INSTRUCTIONS-PARTS LIST

307–913

Rev. C
Supersedes Rev. B and PCN C

First choice when quality counts.™

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

INSTRUCTIONS

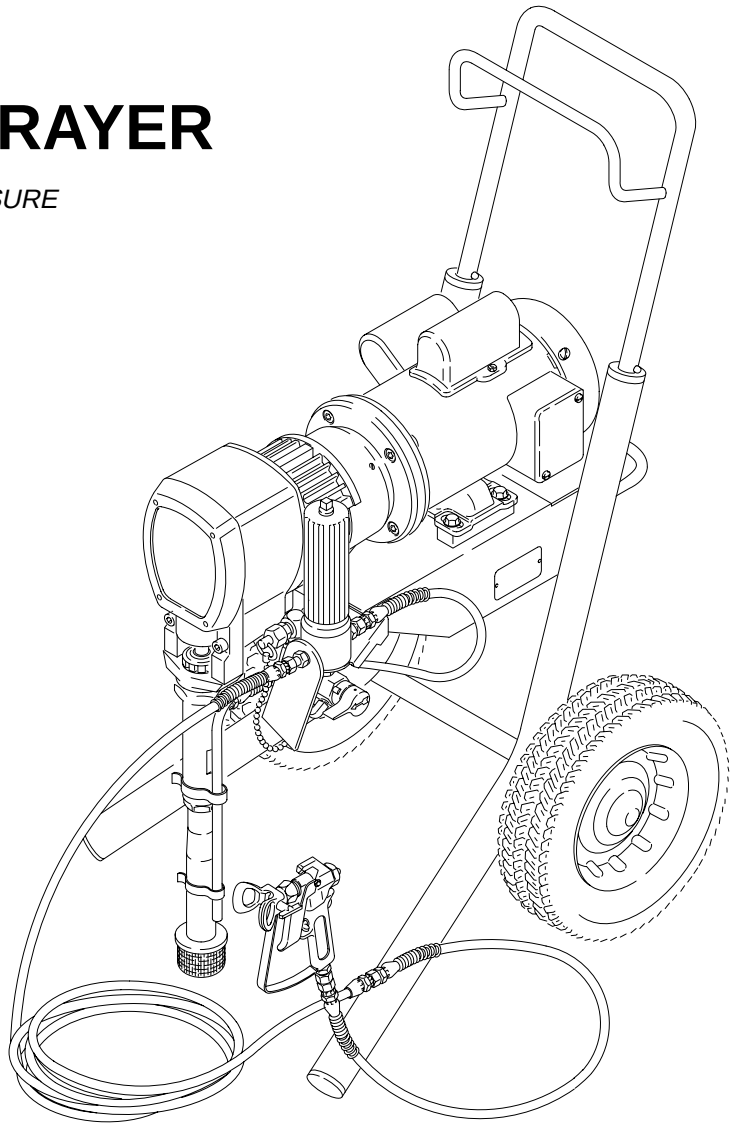
ELECTRIC–POWERED,
220/240 VAC, 50 Hz, 10 Amp

EM 5000

AIRLESS PAINT SPRAYER

21.0 MPa, 210 bar MAXIMUM WORKING PRESSURE

Model 222–246
Complete sprayer, with hose or gun, RAC IV®
Dripless® Tip Guard, and 621 size SwitchTip®



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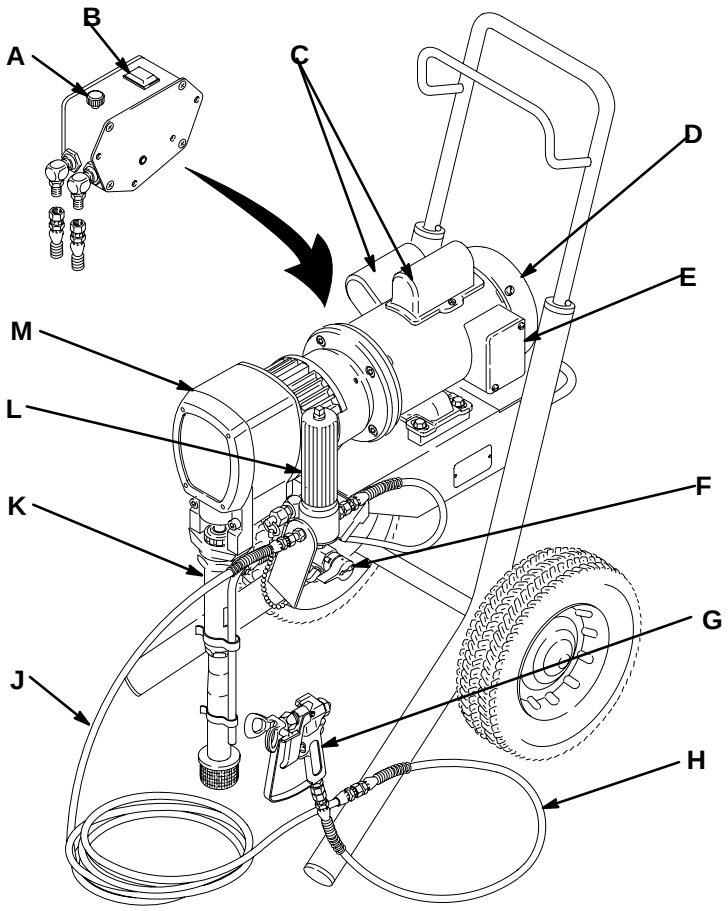
Graco Inc. is registered to I.S. EN ISO 9001

Table of Contents

Manual Change Summary

This manual was revised to include the changes from PCN C.

Part Identification



Key

A Pressure Adjusting Knob
B Pressure Control ON/OFF Switch
C Capacitors
D Motor
E Electrical Junction Box
F Pressure Drain Valve
G Contractor Gun with RAC IV Dripless Tip Guard, and 621 Size SwitchTip
H 0.9 m Hose
J 15.2 m Main Hose
K Displacement Pump
L Fluid Filter
M Drive Assembly

Fig. 1 0479A

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 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 Graco 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 40 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.
- Wear hearing protection when operating this equipment.
- Do not use 1,1,1–trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in pressurized aluminum equipment. Such use could result in a chemical reaction, with the possibility of explosion.

⚠ 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 6 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.
- Disconnect all electrical 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.
- Ground the sprayer to a true earth ground with the ground wire and clamp (supplied).
- Use only electrically conductive hoses.

MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers.

- Keep clear of all moving parts when starting or operating the sprayer.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 6 to prevent the equipment from starting unexpectedly.

⚠ 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

Setup

General Information

NOTE: Reference numbers and letters in parentheses in the text refer to the callouts in the figures and the parts drawing.

⚠ WARNING

FIRE AND EXPLOSION HAZARD
Before operating the pump, ground the system as explained below. Also read the section **FIRE OR EXPLOSION HAZARD** on page 5.

Grounding

1. *Sprayer*: plug the power supply cord, or extension cord into a properly grounded outlet. Do not use an adapter. All extension cords must have three wires and be rated for 15 amps.
2. *Fluid hoses:* use only grounded hoses with a maximum of 150 m combined hose length to ensure grounding continuity.
3. *Spray gun:* obtain grounding through connection to a properly grounded fluid hose and sprayer.
4. *Object being sprayed:* according to local code.
5. *Fluid supply container:* according to local code.
6. *All solvent pails used when flushing,* according to local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.
7. *To maintain grounding continuity when flushing or relieving pressure*, always hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun.

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,
- check or service any of the system equipment,
- or install or clean the spray tips.

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 the side of a grounded metal pail, and trigger the gun to relieve pressure.
5. Engage the gun safety latch.
6. Open the pressure drain valve. Leave the valve open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, wrap a rag around the tip guard retaining nut or hose end coupling and very slowly loosen the part to relieve pressure gradually. Now clear the tip or hose.

Setup

1. **Connect Hose and Gun** (Refer to Fig. 2)

   a. Remove the plastic cap plug from the filter outlet nipple (E). Screw the 15.2 m main fluid hose (H) onto the nipple.

   b. Connect the 0.9 m hose (J) between the fluid hose and the gun inlet.

   c. DO NOT use thread sealant on the hose and gun connections. DO NOT install the spray tip yet!

⚠ 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 *21.0 MPa, 210 bar) Maximum Working Pressure.* These precautions reduce the risk of serious injury caused by static sparking, fluid injection, or over-pressurization and rupture of the hose and gun.

2. **Two Gun Hookup** (Refer to Fig. 2) Remove the cap from the secondary hose outlet (C). Attach an accessory hose and gun to the 1/4 npsm(m) nipple.

⚠ CAUTION

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

1. Always use nylon spray hose at least 15.2 m long.
2. Never use wire braid hose; it is too rigid to act as a pulsation dampener.
3. Never install any shutoff device between the filter and the main hose. See Fig. 2.
4. Always use the main filter outlet for one gun operation. Never plug this outlet.

3. **Fill Packing Nut/Wet–Cup** (See Fig. 2) Fill the packing nut/wet–cup (D) 1/3 full with Graco Throat Seal Liquid (TSL), supplied.

4. **Check the Electrical Service**

   a. Be sure the electrical service is 220/240 Volts, 50 HzAC, 10 Amp (minimum) slow blow. The outlet you use must be properly grounded.

   b. Use a grounded extension cord which has 3 wires, each with a minimum 1.5 mm diameter, and having a maximum length of 30 m. Longer lengths or smaller diameter wires may affect sprayer performance.

5. **Be sure your system is properly grounded before operating it.** Read and follow the warning section, **FIRE AND EXPLOSION HAZARD**, on page 5.

KEY

- **A** ON/OFF Switch
- **B** Pressure Adjusting Knob
- **C** Secondary Hose Outlet; 1/4 npsm(m)
- **D** Wet–Cup; Keep 1/3 full with TSL
- **E** Outlet Nipple; 1/4 npsm(m)
- **F** Pressure Drain Valve
- **G** Spray Gun
- **H** 15.2 m Main Hose
- **J** 0.9 m Hose

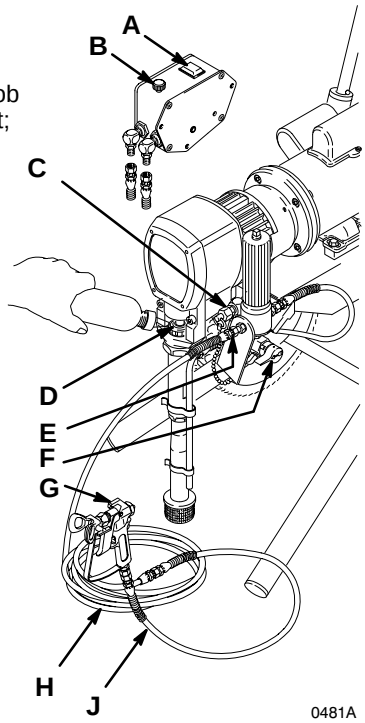


Fig. 2

6. **Plug in the Sprayer.**

   a. Be sure the ON/OFF switch (A) is OFF. See Fig. 2.

   b. Plug the power supply cord into a grounded electrical outlet that is at least 6 m away from the spray area to reduce the chance of a spark igniting the spray vapors.

7. **Flush the pump** to remove the lightweight oil which was left in the pump to protect it from rust.

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

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

   c. Flush. See page 11.

8. **Prepare the paint** according to the manufacturer's recommendations.

   a. Remove any skin that may have formed on top of the paint.

   b. Stir the paint to mix its pigments.

   c. Strain the paint through a fine nylon mesh bag (available at most paint dealers) to remove particles that could clog the filter or spray tip. This is probably the most important step toward trouble–free spraying.

Operation

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

1. **Prime the Sprayer with Paint.**

   a. Close the pressure drain valve (C). See Fig. 3.

   b. Don't install the spray tip yet!

   c. Put the suction tube (D) into the paint container.

   d. Turn the pressure adjusting knob (B) all the way counterclockwise to lower the pressure setting.

   e. Disengage the gun safety latch (E).

   f. Hold a metal part of the gun firmly against, and aimed into, a grounded metal waste container. See Fig. 4. Squeeze the trigger and hold it open. Turn the ON/OFF switch (A) to ON. See Fig 8–1. 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. Release the trigger and engage the gun safety latch.

NOTE: If the pump is hard to prime, open the pressure drain valve (C). When fluid comes from the valve, close it. Disengage the gun safety and proceed as in Step 1f, above.

   g. Check all fluid connections for leaks. If any leaks are found, **relieve the pressure** before tightening connections.

2. **Install the Spray Tip and Tip Guard**

   a. Be sure the gun safety latch is engaged.

   b. Install the spray tip. If you are using the RAC IV tip guard, refer to manual 307–848, supplied with the gun, for installation instructions.

KEY

A ON/OFF Switch
B Pressure Adjusting Knob
C Pressure Drain Valve
D Suction Tube
E Gun Safety Latch

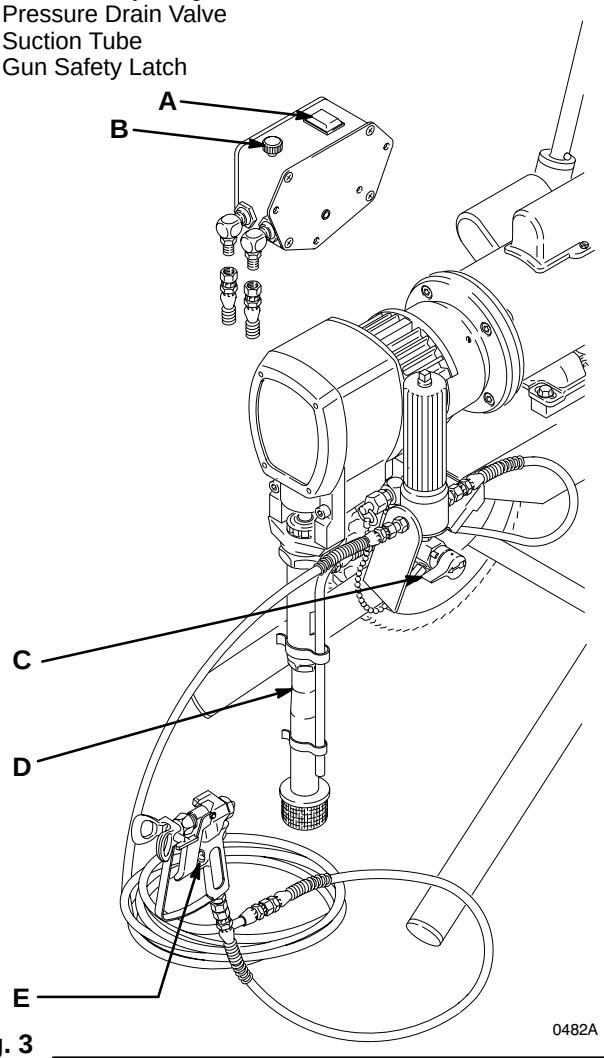


Fig. 3

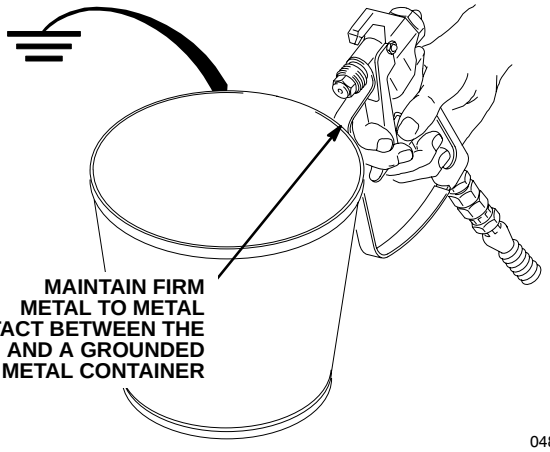


Fig. 4

Operation

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

3. **Adjust the Spray Pattern**

   a. Turn the pressure adjusting knob (B) just until spray from the gun is completely atomized. See Fig. 3. To avoid excessive over–spray 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 paint 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 (E). See Fig. 3. Loosen the tip guard retaining nut (A). Position the tip guard (B) horizontally for a horizontal pattern or vertically for a vertical pattern. Tighten the retaining nut. See Fig. 5.

4. **To Clean a Clogged Tip**

⚠ WARNING

To reduce the risk of serious injury from injection, use extreme caution when cleaning or changing spray tips. If the spray tip clogs while spraying, engage the gun safety latch immediately, and then follow the procedure in Steps a. to e., below.

Never wipe off buildup around the spray tip until pressure is fully relieved and the gun safety latch is engaged.

   a. **Clean the front of the tip frequently** during daily operation. First, **relieve the pressure**. Then, use a solvent–soaked brush to clean the tip.

   b. **If the spray tip does clog,** release the gun trigger, and engage the gun safety latch.

   c. **If using the RAC IV Spray Tip Kit**, rotate the RAC IV handle 180°. See Fig. 5. Disengage the gun safety latch.Trigger the gun into a grounded waste container. Engage the gun safety latch again. Return the handle to the spraying position.

   d. **If you are using a spray tip kit which is not self–cleaning,** VERY SLOWLY loosen the tip guard retaining nut or hose coupling to relieve pressure gradually, and then loosen the fitting completely. Clean the tip or hose, then reassemble.

   e. **Disengage the gun safety latch,** and resume spraying.

   f. **If the tip is still clogged,** engage the gun safety latch, shutoff and unplug the sprayer, and open the pressure drain valve to relieve pressure. Remove the spray tip and clean it.

   g. **Instructions for cleaning the RAC IV** spray tip are given in manual 307–848, supplied.

KEY

A Tip Guard Retaining Nut
B RAC IV Tip Guard
C Rotate Handle 180° and trigger gun to clear tip clog

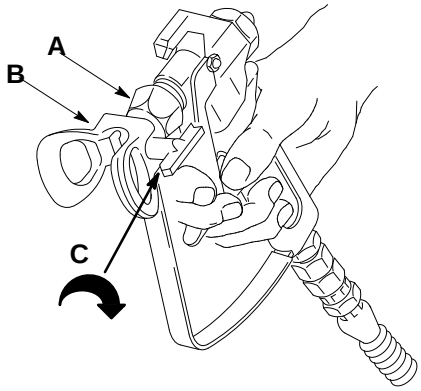


Fig. 5 0484

5. **If the sprayer shuts itself off when you are spraying at high pressure, Relieve the pressure**. A switch in the pressure control box shuts off the sprayer if it is operated at a pressure too high for the operating conditions. Before resetting the switch, determine and correct the cause of over–pressurization.

6. Be sure the spray tip you use is properly sized for the fluid being sprayed. Always use the lowest pressure needed to obtain a good spray pattern. Higher pressure does not improve the spray pattern, but does cause premature tip and sprayer wear.

7. To reset the switch, be sure the fluid pressure is relieved and the power supply cord is unplugged. Remove the pressure control cover. Press the reset button. Reinstall the pressure control cover. See Fig 6.

