



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

INSTRUCTIONS

First choice when quality counts.™

Rev. D
Supersedes Rev. B
and PCN D

Roof Rigs™

GM 1230

GASOLINE-POWERED AIRLESS SPRAYER

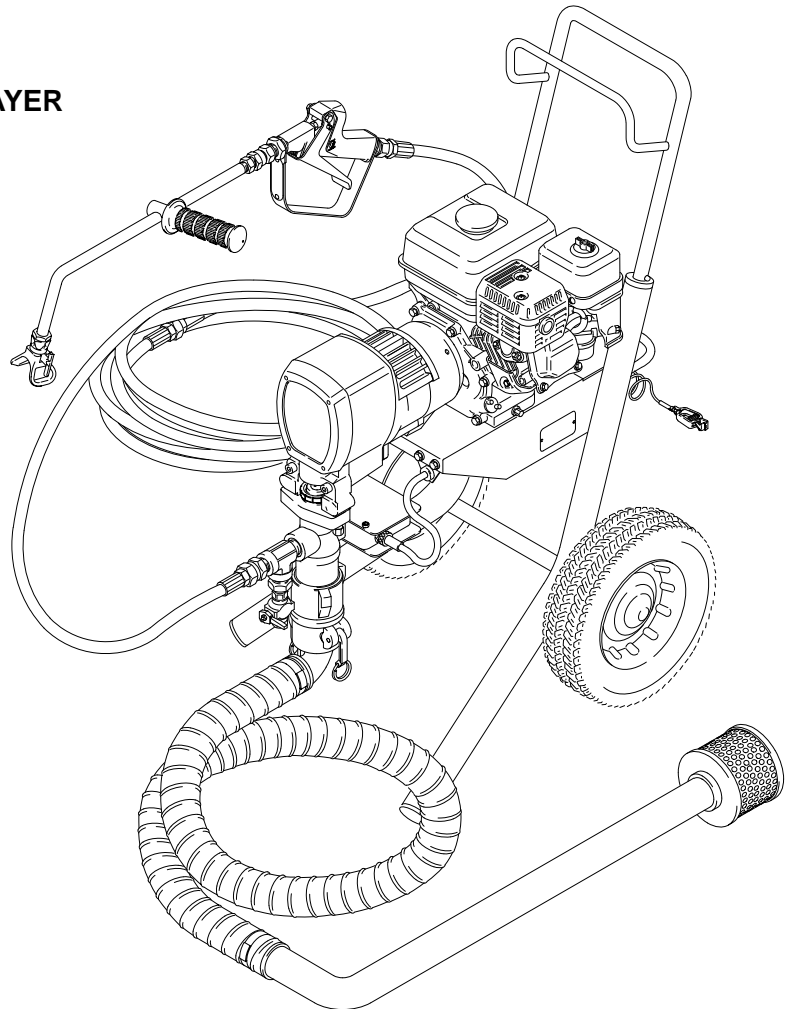
1200 psi (8.3 MPa, 83 bar) MAXIMUM WORKING PRESSURE

Model 231-148

With one gun, Heavy Duty RAC IV®
DripLess™ Tip Guard,
and 861 size tip,
90 foot (28 m) hose

Model 224-483, Series A

Without hose or gun



0394A



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NOTE: This is an example of the English language DANGER label on your sprayer. This label is supplied with the sprayer in other languages. Before operating the sprayer, apply a DANGER label in the appropriate language for your operators, according to the separate instructions supplied with it.

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

Symbols

Warning Symbol



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

Caution Symbol



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

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.

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 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.
- 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.



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 8 to prevent the equipment from starting unexpectedly.

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 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.

Notes

Setup

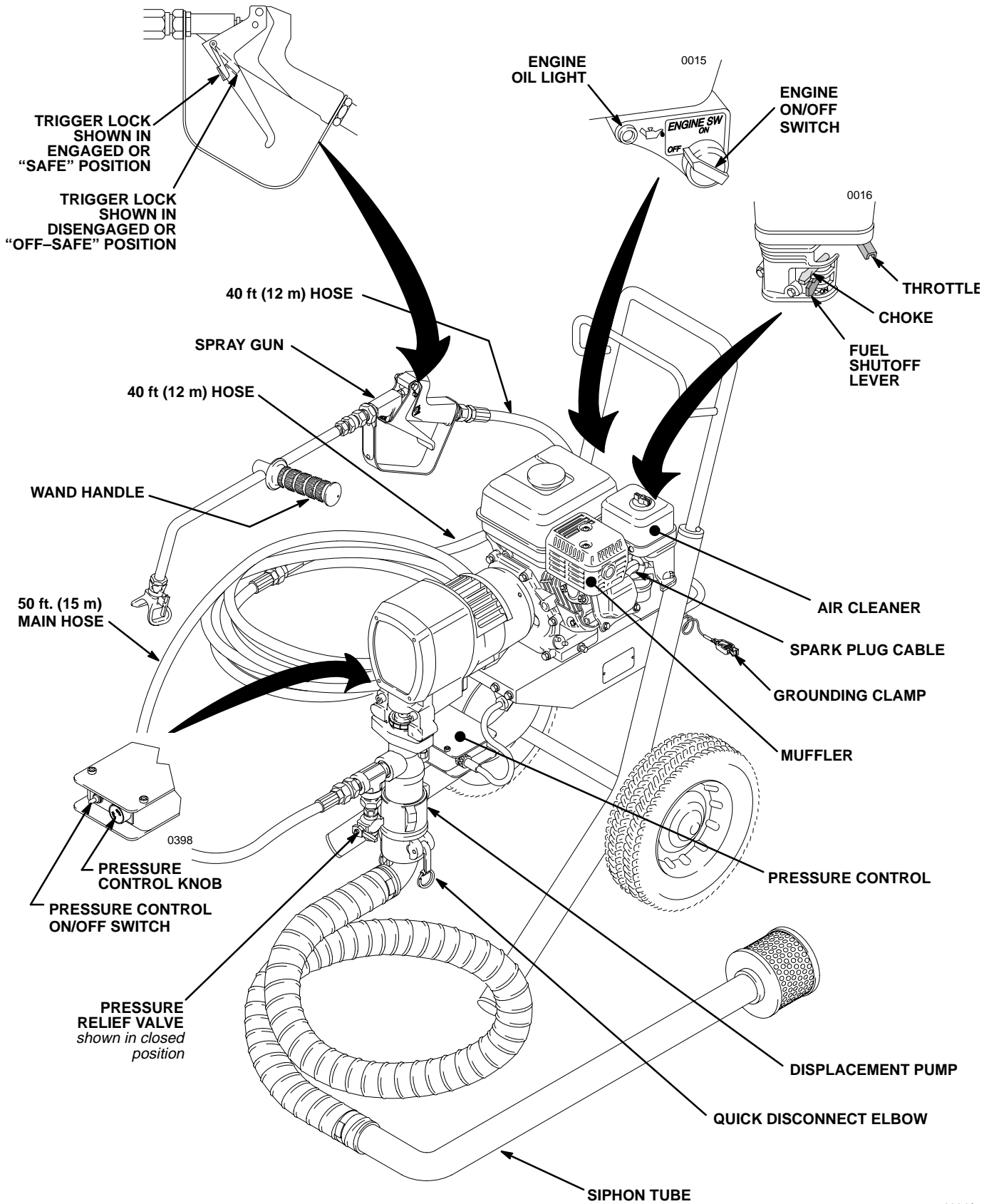



Fig. 1


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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 3.




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, having a container ready to catch the drainage. Leave the valve open until you are ready to spray again.
7. Disconnect the spark plug cable.

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. **Read and follow the warnings on pages 3–3** before setting up or operating this sprayer.
2. **Install the hoses and gun.**
3. **Clamp the siphon hose to the pump.** Be sure the gasket is in the quick disconnect elbow; air leaks will prevent priming.
4. **Check the engine oil level.** Refer to the Honda engine manual, supplied. In summary: remove one oil fill plug – the oil should be almost overflowing. See Fig. 1. Add oil as necessary. Also read the MAINTENANCE section on page 15.

Recommended engine oil: Use a high-quality, detergent oil, SAE 10W–40, classified “FOR SERVICE SE or SF”.

5. **Ground the sprayer before operating it.** Connect the grounding clamp (32) to a true earth ground. Follow the FIRE OR EXPLOSION HAZARD on page 3.

6. **Fill the gas tank.** See FUELING, below.
7. **Flush the pump** to remove the protective light-weight oil. See FLUSHING GUIDELINES on page 12.
8. **AGITATE OR MIX THE MATERIAL THOROUGHLY!** Make sure the heavier material on the bottom of the container is completely mixed in.
9. **Start the sprayer.** See page 10.

⚠ CAUTION

To avoid damaging the pressure control, follow these precautions.

1. Always use spray hose at least 90 ft. (27 m) long.
2. Do not allow water or water-base material to freeze in the pressure control.

Fueling

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions. To reduce the risk of a fire or explosion:

1. Always shut off the engine before refueling.
2. Refuel in a well-ventilated area.
3. Do not smoke or allow flames or sparks in the area where the engine is refueled or where the gasoline is stored.
4. Do not overfill the tank. Make sure the filler cap is securely closed after refueling.
5. Fuel vapor or spilled fuel can ignite. If any fuel is spilled during refueling, make sure the area is dry before starting the engine.

1. **Fuel specifications.** Use automotive gasoline with a pump octane number of 86 or higher. If the engine knocks or pings, use a higher octane fuel. Unleaded fuel minimizes combustion chamber deposits.
2. **Gasolines containing alcohol (gasohol).** Do not use gasohol which contains methanol, if the gasohol does not contain cosolvents and corrosion inhibitors for methanol. Even if it does contain such additives, do not use the gasohol if it contains more than 5% methanol.

NOTE: The HONDA engine warranty does not cover damage resulting from the use of gasolines containing alcohol. See the HONDA engine manual for more information.

3. **General.** Do not use oil and gasoline mixtures or contaminated gasoline. Avoid getting dirt, dust or water in the fuel tank.
4. **Tank capacity:** 0.95 gallons (3.6 liter). Leave 1/2 in. (13 mm) at the top of the tank for gas expansion.
5. **Shut off the engine switch before refueling.**
6. **After refueling, tighten the fuel tank cap firmly.**

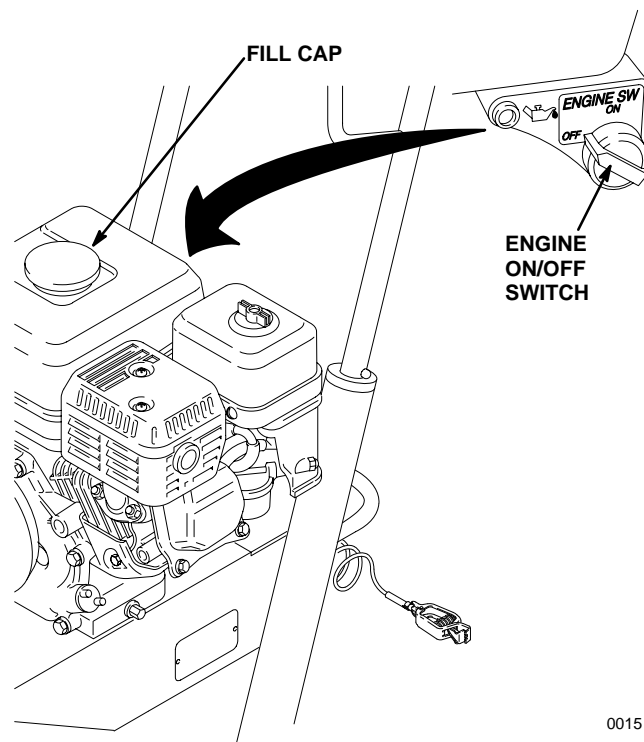


Fig. 2

0015
0141D

Start Up

Before You Start The Sprayer

- 1 See **FLUSHING GUIDELINES**, page 12, to determine if the unit should be flushed.
- 2 Be sure the gas tank is full.
- 3 Check the engine oil level.

NOTE: The engine stops automatically, or will not start, if it is low on oil. If you try to start it again without adding more oil, a red light near the engine on/off switch glows as you pull the starter rope.

- 4 Push the **spark plug cable** firmly onto the spark plug.
- 5 If the sprayer is not primed, remove the spray tip.

Refer to Fig. 3 as you start the sprayer.

Start Up

1. Place the **siphon tube into the coating, water or solvent container**, depending on whether you are flushing or are ready to spray.
2. Open the **black fuel shutoff lever** by pushing it in the direction of the arrow.

⚠ CAUTION

Never start the engine unless fluid pressure is relieved and the pressure control switch is turned OFF. Attempting to start the engine when it is pressurized could damage the recoil system.

3. Turn **OFF** the pressure control switch.
4. To start the engine:
 - a. Turn the pressure adjusting knob all the way counterclockwise to the lowest pressure setting.
 - b. Slide the metal throttle lever away from the fuel tank to the maximum position (fully left).
 - c. If the engine is cold, close the choke by moving the gray lever.If the engine is warm, close the choke by moving the gray lever only half way or not at all.
- d. Turn **ON** the engine switch.

⚠ WARNING

A starter rope that recoils too quickly may hit someone and cause serious injury. The rope could also jam in the recoil assembly.

- e. Hold the frame of the sprayer with one hand and pull the starter rope rapidly and firmly. Continue holding the rope as you let it return. Pull and return the rope until the engine starts.
 - f. Open the choke as soon as the engine starts, except in cold weather. In cold weather, leave the choke closed for 10 to 30 seconds before opening it to keep the engine running.
5. Engage the **gun trigger safety latch** by tipping the gun forward.

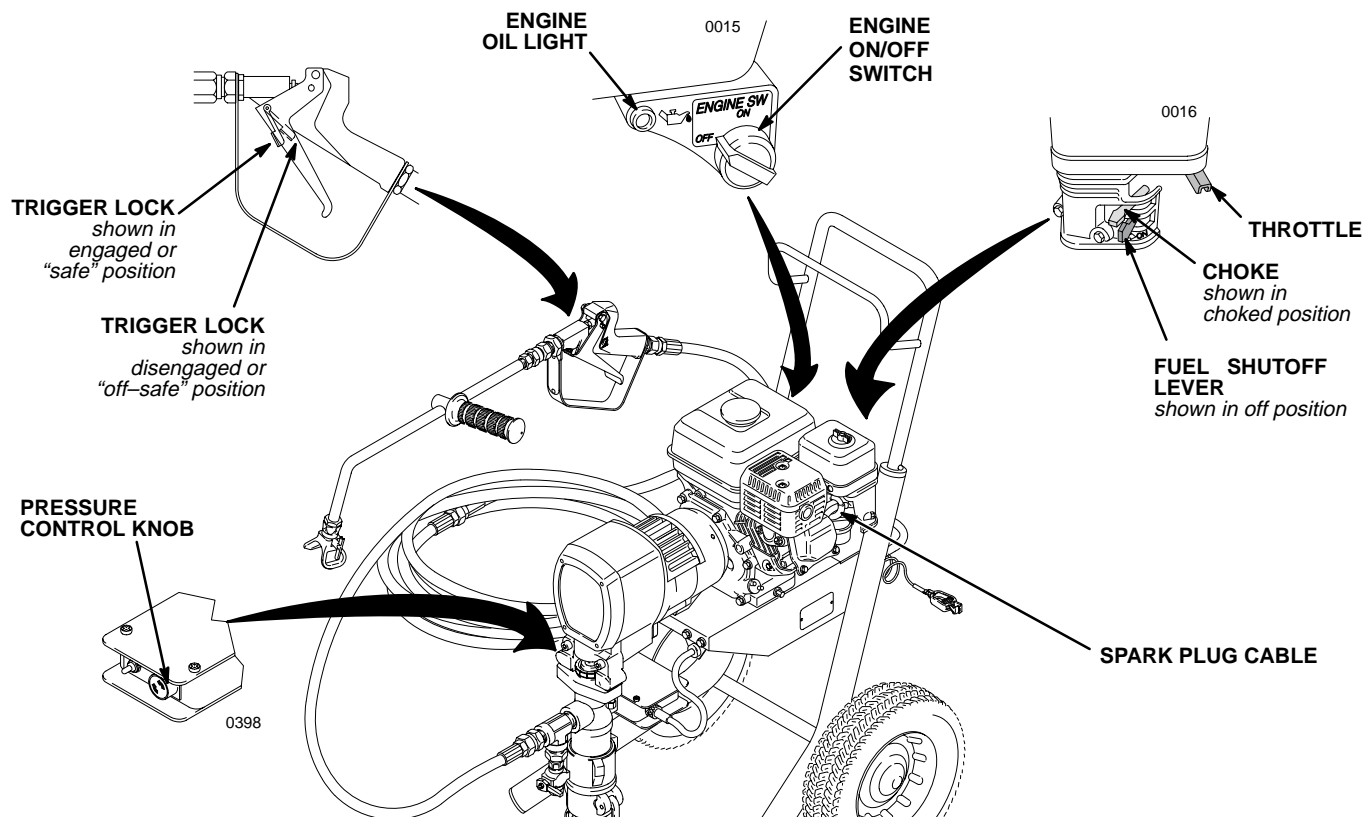


Fig. 3

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Start Up

6. To start the pump:

- Place a container under the pressure drain valve and open the valve.
- Reduce the engine speed by moving the metal throttle lever away from the fuel tank about half way to the left.
- Turn the pressure control knob to minimum.
- Turn ON the pressure control switch.
- Turn the pressure control knob 1/4 turn from minimum pressure. Run the pump until fluid flows smoothly from the pressure drain valve.
- Close the pressure drain valve.

