

# INSTRUCTIONS-PARTS LIST



307-958

This manual contains **IMPORTANT INSTRUCTIONS and WARNINGS.**  
READ AND RETAIN FOR REFERENCE.

Rev D  
Supersedes C and PCN D

120 V AC, 15 AMP

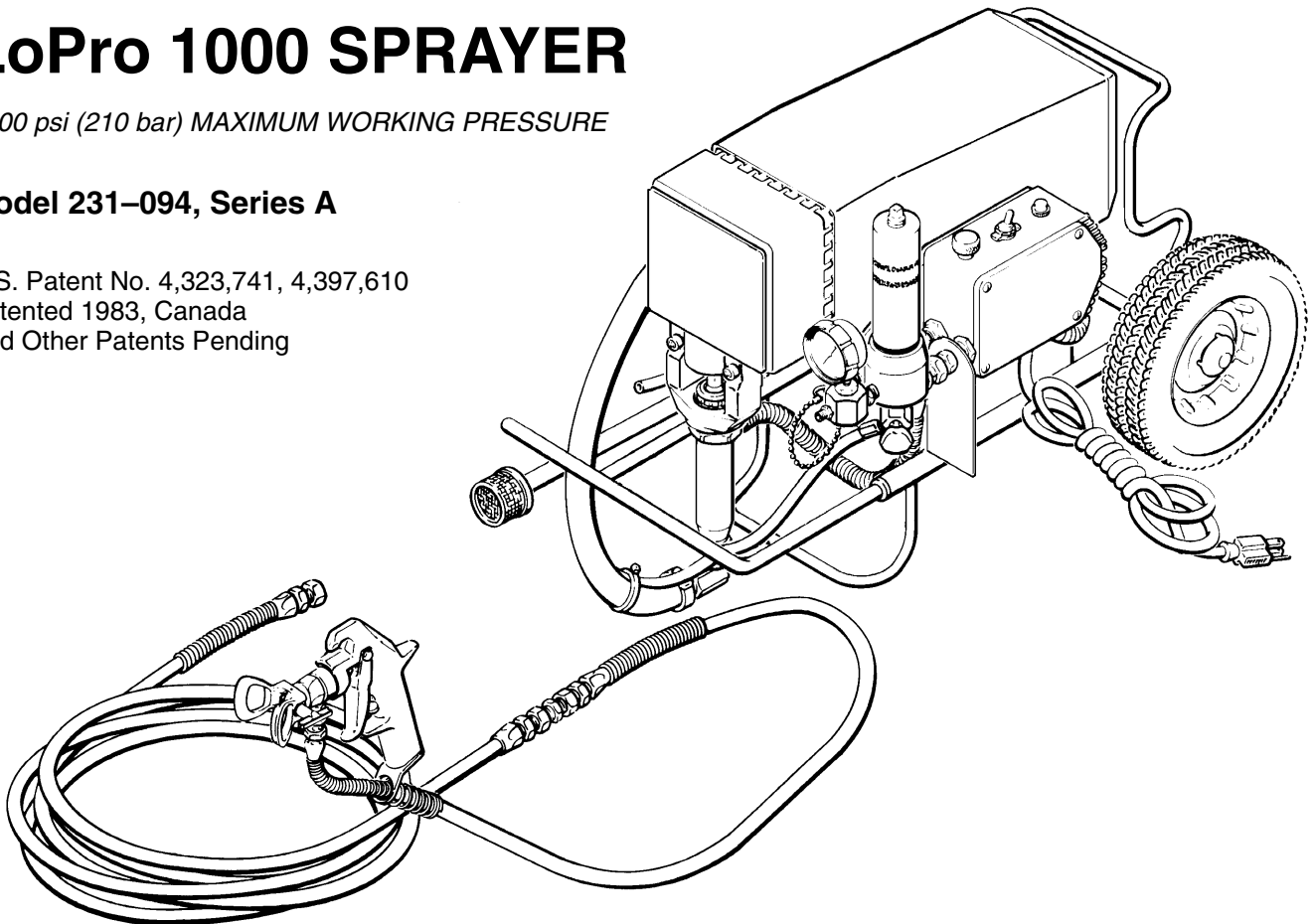
## ABATEMENT TECHNOLOGIES

# LoPro 1000 SPRAYER

3000 psi (210 bar) MAXIMUM WORKING PRESSURE

Model 231-094, Series A

U.S. Patent No. 4,323,741, 4,397,610  
Patented 1983, Canada  
And Other Patents Pending



**NOTE:** This is an example of the DANGER label on your sprayer.  
This label is available in other languages, free of charge.  
See page 43 to order.

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

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## TABLE OF CONTENTS

<b>Introduction</b> .....	2	<b>Electrical</b>	
<b>Warnings</b> .....	4	Motor Brush Replacement .....	25
<b>Avertissement</b> .....	6	Power Supply Cord Replacement .....	26
<b>Advertencia</b> .....	8	ON/OFF Switch Replacement .....	26
<b>Setup</b> .....	10	Bridge Rectifier Replacement .....	27
<b>Operation</b> .....	13	Circuit Breaker Replacement .....	27
<b>Shutdown &amp; Care</b> .....	14	Circuit Board Replacement .....	28
<b>Flushing Guidelines</b> .....	15	Pressure Control Replacement .....	29
		Pressure Control Adjustment .....	30
<b>Troubleshooting Guide</b>		<b>Mechanical</b>	
Motor Won't Operate .....	16	Motor Replacement .....	32
Low Output .....	19	Bearing Housing &	
No Output .....	20	Connecting Rod Replacement .....	34
Excessive Pressure Fluctuations .....	20	Drive Housing Replacement .....	35
Motor Is Hot and Runs Intermittently .....	21	Displacement Pump Repair .....	36
Electrical Short .....	21		
Spin Test .....	22	<b>Parts Lists and Drawings</b>	
Bridge Test .....	23	Sprayer .....	38
		Pressure Control Assembly .....	40
<b>Repair</b>		Wiring Diagram .....	41
General Repair Notes .....	24	Displacement Pump .....	42
		<b>Technical Data</b> .....	43
		<b>Dimensions</b> .....	43
		<b>Warranty</b> .....	Back Cover

## INTRODUCTION

### LoPro 1000 BASIC COMPONENTS

Your new sprayer functions and operates differently than other airless material sprayers. This section will help you become familiar with the sprayer before operating it.

#### Pressure Control

The pressure control includes an ON/OFF switch for the sprayer, the pressure adjusting control knob, a pressure sensing device and a current overload circuit breaker with a manual reset button. The function of the pressure control is to control the motor speed so that the sprayer maintains constant fluid pressure at the pump outlet.

#### Motor

The DC motor has sealed bearings and replaceable motor brushes. Its function is to drive the displacement pump at the rate needed to supply sufficient material volume at the selected pressure. Working together, the pressure control and motor cause the pump to cycle whenever there is fluid or pressure demand. When the pump is cycling, the motor sounds like an automobile starter cranking. When the pump is not cycling, the motor may hum intermittently until the fluid pressure stabilizes, then the motor will shut itself off. However, there will still be power to the sprayer and it will stay pressurized and ready to use until you manually shut it off and relieve pressure.

Because the motor is DC, it is less sensitive to low voltage or voltage fluctuations than an AC motor, and a 3-wire, 12 gauge (minimum) extension cord of up to 150 ft (45 m) can be used.

#### Drive Assembly

The sealed drive assembly transfers power from the DC motor to the displacement pump.

#### Displacement Pump

The positive displacement, volume-balanced pump provides equal fluid delivery on both the up and down pump strokes. The pump has a wet-cup which, when filled with Graco Throat Seal Liquid, helps prevent damage to the throat packings and piston rod.

#### Fluid Filter

The fluid filter strains the material to help avoid clogs in the hose and spray tip. The filter includes a reusable element and has a pressure drain valve for manually relieving fluid pressure.

#### Hoses

The grounded, nylon spray hoses have spring guards on both ends. The 50 ft (15.2 m) hose has a 1/4 in. ID. The 6 ft (1.8m), 3/16 in. ID hose provides more flexible gun movement. The nylon hose acts as a pulsation damper to absorb pressure fluctuations.

#### Spray Gun & RAC IV DripLess Tip Guard

The high pressure spray gun has a trigger safety which prevents accidental triggering when it is engaged. See *the Detail in Fig 3-1*. The gun also has a filter for material straining. The gun's tip guard is a safety feature which helps reduce the risk of fluid injection injury. NEVER operate the gun without the tip guard in place.