KEY

A Reset Button

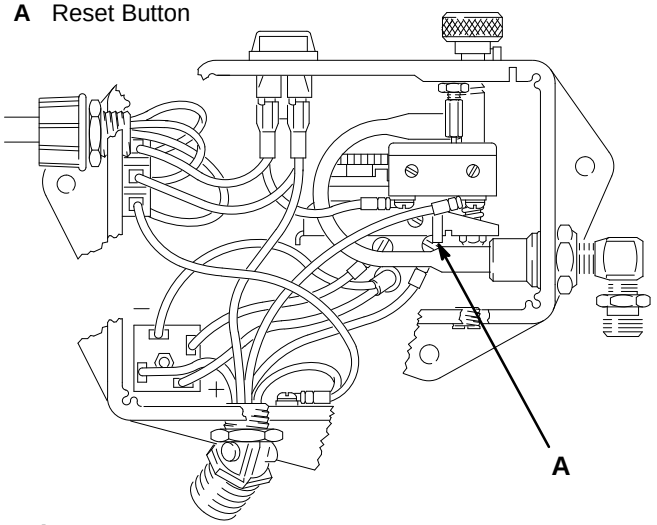


Fig. 6 0485

Maintenance

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

1. **Check the packing nut/wet–cup (C) daily. Relieve the pressure** Keep packing nut/wet–cup1/3 full of TSL at all times to help prevent dried fluid from collecting on the piston rod, and to reduce premature wear of the packings. The packing nut/wet–cup should be tight enough to stop leakage, but no tighter. Over–tightening the packing nut/wet–cup may cause binding and excessive packing wear. Use a metal punch and a light hammer to adjust the nut. See Fig. 7.

2. **Clean the fluid filter (B) often** and whenever the sprayer is stored. **Relieve the pressure**. Refer to manual 307–273, supplied, for the cleaning procedure of the filter.

3. **Flush the sprayer at the end of each work day** and fill it with mineral spirits to help prevent corrosion and freezing of the pump. See **FLUSHING** on page 11.

⚠ CAUTION

To prevent pump corrosion, and to prevent fluid from freezing in the pump and pressure control, never leave water or any paint in the sprayer. If water or paint freezes in the pressure control, it may prevent the sprayer from being started, cause loss of pressure or stalling, and cause serious damage to the pressure control. Always use mineral spirits for the final flush and **relieve the pressure**. Leave the mineral spirits in the sprayer.

4. **For very short shutoff periods,** leave the suction tube in the paint. **Relieve the pressure**. Clean the spray tip.

5. **Coil the hose** and hang it on the hose rack (A) when storing it, even for overnight. Proper storage of the hose helps protect it from kinks, abrasion, coupling damage.

⚠ WARNING

Refer to the warning section **INJECTION HAZARD** on page 4 for information on the hazard of using damaged hoses.

KEY

A Hose Rack
B Fluid Filter
C Packing Nut/Wet-Cup

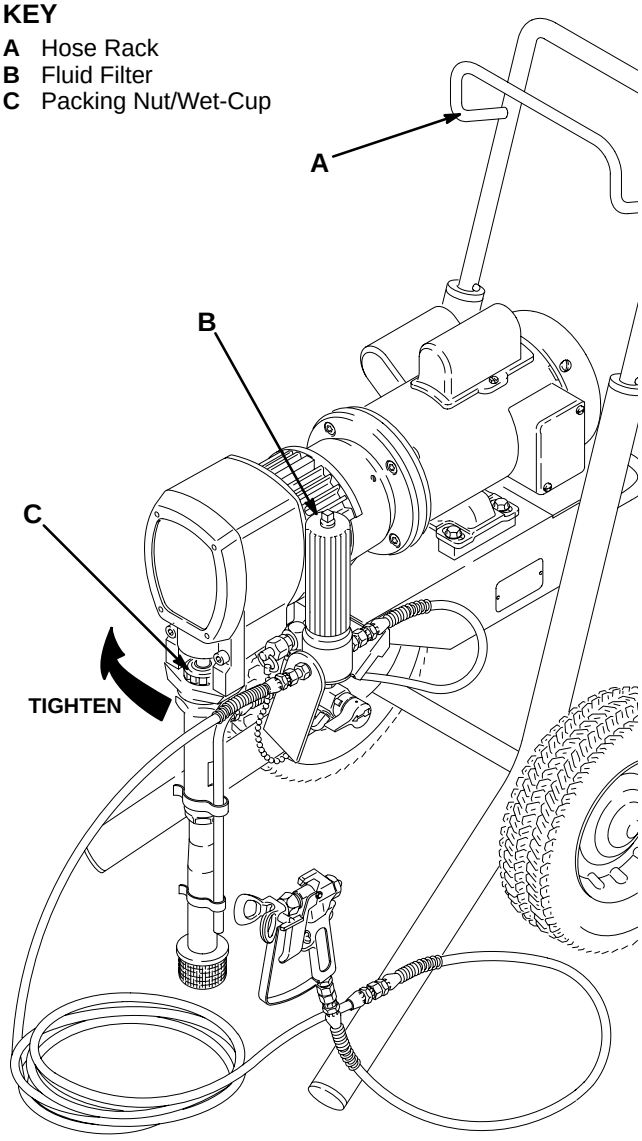


Fig. 7 0478A

Flushing

When To Flush

1. **New Sprayer.** Your new EM5000 sprayer was factory tested in lightweight oil,which was left in to protect the pump parts.

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

   Before using oil–base paint, flush with mineral spirits, only.
2. **Changing Colors.** Flush with a compatible solvent such as mineral spirits or water.
3. **Changing from water–base to oil–base paint.** Flush with warm, soapy water, then mineral spirits.
4. **Changing from oil–base to water–base paint.**Flush with mineral spirits, followed by warm, soapy water, and then a clean water flush.
5. **Storage.**
   Water base paint: flush with water, then mineral spirits and leave the pump, hose and gun filled with mineral spirit. Shut off the sprayer, and open the pressure drain valve to relieve pressure. Leave the drain valve open.

   Oil base paint: flush with mineral spirits and leave the pump, hose and gun filled with mineral spirits. Shut off the sprayer, and open the pressure drain valve to relieve pressure. Leave the drain valve open.

⚠ CAUTION

Never leave water in the sprayer if there is the slightest chance it could freeze. Flush with mineral spirits to push the water out of the sprayer. Water left in the pressure control tube may freeze, which can prevent the sprayer from being started, and may cause serious damage to the pressure control.

6. **Startup after storage.**

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

   When using oil–based paint, flush out the mineral spirits with the paint to be sprayed.

Continued on page 12

Flushing

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

How To Flush

1. **Relieve the pressure**.

2. Remove the filter bowl (A), screen (B) and support (C). Clean the screen and support separately. Install the bowl, without the screen and support, to flush it. See Fig. 8. See instruction manual 307–273, supplied, for detailed instructions.

KEY

A Filter Bowl
B Filter Screen
C Filter Support
D Pressure Drain Valve

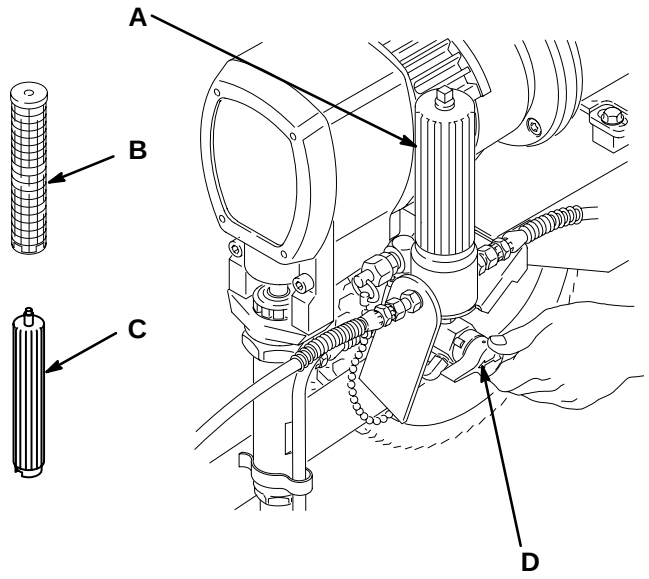


Fig. 8 0486

3. Close the pressure drain valve (D).

4. Pour 2 liters of compatible solvent into a grounded metal pail. Put the suction tube in the pail.

5. Remove the spray tip from the gun.

⚠ WARNING

To reduce the risk of static sparking and splashing when flushing, always remove the spray tip from the gun, and hold a metal part of the gun firmly to the side of, and aimed into, a grounded metal pail.

6. Disengage the gun safety latch. Point the spray gun into a metal waste container. With a metal part of the gun firmly touching the metal container, squeeze the gun trigger. See Fig. 9. This procedure helps reduce the risk of static sparking and splashing. Start the sprayer, trigger the gun, and slowly turn the pressure adjusting knob clockwise, just until the pump starts. Keep the gun triggered until clean solvent comes from the nozzle. Release the trigger. Engage the gun safety latch.

7. Check all fluid connections for leaks. If any connections leak, first **relieve the pressure**. Tighten the connections. Start the sprayer. Recheck the connections for leaks.

8. Remove the suction tube from the pail. Disengage the gun safety latch. Trigger the gun to force solvent from the hose. Do not let the pump run dry for more than 30 seconds, to avoid damaging the pump packings! **Relieve the pressure**.

9. Leave the pressure drain valve open until you are ready to use the sprayer again. 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 followed by a clean water flush. **Relieve the pressure**.

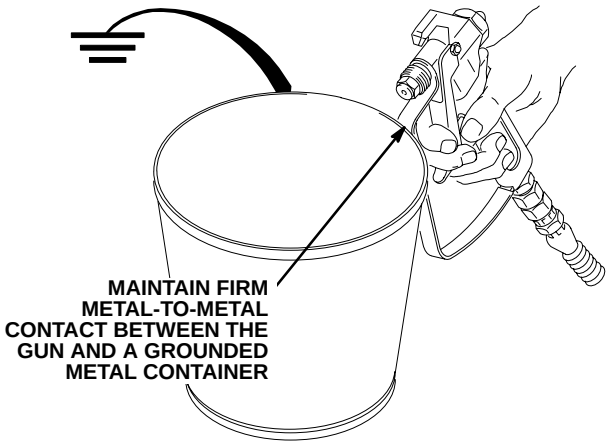


Fig. 9 0483

Application Methods

Always hold the gun perpendicular to the surface and keep the gun at an even to 300–356 mm from the surface you are spraying. See Fig. 10.

Begin moving the gun in a horizontal direction at a steady rate. Start the spray stroke off the target surface and pull the trigger as the gun is moving. Then, while the gun is still moving, and as you approach the other edge, release the trigger. This method avoids excess paint buildup at the end of each stroke.

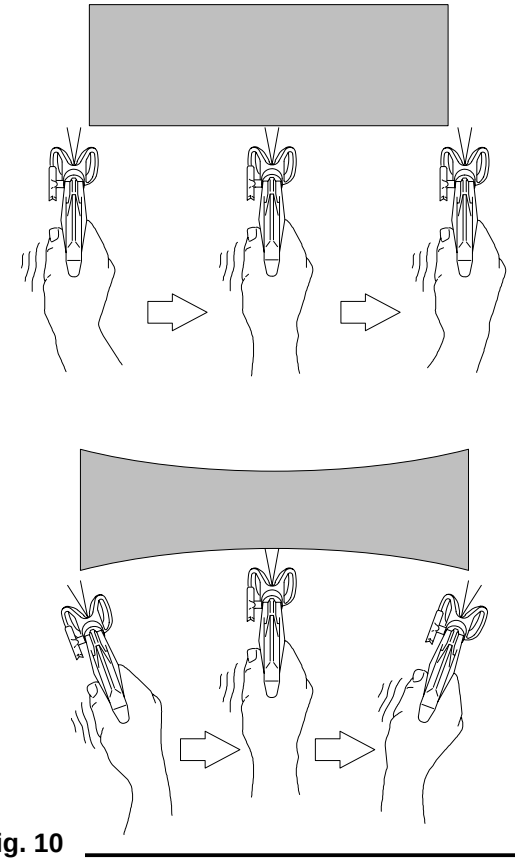


Fig. 10 0277

The correct speed for moving the gun will allow a full, wet coating to be applied without runs or sags. Lapping each stroke 50% over the previous stroke produces uniform paint thickness. And spraying in a uniform pattern alternately from right to left, then left to right, provides a professional finish. See Fig. 11.

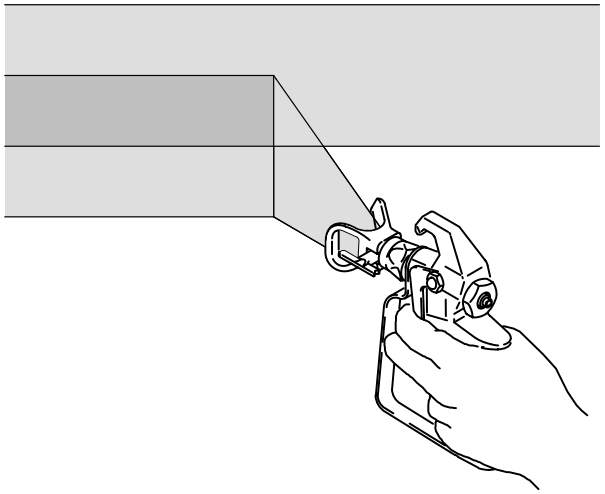


Fig. 11 0487

The best way to control the rate of coverage is with the gun tip size. A small tip orifice applies less paint and a narrower pattern. A larger tip orifice applies more paint and a wider pattern.

Do not try to increase coverage by increasing the fluid pressure! Using the lowest pressure necessary to get the desired results will help prolong the life of your sprayer and minimize paint lost by over–spray.

For interior corners, such as on a bookcase or inside a cabinet, aim the gun toward the center of the corner to spray. By dividing the spray pattern this way, the edges on both sides are sprayed evenly. See Fig. 12.

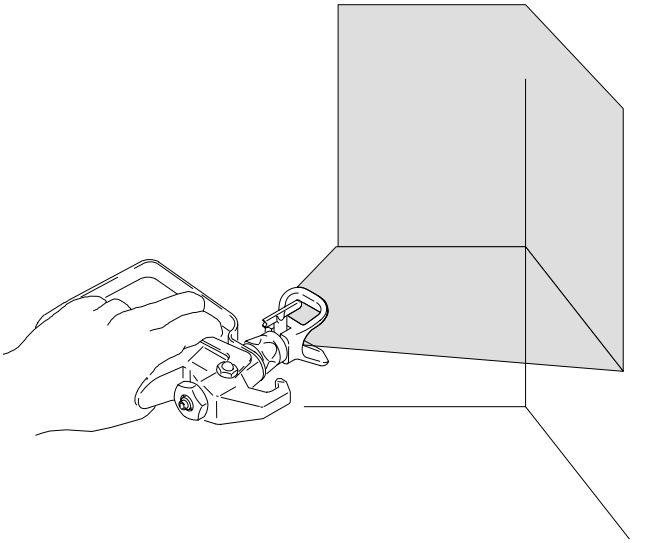


Fig. 12 0488

If there is a wind, angle the spray pattern into the wind to minimize drifting. Paint from the ground to the roof.

Shrubs. When next to the house, tie back shrubs from the surface to be painted with rope and stakes. Then cover them with a canvas drop cloth as the painter approaches the area. Remove the canvas drop cloth as soon as the area is painted, to prevent possible damage to the shrubs.

Concrete walks. If the walkways will be walked on, cover them with a canvas drop cloth to avoid slipping. Otherwise a plastic drop cloth is all that is needed.

Electrical outlets and lamps. Protect electrical outlets with masking tape. Cover lamps with plastic bags secured with masking tape.

Nearby objects. Move objects such as automobiles, picnic tables, lawn furniture, etc. upwind of the surface to be sprayed. In the case of a nearby home, make a protective barrier by hanging plastic between two long poles. 4

Troubleshooting

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

Check everything in the chart before disassembling the sprayer.

PROBLEM	CAUSE	SOLUTION
Motor won't run, or the motor stops while spraying	Power cord or extension cord unplugged, or damaged, or building circuit breaker or fuse has tripped	Check, reset or replace.
	Motor overload switch opened	Unplug power supply cord, relieve pressure, allow motor to cool. See NOTE A, page 15.
	Over–pressure switch opened	Reset. Correct cause of over–pressure. See page 9, Step 5., and NOTE C, page 15.
	Pressure setting too low	Increase.
	Pressure control frozen or damaged by over–pressurization.	Try to thaw, or replace pressure control. See NOTE B and C, page 15.
	Spray tip or filter plugged	Remove and clean.
	Wrong type extension cord	Use maximum 30 m, 3 wires, 1.5 mm gauge minimum, grounded extension cord.
Motor labors when starting, and trips building circuit breaker or fuse	Circuit board has failed	Replace the circuit board inside electrical junction box. See page 27.
	Motor capacitor has failed	Replace the capacitor. See page 28.
Motor runs, but displacement pump doesn't operate	Pressure setting too low	Increase pressure.
	Displacement pump outlet filter dirty	Clean filter.
	Tip or tip filter clogged	Clean tip or tip filter.
	Paint dried on the displacement rod	Service pump. See page 32.
	Connecting rod worn or damaged	Replace. See page 19.
	Drive housing worn or damaged	Replace. See page 21.
	Clutch worn or damaged	Service. See page 25.
	Pinion assembly worn or damaged	Service. See page 22.
Motor runs, but there is little or no paint output and *pump does stroke*	Sprayer is not primed.	Prime sprayer. See page 8.
	Spray tip too big or worn	Change the spray tip.
	Piston ball check not seating	Service. See page 32.
	Piston packings worn or damaged	Replace. See page 32.
	Intake valve ball check not seating	Service. See page 32.
	Displacement pump worn or damaged	Replace. See page 32.
	Clutch worn or damaged	Service. See page 25.
	Drive assembly damaged	Replace. See page 21.

PROBLEM	CAUSE	SOLUTION
Motor runs, but there is little or no paint output and *pump does not stroke*	Filter element installed upside down	Correct. See page 12 or manual 307–273.
	Pressure control frozen or damaged by over–pressurization.	Try to thaw, or replace pressure control. See NOTE B and C, below
.	Pump is frozen	Thaw. See NOTE B, below.
Paint leaks into wet–cup	Loose wet–cup	Tighten just enough to stop leakage.
	Throat packings worn or damaged	Replace packings. See page 32.
	Displacement rod worn or damaged	Replace rod. See page 32.
Excessive surging from spray gun	Spray tip or fluid filter is plugged	Disassemble and clean.
	Spray tip too big or worn	Change the spray tip.
	Paint too viscous	Thin.
	Intake valve ball stuck	Remove and clean intake valve.
	Wrong type hose	Use minimum 15.2 m, static–free nylon hose (wire braid hose is unacceptable).
Not enough paint pressure	Pressure setting too low	Increase.
	Pressure control frozen or damaged by over–pressurization.	Try to thaw, or replace pressure control. See NOTE B and C, below.
	Displacement pump worn or damaged	Replace. See page 32.
Tails or fingers in spray pattern	Pressure setting too low	Increase pressure.
	Fluid outlet filter is dirty or clogged	Clean. See page 12 or manual 307–273.
	Spray tip too big or worn	Change the spray tip.
	Fluid supply is low or empty	Refill and prime the pump. See **OPERATION,** page 8. Check fluid supply often to prevent running the pump dry.
	Paint too viscous	Thin.
	Wrong type hose	Use minimum 15.2 m, static–free nylon hose (wire braid hose is unacceptable).
Paint runs or sags	Spray tip too big or worn	Change the spray tip.
Spitting from gun	Air in fluid pump or hose	Check for loose connections at pump intake and tighten. Them prime the pump. See **OPERATION,** page 8.
	Tip partially clogged	Clear.
	Fluid supply is low or empty	Refill and prime the pump. See **OPERATION,** page 8. Check fluid supply often to prevent running the pump dry.
Static sparking from the gun	Spray or work being sprayed is not properly grounded	Correct problem before continuing. Follow the warning section, **FIRE OR EXPLOSION HAZARD** on page 5.

