

# Electric Airless Sprayers

332759A

EN

- For portable spray applications of architectural paints and coatings -
- For professional use only -
- Not approved for use in explosive atmospheres or hazardous locations -

**190 Models:**

3000 psi (207 bar, 20.7 MPa) Maximum Working Pressure

**290/390 Models:**

3300 psi (227 bar, 22.7 MPa) Maximum Working Pressure

**390 Classic Model 24U105:**

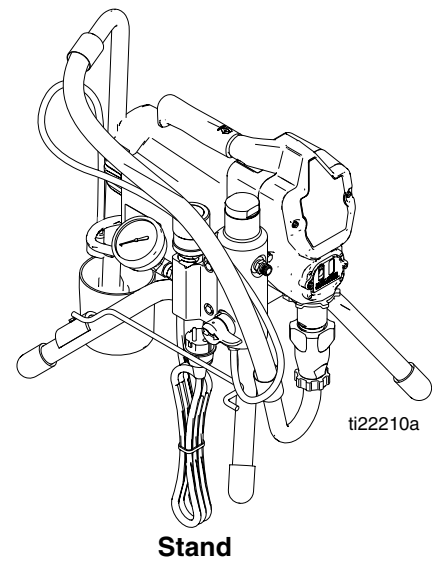
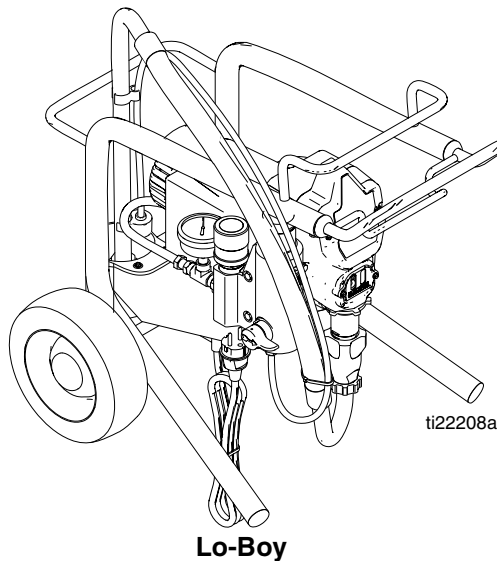
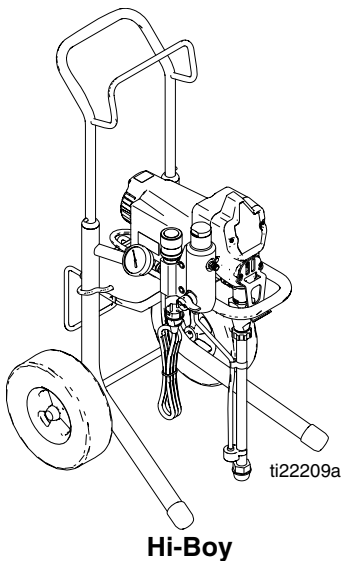
3000 psi (207 bar, 20.7 MPa) Maximum Working Pressure

For a full list of models, see page 2.



**IMPORTANT SAFETY INSTRUCTIONS**

Read all warnings and instructions in this manual and on the unit, including the power cord. Save these instructions.



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# Models

VAC	Model	CE	ETL Intertek	Warning	Hi-Boy	Lo-Boy	Stand	Spray Gun	Hose
120	390		✓		253958		262019	FTx (Manual 311861)	1/4 in. x 50 ft
	390SW		✓		826084				
230 CEE	190 Classic	✓			24U088		24U090	SG3 (Manual 312830)	1/4 in. x 25 ft
	290 Classic	✓			24U092		24U091	FTx (Manual 311861)	1/4 in. x 50 ft
	390 Classic	✓			24U095		24U096		
230 Europe	390 Classic	✓			24U093		24U098		
110 UK	190 Classic	✓			24U089			SG3 (Manual 312830)	1/4 in. x 25 ft
	390 Classic	✓			24U094		24U097	FTx (Manual 311861)	1/4 in. x 50 ft
230 Asia/ANZ	390S			✓	24U104	24U106	24U107		
230 Asia	390 Classic	✓			24U105			SG3 (Manual 312830)	

# Warning

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

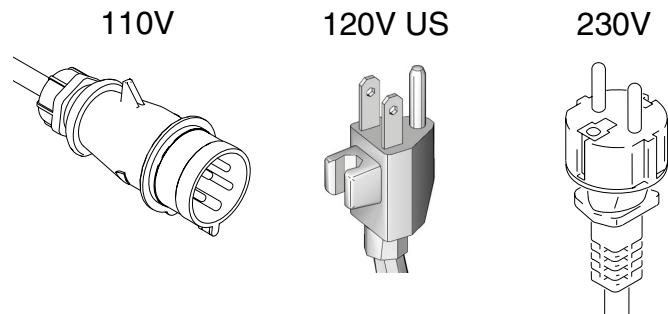
## ! WARNING



### GROUNDING

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

- Improper installation of the grounding plug is able to result in a risk of electric shock.
- When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal.
- The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.
- Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded.
- Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.
- This product is for use on a nominal 110V, 120V, or 230V (as specified by model) circuit and has a grounding plug similar to the plugs illustrated in the figure below.



- Only connect the product to an outlet having the same configuration as the plug.
- Do not use an adapter with this product.

#### Extension Cords:

- Use only a 3-wire extension cord that has a grounding plug and a grounding receptacle that accepts the plug on the product.
- Make sure your extension cord is not damaged. If an extension cord is necessary, use 12 AWG. (2.5 mm<sup>2</sup>) minimum to carry the current that the product draws.
- An undersized cord results in a drop in line voltage and loss of power and overheating.

# ! WARNING

## FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:

- Do not spray flammable or combustible materials near an open flame or sources of ignition such as cigarettes, motors, and electrical equipment.
- Paint or solvent flowing through the equipment is able to result in static electricity. Static electricity creates a risk of fire or explosion in the presence of paint or solvent fumes. All parts of the spray system, including the pump, hose assembly, spray gun, and objects in and around the spray area shall be properly grounded to protect against static discharge and sparks. Use Graco conductive or grounded high-pressure airless paint sprayer hoses.
- Verify that all containers and collection systems are grounded to prevent static discharge. Do not use pail liners unless they are antistatic or conductive.
- Connect to a grounded outlet and use grounded extensions cords. Do not use a 3-to-2 adapter.
- Do not use a paint or a solvent containing halogenated hydrocarbons.
- Keep spray area well-ventilated. Keep a good supply of fresh air moving through the area. Keep pump assembly in a well ventilated area. Do not spray pump assembly.
- Do not smoke in the spray area.
- Do not operate light switches, engines, or similar spark producing products in the spray area.
- Keep area clean and free of paint or solvent containers, rags, and other flammable materials.
- Know the contents of the paints and solvents being sprayed. Read all Material Safety Data Sheets (MSDS) and container labels provided with the paints and solvents. Follow the paint and solvents manufacturer's safety instructions.
- Fire extinguisher equipment shall be present and working.
- Sprayer generates sparks. When flammable liquid is used in or near the sprayer or for flushing or cleaning, keep sprayer at least 20 feet (6 m) away from explosive vapors.

## SKIN INJECTION HAZARD

High-pressure spray is able to inject toxins into the body and cause serious bodily injury. In the event that injection occurs, **get immediate surgical treatment.**

- Do not aim the gun at, or spray any person or animal.
- Keep hands and other body parts away from the discharge. For example, do not try to stop leaks with any part of the body.
- Always use the nozzle tip guard. Do not spray without nozzle tip guard in place.
- Use Graco nozzle tips.
- Use caution when cleaning and changing nozzle tips. In the case where the nozzle tip clogs while spraying, follow the **Pressure Relief Procedure** for turning off the unit and relieving the pressure before removing the nozzle tip to clean.
- Do not leave the unit energized or under pressure while unattended. When the unit is not in use, turn off the unit and follow the **Pressure Relief Procedure** for turning off the unit.
- Check hoses and parts for signs of damage. Replace any damaged hoses or parts.
- This system is capable of producing 3300 psi (227 bar, 22.7 MPa). Use Graco replacement parts or accessories that are rated a minimum of 3300 psi (227 bar, 22.7 MPa).
- Always engage the trigger lock when not spraying. Verify the trigger lock is functioning properly.
- Verify that all connections are secure before operating the unit.
- Know how to stop the unit and bleed pressure quickly. Be thoroughly familiar with the controls.

# ! WARNING



## EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Always wear appropriate gloves, eye protection, and a respirator or mask when painting.
- Do not operate or spray near children. Keep children away from equipment at all times.
- Do not overreach or stand on an unstable support. Keep effective footing and balance at all times.
- Stay alert and watch what you are doing.
- Do not leave the unit energized or under pressure while unattended. When the unit is not in use, turn off the unit and follow the **Pressure Relief Procedure** for turning off the unit.
- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not kink or over-bend the hose.
- Do not expose the hose to temperatures or to pressures in excess of those specified by Graco.
- Do not use the hose as a strength member to pull or lift the equipment.
- Do not spray with a hose shorter than 25 feet.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.



## ELECTRIC SHOCK HAZARD

This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.

- Turn off and disconnect power cord before servicing equipment.
- Connect only to grounded electrical outlets.
- Use only 3-wire extension cords.
- Ensure ground prongs are intact on power and extension cords.
- Do not expose to rain. Store indoors



## PRESSURIZED ALUMINUM PARTS HAZARD

Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.

- Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.
- Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.



## BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.



## MOVING PARTS HAZARD

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.



# **WARNING**



## **TOXIC FLUID OR FUMES HAZARD**

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read MSDSs to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.



## **PERSONAL PROTECTIVE EQUIPMENT**

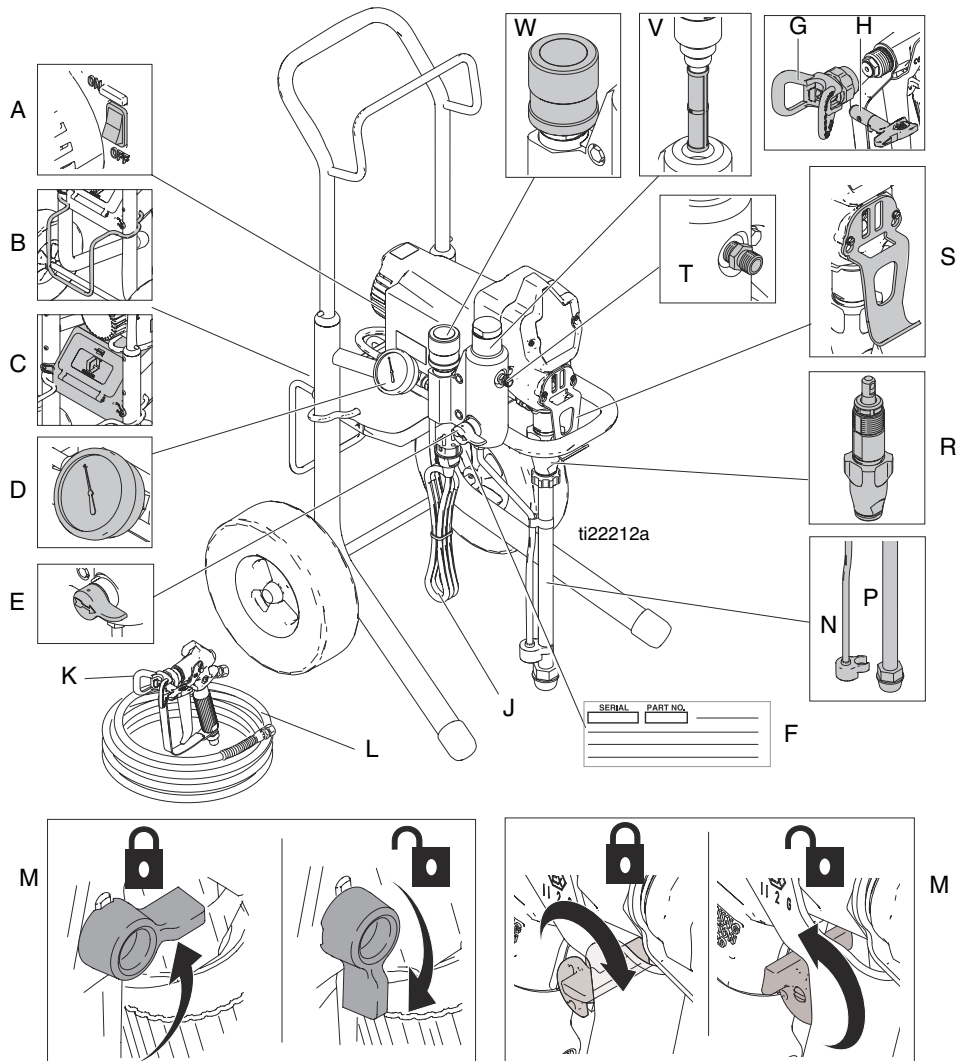
Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer

