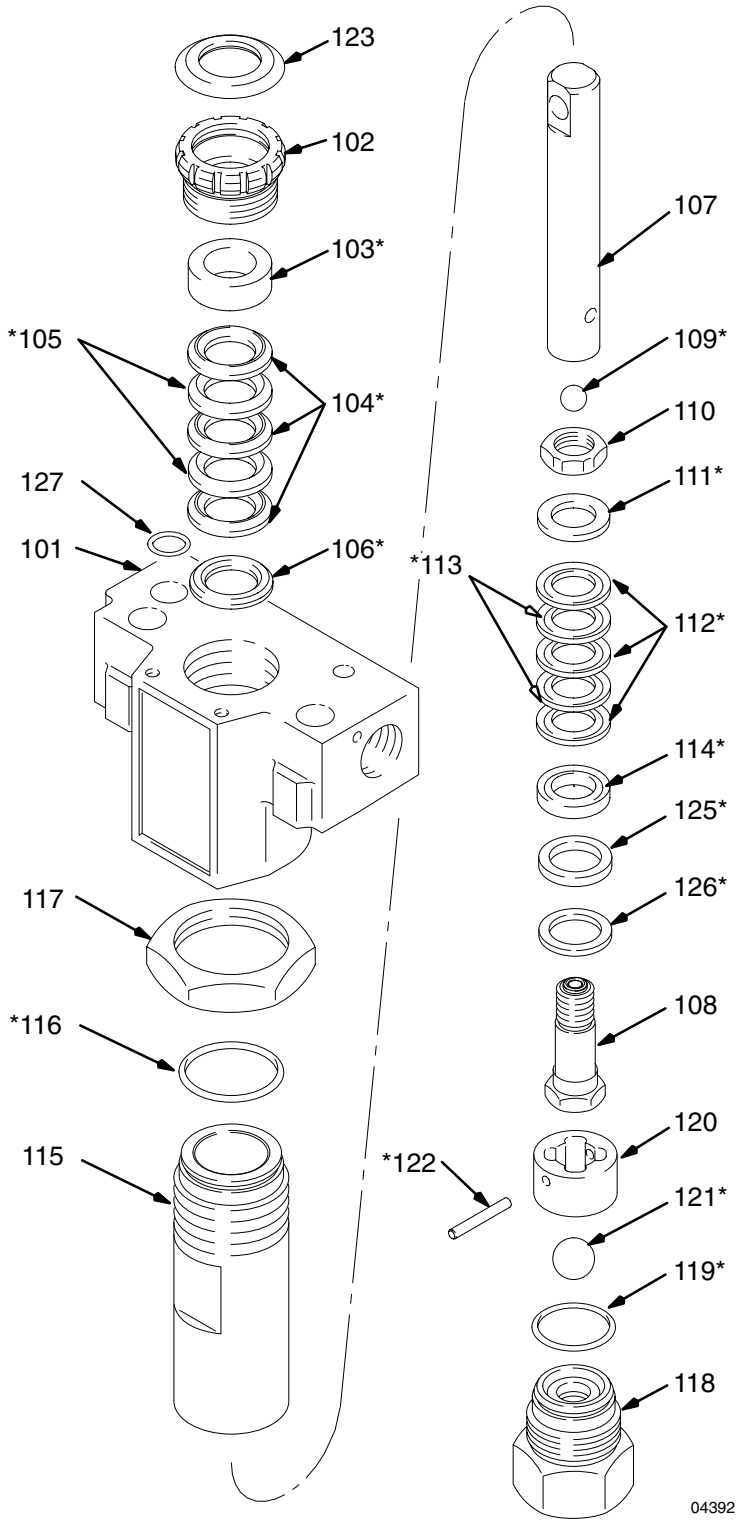
■ Replace Ref. No. 42d with 112–319 if using severe solvents such as lacquer thinner and acetone.