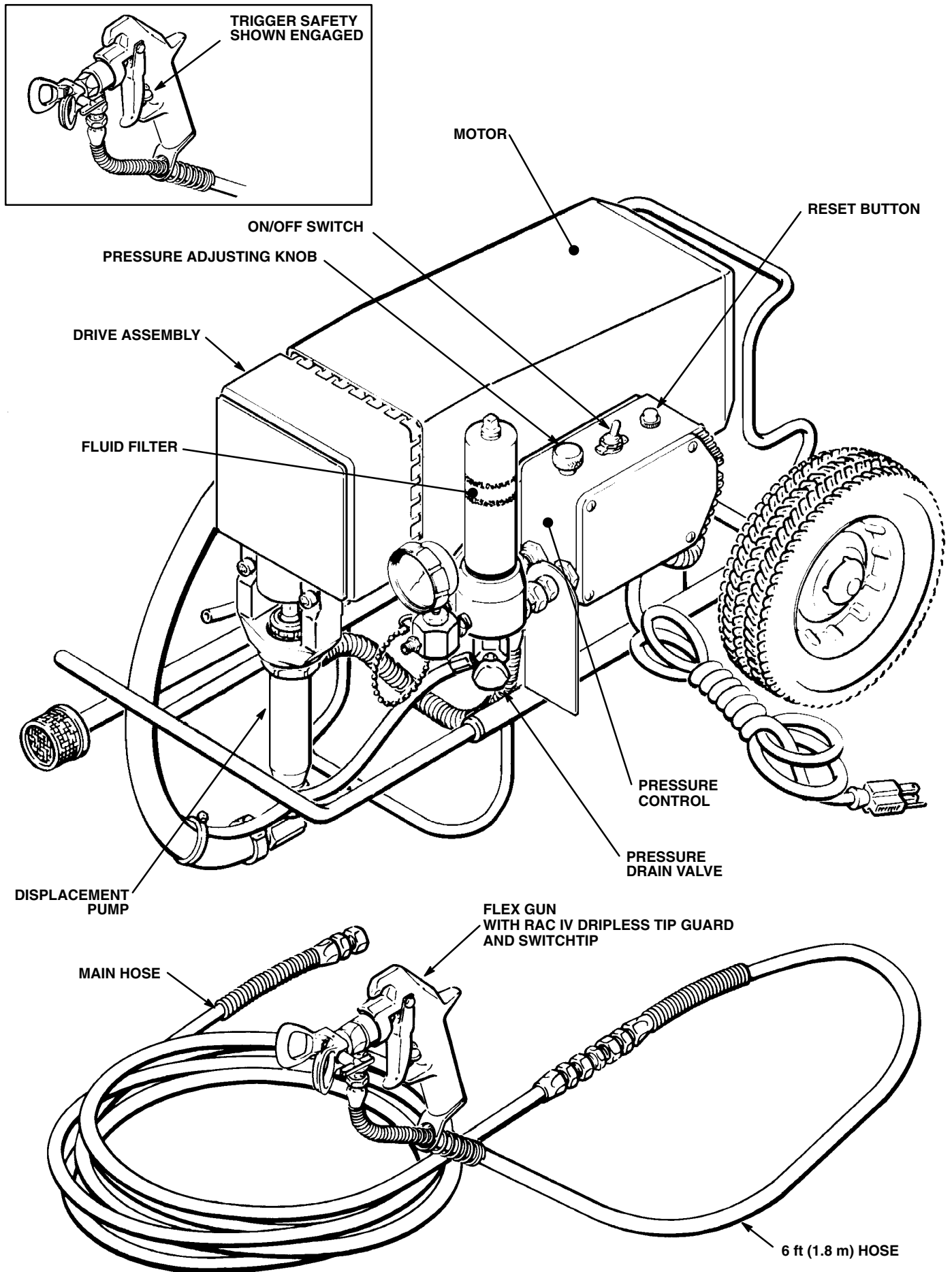


Fig 3-1

# SAFETY WARNINGS

HIGH PRESSURE SPRAY CAN CAUSE SERIOUS INJURY.  
FOR PROFESSIONAL USE ONLY. OBSERVE ALL WARNINGS

Read and understand all instruction manuals before operating equipment.

## FLUID INJECTION HAZARD

### General Safety

This equipment generates very high fluid pressure. Spray from the gun, leaks or ruptured components can inject fluid through your skin and into your body and cause extremely serious bodily injury, including the need for amputation. Also, fluid injected or splashed into the eyes or on the skin can cause serious damage.

NEVER point the spray gun at anyone or at any part of the body. NEVER put hand or fingers over the spray tip. NEVER try to “blow back” material; this is NOT an air spray system.

ALWAYS have the tip guard in place on the spray gun when spraying.

ALWAYS follow the **Pressure Relief Procedure**, below, before cleaning or removing the spray tip or servicing any system equipment.

NEVER try to stop or deflect leaks with your hand or body.

Be sure equipment safety devices are operating properly before each use.

### Medical Alert—Airless Spray Wounds

If any fluid appears to penetrate your skin, get **EMERGENCY MEDICAL CARE AT ONCE. DO NOT TREAT AS A SIMPLE CUT.** Tell the doctor exactly what fluid was injected.

**Note to Physician:** *Injection in the skin is a traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the blood stream. Consultation with a plastic surgeon or reconstructive hand surgeon may be advisable.*

### Spray Gun Safety Devices

Be sure all gun safety devices are operating properly before each use. Do not remove or modify any part of the gun; this can cause a malfunction and result in serious bodily injury.

### Safety Latch

Whenever you stop spraying, even for a moment, always set the gun safety latch in the closed or “safe” position, making the gun inoperative. Failure to set the safety latch can result in accidental triggering of the gun.

### Diffuser

The gun diffuser breaks up spray and reduces the risk of fluid injection when the tip is not installed. Check diffuser operation regularly. Follow the **Pressure Relief Procedure**, below, then remove the spray tip. Aim the gun into a metal pail, holding the gun firmly to the pail. Using the lowest possible pressure, trigger the gun. If the fluid emitted is not diffused into an irregular stream, replace the diffuser immediately.

### Tip Guard

ALWAYS have the tip guard in place on the spray gun while spraying. The tip guard alerts you to the fluid injection hazard and helps reduce, but does not prevent, the risk of accidentally placing your fingers or any part of your body close to the spray tip.

### Trigger Guard

Always have the trigger guard in place on the gun when spraying to reduce the risk of accidentally triggering the gun if it is dropped or bumped.

### Spray Tip Safety

Use extreme caution when cleaning or changing spray tips. If the spray tip clogs while spraying, engage the gun safety latch immediately. ALWAYS follow the **Pressure Relief Procedure** and then remove the spray tip to clean it.

NEVER wipe off build-up around the spray tip until pressure is fully relieved and the gun safety latch is engaged.

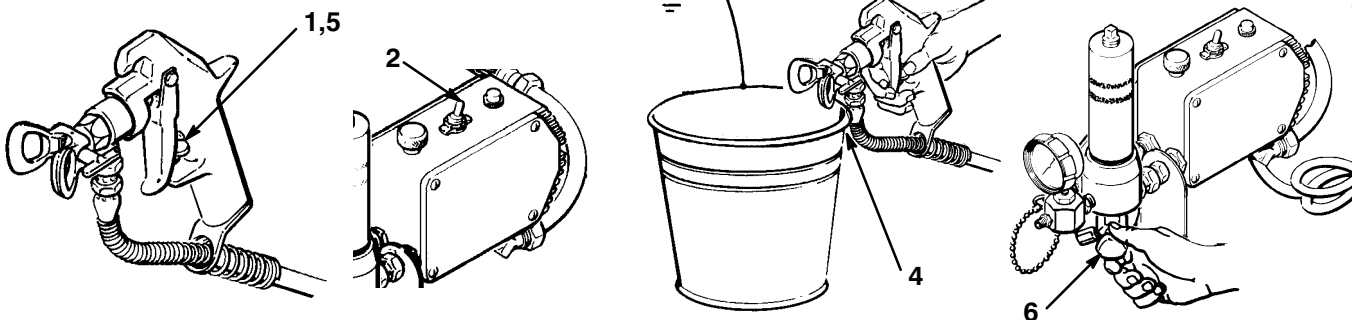
### Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, splashing fluid or solvent in the eyes or on the skin, or injury from moving parts or electric shock, always follow this procedure whenever you shut off the sprayer, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the sprayer.

4. Disengage the gun safety latch. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
5. Engage the gun safety latch.
6. Open the pressure drain valve, having a container ready to catch the drainage. Leave the valve open until you are ready to spray again.

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



## MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers or other body parts. KEEP CLEAR of moving parts when starting or operating the sprayer. Follow the **Pressure Relief Procedure** on page 4 before checking or servicing any part of the sprayer, to prevent it from starting accidentally.

## EQUIPMENT MISUSE HAZARD

### General Safety

Any misuse of the spray equipment or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in fluid injection, splashing in the eyes or on the skin, or other serious bodily injury, or fire, explosion or property damage.

NEVER alter or modify any part of this equipment; doing so could cause it to malfunction.

CHECK all spray equipment regularly and repair or replace worn or damaged parts immediately.

Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.

### System Pressure

This sprayer can develop **3000 psi (210 bar) MAXIMUM WORKING PRESSURE**. Be sure that all spray equipment and accessories used are rated to withstand this pressure. DO NOT exceed the maximum working pressure of any component or accessory used in the system.

### Fluid and Solvent Compatibility

BE SURE that all fluids and solvents used are chemically compatible with the wetted parts shown in the **TECHNICAL DATA** on page 43. Always read the fluid and solvent manufacturer's literature before using them in this sprayer.

## FIRE OR EXPLOSION HAZARD

Static electricity is created by the flow of fluid through the pump and hose. If every part of the spray equipment is not properly grounded, sparking may occur, and the system may become hazardous. Sparking may also occur when plugging in or unplugging a power supply cord or using a gasoline engine. Sparks can ignite fumes from solvents and the fluid being sprayed, dust particles and other flammable substances, whether you are spraying indoors or outdoors, and can cause a fire or explosion and serious bodily injury and property damage.

If you experience any static sparking or even a slight shock while using this equipment, **STOP SPRAYING IMMEDIATELY**. Check the entire system for proper grounding. Do not use the system again until the problem has been identified and corrected.

### Grounding

To reduce the risk of static sparking, ground the sprayer and all other spray equipment used or located in the spray area. CHECK your local electrical code for detailed grounding instructions for your area and type of equipment. BE SURE to ground all of this spray equipment:

1. *Sprayer*: plug the power supply cord, or extension cord, each equipped with an undamaged three-prong plug, into a properly grounded outlet. Do not use an adapter. All extension cords must have three wires and be rated for 15 amps.

## HOSE SAFETY

High pressure fluid in the hoses can be very dangerous. If the hose develops a leak, split or rupture due to any kind of wear, damage or misuse, the high pressure spray emitted from it can cause a fluid injection injury or other serious bodily injury or property damage.

**ALL FLUID HOSES MUST HAVE SPRING GUARDS ON BOTH ENDS!** The spring guards help protect the hose from kinks or bends at or close to the coupling which can result in hose rupture.

TIGHTEN all fluid connections securely before each use. High pressure fluid can dislodge a loose coupling or allow high pressure spray to be emitted from the coupling.