## **CALIFORNIA PROPOSITION 65**

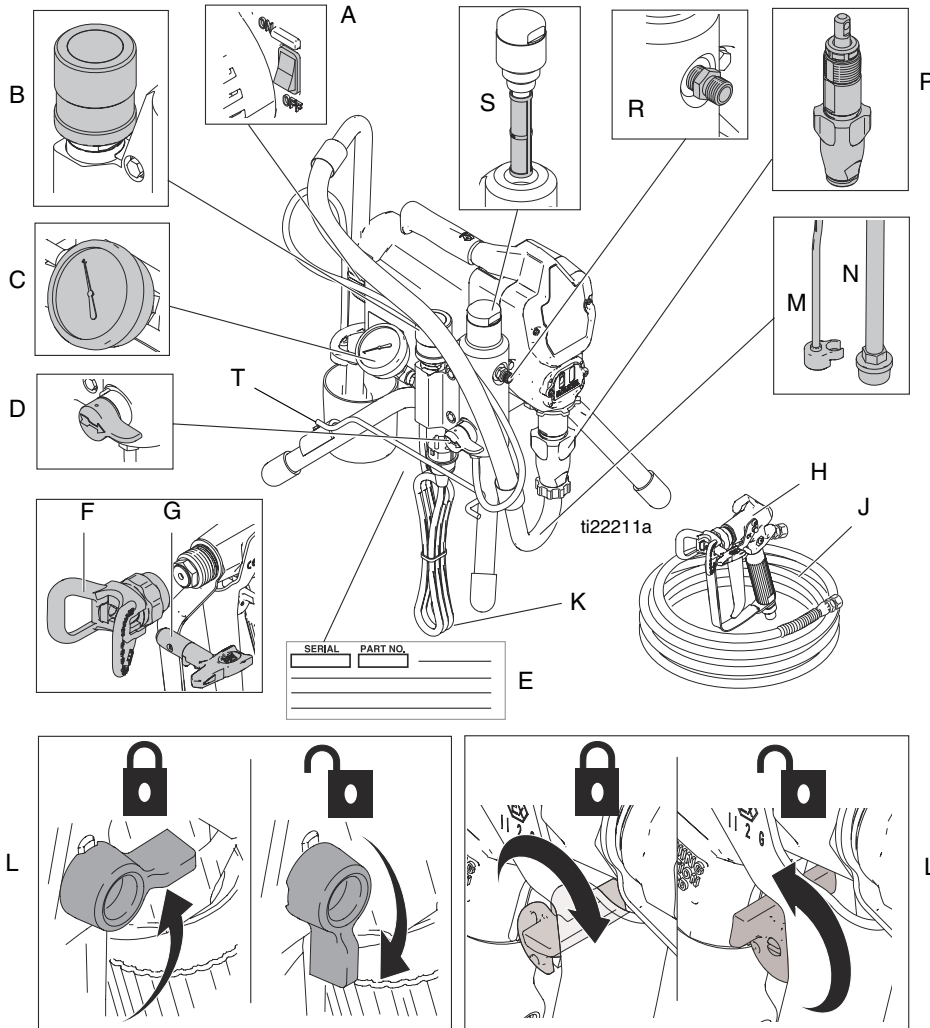
This product contains a chemical known to the State of California to cause cancer, birth defects or other reproductive harm. Wash hands after handling.

# Component Identification (Hi-Boy Models)



A	ON/OFF Switch
B	Kickstand (not available on all models)
C	Toolbox (not available on all models)
D	Pressure Gauge (not available on all models)
E	Prime Valve
F	Model/Serial Tag
G	Guard
H	Tip
J	Power Cord
K	Gun
L	Fluid Hose
M	Trigger Lock
N	Drain Hose
P	Suction Hose
R	Pump
S	Pail Hook
T	Fluid Outlet
V	Filter (not available on all models)
W	Pressure Control

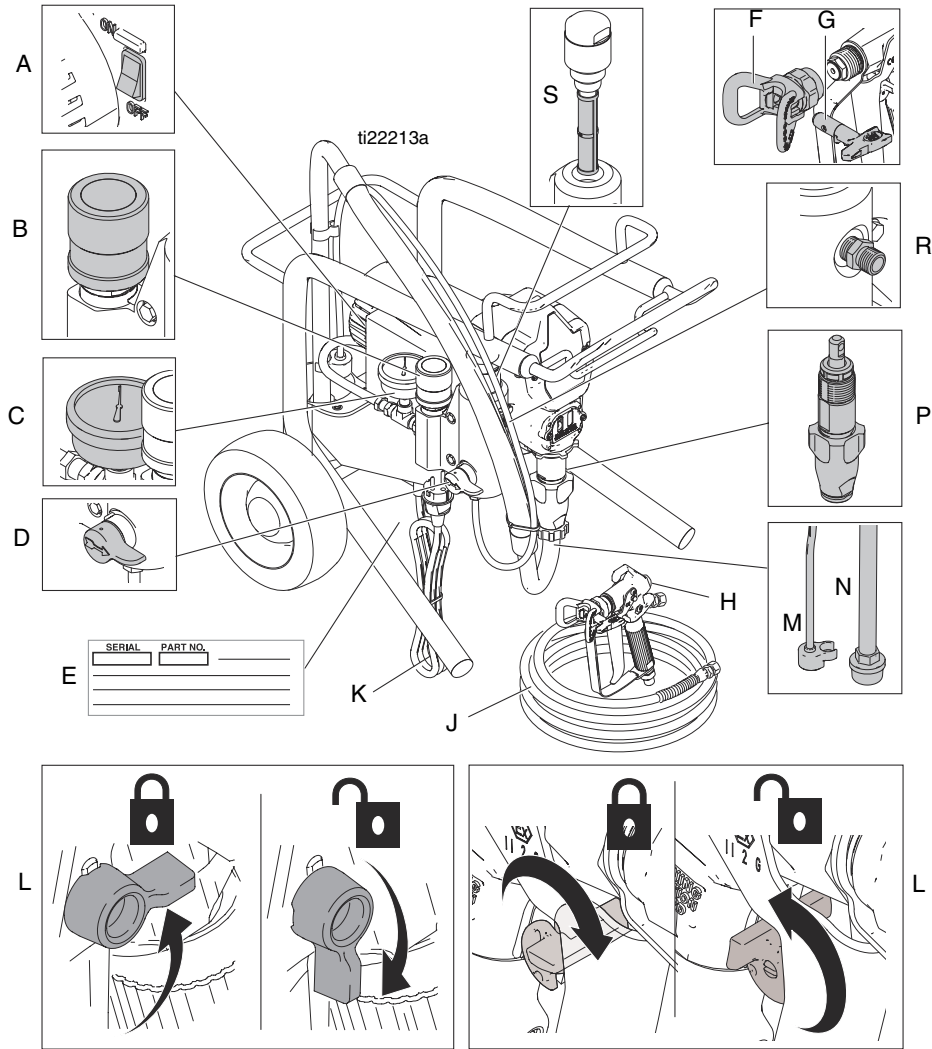
# Component Identification (Stand Models)



A	ON/OFF Switch
B	Pressure Control
C	Pressure Gauge (not available on all models)
D	Prime Valve
E	Model/Serial Tag
F	Guard
G	Tip
H	Gun
J	Fluid Hose
K	Power Cord
L	Trigger Lock
M	Drain Hose
N	Suction Hose
P	Pump
R	Fluid Outlet
S	Filter (not available on all models)
T	Cord Wrap



# Component Identification (Lo-Boy Models)



A	ON/OFF Switch
B	Pressure Control
C	Pressure Gauge (not available on all models)
D	Prime Valve
E	Model/Serial Tag
F	Guard
G	Tip
H	Gun
J	Fluid Hose
K	Power Cord
L	Trigger Lock
M	Drain Hose
N	Suction Hose
P	Pump
R	Fluid Outlet
S	Filter (not available on all models)

# Pressure Relief Procedure

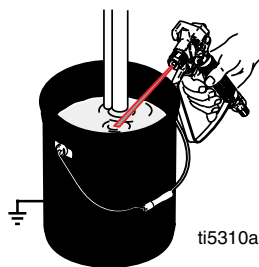
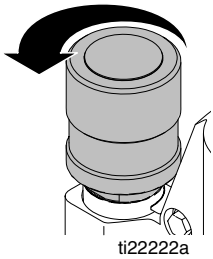


Follow the Pressure Relief Procedure whenever you see this symbol.



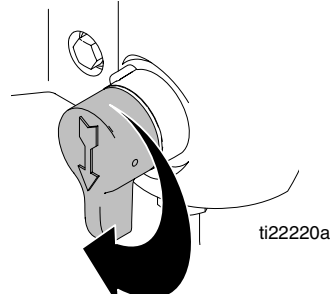
This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.

1. Engage trigger lock.
2. Turn pressure control to lowest pressure.

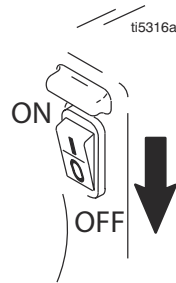


3. Disengage the trigger lock.
4. Hold a metal part of the gun firmly to a grounded metal pail. Trigger the gun to relieve pressure.
5. Engage the trigger lock.

6. Turn prime valve down. Have a waste container ready to catch drainage. Leave prime valve open until you are ready to spray again.







7. Turn power switch OFF, if unit is being shut down or will be left unattended.



If you suspect the spray tip or hose is clogged or that pressure has not been fully relieved after following the steps above, **VERY SLOWLY** loosen tip guard retaining nut or hose end coupling to relieve pressure gradually, then loosen completely. Clear hose or tip obstruction.

# Grounding and Electric Requirements

						
<p>The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.</p>						

**Air and fluid hoses:** use only electrically conductive hoses with a maximum of 500 ft. (150 m) combined hose length to ensure grounding continuity. Check electrical resistance of hoses. If total resistance to ground exceeds 29 megohms, replace hose immediately.

**Spray gun:** ground through connection to a properly grounded fluid hose and pump.

**Fluid supply container:** follow local code.

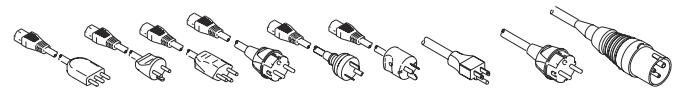
**Object being sprayed:** follow local code.

**Solvent pails used when flushing:** Follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.

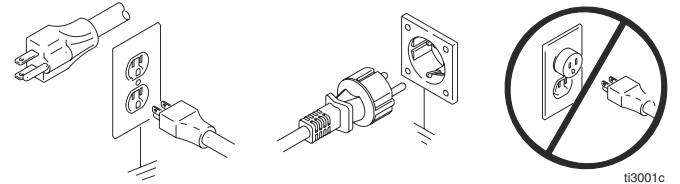
**To maintain grounding continuity when flushing or relieving pressure:** hold metal part of the spray gun/dispense valve firmly to the side of a grounded metal pail, then trigger the gun/valve.

**Power Requirements:** 100-120V units require 100-120 VAC, 50/60 Hz, 11A, 1 phase. 230V units require 230 VAC, 50/60 HZ, 7.5A, 1 phase.

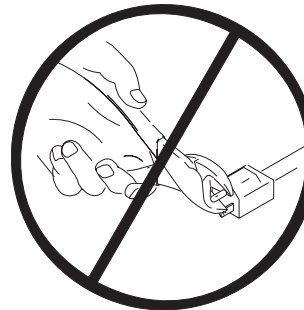
The sprayer cord includes a grounding wire with an appropriate grounding contact.



The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.



Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.



**Extension Cords:** Use an extension cord with an undamaged ground contact. If an extension cord is necessary, use a 3-wire, 12 AWG (2.5 mm<sup>2</sup>) minimum.

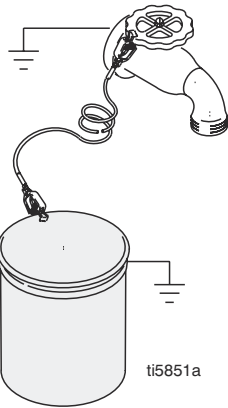
**NOTE:** Smaller gauge or longer extension cords may reduce sprayer performance.

## Pails

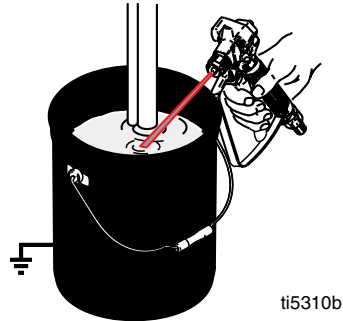
**Solvent and oil/based fluids:** follow local code. Use only conductive metal pails, placed on a grounded surface such as concrete.

Do not place pail on a nonconductive surface such as paper or cardboard which interrupts grounding continuity.

**Grounding a metal pail:** connect a ground wire to the pail by clamping one end to pail and other end to a true earth ground such as a water pipe.



**To maintain grounding continuity when flushing or relieving pressure:** hold metal part of spray gun firmly to side of a grounded metal pail. Then trigger gun.



# General Repair Information

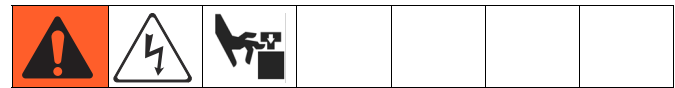


Flammable materials spilled on hot, bare, motor could cause fire or explosion. To reduce risk of burns, fire or explosion, do not operate sprayer with cover removed.

