



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

INSTRUCTIONS

## Model PRO 3500wb<sup>TM</sup> Electrostatic Air Spray Gun

100 psi (0.7 MPa, 7 bar) Maximum Working Pressure

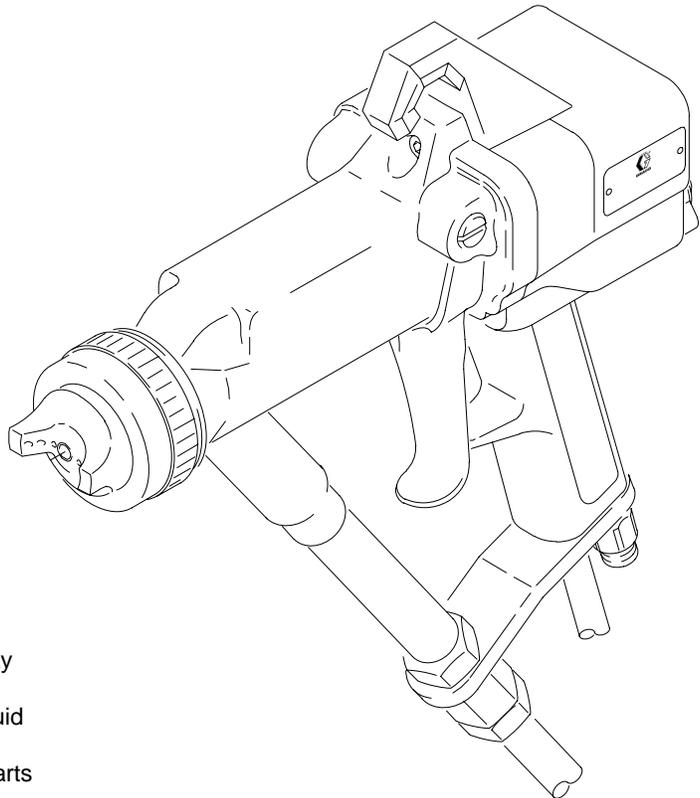
### Part No. 222700, Series C

For use when electrostatically spraying conductive, waterborne fluids that meet at least one of the following conditions for non-flammability:

1. The fluid has a flash point above 140°F (60°C) and a maximum organic solvent concentration of 20%, by weight, per ASTM Standard D93.
2. The fluid does not sustain burning when tested per ASTM Standard D4206 Sustained Burn Test.



**Approved**



05148B

**NOTE:** The PRO 3500wb spray gun is Factory Mutual approved for use with Graco isolation systems. The spray gun is also approved for use with other Factory Mutual approved voltage isolations systems provided that the fluid hose is assembled as shown in Fig. 6, page 13. Any modification of genuine Graco parts or replacement of parts with non-Graco parts will void agency approvals.

U.S. PATENT NO. 4,290,091; 4,219,865; 4,497,447; 4,462,061; 4,660,774 ; D313,064; 4,978,075

Patented 1986, 1987 Canada

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U.K. PATENT NO. 2,147,158; 2,142,559B; 2,140,327B

French Patent No. 89 16305

Other U.S. and Foreign Patents Pending

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## Symbols

### Warning Symbol



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

### Caution Symbol



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

# WARNING

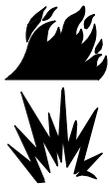


## ELECTRIC SHOCK HAZARD

Improper grounding or an improper setup can cause a hazardous condition and result in an electric shock or other serious injury.

- Ground the equipment, personnel in or close to the spray area, the object being sprayed, and all other electrically conductive objects in the spray area. See **Ground the System** on page 14.
- The gun must be connected to a voltage isolation system that will discharge the system voltage when the gun is not in use.
- Components of the isolation system which are charged with high voltage must be inaccessible to personnel to avoid electric shock. These components must be contained in an enclosure or a safety fence that prohibits personnel from making contact with them before the system voltage is discharged.
- The areas of the waterborne fluid hose that are accessible to the personnel must be covered by the conductive hose layer. The area on the hose that is not covered by the conductive hose layer must be inside the voltage isolation system enclosure. Refer to Fig. 6, page 13.
- Only use the red-colored Graco electrically conductive gun air hose with this gun. Do not use the black or grey-colored Graco air hoses.
- Install only one continuous Graco waterborne fluid hose between the isolated fluid supply and the spray gun. Do not splice hoses together.
- Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 when instructed to discharge the voltage; before cleaning, flushing, or servicing the system; before approaching the front of the gun; and before opening the safety fence or the enclosure for the isolated fluid supply.
- Do not enter a high voltage or hazardous area until all high voltage equipment has been discharged.
- Do not come within 4 in. (101.6 mm) of the front of the gun until the **Fluid Voltage Discharge and Grounding Procedure** on page 16 has been completed.
- Do not connect more than one gun to the same fluid isolation system. Regulations applying to this type of equipment prohibit the use of multiple hand-held guns.
- If there is any static sparking while using the equipment, **stop spraying immediately**. Identify and correct the problem.
- Follow the warnings and instructions in the voltage isolation system manual.

# WARNING



## FIRE AND EXPLOSION HAZARD

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

- Electrostatic equipment must be used only by trained, qualified personnel who understand the requirements stated in this instruction manual.
- Ground the equipment, personnel in or close to the spray area, the object being sprayed, and all other electrically conductive objects in the spray area. See **Ground the System** on page 14.
- Test the gun electrical resistance daily as instructed on page 28.
- Provide fresh air ventilation to avoid the buildup of toxic vapors. See **Ventilate the Spray Booth** on page 9.
- Only use this equipment to spray non-flammable, waterborne fluids, as defined on the front cover of this manual.
- Only flush, purge, or clean the electrostatic, waterborne spray system with non-flammable fluids, as defined on the front cover of this manual.
- Do not flush the system with the gun electrostatics turned on.
- Use only non-sparking tools to clean residue from the booth and hangers.
- Extinguish all open flames or pilot lights in the spray area.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Do not store any flammable fluids 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 smoke in the spray area.
- Do not operate a gasoline engine in the spray area.



## PRESSURIZED EQUIPMENT HAZARD

Spray from the gun, hose leaks, or ruptured components can splash fluid in the eyes or on the skin and cause a serious injury.

- Do not point the spray gun at anyone or any part of the body.
- Do not stop or deflect fluid leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** on page 16 whenever you: are instructed to relieve the pressure; stop spraying; clean, check, or servicing the equipment; and install or clean the fluid nozzles.
- Tighten all the fluid connections before operating the equipment.
- Check the hoses, tubes and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.

*Warnings are continued on the next page.*

# ! WARNING



INSTRUCTIONS



## EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all the instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check the equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. This equipment has a **100 psi (0.7 MPa, 7 bar) maximum working air and fluid pressure**.
- Use fluids that are compatible with the equipment wetted parts. See the **Technical Data** section of all the equipment manuals. Read the fluid manufacturer's warnings.
- Route the hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below -40°F (-40°C).
- Do not use the hoses to pull equipment.
- Wear hearing protection when operating this equipment.
- Comply with all applicable local, state, and national fire, electrical, and other safety regulations.



## TOXIC FLUID HAZARD

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

- Know the specific hazards of the fluid you are using. Read the fluid manufacturer's warnings.
- Store hazardous fluid in an approved container. Dispose of the hazardous fluid according to all local, state, and national guidelines.
- Wear appropriate protective clothing, gloves, eyewear, and respirator.

# Introduction

## Spraying Waterborne Fluids Electrostatically

The PRO 3500wb spray gun is a 60 kV electrostatic spray gun that is designed to spray conductive, waterborne, non-flammable fluids. When spraying waterborne fluids electrostatically, the gun must be connected to a voltage isolation system, which isolates the fluid supply from ground and allows voltage to be maintained at the tip of the gun.

A safe, well designed isolation system should have the following features:

- All components of the isolation system that are charged to high voltage must be contained within a fence or enclosure that prohibits personnel from making contact with the high voltage components.
- A means for automatically discharging the system voltage if anyone opens the fence or enclosure.
- A bleed resistor to drain off the system voltage when the spray gun is not in use.
- The system should not have any severe arcing occurring when the isolation mechanism opens and closes. Severe arcing will shorten the life of the system components.

When connected to a voltage isolation system, all of the fluid in the spray gun, fluid hose, and isolated fluid supply are charged to high voltage, which means that the system has more electrical energy than a solvent-based system. Therefore, only non-flammable fluids (defined on the front cover of this manual) can be sprayed with the system or be used to clean, flush, or purge the system.

Precautions must be taken when using electrostatic waterborne equipment to avoid potential shock hazards. When the spray gun charges the isolated fluid to high voltage, it is similar to charging a capacitor or battery. The system will store some of the energy while spraying and retain some of that energy after the spray gun is shut off. It is not safe to touch the front end of the gun until the stored energy is discharged. The amount of time it takes to discharge the energy depends on the system design. Follow the **Fluid Voltage Discharge and Grounding Procedure**, page 16, before approaching the front of the gun.

Do not intentionally ground out the system by arcing the electrode to ground when you are done spraying. Sudden arcs or shocks to the gun and system puts extra stress on the components and will shorten the life of the gun and fluid hose. When hanging up the gun, avoid arcing the gun to a grounded gun hanger. An optional plastic gun holster is available, which can be used to hang up the gun without causing arcs.

## Operating the Electrostatics

Refer to Fig. 1, page 7

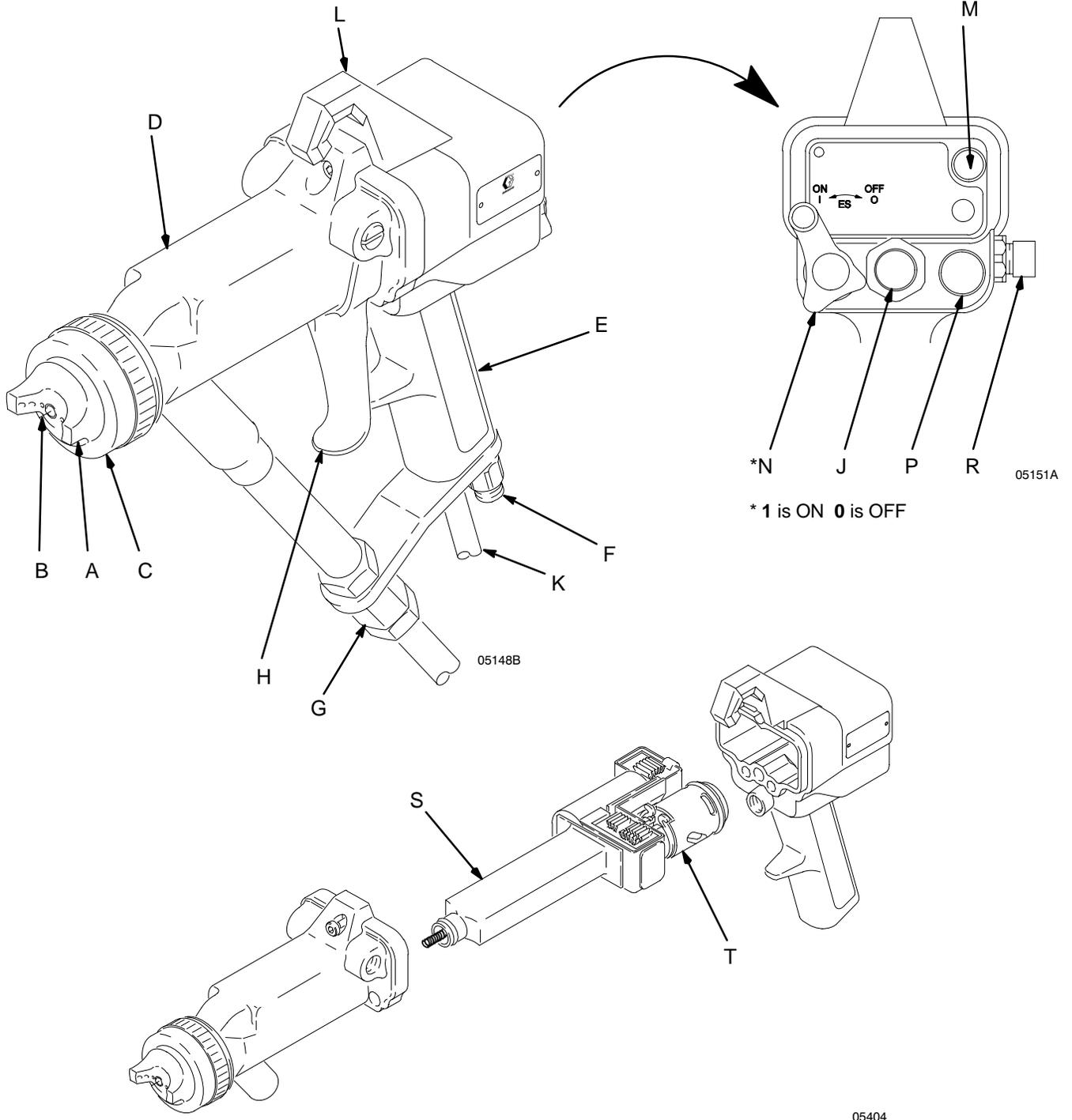
To operate the electrostatics, air pressure is supplied through a Graco electrically conductive air hose to the gun air inlet (F). When the gun is triggered, air enters the gun and is directed to the inlet of the turbine/alternator (T). The air spins the turbine, which then provides electrical power to the power supply. The fluid is charged by the spray gun electrode (B). The charged fluid is attracted to the nearest grounded object, wrapping around and evenly coating all surfaces.

# Introduction

**KEY-Fig. 1**

- A Air Cap
- B Electrode
- C Retaining Nut
- D Gun Barrel
- E Gun Handle
- F Air Inlet
- G Fluid Inlet
- H Trigger

- J Fluid Adjustment Knob
- K Exhaust Tube
- L Hook
- M ES Indicator Light
- N ES ON-OFF Lever
- P Fan Air Adjustment Valve
- R Atomizing Air Valve
- S Power Supply
- T Turbine/Alternator



**Fig. 1**

# Introduction

## Graco Waterborne Fluid Hose (purchased separately)

A Graco waterborne fluid hose must be used between the voltage isolation system fluid outlet and the spray gun fluid inlet. This fluid hose consists of three layers (see Fig. 2):

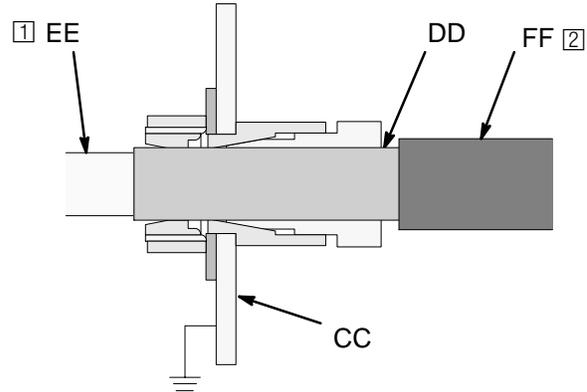
- **Inner Hose Layer (EE):** is a PTFE tube.
- **Conductive Hose Layer (DD):** covers the PTFE tube.
- **Outer Hose Jacket (FF):** is a protective polyethylene hose cover.

If a hose failure occurs, where the high voltage arcs through the inner hose layer (EE), the voltage will be discharged to ground through the conductive hose layer (DD). When properly installed, the conductive hose layer is grounded through its connection to the grounded safety fence or enclosure (CC). All areas of the fluid hose that are accessible to personnel during normal operation must be covered by the outer hose jacket (FF) to avoid electric shock.

### KEY-Fig. 2

DD Conductive Hose Layer  
EE Inner Hose Layer  
FF Outer Hose Jacket  
CC Grounded Enclosure

- 1 The portion of the inner hose layer (EE-PTFE tube) that is not covered by the conductive hose layer (DD), must be inside the safety fence or enclosure (CC).
- 2 The areas of the waterbase fluid hose that are accessible to personnel during normal operation must be covered by the outer hose jacket (FF).



H<sub>2</sub>O PRO Voltage Block connection shown

Fig. 2

05179

# Installation

## Installing the System

**⚠ WARNING**



**ELECTRIC SHOCK HAZARD**  
Installing and servicing this equipment requires access to parts which could cause an electric shock or other serious injury if the work is not performed properly.

- Do not install or service this equipment unless you are trained and qualified.
- Comply with all local, state, and national codes for the installation of electrical apparatus in a Class 1, Group D, Hazardous Location.
- Comply with all applicable local, state, and national fire, electrical, and other safety regulations.

Fig. 3, page 10, shows a typical Model PRO 3500wb waterborne system. The particular type and size system for your operation must be custom designed for your needs. For assistance in designing a system, contact your Graco representative.

Accessories are available from your Graco representative. Refer to the Product Data Sheet for the gun, Form No. 305681.