⚠ WARNING

Hold the handle of the wand firmly when triggering the gun to reduce the risk of it kicking back from the surge of pressure, which could cause serious injury.

- Disengage the gun safety latch. Hold a metal part of the gun firmly against a grounded metal container. Holding the gun firmly with both hands, squeeze the trigger until fluid flows from the gun.
- Release the trigger. Engage the safety latch.

7. If you have not primed the unit with the coating yet, move the siphon tube to the coating container. Release the trigger safety latch. Trigger the gun into the water/solvent pail just until coating appears. Tip the gun forward and fully release the trigger to engage the trigger safety latch.

⚠ WARNING

To reduce the risk of serious injury from fluid injection, never operate the spray gun with the tip guard removed.

8. Install the tip guard and spray tip. See page 13.

⚠ CAUTION

Use the lowest fluid pressure and the lowest throttle setting needed. Higher settings cause excessive clutch cycling and premature tip and pump wear.

9. Adjust the engine speed and pump pressure before transporting the hoses to the roof. Trigger the gun onto a test paper to check the spray pattern and atomization. Turn the pressure adjusting knob until you get a good pattern. Then slowly lower the throttle setting as far as you can without changing the spray pattern (the clutch does not cycle).

10. Read **SPRAY TECHNIQUES** on page 14.

⚠ CAUTION

Close the black fuel shutoff lever whenever you are transporting the sprayer to prevent fuel from flooding the engine.

Keep the sprayer upright and level when operating it and when transporting it. This prevents crankcase oil from leaking into the combustion chamber, which makes start up very difficult.

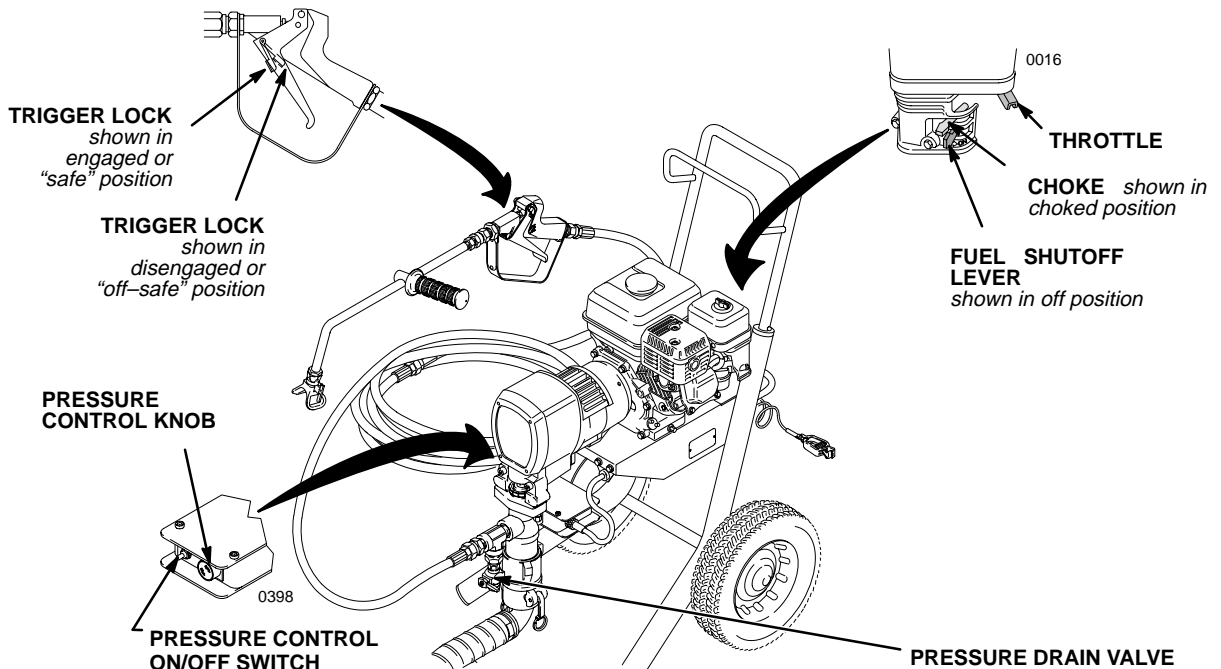


Fig. 4

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Flushing Guidelines

⚠ WARNING

To reduce the risk of serious injury, including fluid injection, always follow the **Pressure Relief Procedure Warning** on page 8 before checking, adjusting, cleaning, or shutting down the sprayer.

When To Flush

1. **Flush a new sprayer** to remove the protective oil.
Before using water-base coating, flush with a compatible solvent, then warm, soapy water, and then clean water.
Before using oil-base coating, flush with a compatible solvent.
2. **Changing coatings**. Use a compatible solvent.
3. **Changing from water-base to oil-base coating**. Flush with warm, soapy water, and then a compatible solvent.
4. **Changing from oil-base to water-base coating**. Flush with a compatible solvent, then warm, soapy water, and then clean water.
5. **Storage**.
Flush the pump only with a compatible solvent, followed by an oil-base solvent, such as mineral spirits.
Leave the drain valve open!
6. **Startup after storage**.
Before using water-base coating, flush out the compatible solvent with warm, soapy water, and then with clean water.
When using oil-based coating, flush out the compatible solvent with the coating to be sprayed.

How To Flush The Pump Only

1. Relieve pressure. Leave the drain valve open. See Fig. 5.
2. Disconnect the siphon assembly.
3. Put the pump in a grounded metal pail of water or compatible solvent.
4. Start the sprayer – see page 10. Flush until the ball in the foot valve is clean and moves up and down easily.

How To Flush The Entire Fluid System

1. Relieve pressure. Leave the drain valve open. See Fig. 5.

2. Put the siphon tube in a grounded metal pail of water or compatible solvent.
3. Start the sprayer. Trigger the gun into the coating container *just* until water or solvent comes from the nozzle. Release the trigger.
4. Move the gun to the grounded flushing container. Trigger the gun until clean water or solvent comes from the it. See Fig. 6. Release the trigger and engage the safety latch. Open the drain valve to clean it.
5. Check all fluid connections for leaks. Relieve pressure before tightening any connections. Start the sprayer. Recheck the connections for leaks.
6. Remove the siphon tube from the solvent pail. Disengage the gun safety latch. Trigger the gun to force water or solvent from the hose. Do not let the pump run dry for more than 30 seconds to avoid damaging the pump packings! Relieve pressure.

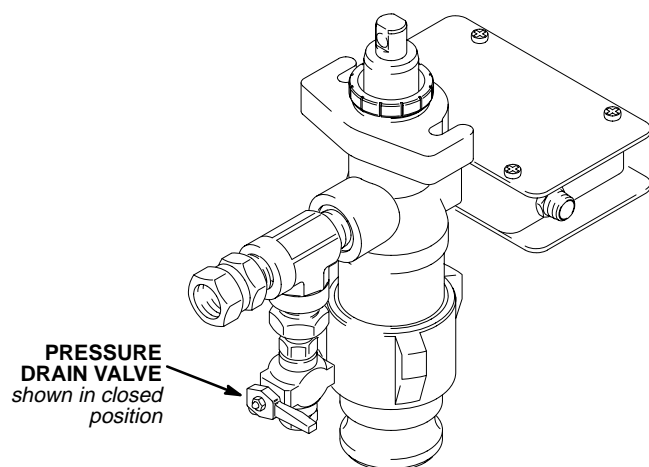


Fig. 5

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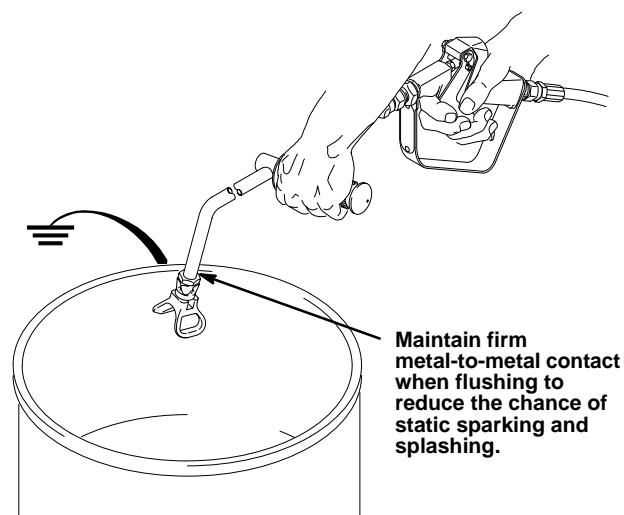


Fig. 6

0406

Spray Tip and Tip Guard

⚠ WARNING

To reduce the risk of fluid injection or splashing in the eyes or on the skin, completely relieve the fluid pressure before installing, cleaning, or changing tips. See the **Pressure Relief Procedure** on page 8.

Installation

1. Insert the housing through the back of the retaining nut and pull it forward. See Fig. 7.
2. Install the metal seal in the housing, flat side first. See Fig. 8.
3. Install the cylinder tip in the housing so its small orifice faces front. See Fig. 9.
4. Snap on the tip guard. Install the screw and the white gasket. See Fig. 10.

Operation

Be sure the tip arrow handle is in the FULL SPRAY position before operating the gun. See Fig. 10.

⚠ WARNING

Keep clear of the nozzle. High pressure fluid from leaks or spray can penetrate the skin and cause extremely serious injury, including the need for amputation. The tip guard provides extra protection against injection, but does not prevent it. Never cut off the tip guard.

Clearing a clogged spray tip See Fig. 11.

1. Engage the trigger safety latch.
2. Turn the arrow handle to the FULL CLEAN position.
3. Disengage the trigger safety latch and trigger the gun into the waste container.
4. Engage the trigger safety latch. Return the arrow handle to the FULL SPRAY position.

Maintenance

Replace the gasket and seal whenever you replace a tip; these parts wear at about the same rate.

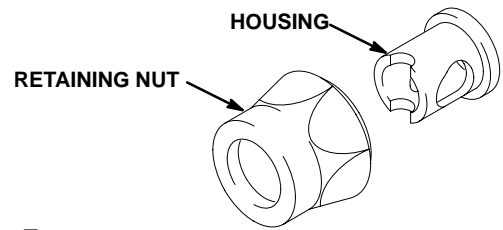


Fig. 7

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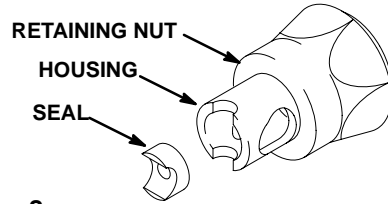


Fig. 8

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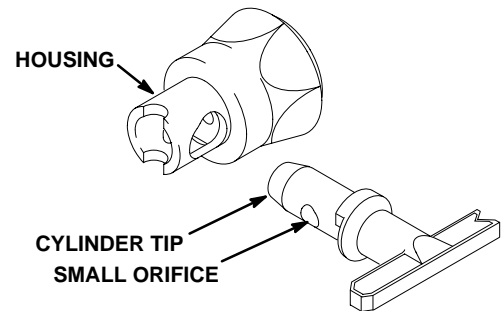


Fig. 9

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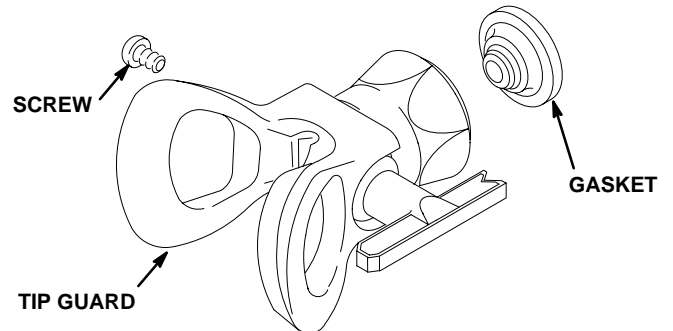


Fig. 10

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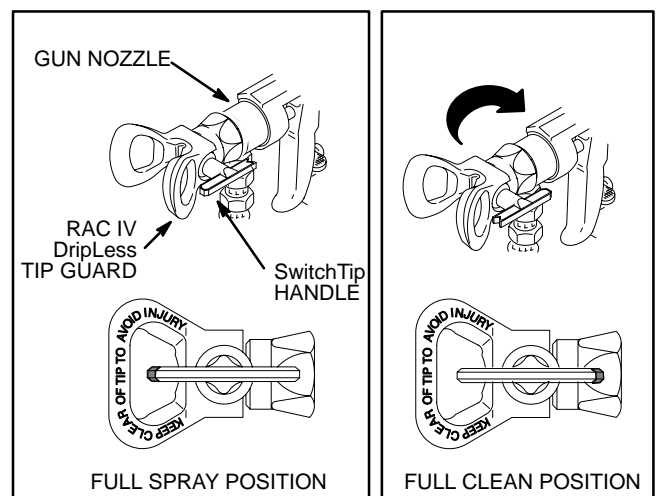


Fig. 11

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Spray Techniques

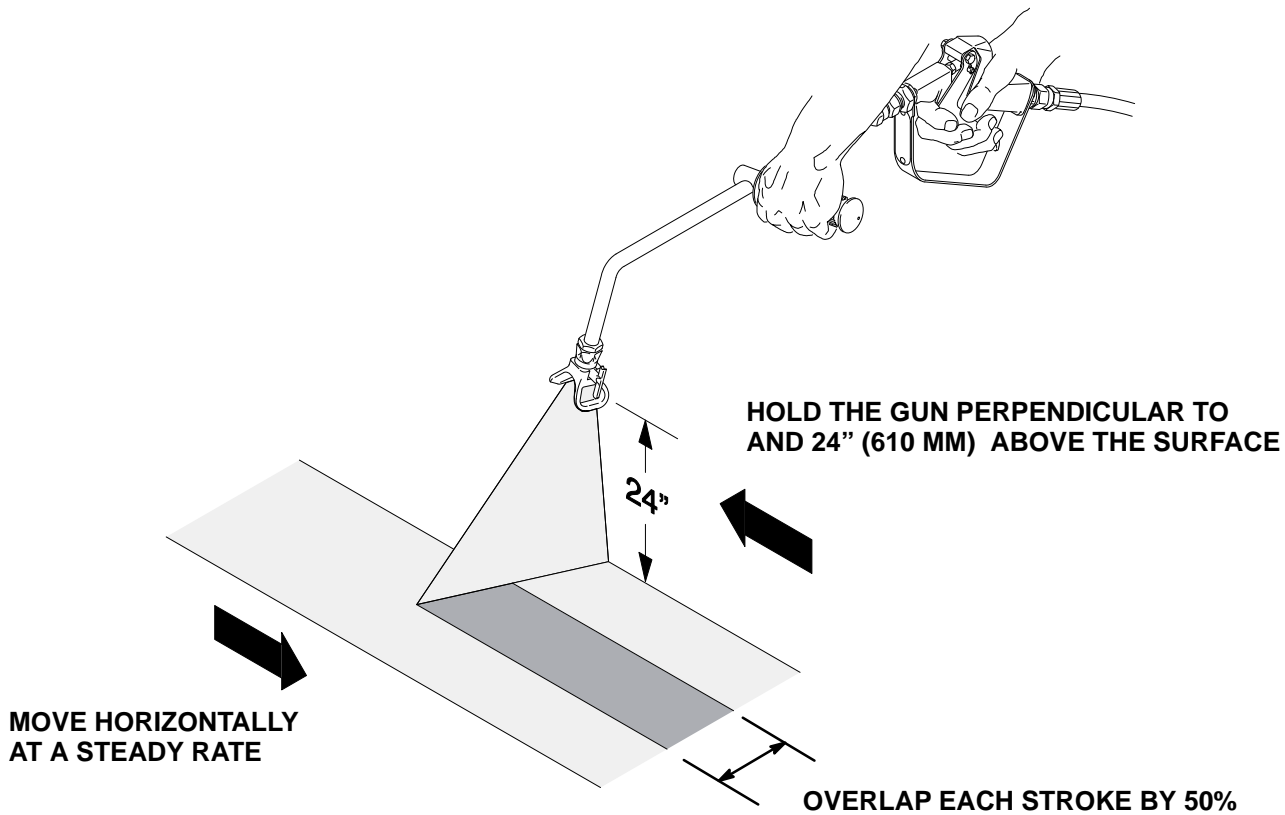


Fig. 12

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Type of Coating ¹	Fibered?	Recommended Tip Size ²
Primers	N/A	0.031 or larger
Aluminum Solvent-Base	No	0.041 or larger
Aluminum Emulsion	No	0.051 or larger
Asphalt Solvent-Base	No	0.051
Asphalt Emulsion	No	0.051
Aluminum Solvent-Base	Yes	0.061
Aluminum Emulsion	Yes	0.061
Asphalt Emulsion	Yes	0.061

Start the spray stroke 24" (610 mm) above 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 material build-up at the end of each stroke.