- Keep all screws, nuts, washers, gaskets, and electrical fittings removed during repair procedures. These parts usually are not provided with replacement kits.
- Test repairs after problems are corrected.
- If sprayer does not operate properly, review repair procedure to verify you did it correctly. See **Troubleshooting**, page 14.
- Overspray may build up in the air passages. Remove any overspray and residue from air passages and openings in the enclosures whenever you service sprayer.
- Do not operate the sprayer without the motor shroud in place. Replace if damaged. Motor shroud directs cooling air around motor to prevent overheating.

## NOTICE

Do not operate the sprayer without the motor shroud in place. Replace if damaged. Motor shroud directs cooling air around motor to prevent overheating. Operating the sprayer without the motor shroud in place will result in damage to the sprayer.



To reduce risk of serious injury, including electric shock:

- Do not touch moving or electric parts with fingers or tools while testing repair.
- Unplug sprayer when power is not required for testing.
- Install all shrouds, covers, gaskets, screws and washers before you operate sprayer.

## NOTICE

- Do not run sprayer dry for more than 30 seconds. Doing so could damage pump packings.
- Protect the internal drive parts of this sprayer from water. Openings in the cover allow for air cooling of the mechanical parts and electronics inside. If water gets in these openings, the sprayer could malfunction or be permanently damaged.
- Prevent pump corrosion and damage from freezing. Never leave water or water-base paint in sprayer when its not in use in cold weather. Freezing fluids can seriously damage sprayer. Store sprayer with Pump Armor to protect sprayer during storage.

# Troubleshooting



Problem	What To Check <i>(If check is OK, go to next check)</i>	What To Do <i>(When check is not OK, refer to this column)</i>
<b>Motor Won't Operate</b>		
Basic Fluid Pressure	1. Pressure control knob setting. Motor will not run if set at minimum (fully counter-clockwise).	Slowly increase pressure setting to see if motor starts.
	2. Spray tip or fluid filter may be clogged.	<b>Relieve Pressure</b> , page 10. Then clear clog or clean gun filter. Refer to separate gun instruction manual.
Basic Mechanical	1. Pump frozen or hardened paint	Thaw sprayer if water or water-based paint has frozen in sprayer. Place sprayer in warm area to thaw. Do not start sprayer until thawed completely. If paint hardened (dried) in sprayer, replace pump packings. See page 18, <b>Displacement Pump Replacement</b> .
	2. Displacement pump connecting rod pin. Pin must be completely pushed into connecting rod and retaining spring must be firmly in groove or pump pin.	Push pin into place and secure with spring retainer. See page 18, <b>Displacement Pump Replacement</b> .
	3. Motor. Remove drive housing assembly. See page 20, <b>Drive Housing Replacement</b> . Try to rotate fan by hand.	Replace motor if fan won't turn. See page 37, <b>Motor Replacement</b> .

<p><b>Problem</b></p>	<p><b>What To Check</b> <i>(If check is OK, go to next check)</i></p>	<p><b>What To Do</b> <i>(When check is not OK, refer to this column)</i></p>
<p>Basic Electrical See <b>Wiring Diagram</b>, page 38</p>	<p>1. Electric supply. ON/OFF switch in OFF position. Meter must read 100-130 VAC for 110-120 VAC models and 210-255 VAC for 230 VAC models.</p>	<p>Turn ON/OFF switch to ON position. Reset building circuit breaker, replace building fuses. Try another outlet.</p>
	<p>2. Extension cord. Check extension cord continuity with volt meter.</p>	<p>Replace extension cord.</p>
	<p>3. Sprayer power supply cord. Inspect for damage such as broken insulation or wires.</p>	<p>Replace power supply cord. See page 36, <b>Power Cord Replacement</b>.</p>
	<p>4. Fuse. Check replaceable fuse on control board (next to ON/OFF switch).</p>	<p>Replace fuse after completing motor inspection. See page 29, <b>Fuse Replacement</b>.</p>
	<p>5. Motor leads are securely fastened and properly connected to control board.</p>	<p>Replace loose terminals; crimp to leads. Be sure terminals are firmly connected.  Clean circuit board terminals. Securely reconnect leads.</p>
	<p>6. Motor thermal switch. Yellow motor leads must have continuity through thermal switch.</p>	<p>Replace motor. See page 37, <b>Motor Replacement</b>.</p>
	<p>7. Brush cap missing or loose brush lead connections.</p>	<p>Install brush cap or replace brushes if leads are damaged. See page 24, <b>Motor Brush Replacement</b>.</p>
	<p>8. <b>230V models only:</b> Capacitor board for damaged capacitors, burn marks or a cracked red MOV.</p>	<p>Replace capacitor board after completing motor inspection. See page 26, <b>Control Board Replacement</b>.</p>
	<p>9. <b>230V models only:</b> Capacitors with a multimeter. Disconnect capacitor connectors (D, E) from control board. Meter must read 400-700 <math>\mu</math>F.</p>	<p>Replace capacitor board after completing motor inspection. See page 26, <b>Control Board Replacement</b>.</p>
	<p>10. Brush length which must be 1/4 in. (6mm) minimum. <b>NOTE:</b> Brushes do not wear at the same rate on both sides of motor. Check both brushes.</p>	<p>Replace brushes. See page 24, <b>Motor Brush Replacement</b>.</p>
	<p>11. Motor armature commutator for burn spots, gouges and extreme roughness.</p>	<p>Remove motor and have motor shop resurface commutator if possible. See page 37, <b>Motor Replacement</b>.</p>
	<p>12. Motor armature for shorts using armature tester (growler) or perform spin test, page 21.</p>	<p>Replace motor. See page 37, <b>Motor Replacement</b>.</p>
	<p>13. Pressure control not plugged in to control board.</p>	<p>Insert pressure control connector into control board.</p>

<b>Problem</b>	<b>What To Check</b> <i>(If check is OK, go to next check)</i>	<b>What To Do</b> <i>(When check is not OK, refer to this column)</i>
Low Output	1. Worn spray tip.	<b>Relieve Pressure</b> , page 10. Replace tip. Refer to separate gun instruction manual.
	2. Verify pump does not continue to stroke when gun trigger is released.	Service pump. See page 18, <b>Displacement Pump Replacement</b> .
	3. Prime valve leaking.	<b>Relieve Pressure</b> , page 10. Then repair prime valve. See page 34, <b>Prime valve Replacement</b> .
	4. Suction hose connections.	Tighten any loose connections. Check o-rings on suction hose swivel.
	5. Electric supply with volt meter. Meter must read 100-130 VAC for 110-120 VAC models and 210-255 VAC for 230 VAC models. Low voltages reduce sprayer performance.	Reset building circuit breaker; replace building fuse. Repair electrical outlet or try another outlet.
	6. Extension cord size and length.	Replace with a correct, grounded extension cord. See page 11, <b>Grounding and Electric Requirements</b> .
	7. Leads from motor to circuit board for damaged or loose wire connectors. Inspect wiring insulation and terminals for signs of overheating.	Be sure male terminal pins are centered and firmly connected to female terminals. Replace any loose terminals or damaged wiring. Securely reconnect terminals.
	8. Worn motor brushes which must be 1/4 in. (6 mm) minimum.	Replace brushes. See page 24. <b>Motor Brush Replacement</b> .
	9. Motor brushes binding in brush holders.	Clean brush holders. Remove carbon dust by using compressed air to blow out brush dust.
	10. Low stall pressure. Turn pressure control knob fully clockwise.	Replace pressure control assembly. See page 30, <b>Pressure Control Assembly Replacement</b> .
	11. Motor armature for shorts by using an armature tester (growler) or perform <b>Spin Test</b> , page 21.	Replace motor. See page 37, <b>Motor Replacement</b> .



<p><b>Problem</b></p>	<p><b>What To Check</b> <i>(If check is OK, go to next check)</i></p>	<p><b>What To Do</b> <i>(When check is not OK, refer to this column)</i></p>
<p>Motor runs and pump strokes</p>	<p>1. Prime Valve Open.</p>	<p>Close prime valve.</p>
	<p>2. Paint supply.</p>	<p>Refill and reprime pump.</p>
	<p>3. Intake strainer clogged.</p>	<p>Remove and clean, then reinstall.</p>
	<p>4. Suction hose leaking air.</p>	<p>Tighten nut. Check o-rings on swivel.</p>
	<p>5. Intake valve ball and piston ball are seating properly.</p>	<p>See Pump Manual 309250. Strain paint before using to remove particles that could clog pump.</p>
	<p>6. Leaking around throat packing nut which may indicate worn or damaged packings.</p>	<p>See Pump Manual 309250.</p>
	<p>7. Pump rod damaged.</p>	<p>See Pump Manual 309250.</p>
<p>Motor runs but pump does not stroke</p>	<p>1. Displacement pump pin damaged or missing.</p>	<p>Replace pump pin if missing. Be sure retaining spring is fully in groove all around connecting rod. See page 18, <b>Displacement Pump Replacement.</b></p>
	<p>2. Connecting rod assembly for damage.</p>	<p>Replace connecting rod assembly. See page 18, <b>Displacement Pump Replacement.</b></p>
	<p>3. Gears or drive housing.</p>	<p>Inspect drive housing assembly and gears for damage and replace if necessary. See page 20, <b>Drive Housing Replacement.</b></p>
<p>Motor is hot and runs intermittently</p>	<p>1. Be sure ambient temperature where sprayer is located is not more than 115°F (46°C) and sprayer is not located in direct sun.</p>	<p>Move sprayer to shaded, cooler area if possible.</p>
	<p>2. Motor has burned windings indicated by removing positive (red) brush and seeing burned adjacent commutator bars.</p>	<p>Replace motor. See page 37, <b>Motor Replacement.</b></p>
	<p>3. Tightness of pump packing nut. Overtightening tightens packings on rod, restricts pump action and damages packings.</p>	<p>Loosen packing nut. Check for leaking around throat. Replace pump packings if necessary. See pump manual 309250.</p>
<p>Sudden noise heard from sprayer. Change in motor speed or performance.</p>	<p>1. <b>230V models only:</b> Capacitor board for damaged capacitors, burn marks or a cracked red MOV.</p>	<p>Replace capacitor board after completing motor inspection. See page 26, <b>Control Board Replacement.</b></p>
	<p>2. <b>230V models only:</b> Capacitors with a multimeter. Disconnect capacitor connectors (D, E) from control board. Meter must read 400-700 µF.</p>	<p>Replace capacitor board after completing motor inspection. See page 26, <b>Control Board Replacement.</b></p>

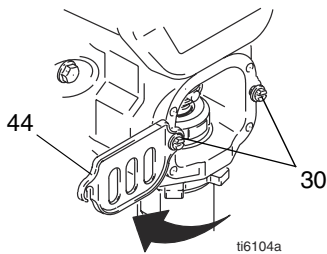
# Displacement Pump Replacement

See manual 309250 for pump repair instructions.

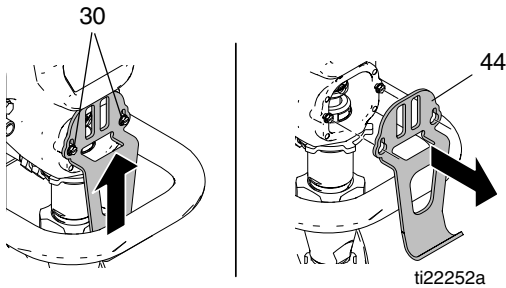
## Removal



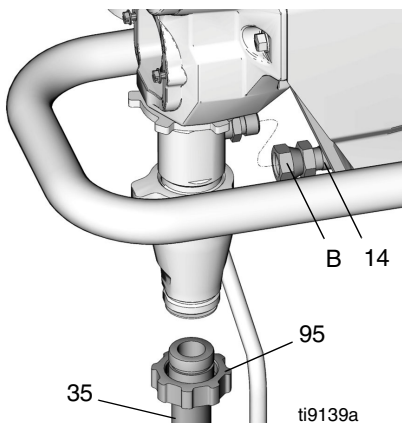
1. **Relieve Pressure**, page 10. Unplug sprayer from outlet.
2. **Style A:** Loosen two screws (30) and rotate cover (44).



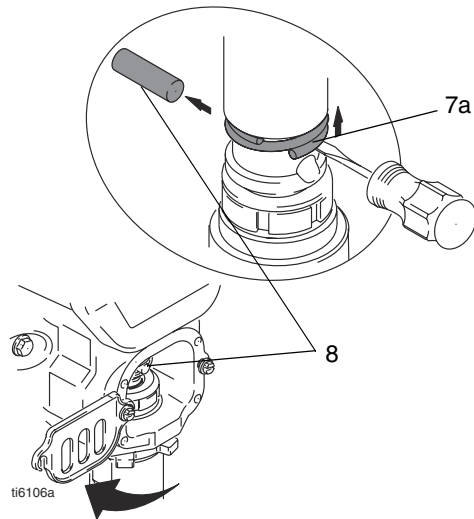
**Style B:** Loosen two screws (30). Push cover (44) up and remove from sprayer.



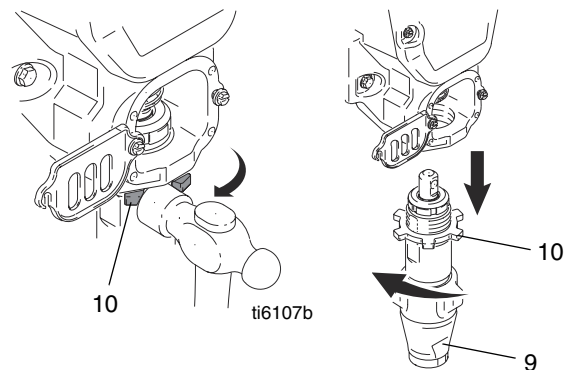
3. Loosen nut (95) and remove suction hose (35). Loosen nut (B) and remove high pressure hose (14).