## Basic Guidelines

When spraying waterborne fluids electrostatically:

- The gun must be connected to a voltage isolation system, which isolates the fluid supply from ground and allows voltage to be maintained at the tip of the gun.
- All components of the isolation system that are charged to high voltage must be contained within a fence or enclosure that prohibits personnel from making contact with the high voltage components.
- The system should not have any severe arcing occurring when the isolation mechanism opens and closes. Severe arcing will shorten the life of the system components.

## Warning Signs

Mount the warning sign, part no. 186118, in the spray area where it can easily be seen and read by all operators. Additional warning signs are available at no charge.

## Ventilate the Spray Booth

**⚠ WARNING**



**TOXIC FLUID HAZARD**  
Provide fresh air ventilation to avoid the buildup of toxic vapors. Do not operate the gun unless the ventilating fans are on.

Check and follow all local, state, and national codes regarding air exhaust velocity requirements. High velocity air exhaust will decrease the operating efficiency of the electrostatic system. The minimum allowable air exhaust velocity is 60 linear feet/minute (18.3 linear meters/minute).

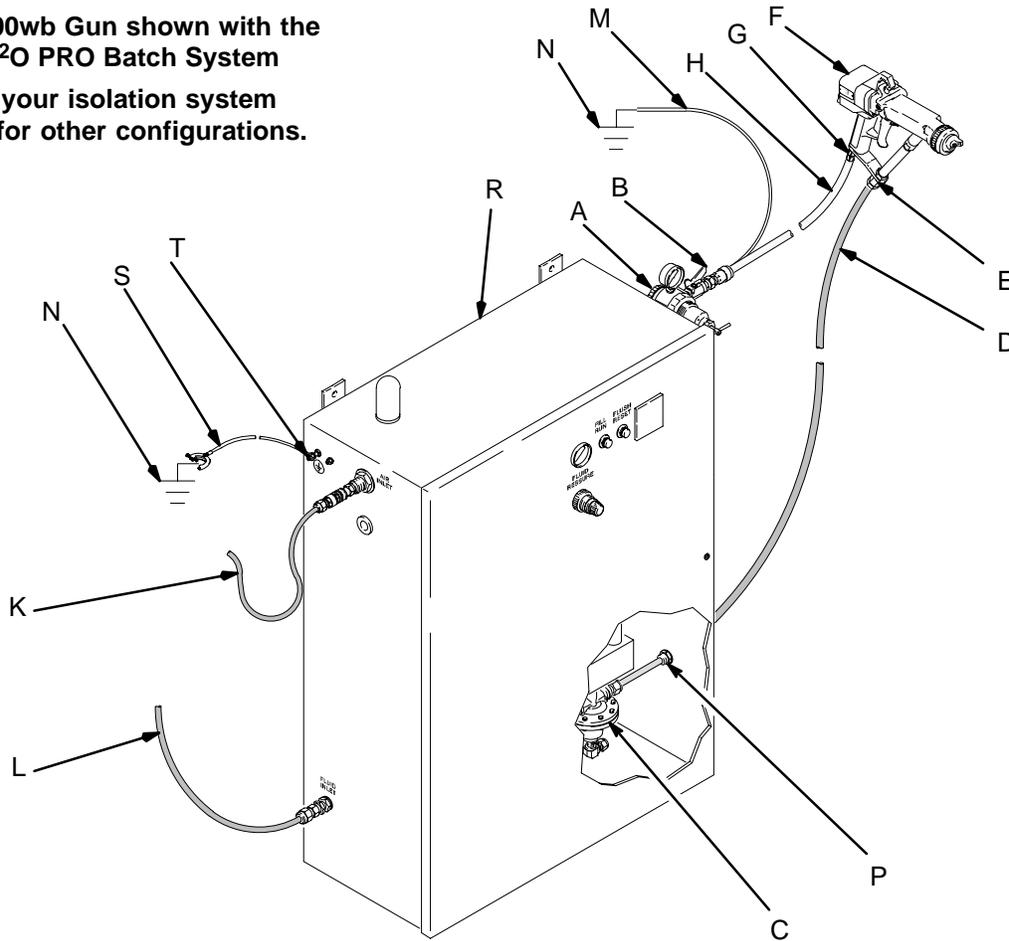
# Installation

## KEY-Fig. 3

- |   |  |   |   |
|---|--|---|---|
| A | Air Regulator                                  | K | Air Supply Hose   |
| B | Spray Gun Air Shut-off Valve                   | L | Fluid Supply Hose   |
| C | Gun Fluid Regulator                            | M | Gun Air Hose Ground Wire                                  |
| D | Graco Waterborne Fluid Hose                    | N | True Earth Ground   |
| E | Gun Fluid Inlet                                | P | Fluid Hose Port   |
| F | PRO 3500wb Spray Gun                           | R | H <sub>2</sub> O PRO Batch System Voltage Block Enclosure |
| G | Gun Air Inlet                                  | S | Main Ground Wire  |
| H | Graco Red Electrically Conductive Gun Air Hose | T | Ground Lug  |

**PRO 3500wb Gun shown with the  
Graco H<sub>2</sub>O PRO Batch System**

**Consult your isolation system  
manual for other configurations.**



**Fig. 3**

05310

# Installation

## Install the Air Line Accessories

1. Install an air line filter and an air and water separator on the main air supply line to ensure a dry, clean air supply to the gun. Dirt and moisture can ruin the appearance of your finished workpiece and can cause the gun to malfunction.
2. Install a bleed-type air regulator (A) on the pump and gun air supply lines to control air pressure to the pump and gun. Refer to Fig. 3, page 10.
3. Install a bleed-type air shutoff valve on the main air line, the pump air line (to shut off air to the pump), and the gun air line (B) (to shut off air to the gun).

### **WARNING**

#### **PRESSURIZED EQUIPMENT HAZARD**

Trapped air can cause the pump to cycle or the gun to spray unexpectedly, which could result in a serious injury, including splashing in the eyes or on the skin. The bleed-type air shutoff valve is required on the main air supply line so trapped air will be relieved between this valve and the pump after the air regulator is closed.

## Connect the Air Line

### **WARNING**



#### **ELECTRIC SHOCK HAZARD**

To reduce the risk of an electric shock or other serious injury, you must use the red-colored Graco Electrically Conductive Air Hose for the gun air supply hose, and you must connect the hose ground wire to a true earth ground. Do not use the black or grey-colored Graco air hoses.

Connect the red-colored Graco Electrically Conductive Air Hose (H) to the gun air inlet and connect the hose ground wire (M) to a true earth ground (N). Refer to Fig. 3, page 10. Check the electrical grounding of the gun as instructed on page 15. See page 48 to order the air hose.

**NOTE:** The hose and the gun have special left-hand threads to prevent connecting another type of air hose to the gun air inlet.

## Connect the Exhaust Tube

Press the exhaust tube (provided) onto the barbed adapter on the bottom of the gun handle. Secure the tube with the clamp provided. Refer to page 46.

## Install the Fluid Line Accessories

1. Before connecting the fluid line, blow it out with air and flush it with water.
2. A fluid regulator (C) is needed in the fluid line to control fluid pressure to the gun. Refer to Fig. 3, page 10.

**NOTE:** The H<sup>2</sup>O PRO voltage block comes with a fluid regulator already installed.

3. Install a fluid filter and drain valve at the pump outlet.

### **WARNING**

#### **PRESSURIZED EQUIPMENT HAZARD**

To reduce the risk of serious injury, including splashing in the eyes or on the skin, install a fluid drain valve close to the pump's fluid outlet. The fluid drain valve is required in your system to assist in relieving fluid pressure in the displacement pump, hose and gun; triggering the gun to relieve pressure may not be sufficient.

# Installation

## Filter the Fluid

Filter the fluid to remove coarse particles and sediment which could clog the fluid nozzle. The filter must be installed at the grounded fluid inlet to the voltage isolation system.

## Connect the Fluid Hose

### NOTE:

- A Graco waterborne fluid hose must be used between the voltage isolation system fluid outlet and the spray gun fluid inlet. See page 48 to order the Graco waterborne fluid hoses and the hose replacement parts.
- Before connecting the fluid supply line to the gun, blow it out with air, and flush it with water to remove contaminants. Flush the gun before using it.

**⚠ WARNING**

**ELECTRIC SHOCK HAZARD**  
To reduce the risk of an electric shock, install only one continuous Graco waterborne fluid hose between the isolated fluid supply and the spray gun. Do not splice hoses together.

1. For the fluid hose to seal properly and be held securely, the hose must be stripped and assembled to the dimensions shown in Fig. 4. Refer also to Fig. 29, page 42. A new Graco waterborne fluid hose comes fully assembled to the proper dimensions.

**⚠ CAUTION**

Be careful not to cut into the inner hose layer (K) when stripping the hose. Nicks or cuts in the tube will cause premature hose failure.

2. Inspect the condition of the o-rings (G) on the hose barbed-fitting. Replace the o-rings if they are worn or damaged.
3. Unscrew the hose ferrule housing (79) from the gun fluid inlet fitting, and slide the nut onto the barbed-end of the hose. Refer to Fig. 5.
4. Apply a light coat of dielectric grease (supplied with the gun) to the o-rings (G) and to the entire length of the inner hose layer (K). See Fig. 4.

### KEY- Fig. 4

- G O-Rings
- H Outer Hose Jacket
- J Conductive Hose Layer
- K Inner Hose Layer

- 1 Apply a light coat of dielectric grease to the o-rings (G) and the entire length of the inner hose layer (K)
- 2  $4.075 \pm 0.10$  in. ( $103.5 \pm 2.5$  mm)
- 3 Minimum of  $4.375 \pm 0.10$  in. ( $111.1 \pm 2.5$  mm)

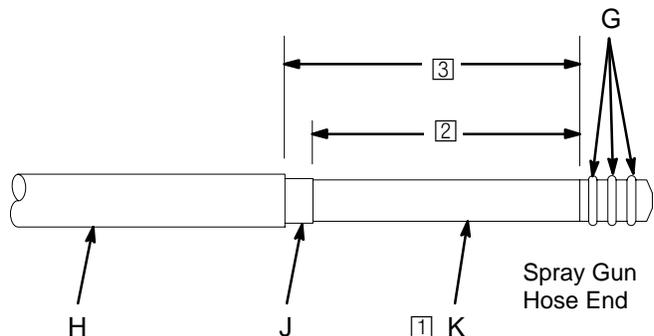


Fig. 4

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*Continued on the next page*

# Installation

## Connect the Fluid Hose (continued)

5. Insert the hose (Y) into the hose ferrule housing (79). See Fig. 5.
6. Push the hose firmly through the fluid inlet tube (75) until the o-rings on the hose barbed fitting are seated and the hose bottoms out.
7. Tighten the hose ferrule (77) firmly with a wrench to about 50 in-lb (5.6 N•m). Pull back on the hose to make sure it is secure. If not, disconnect the hose and inspect it for damage. Check the hose connection periodically for signs that the hose is loosening.

### ⚠ CAUTION

If the hose comes loose from the fitting, fluid leakage will occur. Make sure the hose ferrule (77) is tight and that nothing will pull or catch on the hose during operation.

8. Connect the other end of the hose to the isolated fluid supply as instructed in the voltage isolation system manual. See Fig. 6.

#### KEY- Fig. 5

- Y Graco Waterborne Fluid Hose
- 75 Fluid Inlet Tube
- 77 Hose Ferrule
- 79 Hose Ferrule Housing
- 1 Torque to 50 in-lb (5.6 N•m)

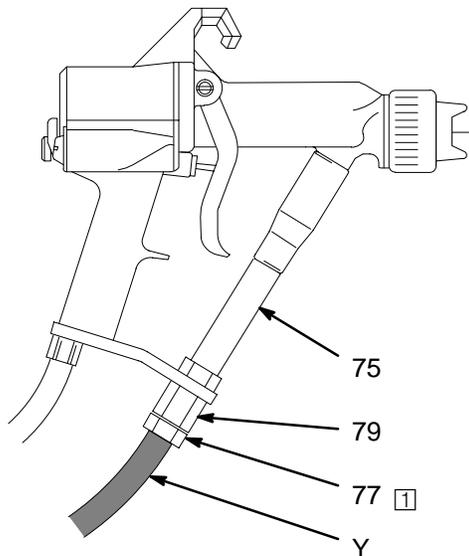


Fig. 5

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### ⚠ WARNING



#### ELECTRIC SHOCK HAZARD

To reduce the risk of an electric shock, the areas of the waterborne fluid hose that are accessible to personnel during normal operation must be covered by the outer hose jacket (H). See Fig. 6.

### ⚠ CAUTION

The Graco warranty is void if the spray gun is connected to a non-Graco voltage isolation system or if the gun is operated above 60 kV.

#### KEY- Fig. 6

- H Outer Hose Jacket
- K Inner Hose Layer
- R Voltage Isolation System Enclosure

- 1 The areas of the waterborne fluid hose that are accessible to personnel during normal operation must be covered by the outer hose jacket (H).
- 2 The portion of the inner hose layer (K) that is not covered by the outer hose jacket (H) must be inside the voltage isolation system enclosure (R).
- 3 The conductive hose layer (J) must be grounded through its connection to the isolation system's grounded safety fence or enclosure (R).

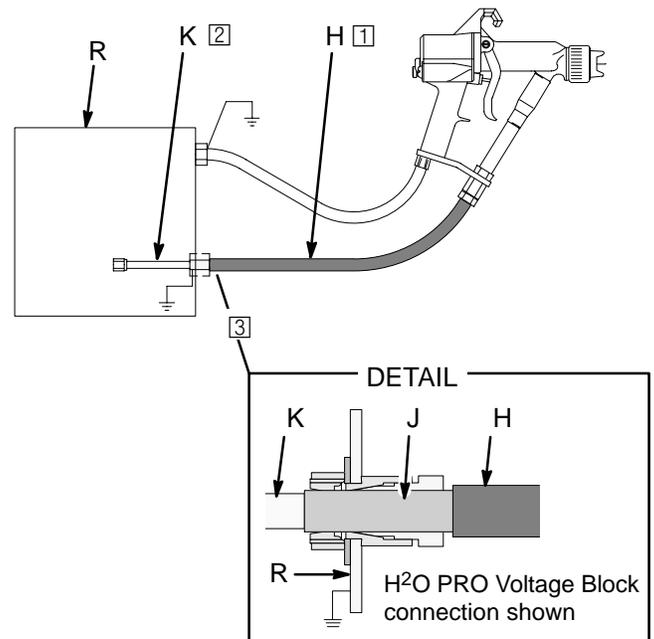


Fig. 6

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# Installation

## Ground the System

**⚠ WARNING**



**FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD**

When operating the electrostatic device, any ungrounded objects in the spray area (such as people, containers, tools, etc.) can become electrically charged. Improper grounding can result in static sparking, which can cause a fire, explosion, or electric shock. Follow the grounding instructions below.

The following grounding instructions are minimum requirements for a basic electrostatic, waterborne system. Your system may include other equipment or objects which must be grounded. Check your local electrical code for detailed grounding instructions. Your system must be connected to a true earth ground.

1. **Fluid Supply:** Ground the fluid supply by connecting a ground wire and clamp between the fluid supply and a true earth ground. See your fluid supply instruction manual for grounding instructions.
2. **PRO 3500wb Electrostatic Air Spray Gun:** Install the red-colored Graco electrically conductive air hose between the gun and air supply line and connect the air hose ground wire to a true earth ground. Check the electrical grounding of the gun as instructed on page 15.
3. **Graco Waterborne Fluid Hose:** The conductive layer of the hose must be properly grounded by correct installation as instructed on pages 12 to 13.
4. **Voltage Isolation System:** Ground the system according to the manufacturer's instructions.
5. **All persons entering the spray area:** Their shoes must have conductive soles, such as leather, or personal grounding straps must be worn. Rubber or plastic soles are not conductive. The operator must not wear gloves which insulate the hand from the spray gun. The gloves must be conductive or modified as shown on page 17.
6. **Object being sprayed:** Keep the workpiece hangers clean and grounded at all times. Contact points must be sharp points or knife edges.
7. **The floor of the spray area:** The floor must be electrically conductive and grounded. Do not cover the floor with cardboard or any non-conductive material which would interrupt grounding continuity.
8. **All electrically conductive objects or devices in the spray area:** They must be properly grounded.

# Installation

## Check the Electrical Grounding

1. Have a qualified electrician check the electrical grounding continuity of the spray gun and air hose.
2. Make sure the red Graco electrically conductive air hose (EE) is connected to the gun and the hose ground wire is connected to a true earth ground. See Fig. 7.
3. The air and fluid supplies to the fluid hose must be turned off and the fluid hose must not have any fluid in it when checking the continuity.
4. Turn the gun ES ON-OFF lever (DD) to OFF.
5. Measure the resistance between the gun handle (AA) and a true earth ground (BB) with an ohmmeter (CC). Resistance should not exceed 100 ohms.
6. If the resistance is greater than 100 ohms, check the tightness of the ground connections, and be sure the air hose ground wire is connected to a true earth ground. If the resistance is still too high, replace the air hose.