NEVER use a damaged hose. Before each use, check the entire hose for cuts, leaks, abrasion, bulging cover, or damage or movement of the hose couplings. If any of these conditions exist, replace the hose immediately. DO NOT try to recouple high pressure hose or mend it with tape or any other device. A repaired hose cannot contain the high pressure fluid.

HANDLE AND ROUTE HOSES CAREFULLY. Do not pull on hoses to move equipment. Keep hoses clear of moving parts and hot surfaces of the pump and gas engine. Do not use fluids or solvents which are not compatible with the inner tube and cover of the hose. DO NOT expose Graco hose to temperatures above 180° F (82° C) or below -40° F (-40° C).

### Hose Grounding Continuity

Proper hose grounding continuity is essential to maintaining a grounded spray system. Check the electrical resistance of your fluid hoses at least once a week. If your hose does not have a tag on it which specifies the maximum electrical resistance, contact the hose supplier or manufacturer for the maximum resistance limits. Use a resistance meter in the appropriate range for your hose to check the resistance. If the resistance exceeds the recommended limits, replace it immediately. An ungrounded or poorly grounded hose can make your system hazardous. Also read **FIRE OR EXPLOSION HAZARD**.

2. *Fluid hoses*: use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity. See **Hose Grounding Continuity**.
3. *Spray gun*: obtain grounding through connection to a properly grounded fluid hose and sprayer.
4. *Object being sprayed*: according to local code.
5. *Fluid supply container*: according to local code.
6. *All solvent pails used when flushing*, according to local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.
7. *To maintain grounding continuity when flushing or relieving pressure*, always hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun.

### Flushing Safety

Reduce the risk of fluid injection injury, static sparking, or splashing by following the flushing procedure given on page 15 of this manual. Follow the **Pressure Relief Procedure** on page 4, and remove the spray tip before flushing. Hold a metal part of the gun firmly to the side of a grounded metal pail and use the lowest possible fluid pressure during flushing.

## IMPORTANT

United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards – particularly the General Standards, Part 1910, and the Construction Standards, Part 1926 – should be consulted.

# AVERTISSEMENT

La pulvérisation à haute pression peut causer des blessures très graves.  
Réservé exclusivement à l'usage professionnel. Observer toutes les consignes de sécurité.  
Bien lire et bien comprendre tous les manuels d'instructions avant d'utiliser le matériel.

## RISQUES D'INJECTION

### Consignes générales de sécurité

Cet appareil produit un fluide à très haute pression. Le fluide pulvérisé par le pistolet ou le fluide sous pression provenant de fuites ou de ruptures peut pénétrer sous la peau ou à l'intérieur du corps et entraîner des blessures très graves, voir même une amputation. Même sans être sous pression, le fluide éclaboussant ou entrant dans les yeux peut aussi entraîner des blessures graves.

NE JAMAIS pointer le pistolet vers quelqu'un ou vers une partie quelconque du corps. NE JAMAIS mettre la main ou les doigts sur l'ajutage du pulvérisateur. NE JAMAIS essayer de "refouler" la peinture.

TOUJOURS garder la protection de l'ajutage en place sur le pistolet pendant la pulvérisation.

TOUJOURS observer la **Marche à Suivre pour Détendre la Pression** donnée plus loin, avant de nettoyer ou d'enlever l'ajutage du pulvérisateur, ou d'effectuer un travail quelconque sur une partie de l'appareil.

NE JAMAIS essayer d'arrêter ou de dévier les fuites avec la main ou le corps.

Avant chaque utilisation, bien s'assurer que les dispositifs de sécurité fonctionnent correctement.

### Soins médicaux

En cas de pénétration de fluide sous la peau: **DEMANDER IMMEDIATEMENT DES SOINS MEDICAUX D'URGENCE.** NE PAS SOIGNER CETTE BLESSURE COMME UNE SIMPLE COUPURE.

*Avis au medecin:* La pénétration des fluides sous la peau est un traumatisme. **Il est important de traiter chirurgicalement cette blessure immédiatement.** Ne pas retarder le traitement pour effectuer des recherches sur la toxicité. Certains revêtements exotiques sont dangereusement toxiques quand ils sont injectés directement dans le sang. Il est souhaitable de consulter un chirurgien esthétique ou un chirurgien spécialisé dans la reconstruction des mains.

### Dispositifs de sécurité du pistolet

Avant chaque utilisation, bien s'assurer que tous les dispositifs de sécurité du pistolet fonctionnent correctement. Ne pas enlever ni modifier une partie quelconque du pistolet; ceci risquerait d'entraîner un mauvais fonctionnement et des blessures graves.

#### Verrou de sécurité

A chaque fois que l'on s'arrête de pulvériser, même s'il s'agit d'un court instant, toujours mettre le verrou de sécurité du pistolet sur la position "fermée" ou "sécurité" ("safe") pour empêcher le pistolet de fonctionner. Si le verrou de sécurité n'est pas mis, le pistolet peut se déclencher accidentellement.

#### Diffuser

Le diffuseur du pistolet sert à diviser le jet et à réduire les risques d'injection accidentelle quand l'ajutage n'est pas en place. Vérifier le fonctionnement du diffuseur régulièrement. Pour cette vérification, détendre la pression en observant la **Marche à Suivre pour Détendre la Pression** donnée plus loin puis enlever l'ajutage du pulvérisateur. Pointer le pistolet dans un seau en métal, en le maintenant fermement contre le seau. Puis, en utilisant la pression la plus faible possible, appuyer sur la gachette du pistolet. Si le fluide projette *n'est pas* diffusé sous forme de jet irrégulier, remplacer immédiatement le diffuseur.

#### Protection de l'ajutage

TOUJOURS maintenir la protection de l'ajutage en place sur le pistolet du pulvérisateur pendant la pulvérisation. La protection de l'ajutage attire l'attention sur les risques d'injection et contribue à réduire, mais n'évite pas le risque, que les doigts ou une partie quelconque du corps ne passent accidentellement à proximité immédiate de l'ajutage du pulvérisateur.

### Consignes de sécurité concernant l'ajutage du pulvérisateur

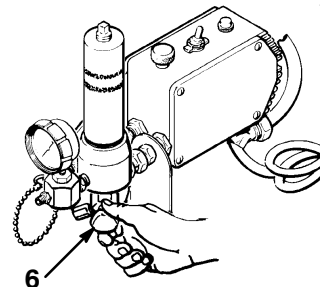
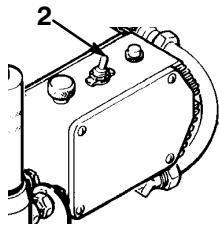
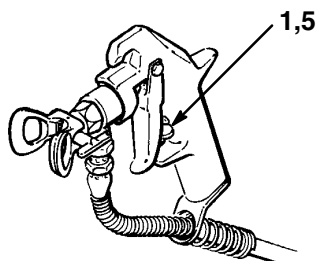
Faire extrêmement attention à l'occasion du nettoyage ou du remplacement des ajutages du pulvérisateur. Si l'ajutage se bouche pendant la pulvérisation, mettre immédiatement le verrou de sécurité du pistolet. TOUJOURS bien observer la **Marche à Suivre pour Détendre la Pression** puis enlever l'ajutage du pulvérisateur pour le nettoyer.

NE JAMAIS essayer ce qui s'est accumulé autour de l'ajutage du pulvérisateur avant que la pression ne soit complètement tombée et que le verrou de sécurité du pistolet ne soit engagé.

### Marche à Suivre pour Détendre la Pression

Pour réduire les risques de blessures graves, y compris les blessures par injection de fluide ou celles causées par des éclaboussures dans les yeux ou sur la peau, des pièces en mouvement ou par électrocution, toujours bien observer cette marche à suivre à chaque fois que l'on arrête le pulvérisateur, à l'occasion de la vérification, du réglage ou du nettoyage du système ou lors du changement des ajutages.

1. Engager le verrou de sécurité du pistolet.
2. Basculer l'interrupteur de commande de pression sur ARRÊT (OFF).
3. Débrancher le cordon d'alimentation.



4. Désengager le verrou de sécurité du pistolet. Tout en maintenant une partie métallique du pistolet fermement appuyée contre le côté d'un seau en métal, actionner le pistolet pour libérer la pression.
5. Engager le verrou de sécurité du pistolet.
6. Ouvrir la soupape de sécurité et la laisser ouverte jusqu'à ce que l'on soit prêt à se servir de nouveau du pulvérisateur. Débrancher le fil de la bougie.

Si l'on soupçonne que le tuyau ou l'ajutage du est complètement bouché, ou que la pression n'a pas été complètement libérée après avoir procédé aux opérations ci-dessus, desserrer très LENTEMENT un raccord du bout du tuyau ou l'écrou de retenue de la protection de l'ajutage et libérer progressivement la pression.

## RISQUES EN CAS DE MAUVAISE UTILISATION DU MATERIEL

### Consignes générales de sécurité

Toute utilisation anormale de l'appareil de pulvérisation ou des accessoires comme, par exemple, la mise sous une pression excessive, les modifications de pièces, l'utilisation de produits chimiques et de matières incompatibles et l'utilisation de pièces usées ou abîmées peut causer des dégâts à l'appareil ou des ruptures de pièces et entraîner une injection de liquide ou d'autres blessures sérieuses, un incendie, une explosion ou d'autres dégâts.

NE JAMAIS altérer ou modifier une pièce de cet appareil; ceci risquerait d'entraîner son mauvais fonctionnement.

Vérifier régulièrement tout l'appareil de pulvérisation et ses équipements et réparer ou remplacer immédiatement les pièces usées ou abîmées.

### MESURES DE SÉCURITÉ CONCERNANT LES TUYAUX FLEXIBLES

Le fluide à haute pression circulant dans les tuyaux peut être très dangereux. En cas de fuite sur le tuyau, de fissure, déchirure ou rupture à la suite de l'usure, de dégâts ou d'une mauvaise utilisation, les projections de fluide haute pression qui en proviennent peuvent entraîner des blessures graves par pénétration sous la peau ou par contact, ainsi que des dégâts matériels.