Do not try to increase coverage by increasing the fluid pressure! Use a slower stroke. Use the lowest pressure necessary to get the results you want; this helps prolong the life of your sprayer and minimizes coating lost by overspray.

If there is a wind, angle the spray pattern into the wind to minimize drifting.

The best way to control the rate of coverage is with the gun tip size. A small tip orifice applies less coating. A larger tip orifice applies more coating. The width of the pattern depends on the fan pattern of the tip you choose.

¹ Roof coatings vary greatly. The formulas, batch, temperature, and age of the coating all affect its viscosity. If the sprayer does not atomize the coating well, thinning and/or agitating it should help. Apply thinned coating more heavily to get an equal dry film thickness. For example, coating that is thinned 10% should be applied about 10% thicker.

² A 0.061 tip is standard with the sprayer.

Maintenance

WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before checking, adjusting, cleaning, or shutting down the sprayer.

CAUTION

For detailed engine maintenance and specifications, refer to the HONDA engine manual.

CAUTION

Close the black fuel shutoff lever whenever you are transporting the sprayer to prevent fuel from flooding the engine.

Keep the sprayer upright and level when operating it and when transporting it. This prevents crankcase oil from leaking into the combustion chamber, which makes startup very difficult.

DAILY: Check the engine oil level and fill as necessary.

DAILY: Check and fill the gas tank.

AFTER THE FIRST 20 HOURS OF OPERATION AND EACH 100 HOURS THEREAFTER: Change the oil.

WEEKLY: Remove the air filter cover and clean the element. In very dusty environments, check the filter daily. Replace the element as needed. Replacement elements can be purchased from your local HONDA dealer.

SPARK PLUG: Use only a (NGK) BP6ES or BPR6ES plug. Gap the plug to 0.025 to 0.030 in. (0.7 to 0.8 mm). Always use a spark plug wrench.

Troubleshooting

WARNING

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

Check everything in the guide before disassembling the sprayer.

Relieve the pressure before disassembling the sprayer.

PROBLEM	CAUSE	SOLUTION
Engine/sprayer won't start	Engine switch not on	Turn on engine switch.
	Out of gas	Refill gas tank.
	Engine oil level low	Try starting engine. If light on rear of engine glows, replenish oil.
	Spark plug cable disconnected or spark plug damaged	Connect cable on top of engine or replace spark plug.
	Adjusting the pressure control knob doesn't start pump	Return pressure control to authorized Graco dealer for repair.
Engine won't "fire" or "pull over"	Oil seepage into combustion chamber	Remove spark plug. Pull starter rope 3 or 4 times. Clean and replace plug. Try to start. Keep sprayer upright to avoid oil seepage.
Engine operates, but displacement pump doesn't <i>Also see manual 308–126.</i>	Pressure control switch turned OFF	Turn on pressure control switch.
	Pressure setting too low	Increase pressure.
	Tip clogged	Clean tip.
	Displacement pump rod seized by dry coating	Service pump. See page 19.
	Connecting rod worn or damaged	Replace connecting rod. See page 22.
	Drive housing worn or damaged	Replace drive housing. See page 23.
	Electrical power not energizing field	Check wiring connections. See page 28. With pressure control switch ON and pressure turned to MAXIMUM, use a test light to check continuity across black and white wires from pressure control. Have pressure control checked by authorized Graco dealer.
	Clutch worn or damaged	Service clutch. See page 26.
	Pinion assembly worn or damaged	Service pinion assembly. See page 24.

PROBLEM	CAUSE	SOLUTION
Engine starts but dies	Oil level drops below oil sensor	Add oil.
Displacement pump output low on upstroke	Siphon hose strainer is clogged	Clean strainer.
	Piston ball check not seating	Service piston ball check. See page 19.
	Piston packings worn or damaged	Replace packings. See page 19.
	Sleeve o-ring in displacement pump worn or damaged	Replace o-ring gasket. See page 19.
Displacement pump output low on downstroke or both strokes	Siphon hose strainer is clogged	Clean strainer.
	Piston packings worn or damaged	Replace packings. See page 19.
	Intake valve ball check not seating properly	Clean and service intake valve. See page 19.
	Clutch worn or damaged	Replace clutch. See page 26.
Coating leaks into wet-cup	Loose wet-cup	Tighten wet-cup just enough to stop leakage.
	Throat packings worn or damaged	Replace packings. See page 19.
	Displacement rod worn or damaged	Replace displacement rod. See page 19.
Low fluid delivery	Siphon hose strainer is clogged.	Clean strainer.
	Pressure setting too low	Increase pressure. See Startup , Step 9, page 11.
	Engine RPM too low	Increase throttle setting. See Startup , Steps 4b and 9, pages 10 and 11.
	Large pressure drop in hose	Use larger diameter hose.
Spitting from gun	Air in fluid pump or hose	Change gasket in siphon hose quick disconnect coupling, if worn or missing. Replace pump cylinder o-ring. Then prime the pump. See Startup , page 10.
	Fluid supply is low or empty	Refill and prime the pump. See Startup , page 10. Check fluid supply often to prevent running the pump dry.

Removing and Installing a Displacement Pump

Removal

⚠ WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before repairing the sprayer.

1. Flush the sprayer. Remove the suction hose, if used.

⚠ WARNING

To reduce the risk of pinching or amputating a finger, keep your fingers away from the area of the connection rod and pin while jogging the engine.

2. Start the engine. Jog the pressure control ON/OFF switch until the connecting link stops near the bottom of the stroke and is fully exposed. See Fig. 13. Shut off the engine.
3. Unscrew the collar of the power supply cord and unplug the cord from the pressure control. See Fig. 14.
4. **Relieve the pressure.**
5. Remove the outlet hose. Slightly loosen the two mounting screws. See Fig. 13.
6. Use a small screwdriver to push in the connecting link pin just until you can gently pry the retaining ring up from the back of the connecting link. Then push the pin in so it falls out the back.

7. Remove the two mounting screws while supporting the weight of the pump with your free hand.

Installation

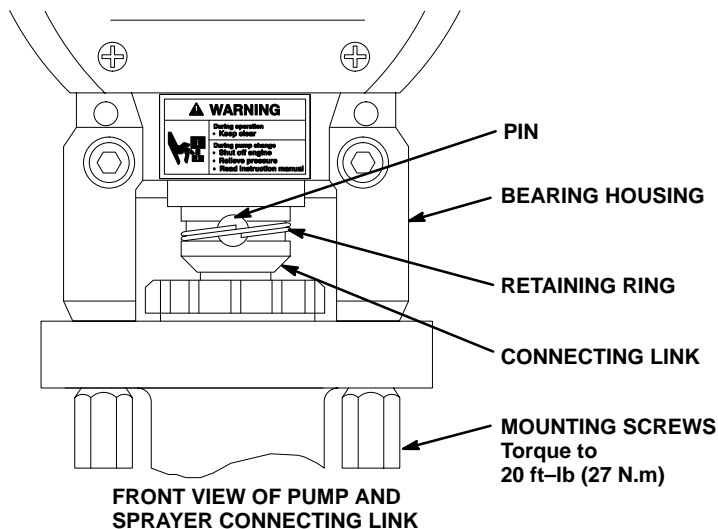
1. Push the pin just barely into the connecting link, but not into the mating hole of the displacement pump.
2. Pull the displacement rod out of the pump 2 to 3 in. (50–75 mm).
3. Align the flats of the pump piston rod and the pump outlet. Lift the pump into position and gently push on the pin while moving the pump slightly until the pin slips into the hole. Be sure the retaining ring snaps down over the end of the pin.

⚠ WARNING

Be sure the retaining spring is firmly in the groove of the connecting link, all the way around, to prevent it from working loose due to vibration. See Fig. 13.

If the pin work loose, it or other parts could break off due to the force of the pumping action and result in serious injury or property damage, including damage to the pump, connecting link or bearing housing.

Procedure continued on page 19.



**CUTAWAY VIEW
SHOWS HOW PIN GOES
THROUGH CONNECTING ROD**

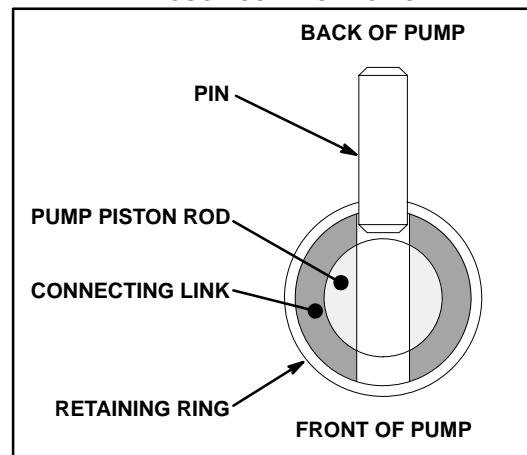


Fig. 13

0407

Removing and Installing A Displacement Pump

4. Check the back of the bearing housing to be sure the parts are installed properly.
5. Lift the pump to align the mounting holes and install the mounting screws. **IMPORTANT** – torque the screws to 20 ft-lb (27 N.m). See Fig. 13.
6. Plug in the power cord so the notch in the collar and the tab in the socket align. Screw on the collar. See Fig. 14.

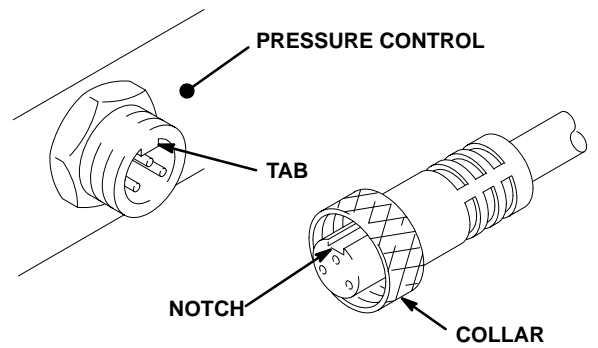


Fig. 14

0408

Displacement Pump

⚠ WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before repairing the sprayer.

Disassemble the pump

- 1 See page 18 for how to remove the pump.
- 2 Use a hard rubber mallet on the tabs of the lug nut (421) to loosen the foot valve housing.
- 3 Disassemble the pump, but do not disassemble the piston rod (401) from the piston housing (416) unless one of those needs to be replaced. Due to the high-strength Loctite® used at the joint of these two parts, the joint must be heated before disassembly. Refer to Fig. 15.

Clean and inspect all parts

- 1 Use a compatible solvent to thoroughly clean all parts and remove all traces of sealant.
2. Inspect the parts, including seats, for nicks and scratches. Replace worn or damaged parts as they cause the packings to wear more quickly and/or result in poor pump performance.

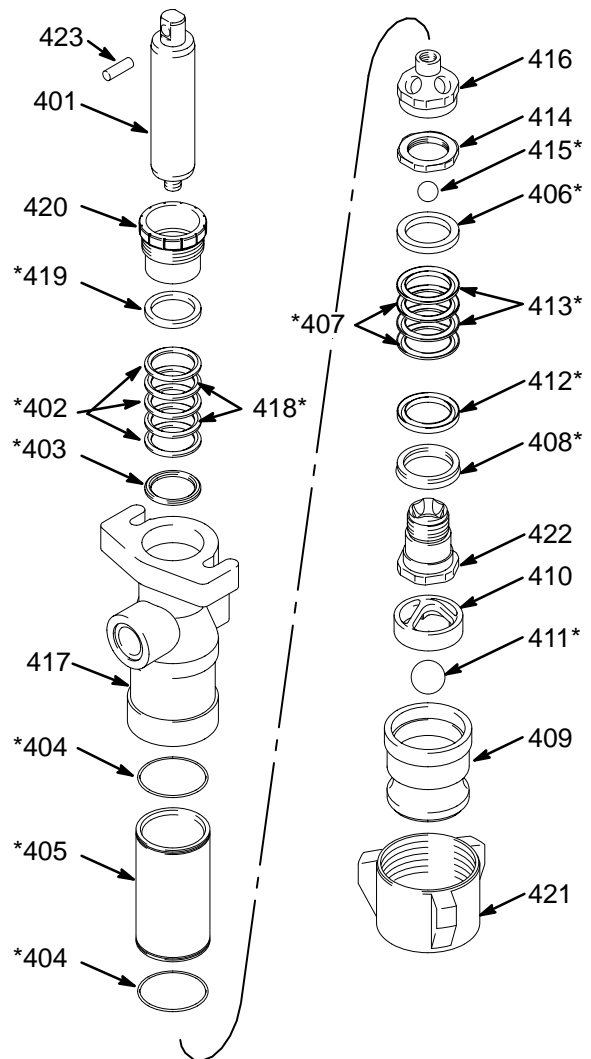


Fig. 15

0412

Continued on page 20.

Displacement Pump

Repair Kit

- 1 A Packing Repair Kit, Part No. 224–523, is available. Use all the parts in the kit for the best results.
- 2 Parts included in the kit are marked with an asterisk in the text and drawings. For example, 408*.

Reassemble the pump

NOTE: Refer to Fig. 13 for reassembly except where noted.

NOTE: Grease all packings and o-rings before installing them.

1. Install the ball guide (409), ball (411*) and intake housing (410) in the lug nut (421).
2. Place new o-rings (404*) on the cylinder (405).
3. On the piston seat (422), install the u-cup seal (408*), lips down. Install the female gland (412*). With the lips of the v-packings facing up, alternately install the leather (407*) and poly packings (413*). Install the male gland (406*).
4. Install the nut (414) on the piston seat (422). Hand tighten the nut very firmly.

NOTE: If you disassembled the piston rod (401) and piston housing (416), clean the threads thoroughly. Apply red Loctite® and torque to 35–50 ft-lb (47–68 N.m).

5. Apply Loctite® green (supplied in the repair kit) to the piston seat (422) threads. Install the ball (415*).

⚠ CAUTION

Before assembling the piston, note that the top of the piston seat (422) has four flutes (B) and that the piston housing (416) has four holes (A). Together these flutes and holes provide the fluid flow path. Failure to align the parts properly, as instructed in Step 6, will result in poor pump performance.

6. Back off the piston housing just until the holes and flutes (B) mentioned in the CAUTION are perfectly aligned, and the tips (B) are not visible when you look through the holes (A). See Fig 20–1. Screw the piston housing (416) down to the nut (414) and torque to 90–125 ft-lb (122–170 N.m).