### KEY- Fig. 7

- AA Gun Handle
- BB True Earth Ground
- CC Ohmmeter
- DD ES ON-OFF Lever
- EE Graco Electrically Conductive Air Hose

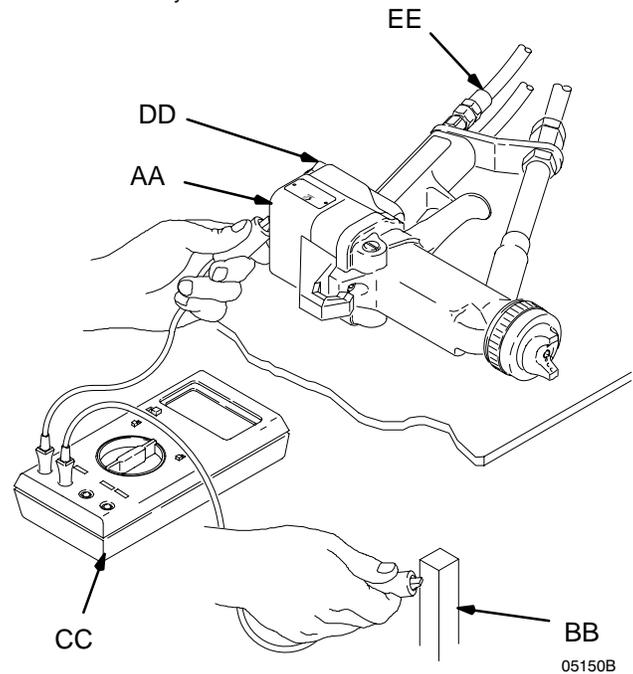


Fig. 7

# Operation

## Fluid Voltage Discharge and Grounding Procedure

### **WARNING**



#### **ELECTRIC SHOCK HAZARD**

The high voltage fluid supply is charged with high voltage until the voltage is discharged. Contact with the charged components of the isolation system or spray gun electrode will cause an electric shock. To avoid an electric shock, follow the **Fluid Voltage Discharge and Grounding Procedure**:

- when instructed to discharge the voltage,
- before cleaning, flushing, or servicing the system equipment,
- before approaching the front of the gun,
- and before opening the safety fence or the enclosure for the isolated fluid supply.

**NOTE:** An accessory grounding rod, part no. 210084, is available to discharge any voltage remaining on a system component. Contact your Graco representative to order it.

1. Turn off the gun electrostatics by turning the gun ES ON-OFF lever to the OFF position.
2. Discharge the voltage at the voltage isolation system by following the procedure specified in the voltage isolation system instruction manual.
3. Touch the electrode of the gun with a grounded rod to make sure that the voltage has been discharged. If an arc is seen, verify that the electrostatics are turned off or see **Troubleshooting**, page 24, or the voltage isolation system manual for other possible problems. Resolve the problem before proceeding.

## Pressure Relief Procedure

### **WARNING**

#### **PRESSURIZED EQUIPMENT HAZARD**

The system pressure must be manually relieved to prevent the system from starting or spraying accidentally. To reduce the risk of an injury from accidental spray from the gun, 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 fluid nozzle.

1. Follow the **Fluid Voltage Discharge and Grounding Procedure**, at left.
2. Relieve fluid pressure in the fluid supply and voltage isolation system as instructed in their instruction manuals.
3. Turn off the fluid supply to the gun.
4. Shut off the air supply to the spray gun. The shut-off device must bleed the air out of the system.
5. Trigger the gun into a grounded metal waste container to relieve fluid pressure.

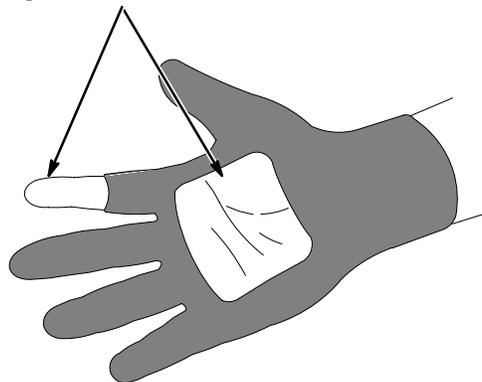
# Operation

## Operating Checklist

Check the following list daily, before starting to operate the system, to help ensure safe, efficient operation.

- \_\_\_ 1. All the operators are properly trained to safely operate an electrostatic, waterborne, air spray system as instructed in this manual and the voltage isolation system manual.
- \_\_\_ 2. All the operators are trained how to properly relieve system pressure as instructed on page 16.
- \_\_\_ 3. All the operators are trained how to properly discharge the voltage as instructed on page 16.
- \_\_\_ 4. The operator is not wearing gloves which insulate the hand from the spray gun. If worn, gloves must be conductive or modified as shown in Fig. 8 so as not to interfere with the operator grounding through the gun.
- \_\_\_ 5. The system is thoroughly grounded and the operator and all persons entering the spray area are properly grounded. See **Ground the System**, page 14, and **Check the Electrical Grounding**, page 15.
- \_\_\_ 6. The condition of the electrical components of the spray gun has been checked as instructed in **Electrical Tests**, page 28.
- \_\_\_ 7. All fluid hose connections are tight.
- \_\_\_ 8. The ventilation fans are operating properly.
- \_\_\_ 9. All the debris, including flammable liquids and rags, is removed from the spray area.

3 in. (76 mm) square cut out and  
finger of glove cut off



**NOTE:** If gloves are worn, they must be conductive or modified as shown so they do not interfere with operator grounding through the gun.

**Fig. 8** \_\_\_\_\_

## Selecting a Fluid Nozzle and Air Cap

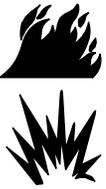
The gun is supplied with a 0.06 inch (1.5 mm) fluid nozzle, part no. 191833, and an air cap, part no. 193033. If your application requires a different nozzle and air cap combination, see instruction manual 307803 or consult your authorized Graco distributor to select the appropriate fluid nozzle and air cap. Install the air cap and fluid nozzle as instructed on page 30.

# Operation

## Operating the Spray Gun

**⚠ WARNING**

**FIRE AND EXPLOSION HAZARD**  
To reduce the risk of fire and explosion, only use this equipment to spray non-flammable, waterborne fluids as defined on the front cover of this manual.



**⚠ WARNING**

**ELECTRIC SHOCK HAZARD**  
Contact with the charged components of the spray gun will cause an electric shock. Do not touch the gun nozzle or electrode or come within 4 inches (101.6 mm) of the front of the gun during gun operation or until after following the **Fluid Voltage Discharge and Grounding Procedure** on page 16.

Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 when you stop spraying and whenever you are instructed to discharge the voltage.



**⚠ WARNING**

**PRESSURIZED EQUIPMENT HAZARD**  
To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 when you stop spraying, before installing or cleaning the fluid nozzle, and whenever you are instructed to relieve the pressure.

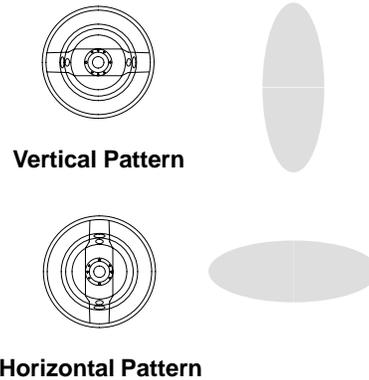
**⚠ WARNING**

**COMPONENT RUPTURE HAZARD**  
To reduce the risk of component rupture, which can cause serious injury, do not exceed the maximum working pressure of the lowest rated system component. This equipment has a **100 psi (0.7 MPa, 7 bar) maximum working air and fluid pressure.**



Follow the steps below to establish the correct fluid flow and air flow. **Do not** turn the ES ON-OFF lever to ON yet:

1. Follow the **Operating Checklist** on page 17.
2. Make sure the system voltage is discharged. Loosen the air cap retaining nut, and rotate the air cap for a vertical or horizontal spray pattern. See Fig. 9. Then tighten the retaining nut until the air cap is held firmly in place; you should not be able to rotate the air cap horns by hand.



**Fig. 9**

02020

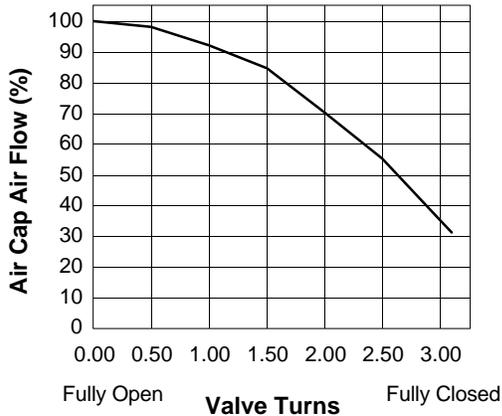
3. Pressurize the fluid supply, and adjust the fluid flow by using the fluid pressure regulator installed in the fluid line. Refer to instruction manual 307803 to set the fluid pressure for various fluid flows, according to the size of the fluid nozzle being used.
4. If necessary, further adjust the fluid flow rate with the fluid adjustment knob (J). See Fig. 10.
5. Fully open the fan air valve (P).
6. Set the air pressure with the air pressure regulator. The following chart shows the air hose inlet pressure required to get full voltage from the power supply. To avoid shortening the turbine life, do not exceed the recommended air pressures.

Air Hose Length ft. (m)	Dynamic pressure at air hose inlet required for full voltage psi (kPa, bar)
15 (4.6)	45 to 50 (314 to 345, 3.1 to 3.4)
25 (7.6)	50 to 55 (345 to 379, 3.4 to 3.7)
50 (15.3)	60 to 65 (410 to 444, 4.1 to 4.4)
75 (22.9)	68 to 73 (465 to 501, 4.5 to 5.0)
100 (30.5)	75 to 80 (514 to 550, 5.1 to 5.5)

# Operation

- Set the atomizing air valve (R) about 1.5 turns out for most applications. The **Atomizing Air Valve Adjustment** chart shows the effect of the atomizing air valve adjustment on the air cap air flow.
- Adjust the pattern width with the fan air valve (P).

## Atomizing Air Valve Adjustment



## Fine Adjustments of the Spray Gun

- To improve the atomization, open the atomizing air valve further (R). If more atomizing air is needed beyond the fully open position of the valve, increase the air hose inlet pressure.

Use the lowest air flow settings needed for acceptable atomization. The slower particle velocity will improve the electrostatic effect.

- To reduce the atomization air and minimize any overspray, turn the atomizing air valve in.
- Turn the ES ON-OFF lever (N) to ON to begin spraying with the electrostatics. When spraying, the ES indicator light (M) should glow, indicating the electrostatic charge.

**NOTE:** See **Spray Pattern Troubleshooting** on page 25 to correct spray pattern problems. See **Voltage Loss Troubleshooting** on page 22 to correct voltage problems.

- Operate the voltage isolation system as instructed in the system manual. Normal spraying voltage for the system will be 45 to 55 kV.

- Use the same spraying technique you would use with a conventional air spray system to coat the workpiece.
- Relieve the pressure and discharge the voltage when you stop spraying.

## CAUTION

Hang the gun with its nozzle pointing down when it is not being used to avoid having fluid run into the gun air passages. See Fig. 11. Fluid in the gun air passages can cause poor atomization and excessive current demands and damage the gun.

### KEY-Fig. 10

- J Fluid Adjustment Knob
- M ES Indicator Light
- N ES ON-OFF Lever
- P Fan Air Adjustment Valve
- R Atomizing Air Valve

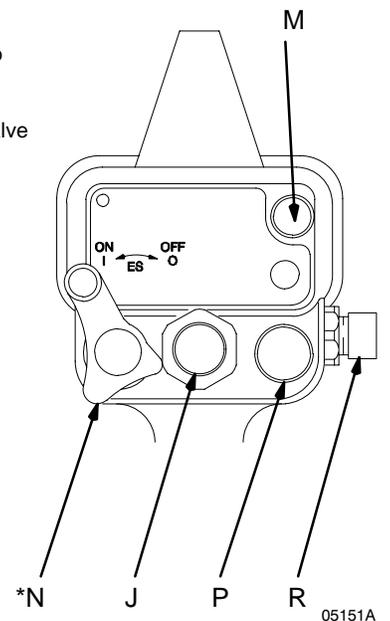


Fig. 10

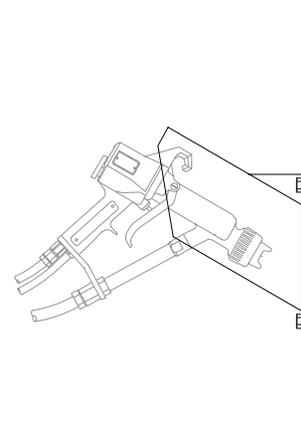


Fig. 11

# Operation

## Shutdown

### **WARNING**

#### **PRESSURIZED EQUIPMENT HAZARD**

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 whenever you stop spraying and whenever you are instructed to relieve pressure.

1. Relieve the pressure.
2. Flush and clean the equipment. Follow the instruction in **Maintenance**.

# Maintenance

### **WARNING**



#### **FIRE AND EXPLOSION HAZARD**

To reduce the risk of fire and explosion:

- Only flush, purge, or clean the PRO 3500wb spray gun with non-flammable fluids, as defined on the front cover of this manual.
- Do not flush with the gun electrostatics turned on.



### **WARNING**



#### **ELECTRIC SHOCK HAZARD**

Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 before cleaning or flushing the gun to ensure the voltage is discharged and avoid serious injury from an electric shock.

### **WARNING**

#### **PRESSURIZED EQUIPMENT HAZARD**

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 when you stop spraying, before cleaning or flushing the spray gun, and whenever you are instructed to relieve the pressure.

## Daily Care and Cleaning

### **CAUTION**

Fluid left in gun air passages could result in a poor quality paint finish and may draw current and reduce the electrostatic effect. Fluid in the power supply cavity can reduce the alternator life.

- Immersing the gun in fluid is not recommended.
- Do not use any cleaning method which may allow solvent into the gun air passages. Point the gun down while cleaning to prevent fluid from running into the air passages. See Fig. 12.
- Hang the gun with its nozzle pointing down when it is not being used.

1. Clean the fluid and air line filters daily.
2. Clean the outside of the gun daily with a soft cloth dampened in a non-flammable cleaning fluid.
3. Clean the air cap and fluid nozzle daily, minimum, as instructed on page 21. Some applications require more frequent cleaning. Replace the fluid nozzle and air cap if they are damaged. See page 30.
4. Check the electrode wire. Straighten it if it is bent, and replace it if it is broken or damaged. See page 32.
5. Check for any fluid leakage from the gun and fluid hoses. Tighten fittings or replace equipment as needed.
6. Check all of the work hangers for build-up of material; clean them if necessary.
7. Flush the gun before changing colors and whenever you are done operating the gun. See page 21.

# Maintenance

## Clean the Air Cap and Fluid Nozzle

### Equipment needed:

- Soft bristle brush
- Non-flammable cleaning fluid

### CAUTION

Do not use metal tools to clean the air cap or fluid nozzle holes as this could scratch them, and make sure the electrode wire is not damaged. Scratches in the air cap or nozzle or a damaged electrode wire can distort the spray pattern.

### Procedure:

1. Relieve the pressure and discharge the system voltage as instructed on page 16.
2. Remove the air cap retaining nut and air cap.
3. Clean the air cap with the soft bristle brush and a non-flammable cleaning fluid or submerge the air cap in the cleaning fluid and wipe it clean.
4. With the front of the gun pointed down, clean the fluid nozzle and the front of the gun with the soft bristle brush and cleaning fluid. See Fig. 12.

**NOTE:** If it appears that there is fluid inside the fluid nozzle air passages, remove the gun from the line for servicing.

5. Clean the exterior of the gun with a cloth dampened in a non-flammable cleaning fluid.
6. Carefully install the air cap. Be sure to insert the electrode wire through the *center* air cap hole and do not bend the wire. Rotate the air cap horns to the desired position.
7. Tighten the retaining nut until the air cap is held firmly in place; you should not be able to rotate the air cap horns by hand.
8. Test the gun resistance as instructed on page 28.

## Flush the Spray Gun

1. Relieve the pressure and discharge the system voltage as instructed on page 16.
2. Make sure the gun ES ON-OFF lever is turned to OFF.
3. Turn off the air to the spray gun.
4. Change the fluid supply over to the cleaning fluid. Read the voltage isolation system manual for specific flushing procedures.
5. Spray the cleaning fluid until the fluid that comes out of the gun is clear.
6. Shut off the fluid supply and relieve the pressure as instructed on page 16.
7. Before spraying paint again, reconnect the paint supply, turn on the fluid and air supplies, and trigger the gun until it is clear of cleaning fluid.