4. Cycle pump until pin (8) is in position to be removed.
5. Disconnect power cord from outlet.
6. Using a flat screwdriver, push retaining spring (7a) up. Push out pump pin (8).



7. Using a hammer, loosen pump jam nut (10). Unscrew and remove pump (9).



## Installation

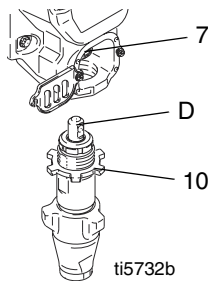


If pump pin works loose, parts could break off due to force of pumping action. Parts could project through air and result in serious injury or property damage. Pin must be completely pushed into connecting rod and retaining spring must be firmly positioned in groove over pump pin.

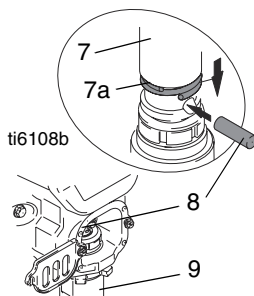
### NOTICE

If the pump jam nut loosens during operation, the threads of the drive housing will be damaged.

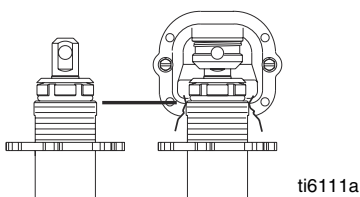
1. Extend pump piston rod fully. Apply grease to top of pump rod at (D) or inside connecting rod (7). Install jam nut (10) on pump threads.



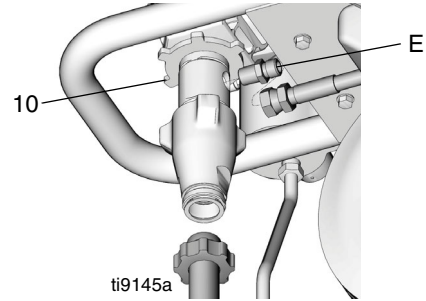
2. Install pump rod (D) into connecting rod (7).
3. Install pump pin (8). Verify retainer spring (7a) is in groove over pump pin.



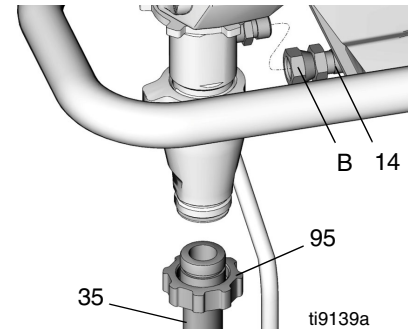
4. Push pump (9) up until pump threads engage.
5. Screw in pump until threads are flush with top of drive housing opening.



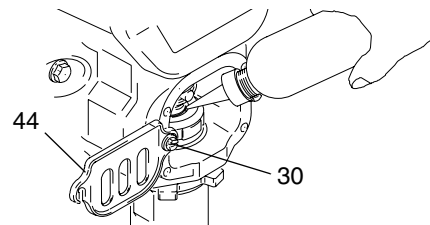
6. Align pump outlet (E) to back.



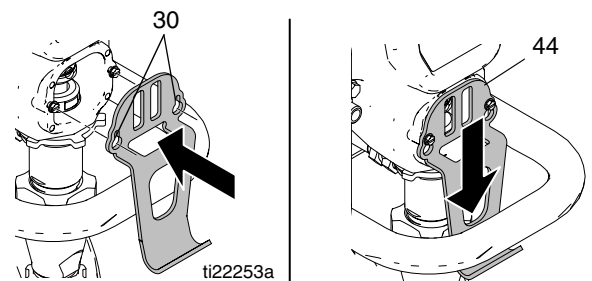
7. Screw jam nut (10) up onto pump until nut stops. Tighten jam nut by hand, then tap 1/8 to 1/4 turn with a 20 oz (maximum) hammer to approximately 75 ft-lb (102 N•m).
8. Install suction tube (35) and high pressure hose. Tighten nuts (95) and (B).



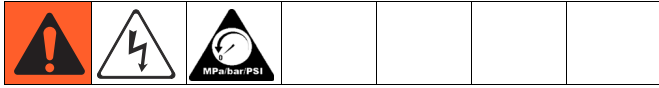
9. Fill packing nut with Graco TSL until fluid flows onto top of seal.
10. **Style A:** Rotate cover (44) back over screws. Tighten two screws (30).



**Style B:** Replace cover (44) over screws. Push cover down into place. Tighten two screws (30).

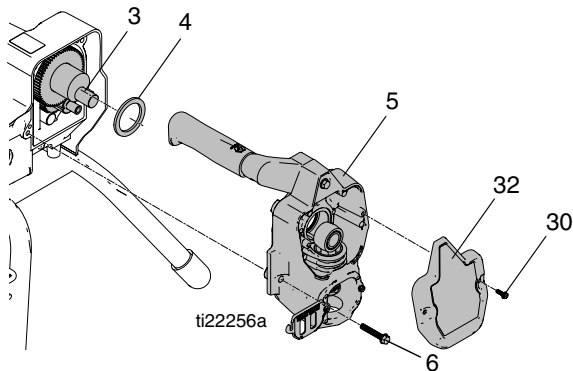
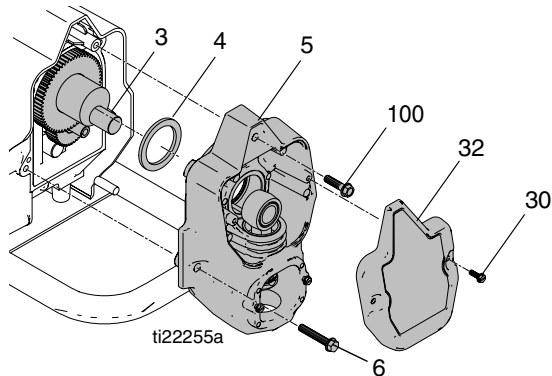


# Drive Housing Replacement



## Removal

1. **Relieve Pressure**, page 10.
2. Remove pump (9). **Displacement Pump Replacement**, page 18.
3. Disconnect power cord from outlet.
4. Remove two screws (30) and cover (32). Remove four screws (6). **NOTE:** For models 24U090 and 24U091, remove screw (100).



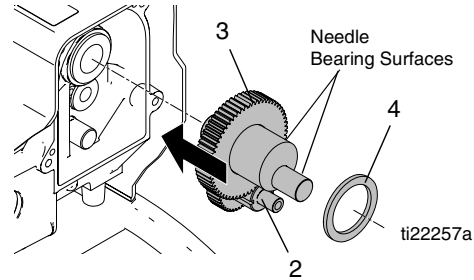
5. Pull drive housing (5) out of motor front endbell.
6. Remove gear cluster (2) and (3) and thrust bearing (4) from drive housing.

### NOTICE

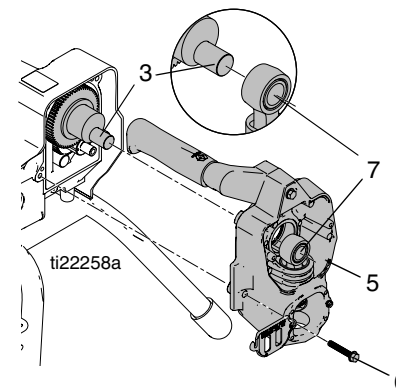
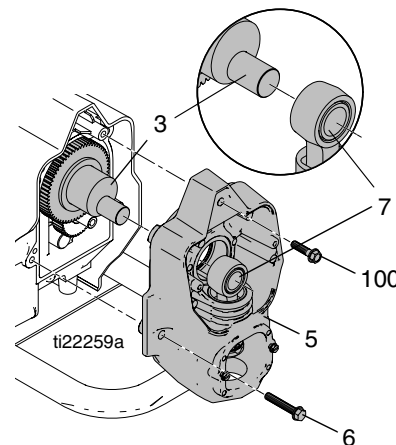
Gear cluster may stay engaged in motor front endbell or drive housing. Do not drop gear cluster (3) and (2) when removing from drive housing (5). Damage to gear cluster will occur.

## Installation

1. Apply a liberal coat of grease to gears and needle bearing surfaces. Install thrust bearing (4) and gears (2) and (3) in front endbell housing.



2. Push drive housing (5) into front endbell housing. Insert gear crank (3) through hole in connecting rod (7).



3. Install four screws (6). **NOTE:** For models 24U090 and 24U091, install screw (100).
4. Install cover (32) with two screws (30).
5. Install pump (9). **Displacement Pump Replacement**, page 18.

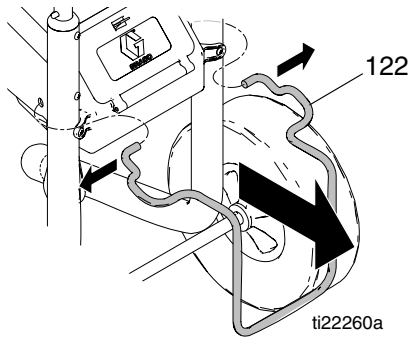
# Spin Test

See *Wiring Diagram*, page 38.

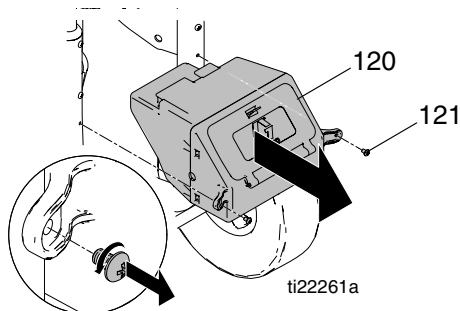


To check armature, motor winding and brush electrical continuity:

1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).

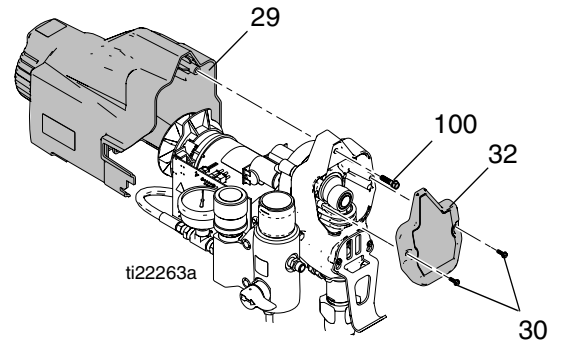


- b. Remove two screws (121) and toolbox (120).



3. **For models 24U090 and 24U091:**

- a. Remove two screws (30) and front cover (32).
- b. Remove screw (100) and shroud (29).



**For all other models:** Remove two screws (30) and shroud (29).

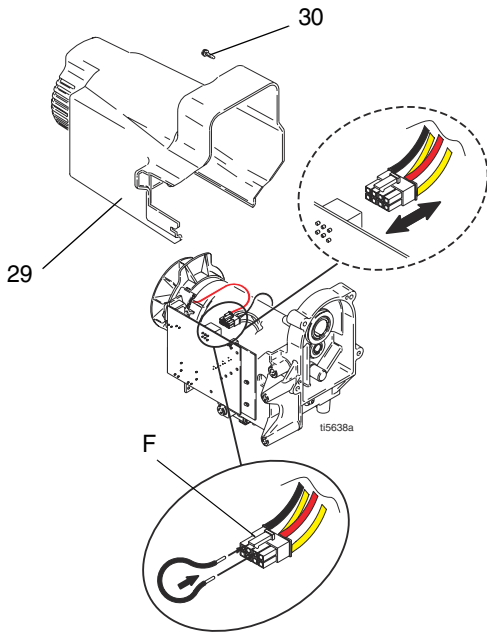
4. Remove **Drive Housing** (5), page 20.
5. Disconnect motor connector (F).

## Armature Short Circuit Test

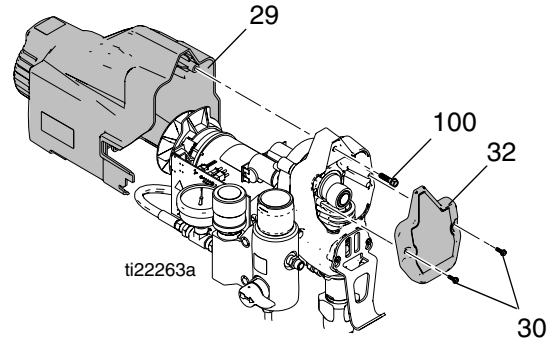
Quickly turn motor fan by hand. If motor coasts two or three revolutions before complete stop, there are no electrical shorts. If motor does not spin freely, armature is shorted. Replace **Motor**, page 37.

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

1. Connect red and black motor leads with test lead. Turn motor fan by hand at about two revolutions per second.
2. If uneven or no resistance, check for missing brush caps, broken brush springs, brush leads, and worn brushes. Repair as needed, page 24.
3. If still uneven or no resistance, replace **Motor**, page 37.



4. Reattach motor connector (F).
5. Install **Drive Housing**, page 20.
6. **For models 24U090 and 24U091:**
  - a. Install shroud (29) and screw (100).
  - b. Install front cover (32) and two screws (30).