7. From the top of the pump housing (417), install the male gland (403). With the lips of the v-packings facing down, alternately install the leather packings (418*), and poly packings (402*). Install the female gland (419*).
8. Screw in the packing nut (420) loosely. It will be tightened after the pump is installed and operating.
9. Grease the o-rings on the cylinder (405). Slide the cylinder into the bottom of the pump housing (417).
10. Grease the piston rod (401) and piston packings. Slide the piston rod assembly into the bottom of the cylinder so it extends out of the piston housing 2–3 in. (50–75 mm). Be careful not to damage any packings.
11. Align the holes in the top of the piston rod with the pump outlet.

NOTE: If you push the piston rod too far out of the pump housing, using a hard rubber mallet (ONLY!) to tap it down.

If the piston rod does not extend out far enough, remove the foot valve and tap the piston up.

12. Install the intake valve housing and tighten firmly.
13. Install the pump and prime it. Check the packing nut (20) and tighten it just enough to prevent leakage.

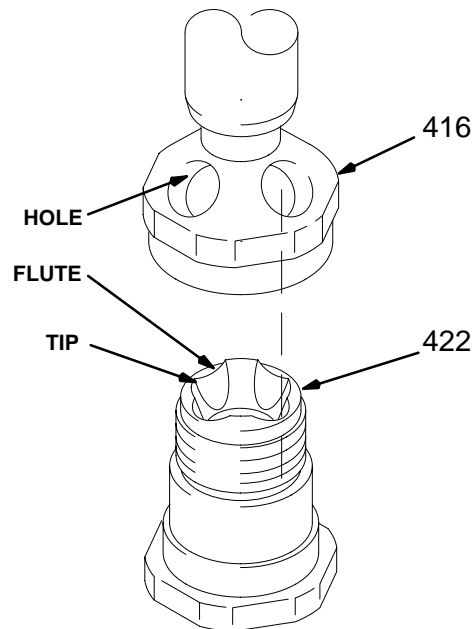


Fig. 16

0552

Displacement Pump

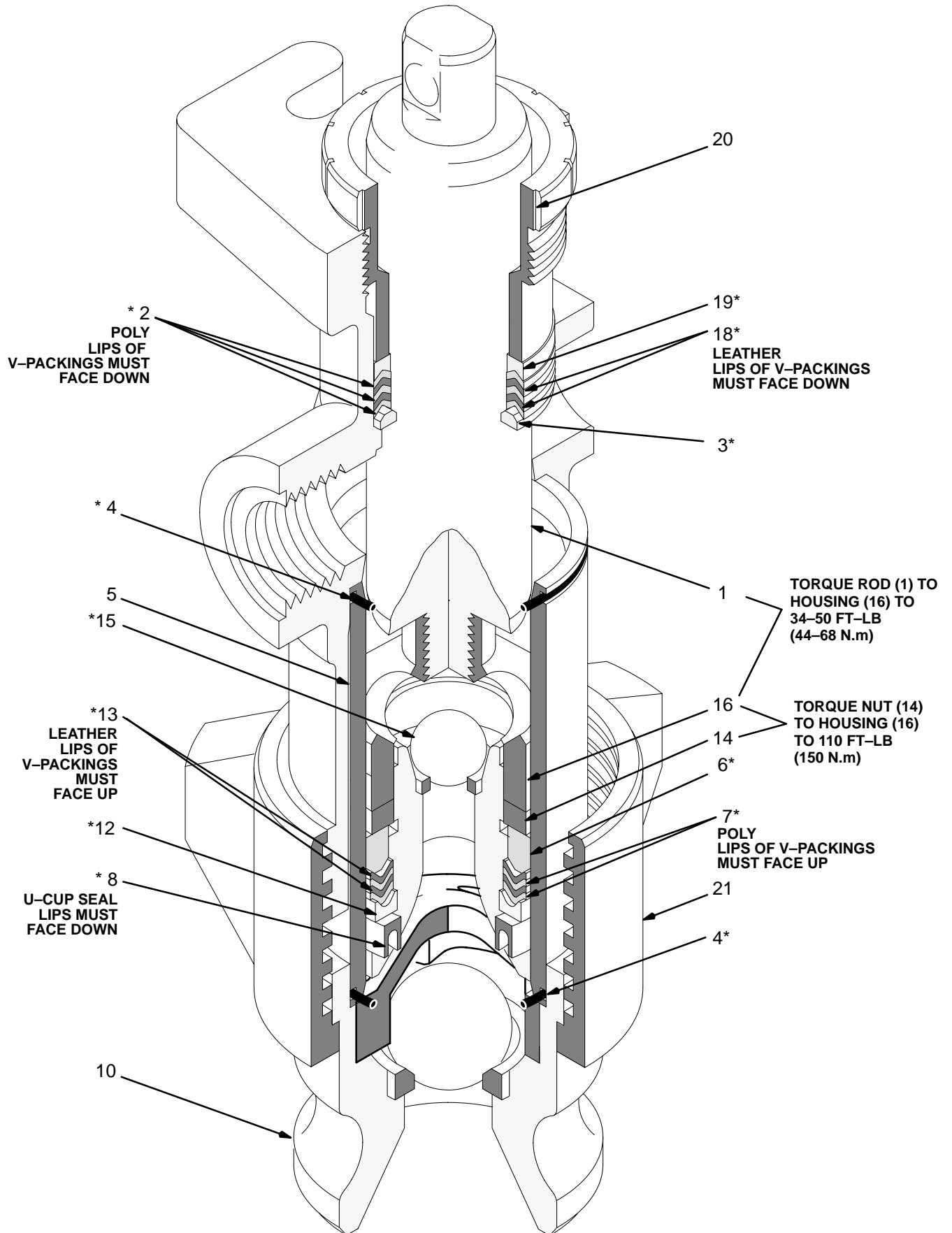


Fig. 17

Bearing Housing and Connecting Rod

⚠ WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before repairing the sprayer.

NOTE: Steps 1 to 10 refer to Fig. 18.

1. Refer to **Removing the pump** on page 18.
2. Remove the screws (48) and lockwashers (49) from the bearing housing (23).
3. While pulling the connecting rod assembly (22) with one hand, lightly tap the lower rear of the bearing housing (23) with a plastic mallet to loosen it from the drive housing (20). Pull the bearing housing and the connecting rod assembly off the drive housing.
4. Inspect the crank (A) for excessive wear and replace the drive housing. See page 23.
5. Evenly lubricate the inside of the bronze bearing (C) in the bearing housing (23), and the inside of the connecting rod link (D), with high-quality motor oil (do not use grease). Liberally pack the roller bearing (E) in the connecting rod assembly (22) with bearing grease (20d), supplied.
6. Assemble the connecting rod (22) and bearing housing (23).
7. Clean the mating surfaces of the bearing (23) and drive (20) housings.
8. Align the connecting rod with the crank (A) and carefully align the locating pins (B) in the drive housing (20) with the holes in the bearing housing (23). Push the bearing housing onto the drive housing or tap it into place with a plastic mallet.

⚠ CAUTION

DO NOT use the bearing housing screws (48) to align or seat it with the drive housing. These parts must be aligned using the locating pins (B), to help avoid premature bearing wear.

9. Install the screws (48) and lockwashers (49) on the bearing housing. Tighten the screws evenly to 25 ft-lb (34 N.m).
10. Refer to **Installing the pump** on page 18.

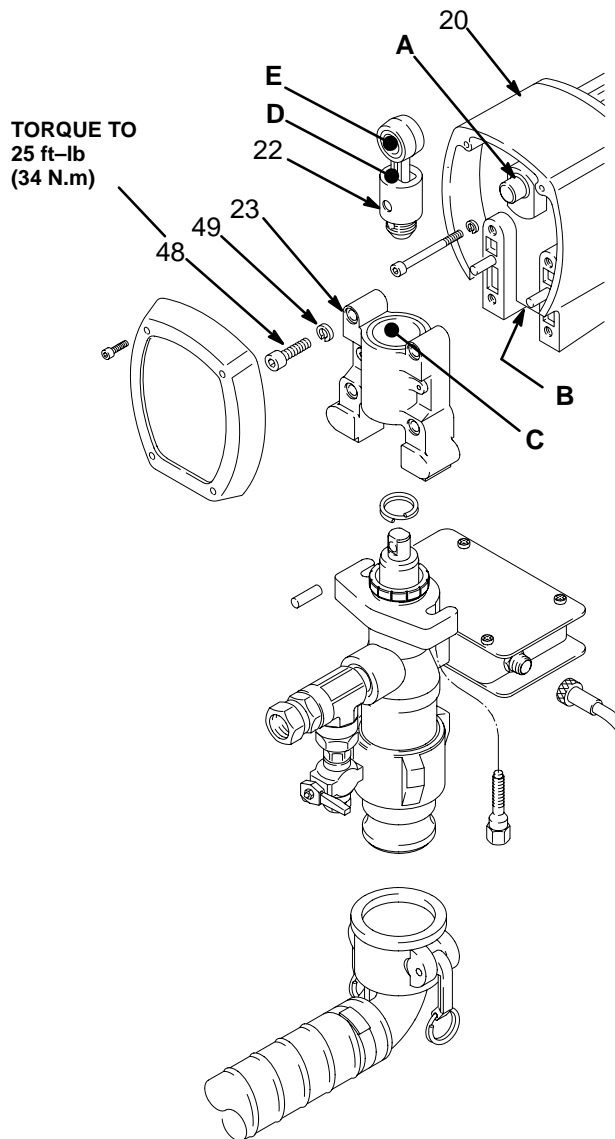


Fig. 18

0400

Drive Housing

⚠ WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before repairing the sprayer.

NOTE: Refer to Fig. 19 for this procedure.

1. Disconnect the suction hose (A). Disconnect the pressure control cord (62). Remove the front cover (21).
2. Disconnect the pump outlet hose.
3. Remove the four screws (48) and lockwashers (49) from the bearing housing (23).
4. Lightly tap the back of the bearing housing (23) with a plastic mallet. Pull the pump, bearing housing and connecting rod away from the drive housing (20) as one assembly.
5. Remove the bearing housing screws (41) and the pinion housing screws (3).
6. Lightly tap around the drive housing (20) with a plastic mallet to loosen it from the pinion housing (19p).

⚠ CAUTION

Do not drop the gear cluster (1) when removing the drive housing (20). The gear cluster is easily damaged. The gear may stay engaged in either the drive housing or the pinion housing.

Do not lose the thrust balls (20c and 19k) located at each end of the gear cluster. The balls, which are heavily covered with grease, usually stay in the shaft recesses, but they could be dislodged. If they are caught between the gears and not removed, the balls will seriously damage the drive housing. If the balls are not in place, the bearings will wear prematurely.

7. Liberally apply bearing grease (20d, supplied) to the gear cluster (1). Be sure the thrust balls (20c and 19k) 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. Reassemble the sprayer. Or, go to the next section in this manual if further service is needed.

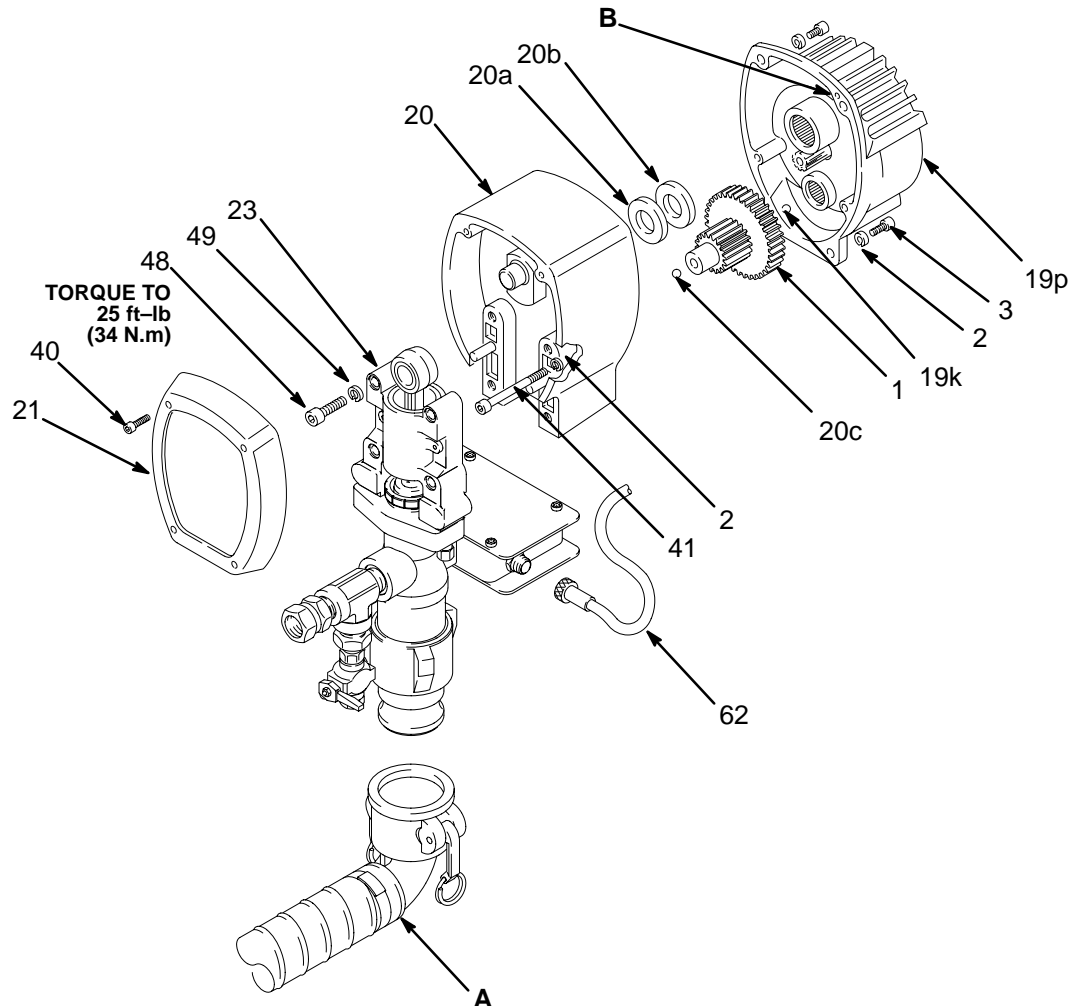


Fig. 19

Pinion, Clutch, Clamp, Field, and Engine

Disassembling 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 23, and then continue with the procedure below.

If starting from the clutch, see page .

Pinion Housing

Removing the Pinion Housing

⚠ WARNING

To reduce the risk of serious injury, always follow the **Pressure Relief Procedure** on page 8 before repairing the sprayer.

NOTE: Refer to Fig. 20 for Steps 1 to 3.

- 1 Remove the two bottom screws (3) first, and then remove the top three screws (3).
- 2 Pull the pinion housing (19p) away from the clutch housing (17). The armature (9b) will come with it.

- 3 Pull the armature (9b) off the hub (19j – see Fig. 21) of the pinion housing.

⚠ CAUTION

Do not lose the thrust ball (19k). Refer to the **CAUTION** on page 23 for more information.

NOTE: To disassemble the pinion, go to **Repairing the Pinion**, page 25. To disassemble more of the sprayer, go to page 27. To reassemble the sprayer from this point, go to **Reassembly**, page 31, Step 7.