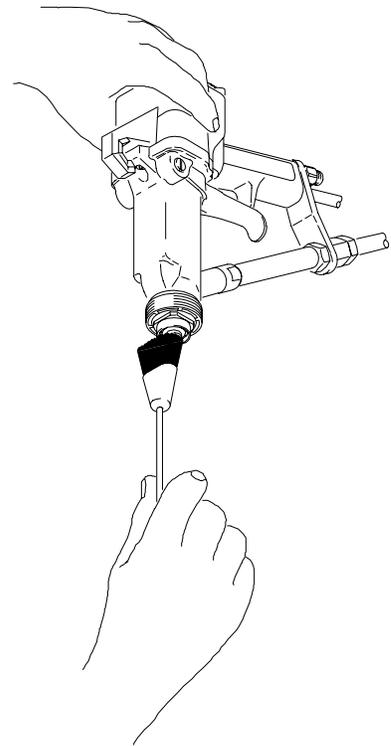


Fig. 12

05152A

# Troubleshooting

## WARNING



### **ELECTRIC SHOCK HAZARD**

Installing and servicing this equipment requires access to parts which may cause an electric shock or other serious injury if the work is not performed properly. Do not install or service this equipment unless you are trained and qualified.

Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 before checking or servicing the system and whenever you are instructed to discharge the voltage to ensure the voltage is discharged and avoid serious injury from an electric shock.

## WARNING

### **PRESSURIZED EQUIPMENT HAZARD**

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 before checking or servicing any part of the system and whenever you are instructed to relieve the pressure.

## Voltage Loss Troubleshooting

Normal spraying voltage for a system using the PRO 3500wb gun is 45 to 55 kV. The system voltage is lower due to spraying current demands and voltage isolation system losses.

A loss of spraying voltage can be caused by a problem with the spray gun, fluid hose, or voltage block, since all of the system components are electrically connected through the conductive, waterborne fluid.

Before troubleshooting or servicing the voltage block itself, you need to determine which component in the system is most likely causing a problem. Possible causes include:

### **Spray Gun**

- Fluid leakage
- Dielectric breakdown at the fluid hose connection or fluid packings
- Not enough air pressure for the turbine

- Faulty power supply
- Excessive overspray on gun surfaces
- Fluid in the air passages

### **Waterborne Fluid Hose**

- Dielectric failure of hose (pin-hole leak through PTFE layer)
- Air gap in the fluid column between the gun and isolated fluid supply, causing a low voltage reading on the isolation system voltage meter.

### **Voltage Block**

- Fluid leakage
- Dielectric breakdown of hoses, seals, or connections
- Isolators not functioning properly

### *Visual Check*

First, check the system for any visible faults or errors to help isolate whether the spray gun, fluid hose or voltage block has failed. A voltage probe and meter, part no. 236003, is helpful for diagnosing voltage problems and is required for some of the troubleshooting tests that follow.

1. Check that all of the air and fluid tubes and hoses are properly connected.
2. Check that the voltage isolation system valves and controls are properly set for operation. Refer to the voltage isolation system manual.
3. Check that the spray gun and voltage isolation system have sufficient air pressure.
4. Check that the gun ES ON-OFF lever is in the ON position and that the gun ES indicator light comes on. If the ES indicator light does not come on, remove the spray gun for service, and complete the electrical tests on page 28.
5. Check that the voltage isolation system's enclosure door or safety fence gate is closed and that any safety interlocks are engaged and working properly.
6. Make sure the voltage isolation system is in the "isolate" mode, where it is isolating the fluid voltage from ground.

# Troubleshooting

## Voltage Loss Troubleshooting (continued)

7. To eliminate air gaps in the fluid column, spray enough fluid to purge the air out between the voltage isolation system and the spray gun. An air gap in the fluid hose can break the electrical continuity between the spray gun and the isolated fluid supply and cause a low voltage reading on a voltage meter connected to the isolated fluid supply.
8. Check the spray gun cover and barrel for accumulated overspray. Excessive overspray can create a conductive path back to the grounded gun handle. Install a new gun cover and clean the exterior of the gun.
9. Inspect the entire system for any visible fluid leakage and repair any fluid leaks that are found. Pay special attention to the following areas:
  - Packing area of the spray gun
  - Fluid hose: check for leakage or any bulges in the outer jacket, which may indicate an internal leak
  - Internal voltage isolation system components

### Tests

If you still have no voltage, separate the spray gun and hose from the voltage isolation system and check whether the gun and hose alone will hold voltage with the following test.

1. Flush the system with water and leave the lines filled with water.
2. Relieve the pressure and discharge the system voltage as instructed on page 16.
3. Disconnect the fluid hose from the voltage isolation system.

**NOTE:** Avoid allowing any water to leak out of the fluid hose as that could cause a significant air gap in the fluid column up to the gun electrode, which can break the conductivity path and conceal a potential failure area.

4. Position the end of the hose as far as possible away from any grounded surface. The end of the hose must be at least 1 ft. (305 mm) from any ground. Make sure that no one is within 3 ft. (914 mm) of the end of the hose.
5. Turn the ES ON-OFF valve to ON, and trigger the gun just enough to turn on the air to the gun but not the fluid. Measure the voltage at the gun electrode with a voltage probe and meter.
6. Discharge the system voltage by waiting 30 seconds and then touching the gun electrode with a grounded rod.
7. If the meter reading is 45 to 55 kV, the gun and fluid hose are okay, and the problem is in the voltage isolation system. See the voltage isolation system manual for further troubleshooting information.

If the reading is below 45 kV, the problem is in the gun or fluid hose.

8. Flush the fluid hose and gun with enough air to dry out the fluid passages.
9. Turn the ES ON-OFF valve to ON, and trigger the gun. Measure the voltage at the gun electrode with a voltage probe and meter.
10. If the meter reading is 55 to 60 kV, the gun power supply is okay, and there is probably a dielectric breakdown somewhere in the fluid hose or gun. Continue with step 11.

If the reading is below 55 kV range, do the electrical tests on page 28 to check the gun and power supply resistance. If those tests show the gun and power supply are okay, continue with step 11, page 24.

# Troubleshooting

## Voltage Loss Troubleshooting (continued)

11. A dielectric breakdown is most likely in one of the following three areas. Repair or replace the component that is failing.

- Fluid hose

Check for leakage or any bulges in the outer jacket, which may indicate a pin-hole leak through the PTFE layer. Disconnect the fluid hose from the gun, and look for signs of fluid contamination on the outside of the PTFE portion of the fluid tube.

Inspect the end of the hose connected to the voltage block. Look for cuts or nicks.

Make sure the hose is properly stripped; see Fig. 4, page 12, for hose stripping dimensions. Restrip or replace the hose.

- Fluid packings

Remove the packing assembly from the gun as instructed on page 33, and look for signs of fluid leakage or any blackened areas, which would indicate arcing is occurring along the packing rod.

- Fluid hose connection joint to the spray gun

A breakdown at the fluid hose connection joint would be caused by fluid leaking past the o-ring seals on the end of the hose. Remove the hose at the gun connection and look for signs of fluid leakage along the PTFE tube.

12. Before reassembling the gun, clean and dry the gun fluid inlet tube (item 75 on page 46). Repack the inner spacer of the fluid packing rod with dielectric grease and reassemble the gun as instructed on page 34.

13. Reconnect the fluid hose as instructed on page 12.

14. Check the gun voltage with the voltage probe and meter before filling the gun with fluid.

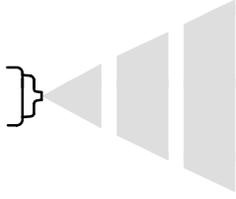
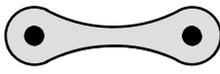
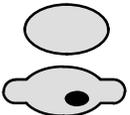
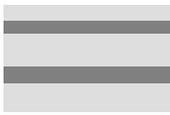
## Electrical Troubleshooting

Problem	Cause	Solution
Voltage is still present at the gun after following the <b>Fluid Voltage Discharge and Grounding Procedure</b>	Gun electrostatics (gun ES lever) are not turned off.	Turn off the gun electrostatics.
	Did not wait long enough for the voltage to discharge through the voltage bleed resistor.	Wait a longer period of time before touching the electrode with a grounded rod. Check for possible bleed resistor failure.
	There is an air pocket in the fluid line that leaves the fluid near the gun isolated.	Determine the cause of the air pocket and fix the problem. Purge the air out of the fluid line.
	Voltage isolation system failed.	See the isolation system manual for service information.
The operator gets a shock	The operator is not properly grounded or is near an ungrounded object.	Be sure the floor and the operator are properly grounded; see <b>Ground the System</b> , page 14.
	The gun is not properly grounded.	See <b>Check the Electrical Grounding</b> , page 15.
The operator gets a shock when touching the workpiece	The workpiece is not properly grounded.	Clean the workpiece hangers; check for proper grounding on the conveyor or track

# Troubleshooting

## Spray Pattern Troubleshooting

**NOTE:** Some spray pattern problems are caused by the improper balance between air and fluid.

Problem	Cause	Solution
Fluttering or spitting spray 	The fluid supply is insufficient.	Adjust the fluid regulator, or fill the fluid supply.
	The fluid nozzle is loose, or the fluid nozzle taper seat is damaged.	Tighten or replace the fluid nozzle; see page 30.
	There is dirt between the fluid nozzle, taper seat, and gun body.	Clean the parts; see page 21.
	The coupler at the fluid inlet is loose or cracked.	Tighten or repair the coupler.
Improper spray pattern 	There is fluid build-up on the air cap; partially clogged horn holes; or full air pressure from the clean horn hole forces the fan pattern toward the clogged end.	Clean the air cap with a soft implement or submerge it in water and wipe it clean; see page 21.
	The electrode is bent.	Straighten the electrode.
	The fluid nozzle or air cap holes are damaged.	Replace the damaged part; see page 30.
	There is fluid buildup on the perimeter of the fluid nozzle orifice, or a partially clogged fluid nozzle orifice.	Remove the obstruction; never use wire or hard instruments; see page 21.
	The electrode is bent.	Straighten the electrode wire.
	The fan air pressure is too high.	Reduce the fan air pressure.
	The fluid is too thin.	Reduce the fluid viscosity.
	There is not enough fluid pressure.	Increase the fluid pressure.
	The fan air pressure is too low.	Increase the fan air pressure.
	The fluid is too thick.	Reduce the fluid viscosity.
	There is too much fluid.	Reduce the fluid flow.
Streaks 	The last coat of fluid is applied too wet.	Apply a drier finish using multiple strokes.
	There is too much air pressure.	Decrease the air pressure.
	The air pressure is insufficient.	Increase the air pressure.
	The spray pattern is non-uniform.	Clean or replace the air cap; see page 21.

# Troubleshooting

## Poor Electrostatic Wrap Troubleshooting

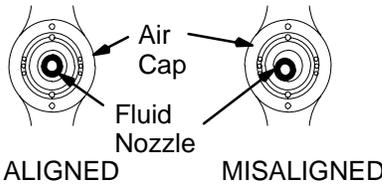
Problem	Cause	Solution
The system is holding voltage but there is poor electrostatic wrap on the part being sprayed	The distance between the gun and workpiece is incorrect.	Adjust the spraying distance to 8 to 12 inches (203 to 305 mm).
	The parts are poorly grounded.	Clean the workpiece hangers; check for proper grounding on the conveyor or track.
	Booth exhaust velocity is too high.	Reduce the exhaust velocity within the code limits.
	The atomizing air pressure is too high.	Reduce the atomizing air pressure.
	The fluid pressure is too high.	Reduce the fluid pressure.
	The fluid viscosity is not right for electrostatic spray.	Check with the supplier for proper fluid viscosity for electrostatic spray.

## Gun Operation Troubleshooting

Problem	Cause	Solution
Fluid leakage from the fluid packing area	The fluid rod packings or fluid rod are worn.	Replace the packings or rod; see page 33.
	The packing nut is loose	Tighten the packing nut; see page 33.
Air leakage from the front of the gun	The air valve is not seating properly.	Clean and service the air valve; see page 36.
	The air valve o-ring is sticking.	Lubricate the o-ring; see page 36.
Fluid leakage from the front of the gun	The fluid rod is worn or damaged.	Replace the fluid rod; see page 33.
	The fluid seat is worn.	Replace the fluid nozzle and/or electrode needle; see pages 30 to 32.
	The fluid packing is too tight.	Lubricate and adjust the packing nut; see page 33.
	The resistor stud is loose.	Tighten the resistor stud; see page 30.
	The fluid nozzle is loose.	Tighten the fluid nozzle; see page 30.
	The resistor stud o-ring is damaged.	Replace the o-ring; see page 30.
"Orange Peel" finish	The air pressure is insufficient for good atomization.	Increase the air cap air pressure by opening the atomizing air valve more or increasing the gun air inlet pressure; use the least air pressure needed for good results.
	The fluid is poorly mixed or filtered.	Remix or refilter the fluid.
	An improper thinner is being used.	Use the proper thinner.

# Troubleshooting

## Gun Operation Troubleshooting (continued)

Excessive spray fog	The air pressure is too high.	Reduce the air cap air pressure by closing the atomizing air valve more or decreasing the gun air inlet pressure; use the least air pressure needed for good results. Do not reduce below minimum pressure needed for full voltage. See page 18.
	The fluid is thinned too much.	Properly thin the fluid.
No fluid sprays from the gun	The fluid supply is low.	Check the fluid supply; add fluid if necessary.
	The fluid nozzle is dirty or clogged.	Clean the fluid nozzle; see page 21.
	The fluid nozzle is damaged.	Replace the fluid nozzle; see page 30.
The equipment is covered with fluid	The exhaust air flow is insufficient or not directed properly.	Check for the proper CFM; check the baffles and direction of the air flow.
	The distance between the gun and workpiece is incorrect.	Adjust the spraying distance to 8 to 12 inches (203 to 305 mm).
Dirty air cap	The electrode is bent.	Straighten the electrode.
	The nozzle orifice is damaged.	Replace the fluid nozzle; see page 30.
	The air cap and fluid nozzle are misaligned.	Check the air cap and fluid nozzle seat for fluid buildup. Clean or replace parts as needed; see page 21 or 30.
		

# Electrical Tests

## ⚠ WARNING



### ELECTRIC SHOCK HAZARD

Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 before checking or servicing and whenever you are instructed to discharge the voltage to ensure the voltage is discharged and avoid serious injury from an electric shock.

## ⚠ WARNING

### PRESSURIZED EQUIPMENT HAZARD

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 before checking or servicing the gun and whenever you are instructed to relieve the pressure.

## ⚠ WARNING



### FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Megohmmeter P/N 218979 (A-see Fig. 13) is not approved for use in a hazardous area. To reduce the risk of sparking, do not use the megohmmeter to do electrical tests unless:

- The gun has been removed from the hazardous area;
- Or all spraying devices in the hazardous area are turned off, ventilation fans in the hazardous area are operating, and there are no flammable vapors in the area (such as open solvent containers or fumes from spraying).

Failure to follow this warning could cause fire, explosion, electric shock and result in serious injury and property damage.

The performance and safety of the spray gun are directly affected by the condition of the electrical components contained inside the gun. The electrical tests can be used to determine the condition of the power supply (18) and the resistor stud (22) as well as the continuity of the electrical path between the components.

Use the megohmmeter (A), part no. 218979, and an applied voltage of 500 volts to complete these electrical tests. Connect the leads as shown.

## Test Gun Resistance

**NOTE:** The fluid passage must be flushed and dried to get an accurate reading. Check the resistance with the gun triggered and untriggered.

1. Prepare the gun for service as instructed on page 30.
2. Measure the resistance between the end of the gun electrode (20) and the air inlet fitting (17). See Fig. 13.
3. The resistance should be between 180 to 220 megohms. If the resistance is outside the specified range, go to the next test.
4. If you still have problems, refer to **Voltage Loss Troubleshooting**, page 22, for other possible causes of poor performance, or contact the nearest authorized service agency.

KEY-Fig. 13

- A Megohmmeter
- 17 Air Inlet Fitting
- 20 Electrode

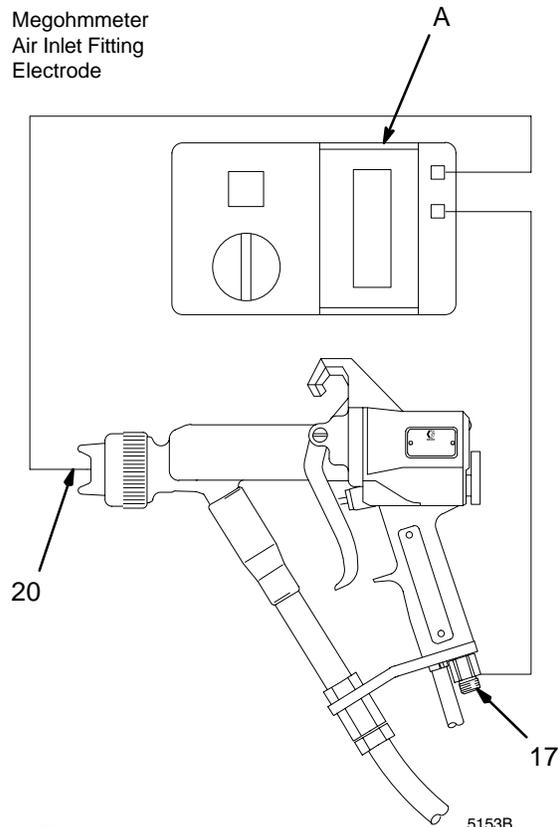


Fig. 13

Continued on the next page.