#### TOUS LES TUYAUX FLEXIBLES DOIVENT AVOIR DES RESORTS SPIRALE DE PROTECTION AUX BOUTS!

Les spirales de protection contribuent à éviter la formation de pliures, de boucles ou de nœuds sur les tuyaux qui pourraient entraîner la rupture du tuyau à l'endroit du raccord ou à son voisinage.

SERRER FERMEMENT tous les raccords avant chaque utilisation. Le fluide sous pression peut faire sauter un raccord desserré ou produire un jet à haute pression s'échappant par le raccord.

NE JAMAIS utiliser un tuyau endommagé. NE PAS essayer de refaire le raccord d'un tuyau haute pression ni de réparer le tuyau avec du ruban adhésif ou par tout autre moyen. Un tuyau réparé ne peut pas résister au fluide sous pression.

### RISQUES D'INCENDIE OU D'EXPLOSION

De l'électricité statique est produite par le passage du fluide à grande vitesse dans la pompe et dans les tuyaux. Si toutes les pièces de l'appareil de pulvérisation ne sont pas convenablement reliées à la masse ou à la terre, des étincelles peuvent se produire et l'appareil risque d'être dangereux. Des étincelles peuvent également se produire à l'occasion du branchement ou du débranchement du cordon d'alimentation. Les étincelles sont suffisantes pour allumer les vapeurs de solvants et le fluide pulvérisé, les fines particules de poussière ainsi que d'autres substances inflammables, quand on pulvérise à l'intérieur ou à l'extérieur, et elles peuvent causer un incendie ou une explosion, ainsi que des blessures graves et des dégâts matériels. Toujours brancher le pulvérisateur dans une prise se trouvant à au moins 6 m (20 pieds) de l'appareil et de l'endroit où se fait la pulvérisation. Ne pas brancher ou débrancher un cordon d'alimentation quel qu'il soit dans la zone où se fait la pulvérisation quand il y a le moindre risque que des vapeurs encore présentes dans l'air prennent feu.

S'il se produit des étincelles d'électricité statique, ou si vous ressentez la moindre décharge, ARRÊTEZ IMMÉDIATEMENT LA PULVÉRISATION. Vérifiez que le système entier est bien mis à la terre. Ne vous servez pas du système avant que le problème soit identifié et corrigé.

#### Mise à la terre ou à la masse

Pour réduire les risques de production d'étincelles d'électricité statique, le pulvérisateur et tous les équipements utilisés ou se trouvant dans la zone de pulvérisation doivent être reliés à la terre ou à la masse. Pour connaître le détail des instructions de mise à la terre dans la région et le type particulier d'équipement, CONSULTER le code ou les réglementations électriques locales. S'ASSURER que tous les équipements de pulvérisation suivants sont bien reliés à la terre:

1. *Pulvérisateur:* Brancher le cordon d'alimentation ou la rallonge qui doivent être équipés d'une prise à 3 fiches en bon état, dans une prise de courant convenablement mise à la terre. Ne pas utiliser d'adaptateur. Toutes les rallonges doivent avoir 3 fils et être prévues pour 15 ampères.

#### Pression

Ce pulvérisateur peut produire une **PRESSION MAXIMUM DE TRAVAIL** 210 bar (3000 lb/po<sup>2</sup>). S'assurer que tous les éléments du pulvérisateur et ses accessoires sont conçus pour résister à la pression maximum de travail de ce pulvérisateur. NE PAS dépasser la pression maximum de travail d'aucun des éléments ou accessoires utilisés avec cet appareil.

#### Compatibilité chimique des corps

BIEN S'ASSURER que tous les corps des solvants utilisés sont chimiquement compatibles avec les parties mouillées indiquées dans les **TECHNICAL DATA**, à page 43. Toujours lire soigneusement les documents et brochures du fabricant des fluides et solvants utilisés avant de s'en servir dans ce pulvérisateur.

MANIPULER LES TUYAUX AVEC PRECAUTION ET CHOISIR SOIGNEUSEMENT LEUR CHEMIN. Ne pas déplacer le fluide en tirant sur le tuyau. Ne pas utiliser de fluides ou de solvants qui ne sont pas compatibles avec l'enveloppe intérieure ou extérieure du tuyau. NE PAS exposer le tuyau à des températures supérieures à 82° C (180° F) ou inférieures à -40° C (-40° F).

#### Continuité de la mise à la terre des tuyaux

Une bonne continuité de la mise à la terre des tuyaux est essentielle pour maintenir la mise à la terre de l'ensemble de vaporisation. Vérifiez la résistance électrique de vos tuyaux à fluides et à air, au moins une fois par semaine. Si votre tuyau ne comporte pas d'étiquette qui précise la résistance électrique maximum, prenez contact avec le fournisseur de tuyaux ou la fabricant pour avoir les limites de résistance maximum. Utilisez un mètre de résistance de la gamme appropriée pour votre tuyau et vérifiez la résistance. Si celle-ci dépasse les limites recommandées, remplacez le tuyau immédiatement. Un tuyau sans mise à la terre ou avec une mise à la terre incorrecte peut entraîner des risques pour votre système. Lisez aussi **LES RISQUES D'INCENDIE OU D'EXPLOSION** ci-dessus.

2. *Tuyaux flexibles:* Afin d'assurer la continuité de la mise à la terre, n'utiliser que des tuyaux comportant une mise à la terre et ayant une longueur maximum combinée de 150 m (1500 pieds). Se reporter également au paragraphe **Continuité du circuit de mise à la terre des tuyaux**.
3. *Pistolet:* Réaliser la mise à la terre en le raccordant à un tuyau flexible et à un pulvérisateur déjà convenablement reliés à la terre.
4. *Récipient d'alimentation:* observer le code ou les réglementations locales.
5. *Objets, matériel ou surfaces recevant la pulvérisation:* observer le code ou les réglementations locales.
6. *Tous les seaux de solvants* utilisés pour le rinçage: observer le code ou les réglementations locales. N'utiliser que des seaux métalliques conducteurs de l'électricité. Ne pas mettre le seau sur une surface non conductrice comme sur du papier ou du carton car cela interromprait la continuité de la mise à la terre.
7. *Pour conserver la continuité de la mise à la terre quand on rince le matériel ou quand on libère la pression*, toujours maintenir une partie métallique du pistolet fermement appuyée contre le côté d'un seau en métal puis appuyer sur la détente du pistolet.

#### Mesures de sécurité concernant le Rinçage

Pour réduire les risques de blessures par pénétration de la peau et les risques dus aux étincelles d'électricité statique ou aux éclaboussures, observer la marche à suivre pour le rinçage donnée à la page 15 de ce manuel. Observer la "Marche à Suivre pour Détendre la Pression" donnée à la page 6 en *enlever l'ajutage du pulvérisateur avant le rinçage*. Maintenir une partie métallique du pistolet fermement appuyée contre le côté d'un seau en métal et utiliser la pression la plus faible possible pendant le rinçage.

# ADVERTENCIA

**EL ROCIADO a ALTA PRESIÓN PUEDE CAUSAR GRAVES LESIONES.  
SOLO PARA USO PROFESIONAL. RESPETE LOS AVISOS DE ADVERTENCIA.**

**Lea y entienda todo el manual de instrucciones antes de manejar el equipo.**

## PELIGRO DE INYECCIÓN DE FLUIDO

### Seguridad general

Este equipo genera un fluido a una presión muy alta. El rociado de la pistola, los escapes de fluido o roturas de los componentes pueden inyectar fluido en la piel y el cuerpo y causar lesiones extremadamente graves, incluyendo a veces la necesidad de amputación. También, el fluido inyectado o salpicado en los ojos puede causar graves daños.

NUNCA apuntar la pistola hacia alguien o alguna parte del cuerpo. NUNCA colocar la mano o los dedos encima de la boquilla. NUNCA tratar de "hacer retornar la pintura"; este NO es un sistema de rociado de aire.

SIEMPRE tener colocado el protector de la boquilla en la pistola mientras se está pulverizando.

SIEMPRE seguir el procedimiento de descarga de presión, dado más abajo, antes de limpiar o sacar la boquilla o de dar servicio a cualquier equipo del sistema.

NUNCA tratar de parar o desviar los escapes con la mano o el cuerpo.

Asegurar que todos los aparatos de seguridad del equipo están funcionando bien antes de cada uso.

### Tratamiento médico

Si pareciera que un poco de fluido penetró la piel, conseguir **TRATAMIENTO MÉDICO DE URGENCIA DE INMEDIATO. NO TRATAR LA HERIDA COMO UN SIMPLE CORTE.** Decir al médico exactamente cual fluido fue.

*Aviso al médico:* Si se llega a inyectar este fluido en la piel se causa una lesión traumática. **Es importante tratar quirúrgicamente la lesión a la brevedad posible.** No demorar el tratamiento para investigar la toxicidad. La toxicidad es algo de suma importancia en algunas pinturas exóticas cuando se inyectan directamente al torrente sanguíneo. Sirá conveniente consultar a un especialista en cirugía plástica o reconstructiva de las manos.

### Aparatos de seguridad de la pistola pulverizadora

Asegurar que todos los aparatos protectores de la pistola están funcionando bien antes de cada uso. No sacar ni modificar ninguna pieza de la pistola pues podría causar el malfuncionamiento de la misma con las consiguientes lesiones personales.

#### Pestillo de seguridad

Cada vez que se deje de pulverizar, aunque sea por un breve momento, siempre colocar el pestillo de seguridad en la posición "cerrada" lo que deja la pistola inoperante. El no hacerlo puede llevar al disparo imprevisto de la pistola.

#### Difusor

El difusor de la pistola dispersa el chorro pulverizado y reduce el riesgo de inyección cuando no está instalada la boquilla. Revisar con regularidad el funcionamiento del difusor. Seguir el **procedimiento de descarga de presión**, dado más abajo, y después sacar la boquilla. Apuntar la pistola a un balde metálico, sosteniéndola bien firme contra el. Utilizando la presión más bajo posible, disparar la pistola. Si el fluido emitido no sale disperso en un chorro irregular, reemplazar de inmediato el difusor.