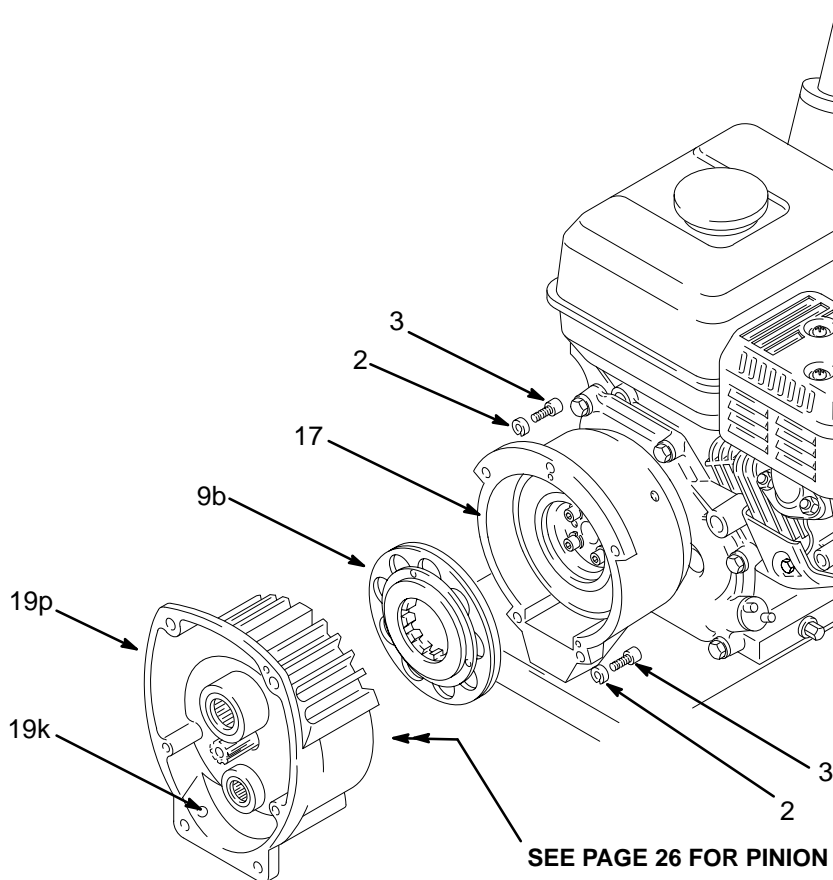


Fig. 20

0171

Pinion Housing

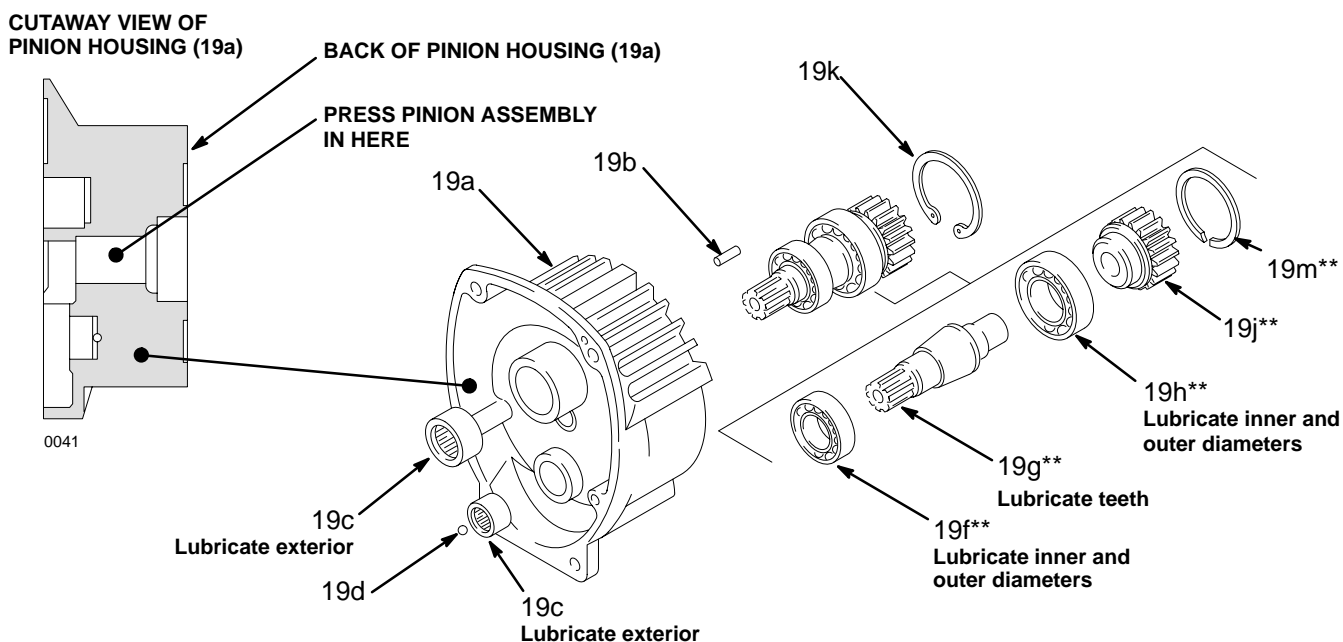


Fig. 21

**Included in Repair Kit 221-032

0169

Repairing the Pinion

NOTE: Refer to Fig. 21 except where noted.

NOTE: A hydraulic press is required if you purchase the pinion parts individually. Otherwise, use Repair Kit No. 221-032, which includes the shaft and bearings pre-assembled and lubricated.

If using Repair Kit 221-032, follow Steps 1 to 5, below.

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).
3. Install the new shaft assembly into the pinion housing, pushing it to the shoulder of the housing (19a).
4. Install the rings (19k and 19m**).
5. Go to **Reassembly**, page 31, Step 7, or continue on page 26.

If purchasing parts separately, use these instructions. Disassemble as far as needed for the parts being replaced.

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 (19h) and hub (19j) 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. Then turn over the shaft and press out the small bearing (19f). See Fig. 22.
5. Apply lubricant to the parts as shown in Fig. 21.
6. 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).
7. Install the shaft assembly, pushing it to the shoulder of the housing (19a).
8. Install the snap ring (19k). Install the small ring (19m).
9. Go to **Reassembly**, page 31, Step 7, or continue on page 26.

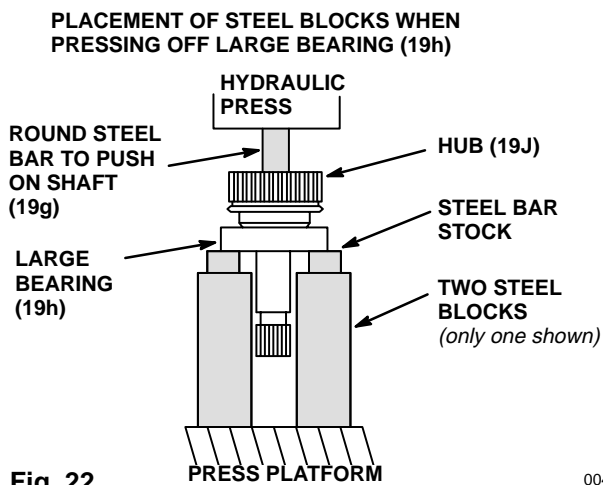


Fig. 22

0043

Clutch

NOTE: The clutch assembly (9) includes the armature (9b) and rotor (9a). 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, follow Steps 1 to 4. Otherwise, start at Step 5.

1. **Relieve the pressure.**
2. Disconnect the hose from the displacement pump. Disconnect the cord set (62) from the pressure control.
3. Remove the bottom two screws (3) from the clutch housing (17) and then remove the remaining three screws (3).
4. Tap lightly on the back of the bearing housing (23) with a plastic mallet to loosen the assembly (D) from the clutch housing (17). Pull the assembly away; the armature (9b) will come with it.

5. Remove the armature from the pinion.
6. There are two ways to remove the rotor (9a):
 - a. Remove the capscrews (4) and lockwashers (2). Install two of the screws in the threaded holes in the rotor (9a). Alternately tighten the screws until the rotor comes off. See Fig. 23.
 - b. Use a standard steering wheel puller (A) with two 1/4-28 x 3 or 4 in. long screws (B). Replace the short screws of the steering wheel puller with the longer screws. Turn the screws (B) into the threaded holes of the rotor (9a). Tighten the cap-screw (C) of the tool until the rotor comes off. See Detail in Fig. 23.
7. Skip ahead to **Reassembly**, page 31, Step 6, or continue on page 27.

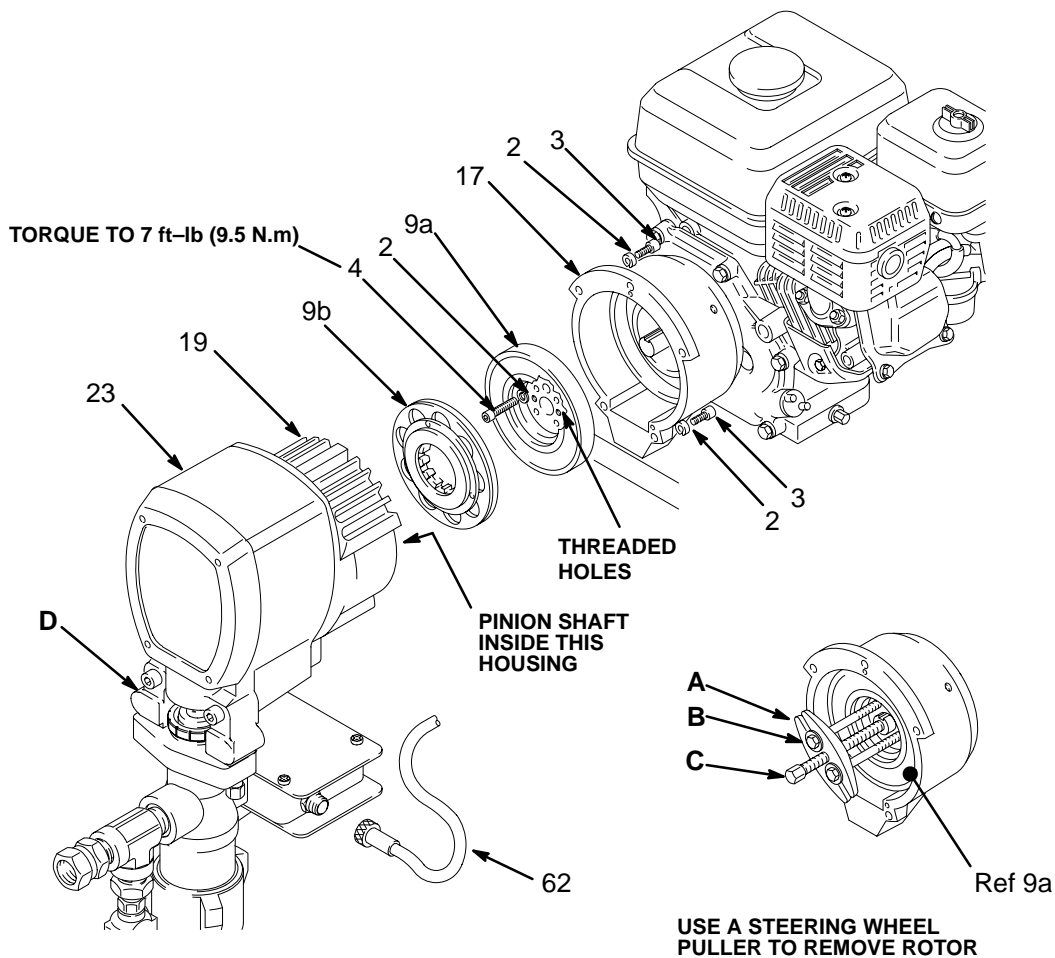


Fig. 23

0402

Engine

- 1 Working under the mounting plate (A) of the cart, remove the screw (5), lockwasher (6) and washer (7). See Fig. 24.
- 2 Remove the engine-mounting locknuts (43) and screws (42). Disconnect the mating black, white and green wires. Pull the wires carefully through the grommets (8) before removing the engine. See Fig. 24 and 25.
- 3 Lift the engine carefully and place it on a work bench.
- 4 Remove the **Field and Wiring Harness, Clamp** and **Clutch Housing**, as instructed on pages 28 and 29.
- 5 Go to **Reassembly**, page 30, Step 1.

NOTE: All service to the engine must be performed by an authorized HONDA dealer.

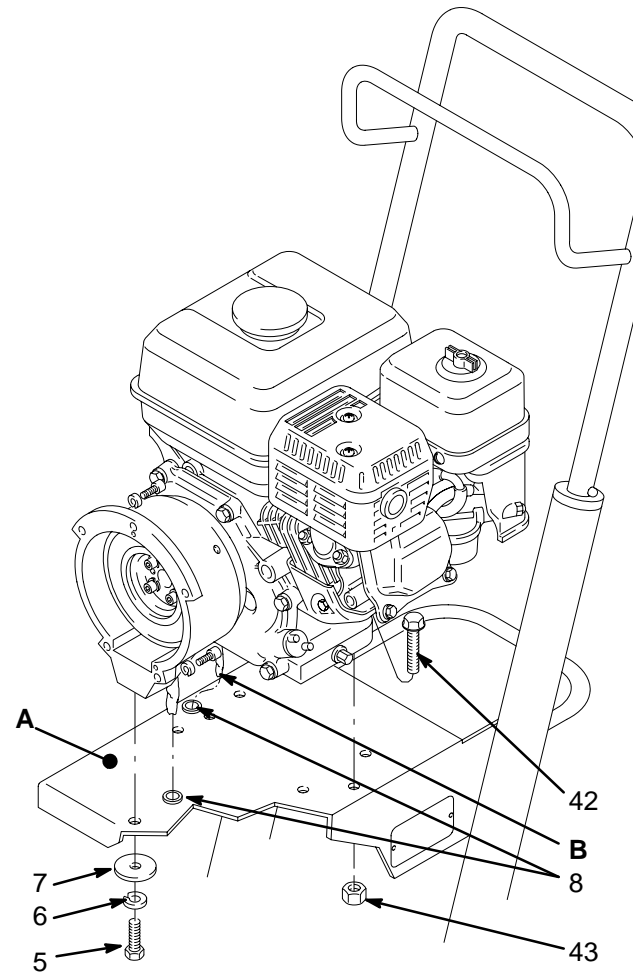


Fig. 24

0153

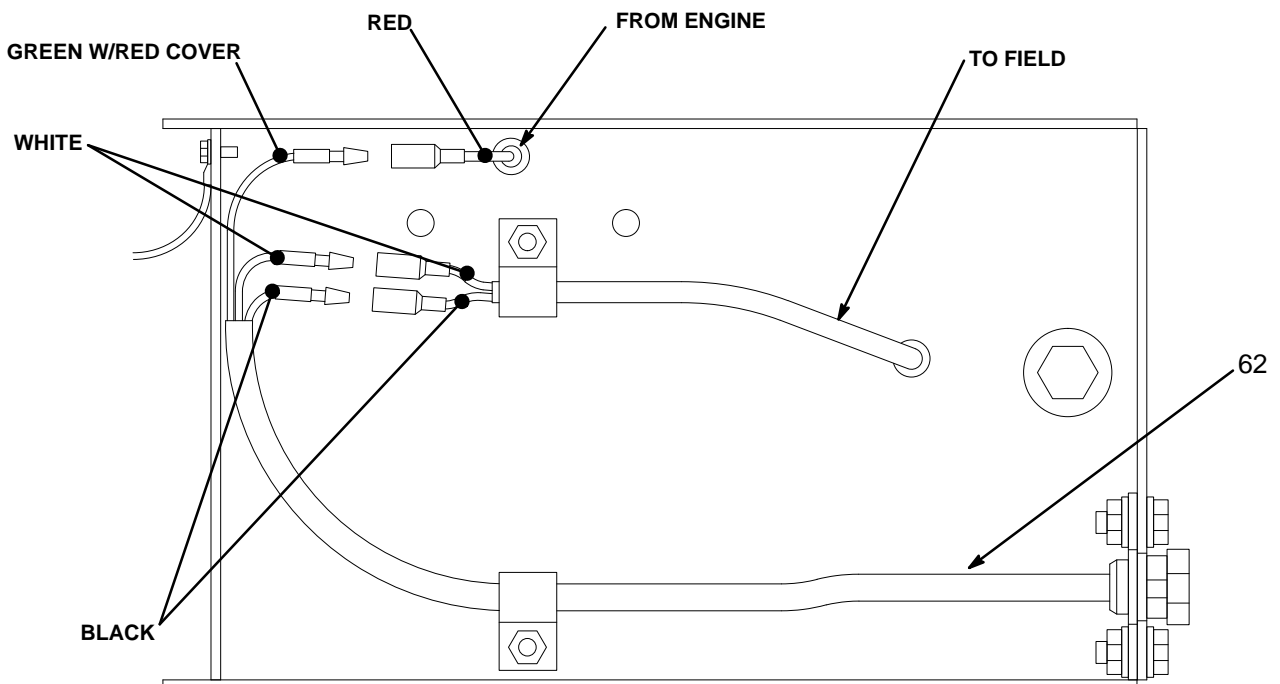


Fig. 25

VIEW FROM UNDER ENGINE MOUNTING PLATE

0405

Field and Wiring Harness

NOTE: Refer to Fig. 26.