# Electrical Tests

## Test Power Supply Resistance

1. Prepare the gun for service as instructed on page 30.
2. Remove the power supply (18) from the gun handle as instructed on page 40.
3. Remove the turbine alternator (37) from the power supply as instructed on page 41.
4. Measure the resistance from the power supply's ground contact point (B) to the contact spring (18c) on the other end of the power supply. See Fig. 14.
5. The resistance should be 157.5 to 192.5 megohms. If the resistance is outside the specified range, the power supply is defective and must be replaced. If the resistance of the power supply is correct, proceed to the next test.

KEY-Fig. 14

- A Megohmmeter
- B Ground Contact Point
- 18 Power Supply
- 18c Contact Spring

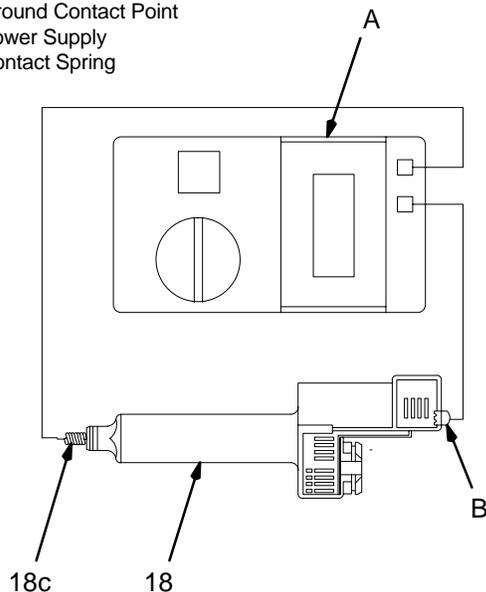


Fig. 14

03566

## Test Resistor Stud Resistance

1. Prepare the gun for service as instructed on page 30.
2. Remove the resistor stud (22) as instructed on page 30.
3. Check the resistance between the black resistor stud contact ring (D) and the needle contact ring (C). See Fig. 15. You may have to press down on the contact ring (D) in several places to get a good reading.
4. The resistance should be 21 to 29 megohms. If the resistance is correct, make sure the metal contact in the gun barrel and the needle contact ring (C) are clean. If the resistance is outside the specified range, the resistor is defective and the resistor stud (22) must be replaced. See page 30 to replace the resistor stud.

## ⚠ WARNING



### FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

The resistor stud contact ring (D) is a conductive contact ring, **not** a sealing o-ring. See Fig. 15. To reduce the risk of sparking, which could cause a sparking or electric shock, **do not** remove the resistor stud contact ring (D) or operate the gun without the contact ring in place. Do not replace the resistor stud (22) with anything but a genuine Graco part.



KEY-Fig. 15

- C Needle Contact Ring
- D Resistor Stud Contact Ring
- 22 Resistor Stud

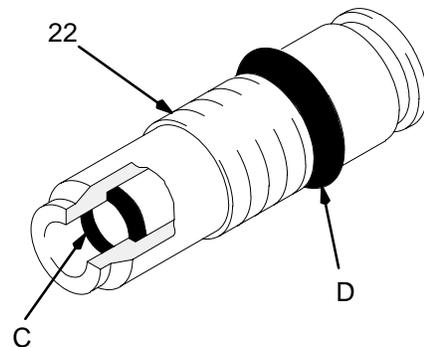


Fig. 15

0442

# Service

## Tools Included with the Gun

- Multi-tool
- Ball-end Wrench
- 2 mm Hex Key Allen Wrench

## Prepare the Gun for Service

### NOTE:

- Check all the possible remedies in **Troubleshooting** before disassembling the gun.
- If the plastic parts of the gun must be held in a vise, use padded vise jaws to avoid damaging parts.
- Lightly lubricate o-rings and seals with petroleum jelly. Do not over-lubricate.
- Only use genuine Graco parts. Do not mix or use parts from other PRO Gun models.

## WARNING



### FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of a fire, explosion, or electric shock:



- Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 and be sure the ES ON-OFF lever is turned to OFF before flushing, checking, or servicing the system and whenever you are instructed to discharge the voltage.
- Clean all the parts with a non-flammable fluid as defined on the front cover of this manual.
- Do not service this equipment unless you are trained and qualified.
- Do not touch the gun nozzle or come within 4 inches (101.6 mm) of the nozzle during gun operation or until after following the **Fluid Voltage Discharge and Grounding Procedure**.

## WARNING

### PRESSURIZED EQUIPMENT HAZARD

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 before checking or servicing any part of the system and whenever you are instructed to relieve the pressure.

1. Discharge the voltage as instructed on page 16.
2. Flush the gun with a non-flammable cleaning fluid as instructed on page 21.
3. Purge the fluid out of the lines with air
4. Relieve the system pressure as instructed on page 16.
5. Disconnect the air and fluid hoses from the gun, and remove the gun from the worksite for service. The service area must be clean.

## Air Cap/Nozzle/Resistor Stud Replacement

### Removal

1. Prepare the gun for service as instructed at left.
2. Remove the air cap assembly (1, 2, 8). See Fig. 16, page 31.

## CAUTION

Hold the front end of the gun up, and trigger the gun while removing the nozzle and resistor stud to help drain the gun and prevent any fluid left in the gun from entering the air passages.

3. Point the front end of the gun up and squeeze the trigger while removing the fluid nozzle/resistor stud (21, 22) assembly with the nozzle wrench (70).

**NOTE:** If the resistor stud (22) remains in the gun when the fluid nozzle is removed, start the nozzle thread onto the stud and pull the stud out.

*Continued on the next page.*

# Service

## Air Cap/Nozzle/Resistor Stud Replacement (continued)

- Unscrew the resistor stud (22) from the fluid nozzle (21) with the multi-tool (62). See Fig. 17.

**⚠ WARNING**



**FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD**

The resistor stud contact ring (D) is a conductive contact ring, **not** a sealing o-ring. See Fig. 16. To reduce the risk of sparking, which could cause a sparking or electric shock, **do not** remove the resistor stud contact ring (D) or operate the gun without the contact ring in place. Do not replace the resistor stud (22) with anything but a genuine Graco part.

- Remove the retaining ring (2) to free the air cap (1) from the retaining nut (8).

### Installation

- Lightly lubricate the o-ring (25) with petroleum jelly, and install it on the resistor stud (22). See Fig. 16.
- Make sure the electrode (20) is tightened properly, as shown in Fig. 18, page 32.
- Install the resistor stud (22) in the fluid nozzle (21) with the multi-tool (62). Tighten the resistor stud to 10 in-lb (1.13 N•m). See Fig. 17.
- Trigger the gun while installing the fluid nozzle (21) and resistor stud (22) assembly with the multi-tool (62). Tighten the assembly until the fluid nozzle seats in the gun barrel (1/8 to 1/4 turn past hand-tight). See Fig. 16.
- Test the gun resistance as instructed on page 28.
- Install the air cap (1) into the retaining nut (8), and secure it with the retaining ring (2).
- Carefully install the air cap assembly (1, 2, 8) onto the gun barrel. Do not bend the electrode (20) wire, and be sure to insert the electrode wire through the *center* air cap hole. Rotate the air cap horns to the desired position.

- Tighten the retaining nut (8) until the air cap is held firmly in place; you should not be able to rotate the air cap horns by hand.

- 1 Apply a very light coat of lubricant to the o-ring (25).
- 2 Tighten the nozzle (21) hand-tight, then 1/8 to 1/4 turn more.

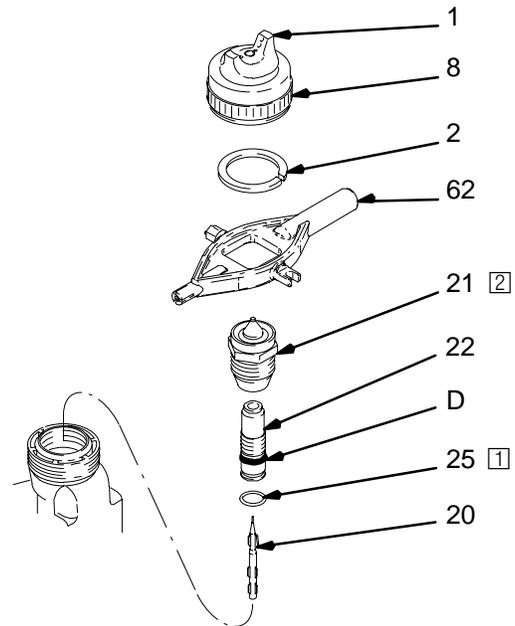


Fig. 16

05154A

- 1 Tighten the resistor stud (22) into the nozzle (21) to 10 in-lbs (1.13 N•m).

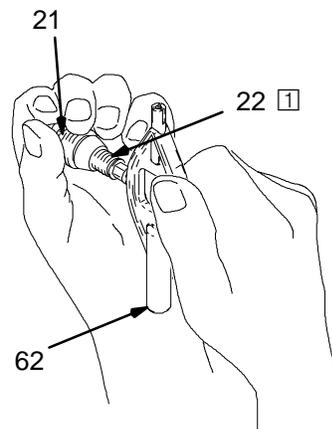


Fig. 17

0444A

# Service

## Electrode Needle Replacement

1. Prepare the gun for service as instructed on page 30.
2. Remove the air cap, nozzle and resistor stud as instructed on page 30.
3. Unscrew and remove the electrode needle (20) with the multi-tool (62). See Fig. 18. Be careful not to damage the contact wire. If the fluid rod turns, hold the back end of the fluid rod (E) by placing a screw driver blade into the slot on the shaft, near the trigger.
4. Apply low-strength (*purple*) Loctite® or equivalent thread sealant to the fluid rod threads.

Hold the back end of the fluid rod (E) to prevent it from turning while installing the new electrode needle (20) finger-tight. Do not over-tighten the electrode needle.

### CAUTION

To avoid damaging the plastic threads or contact wire, be very careful when installing the electrode needle.

5. Install the fluid nozzle and resistor stud assembly and the air cap assembly as instructed on page 31.
6. Test the gun resistance as instructed on page 28.

1. Apply low-strength (*purple*) Loctite or equivalent to the fluid rod threads, then install the electrode needle (20).

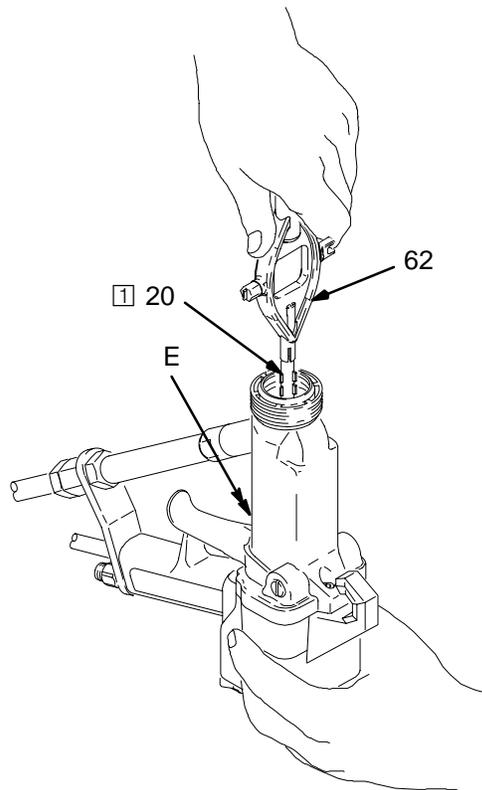


Fig. 18

05155A

# Service

## Fluid Packing Rod Removal and Repair

### Preventative Maintenance

#### **CAUTION**

If the conductive fluid is allowed to leak through the packings, it will eventually cause an electrical short through the packings and along the gun barrel, resulting in a loss of voltage at the tip of the gun. Severe arcing can cause barrel damage. To avoid voltage loss and possible barrel damage, preventative maintenance of the fluid packing assembly must be performed at regular intervals.

Use the following formula to calculate the best packing service interval for your application:

$$\text{Service Interval in Days} = \frac{25,000}{T \times H}$$

Where  $T$  = trigger cycles per minute  
and  $H$  = hours of operation per day

**For example:** If the trigger cycles per minute equals 10 and the hours of operation per day equals 8, the equation would be,

$$\frac{25,000}{10 \times 8} = \frac{25,000}{80} = 312.5$$

The service interval would be 312 work days.

### Procedure

**NOTE:** The fluid packing rod can be replaced as individual parts or as an assembly. If the assembly is purchased, it is pre-adjusted at the factory.

1. Prepare the gun for service as instructed on page 30.
2. Remove the air cap assembly, fluid nozzle, and resistor stud, and electrode as instructed on pages 30 to 32.
3. Loosen the trigger screws (4) far enough to remove the trigger (13). See Fig. 19.

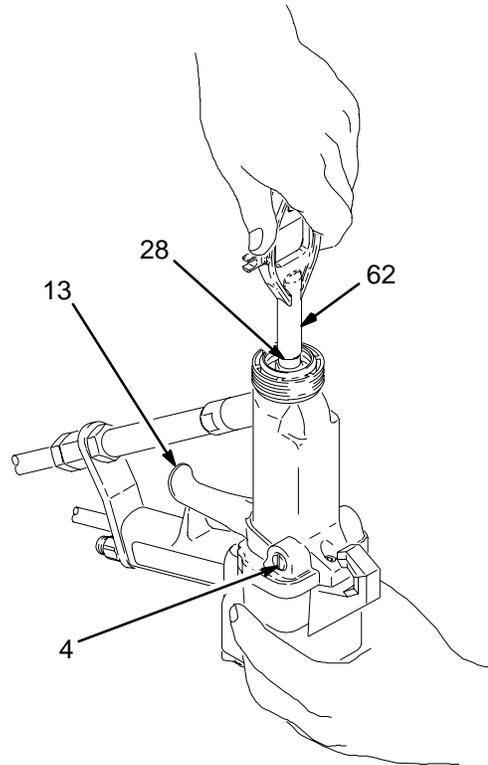


Fig. 19

05159A

4. Remove the fluid packing rod assembly (28) with the multi-tool (62).
5. Check all the parts for wear or damage and replace if necessary.

Before installing the fluid packing rod assembly (28), clean the internal surfaces of the barrel with a soft brush or cloth. Check the inside of the barrel for marks from high voltage arcing. If the marks are present, replace the barrel.

6. If the parts are purchased separately, assemble them as instructed in steps 7 to 16 and as shown in Fig. 20, on page 34.

If installing the complete fluid rod assembly, go to step 11, page 34.

# Service

## Fluid Packing Rod Removal and Repair (continued)

- Place the packing nut (28c) and o-ring (28f) on the fluid rod (28a). Flats on the packing nut must be facing toward the back of the fluid rod.
- Fill the entire inner cavity of the spacer (28h) with the dielectric grease included with the gun. Place the spacer on the fluid rod (28a), in the direction shown in Fig. 20. Generously apply the grease to the outside of the spacer.
- Place the fluid packing (28e), needle packing (28d), and housing (28b) on the fluid rod (28a), as shown in Fig. 20.
- Lightly tighten the packing nut (28c) with the multi-tool (62). The packing nut is properly tightened when there is 2 lbs. (9 N) of drag force when sliding the packing housing (28b) assembly along the shaft. Tighten or loosen the packing nut as needed.
- Lubricate the o-ring (28g).
- Make sure the spring (30) is installed against the nut (U) as shown in Fig. 20.
- Install the fluid packing rod assembly (28) into the gun barrel. Using the multi-tool (62), tighten the assembly until just snug.
- Install the trigger (13) and tighten the trigger screws (4). See Fig. 19.
- Install the electrode needle, fluid nozzle and resistor stud assembly and the air cap assembly as instructed on page 32.
- Test the gun resistance as instructed on page 28.