### For all other models:

Install shroud (29) and two screws (30).

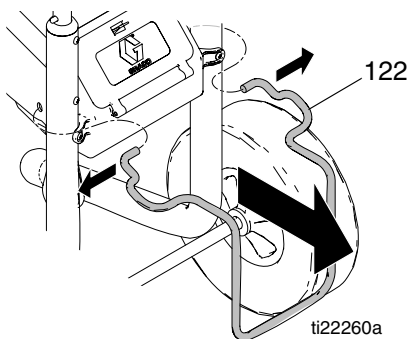
7. **For models 24U096, 24U097, and 24U098:**
  - a. Install toolbox (120) and two screws (121).
  - b. Install kickstand (122).

# Fan Replacement

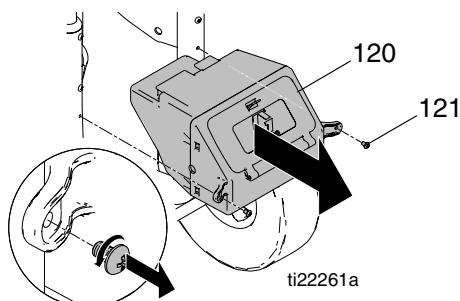
## Removal



1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).

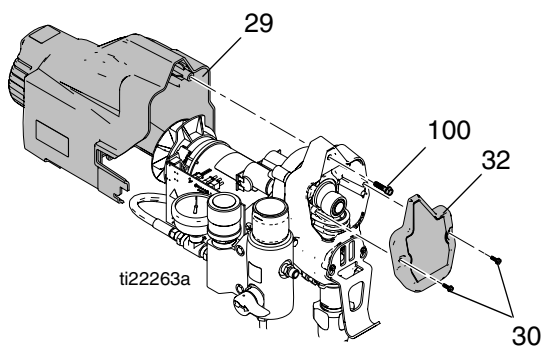


- b. Remove two screws (121) and toolbox (120).



3. **For models 24U090 and 24U091:**

- a. Remove two screws (30) and front cover (32).
  - b. Remove screw (100) and shroud (29).



**For all other models:** Remove two screws (30) and shroud (29).

4. Remove spring clip (1b) on back of motor.
5. Pull off fan (1a).

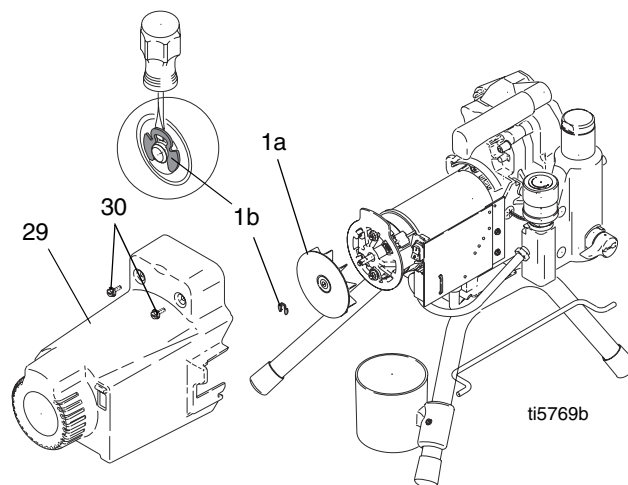
## Installation

1. Slide new fan (1a) in place on back of motor. Be sure blades of fan face motor as shown.
2. Install spring clip (1b).
3. **For models 24U090 and 24U091:**
  - a. Install shroud (29) and screw (100).
  - b. Install front cover (32) and two screws (30).

**For all other models:** Install shroud (29) and two screws (30).

4. **For models 24U096, 24U097, 24U098:**

- a. Install toolbox (120) and two screws (121).
  - b. Install kickstand (122).



# Motor Brush Replacement

See *Wiring Diagram*, page 38.

## Removal

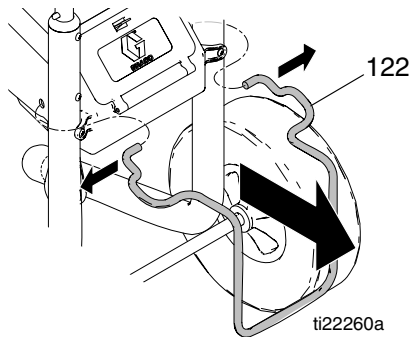
Replace brushes worn to less than 1/4 in. (6mm). Brushes wear differently on each side of motor, check both sides.



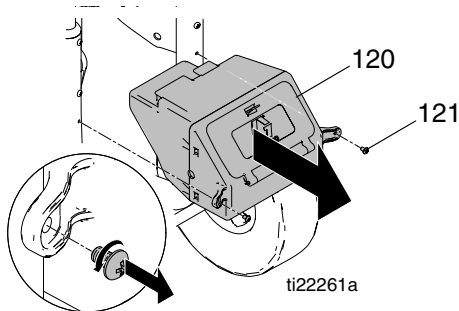
1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.

2. **For models 24U096, 24U097, and 24U098:**

a. Remove kickstand (122).

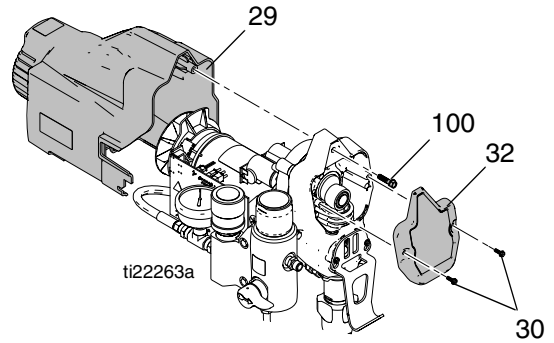


b. Remove two screws (121) and toolbox (120).



3. **For models 24U090 and 24U091:**

- a. Remove two screws (30) and front cover (32).
- b. Remove screw (100) and shroud (29).



**For all other models:**

Remove two screws (30) and shroud (29).

4. Disconnect motor connector (D) from control board (33).
5. Cut tie wrap (F).
6. Locate two yellow wires (C) (thermal leads). Cut each yellow wire at the center.
7. Using a flat screwdriver, pry off two brush caps (A). Remove brushes (B) from motor.
8. Discard old brush harness.
9. While rotating fan by hand, using compressed air, blow air into positive (top) brush holder to remove brush dust.

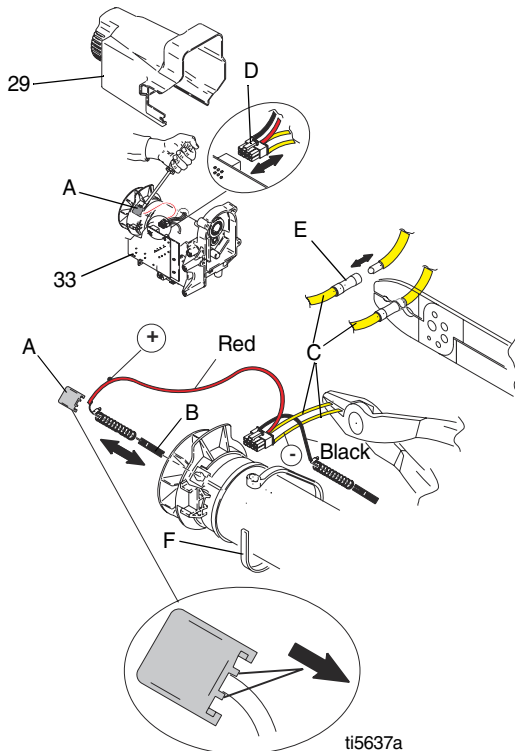
**NOTE:** To contain the dust, turn on your shop vacuum. Place the end of the hose over the negative (lower) brush holder while blowing compressed air into the positive (top) brush holder.



## Installation

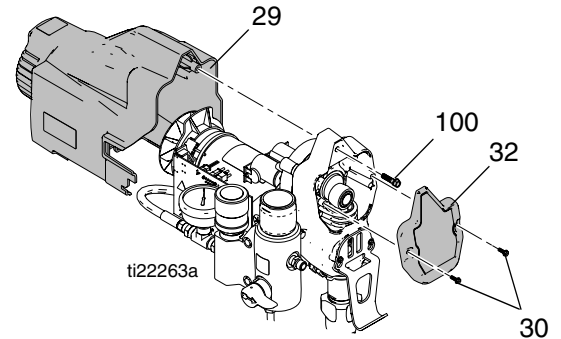
Use all new parts included in your brush kit. Do not reuse old parts if new replacement parts are provided.

1. With wires facing toward front of motor, install new brushes (B) in motor. Be sure to install the positive (red) brush lead in the top of the motor (as shown) and the negative (black) brush lead in the side of the motor.
2. Push each cap (A) into place over brush. Orient each cap with the 2 projections on either side of the brush lead. You will hear a “snap” when cap is securely in place.
3. Using a wire stripper, strip off wire insulation approximately 1/4 inch (6 mm) from the end of each yellow wire (C) from motor.
4. Insert stripped end into end of a butt splice (E) on new brush assembly.
5. Use a crimping tool to squeeze the ends of the butt splice (E) tightly around each wire. Pull gently on each wire to be sure it will not pull out of the butt splice.
6. Using new tie wrap (F) from kit, wrap tie around motor and wires only. Trim off excess. Be sure pressure hose and wire leads are not caught in tie wrap.
7. Reconnect motor connector (D) to control board (33).



### 8. For models 24U090 and 24U091:

- a. Install shroud (29) and screw (100).
- b. Install front cover (32) and two screws (30).



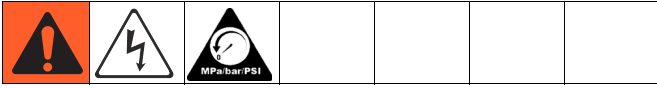
**For all other models:** Install shroud (29) and two screws (30).

### 9. For models 24U096, 24U097, 24U098:

- a. Install toolbox (120) and two screws (121).
- b. Install kickstand (122).

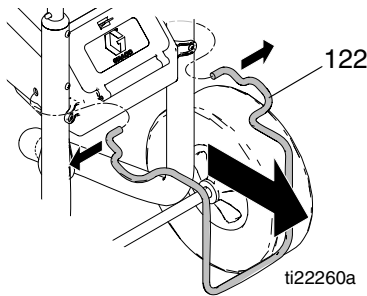
# Control Board Replacement

See *Wiring Diagram*, page 38.

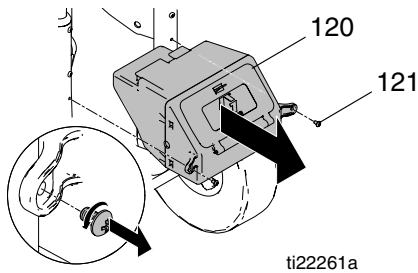


## Removal

1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).

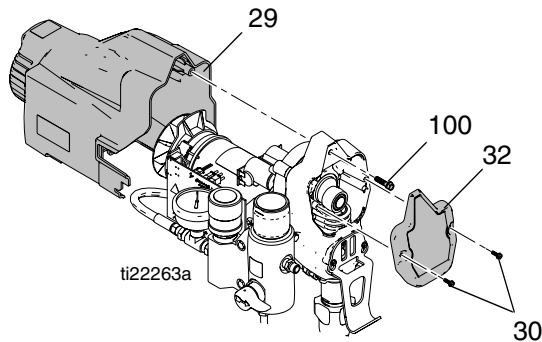


- b. Remove two screws (121) and toolbox (120).



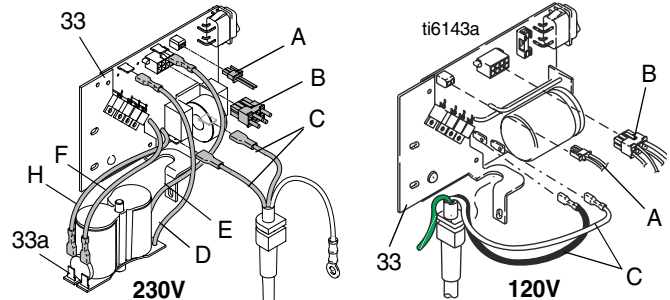
3. **For models 24U090 and 24U091:**

- a. Remove two screws (30) and front cover (32).
  - b. Remove screw (100) and shroud (29).

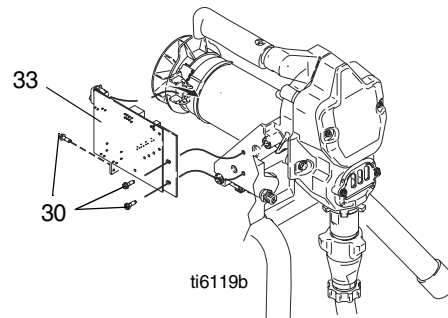


**For all other models:** Remove two screws (30) and shroud (29).

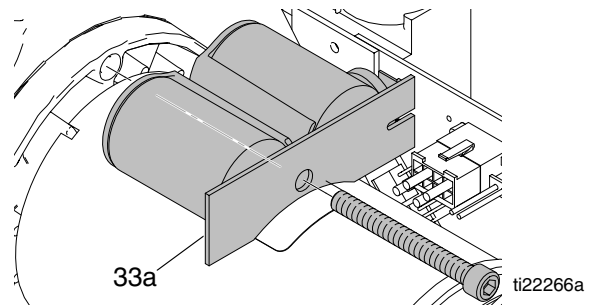
4. Disconnect pressure switch connector (A) from control board (33).