- 1 Remove the engine. See page 27.
- 2 Loosen the setscrews (16). Unplug the wiring harness (69) from under the engine mounting plate. Pull the field out to expose the black and white wires.
- 3 Pull the caps (A) off the wire screws (57) in both places on the field. Loosen the screws and release the wires of the harness (69).
- 4 Go to **Reassembly**, page 30, Step 4.

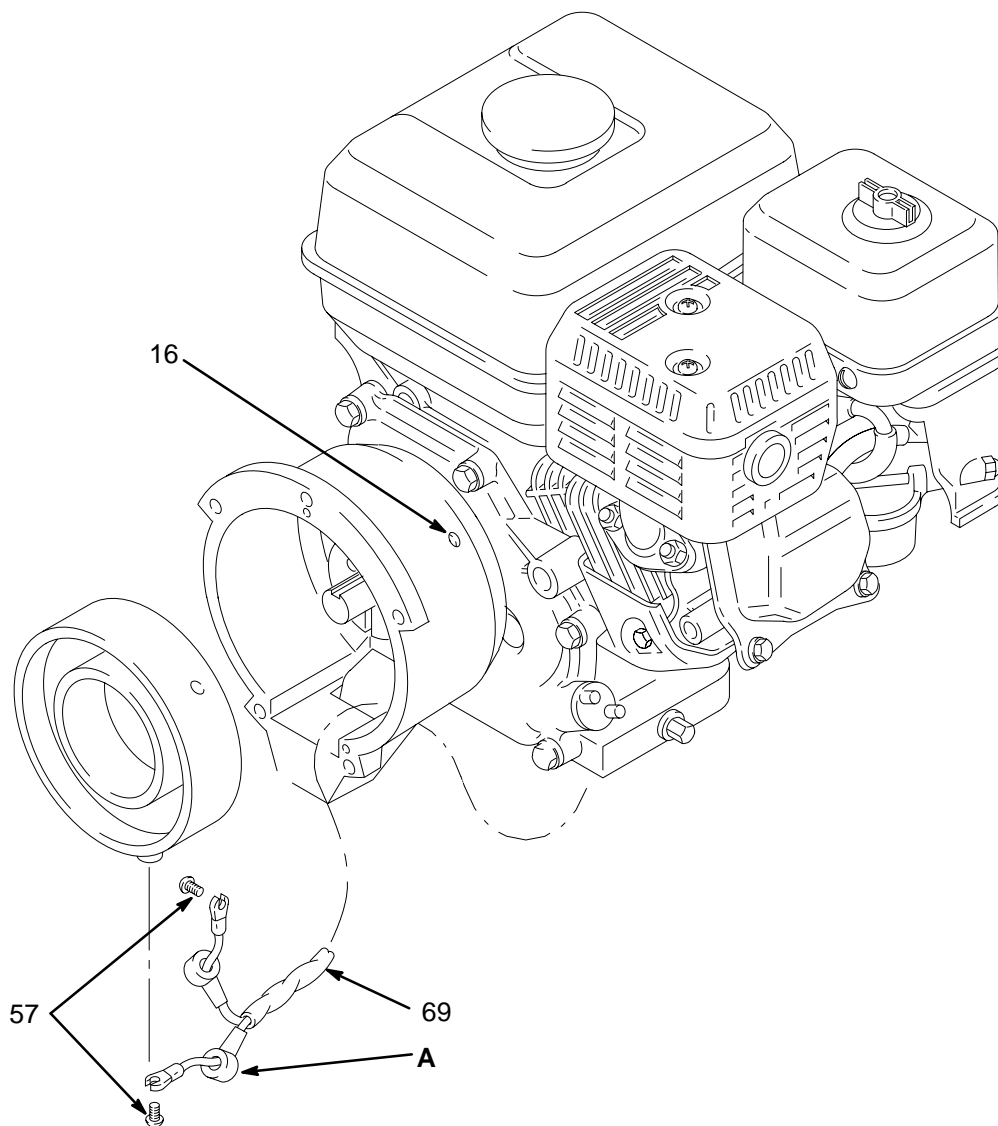


Fig. 26

0046

Clamp

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

NOTE: Refer to Fig. 27.

- 1 Loosen the two screws (4) on the clamp (15), working through the slot at the bottom of the clutch housing (17).
- 2 Install two screws (B) of the tool (A) in two of the threaded holes in the clamp. Tighten the screw (C) until the clamp comes off.
- 3 Go to **Reassembly**, page 30, Step 3, or continue below.

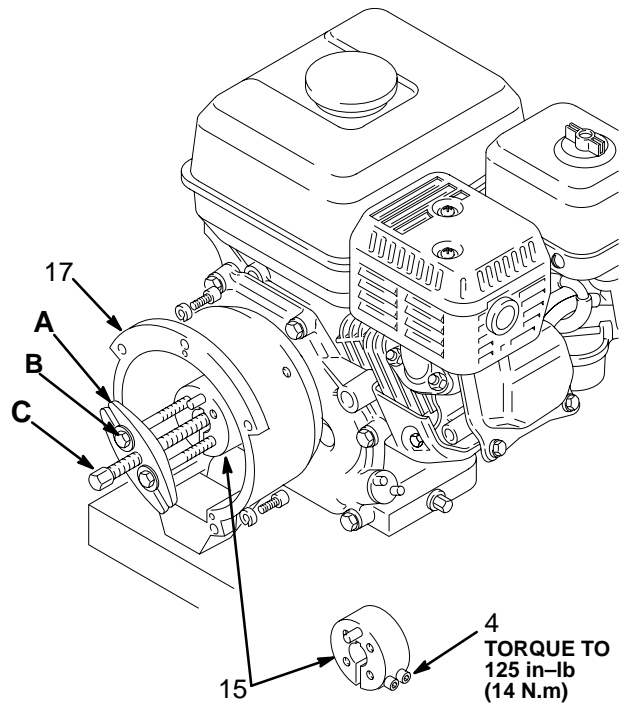


Fig. 27

0155

Clutch Housing

NOTE: Refer to Fig 29–2.

- 1 Remove the capscrews (11) and lockwashers (12) which hold the clutch housing (17) to the engine (45).
- 2 Remove the engine key (14).
- 3 Pull off the clutch housing (17).
- 4 Go to **Reassembly**, page 30, Step 1.

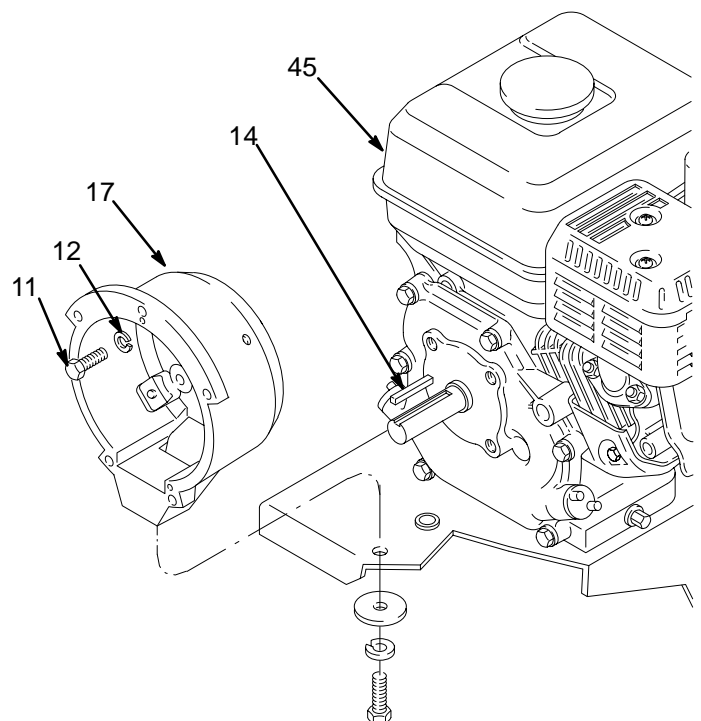


Fig. 28

0156

Reassembly

1. Install the **clutch housing (17)**, capscrews (11) and lockwashers (12) on the engine. See Fig. 29.
2. Install the engine shaft **key (14)**. See Fig. 29.
3. Install the **clamp (15)** onto the engine shaft (A). Maintain the 1.99 in. \pm 0.01 (50.54 mm) dimension shown in Fig. 30.

To check the dimension, place a rigid, straight steel bar (B) across the face of the clutch housing (17). Use an accurate measuring device to measure the distance between the inside of the bar and the face of the clamp. Adjust the clamp as necessary. Torque the two screws (4) to 125 in-lb (14 N.m).

4. Connect the wires of the harness (69) to the screws (57) in both places on the field. Pull the plastic caps (C) up and snap them over the screws. Guide the wires of the harness (69) through the slot in the clutch housing. Slide the **field (10)** into the clutch. Align the setscrew chamfers in the field and the clutch housing (17). Tighten the setscrews (16) oppositely and evenly, to 25 in-lb (2.8 N.m). See Fig. 29.

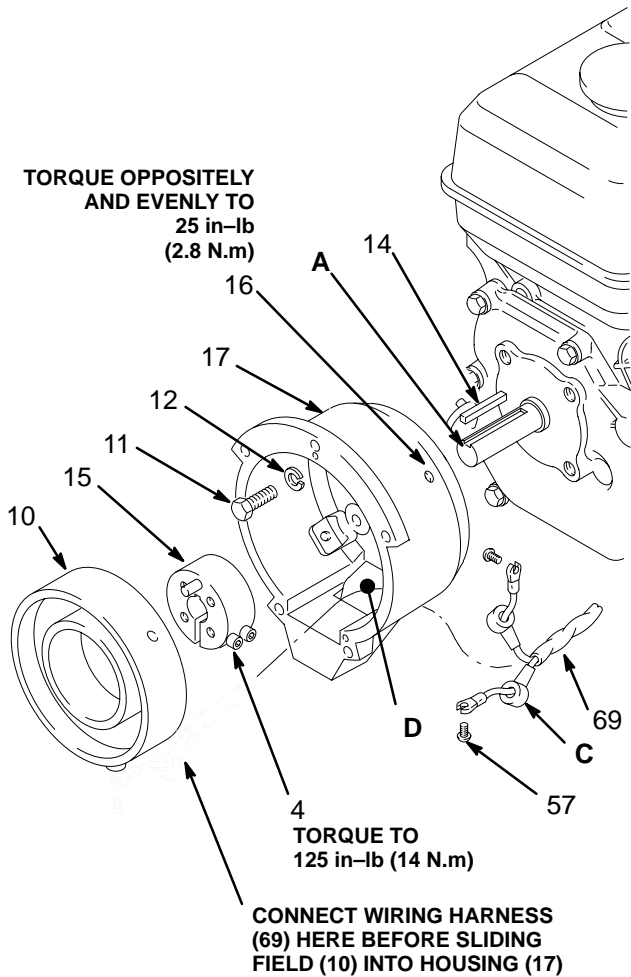
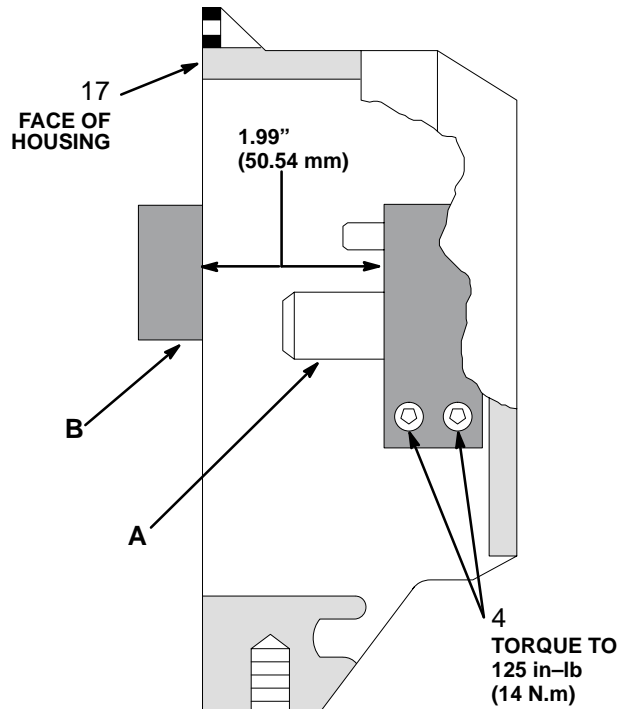


Fig. 29

0049



SIDE CUTAWAY VIEW OF CLUTCH HOUSING

Fig. 30

0050

Reassembly

NOTE: Refer to Fig. 31 for Steps 5–9.

- Place the **engine (45)** on the cart. Align the mounting holes. Guide the engine wire (A) and wiring harness (69) through the mounting plate grommets (8). Install the screws (42) and nuts (43) and torque to 15 ft–lb (20 N.m). Install the capscrews (5), lockwashers (6) and washer (7) from under the engine mounting plate to secure the clutch housing (17). Connect the like-colored wires as shown in the Detail A.
- Be sure the face of the **rotor (9a)** and the field (10) is free of all oil and contaminants. Install the rotor, lockwashers (2) and capscrews (4). Torque the capscrews to 7 ft–lb (9.5 N.m).

After installing the rotor (9a), pull the engine recoil rope to assure that the engine turns freely and there is no friction between the rotor (9a) and the field (10). If there is friction, loosen the setscrews (16) and reposition the field (10) as necessary. Tighten the setscrews oppositely and evenly to 25 in–lb (2.8 N.m). Also make sure there are no burrs on the outside edge of the rotor.

- Be sure the face of the **armature (9b)** is clean. Assemble the armature to the shaft in the pinion housing (C). A retaining ring located within the armature makes it difficult to assemble these parts. For the best results, first engage a few splines of both parts, then use a screwdriver to gently push the retaining ring into the armature, and then engage the remaining splines. Push the armature onto the shaft until it contacts the ring.
- Assemble the **drive/pinion housing (C)** to the clutch housing, using the capscrews (3) and lockwashers (2).
- Connect the cord set (62) to the pressure control.