#### Protector de la boquilla

SIEMPRE tener el protector de la boquilla colocado en la pistola mientras se está pulverizando. Este protector llama la atención contra el peligro de inyección y ayuda a reducir, pero no evita, la colocación accidental de los dedos o cualquier otra parte del cuerpo cerca de la boquilla.

### Seguridad de la boquilla pulverizadora

Tener mucho cuidado al limpiar o cambiar las boquillas. Si llegara a obstruirse mientras está pulverizando, enganchar el pestillo de la pistola de inmediato. SIEMPRE seguir el **procedimiento de descarga de presión** y después sacar la boquilla para limpiarla.

NUNCA limpiar la acumulación de pintura alrededor de la boquilla antes de que se haya descargado por completo la presión y el pestillo este enganchado.

### Procedimiento de descarga de presión

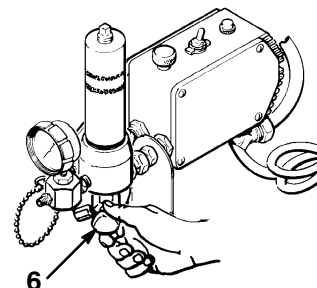
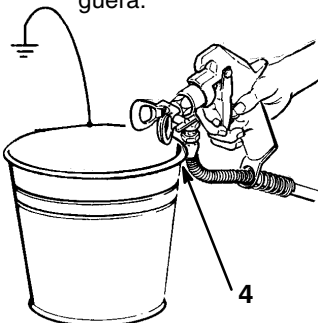
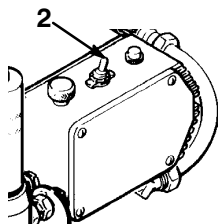
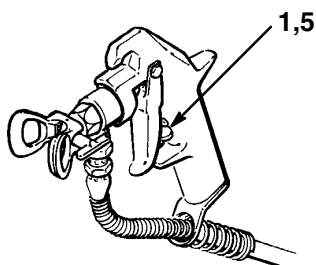
Para reducir el riesgo de sufrir graves lesiones corporales, incluyendo inyección o lesiones causadas por piezás en movimiento o choque eléctrico, siempre seguir este procedimiento al apagar la máquina pulverizadora, al revisar o dar servicio a cualquier parte del sistema de pulverización, al instalar, limpiar o cambiar las boquillas, y cada vez que se deja de pulverizar.

1. Enganchar el pestillo de la pistola.
2. Mover el interruptor eléctrico (ON/OFF) a la posición OFF (apagado).
3. Desenchufar el cordón eléctrico.
4. Desenganchar el pestillo de la pistola. Sujetar una parte metálica de la pistola bien firme contra un balde de metal, y disparar la pistola para descargar la presión.

5. Enganchar el pestillo de la pistola.

6. Abrir la válvula de presión y tener listo un recipiente para recibir la pintura. Dejar la válvula de alivio de presión abierta hasta que se este nuevamente listo para pulverizar.

Si se sospecha que la boquilla o la manguera está completamente obstruida, o que no se ha descargado por completo la presión después de haber seguido el procedimiento anterior, aflojar MUY LENTAMENTE la tuerca de retención del protector de la boquilla o acoplamiento de la punta de la manguera y descargar gradualmente la presión, después, aflojarlo por completo. Luego, despejar la boquilla o la manguera.





## PELIGRO POR MAL USO DEL EQUIPO

### Seguridad general

Cualquier mal uso del equipo pulverizador o los accesorios, tal como sobrepresurización, modificación de piezas, uso de materiales y productos químicos incompatibles, o utilización de piezas dañadas o desgastadas, pueden hacer que se rompan y causen la inyección de fluido u otras lesiones corporales graves, incendio, explosión o daño a la propiedad.

NUNCA alterar o modificar ninguna pieza de este equipo; el hacerlo podría causar una avería.

REVISAR con regularidad el equipo pulverizador y reparar o reemplazar de inmediato las piezas dañadas o desgastadas.

## SEGURIDAD EN EL USO DE LAS MANGUERAS

El fluido que escapa a alta presión por las mangueras puede ser muy peligroso. Si en la manguera se desarrolla un escape, una rotura o rajadura debido a cualquier tipo de desgaste, daño o maltrato, el chorro a alta presión emitido por allí puede causar una lesión por inyección u otras lesiones corporales graves o daños a la propiedad.

### ¡TODAS LAS MANGUERAS PARA FLUIDOS TIENEN QUE TENER GUARDAS DE RESORTE EN AMBOS EXTREMOS!

Estas protegen las mangueras contra dobleces o retorceduras en los acoplamientos o cerca de ellos, los que podrían traducirse en roturas de la manguera.

Antes de usarlas, APRETAR bien firmes todas las conexiones. El fluido a alta presión puede desalojar un acoplamiento suelto o dejar que por el escape un chorro a alta presión.

NUNCA usar una manguera que está dañada. Siempre, revisarla en busca de cortaduras, escapes, abrasión, cubierta abultada, o acoplamientos sueltos o dañados. Si llegara a encontrarse cualquiera de estas condiciones, reemplazar de inmediato la manguera. NO intentar racoplar una manguera de alta presión o enmendarla con cinta adhesiva u otro material similar. Una manguera que ha sido remendada no aguante el fluido a alta presión.

## PELIGRO DE INCENDIO O EXPLOSIÓN

El flujo a alta velocidad del fluido al pasar por la bomba y manguera crea electricidad estática. Si todas las partes del equipo pulverizador no tienen buena tierra, pueden ocurrir chispas, convirtiendo al sistema en algo peligroso. También, pueden producirse chispas al enchufar o desenchufar el cordón eléctrico o al usar un motor de gasolina. Estas chispas pueden inflamar los vapores de los solventes y el chorro de fluido pulverizado, partículas de polvo y otras sustancias inflamables, sea al aire libre o bajo techo, lo que podría causar una explosión o incendio y graves lesiones corporales y daños a la propiedad. Enchufar siempre la pulverizadora a un tomacorriente que se encuentre a por lo menos 6 m (20 pies) de la máquina y del área que se va a rociar. No enchufar o desenchufar ningún cordón eléctrico en el lugar donde se está rociando cuando todavía exista la posibilidad de que queden vapores inflamables en el aire.

Si ocurre una chispa de electricidad estática o incluso un ligero choque eléctrico mientras se usa el equipo, DEJAR DE PULVERIZAR DE INMEDIATO. Revisar todo el sistema en busca de una tierra apropiada. No usar de nuevo el sistema hasta haber identificado y solucionado el problema.

### Peusta a tierra

Para reducir el riesgo de chispas estáticas, conectar a tierra la pulverizadora y todo el otro equipo de pulverizar que se use o se encuentre en el lugar que se va a rociar. Consultar el código eléctrico de la localidad para las instrucciones sobre las conexiones a tierra exigidas para la zona y tipo de equipo. Asegurar de conectar a tierra todo este equipo pulverizador:

1. *Pulverizadora:* enchufar el cordón eléctrico, o cable extensor, cada uno un enchuf de tres patas en buen estado, a un tomacorriente con puesta a tierra apropiado. No usar un adaptador. Todos los cables extensores tienen que tener tres hilos y una capacidad de 15 amperios.

### Presión del sistema

está pulverizadora puede desarrollar 210 barías (3000 psi) de presión DE TRABAJO MÁXIMA. Asegurar que todo el equipo pulverizador y sus accesorios tienen la capacidad para aguantar la presión máxima de trabajo de esta pulverizadora. NO exceder la presión máxima de trabajo de ningún componente o accesorio de este sistema.

### Compatibilidad de fluido

Siempre leer las instrucciones del fabricante del fluido y solvente antes de usarlos en esta pulverizadora.

Siempre usar gafas, guantes, vestimetas protectora y un respiradero, tal como recomiendan los fabricantes del fluido y del solvente.

MANEJAR Y PASAR CUIDADOSAMENTE LAS MANGUERAS. No tirar de las mangueras para mover el equipo. No usar fluidos o solventes que sean incompatibles con el tubo interno y la cubierta de la manguera. NO exponer las mangueras a temperaturas sobre 82 °C (180 °F) o bajo -40 °C (-40 °F).

### Continuidad del circuito de puesta a tierra de la manguera

La continuidad del circuito de puesta a tierra apropiado es esencial para mantener conectado a tierra el sistema pulverizador. Es indispensable revisar la resistencia eléctrica máxima de las mangueras de aire y de fluido por lo menos una vez a la semana. Si la manguera no tiene una etiqueta en la cual se especifica la resistencia eléctrica, ponerse en contacto con el proveedor o fabricante de la manguera para la información sobre los límites de resistencia. Usar un metro de resistencia en la gama apropiada para comprobar la resistencia; si excede los límites recomendados, reemplazarla de inmediato. Es muy arriesgado tener una manguera sin puesta a tierra o con la puesta a tierra en malas condiciones. Leer también la información sobre **RIESGO DE INCENDIO O EXPLOSIÓN**, más arriba.

2. *Mangueras para fluidos:* usar solamente mangueras con puesta a tierra de una longitud combinada de 150 m (500 pies), para asegurar buena continuidad a tierra. Referirse también al párrafo sobre **continuidad a tierra de la manguera**.
3. *Pistola:* hace la puesta a tierra conectándola a una manguera de fluido y pulverizadora bien conectadas a tierra.
4. *Suministrar un recipiente:* de acuerdo al código de la localidad.
5. *Objeto que se está rociando:* de conformidad con el código local.
6. *Todos los baldes de solvente* usados durante el lavado, de conformidad con el código local. Usar *solamente baldes de metal*, que sean conductivos. No colocar el balde en una superficie no conductiva, como papel o cartón, que interrumpe la continuidad a tierra.
7. *Para mantener la continuidad a tierra durante el lavado o descarga de presión,* siempre apoyar una parte metálica de la pistola bien firme contra el costado del *balde de metal*, después apretar el gatillo.