5. Disconnect motor connector (B) from control board (33).
6. **230V models only:** Disconnect capacitor connectors (D and E) from control board (33) and (H and F) from capacitor board (33a).
7. Remove 3 screws (30) securing control board to housing (2 are located on the front and one on the back next to the power cord).



8. **230V models only:** Remove screw which secures capacitor board and bracket to housing.

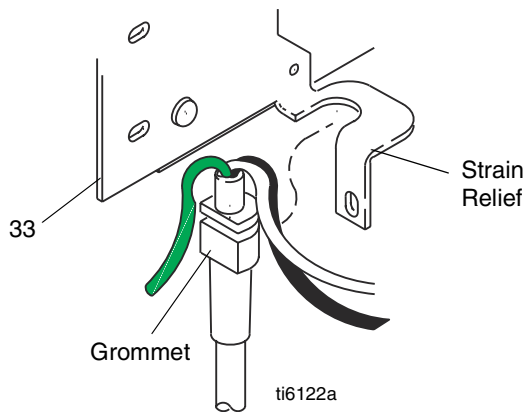


- Pull control board out slightly and then slide it back and off of frame.

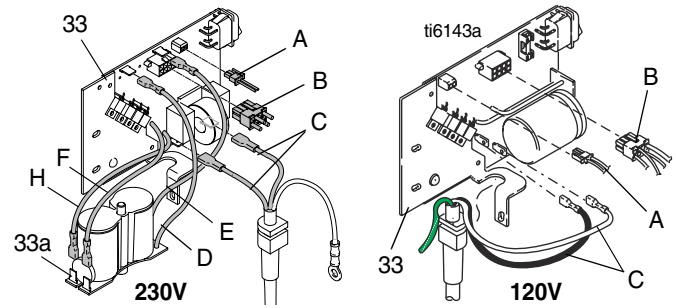
**NOTE:** Make sure power cord is free and NOT wrapped around cord wrap.

- Remove grommet and wires from strain relief.

Ground wire will remain attached to sprayer with grounding screw.

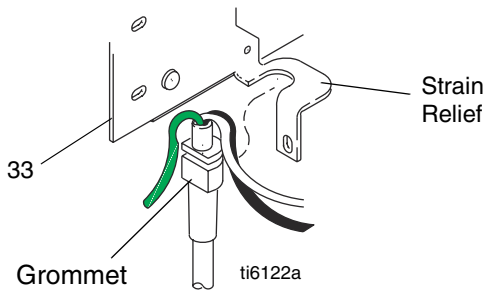


- Remove two power cord (C) connectors from control board.

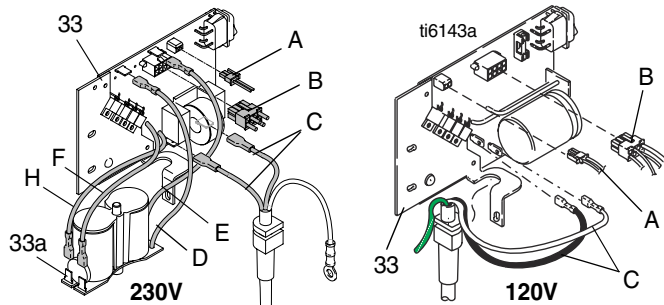


## Installation

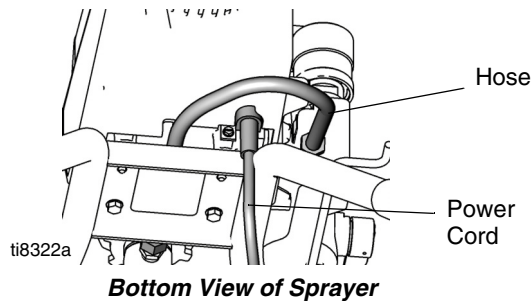
1. Push grommet and power cord wires into strain relief in control board (33).



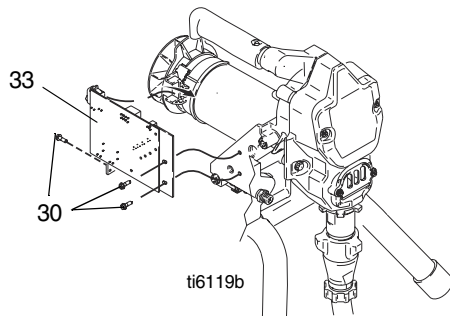
2. Reconnect the power cord (C) connectors to the correct terminals indicated on the control board (33) (120V, black and white, 230V, blue and brown).



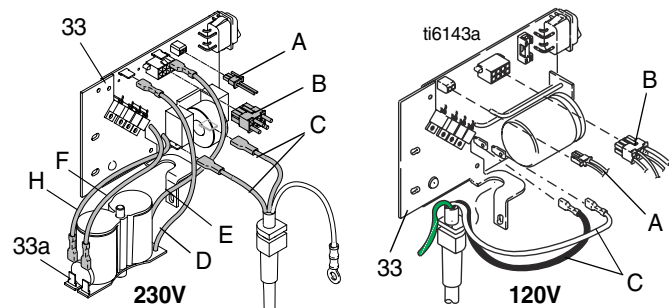
Be sure power cord is routed between the blue high pressure hose to the manifold and the sprayer frame.



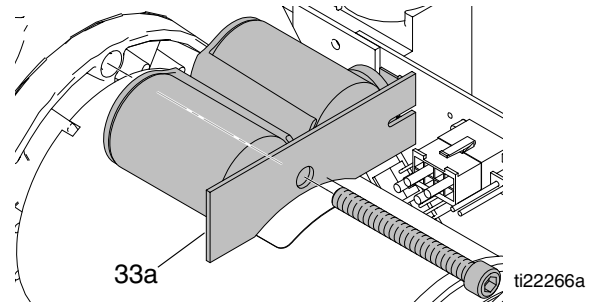
3. Carefully slide control board back into place on the side of the motor frame.



4. Replace 3 screws (30). Torque to 30-35 in-lbs (3.4 - 3.9 N•m).



**230V models only:** Install capacitor board with screw and bracket (33a). Torque to 35-40 in-lb.



### NOTICE

Do not pinch capacitor board wires between housing and bracket. Damage to wires will occur.

5. Reattach motor connector (B) and pressure control assembly connector (A).

**230V models only:**

- a. Attach red and black wires (H and F) from control board to capacitor board.
- b. Attach red and black wires (D and E) from capacitor board to control board.

**For models 24U090 and 24U091:**

- a. Install shroud (29) and screw (100).
- b. Install front cover (32) and have two screws (30).

**All other models:** Install shroud (29) and two screws (30).

6. **For models 24U096, 24U097, and 24U098:**

- a. Install toolbox (120) and two screws (121).
- b. Install kickstand (122).

# Fuse Replacement



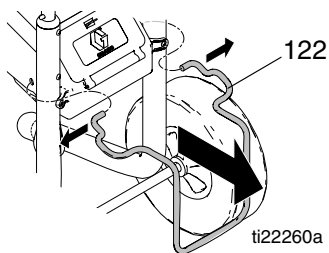
## If the fuse is blown, check for:

- Pinched or shorted wires
- A defective motor (see **Spin Test**, page 21).
- A locked or frozen pump.

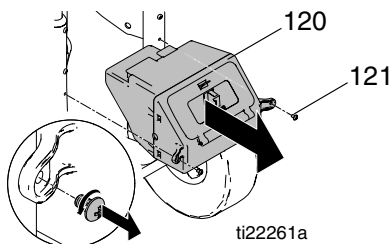
Correct defective condition before replacing fuse.

## Removal

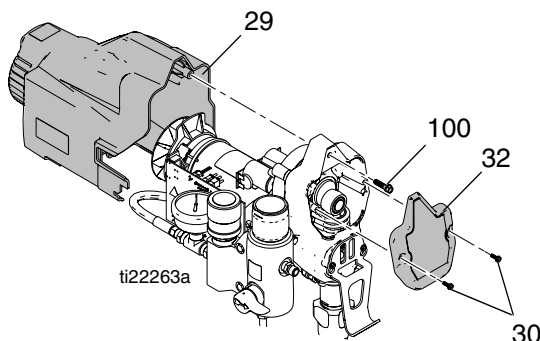
1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).



- b. Remove two screws (121) and toolbox (120).



3. **For models 24U090 and 24U091:**
  - a. Remove two screws (30) and front cover (32).
  - b. Remove screw (100) and shroud (29).



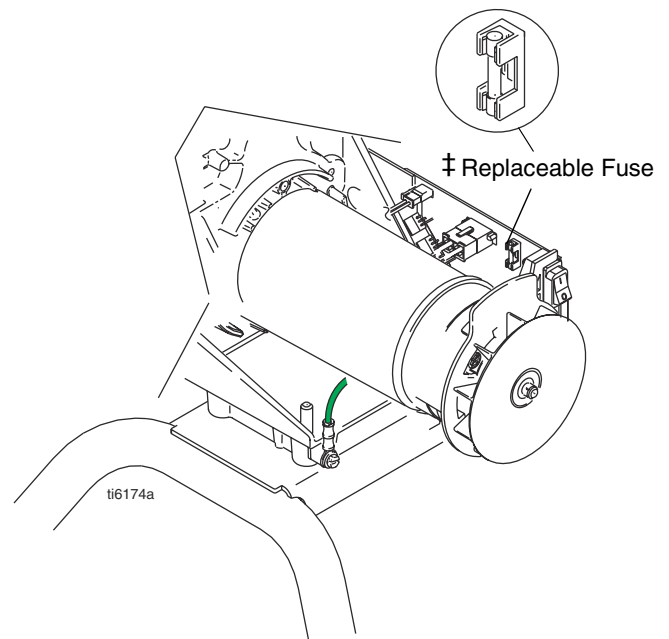
**All other models:** Remove two screws (30) and shroud (29).

4. Remove fuse from control board.

## Installation

1. Install new fuse (‡) on control board.
2. **For models 24U090 and 24U091:**
  - a. Install shroud (29) and screw (100).
  - b. Install front cover (32) and have two screws (30).
3. **For models 24U096, 24U097, and 24U098:**
  - a. Install toolbox (120) and two screws (121).
  - b. Install kickstand (122).

**All other models:** Install shroud (29) and two screws (30).



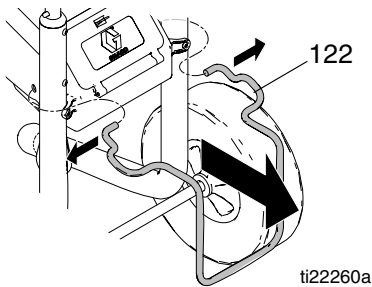
# Pressure Control Assembly Replacement

See *Wiring Diagram*, page 38.

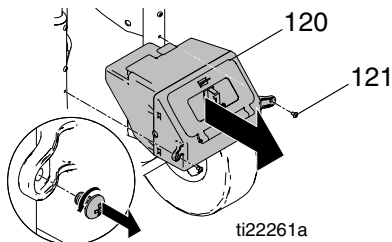


## Removal

1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).

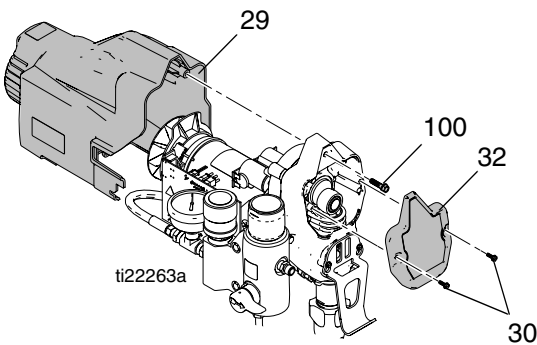


- b. Remove two screws (121) and toolbox (120).



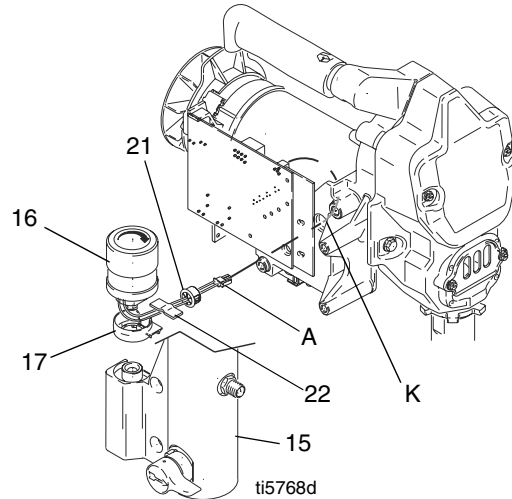
3. **For models 24U090 and 24U091:**

- a. Remove two screws (30) and front cover (32).
  - b. Remove screw (100) and shroud (29).