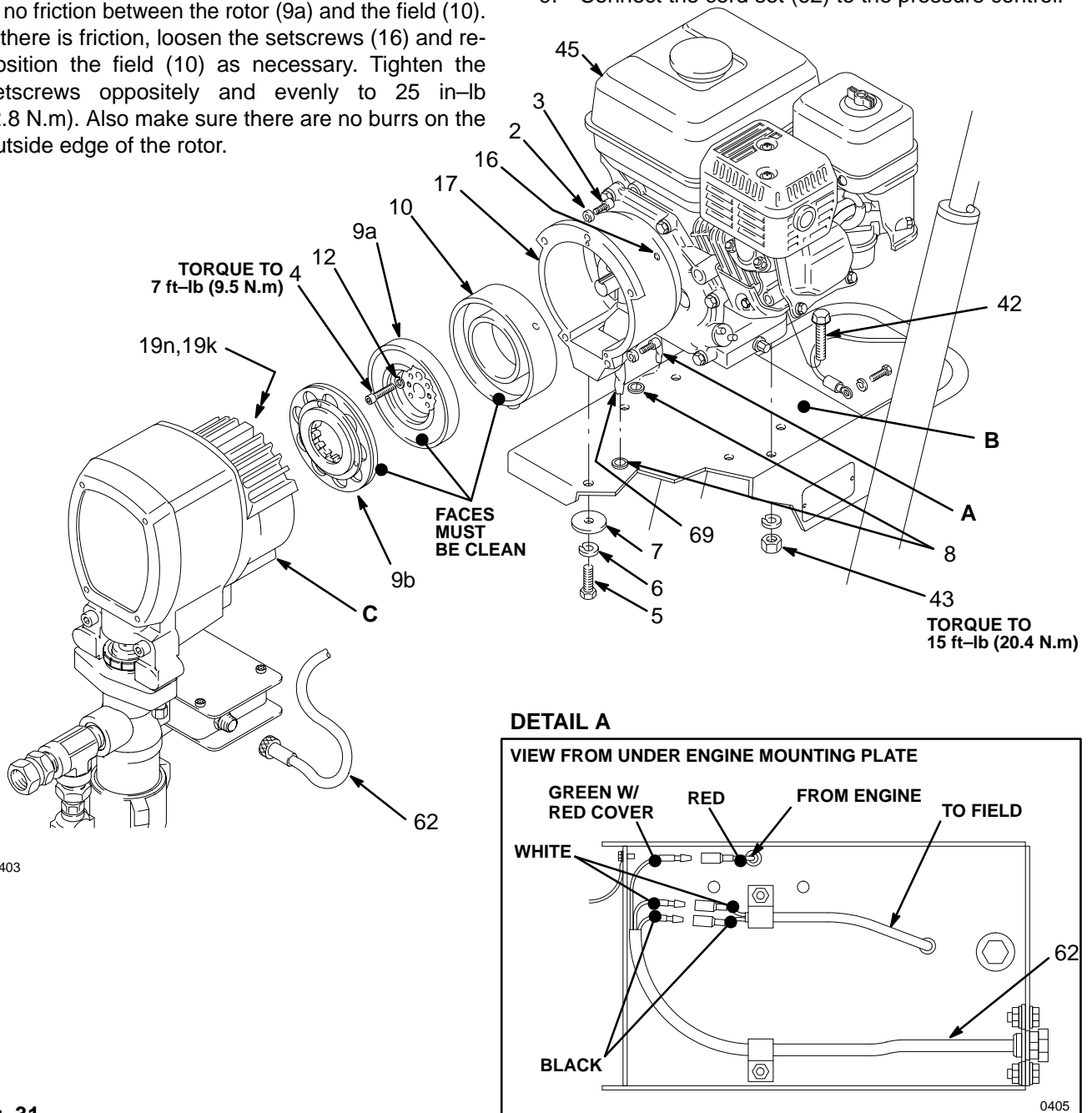


Fig. 31

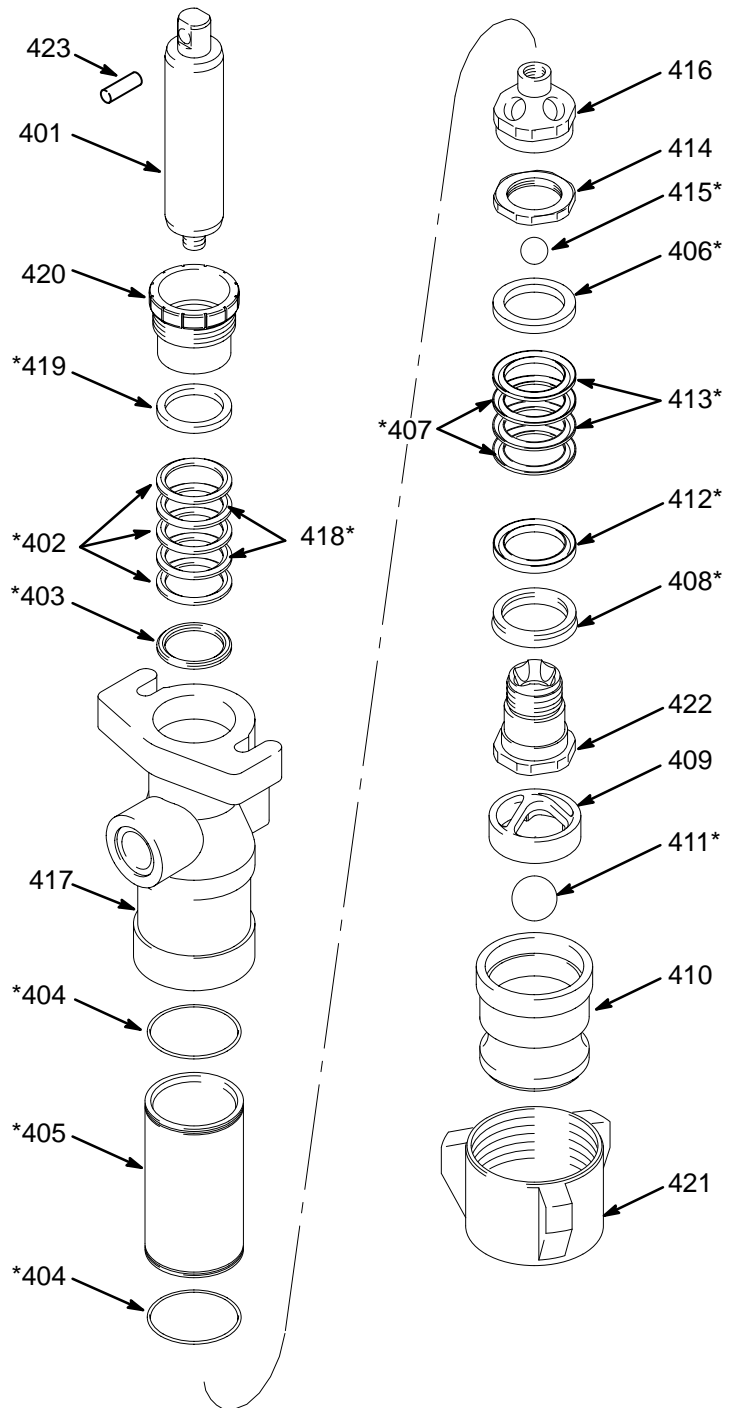
Parts – Displacement Pump

Model 224–527, Series A

Includes items 401–423

Ref No.	Part No.	Description	Qty
401	187-067	ROD, piston	1
402	187-071*	V-PACKING, poly	3
403	187-069*	GLAND, male, steel	1
404	111-486*	O-RING	2
405	187-066	CYLINDER	1
406	187-074*	GLAND, male	1
407	187-072*	V-PACKING, poly	2
408	187-102*	U-CUP SEAL	1
409	187-064	GUIDE, ball	1
410	224-407	HOUSING, pump intake	1
411	102-973*	BALL, intake	1
412	187-073*	GLAND, female	1
413	187-078*	V-PACKING, leather	2
414	187-077	NUT, 1-1/4-18	1
415	101-859*	BALL, piston	1
416	187-076	HOUSING, piston	1
417	186-951	HOUSING, outlet	1
418	187-079*	V-PACKING, leather	2
419	187-070*	GLAND, female	1
420	187-068	PACKING NUT	1
421	187-065	LUG NUT	1
422	224-408	PISTON SEAT	1
423	183-210	PIN	1

*These parts also included in
Packing Repair Kit 224–523.
 Keep a kit on hand to reduce down time.



0412

Parts – Pinion Assembly

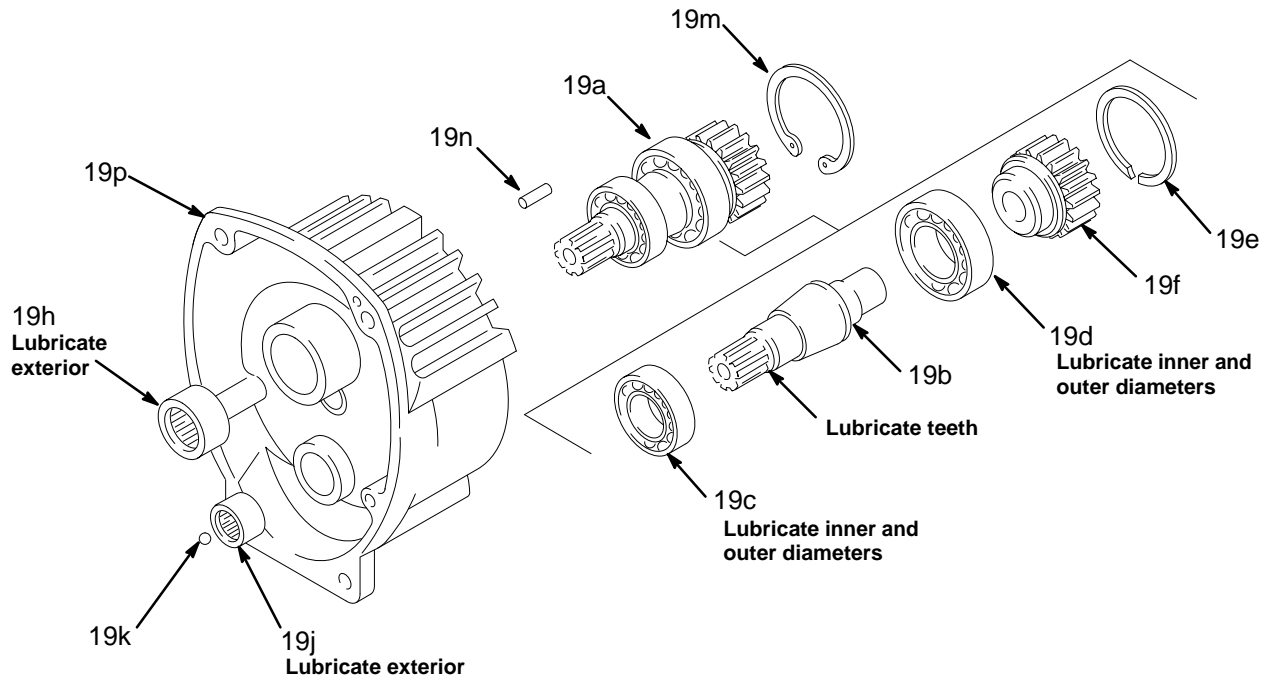
Ref No. 19

Pinion Housing

Includes items 19a to 19f

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
19a	221-032	PINION SHAFT ASSEMBLY Includes items 19b to 19f	1	19h	108-692	BEARING, needle, roller	1
19b	183-395	.SHAFT, pinion	1	19j	107-088	BEARING, needle, needle	1
19c	108-797	.BEARING, ball	1	19k	100-069	BALL, sst	1
19d	108-798	.BEARING, ball	1	19m	108-799	RING, retaining, internal	1
19e	108-796	.RING, retaining, external	1	19n	105-489	PIN, dowel	2
19f	183-396	.HUB, armature	1	19p	183-394	HOUSING, pinion	1

NOTE: Items 19h to 19p are not included in a kit. Order them separately as needed.



0042

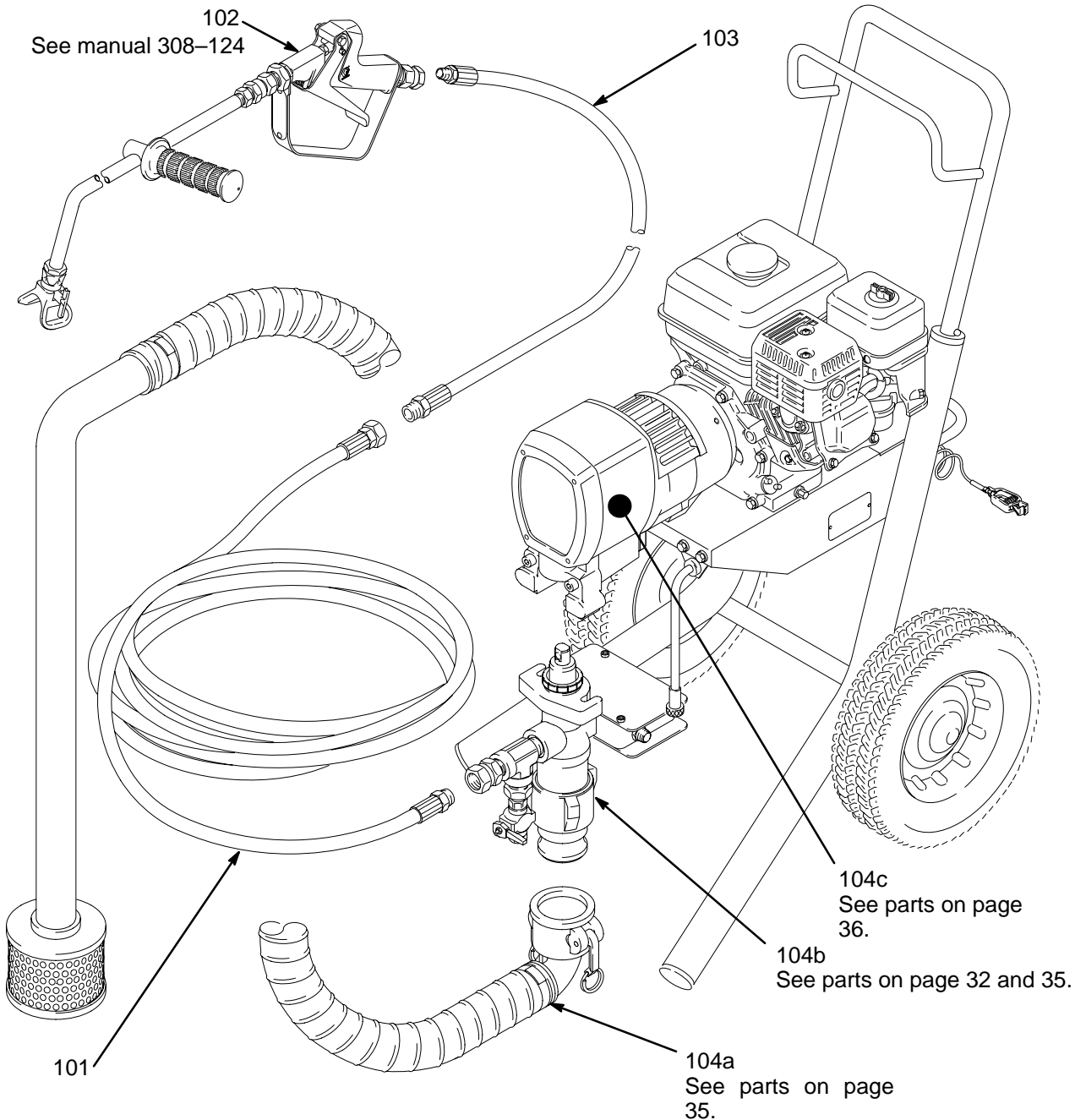
Parts – Complete Sprayer

COMPLETE SPRAYER

Model 231-148

Includes items 101 to 104

Ref No.	Part No.	Description	Qty	Ref No.	Part No.	Description	Qty
101	224-439	HOSE, coupled 3/4 npt(m) x 3/4 nspm(f) swivel, 3/4" ID, 50 ft (15 m) long	1	104	224-483	BASIC SPRAYER <i>Includes items 104a – 104c</i>	1
102	224-472	MASTIC FLOW VALVE <i>See manual 308-124 for parts</i>	1	104a	224-442	. 55 GALLON SUCTION KIT <i>See parts on page 35</i>	1
103	224-440	HOSE, coupled 3/4 npt x 1/2 npt (mbe), 5/8" ID, 40 ft. (12 m) long	1	104b	224-528	. ROOFING PUMP and PRESSURE CONTROL KIT <i>See parts on page 35</i>	1
				104c	224-482	. SPRAYER DRIVE ASSEMBLY <i>See parts on page 36</i>	1