A. The motor has an over–temperature switch which automatically resets upon cooling. If it opens, and the motor shuts itself off, unplug the power supply cord and let the sprayer cool for 30 to 60 minutes. Always use the lowest pressure setting needed when spraying.

B. Freezing results from failure to replace the water–base paint or flushing water with mineral spirits, and usually causes permanent damage to the pressure control.

C. Over–pressurization results from (1) using less than 15.2 m of nylon spray hose, (2) from using a wire braid spray hose, (3) from adding a shutoff device between the pump outlet and the spray gun, (4) from attaching a spray hose to the pressure drain valve, or (5) from using a clogged or incorrectly assembled filter.

Pressure Control Replacement

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 6 before checking, adjusting, cleaning, or shutting of the sprayer. *Unplug the power supply cord!*

1. Disconnect both hoses (59) at the pressure control (63). Hold the hex of the nipple (304) firmly with a wrench to prevent turning the elbow (303). Take note of the original location of each hose to be sure you reassemble them correctly at the end of this procedure. See Fig 13.

⚠ CAUTION

Do not allow the elbow (303) to turn when removing or connecting the hoses. Turning the elbows can damage the sensitive bourdon tube in the pressure control box.

2. Remove the pressure control cover (76). Disconnect the + and – leads from the rectifier (310). These leads go to the clutch field. Disconnect the five motor leads. These leads go through the conduit to the motor. See Fig. 15.
3. Remove the three nuts (61) and lockwashers (9) from the capscrews (62). See Fig 14.
4. Unscrew the nut on the conduit elbow (308). Carefully guide the wires through the elbow as you pull the conduit (94) away from the pressure control.
5. Reassemble. Perform the **PRESSURE CONTROL CALIBRATION PROCEDURE** on page 17 before regular operation of the sprayer.

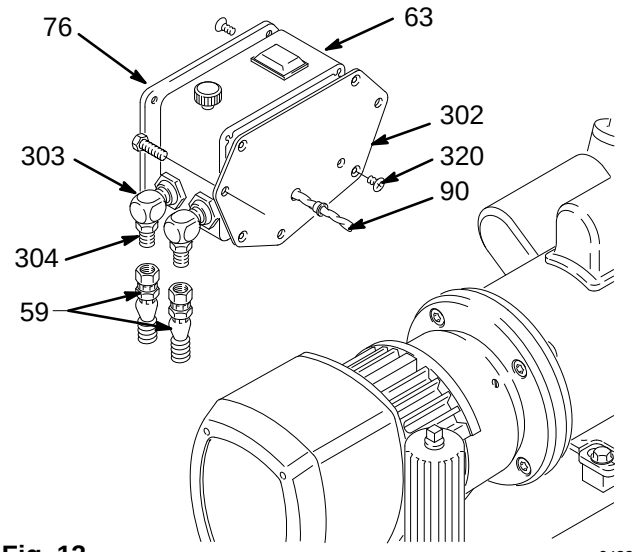
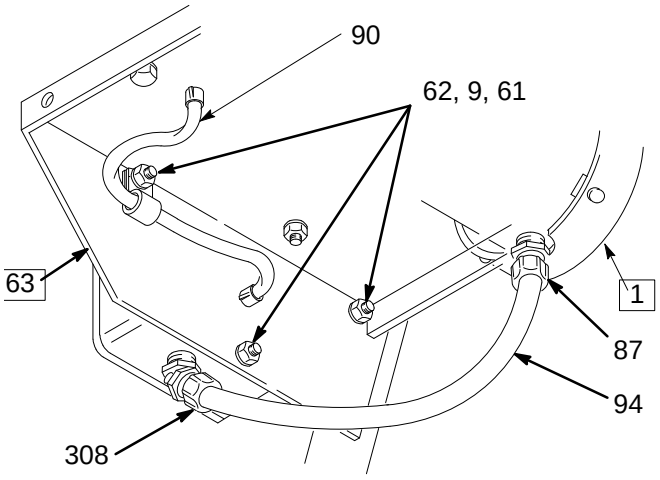


Fig. 13 0489



VIEW FROM UNDER ENGINE MOUNTING

Fig. 14 0490

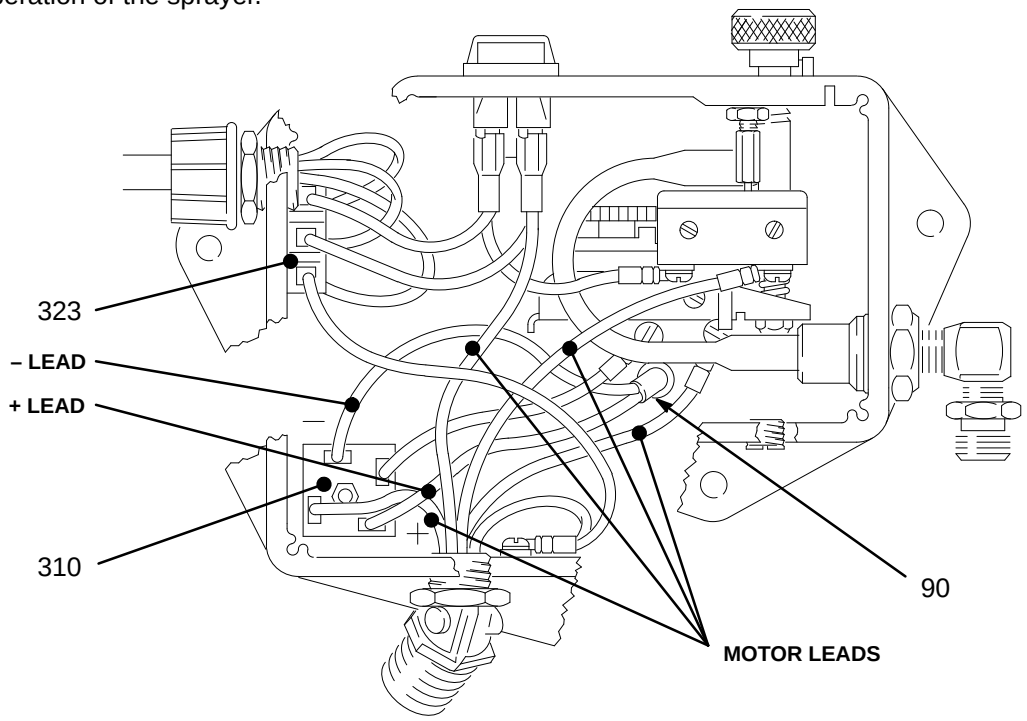


Fig. 15 0485

Pressure Control Adjustment

⚠ WARNING

Use extreme caution when performing this calibration procedure to reduce the risk of a fluid injection injury or other serious bodily injury, which can result from component rupture, electric shock, fire, explosion or moving parts.

This procedure sets the sprayer to 18.0–20.7 MPa, 182–207 bar Maximum Working Pressure.

Perform this procedure whenever the pressure control assembly is removed and reinstalled, or replaced, to be sure the sprayer is properly calibrated.

Improper calibration can cause the sprayer to over–pressurize and result in component rupture, fire or explosion. It may also prevent the sprayer from obtaining the maximum working pressure, resulting in poor sprayer performance.

NEVER attempt to increase the fluid outlet pressure by performing these calibrations in any other way. Never Exceed 20.7 MPa, (207 bar) Maximum Working Pressure. Normal operation of the sprayer at higher pressures could result in component rupture, fire or explosion.

ALWAYS use a *new* 50 foot (15.2 m) spray hose, rated for at least 20.7 MPa, (207 bar) Maximum Working Pressure, when performing this procedure. A used, under–rated hose could develop a high pressure leak or rupture.

Service Tools Needed:

- **NEW** 15.2 m, 21.0 MPa, 210 bar, flexible nylon, airless spray hose, p/n 223–541
- 0–350 bar fluid–filled pressure gauge, p/n 102–814
- **NEW** spray tip, size 0.025 to 0.029
- 3/8 in. ignition wrench or nut driver
- 5 gallon pail and water or mineral spirits
- Swivel, p/n 156–823
- Nipple, p/n 162–453
- Tee, p/n 104–984

Pressure Control Adjustment

Set Up

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

1. **Relieve the pressure**.
2. Set up the system as shown in Fig. 16.

Set the Dead Band (Pressure Differential)

NOTE: Do not alter this adjustment if the wheel is already set as shown in Fig. 17.

1. Turn off and unplug the sprayer. Remove the pressure control cover.
2. Set the white differential wheel (A) on the microswitch. Turn the wheel so the letter **F** is concealed behind the switch and the letter **A** is the first letter seen.

Pressure Up

1. Start the sprayer and prime it.
2. Adjust the pressure to 18.0 MPa, 180 bar.
3. Turn off and unplug the sprayer. If the pressure drops, replace the pump packings before proceeding. See page 32.

Adjust the Pressure

1. Remove the plug (326) in the bottom of the pressure control.
2. Turn and hold the pressure control knob (B) at the maximum pressure setting.
3. Engage the nut (C): insert the nut driver through the pressure control hole, or use the ignition wrench from the front of the pressure control.
   a. Loosen the nut just until you hear a click. STOP.
   b. Slowly tighten the nut just until another click is heard. STOP.
4. Replace the plug (D) and pressure control cover.

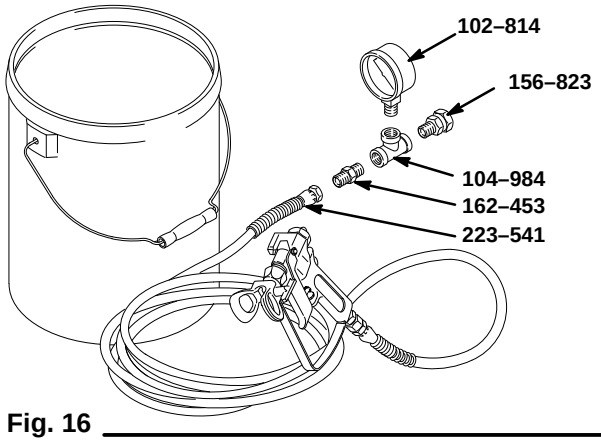


Fig. 16 0474

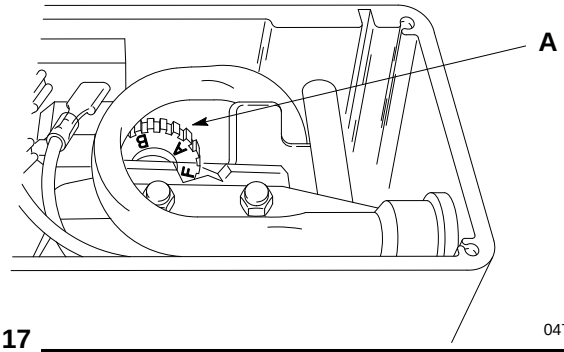


Fig. 17 0475

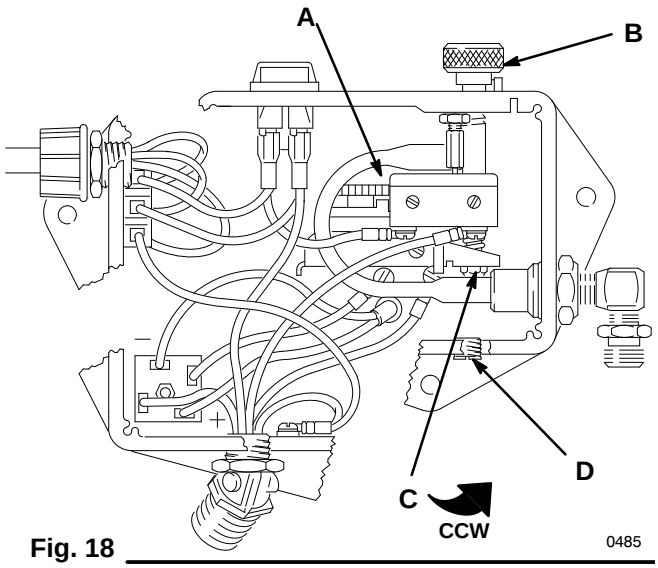


Fig. 18 0485

Bearing Housing & Connecting Rod

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 6 before checking, adjusting, cleaning, or shutting of the sprayer. *Unplug the power supply cord!*

NOTE: Refer to Fig 19 for this procedure.

Disassembly

1. Remove the front cover and screws (23,68). Remove the spring clips (100,102) and the bypass hose (101).
2. Disconnect the pump outlet hose (59) from the displacement pump outlet nipple (49).
3. Use a screwdriver to push aside the retaining spring (26) at the top of the pump. Push the pin (25) out the rear.
4. Loosen the jam nut (27) with an adjustable wrench. Unscrew and remove the displacement pump.
5. Use a hex key wrench to remove the four screws (73) and lockwashers (74) from the bearing housing.
6. While pulling the connecting rod (22) with one hand, lightly tap the lower rear of the bearing housing (21) with a plastic mallet to loosen it from the drive housing (20). Pull the bearing housing and the connecting rod assembly (22) off the drive housing.

Reassembly

1. Evenly lubricate the inside of the bronze bearing (C) in the bearing housing (21), and the inside of the connecting rod link (D), with high–quality motor oil. Liberally pack the roller bearing (E) in the connecting rod assembly (22) with bearing grease.
2. Insert the connecting rod (22) into the bearing housing (21).
3. Clean the mating surfaces of the bearing and drive housings (21 and 20).
4. Align the connecting rod with the crank (A) and carefully align the locating pins (F) in the drive housing (20) with the holes in the bearing housing (21). Push the bearing housing onto the drive housing or tap it into place with a plastic mallet.

⚠ CAUTION

DO NOT use the bearing housing screw (73) to align or seat the bearing housing with the drive housing. These parts must be aligned using the locating pins (F), to help avoid premature bearing wear.

5. Install the screws (73) and lockwashers (74) on the bearing housing. Tighten evenly to16–18 N.m.

procedure continued on page 20

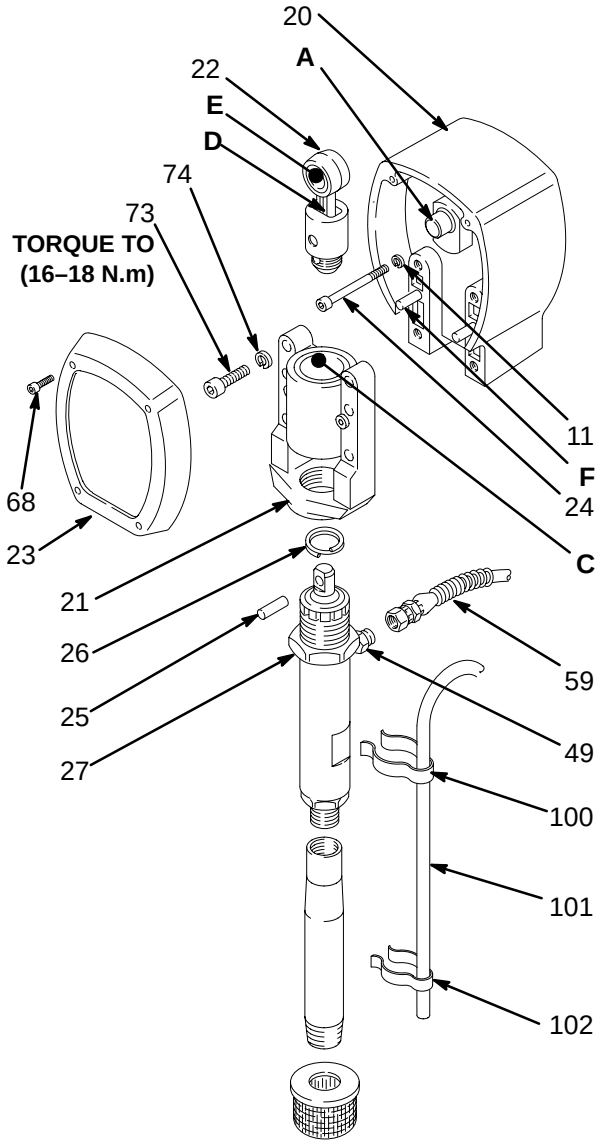


Fig. 19 0491

Bearing Housing & Connecting Rod

NOTE: Refer to Fig. 20 for Step 6..

6. Screw the displacement pump about 3/4 of the way into the bearing housing (21). Hold the pin (25) up the pin hole in the connecting rod assembly (22) and continue screwing in the pump until the pin slides easily into the hole. Back off the pump until the top threads of the pump cylinder are flush with the face of the bearing housing and the outlet nipple (49) faces back. Push the retaining spring (26) into the groove all the way around the connecting rod. Tighten the locknut (27) to 90 to 100 N.m, using a 57 mm open end wrench and a light hammer.

⚠ WARNING

Be sure the retaining spring (26) is firmly in the groove, all the way around, to prevent the pin (25) from working loose due to vibration.

If the pin works loose, it or other parts could break off due to the force of the pump action. These parts could be projected through the air and result in serious injury or property damage, including damage to the pump connecting rod and bearing housing.

7. Install the front cover and screws (23, 68). Connect the suction tube (30) and pump outlet hose (59). See Fig 19.
8. Install the bypass hose and spring clips.

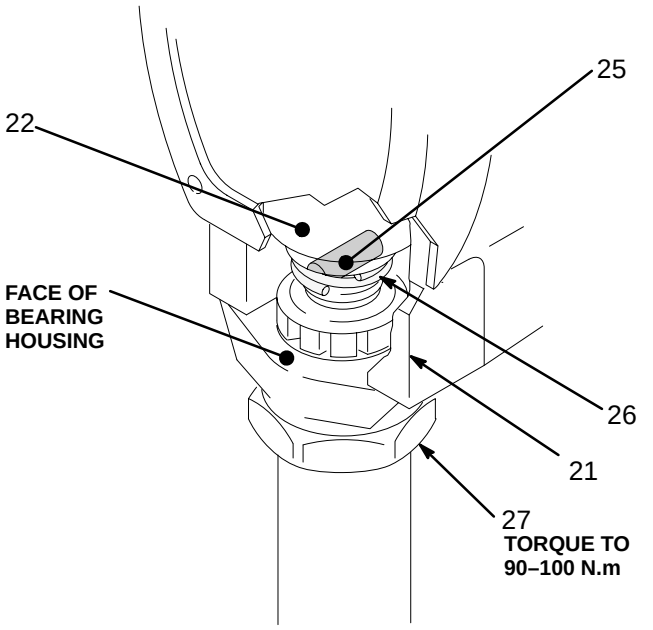


Fig. 20

Drive Housing

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 6 before checking, adjusting, cleaning, or shutting of the sprayer. *Unplug the power supply cord!*

NOTE: Refer to Fig 21 for this procedure.