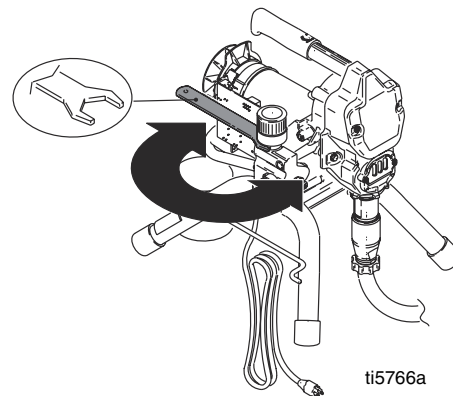


**All other models:** Remove two screws (30) and shroud (29).

4. Disconnect pressure switch connector (A) from control board (33).
5. Remove tape (22) holding wires to manifold, if applicable.
6. Pull bushing (21) from hole (K), then pull wires back through hole (K) in housing.



7. Turn the pressure control knob (16) counter clockwise as far as you can to access the flats on either side of the pressure control assembly.
8. Using a 1 in. (26 mm) wrench loosen and unscrew pressure control assembly.



### NOTICE

If you plan to reuse the pressure control assembly, be very careful not to damage or tangle the wires while unscrewing the assembly. Damage to wires may occur.

9. Remove pressure control assembly.

## Installation

**NOTE:** Inspect pressure control assembly before installation to verify the o-ring is installed and in place. Verify that the wires are routed through bushing (21).

1. Align wire cap (17) on fluid manifold so opening faces toward motor.
2. Apply thread sealant to pressure control assembly (16) threads.
3. Screw pressure control assembly (16) into manifold (15) and torque to 150 in-lbs (17.0 N•m).

### NOTICE

Be careful when tightening pressure control knob that wires do not get pinched between the pressure control assembly and fluid manifold.

4. Guide wires around bottom of knob and route through slot in wire cap (17). Feed wires through hole (K).
5. Insert bushing (21) in hole (K) in housing. Secure wires to manifold housing with tape (22), if applicable.
6. Reconnect pressure switch connector (A) to control board (33).
7. **For models 24U090 and 24U091:**
  - a. Install shroud (29) and screw (100).
  - b. Install front cover (32) and have two screws (30).
- All other models:** Install shroud (29) and two screws (30).
8. **For models 24U096, 24U097, and 24U098:**
  - a. Install toolbox (120) and two screws (121).
  - b. Install kickstand (122).

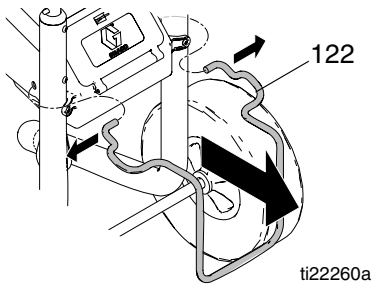
# Manifold Replacement

See **Wiring Diagram**, page 38.

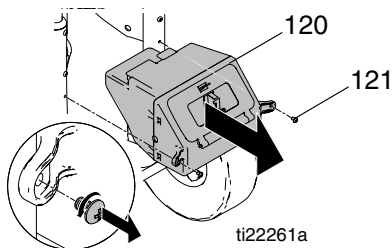


## Removal

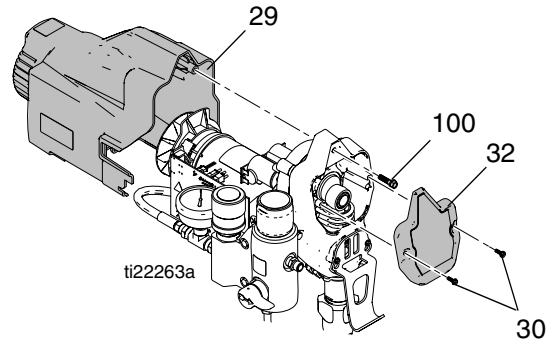
1. Disconnect power cord from outlet. **Relieve pressure**, page 10.
2. Remove drain line (40) and barbed fitting (20) from manifold. See **Drain Line Replacement**, page 35.
3. **For models 24U096, 24U097, and 24U098:**
  - a. Remove kickstand (122).



- b. Remove two screws (121) and toolbox (120).



4. **For models 24U090 and 24U091:**
  - a. Remove two screws (30) and front cover (32).
  - b. Remove screw (100) and shroud (29).



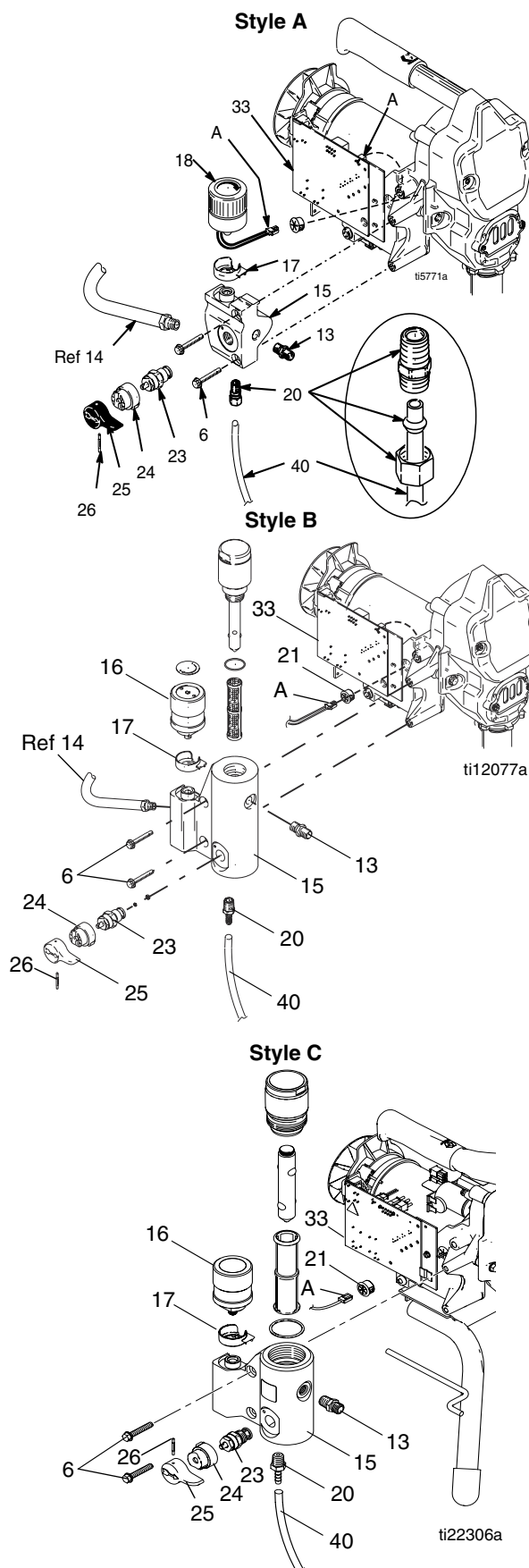
**All other models:** Remove two screws (30) and shroud (29).

5. Disconnect fluid hose (14) at pump outlet.
6. Disconnect pressure switch connector (A) from control board (33).
7. Remove tape (22) holding wires to manifold, if applicable.
8. Pull bushing (21) from hole (K), then pull wires back through hole (K) in housing.
9. If required, remove pressure switch from manifold. See **Pressure Control Assembly Replacement**, page 30.
10. Remove two screws (6) to disconnect manifold (15) from housing.

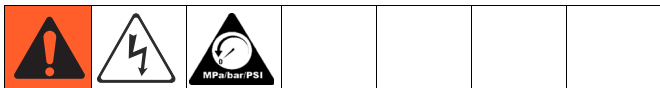


## Installation

1. Position manifold (15) on sprayer frame.
2. Replace screws (6) and torque to 150 in-lb (17 N•m).
3. If removed, install pressure control assembly. See **Pressure Control Assembly Replacement**, page 30.
4. Feed pressure switch wires through hole in housing (K).
5. Insert bushing (21) in hole (K) in housing. Secure wires to manifold housing with tape (22), if applicable.
6. Reconnect pressure switch connector (A) to control board (33).
7. Reconnect fluid hose (14) at pump outlet.
8. **For models 24U090 and 24U091:**
  - a. Install shroud (29) and screw (100).
  - b. Install front cover (32) and have two screws (30).
9. **For models 24U096, 24U097, and 24U098:**
  - a. Install toolbox (120) and two screws (121).
  - b. Install kickstand (122).
10. Install barbed fitting (20) and drain line (40). See **Drain Line Replacement**, page 35.



# Prime Valve Replacement

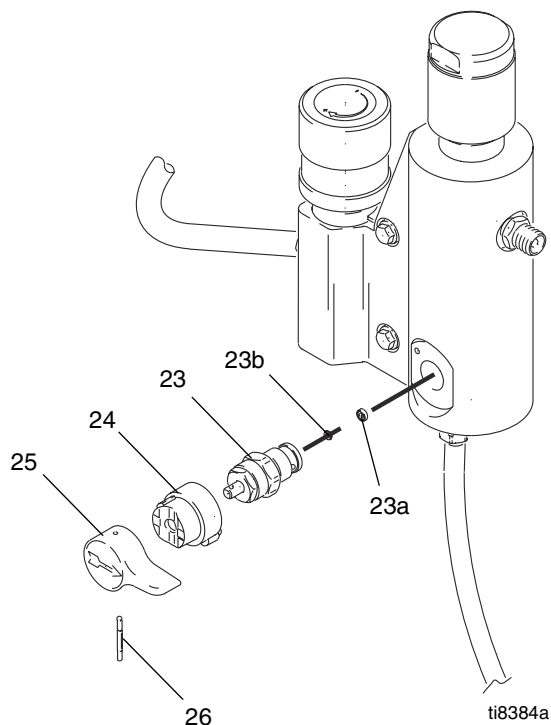


## Removal

1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. Using a punch and hammer, tap pin (26) out of prime valve handle (25).
3. Pull prime valve handle (25) and base (24) off prime valve (23).
4. Using a wrench, loosen prime valve (23) and remove it from manifold (15).
5. Remove valve seat (23b) and seat gasket (23a) from inside of filter manifold (15) or end of prime valve (23).

## Installation

1. Install new gasket (23a) and seat (23b) on end of prime valve (23).
2. Thread prime valve (23) into manifold (15) opening.
3. Hand tighten securely. Using a wrench, torque to 120 to 130 in-lbs.
4. Push base (24) over prime valve (23) and then prime valve handle (25) over base (24).
5. Install new pin (26) in prime valve handle (25). If necessary, use a hammer to tap it in place completely.



# Drain Line Replacement

*This procedure should be used whenever you replace the manifold and reinstall an existing drain line or install a new drain line using the Drain Line Kit.*

## Removal

To remove the drain line (40) from the manifold (15):

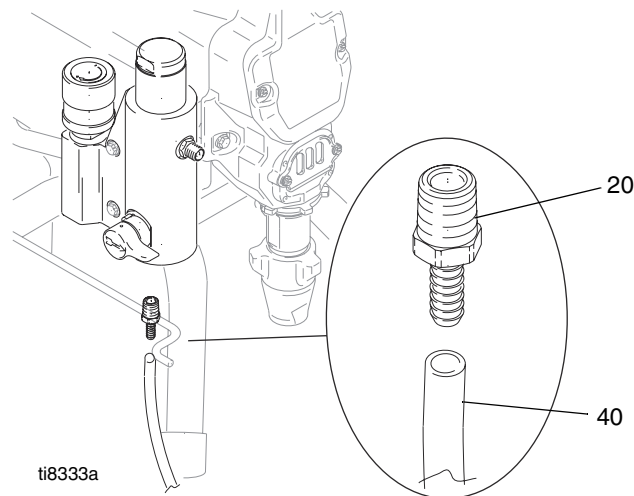
1. Cut drain line (40) from barbed fitting (20).
2. Unscrew barbed fitting (20) from manifold.

If you are only replacing the manifold and will be reusing the existing barbed fitting (20) and drain line (40), you will need to use a sharp knife to cut the remaining drain line material off the end of the barbed fitting (20).

## Installation

1. Screw barbed fitting (20) into manifold (15).
2. Push drain line (40) onto barbed fitting (20).

To make the drain line more pliable and easier to install over barbed fitting, heat end of drain line (40) with a hair dryer or by placing end in hot water a few seconds.



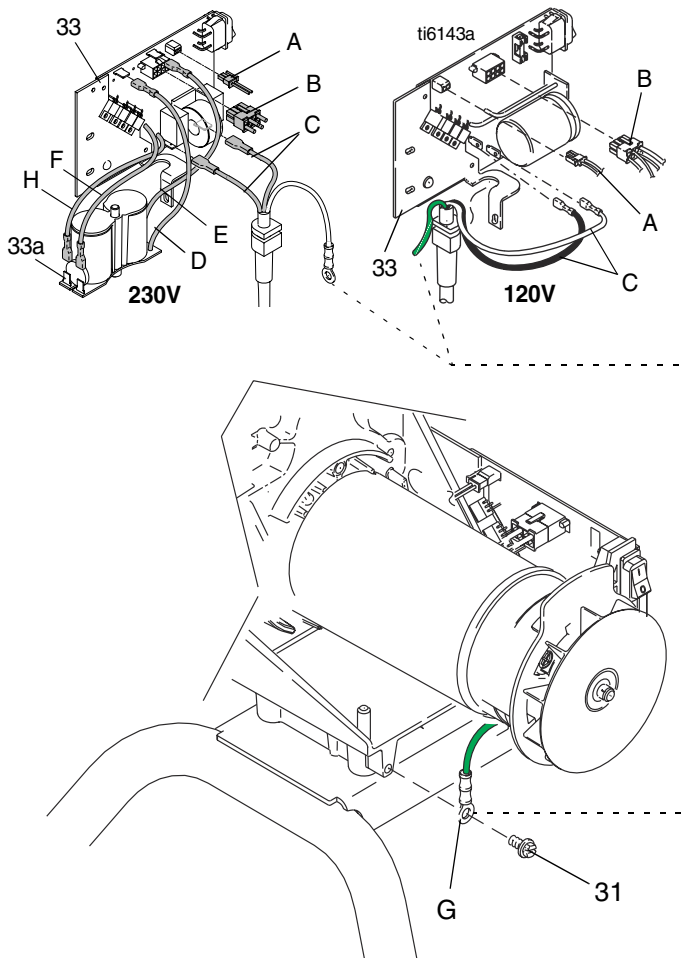
# Power Cord Replacement

See **Wiring Diagram**, page 38.