Parts – Suction Kit and Roofing Pump

SUCTION KIT

Model 224-442

Includes items 301 to 306

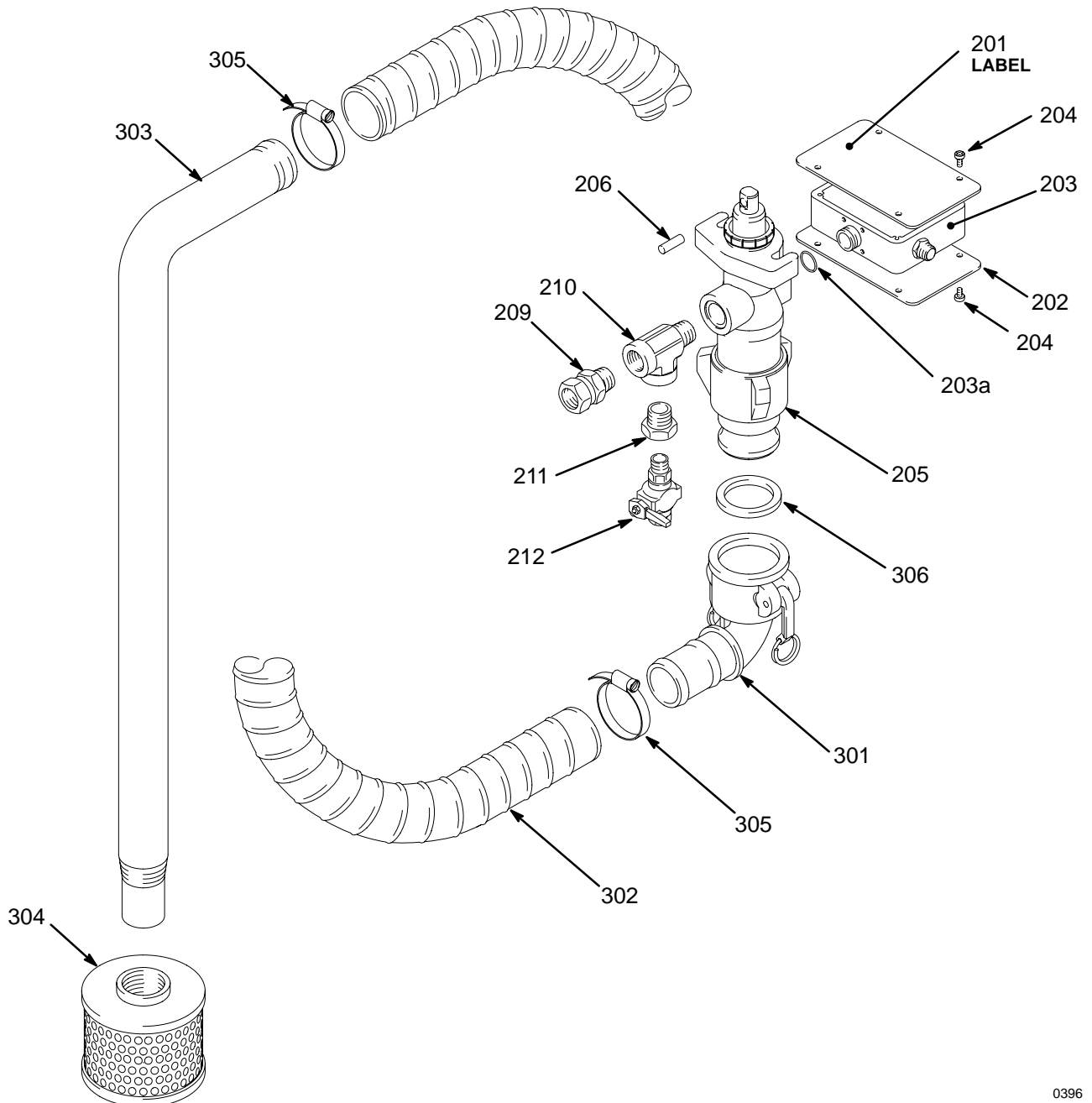
Ref No.	Part No.	Description	Qty
301	111-338	COUPLER, 90°, quick disconnect	1
302	187-123	HOSE, 2" ID	1
303	187-131	SUCTION TUBE	1
304	187-119	STRAINER	1
305	-	CLAMP (clamp supplied with sprayer requires special tool; use radiator clamp as alternative)	2
306	111-340	GASKET	1

ROOFING PUMP AND PRESSURE CONTROL KIT

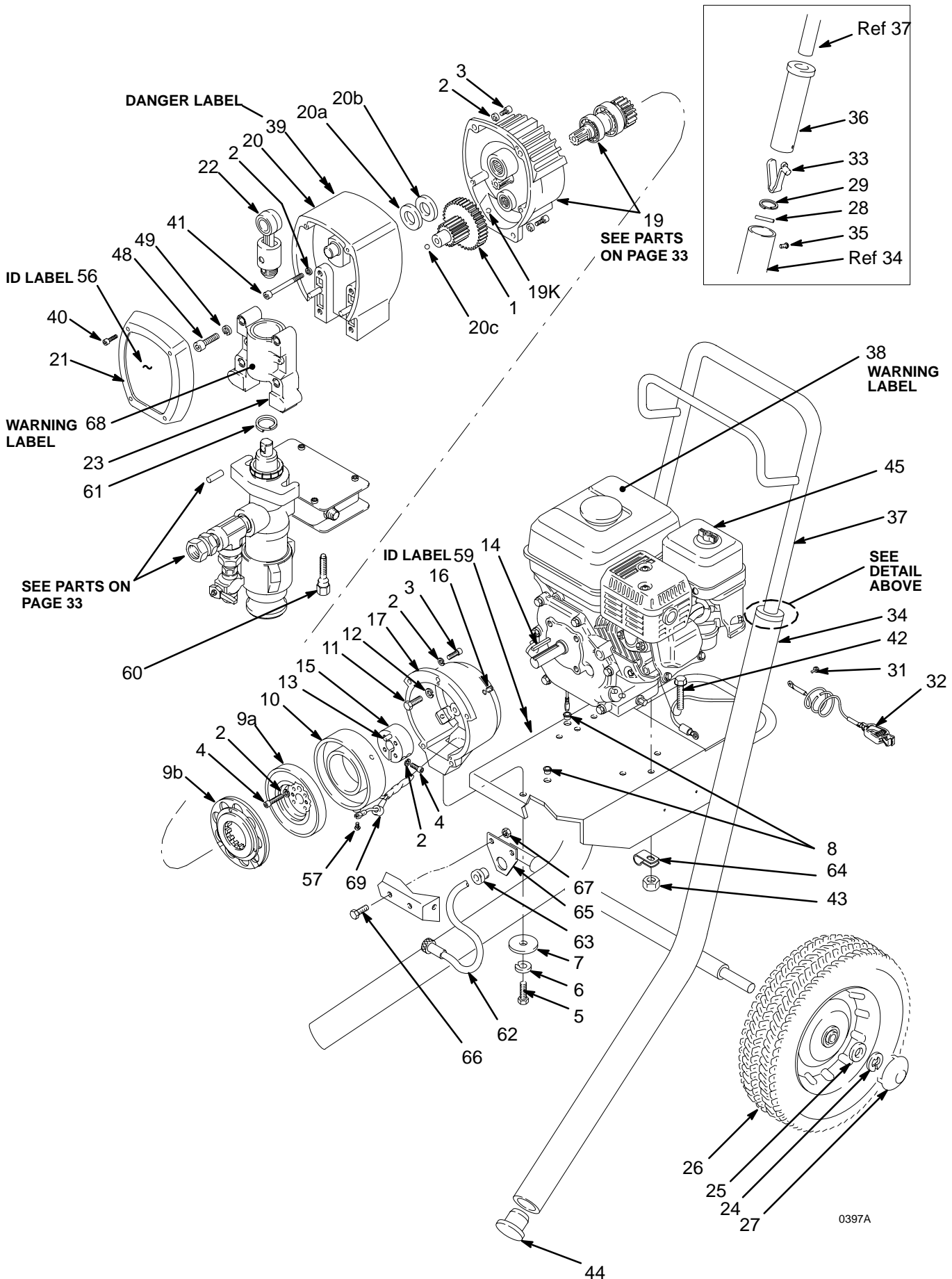
Model 224-528

Includes items 201 to 212

Ref No.	Part No.	Description	Qty
201	187-181	LABEL, ON/OFF & PRES. ADJ.	1
202	187-184	COVER PLATE	2
203	224-711	PRESSURE CONTROL, 1200 PSI <i>Includes replaceable part 203a</i>	1
203a	155-463	O-RING	1
204	110-885	SCREW, mach, pnh, 10-24 x 3/8"	8
205	224-527	ROOFING PUMP, 3 GPM <i>See parts on page 32</i>	1
206	183-210	PIN, straight	1
209	157-785	UNION, swivel, 3/4 npt(m) x 3/4 npsm(f)	1
210	111-337	TEE, 3/4 npt(m) X 3/4 npt(f) x 3/4 npt(f)	1
211	100-505	BUSHING, 3/4 npt(m) x 3/8 npt(f)	1
212	224-441	BALL VALVE <i>See 306-861 for parts</i>	1



Parts – Drive



0397A

Parts – Drive

SPRAYER DRIVE ASSEMBLY

Model 224–482, Series A

Includes items 1 to 69

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
1	220–919	GEAR REDUCER	1	31	112–798	SCREW, mach, hex washer hd, No. 8–32 x 3/8"	1
2	105–510	LOCKWASHER, 1/4"	17	32	237–686	GROUNDING CLAMP w/25 ft (7.6 m) wire	1
3	100–644	CAPSCREW, hex sch; 1/4–20 x 3/4"	9	33	179–777	BUTTON, snap	2
4	108–803	CAPSCREW, hex sch; 1/4–28 x 1"	6	34	224–002	CART	1
5	100–469	CAPSCREW, hex hd; 3/8–16 x 3/4"	1	35	108–795	SCREW, mach, pnh, 10–32 x 0.312	4
6	100–133	LOCKWASHER, 3/8"	1	36	185–188	BUSHING	2
7	108–851	WASHER, plain, 3/8"	1	37	220–918	HANDLE w/hose rack	1
8	108–805	BUSHING, snap	2	38	181–867†	LABEL, WARNING <i>on engine</i>	1
9	221–031	CLUTCH ASSEMBLY <i>Includes items 9a and 9b</i>	1	39	185–953†	LABEL, DANGER <i>on drive housing</i>	1
9a	183–399	.ROTOR	1	40	108–850	SCREW, mach, filh; 8–32 x 1–1/4"	4
9b	108–806	.ARMATURE	1	41	108–849	CAPSCREW, hex sch; 1/4–20 x 3"	2
10	183–400	FIELD	1	42	110–837	SCREW, serrated flange, hex hd, 5/16–18 x 1–1/2"	2
11	108–842	CAPSCREW, sch, 5/16–24 x 3/4"	4	43	110–838	LOCKNUT, 5/16"	4
12	100–214	LOCKWASHER, 5/16"	4	44	108–794	PLUG, tubing	2
13	108–800	PIN, dowel; 5/16 x 1"	1	45	108–802	ENGINE, gasoline, 5 HP	1
14	183–401	KEY, shaft	1	48	110–616	CAPSCREW, sch; 3/8–16 x 1–1/2" (special)	4
15	183–517	CLAMP, mounting, rotor	1	49	106–115	LOCKWASHER, 3/8", high collar	4
16	108–801	SETSCREW, 1/4–20 x 5/16" long, cone point	4	56	187–120	LABEL, ID	1
17	183–397	HOUSING, clutch	1	57	108–860	SCREW, mach, slotted, bdgh 8–32 x 1/4"	2
19	220–920	PINION HOUSING See parts on page 33	1	59	187–121	LABEL, ID	1
20	220–638	DRIVE HOUSING <i>Includes items 20a – 20d</i>	1	60	187–111	SCREW, quick disconnect	2
20a	106–227	.WASHER, bronze colored	1	61	183–169	SPRING, retaining	1
20b	183–209	.WASHER, silver colored	1	62	224–538	CORD SET	1
20c	100–069	.BALL	1	63	111–348	BUSHING, strain relief	1
20d	110–293	.TUBE, grease (<i>not shown</i>)	1	64	108–868	CLAMP, wire	2
21	183–168	COVER, drive housing	1	65	187–182	BRACKET, power cord	1
22	224–560	CONNECTING ROD	1	66	110–963	SCREW, serrated flange, hex hd, 5/16–18 x 3/4"	2
23	224–484	BEARING HOUSING	1	67	110–996	NUT, flanged, hex hd	2
24	101–242	RETAINING RING, ext	2	68	187–240	LABEL, warning	1
25	154–636	WASHER	2	69	220–980	ELECTRICAL HARNESS	1
26	179–811	WHEEL	2				
27	104–811	HUBCAP	2				
28	108–068	PIN, spring, straight, 3/16" x 1.25"	2				
29	183–350	WASHER	2				

† Replacement Warning and Danger Labels and tags available at no charge.

Accessories

USE ONLY GENUINE GRACO PARTS AND ACCESSORIES

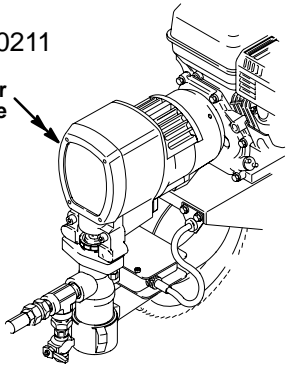
DANGER LABELS

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.

Toll Free: 1-800-328-0211

Apply other language here

French	185-956
Spanish	185-961
German	186-041
Greek	186-045
Korean	186-049
English	185-953

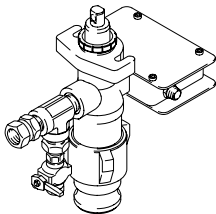


HIGH PRESSURE DISPLACEMENT PUMP, PRESSURE CONTROL, AND FILTER KIT 224-524
 3000 psi (21.0 MPa, 210 bar)
 MAXIMUM WORKING PRESSURE
 Up to 1.25 GPM

Quickly convert your Roof Rig to a system that will spray architectural paints, acrylics, urethanes and bonding adhesives. Maximum recommended tip size is 0.035. Contact your distributor for help in determining when to use this kit. Installation and repair instructions included.

Requires gun and hose (with spring guards on both ends) rated for at least 3000 psi (21.0 MPa, 210 bar) working pressure.

2 GPM PUMP KIT 238-053
 1900 psi (13.2 MPa, 132 bar) Maximum Working Pressure

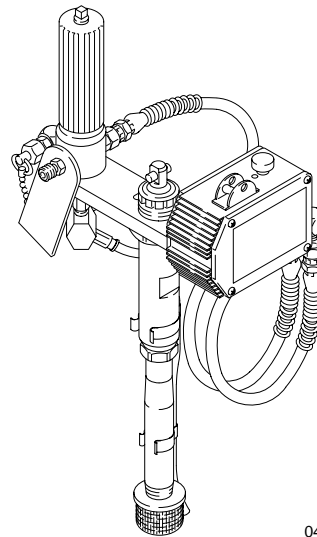
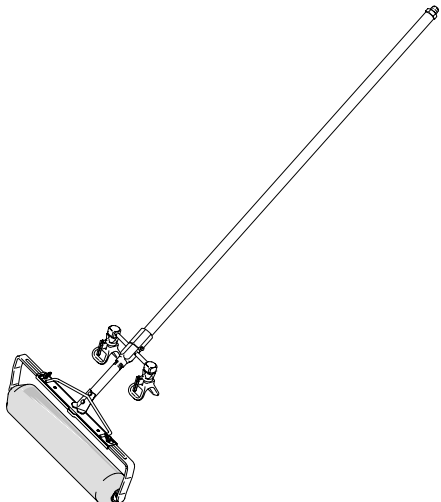


2 GPM PRESSURE CONTROL REPLACEMENT KIT 238-115
 1900 psi (13.2 MPa, 132 bar) Maximum Working Pressure
 Installation instructions are included with the kit.

DISPLACEMENT PUMP REPAIR KIT 224-523
 See contents on page 30. Repair instructions are included with the kit.

SPRAY ROLLER 224-470
 4050 psi (27.6 MPa, 276 bar)
 MAXIMUM WORKING PRESSURE

For rolling roofing coatings that require back rolling, or for use in high wind conditions to minimize overspray. Installation and and repair instructions included.



0416

HIGH PRESSURE SPRAY HOSES
 3000 psi (21.0 MPa, 210 bar)
 MAXIMUM WORKING PRESSURE

214-705 3/8" ID, cpld 3/8 npt(m); 50 ft (15 m), spring guards both ends

223-541 1/4" ID, cpld 1/4 npsm (f); 50 ft (15 m), spring guards both ends

214-701 1/4" ID, cpld 1/4 npsm (f); 3 ft (0.9 m), spring guards both ends

ADAPTERS

157-705 Union, 1/4 npt(m) x 3/8 npsm(f)
150-287 Adapter, 1/4 npt(m) x 3/8 npt(f)
156-173 Union, 3/8 npt(f) x 3/8 npsm(f)

Technical Data

Engine	5 Horsepower, Honda	Length	33 in. (838 mm)
Maximum Working Pressure	1200 psi (8.3 MPa, 83 bar)	Width	23 in. (584 mm)
Cycles/Gallon (liter)	42 (11)	Fluid Outlet Size	3/4 npsm(f)
Maximum Delivery	3 GPM (11 liter/min)	Wetted Parts	
Fuel Tank Capacity	0.97 gallons (3.7 liter)	<i>Displacement Pump</i>	Zinc-Plated Carbon Steel, Stainless Steel, Chrome-Plated Stainless Steel, Polyethylene, Tungsten Carbide, Leather, Polyurethane
Pump Inlet Size	2" quick disconnect		
Weight (dry, without packaging)	140 lb (63 kg)		
Height	32 in. (813 mm)		

Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

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

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

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

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

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

FOR GRACO CANADA CUSTOMERS

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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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<http://www.graco.com>

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