Disassembly

1. Remove the front cover and screws (23,68). Remove the spring clips (100,102) and the bypass hose (101).
2. Disconnect the pump outlet hose from the displacement pump nipple (49).
3. Use a hex key wrench to remove the four screws (73) and lockwashers (74) from the bearing housing (21).
4. Lightly tap the back of the bearing housing (21) with a plastic mallet. Pull the pump, bearing housing and connecting rod away from the drive housing as one assembly.
5. Use a hex key wrench to remove the two screws (24) and lockwashers (11) from the bottom front of the drive housing (20). Remove the four screws (10) and lockwashers (11).
6. Lightly tap around the drive housing (20) with a plastic mallet to loosen it from the pinion housing (19).

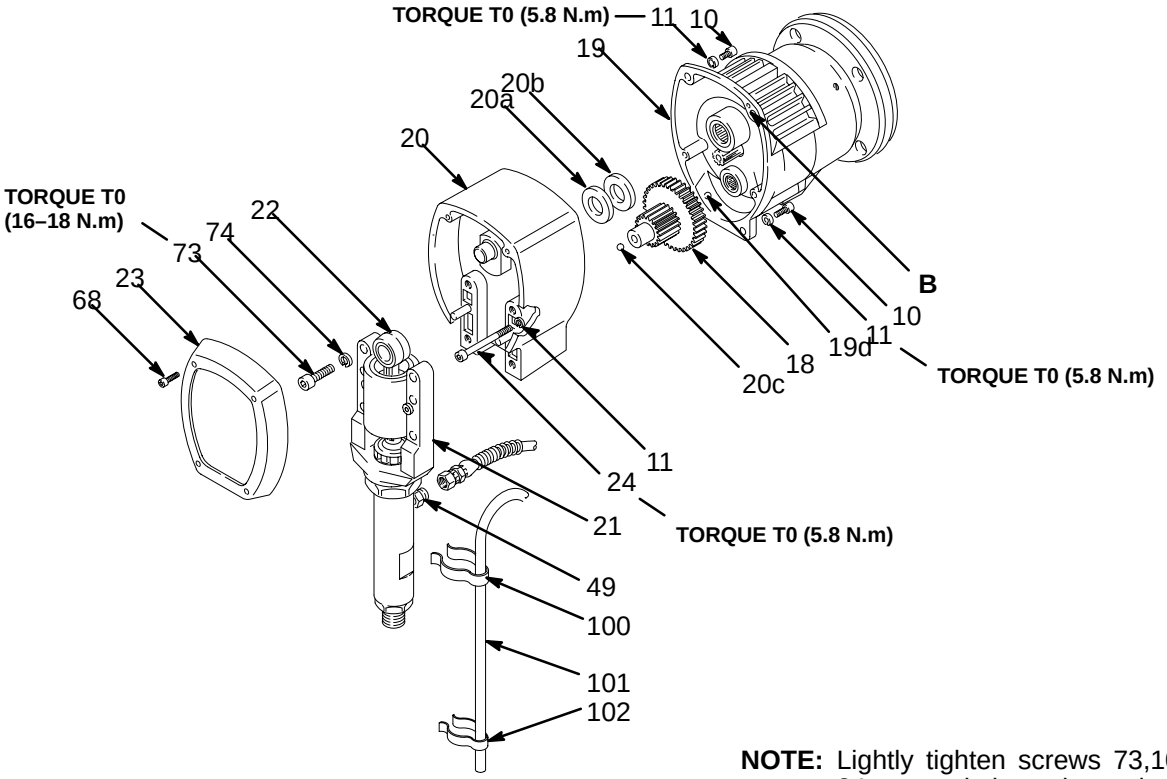
⚠ CAUTION

Do not drop the gear cluster (18) when removing the drive housing (20). The gear cluster is easily damaged. The gear may stop engaged in the drive housing or pinion housing.

Do not lose the thrust balls (20c or 19d) located at each end of the gear cluster, or allow them to fall between the gears. The ball, which is heavily covered with grease, usually stays in the shaft recesses, but could be dislodged. If the balls are caught between the gears and not removed, they will seriously damage the drive housing. If the balls are not in place, the bearing will wear prematurely.

Reassembly

7. Liberally apply bearing grease (20d, supplied) to the gear cluster (18). Be sure the thrust balls (20c and 19d) are in place.
8. Place the bronze colored washer (20a) and then the silver–colored washer (20b) on the shaft protruding from the big bearing of the drive housing (20). Align the gears and push the new drive housing straight onto the pinion housing and locating pins (B).
9. Starting at Step 6, work backwards to reassemble the sprayer. Or, move ahead to the next section in this manual if further service is needed.



NOTE: Lightly tighten screws 73,10 and 24 oppositely and evenly. Then tighten oppositely and evenly again to the specified torque.

0492

Fig. 21

Pinion, Clutch, Clamp, Field & Motor

Disassembly of these parts can start from the pinion housing, or from the clutch, if no pinion service is needed.

If starting from the pinion housing, first follow Steps 1. to 6. of **DRIVE HOUSING**, on page 21, and then continue with the procedure below.

If starting from the clutch, see page 25.

Pinion Housing

Pinion Housing

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 6 before checking, adjusting, cleaning, or shutting of the sprayer. *Unplug the power supply cord!*

NOTE: Refer to Fig 22 for Steps 1. to 3..

1. Remove the two bottom screws (10) and lockwashers (11) first, and then remove the three screws (10) and lockwashers (11) holding the pinion housing (19) to the clutch housing (2).
2. Pull the pinion housing away from the clutch housing. The armature (4a) will come with it.
3. Pull the armature (4a) off the hub (19j – *see Fig. 23)* of the pinion housing.

⚠ CAUTION

Do not lose the thrust ball (19d). Refer to the **CAUTION** on page 21 for more information.

NOTE: To disassemble the pinion, go to page 23. To disassemble more of the sprayer, go to page 25. To reassemble the sprayer from this point, skip ahead to **Reassembly**, page 30, Step 6..

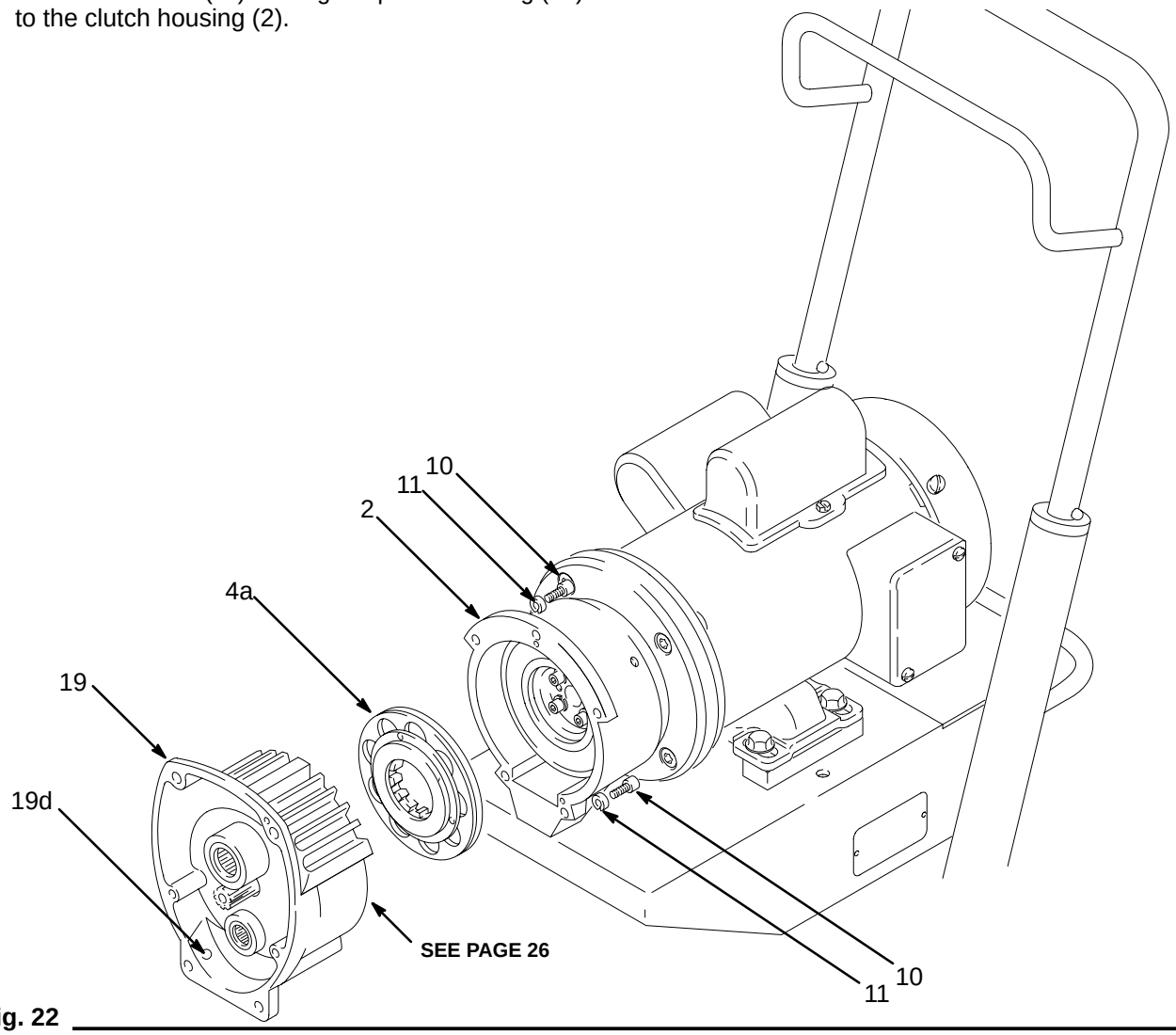


Fig. 22

0493

Pinion Housing

Repairing the Pinion

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 6 before checking, adjusting, cleaning, or shutting of the sprayer. *Unplug the power supply cord!*

NOTE: Refer to Fig 23 for Steps 1. to 5..

NOTE: A hydraulic press is required for disassembly and reassembly if you purchase the pinion parts individually. If you do not have such a press, use Repair Kit No. 221–032, which includes the shaft and bearings pre–assembled and lubricated.

If you are using Repair Kit 221–032, follow Steps 1. to 3., below.

Disassembly

1. Remove the small ring (19m) from the hub (19j) and the large ring (19k) from the bearing recess of the pinion housing (19a).
2. Push on the front of the shaft (19g) to force the bearing and hub assembly out of the housing (19a).

Reassembly

1. Install the shaft assembly into the pinion housing, pushing it to the shoulder of the housing (19a).
2. Install the rings (19k and 19m).
3. Skip ahead to **Reassembly**, page 30, Step 7., or continue on page 25.

If you purchased parts separately, use the following instructions. Disassemble only as far as needed for the parts being replaced.

Disassembly

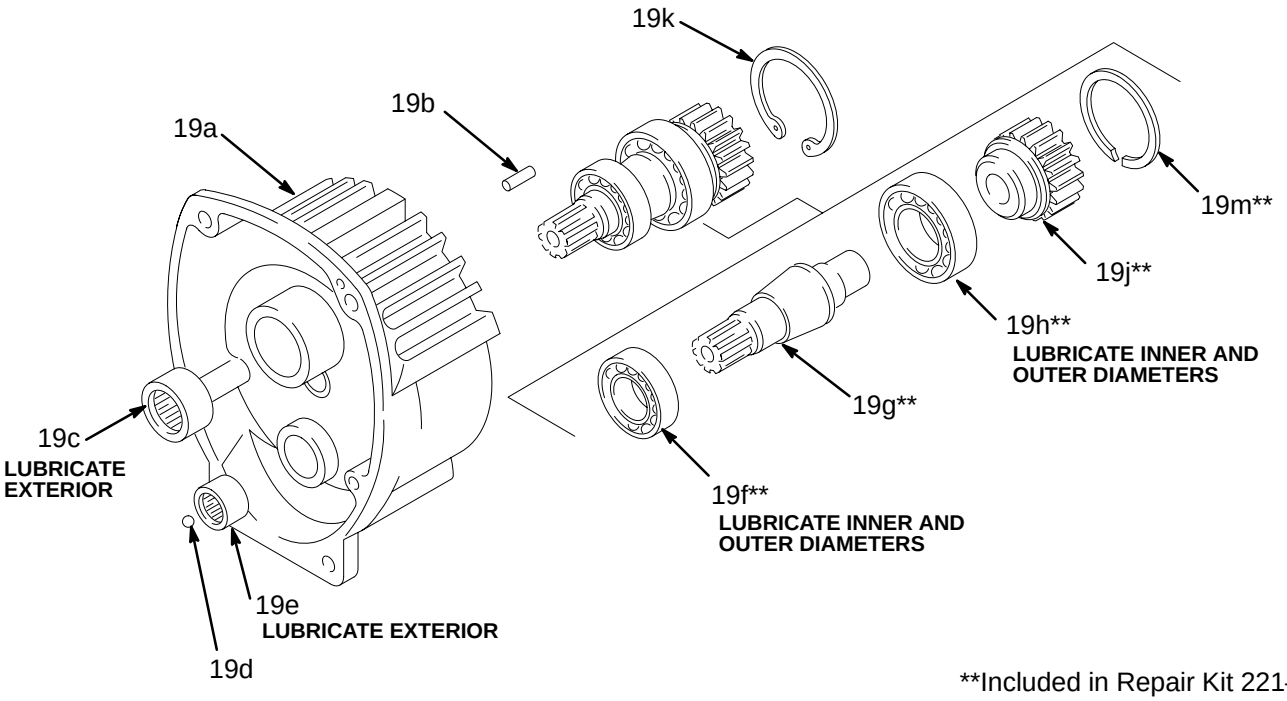
NOTE: The old bearings (19h and 19f) will be damaged when removed. Have extra ones on hand if you need to remove them for any reason.

1. Remove the small ring (19m) from the hub (19j).
2. Remove the snap ring (19k) from the bearing recess of the pinion housing (19a).
3. Push on the front of the shaft (19g) to force the bearing and hub assembly out of the housing.
4. ***Using a hydraulic press,*** place pieces of steel bar stock on the inner race of the large bearing (19h) and press the shaft through the hub and bearing. See Fig 24. Then turn the shaft over and press out the small bearing (19j).

Reassembly

1. Apply lubricant to the parts as shown in Fig 23.
2. Press fit the following parts:
   - Large bearing (19h) to the large shoulder of the shaft (19g).
   - Small bearing (19f) to the shoulder of the shaft (19g).
   - Hub (19j) onto the shaft (19g) all the way to the large bearing (19h).
3. Install the shaft assembly, pushing it to the shoulder of the recess in the housing (19a).
4. Install the snap ring (19k). Install the small ring (19m).
5. Skip ahead to **Reassembly**, page 30, Step 7., or continue on page 25.

Pinion Housing



**Included in Repair Kit 221–032

Fig. 23 0170

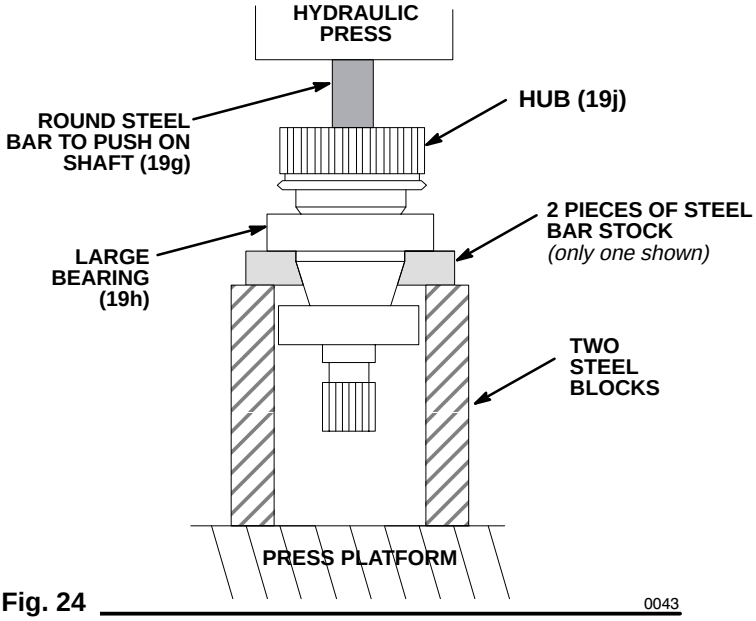


Fig. 24 0043

Clutch

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

NOTE: The clutch assembly (4) includes the armature (4a) and rotor (4b). The armature and rotor must be replaced together so they wear evenly.

NOTE: If the pinion assembly (19) is not yet separated from the clutch housing (2), follow Steps 1. to 4.. Otherwise, start at Step 5..

1. **Relieve the pressure.**
2. Disconnect the hose (59) from the outlet nipple (49) of the displacement pump. Remove the spring clips (100, 102) and bypass hose (101).
3. Remove the bottom two screws and lockwashers (10, 11) from the back of the clutch housing (2) and then remove the remaining three of screws and lockwashers.
4. Tap lightly on the back of the bearing housing (21) with a plastic mallet to loosen the assembly (D) from the clutch housing (2). Pull the assembly away.
5. The armature (4a) will come with the assembly (D). Remove the armature from the hub (19h)
6. Remove the four socket head capscrews (16) and lockwashers (11).
7. There are two ways to remove the rotor (4b).
   a. Install two of the screws in the threaded holes in the rotor. Alternately tighten the screws until the rotor comes off. See Fig. 25.
   b. You can use a standard steering wheel puller. However, two 1/4–28 x 3 or 4 in. long screws (B) are also needed. Replace the short screws of the steering wheel puller with the 3 or 4 in. long screws. Turn the screws (B) into the threaded holes of the rotor (4b). Tighten the capscrew (C) of the tool until the rotor comes off. See the Detail in Fig. 25.
8. Skip ahead to **Reassembly,** page 30, Step 7., or continue on the next page.