- Apply a very light coat of lubricant to the o-ring (28g).
- Fill the inner spacer (28h) cavity with the dielectric grease and generously lubricate the outside of the spacer.
- Tighten the packing nut (28c) to 2 lbs (9 N) of drag force.
- The spring (30) is not included with the fluid packing rod assembly (28)

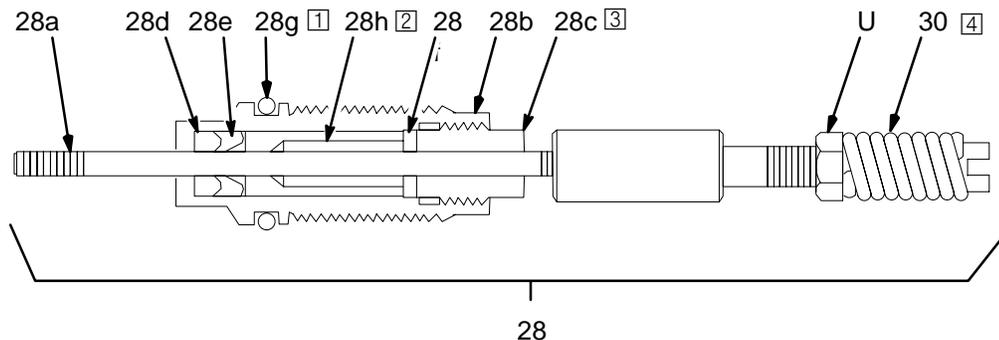


Fig. 20

03558

# Service

## Fan Air Adjustment Valve Repair

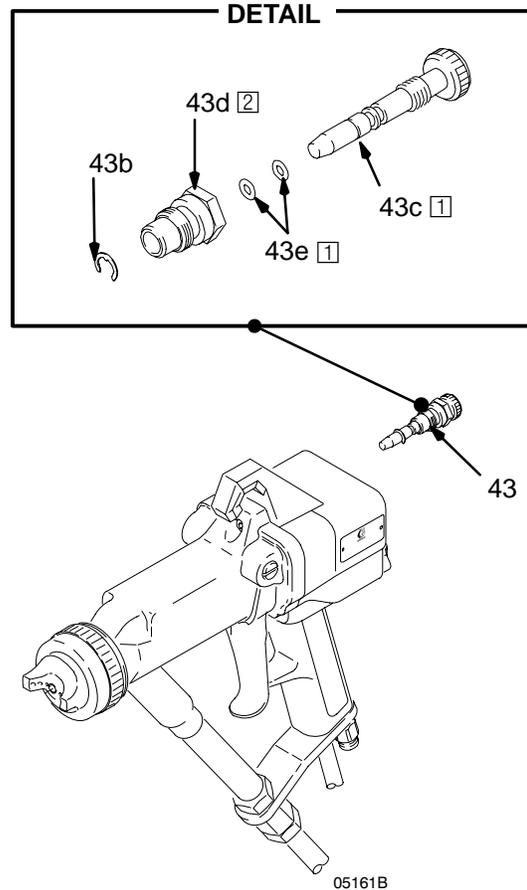
**NOTE:** The fan air valve (43) can be replaced as an assembly or as individual parts.

1. Prepare the gun for service as instructed on page 30.
2. Place a wrench on the flats of the valve housing and remove it from the handle. See Fig. 21.
3. *If the parts are purchased separately, install them as instructed in steps 4 to 8.*

*If installing the complete valve, go to step 8.*

4. Remove the retaining ring (43b). Rotate the air adjusting screw (43c) *counterclockwise* until it is disengaged from the valve housing threads (43d). Pull the adjusting screw out of the valve housing.
5. Clean all the parts and inspect them for wear or damage.
6. Install the o-rings (43e) on the adjusting screw (43c). Lubricate the o-rings and the adjusting screw threads with petroleum jelly.
7. Install the adjusting screw (43c) into the valve housing (43d), and install the retaining ring (43b) on the adjusting screw (43c). Back the adjusting screw out of the valve housing until it bottoms out against the retaining ring.
8. Apply PTFE paste to the threads of the valve housing (43d) and install it in the handle. Torque the housing to 10 to 12 in-lb (1.1 to 1.4 N•m).

- 1 Apply a very light coat of lubricant to the o-rings (43e) and adjusting screw (43c) threads.
- 2 Apply PTFE paste to the valve housing (43d) threads and tighten the housing into the handle to 10–12 in-lb (1.1–1.4 N•m).



**Fig. 21**

## Fluid Adjustment Assembly Repair

1. Prepare the gun for service as instructed on page 30.
2. Using a 14 mm socket wrench, remove the fluid adjustment assembly (45). See Fig. 22, page 36.
3. Turn the stem (45a) fully *clockwise* and remove the sleeve stop (45e).
4. To completely disassemble the fluid adjustment assembly, the sleeve stop (45e) must be assembled back on to the stem (45a). Turn the stem until the sleeve is protruding about 0.4 inches (10 mm).

*Continued on the next page.*

# Service

## Fluid Adjustment Assembly Repair (continued)

- To remove the sleeve (45d), hold the cap (45c) and turn the sleeve stop (45e) *counterclockwise* with a pliers.
- Remove the stem (45a) and o-ring (45b).
- Repair or replace any damaged parts. Lubricate the o-ring (45b).
- Carefully apply low strength (*purple*) Loctite® or equivalent thread sealant to the sleeve (45d) external threads. Turn the sleeve in with the sleeve stop (45e) until it is bottomed out, then back it out 1/8 turn.

### ⚠ CAUTION

Do not allow Loctite to get onto the stem (45a) during assembly or the stem will not turn.

- Place the fluid adjustment assembly on the workbench with its threaded end facing down and allow the Loctite to cure over night.
- After the Loctite has cured, assemble the fluid adjustment assembly into the gun.

## Air Trigger Valve Repair

- Prepare the gun for service as instructed on page 30.
- Using a 14 mm socket wrench, remove the fluid adjustment assembly (45), o-ring (23), and spring (44). See Fig. 22.
- Loosen the air valve packing nut (40) one full turn. Remove the air valve shaft (39) with a pliers.

### ⚠ CAUTION

When removing the air valve shaft (39), be careful not to damage the seat area.

- Check the o-rings (41, 23) for damage and replace them if necessary. Apply a very light coat of petroleum jelly to the o-rings.

### ⚠ CAUTION

Do not over-lubricate parts. Excessive lubricant on the o-ring (41) and air valve shaft (39) can be pushed into the gun air passage and blemish the finish on the workpiece.

- Unscrew the packing nut (40) to check the u-cup (42). Do not remove the u-cup unless it is damaged.
- Install the air valve shaft (39), with the o-ring (41), and spring (44) into the back of the gun handle (7). *If the u-cup (42) was removed*, install the air valve shaft (39) before installing the u-cup. Install the u-cup with its lips facing into the gun handle.
- Install the fluid adjustment knob (45), with the o-ring (23). Tighten the cap with a screw driver. Tighten the air valve packing nut (40) until it bottoms.

- Apply a very light coat of lubricant to the o-rings (41, 23).
- Carefully apply low strength (purple) Loctite or equivalent to sleeve (45d) external thread. Turn sleeve in with sleeve stop (45e) until it bottoms out, then back out 1/8 turn. Allow Loctite to cure overnight.
- Do not remove u-cup (42) unless damaged. Install with lips facing into handle. Tighten packing nut (40) until it bottoms.

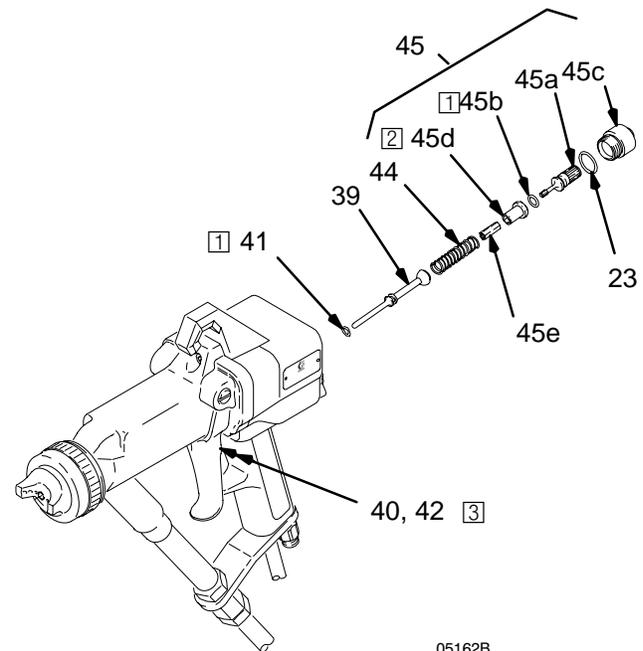


Fig. 22

# Service

## Atomizing Air Valve Repair

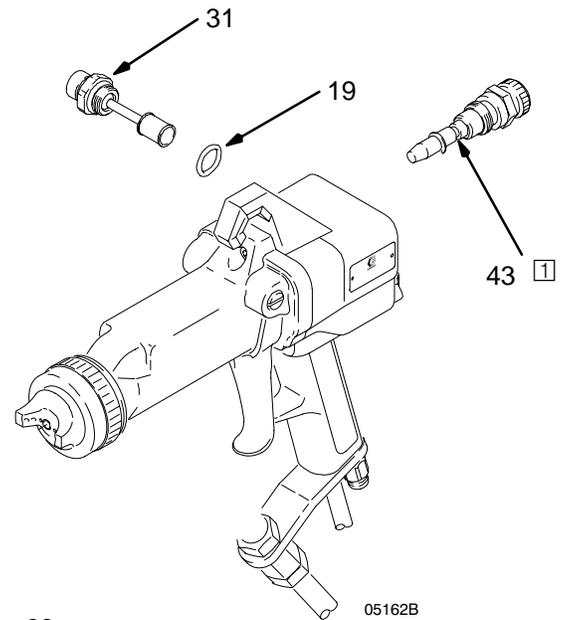
1. Prepare the gun for service as instructed on page 30.
2. Remove the fan air adjustment valve (43) as instructed on page 35.

### **⚠ CAUTION**

To avoid damaging the atomizing air valve, the fan air adjustment valve must be removed before removing the atomizing air valve.

3. Remove the atomizing air valve (31) and o-ring (19). See Fig. 23.
4. Install a new atomizing air valve and o-ring.
5. Apply PTFE paste to the fan air valve (43) housing threads and install the valve in the handle. Torque the housing to 10 to 12 in-lb (1.1 to 1.4 N•m).

- 1 Apply PTFE paste to the fan air valve housing threads; Torque to 10–12 in-lb (1.1–1.4 N•m)



**Fig. 23**

# Service

## ES ON-OFF Valve Repair

1. Prepare the gun for service as instructed on page 30.
2. Loosen the set screw (24) with the 2 mm hex key (69). Remove the lever (26) from the valve. See Fig. 24.

### **⚠ WARNING**



#### **MOVING PARTS HAZARD**

To reduce the risk of an eye injury, wear safety glasses when removing or installing the retaining ring (47) as the retaining ring could slip off the tool when compressed.

3. Use internal snap ring pliers (Graco part no. 110090) to remove the retaining ring (47) from the handle. Align the holes in the retaining ring with the flat on the spacer (32) to ease assembly and disassembly.
4. Remove the valve body (38) from the handle; be careful not to drop the regulator disk (46) and spacer (32).
5. Clean and inspect the parts for damage. Replace parts if necessary. Lightly lubricate the o-ring (36) with petroleum jelly.

### **⚠ CAUTION**

Do not over-lubricate parts. Excessive lubricant on the o-ring (36) can be pushed into the gun air passage and blemish the finish on the workpiece.

6. Install the regulator disk (46) in the valve (38) with its bevelled side facing toward the valve.

### **⚠ CAUTION**

Be sure the regulator disk (46) is installed correctly. A missing or incorrectly installed regulator disc can cause severe damage to the power supply turbine.

7. Install the valve (38) with the regulator disc (46) and o-ring (36) into the gun handle. Install the spacer (32) on the valve.
8. Install the retaining ring (47) into the groove in the handle.

### **⚠ WARNING**



#### **MOVING PARTS HAZARD**

Always make sure that the retaining ring (47) is engaged in the groove in the gun handle when installing the ES ON-OFF valve. If the retaining ring is missing or improperly installed, the valve assembly can be propelled out of the gun when air pressure is applied and cause serious injury.

9. Install the lever (26) and tighten the set screw (24).

- 1 Apply a very light coat of lubricant to the o-ring (36).
- 2 Bevelled side of the regulator disk (46) toward the valve (38).

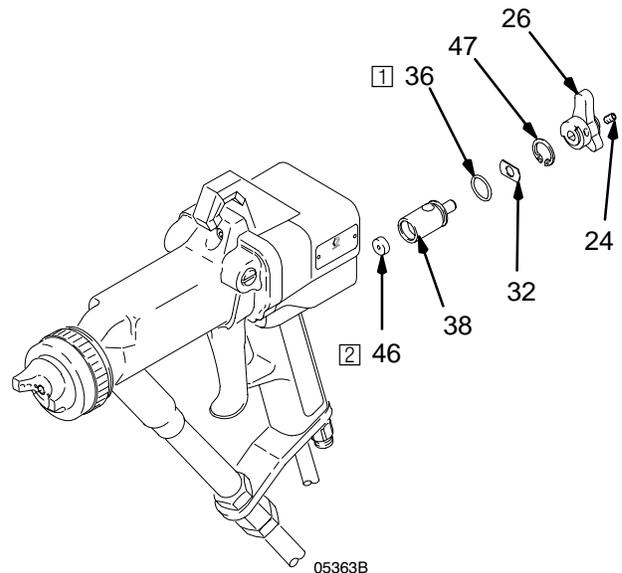


Fig. 24

# Service

## Barrel Removal

1. Prepare the gun for service as instructed on page 30.
2. Loosen the nut (78) from the ferrule housing (79). Pull the ferrule housing through the gun bracket (76). See Fig. 25.
3. Loosen the three barrel screws (5) with the ball-end wrench (63).
4. Hold the gun handle (7) with one hand and pull the barrel (3) straight away from the handle to remove it. Be prepared to catch the nut (78). See Fig. 26.

### **⚠ CAUTION**

To avoid damaging the power cartridge (18), always pull the gun barrel straight away from the gun handle. If necessary, gently move the barrel from side to side to free the power supply from the gun handle.

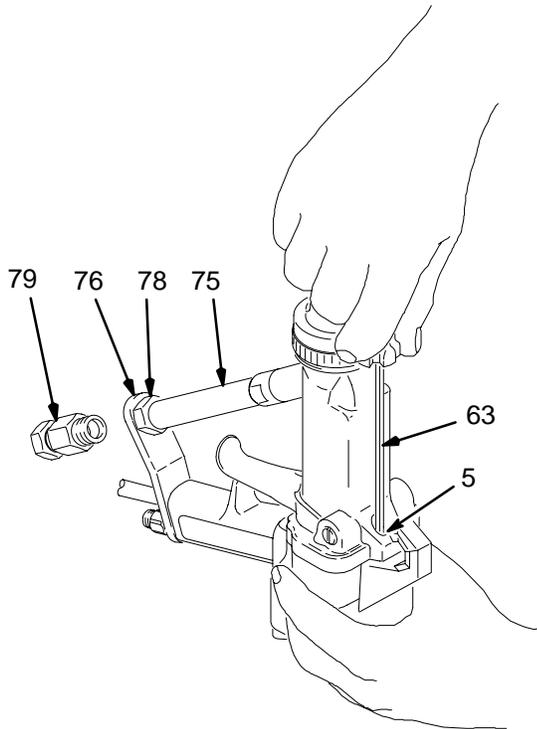


Fig. 25

05156

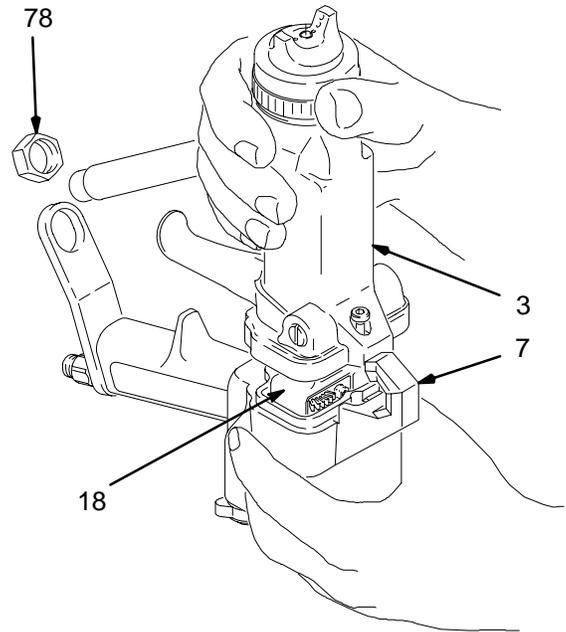


Fig. 26

05157

# Service

## Power Supply Replacement

1. Prepare the gun for service as instructed on page 30.
2. Remove the barrel as instructed on page 39.

### ⚠ CAUTION

Be careful when handling the power supply to avoid damaging it.