Displacement Pump Parts

Model 237–662 Series A

Ref. No.	Part No.	Description	Qty.
101	237–661	MANIFOLD, pump	1
102	176–758	PACKING NUT	1
103	176–757*	GLAND, female, throat	1
104	176–997*	V–PACKING, plastic, throat	3
105	176–755*	V–PACKING, leather, throat	2
106	176–754*	GLAND, male. throat	1
107	235–709	DISPLACEMENT ROD	1
108	218–197	PISTON, valve	1
109	105–444*	BALL, 5/16”, piston	1
110	176–751	NUT, hex, 1/2–20 unf–2b	1
111	176–750*	GLAND, male, piston	1
112	176–882*	V–PACKING, plastic, piston	3
113	176–749*	V–PACKING, leather, piston	2
114	180–073*	GLAND, female, piston	1
115	235–708	CYLINDER, pump	1
116	108–526*	PACKING, o-ring, PTFE	1
117	187–614	NUT, jam,1-3/8 18 unef–2b	1
118	224–966	INLET VALVE	1
119	111–603*	PACKING, o-ring, PTFE	1
120	176–760	GUIDE, ball	1
121	105–445*	BALL, 1/2”, inlet	1
122	176–759*	PIN, ball stop	1
123	180–656	PLUG	1
124	102–969*	SEALANT	1
125	105–522*	PACKING, u-cup, polyurethane	1
126	186–652*	WASHER, backup, steel	1
127	104–319	PACKING, o-ring, manifold	1

***Supplied in Repair Kit 235–703**
Keep a repair kit on hand to reduce down time.



Technical Data

Power Requirements	120 VAC, 60 Hz, 1 phase, 15A minimum
Generator	3000W minimum
Working Pressure Range	0–3000 psi (0–210 bar, 21 MPa)
Motor	3/4 HP
Cycles/Gallon (liter)	530 (140)
Delivery	0.55 gpm (2.1 lpm)
Tip Size	one gun to 0.025 new tip *with latex at 2000 psi (138 bar)*
Power Cord	14 AWG, 3 wire, 6' (1.8 m)
Inlet Paint Strainer	12 mesh (1525 micron) Stainless Steel Screen, reusable
Outlet Filter	60 mesh (250 micron)
Pump Inlet Size	1/2 npt(f)
Fluid Outlet Size	1/4 npsm
Wetted Parts:	
Displacement Pump	Stainless steel, Carbon steel, Aluminum, Polyethylene, Delrin®, Leather
Filter	Aluminum, Steel, PTFE, Stainless steel

NOTE: Delr

Dimensions

Model 820–206

Weight (dry w/o packaging)	50 lb (23 kg)
Length	22 in (559 mm)
Width	15 in (381 mm)
Height	21 in (533 mm)

Model 820–208

Weight (dry w/o packaging)	70 lb 32 kg)
Length	21 in (533 mm)
Width	20.5 in (521 mm)
Height:	
Handle Down	29.5 in (749 mm)
Handle Up	39.5 in (1003 mm)

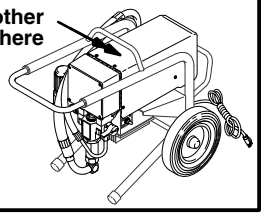
Accessories

DANGER LABELS

The English language DANGER label shown on page 1 is also on your sprayer. If you have painters who do not read English, order one of the following labels to apply to your sprayer. The drawing below shows the best placement of these labels for good visibility.

Order the labels directly from Graco, free of charge:
1–800–328–0211

French	**187–784**
Spanish	**185–956**
German	**185–961**
Greek	**186–041**
Korean	**186–045**
English	**187–791**



Sherwin-Williams Warranty

Graco warrants all equipment listed in this manual which is 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 or 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.

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

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, gas engines, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

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

FOR GRACO CANADA CUSTOMERS

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

ADDITIONAL WARRANTY COVERAGE

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

The SHERWIN-WILLIAMS COMPANY, 101 PROSPECT AVENUE, CLEVELAND, OH 44115

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