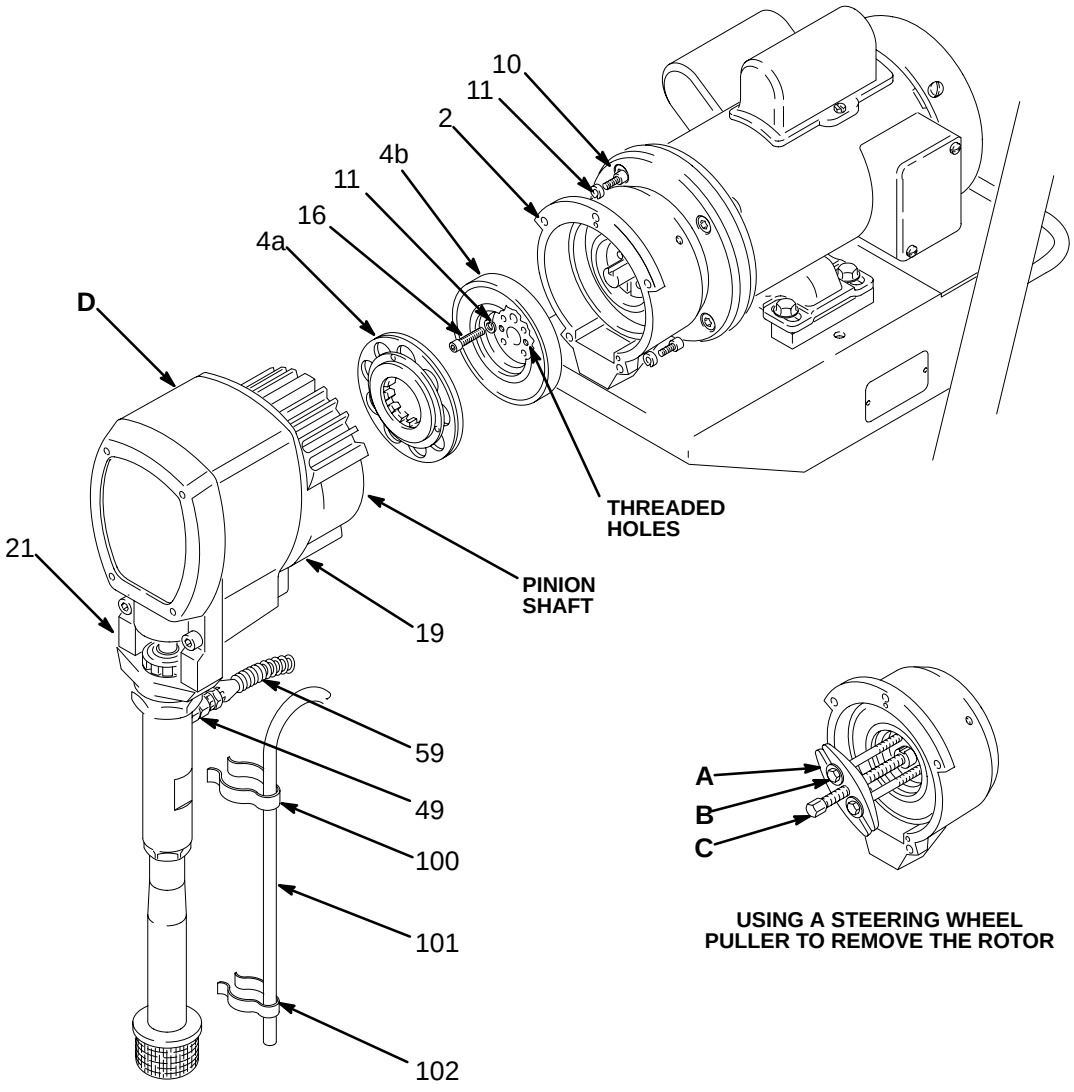


Fig. 25

0494

Motor

NOTE: The motor must be removed from the cart before the Field, Clamp or Clutch Housing can be removed. The Field, Clamp and Clutch Housing must be removed in order to replace the motor.

1. Working under the mounting plate (A) of the cart, remove the screw (15), lockwasher (80) and washer (33) which hold the clutch housing (2) to the cart. See Fig. 27.
2. Remove the four locknuts (107) and lockwashers (9), and then pull the flange screws (14) out of the base of the motor (1). See Fig. 26 and Fig. 27.
3. Remove the pressure control cover. Disconnect the four motor leads. Disconnect the + and – leads from the rectifier (310). See Fig. 15, page 16.
4. Push the grommet (86A) out of the frame (A). Remove the screw, lockwasher and nut (62, 9, 61) and the clamp (85). Push the grommet (86B) out of the frame. See Fig. 26.
5. Fully loosen the nut of the connector (308). Pull the wires carefully through the connector. See Fig. 26.
6. Carefully remove the motor and clutch housing assembly. Place the motor on a work bench.
7. Remove the **Field and Wiring Harness, Clamp** and **Clutch Housing**, as instructed on pages 26 and 27.
8. Skip ahead to **Reassembly,** page 29, Step 1..

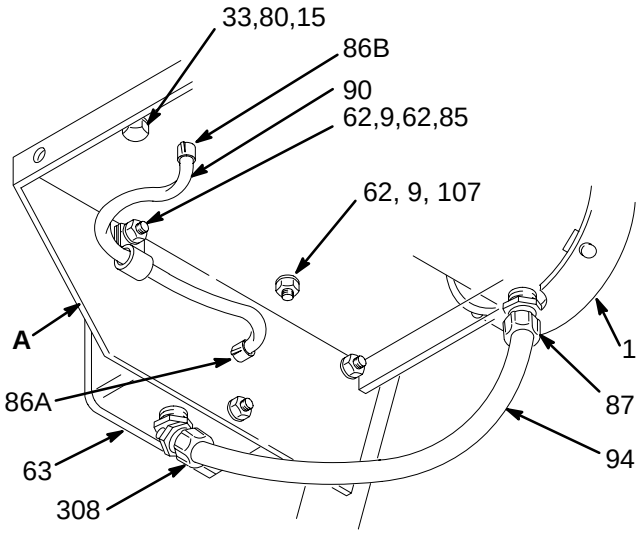


Fig. 26

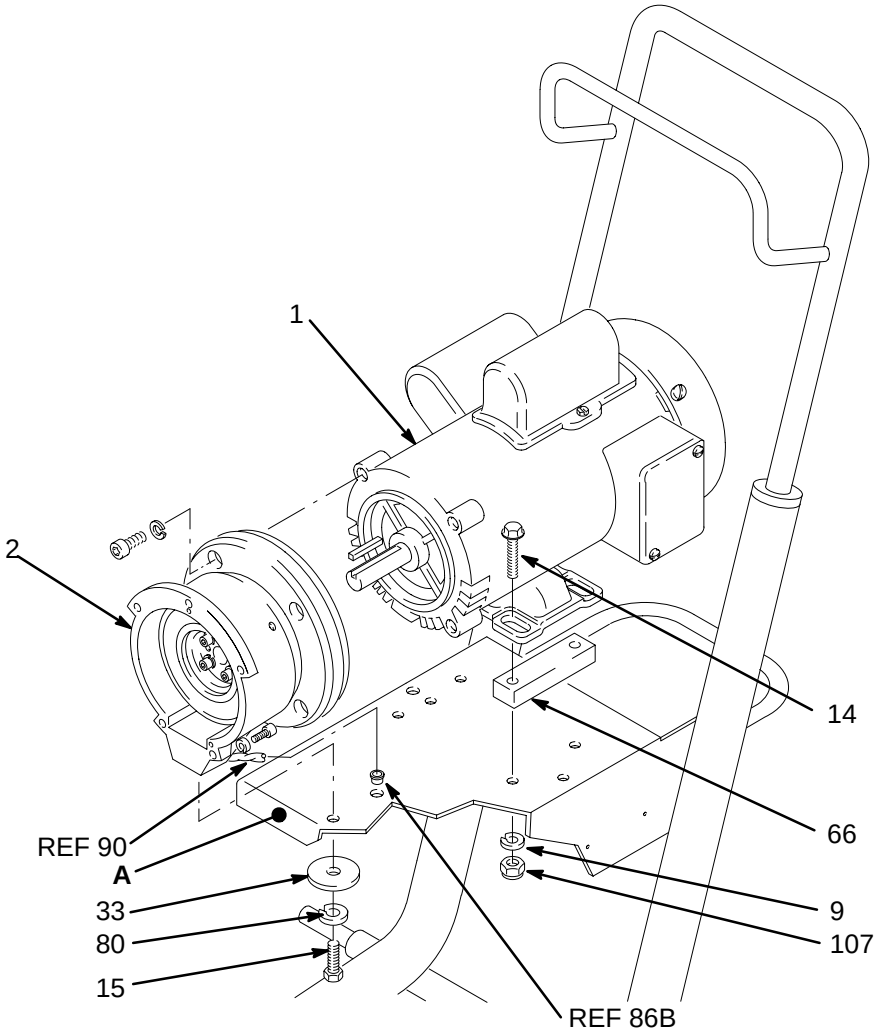


Fig. 27

Field & Wiring Harness

NOTE: Refer to Fig. 28.

1. Remove the motor from the cart. See page 26.
2. Pull the plastic caps (B) off the wire screws (34) in both places on the field (6). Loosen the screws and release the wires (90).
3. Loosen the four setscrews (12) holding the field (6) to the clutch housing (2).
4. Pull out the field.
5. Skip ahead to **Reassembly,** page 29, Step 4..

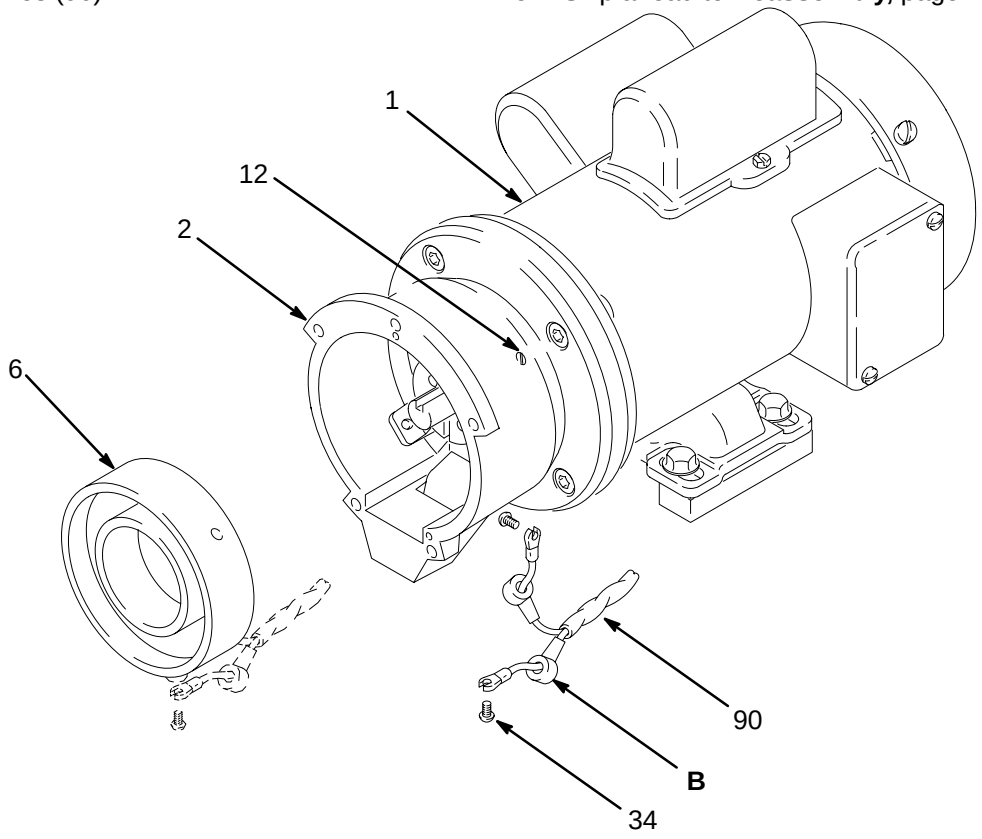


Fig. 28 0496

Circuit Board

NOTE: Early series of sprayers had two circuit boards. The other board should be removed from its bracket and its wires spliced as follows and then insulated and placed in the box.

- Black to Yellow
- Orange to nothing

1. Remove the cover (B) from the motor junction box (A).
2. Remove the screws which secure the circuit board mounting bracket. Remove the board (1a) and bracket.
3. Remove the wires from the board, noting their original locations.
4. Connect the wires to the new board in the same location as the old board. Secure the board inside the box.
5. Replace the box cover.

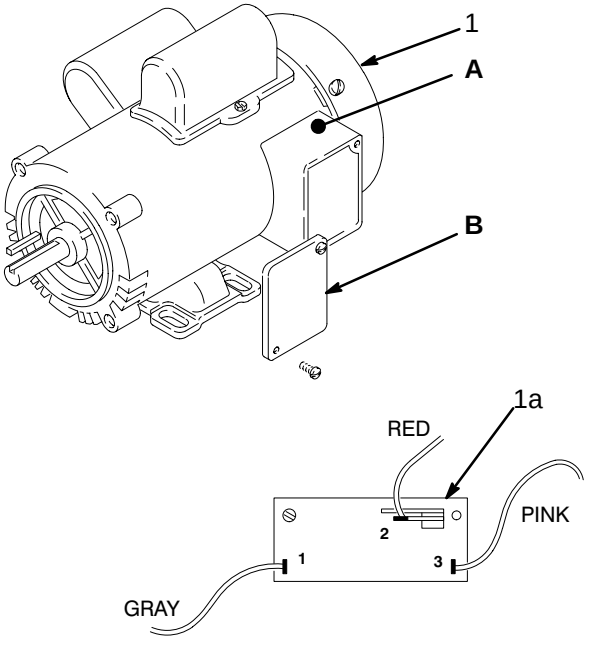


Fig. 29 0497

Clamp

NOTE: A standard steering wheel puller is required to remove the clamp. Two 1/4–28 x 3 or 4 in. long screws are also needed.

NOTE: Refer to Fig. 30.

1. Loosen the two screws (16) on the clamp (3), working through the slot at the bottom of the clutch housing (2).

2. Install two screws (B) of the tool (A) in two of the threaded holes in the clamp (3). Tighten the screws (C) until the clamp comes off.

3. Skip ahead to **Reassembly,** page 29, Step 3., or continue to the right.

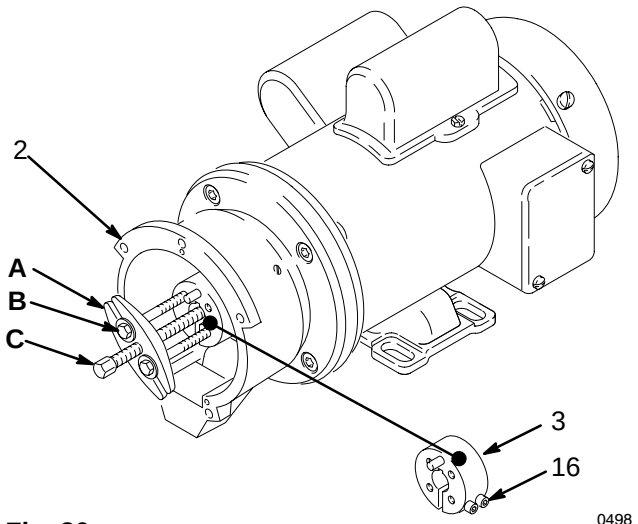


Fig. 30

Clutch Housing

NOTE: Refer to Fig 31. The motor and clutch housing were removed from the cart previously.

1. Remove the four capscrews (62) and lockwashers (9) which hold the clutch housing (2) to the adapter plate (48).
2. Remove the key (13).
3. Pull off the clutch housing (2).
4. Go to **Reassembly,** page 29, Step 1..

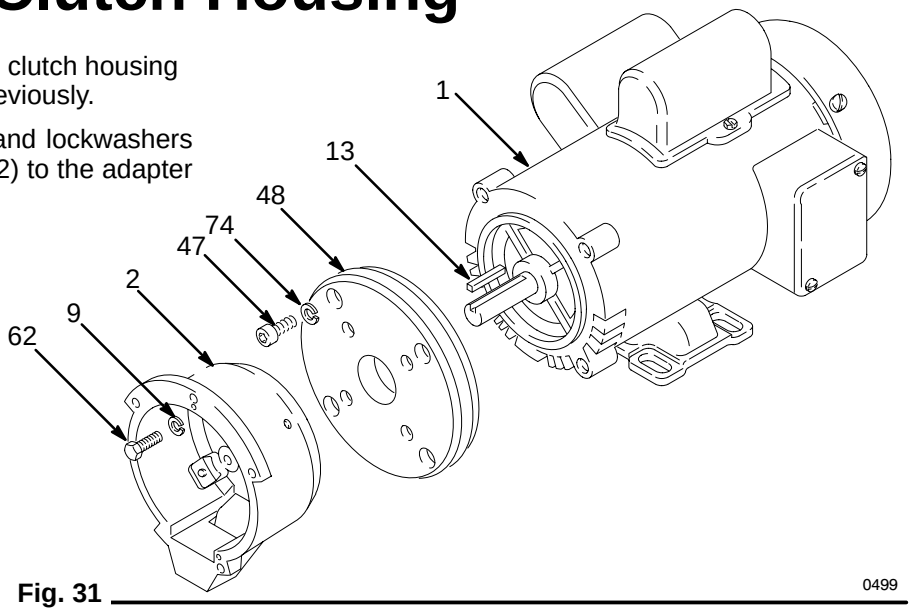


Fig. 31

Motor Capacitor and Inductor Coil

NOTE: A replacement capacitor may include a new resistor, installed. The start capacitor (1b) and the inductor coil (1c) are located under cover A. The run capacitor (1d) is located under cover B.

NOTE: Refer to Fig. 32.

1. Remove the cover (A or B).

2. Remove the flag connectors from the old capacitor or inductor coil.

3. Connect flag connectors of the new component.

4. Replace the cover.

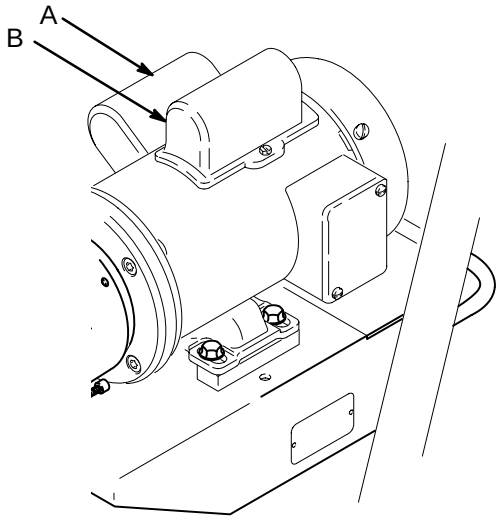


Fig. 32

Reassembly

1. Connect the **clutch housing (2)** to the adapter plate (48) using the screws (62) and lockwashers (9). Install the clutch housing and adapter plate assembly to the motor (1), using the screws (47) and lockwashers (74)
2. Install the motor shaft **key (13).** See Fig. 33.