3. Grasp the power supply with your hand. With a gentle side to side motion, loosen the power supply from the gun handle (7), then pull it straight out. See Fig. 27.
4. Inspect the power supply for any physical damage. Check the electrical resistance as instructed in **Test Power Supply Resistance**, page 29. If necessary, replace the power supply.

- 1 Apply a very light coat of lubricant to the o-rings 37a.
- 2 Do not expose the gasket (18a) to solvents.

5. Inspect the power supply cavity in the handle for dirt or moisture. Clean out the cavity with a clean, dry rag to avoid a loss in electrostatic performance.
6. Lightly lubricate the o-rings (18b, 37a) on the power supply with petroleum jelly.

### ⚠ CAUTION

All the o-rings (18b, 37a) and the compression spring (18c) must be in place or the gun will malfunction.

7. Be sure the gasket (18a) is in place. Insert the power supply in the gun handle.
8. Install the barrel on the handle as instructed on page 41.
9. Test the gun resistance as instructed on page 28.

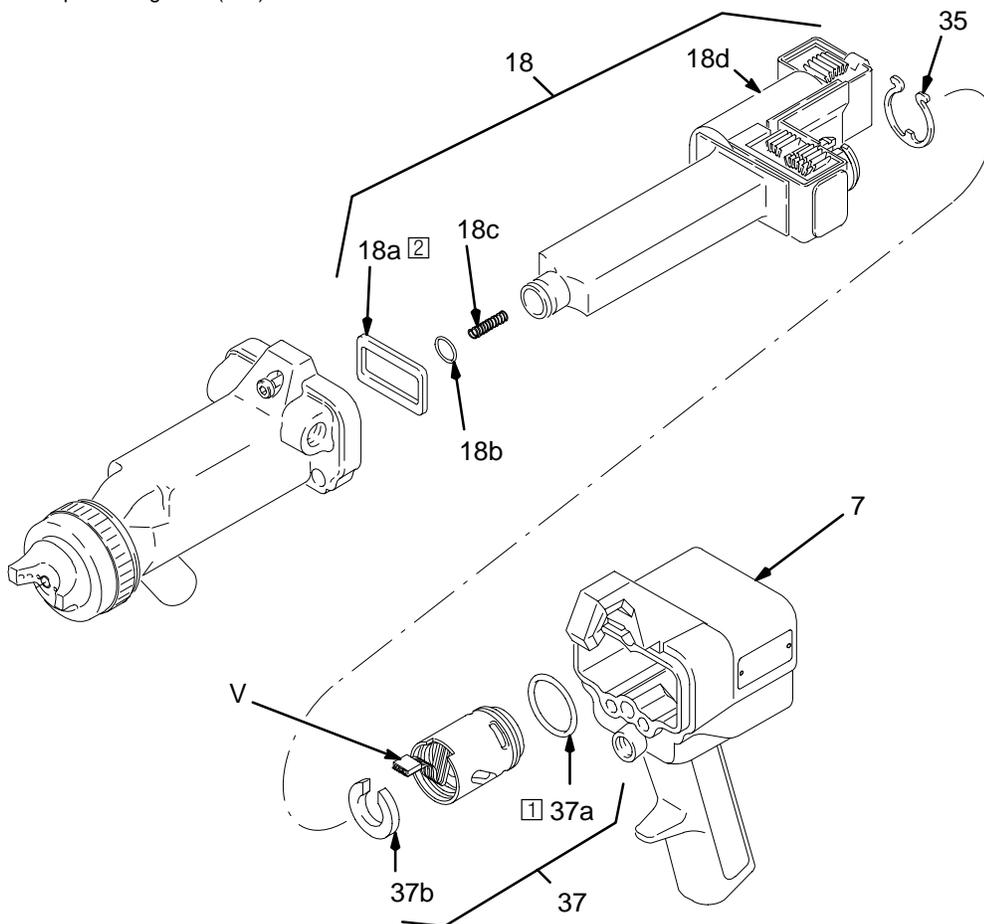


Fig. 27

05160

# Service

## Turbine Alternator Replacement

**NOTE:** Replace turbine bearings after 2,000 hours of operation. See your authorized Graco representative.

1. Prepare the gun for service as instructed on page 30.
2. Remove the barrel as instructed on page 39.
3. Remove the power supply as instructed on page 40.
4. Squeeze the two ends of the retaining ring (35) together, and carefully pull the alternator (37) away from the power supply (18) until the connector (V) disengages. See Fig. 27, page 40.
5. Use an ohmmeter to test the turbine alternator coil. Measure the resistance between the two outer terminals of the 3-wire connector (V). The resistance should be 3 to 5 ohms. If the resistance varies from this value, replace the alternator.
6. Measure the resistance between each outer terminal of the 3-wire connector (V) and the turbine alternator (37) housing. The resistance should be infinite. If the resistance is not infinite, replace the alternator.
7. Connect the 3-wire connector (V) to the 3 prongs in the power supply (18). Push the alternator (37) onto the power supply until the retaining ring (35) engages with the alternator.
8. Install the power supply in the gun handle as instructed on page 40.
9. Install the barrel on the handle as instructed below.

## Barrel Installation

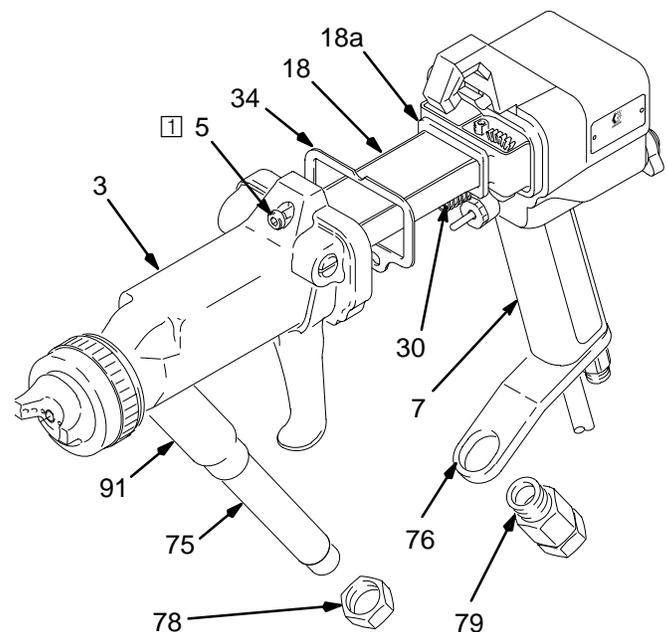
1. Clean and dry the inside of the fluid inlet tube (75). See Fig. 28.
2. Be sure the gaskets (34, 18a) and spring (30) are in place. Replace the parts if they are damaged.

3. Place the barrel (3) over the power supply (18) and onto the gun handle (7). Make sure the fluid needle spring (30) is seated properly, and align the fluid inlet tube (75) with the bracket port. Slide the nut (78) onto the end of the fluid inlet tube.
4. Tighten the three screws (5) oppositely and evenly with the ball-end wrench (63). Tighten the cap screws to 18 in-lbs (2 N•m) maximum (about a half turn past snug). Do not over-tighten the screws.

### **⚠ CAUTION**

To avoid damaging the gun, **do not** over-tighten the screws (5).

5. Install the ferrule housing (79) through the gun bracket (76), and secure it with the nut (78).
  6. Test the gun resistance as instructed on page 28.
- 1 Tighten the screws (5) to 18 in-lbs (2 N•m) maximum (about half turn past snug), using the wrench (63) provided..



**Fig. 28**

05158B

# Service

## Graco Waterborne Fluid Hose Repair

### ⚠ WARNING



#### FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of a fire, explosion, or electric shock:



- Follow the **Fluid Voltage Discharge and Grounding Procedure** on page 16 and be sure the ES ON-OFF lever is turned to OFF before flushing, checking, or servicing the system and whenever you are instructed to discharge the voltage.

- Clean all the parts with a non-flammable fluid as defined on the front cover of this manual.
- Do not service this equipment unless you are trained and qualified.
- Do not touch the gun nozzle or come within 4 inches (101.6 mm) of the nozzle during gun operation or until after following the **Fluid Voltage Discharge and Grounding Procedure**.

### ⚠ WARNING

#### PRESSURIZED EQUIPMENT HAZARD

To reduce the risk of an injury, follow the **Pressure Relief Procedure** on page 16 before checking or servicing any part of the system and whenever you are instructed to relieve the pressure.

Damaged hoses or hoses that have a “pin-hole” dielectric failure, close to the end of the hose, can be repaired by cutting away the failed portion and restripping the hoses to the dimensions shown in Fig. 29.

1. Discharge the voltage as instructed on page 16.
2. Relieve the system pressure as instructed on page 16.
3. Disconnect the fluid hose from the gun and voltage isolation system.
4. Cut off the damaged end of the hose. If the hose has a pin-hole failure, strip back the outer hose jacket (H) and the conductive layer (J) about 12 inches (105 mm) on each hose end. Look for the failure point, which will be a very small pin-hole, discolored due to arcing. Continue stripping back the hose until the failure point is found.

5. Carefully cut through the outer hose jacket (H) and peel it back about 12 inches (105 mm). **Do not** cut into the conductive layer (J) of the hose.
6. Cut through the first 1/2 inch (12.7 mm) of the conductive hose layer (J) to create an edge to hold onto. Peel back the conductive hose layer by unwrapping it in a spiral pattern. Cut it off at the dimension shown in Fig. 29.
7. Cut off the inner hose layer (K) to the dimension shown in Fig. 29.
8. Inspect the hose for any nicks or cuts. Any nicks or cuts into the inner hose layer (K) will weaken the dielectric strength of the hose and shorten the service life. Repeat the above procedure if any damage is found.
9. Install a new barbed fitting by applying red dielectric grease to the outside of the barbs, and pressing the fitting into the gun end of the hose. Refer to the drawing of the Waterborne Fluid Hose Assembly on page 48.
10. Install the three o-rings on the barbed fitting.
11. Connect the fluid hose to the gun as instructed on page 12.

Measurements, inches (mm)			
A*	B*	C	D
7.75 ± 0.1 (196.85 ± 2.5)	9.375 ± 0.1 (238.13 ± 2.5)	4.075 ± 0.1 (103.5 ± 2.5)	4.375 ± 0.1 (111.1 ± 2.5)

\* The measurements specified are for use with the Graco H<sub>2</sub>O PRO Voltage Block isolation system.

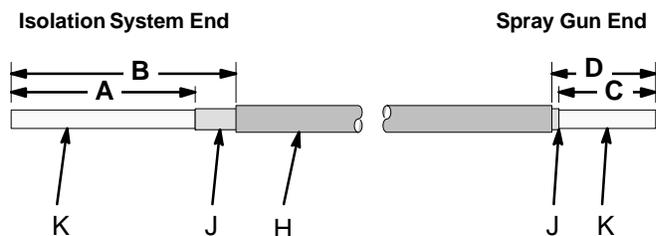


Fig. 29

05180

# PRO 3500sc Gun Conversion

**NOTE:** See page 48 to order the conversion kit, part no. 223114. The fluid hose and air hose are not included with this kit. See page 48 to order hoses. Use only the electrically conductive air supply hoses and waterborne fluid hoses specified in this manual.

## PRO 3500SC Gun Disassembly

1. Remove the air fitting (D), exhaust tube clamp (F), and the exhaust tube (E). *Keep these parts for reassembly.*
2. Remove the fluid tube fitting (B) and fluid seal (A) from the gun. See Fig. 30.
3. Remove the gun fitting bracket (C) with the hose assembly.
4. Remove the air cap assembly (G, P, Z) and discard the retaining nut (G).

**NOTE:** *Keep all the following parts for reassembly.*

5. Point the front end of the gun up and squeeze the trigger while removing the fluid nozzle/resistor stud assembly (H) with the nozzle wrench.

**NOTE:** If the resistor stud remains in the gun when the fluid nozzle is removed, start the nozzle thread onto the stud and pull the stud out.

6. Unscrew and remove the electrode needle (J) with the electrode tool. Be careful not to damage the contact wire. If the fluid rod turns, hold the back end of the fluid rod by placing a screw driver blade into the slot on the shaft, near the trigger.
7. Loosen the trigger screws (L) far enough to remove the trigger (M).
8. Remove the fluid packing rod assembly (K) with the 9 mm hex nut driver.

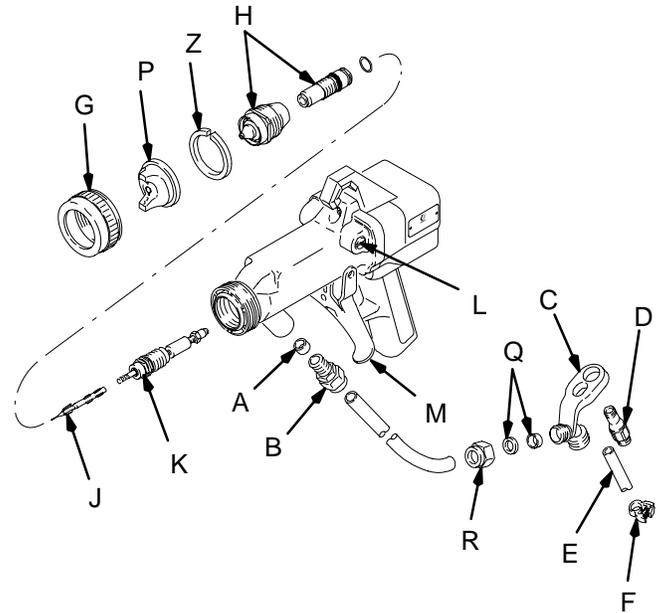
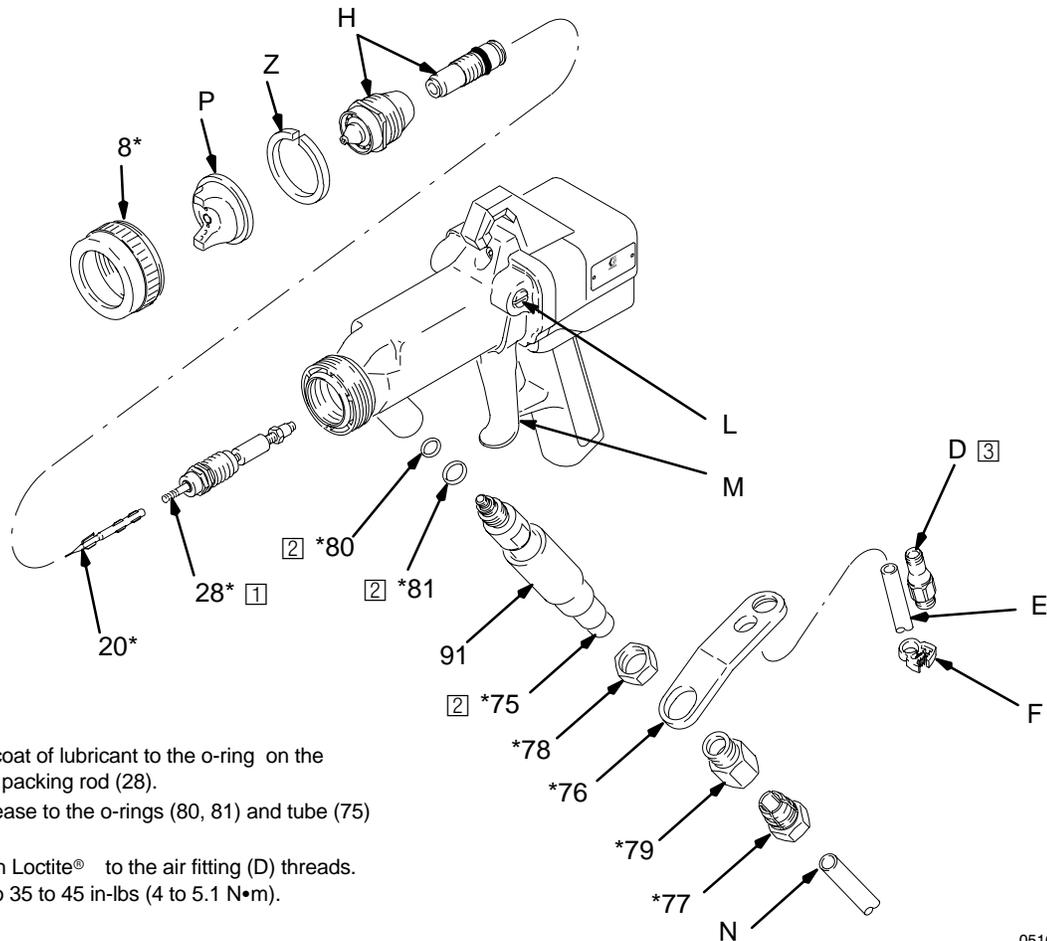


Fig. 30

05423A

*Continued on the next page.*

# PRO 3500sc Gun Conversion



- 1 Apply a very light coat of lubricant to the o-ring on the outside of the fluid packing rod (28).
- 2 Apply dielectric grease to the o-rings (80, 81) and tube (75) threads.
- 3 Apply high strength Loctite® to the air fitting (D) threads. Torque the fitting to 35 to 45 in-lbs (4 to 5.1 N•m).