## Removal

1. Follow **Control Board Replacement** removal instructions, page 26.



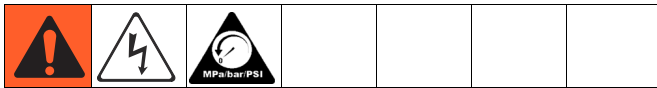
2. Disconnect green ground wire (G) from sprayer by loosening grounding screw (31).

## Installation

1. Reconnect, green ground wire (G) to green grounding screw (31) on frame. Be sure terminal on ground faces UP or wires could get caught in shroud.
2. Follow **Control Board Replacement** installation instructions, page 26.

# Motor Replacement

See *Wiring Diagram*, page 38.



## NOTICE

Gear cluster may stay engaged in motor front endbell or drive housing. Do not drop gear cluster (3) and (2) when removing from drive housing (5). Damage to gear cluster will occur.

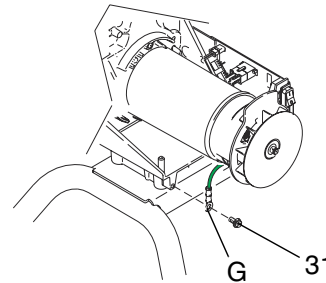
## Removal

1. **Relieve Pressure**, page 10. Disconnect power cord from outlet.
2. Remove pump (9). **Displacement Pump Replacement**, page 18.
3. Remove drive housing (5), **Drive Housing Replacement**, page 20.
4. Remove Pressure (Fluid) Manifold (15), **Manifold Replacement**, page 32.
5. Disconnect all leads from board (33) and remove control board. **Control Board Replacement**, page 26.
6. Remove ground wire (G) from motor endbell.

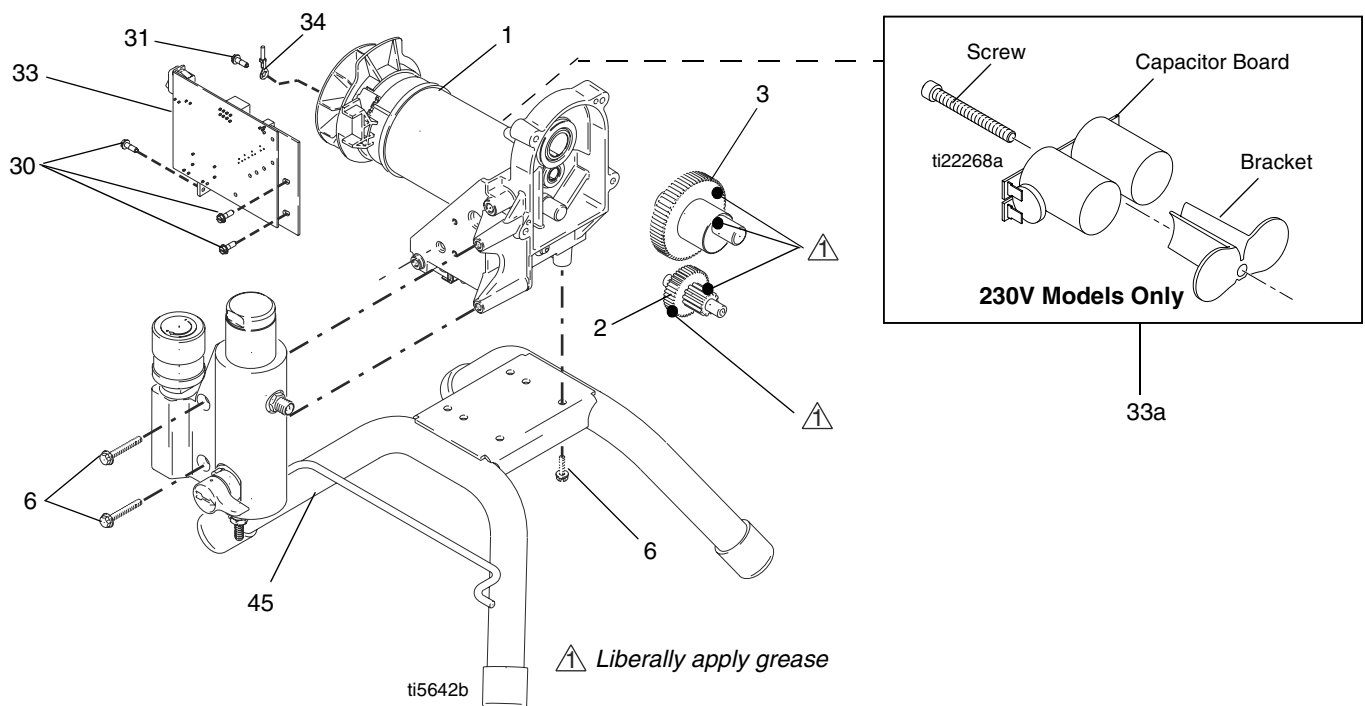
7. Remove four screws (6) and motor (1) from frame (45).

## Installation

1. Install new motor (1) on frame (45) with four screws (6).
2. Reconnect, green ground wire (G) to green grounding screw (31) on frame. Be sure terminal on ground faces UP or wires could get caught in shroud.

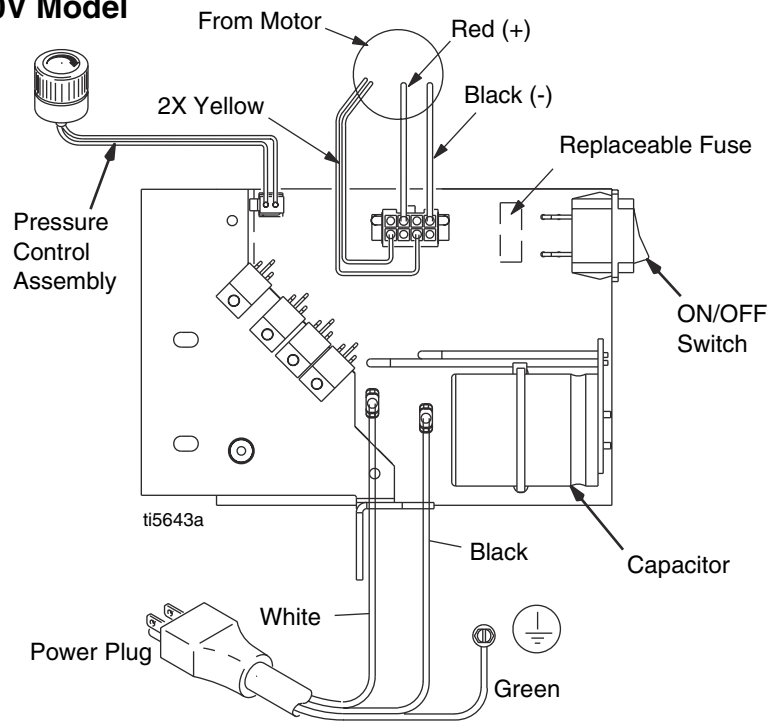


3. Install control board (33) with three screws (30). Connect all leads to board. See **Control Board Replacement**, page 26 and **Wiring Diagram**, page 38.
4. Install manifold (15) with two screws (6). **Manifold Replacement**, page 32
5. Install Drive Housing (5). **Drive Housing Replacement**, page 20.
6. Install pump (9). **Displacement Pump Replacement**, page 18.

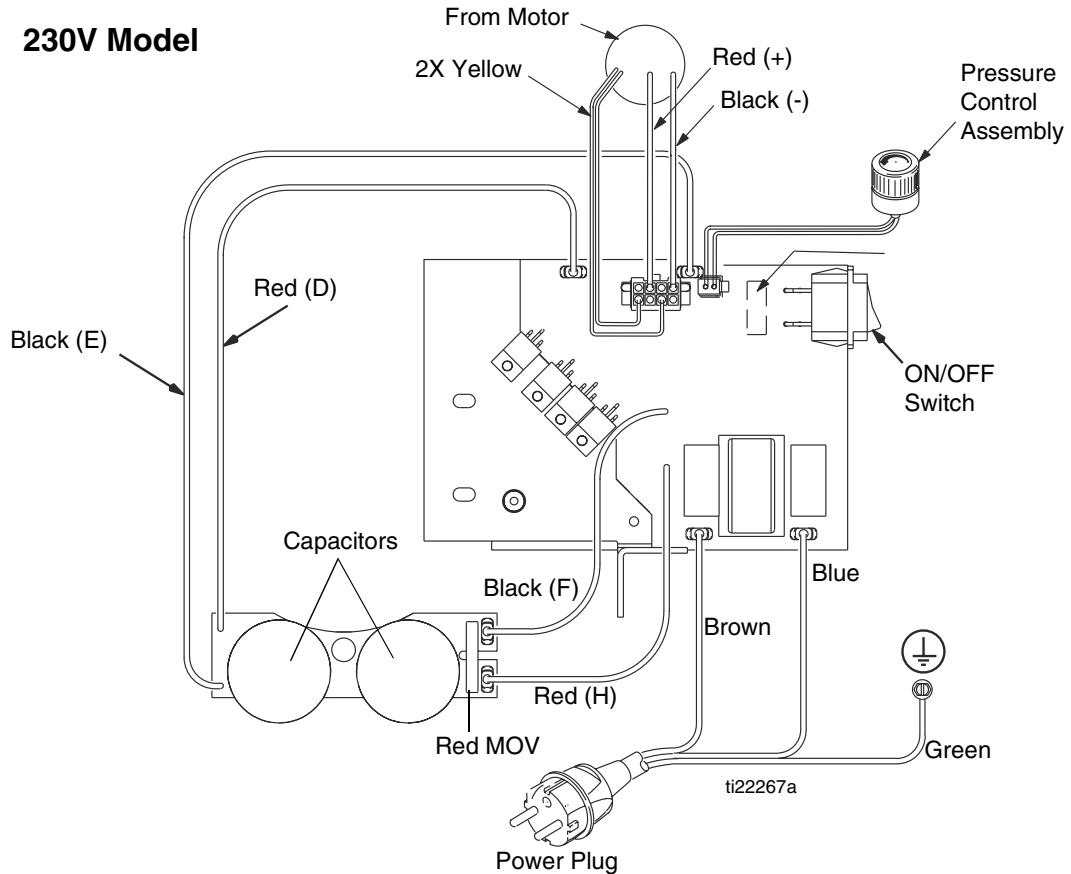


# Wiring Diagram

## 110V/120V Model



## 230V Model



# Technical Specifications

<b>Electric Airless Sprayers</b>		
	<b>U.S.</b>	<b>Metric</b>
<b>Sprayer</b>		
Power requirements	100/120V AC, 50/60 hz, 11A, 1 phase 230V AC, 50/60 Hz, 7.5 A, 1 phase	
Generator required	3000 w minimum	
Maximum working pressure		
190	3000 psi	207 bar, 20.7 MPa
290/390	3300 psi	227 bar, 22.7 MPa
Model 24U105	3000 psi	207 bar, 20.7 MPa
Cycles per gallon (liter)*	680	180
Maximum delivery		
190	0.38 gpm	1.44 lpm
290/390	0.47 gpm	1.78 lpm
Maximum tip size		
190	0.019 in.	
290/390	0.021 in.	
Fluid outlet npsm	1/4 in.	
Wetted parts	zinc and nickel-plated carbon steel, nylon, stainless steel, PTFE, Acetal, leather, UHMWPE, aluminum, tungsten carbide	
<b>Dimensions</b>		
Stand:		
Length	15.75 in.	40.0 cm
Width	14.0 in.	35.6 cm
Height	17.0 in.	43.0 cm
Weight	31.0 lb	14.1 kg
Hi-Boy:		
Length	22.0 in.	55.9 cm
Width	20.5 in.	52.1 cm
Height	38.8 in.	98.6 cm
Weight	58.0 lb	26.3 kg
Lo-Boy:		
Length	26.0 in.	66.0 cm
Width	20.5 in.	52.1 cm
Height	21.0 in.	53.3 cm
Weight	50.0 lb	22.7 kg
<b>Noise (dBa)</b>		
Sound power	100 dBa	
Sound pressure	90 dBa	
<b>Notes</b>		
* Startup pressures and displacement per cycle may vary based on suction condition, discharge head, air pressure, and fluid type.		
Sound pressure measured 3.3 ft (1 meter) from equipment.		
Sound power measured per ISO-3744.		

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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 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.

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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.

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