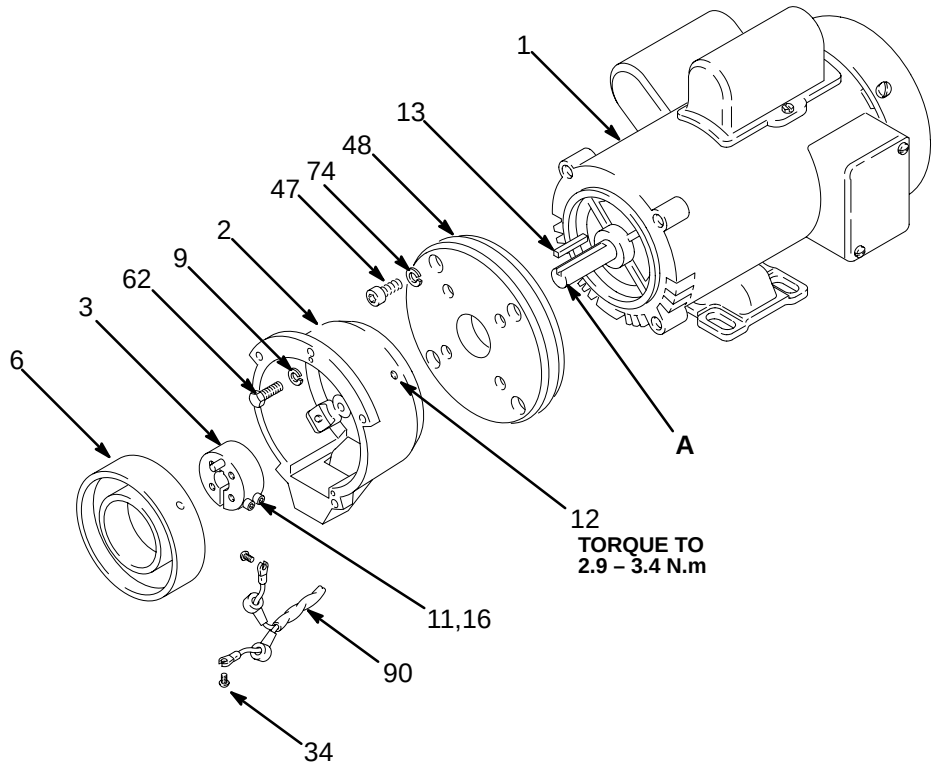


Fig. 33 0500

3. Press the **clamp (3)** onto the motor shaft (A). Maintain the 50.55 mm (+/– 0.25 mm) dimension shown in Fig. 33.
4. To check the dimension, place a rigid, straight steel bar (B) across the face of the clutch housing (2). Use an accurate measuring device to measure the distance between the bar and the face of the clamp. Adjust the clamp as necessary. Torque the two screws (16) to 13–15 N.m.
5. Install the **field (6)** in the clutch housing (2). Working through the slot in the clutch housing, connect the wires of the harness (90) to the screws (34) in both places on the field. Pull the plastic caps (C) up and snap them over the screws. With the setscrew holes in the field and the clutch housing (2) aligned, tighten the setscrews (12) oppositely and evenly, to 2.9 to 3.4 N.m. See Fig. 33.

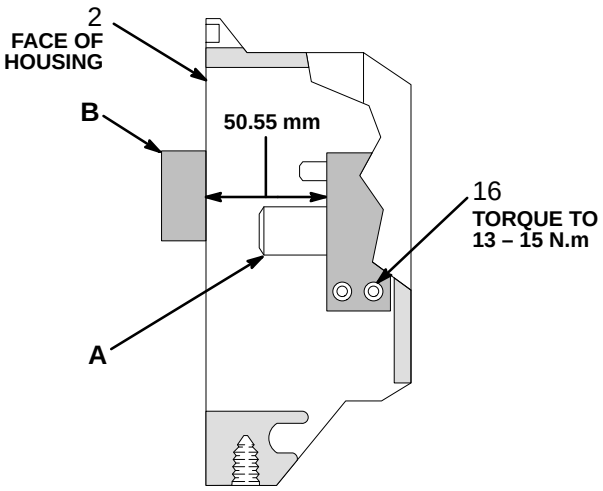


Fig. 34 0501

Reassembly

6. Place the **motor (1)** assembly on the cart. Align the mounting holes. Carefully guide the motor leads through the conduit. Tighten the conduit connector (87). See Detail A, Fig. 35.
7. Insert the grommet (86B) in the frame so 10 mm of it is exposed above the frame. Guide the field wire harness (90) through the grommet. Secure the wire harness to the bottom of the frame with the clamp (85), and hardware (62, 9, 61). Guide the wire harness through the grommet (86A) and into the pressure control. Press the grommet into the frame. See DETAIL A.
8. Secure the motor to the spacer (66) and motor mounting plate, using the flange screws (14), lockwashers (9) and locknuts (107). Torque to 20.4 N.m. Secure the clutch to the motor mounting plate using the the capscrews (15), lockwashers (80) and washer (99).
9. Refer to Fig. 15, page 16 and page 40, to reconnect the motor leads.
10. Be sure the face of the **rotor (4b)** and the field is free of all oil and contaminants. Install the rotor, lockwashers (11) and capscrews (16). Torque the capscrews to 8.8 to 10 N.m. See Fig. 35.
11. After installing the rotor (4b), turn the motor from the fan end, using a screw driver, to ensure there is no friction between the rotor (4b) and the field (6). If there is friction, recheck the dimensions of the clamp and field as explained in Steps 3. & 4., page 29.
12. Be sure the face of the **armature (4a)** is clean. Assemble the armature to the shaft in the pinion housing (19). A retaining ring located within the armature makes it difficult to assemble these parts. Follow this procedure for the best results. First, engage a few splines of both parts. While they are engaged, use a screwdriver to gently push the retaining ring onto the armature, and finish engaging the splines. Push the armature onto the shaft until it contacts the ring (19m). See Fig. 35.
13. Assemble the **pinion housing (19)** to the clutch housing, using the capscrews (10) and lockwashers (11). See Fig. 35.
14. Secure the drive housing assembly (F) to the clutch housing (2), using the screws (10) and lockwashers (11).

Reassembly

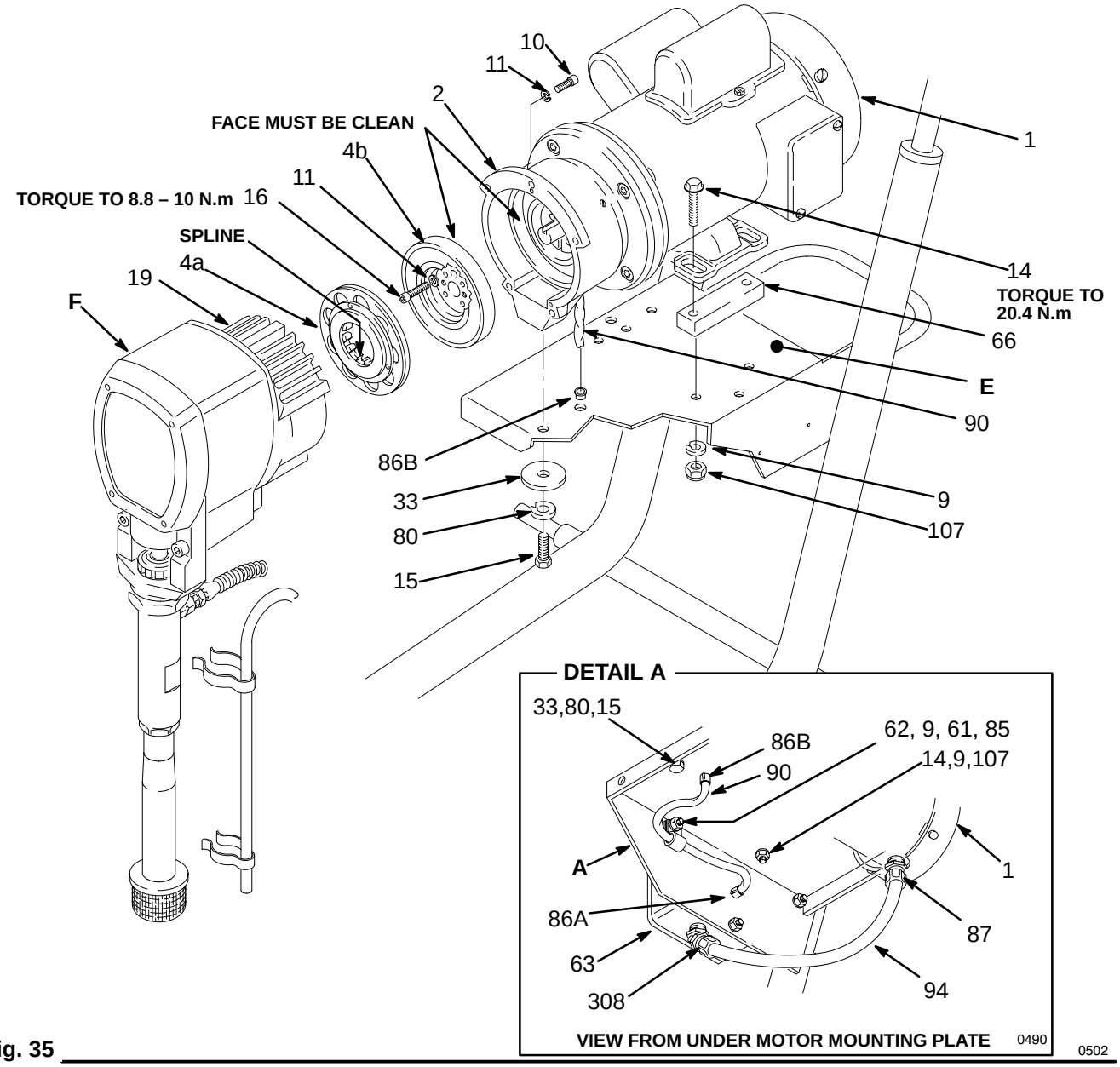


Fig. 35

Removing and Installing the Pump

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

Removing the pump. (See Fig. 36)

1. Flush the pump. **Relieve the pressure**.
2. Remove the spring clips (100,102) and drain hose (101).Hold the intake valve (423) with a wrench and unscrew the suction tube (30). Remove the hose (59).
3. Push the retaining spring (26) up. Push the pin (25) out the rear.
4. Loosen the locknut (27). Unscrew the pump. See below for how to repair the pump.

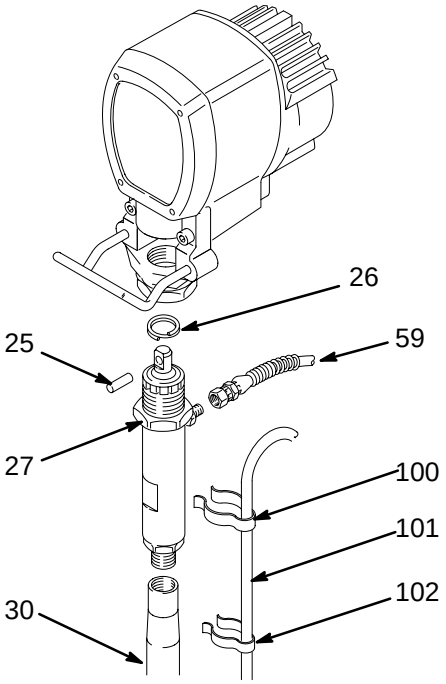


Fig. 36 0477

Installing the pump. (See Fig. 37)

1. Screw the pump about 3/4 of the way into the bearing housing (21). Hold the pin (25) up to the pin hole on the connecting rod (22) and continue screwing in the pump until the pin slides easily into the hole.
2. Back off the pump until the top threads of the pump cylinder are flush with the face of the bearing housing and the outlet nipple faces back.
3. Push the retaining spring (26) into the groove all the way around the connecting rod. Tighten the locknut (27) to 97 N.m using a 2–1/4 in. open end wrench and a light hammer.
4. Install the front cover and screws. Connect the pump outlet hose. Install the suction tube parts. Install the spring clips and drain hose.

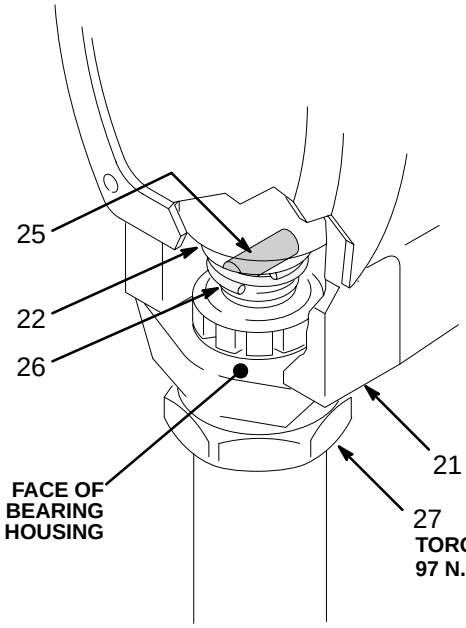


Fig. 37 0031

Displacement Pump

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

Disassembly

1. **Relieve the pressure**. Remove the pump from the sprayer. See page above.
2. Disassemble the intake valve. See Fig. 38.
3. Clean and inspect the parts. Replace any worn or damaged parts. Use a new o–ring (401*). If no further service is needed, reassemble the intake valve and torque it into the cylinder to 146 N.m.

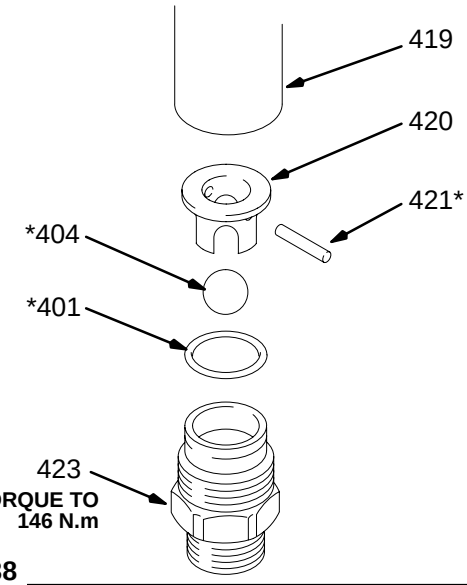


Fig. 38

4. To disassemble the rest of the pump, remove the packing nut (416) and plug (405). See Fig. 43.

5. Use a plastic mallet to tap the piston rod (424) down. Pull the rod out through the bottom of the cylinder.

6. Remove the throat packings. See Fig. 43.

⚠ WARNING

Always use the special removal tool, P/N 220–991, to remove the sleeve. Other removal methods could cause the pump to rupture, resulting in serious injury. If the sleeve cannot be removed easily using the tool, return the sleeve and cylinder to your Graco distributor for removal.

7. Remove the sleeve. Screw the large nut (B) of the tool into the top of the cylinder (419). Screw down the rod (A) to push the sleeve out. Remove the tool. See Fig. 39.

8. Clamp the flats of the piston rod (424) in a vise. Loosen the retaining nut (411). Unscrew the piston valve (422). See Fig. 40.

9. Disassemble the piston valve (422). See Fig. 40.

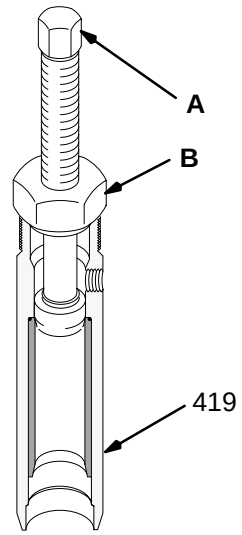


Fig. 39

Reassembly Notes

A. Pump Repair Kit, P/N 220–877, is available. For the best results, use all the new parts in the kit, even if the old ones still look good. Parts included in the kit are shown with an asterisk, i.e., (410*) in the text and drawings.

B. Check the outside of the piston rod (424) and the inside of the sleeve (418) for scoring or scratches. If the parts are damaged, new packings will not seal properly. Replace these parts if needed.

C Alternate leather and plastic packings as shown in Fig 31–2. The lips of the throat “V” packings must face down. The lips of the piston “V” packings must face up. The lips of the U–cup seal (403) face down. Incorrect installation damages the packings and causes the pump to leak.

D. Soak leather packings in oil before reassembling the pump.

Reassembly Procedure

1. Stack the backup washer (414), seal (403*), female gland (415*), alternate the packings (412*,406*), and then male gland (410*) onto the piston valve (422). See Fig. 40.

2. Tighten the packing retaining nut (411) onto the piston valve (22) to the torque specified in Fig. 40.

3. Put the ball (425*) on the piston valve (422). See Fig. 40.

⚠ CAUTION

Step 5., tightening the piston valve into the rod, is critical. Follow the procedure carefully to avoid damaging the packings by overtightening.

4. Apply one drop of adhesive, supplied, to the threads of the piston valve. Then hand tighten the valve assembly into the piston rod just until the nut (411) contacts the rod. See Fig. 40.

   Note the alignment of the piston (422) to the nut (411). Maintain this alignment through Steps 5., 6. and 7..

5. Place the flats at the top of the rod (424) in a vise.

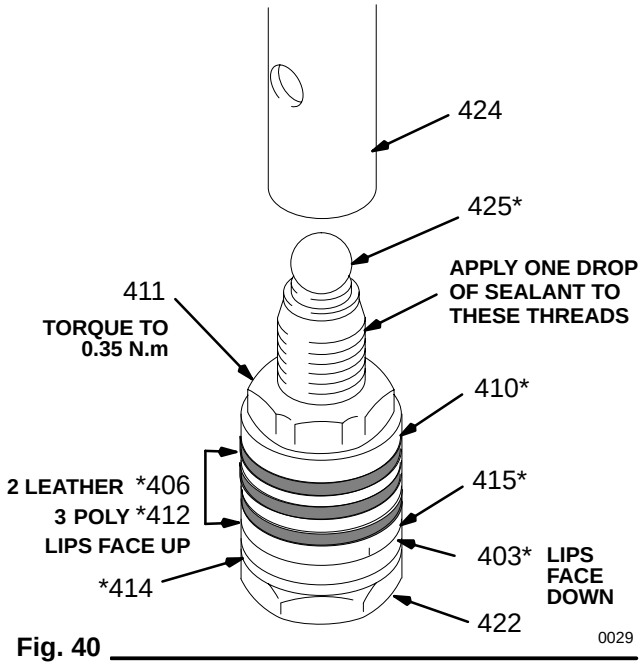


Fig. 40

Displacement Pump

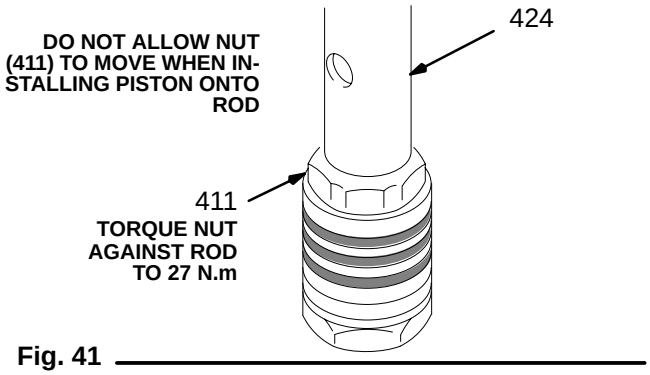


Fig. 41

6. Use a wrench to **CAREFULLY** tighten the nut (411) against the piston rod to 25 N.m. See Fig. 41.

   Use two wrenches to maintain the alignment mentioned in Step 4., page 33.

7. Put a new o–ring (417*) firmly in the cylinder groove. See Fig. 42.

8. One at a time stack the male gland (408*), alternate the packings (413*, 40 7*), and then install the female gland (409*), into the top of the cylinder (419). See Fig. 42.

9. Install the packing nut (416) and plug (405), but leave loose for now. See Fig. 42.

NOTE: The tapered end of the sleeve is the bottom of it. Do not install it upside down. See Fig. 42.

10. Coat the piston rod and packings with oil. Carefully slide the assembly **INTO THE TOP OF THE SLEEVE**.

    And then slide the sleeve/piston rod assembly **INTO THE BOTTOM OF THE CYLINDER**. This procedure helps prevent damaging the packings during reassembly. See Fig. 42.