### Seguridad durante el lavado

Para reducir el riesgo de que se inyecte o salpique fluido en la piel, o que ocurra una descarga de electricidad estática, siempre seguir las INSTRUCCIONES PARA EL LAVADO, dadas en la página 15. Seguir el **procedimiento de descarga de presión** en la página 8, y quita la *boquilla rociadora antes de lavar*. Apoyar una parte metálica de la pistola bien firme contra el costado de un *balde de metal* y usar la presión más baja posible de fluido durante el lavado.

# SETUP

## 1. Connect Hose and Gun. Refer to Fig 10-1

**NOTE:** When tightening fittings at the pressure control, hold one wrench firmly on the hex of the pressure control fitting to keep it from rotating. Use another wrench to tighten the mating fitting.

- Remove the cap from the filter outlet nipple and screw the 50 ft. (15.2 m) main fluid hose on to the nipple.
- Connect the 6 ft. (1.8 m) hose to the main fluid hose with the nipple provided. Connect the short hose to the gun inlet connection.
- Don't use thread sealant, and don't install the spray tip yet!

### WARNING

If you are supplying your own hoses and spray gun, be sure the hoses are electrically conductive, that the gun has a tip guard, and that each part is rated for at least **3000 psi (210 bar) Working Pressure**. This is to reduce the risk of serious bodily injury caused by static sparking, fluid injection or over-pressurization and rupture of the hose or gun.

## 2. Two Gun Hookup.

Remove the cap from the 1/4 npsm(m) nipple – See Fig 10-1 – and attach an accessory hose and gun.

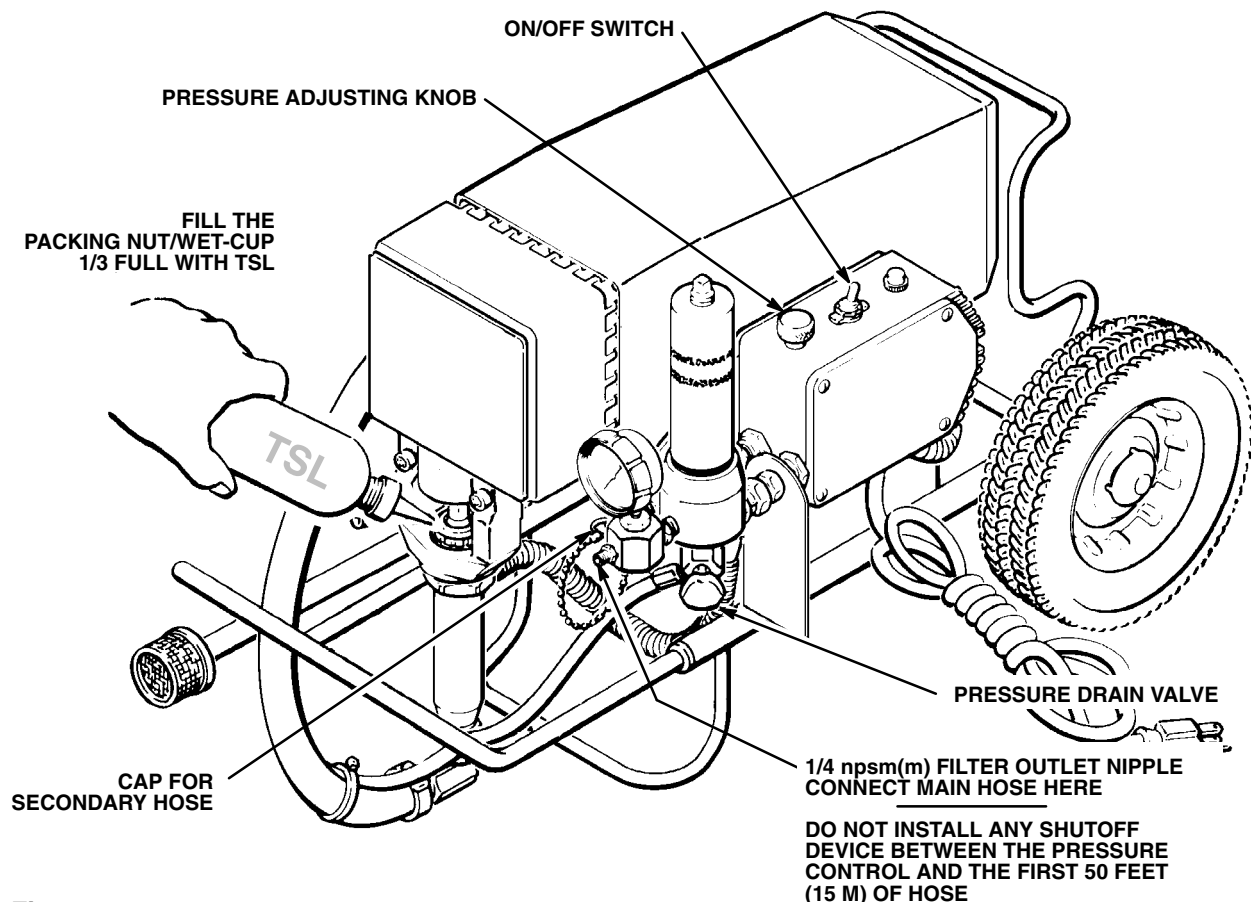


Fig 10-1

### CAUTION

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

- Always use nylon spray hose at least 50 ft (15.2 m) long.
- Never use a wire braid hose as it is too rigid to act as a pulsation dampener.
- Never install any shutoff device between the filter and the main hose. See Fig 10-2.
- Always use the main filter outlet for one gun operation. Never plug this outlet.

## 3. Fill Packing Nut/Wet-Cup. See Fig 10-1

Fill the packing nut/wet-cup 1/3 full with Graco Throat Seal Liquid (TSL), supplied.

## 4. Check the Electrical Service.

- Be sure the electrical service is 120 V, 60 HzAC, 15 Amp (minimum) and that the outlet you use is properly grounded.
- Do not remove the third prong of the power supply cord, which is the grounding prong, and do not use an adapter.
- Use an extension cord which has 3 wires of a minimum 12 gauge size, and a maximum of 150 ft. (45 m) long. Longer lengths may affect spray-performance.

## SETUP

- 5. Plug in the Sprayer .** Be sure the ON/OFF switch is OFF. Then plug the cord into a grounded electrical outlet at least 20 ft. (6 m) away from the spray area.

### WARNING

Proper electrical grounding is essential to reduce the risk of fire or explosion which can result in serious bodily injury and property damage. Refer to the warning section **FIRE OR EXPLOSION HAZARD** on page 5 for more detailed grounding instructions.

- 6. Flush the pump** to remove the lightweight oil which was left in to protect pump parts after factory testing.
  - Before using water–base material, flush with mineral spirits followed by soapy water, and then a clean water flush.
  - Before using oil–base material, flush with mineral spirits only.
  - See **FLUSHING GUIDELINES** on page 15 for the flushing procedure.
- 7. Prepare the material** according to the manufacturer's recommendations.

## WARNING

### Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, splashing fluid or solvent in the eyes or on the skin, or injury from moving parts or electric shock, always follow this procedure whenever you shut off the sprayer, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the power supply cord.
4. Disengage the gun safety latch. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
5. Engage the gun safety latch.
6. Open the pressure drain valve, having a container ready to catch the drainage. Leave the valve open until you are ready to spray again.

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

## Startup

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

**NOTE:** For the first time startup, be sure to flush the sprayer first. See page 15 for **FLUSHING GUIDELINES**.

1. **Close the pressure drain valve.**
2. **Don't install the spray tip yet!**
3. **Put the suction tube into the material container.**

**NOTE:** To adjust the pressure, use the pressure adjusting knob on the pressure control. Turn the knob counterclockwise to decrease pressure and clockwise to increase pressure.

4. **Lower the pressure setting** by turning the pressure adjusting knob all the way counterclockwise. *See Fig 13-1.*
5. **Disengage the gun safety latch.** *See Fig 13-2.*
6. **To prime the pump**, hold a metal part of the gun firmly against and aimed into a metal waste container. *See Fig 12-1.* Squeeze the trigger and hold it open, turn the ON/OFF switch to ON, and slowly increase the pressure until the sprayer starts. Keep the gun triggered until all air is forced out of the system and the material flows freely from the gun. Release the trigger and engage the gun safety latch.

## CAUTION

If the pump runs without fluid in it for more than 30 seconds, the displacement pump packings will be damaged. If the pump does not prime easily, follow the **NOTE** below.

**NOTE:** If the pump is hard to prime, place a container under the pressure drain valve and open it. When fluid comes from the valve, close it. Then disengage the gun safety latch and proceed as in Step 6, above.

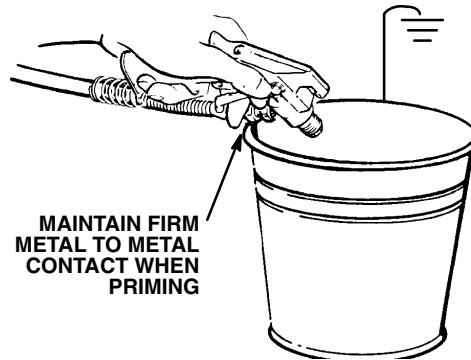


Fig 12-1

7. **Check all fluid connections for leaks.** If any leaks are found, follow the **Pressure Relief Procedure Warning**, to the left, before tightening the connections.
8. **Install the Spray Tip and Tip Guard.** Be sure the gun safety latch is engaged. *See Fig 13-2.* Install the spray tip. If you are using the RAC IV tip guard, refer to manual 307-848, supplied with the gun, for installation instructions.
9. **Adjust the Spray Pattern**
  - a. Increase the pressure just until spray from the gun is completely atomized. To avoid excessive overspray and fogging, and to decrease tip wear and extend the life of the sprayer, always use the lowest possible pressure needed to get the proper atomization of the material you are spraying.
  - b. Check your material manufacturer's spray pressure recommendations. With the gun triggered, adjust the pressure until the pressure gauge indicates you are within the recommended pressure range.
    - b. If more coverage is needed, use a larger tip rather than increasing the pressure.
    - c. Test the spray pattern. To adjust the direction of the spray pattern, engage the gun safety latch and loosen the retaining nut. Position the tip guard horizontally for a horizontal pattern or vertically for a vertical pattern. Then tighten the retaining nut.