Fig. 31

05164B

## Installing the Fluid Needle Assembly

**NOTE:** The parts marked with an asterisk (\*) are included with the conversion kit, part no. 223114.

1. Before installing the new fluid packing rod assembly (28\*), clean the internal surfaces of the barrel with a soft brush or cloth. Check the inside of the barrel for marks from high voltage arcing. If the marks are present, replace the barrel.
2. Lubricate the o-ring on the outside of the fluid packing rod assembly. Make sure the spring is installed on the fluid packing rod nut.

**NOTE:** See Fig. 20, page 34, for information on individual fluid packing rod parts.

3. Install the fluid packing rod assembly (28\*) into the gun barrel. See Fig. 31. Using the 9 mm hex nut driver, tighten the assembly until just snug, then check the drag on the fluid rod. The fluid rod packing nut is properly tightened when there is 2 lbs. (9 N) of drag force. Tighten or loosen the packing nut as needed.
4. Install the trigger (L) and tighten the trigger screws (K).
5. Install the electrode needle (20\*), fluid nozzle and resistor stud assembly (H) and the air cap assembly (P, 8\*, Z) as instructed on page 32.

# PRO 3500sc Gun Conversion

6. Assemble the two o-rings (80\*, 81\*) onto the fluid inlet tube (75\*). Apply dielectric grease to the o-rings and tube threads.
7. Screw the fluid inlet tube (75\*) into the barrel inlet until it bottoms out.
  - a. Apply dielectric grease (82) to the O.D. threads of the fluid inlet tube (75\*). Thread the sleeve (91) onto the fluid inlet tube until it bottoms out.
8. Loosely assemble the ferrule housing parts (77\*, 78\*, 79\*) to the gun bracket (76\*).
9. Apply high strength Loctite® to the air fitting (D) threads. Align the nut (78\*) with the fluid inlet tube (75\*), and install the air fitting to hold the bracket in place; torque the fitting to 35 to 45 in-lbs (4 to 5.1 N•m).
10. Tighten the nut (78\*) onto the ferrule housing (79\*).
11. Press the exhaust tube (E) onto the barbed adapter on the bottom of the gun handle. Secure the tube with the clamp (F).
12. Test the gun resistance as instructed on page 28.
13. Mount the warning sign (71\*) in the spray area where it can easily be seen and read by all operators.
14. Follow the additional warnings, installation, operation, service, and other instructions given in this manual for a water-base system. Order replacement parts for the gun from the parts list on page 47.

## **WARNING**



### **ELECTRIC SHOCK HAZARD**

To help avoid electric shock, which could cause serious injury, only use the air and fluid hoses listed on page 48.

# Spray Gun Parts

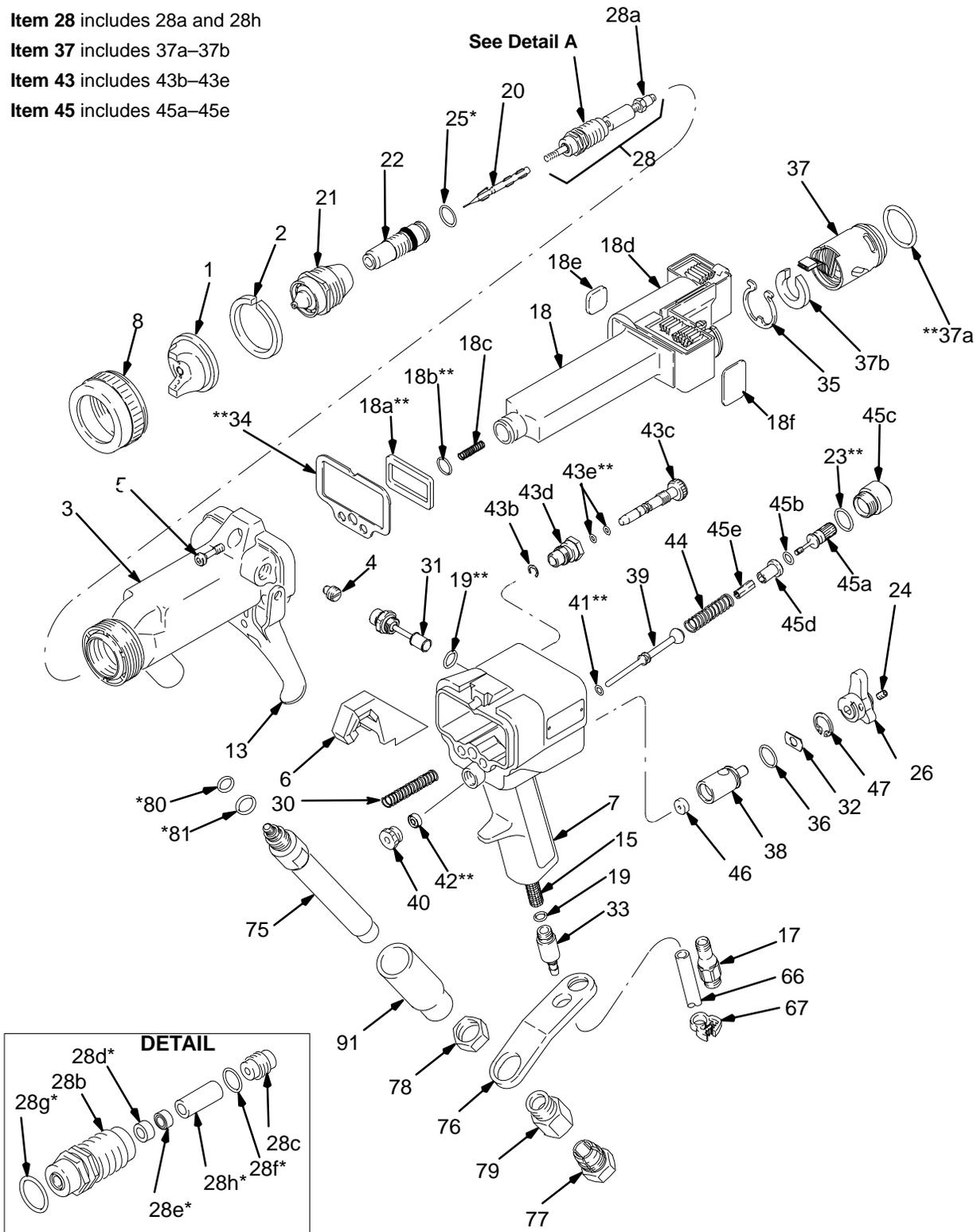
Item 18 includes 18a–18f

Item 28 includes 28a and 28h

Item 37 includes 37a–37b

Item 43 includes 43b–43e

Item 45 includes 45a–45e



# Spray Gun Parts

## WARNING

### EQUIPMENT MISUSE HAZARD

Use only genuine Graco replacement parts. Using non-Graco parts could alter the gun's grounding continuity or cause parts to rupture or fail, which could result in a serious injury and property damage.

### Part No. 222700, Series C Model PRO 3500wb Spray Gun

Ref. No.	Part No.	Description	Qty.
33	185112	ADAPTER, exhaust hose	1
34†	185113	GASKET, manifold; polyethylene	1
35	185114	RING, retainer, alternator	1
36	113746	O-RING, CV75	1
37	222319	ALTERNATOR, turbine	1
		Includes items 37a & 37b	1
37a†	110073	•O-RING, Viton	1
37b	185124	•CUSHION	1
38	185118	VALVE, electrostatic	1
39	224194	SHAFT ASSY., air valve	1
40	185115	NUT, packing	1
41†	111508	O-RING, trigger valve;	1
		fluoroelastomer	1
42†	105452	U-CUP, PTFE	1
43	222321	VALVE ASSY, fan air	1
		Includes items 43b–43e	1
43b	105681	•RING, retaining	1
43c	191805	•VALVE, fan air adjustment	1
43d	185090	•HOUSING, valve	1
43e†	103557	•O-RING, Viton	2
44	185116	SPRING, compression, air valve	1
45	238895	VALVE, fluid adjustment	1
		Includes items 45a–45e	1
45a	186826	•STEM, fluid adjustment	1
45b†	111516	•O-RING, CV 75	1
45c	186822	•CAP	1
45d	191794	•SLEEVE, guide	1
45e	191795	•STOP, sleeve	1
46	107107	REGULATOR, disc	1
47	110082	RING, retaining	1
62☞	191744	MULTI-TOOL	1
63☞	107460	WRENCH, barrel	1
66	185103	TUBE, exhaust; polyurethane	1
67	110231	CLAMP, exhaust tube	1
69☞	110086	WRENCH, allen, hex key; 2 mm	1
71☞▲	186118	SIGN, warning, English	1
72☞	180209	COVER, gun	1
75	196161	HOUSING TUBE	1
76	190759	BRACKET	1
77	190863	HOSE FERRULE	1
78	185548	NUT	1
79	190862	FERRULE HOUSING	1
80*	110736	O-RING	1
81*	103338	O-RING	1
82☞	217115	DIELECTRIC GREASE	1
91	196158	SLEEVE	1
		* These parts are included in Fluid Seal Repair Kit 238146, which may be purchased separately.	
		† These parts are included in Air Seal Repair Kit 223021, which may be purchased separately.	
		☆ An Optional Plug 185079 is provided with the gun.	
		☞ These parts are not shown in the parts drawing.	
		▲ Replacement Warning signs are available at no cost.	

# Accessories

Use Only Genuine Graco Parts and Accessories

## Waterborne Fluid Hose Assembly

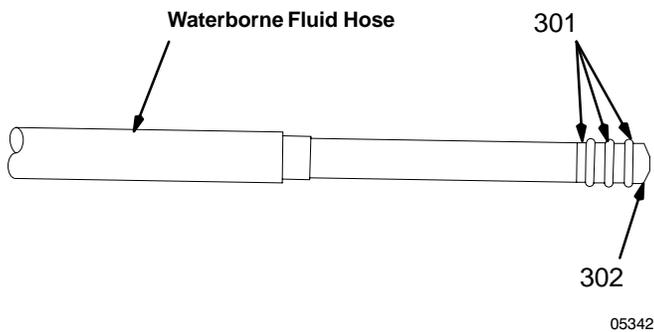
100 psi (0.7 MPa, 7 bar) Maximum Working Pressure

To connect between the Graco H<sup>2</sup>O PRO Voltage Block and the gun; 0.25 in. (6.35 mm) ID; PTFE

Fluid Hose Assy. Part No.	Hose Length
237924	25 ft. (7.6 m)
237925	36 ft. (11 m)
237926	50 ft. (15.3 m)

## Waterborne Fluid Hose Replacement Parts

Ref. No.	Part No.	Description	Qty.
301	111450	O-RING	3
302	190143	BARBED FITTING	1



## Graco Electrically Conductive Air Hose

100 psi (0.7 MPa, 7 bar) Maximum Working Pressure

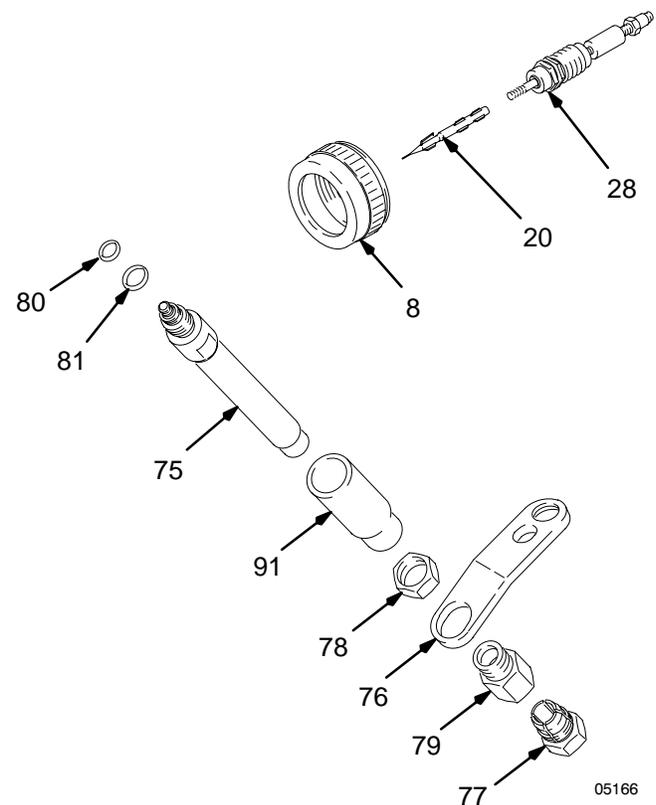
Conductive SST wire braid for grounding; polyurethane tube and cover; 0.315 inch I.D.; 1/4 npsm(f) x 1/4 npsm(f) left-hand thread; the hose is color-coded red

Hose Part No.	Hose Length
235068	6 ft. (1.8 m)
235069	15 ft. (4.6 m)
235070	25 ft. (7.6 m)
235071	36 ft. (11.0 m)
235072	50 ft. (15.2 m)
235073	75 ft. (23.0 m)
235074	100 ft. (30.5 m)

## PRO 3500sc Gun Conversion Kit 223114

Ref. No.	Part No.	Description	Qty.
8	223653	RETAINING NUT	1
20	186615	ELECTRODE NEEDLE	1
28	223444	PACKING ROD ASSEMBLY	1
71	186118	WARNING SIGN ( <i>not shown</i> )	1
75	196161	HOUSING TUBE	1
76	190759	BRACKET	1
77	190863	HOSE FERRULE	1
78	185548	NUT	1
79	190862	FERRULE HOUSING	1
80	110736	O-RING	1
81	103338	O-RING	1
82	217115	DIELECTRIC GREASE	1
91	196158	SLEEVE	1

The Kit Ref Nos. correspond with the Gun Ref Nos. on page 37.



# Accessories

*Use Only Genuine Graco Parts and Accessories*

## **Snap Ring Pliers 110090**

For removing the ES ON-OFF Valve Retaining Ring (item 47 in Parts List).

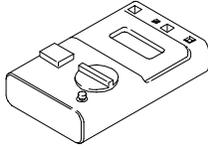
## **Gun High Voltage Probe & Meter 217452**

For direct measurement of the gun output voltage.

## **Megohmmeter 218979**

500 Volt output; 0.01–2000 megohms.

**Not for use in Hazardous areas.**



## **Gun Cover 180209**

Order Part No. 218374 for package of 10.

## **Gun Holster 236090**

Mount the gun holster to the side of the spray booth. Hang gun in holster while the voltage discharges.

## **Grounding Rod 210084**

For use in the **Fluid Voltage Discharge and Grounding Procedure**.

# Manual Change Summary

Rev. D – The manual was updated to change air cap part no. 173033 to 193033.

Rev. H – The manual was updated to add part 196158, Dielectric Fluid Tube Sleeve per ECO Z001153.



# Technical Data

Category	Data
Weight	1.87 lb (0.85 Kg)
Gun Length	9.5 in. (240 mm)
Maximum Working Pressure	100 psi (0.7 MPa, 7 bar)
Air Pressure Operating Range	0–100 psi (0–0.7 MPa, 0–7 bar)
Fluid Pressure Operating Range	0–100 psi (0–0.7 MPa, 0–7 bar)
Voltage Output	0–65 kV*
Air Inlet	1/4 npsm(m) L.H.
Fluid Inlet	custom inlet for Graco waterborne fluid hose
Fluid Specification	<p>For use with fluids that meet at least one of the following conditions:</p> <ul style="list-style-type: none"> <li>• The fluid has a flash point above 140°F (60°C) and a maximum organic solvent concentration of 20%, by weight, per ASTM Standard D93.</li> <li>• The fluid does not sustain burning when tested per ASTM Standard D4206 Sustained Burn Test.</li> </ul>

Category	Data
Wetted Parts	Stainless Steel, Brass, Nylon, Acetal, PTFE, Fluoroelastomer, PTFE High Molecular Weight Polyethylene, Ceramic
Typical Noise Level with atomization air at 40 psi (280 kPa, 2.8 bar) and typical air flow	
Sound Pressure †	87 Db(A)
Sound Power ‡	90.4 Db(A)
Maximum Noise Level with atomization air at 100 psi (0.7 MPa, 7 bar) and maximum air flow	
Sound Pressure †	99 Db(A)
Sound Power ‡	105.4 Db(A)

† Sound pressure was measured per Cagi Pneurop, 1969.

‡ Sound power was measured per ISO–3744, 1981.

\* Voltage output when used with Graco H<sup>2</sup>O PRO is 0–59 kV due to bleed resistor current draw.

Viton® is a registered trademark of the DuPont Co.

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# The Graco Warranty and Disclaimers

## WARRANTY

Graco warrants all equipment manufactured by it 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. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment proven 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, 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 with Graco equipment of 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 claim. 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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