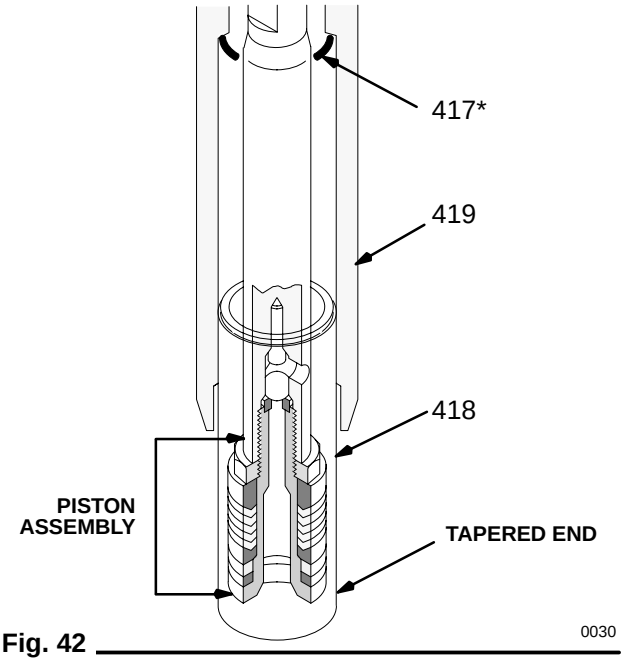


Fig. 42

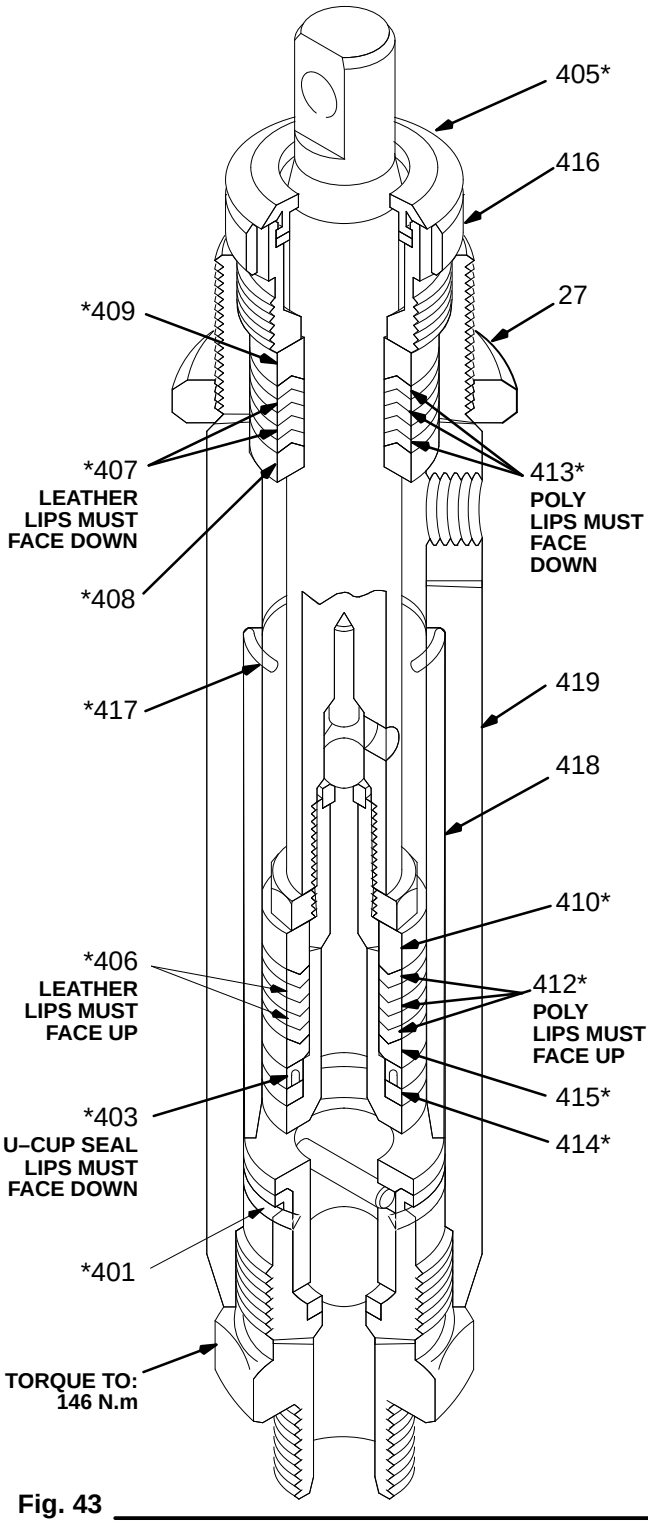


Fig. 43

11. Screw down the cylinder locknut (27) until it is finger tight at the bottom of the external cylinder threads.

12. Put the flats of the intake valve (423) in a vise. Install a new o-ring (401*) and screw the intake valve onto the pump cylinder. See Fig. 42. Torque the valve to 146 N.m.

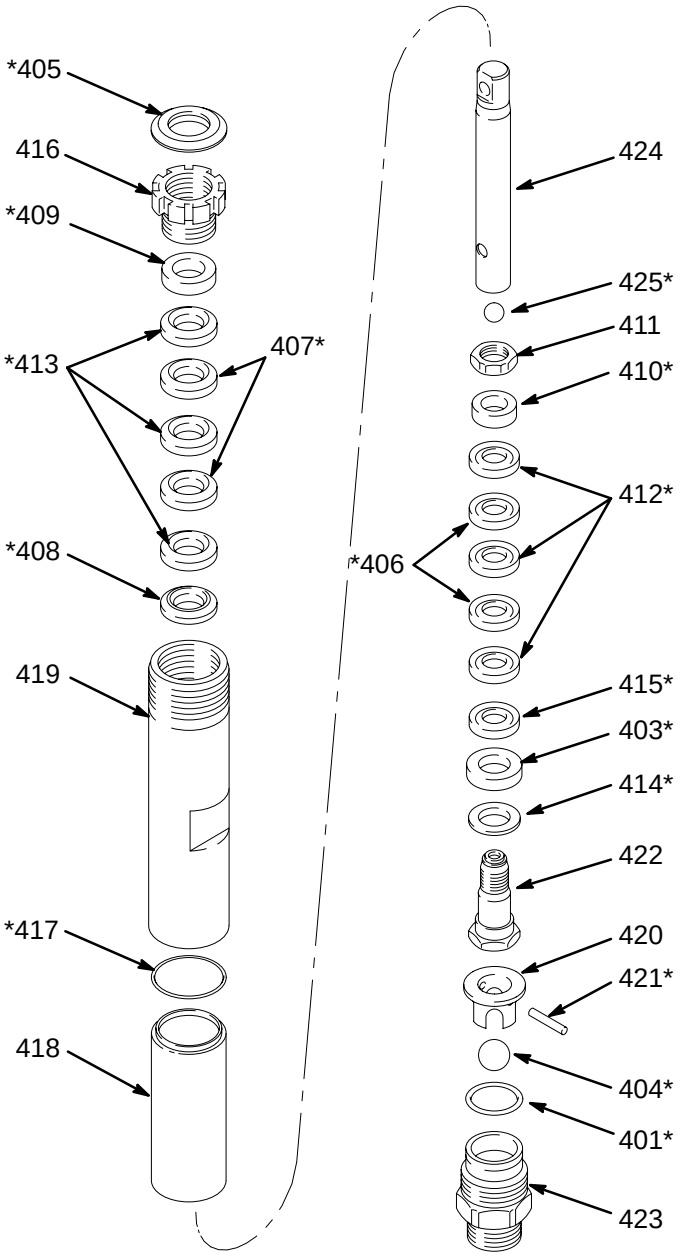
13. Reinstall the pump. See page 32.

Displacement Pump Parts List & Drawing

Model 220–872, Series A
Includes items 401 to 425

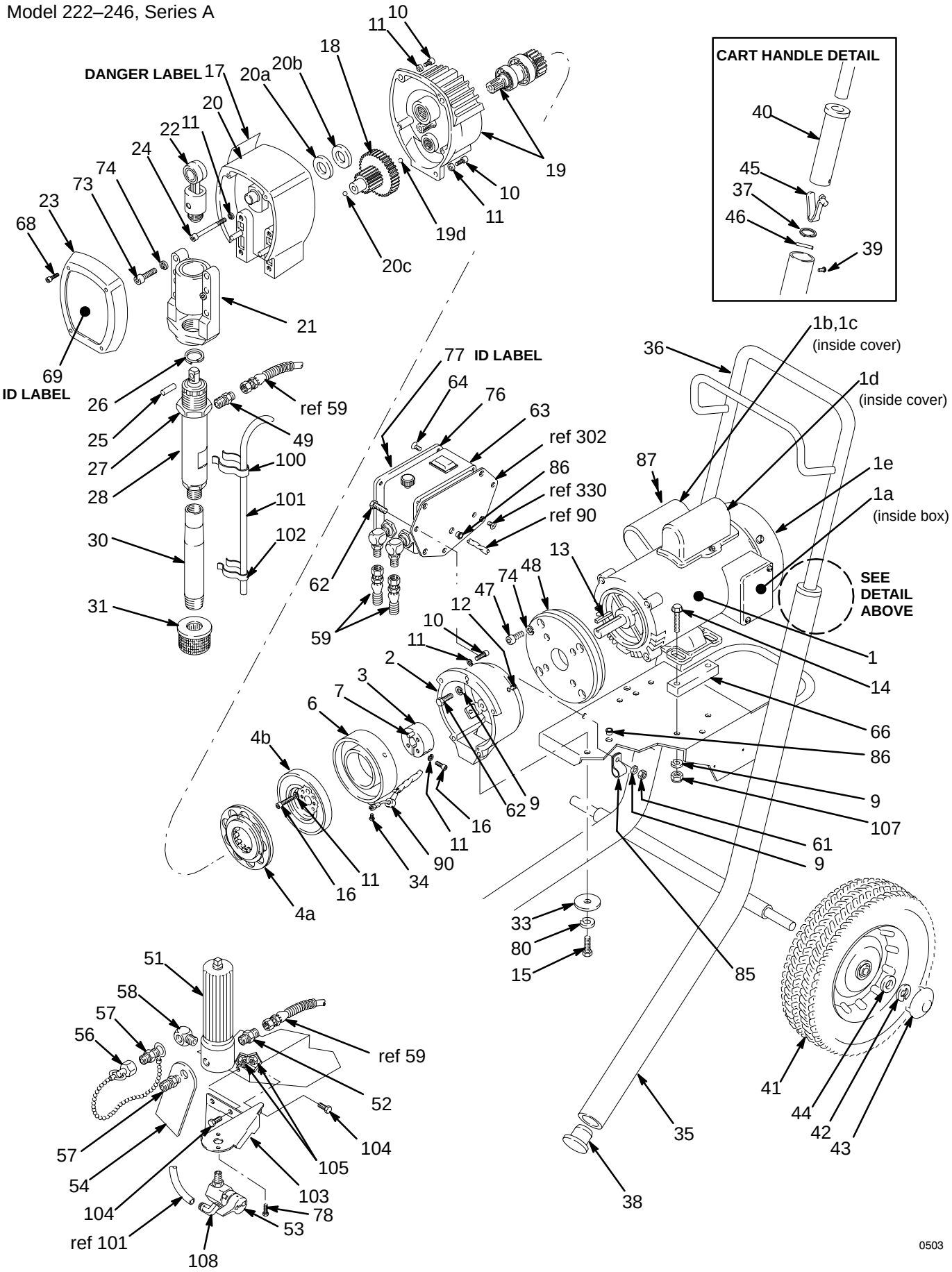
REF NO.	PART NO.	DESCRIPTION	QTY
401	107–098*	PACKING, o–ring, PTFE	1
403	108–690*	SEAL, u–cup, polyurethane	1
404	108–775*	BALL; sst	1
405	183–171*	PLUG	1
406	183–174*	V–PACKING, leather	2
407	183–175*	V–PACKING, leather	2
408	183–176*	GLAND, male	1
409	183–177*	GLAND, female	1
410	183–178*	GLAND, male	1
411	183–179	NUT, hex, retaining	1
412	183–182*	V–PACKING, polyurethane	3
413	183–183*	V–PACKING, polyurethane	3
414	183–653*	WASHER, backup	1
415	183–185*	GLAND, female	1
416	183–186	NUT, packing	1
417	183–172*	O–RING, PTFE	1
418	183–361	SLEEVE, cylinder	1
419	183–181	CYLINDER	1
420	183–180	GUIDE, ball	1
421	183–173*	PIN, ball stop	1
422	220–631	VALVE, piston	1
423	220–629	VALVE, intake	1
424	220–630	ROD, piston	1
425	101–947*	BALL	1

*These parts also supplied in accessory
Packing Repair Kit 220–877.
Keep an extra kit on hand to reduce down time.



Parts Drawing – Sprayer

Model 222–246, Series A



Parts List – Sprayer

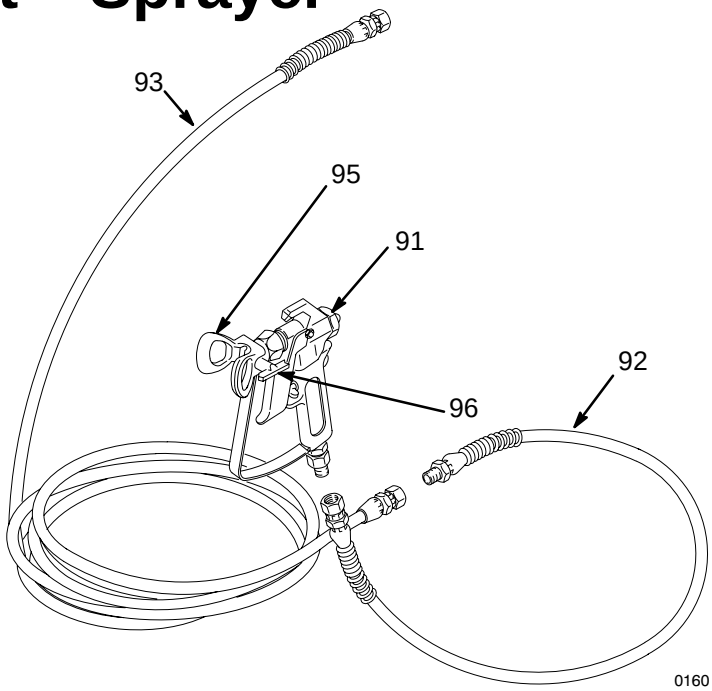
REF NO.	PART NO.	DESCRIPTION	QTY
1	222–367	MOTOR, electric Includes items 1a – 1e	1
1a	110–938	.CIRCUIT BOARD, start switch	1
1b	091–585	.CAPACITOR, start	1
1c	091–586	.COIL, inductor	1
1d	091–587	.CAPACITOR, run	1
1e	091–588	.COVER, fan, motor	1
2	183–397	HOUSING, clutch	1
3	183–517	CLAMP, mounting, rotor	1
4	221–031	CLUTCH ASSEMBLY Includes items 4a and 4b	1
4a	108–806	.ARMATURE	1
4b	183–399	.ROTOR	1
6	185–058	FIELD	1
7	108–800	PIN, dowel; 5/16 x 1”	1
9	100–214	LOCKWASHER, 5/16”	11
10	100–644	CAPSCREW, sch; 1/4–20 UNC–3A x 0.75”	9
11	105–510	LOCKWASHER, spring, 1/4”	17
12	108–801	SETSCREW, 1/4”	4
13	183–401	KEY, parallel, 3/16” sq x 7/8”	1
14	110–837	FLANGE SCREW, hex hd; 5/16–18 UNC–2A x 1.5”	4
15	100–469	CAPSCREW, hex hd; 3/8–16 UNC–2A x 0.75”	1
16	108–803	CAPSCREW, hex sch; 1/4–28 x 1.0”	6
17	185–953*	DANGER LABEL	1
18	220–919	GEAR REDUCER	1
19	220–920	PINION See parts on page 38	1
20	220–879	DRIVE HOUSING Includes items 20a to 20d	1
20a	106–227	.WASHER, bronze	1
20b	183–209	.WASHER, silver	1
20c	100–069	.BALL, sst	1
20d	107–329	.TUBE, grease (supplied only when purchasing a new drive housing)	1
21	220–639	BEARING HOUSING	1
22	220–640	CONNECTING ROD	1
23	183–168	COVER, housing	1
24	108–849	CAPSCREW, sch; 1/4–20 UNC–3A x 3”	2
25	183–210	PIN, straight, 3/8 x 1.125”	1
26	183–169	SPRING, retaining	1
27	183–170	NUT, hex; 3/8–16 UNC–2B	1
28	220–872	DISPLACEMENT PUMP See page 35 for parts	1
30	183–423	TUBE, intake	1
31	181–072	STRAINER	1
33	108–851	WASHER, plain, 3/8”	1
34	108–860	SCREW, mach, 8–32 x 1/4”	2
35	224–002	CART FRAME	1
36	220–918	CART HANDLE & HOSE RACK	1
37	183–350	WASHER, plain	2
38	108–794	PLUG, tubing	2
39	108–795	SCREW, mach, pnh; 10–24 x 3/8”	4
40	185–188	SLEEVE	2
41	179–811	WHEEL, semi–pneumatic	2
42	101–242	RING, retaining	2
43	104–811	HUBCAP	2
44	154–636	WASHER, 5/8” size, 16 ga	2
45	179–777	BUTTON, snap	2
46	108–068	PIN, spring, straight; 3/16” x 1-1/4”	2
47	110–067	SCREW, mach, 3/8–16 UNC-A x 7/8”	4
48	185–045	PLATE, adapter	1
49	183–461	NIPPLE, 3/8–18 npsm x 1/4–18 npt	1
51	214–570	FLUID FILTER See 307–273 for parts	1
52	162–485	NIPPLE, pipe; 3/8 npt x 3/8 npsm	1
53	237–677	VALVE, pressure drain	1
54	178–034	TAG, warning	1
56	220–285	CAP	1
57	162–453	NIPPLE, hex, 1/4 npsm x 1/4 npsm x 1/4 nps, 1–3/16” long	1
58	100–840	ELBOW, street, 1/4–18 (m x f)	1
59	220–849	HOSE, 3/8” ID, cpld 3/8 npsm (fbe); 29” (737 mm); spring guard both ends	2
61	100–188	NUT, heavy hex; 5/16–18 UNC–2a	3
62	101–344	CAPSCREW, hex hd; 5/16–18 UNC–2A	7
63	222–313	PRESSURE CONTROL ASSEMBLY See page 34 for parts	1
64	110–037	SCREW, mach, Type C, 10–24 x 5/8”	4
65	206–994	THROAT SEAL LIQUID, 0.27 liter	1
66	185–056	SPACER	2
68	108–850	SCREW, 8–32 UNC–2a x 1-1/4”	4
69	185–059	LABEL, identification	1
73	110–141	CAPSCREW, sch; 3/8–16 UNC–3a x 1-1/2”	4
74	106–115	LOCKWASHER, spring, 3/8”	8
76	185–000	COVER, pressure control	1
77	185–060	LABEL, identification, outside cover	1
78	110–997	SERRATED FLANGE SCREW, 1/4–UNC 20–2A x 5/8”	2
80	100–133	LOCKWASHER, spring, 3/8”	1
84	101–754	PLUG, pipe, 3/8–18 npt (shown on page 39)	1
85	108–868	CLAMP, wire	1
86	108–805	BUSHING	2
87	110–138	CONNECTOR, conduit, straight (motor)	1
88	107–263	TERMINAL, 1/4” blade (f) (shown on page 39)	4
89	102–799	TERMINAL, ring	3
90	222–377	HARNESS, wire	1
94	065–099	CONDUIT, specify length when ordering	241 mm
100	186–490	CLIP, spring	1
101	186–495	TUBE, bypass	1
102	181–102	CLIP, spring	1
103	186–638	BRACKET, mounting, filter	1
104	110–963	SERRATED FLANGE SCREW, hex hd; 5/16–18 UNC–2A x .75”	3
105	110–996	SERRATED FLANGE NUT, hex, 5/16 x18 UNC–2B	3
107	110–838	LOCKNUT, heavy hex; 5/16–18	4
108	111–225	CONNECTOR, tube	1

NOTE: Ref Nos. 91, 92, 93, 95, and 96 are on page 38.