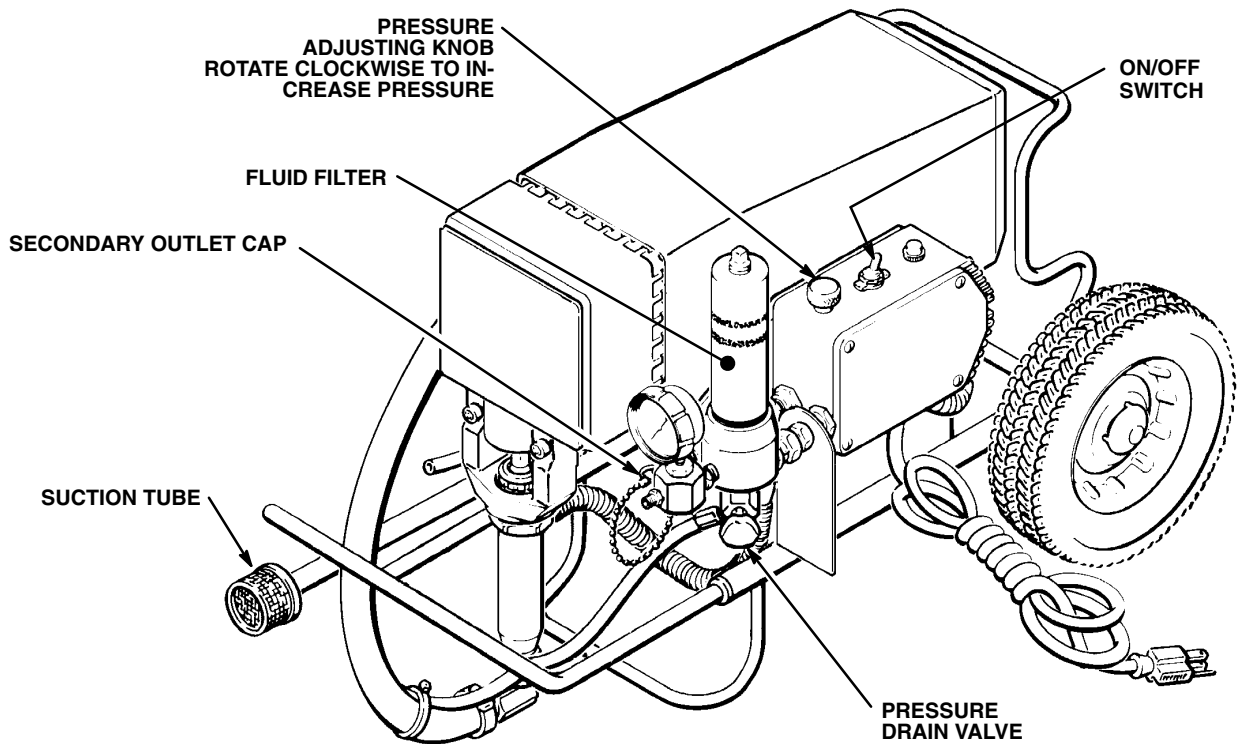


Fig 13-1

## Cleaning a Clogged Tip

### WARNING

To reduce the risk of serious bodily injury from fluid injection;

NEVER operate the spray gun with the tip guard removed.

DO NOT hold your hand, body, or a rag in front of the spray tip when cleaning or checking a clogged tip. Always point the gun toward the ground or into a waste container when checking to see if the tip is clear.

DO NOT try to "blow back" material; this is NOT an air spray sprayer.

1. Clean the front of the tip frequently during the day's operation. First, follow the **Pressure Relief Procedure Warning** on page 12.
2. If the spray tip does clog, release the gun trigger and engage the gun safety latch. Rotate the RAC IV handle 180°. See Fig 13-2.
3. Disengage the gun safety latch and trigger the gun into a waste container. Engage the gun safety latch again.

4. Return the handle to the original position, disengage the gun safety latch, and resume spraying.
5. If the tip is still clogged, engage the gun safety latch, shut off and unplug the sprayer, and open the pressure drain valve to relieve pressure. Clean the spray tip as shown in manual 307-848, supplied with the RAC IV tip guard.

HANDLE SHOWN IN SPRAYING POSITION.

TURN HANDLE 180°, DISENGAGE SAFETY LATCH AND TRIGGER GUN TO CLEAR CLOG

GUN SAFETY LATCH SHOWN ENGAGED

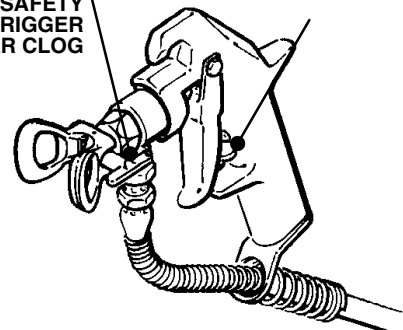


Fig 13-2

## WARNING

To reduce the risk of serious bodily injury, including fluid injection or splashing in the eyes or on the skin, or injury from moving parts, always follow the **Pressure Relief Procedure Warning** on page 12 before checking, adjusting, cleaning and shutting down the sprayer.

1. **Check the packing nut/wet-cup daily** . Relieve pressure. See page 12. Be sure the wet-cup is 1/3 full of TSL at all times to help prevent fluid buildup on the piston rod and premature wear of packings.

The packing nut should be tight enough to stop leakage, but no tighter. Over tightening may cause binding and excessive packing wear. Use a round punch or brass rod and light hammer to adjust the nut. See Fig 15-1.

2. **Clean the fluid filter often** and whenever the sprayer is stored. Relieve pressure first. See page 12. See manual 307-273, for the cleaning procedure.
3. **Lubricate the bearing housing** after every 100 hours of operation. Remove the cover of the bearing housing. Fill the bearing housing cavity with SAE non-detergent oil. See Fig 14-2.
4. **Flush the sprayer at the end of each work day** and fill it with mineral spirits to help prevent pump corrosion and freezing. See **FLUSHING GUIDELINES** on page 15.

## CAUTION

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

5. **For very short shutoff periods**, leave the suction tube in the material, relieve pressure, and clean the spray tip.
6. **Coil the hose and hang it on the hose rack** when storing it, even for overnight, to help protect the hose from kinking, abrasion, coupling damage, etc.

## WARNING

Refer to the warning section, **HOSE SAFETY**, on page 5, for information on the hazard of using damaged hoses.

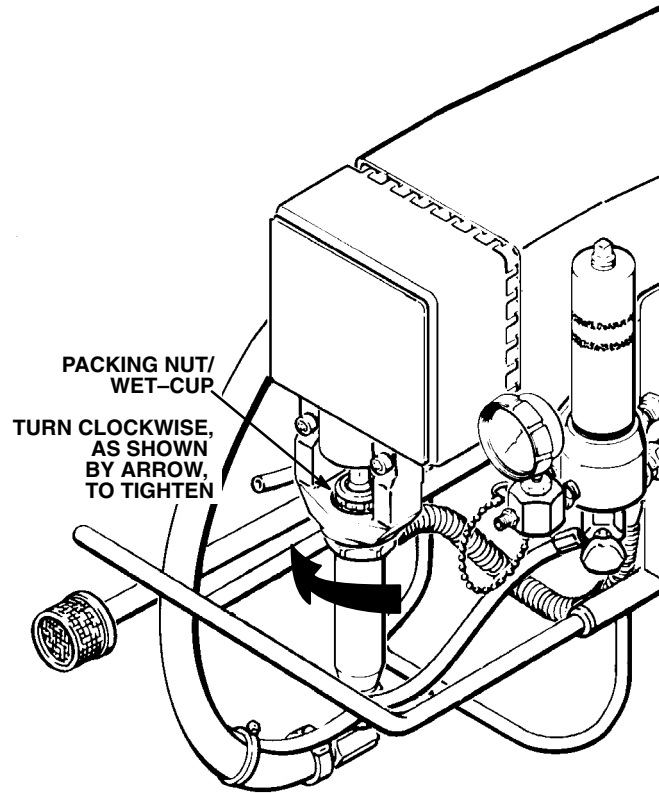


Fig 14-1

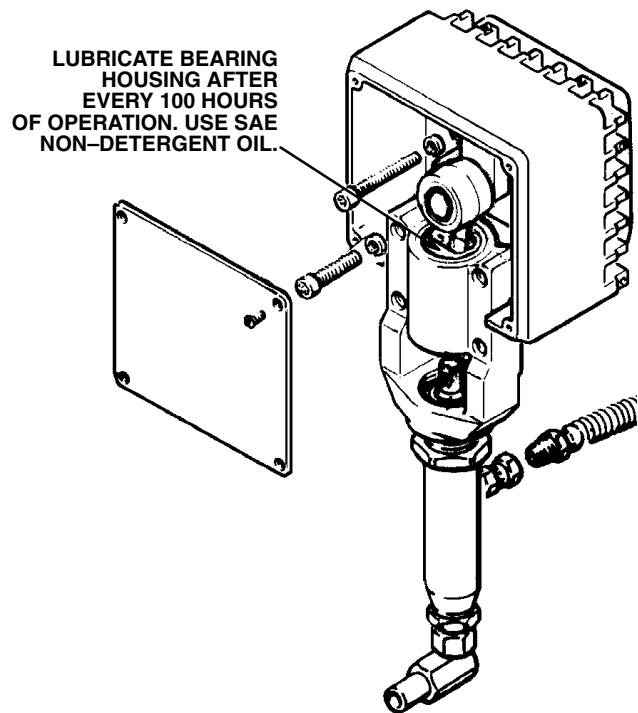


Fig 14-2

## FLUSHING GUIDELINES

### When to Flush

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

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

*Before using oil–base material,* flush with mineral spirits.