**Extra Danger and Warning labels are available free.*

Parts List – Sprayer

91	222–667	“CONTRACTOR” SPRAY GUN See 307–614 for parts	1
92	214–701	HOSE, grounded, nylon; 3/16” ID; cpld 1/4 npsm(f); 3 ft (0.9 m); spring guards both ends	1
93	223–541	HOSE, grounded, nylon; 1/4” ID; cpld 1/4 npsm(f);50 ft (15 m);’ spring guards both ends	1
95	220–422	TIP GUARD, RAC IV, DripLess	1
96	221–621	TIP, RAC IV, Size 621 See manual 307–848	1

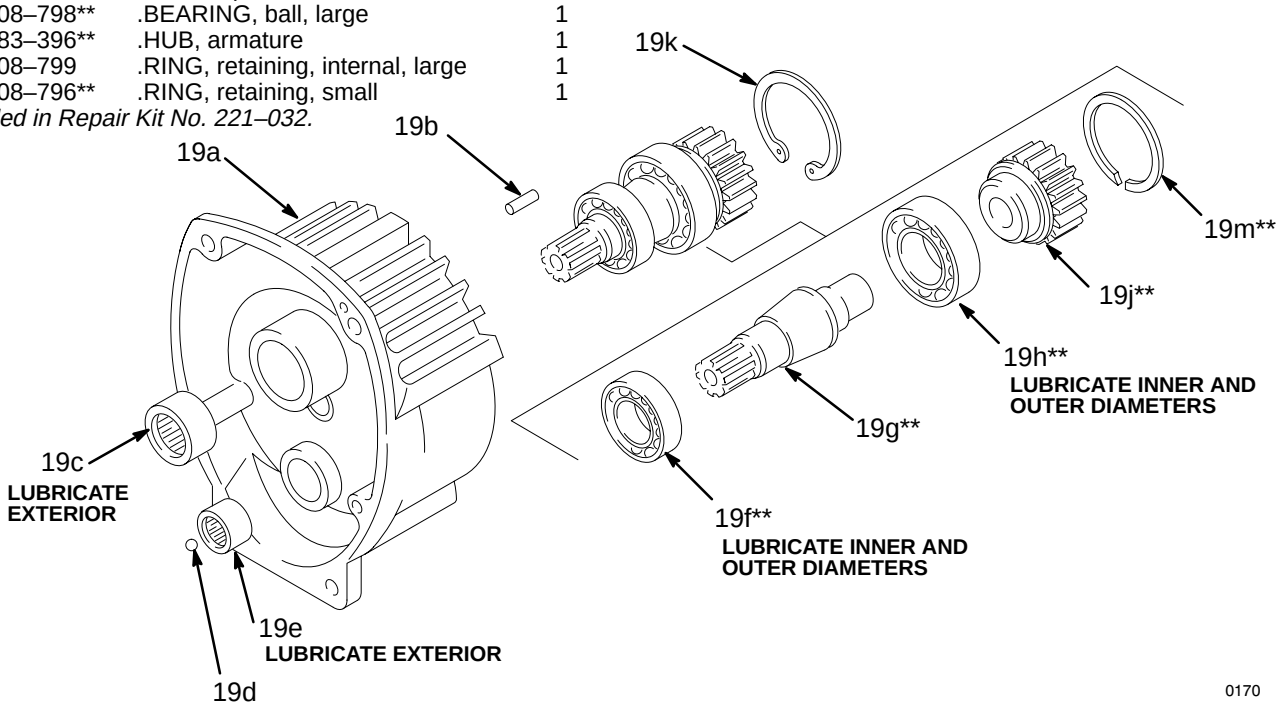


Parts List & Drawing – Pinion Assembly

Ref No. 19
Pinion Housing
Includes items 19a to 19m

REF NO.	PART NO.	DESCRIPTION	QTY
19a	183–394	.HOUSING, pinion	1
19b	105–489	.PIN, dowel	1
19c	108–692	.BEARING	1
19d	100–069	.BALL, sst	1
19e	107–088	.BEARING	1
19f	108–797**	.BEARING, ball, small	1
19g	183–395**	.SHAFT, pinion	1
19h	108–798**	.BEARING, ball, large	1
19j	183–396**	.HUB, armature	1
19k	108–799	.RING, retaining, internal, large	1
19m	108–796**	.RING, retaining, small	1

***Included in Repair Kit No. 221–032.*



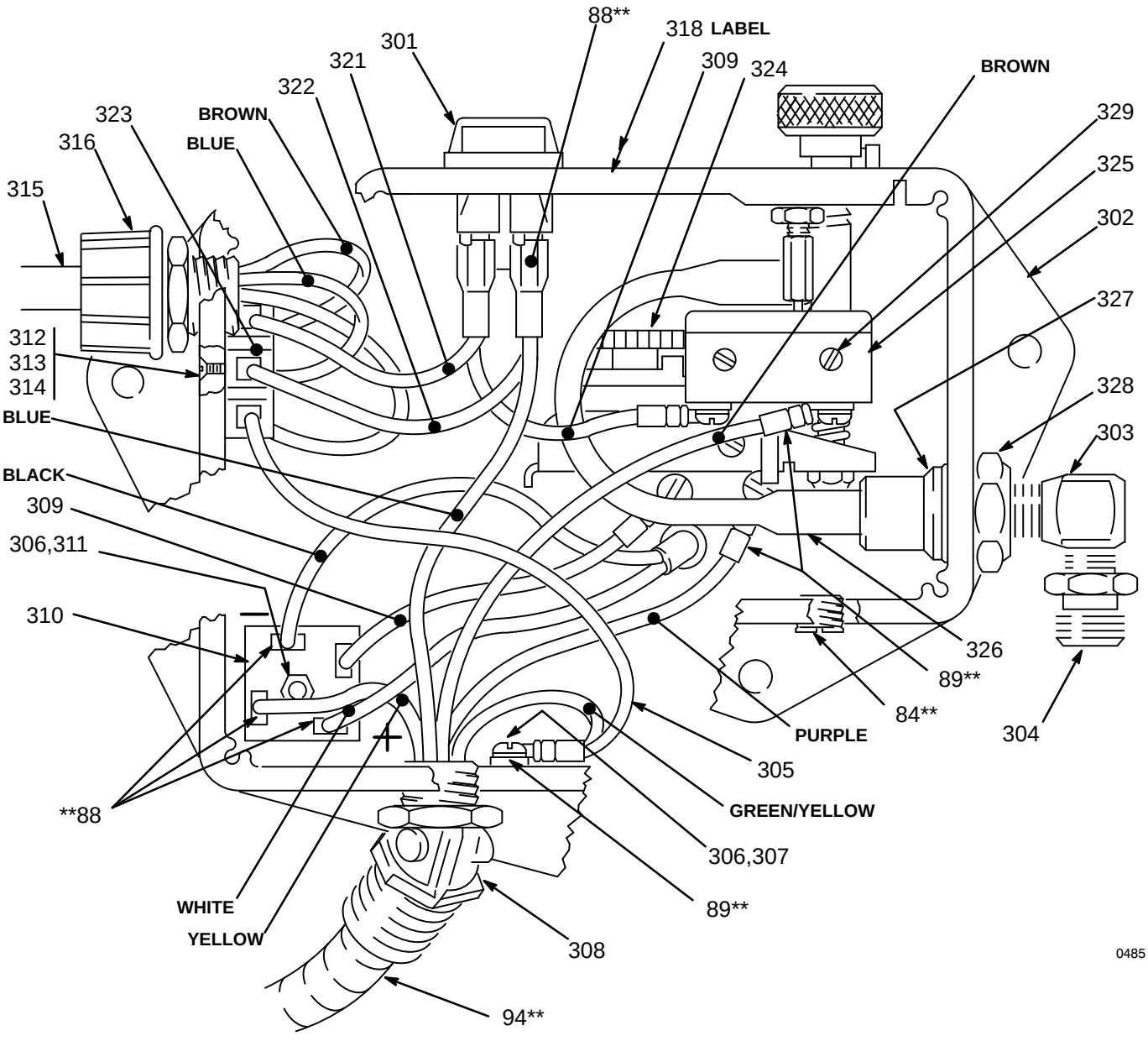
Parts List & Drawing – Pressure Control

PRESSURE CONTROL ASSEMBLY 222–313
Includes items 300–330

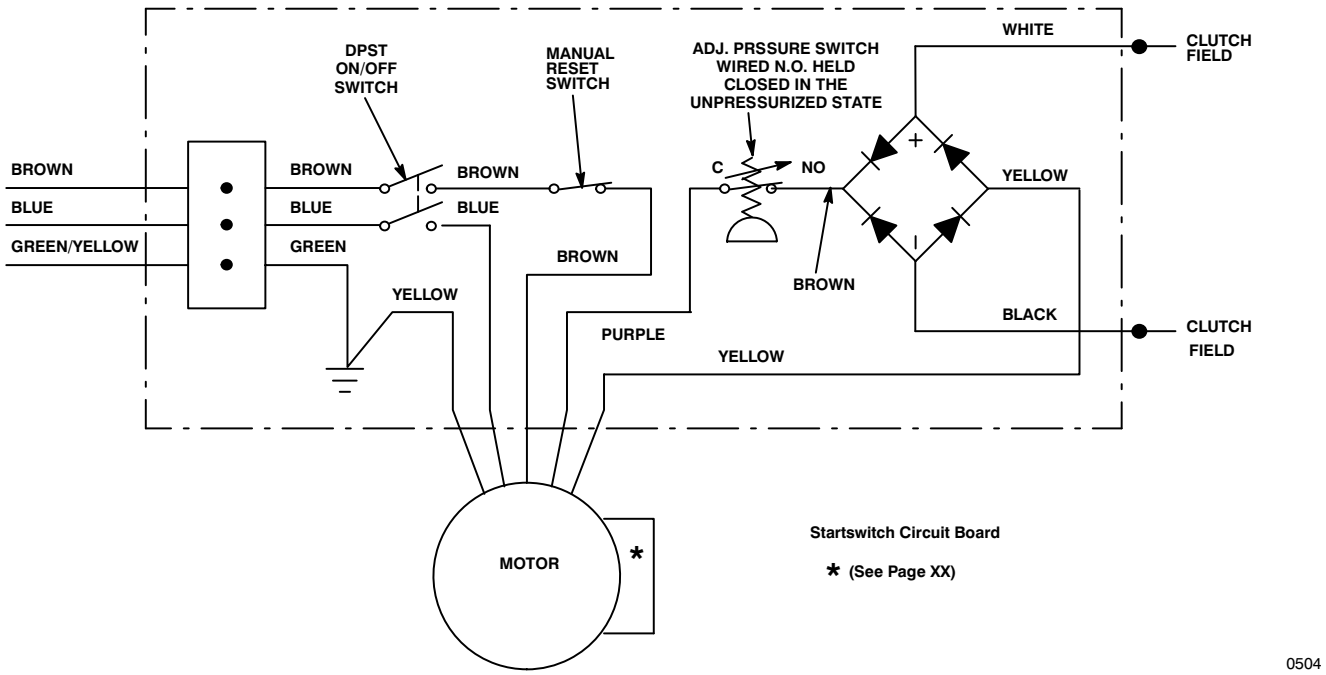
REF NO.	PART NO.	DESCRIPTION	QTY
300	222–275	BASIC PRESSURE CONTROL Includes items 301–330	1
301	109–191	SWITCH, ON/OFF	1
302	185–070	BRACKET, mounting (see page 36)	1
303	100–840	ELBOW, street	2
304	183–461	NIPPLE, adapter	2
305	222–195	HARNESS, wire	1
306	157–021	LOCKWASHER	2
307	100–035	SCREW, mach	1
308	108–460	CONNECTOR, conduit	1
309	222–355	CONDUCTOR	2
310	108–219	RECTIFIER	1
311	100–284	SCREW	1
312	107–438	SCREW, mach	2
313	101–792	LOCKWASHER	2
314	100–975	NUT	2
315	183–963	CORD, power supply	1
316	108–295	BUSHING	1
318	183–960*	LABEL, caution	1
321	222–353	CONDUCTOR	1
322	222–354	CONDUCTOR	1
323	107–436	STRIP, terminal	1
324	105–660	SWITCH	1
325	110–118	MICROSWITCH	1
326	222–276	TUBE, bourdon	1
327	105–772	LOCKWASHER	2
328	176–906	NUT, hex	2
329	102–552	SCREW, 6–32 unc–2A x 7/8”	2
330	106–078	SCREW, mach, flat head; thd forming; No. 10–24 x 3/8” (see page 36)	4

**Extra warning labels are available free.*

NOTE: Wiring Schematic shown on page 40.



Pressure Control – Wiring Schematic



0504

Technical Data

Maximum Working Pressure . . . . . 21.0 MPa, 210 bar
Cycles/liter 53
Maximum Delivery . . . . . 4.7 liter/min
Maximum Tip Size . . . . . 1 gun with 0.031 tip
2 guns with 0.021 tip
Inlet Paint Strainer . . . . . 190 micron
Stainless Steel screen, reusable
Outlet Paint Filter . . . . . 250 micron
Stainless Steel screen, reusable
Pump inlet Size . . . . . 3/4 npt (m)
Fluid Outlet Size . . . . . 1/4 npsm from fluid filter

Wetted Parts
Displacement Pump . . . Carbon Steel, Polyurethane UHMW polyethylene, Delrin®, Leather
Filter . . . . . Aluminum, Carbon Steel, Stainless Steel

NOTE: For information on converting your sprayer to one that can safely pump fluids containing halogenated hydrocarbons, contact Graco Product Service.

NOTE: Delrin® is a registered trademark of the DuPont Company.

Dimensions

Model 222–246
without hose or gun

Weight (dry, without packaging) . . . . . 55 Kg
Height . . . . . 803 mm
Length . . . . . 775 mm
Width . . . . . 572 mm

Accessories

USE ONLY GENUINE GRACO PARTS AND ACCESSORIES

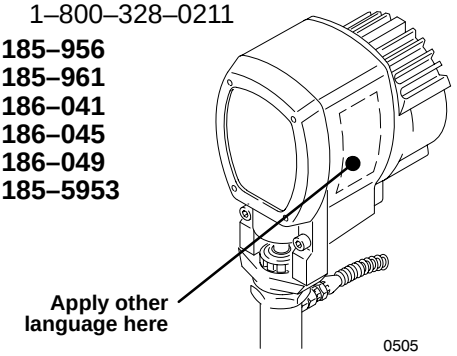
DANGER LABELS

The English language DANGER label shown on page 5 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.

Toll Free: 1–800–328–0211

French	**185–956**
Spanish	**185–961**
German	**186–041**
Greek	**186–045**
Korean	**186–049**
English	**185–5953**

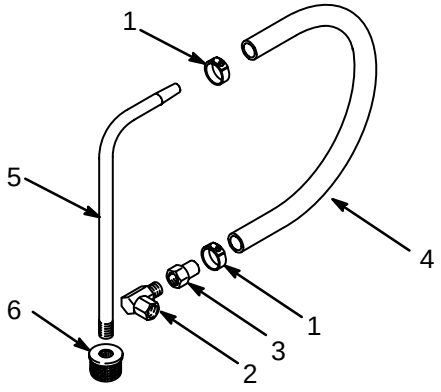


DISPLACEMENT PUMP REPAIR KIT 220–877
Repair instructions are included with the kit.

SLEEVE REMOVAL TOOL 220–991
Required for removing the displacement pump sleeve during service.

SUCTION TUBE KIT 208–920
5 gallon (19 liter) size
Includes:

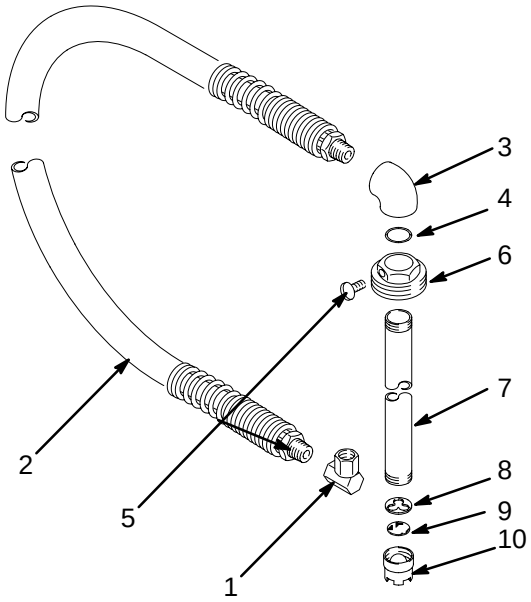
REF NO.	PART NO.	DESCRIPTION	QTY
1	101–818	CLAMP, hose	2
2	160–327	UNION, 90° swivel; 3/4 npt(m x f)	1
3	170–705	ADAPTER, intake	1
4	170–706	HOSE, 1” ID x 48”; nylon	1
5	170–957	TUBE, suction	1
6	181–072	STRAINER	1



0161

SUCTION TUBE KIT 208–259
55 gallon (200 liter) size
Includes:

REF NO.	PART NO.	DESCRIPTION	QTY
1	156–589	UNION, 90° ADAPTER, 3/4 npt(f) x 3/4 np(f) swivel	1
2	214–961	HOSE, coupled 3/4 npt(mbe) 3/4” ID; nylon, 6 ft (1.8 m); spring guard one end	1
3	156–591	ELBOW, 90°; 3/4 npt x 1–1/2 – 24 NS	1
4	156–593	PACKING, o–ring, nitrile rubber	1
5	100–220	THUMBSCREW, 5/16–18 x 1”	1
6	176–684	ADAPTER, bung	1
7	156–592	TUBE, riser	1
8	159–100	RETAINER, screen	1
9	161–377	SCREEN, filter	1
10	159–101	NUT, screen retainer	1



0162

Notes

Notes

Graco Warranty

Graco warrants all equipment referenced in this document 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 of structures, accessories, equipment or materials not supplied by Graco.

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

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

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

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

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

FOR GRACO CANADA CUSTOMERS

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Graco Phone Number

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you:
1–800–367–4023 Toll Free

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Graco reserves the right to make changes at any time without notice.

Sales Offices: Minneapolis, Detroit, Los Angeles
Foreign Offices: Belgium, Canada, England, Korea, France, Germany, Hong Kong, Japan

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PRINTED IN U.S.A. 307–913 October 1988, Revised September 1997