2. **Changing Colors.** Flush with a compatible solvent.
3. **Changing from water–base to oil–base material.** Flush with warm, soapy water, then mineral spirits.
4. **Changing from oil–base to water–base material.** Flush with mineral spirits, followed by warm, soapy water, then a clean water flush.
5. **Storage.**

*Water–base material:* flush with water, then mineral spirits. Relieve pressure.

*Oil–base material:* flush with mineral spirits. Relieve pressure.

### CAUTION

NEVER leave water in the sprayer if there is the slightest chance it could freeze. Push the water out with mineral spirits. Water left to freeze in the pressure control tube prevents the sprayer from being started and causes serious damage to the pressure control.

6. **Startup after storage.**

Before using water–base material, flush out the mineral spirits with soapy water and then a clean water flush. When using oil–base material, flush out the mineral spirits with the material to be sprayed.

### How To Flush

1. Follow the **Pressure Relief Procedure Warning** on page 12.
2. If the sprayer has been used before, remove the filter bowl and screen; see manual 307–273, supplied. Clean the screen separately and install the bowl without the screen to flush it. See Fig 15–1.

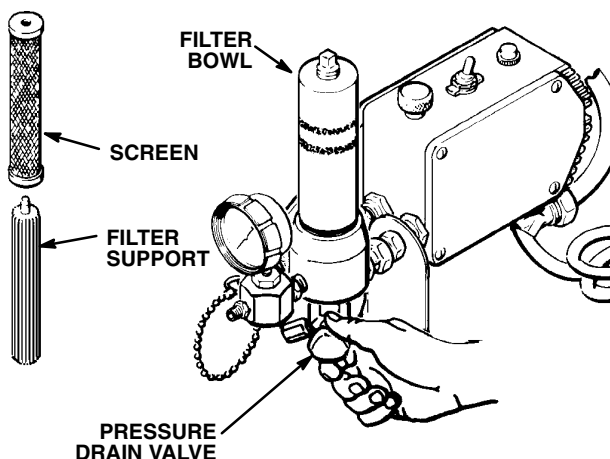


Fig 15–1

3. Close the pressure drain valve.
4. Put the suction tube in a grounded metal pail of compatible solvent.
5. Remove the spray tip from the gun, if it is installed.

### WARNING

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

6. Lower the pressure setting by turning the pressure adjusting knob all the way counterclockwise.

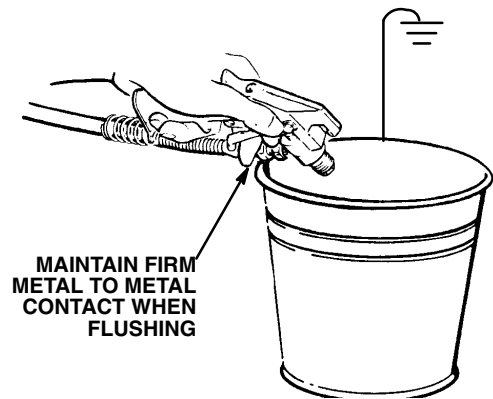


Fig 15–2

7. Hold a metal part of the gun firmly against and aimed into a metal waste container. See Fig 15–2. Squeeze the trigger and hold it open, turn the ON/OFF switch to ON, and slowly increase the pressure setting until the sprayer starts. Keep the gun triggered until all air is forced out of the system and the solvent flows freely from the gun. Release the trigger and engage the gun safety latch. This procedure helps reduce the risk of static sparking and splashing.

**NOTE:** If the pump is hard to prime, place a container under the pressure drain valve and open it. When fluid comes from the valve, close it.

8. Remove the suction tube from the pail. Disengage the gun safety latch and trigger the gun to force solvent from the hose. Do not let the pump run dry for more than 30 seconds to avoid damaging the pump packings! Relieve pressure.
9. Leave the pressure drain valve open until you are ready to use the sprayer again. If the screen was removed, unscrew the filter bowl and reinstall the clean screen. Reinstall the bowl, hand tight only.
10. If you flushed with mineral spirits and are going to use a water–base material, flush with soapy water followed by a clean water flush. Relieve pressure.

# TROUBLESHOOTING GUIDE

## WARNING

### Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, injury from splashing fluid or solvent in the eyes or on the skin, moving parts or electric shock, always follow this procedure whenever you shut off the sprayer, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the power supply cord.
4. Disengage the gun safety latch. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.

5. Engage the gun safety latch.
6. Open the pressure drain valve, having a container ready to catch the drainage. Leave the pressure drain valve open until you are ready to spray again.

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

Check everything in the guide before disassembling the sprayer.

## MOTOR WON'T OPERATE

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
Basic Fluid Pressure Problems	<ol style="list-style-type: none"> <li>1. Check the pressure control knob setting. The motor will not run if it is at the minimum setting (fully counterclockwise).</li> <li>2. Check for a clogged spray tip. Refer to the separate gun or tip instruction manual.</li> </ol>	<ol style="list-style-type: none"> <li>1. Slowly increase the pressure setting to see if the motor starts.</li> <li>2. Relieve pressure, refer to the separate gun or tip instruction manual for tip cleaning.</li> </ol>
Basic Mechanical Problems	<ol style="list-style-type: none"> <li>1. Check for frozen or hardened material in the pump (42) and/or pressure control bourdon tube. Using a screwdriver, carefully try to rotate fan at back of motor by hand. See page 22.</li> <li>2. Check displacement pump connecting rod pin (63). It must be completely pushed into connecting rod (60) and retaining spring (60) must be firmly in groove of connecting rod. See page 36.</li> <li>3. Check for motor damage. Remove drive housing assembly (59). See page 33. Try to rotate fan by hand.</li> </ol>	<ol style="list-style-type: none"> <li>1. Thaw. Plug in sprayer and turn on. Slowly increase pressure setting to see if motor starts. If it doesn't, replace the displacement pump packings (see page 36) and/or replace the pressure control (301). See page 29.</li> <li>2. Push pin into place and secure with the spring retainer.</li> <li>3. Replace motor (56) if fan won't turn. See page 34.</li> </ol>
Basic Electrical Problems	<ol style="list-style-type: none"> <li>1. Check sprayer circuit breaker (309) button to be sure it has not popped up.</li> <li>2. Check electrical supply with volt meter. Meter should read 105–125 VAC.</li> <li>3. Check extension cord for visible damage. Use a volt meter or test lamp at extension cord outlet to check.</li> <li>4. Check sprayer power supply cord (311) for visible damage such as broken insulation or wires.</li> <li>5. Check motor brush leads, terminals and brush length. Brush length should be 1/2" minimum. See page 25.</li> </ol>	<ol style="list-style-type: none"> <li>1. Depress button to reset. If circuit breaker continues to open, see 'Electrical Short' on page 21.</li> <li>2. Reset building circuit breaker; replace building fuse. Try another electrical outlet.</li> <li>3. Replace extension cord.</li> <li>4. Replace power supply cord. See page 27.</li> <li>5. Tighten terminal screws; replace brushes. See page 25.</li> </ol>

Thaw the sprayer if water or water-based material has frozen in it, due to exposure to low temperatures, by placing it in a warm area. Do not try to start the sprayer until it has thawed completely. If the bourdon tube was not damaged by the freezing, the pump should operate. If material hardened (dried) in the sprayer, the pump packings and/or pressure control must be replaced. See page 29 (pressure control) or page 36 (displacement pump).

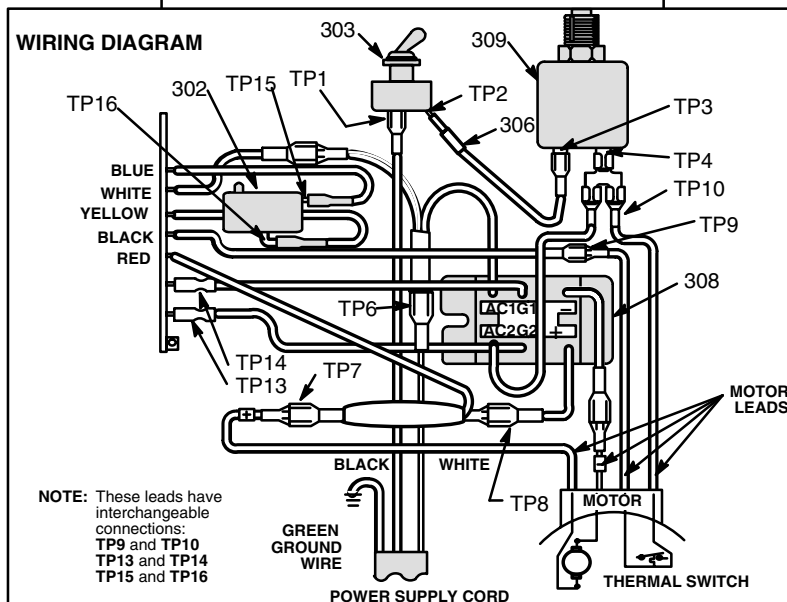


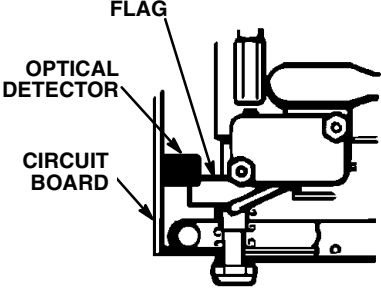
## MOTOR WON'T OPERATE

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
<p>Diagnosing circuit board indicator lamps. The normal condition is red lamp on, clear lamp <i>on when board is telling pump to run.</i></p> <p>Follow <b>Pressure Relief Procedure Warning</b>. Remove gun from hose. Remove pressure control cover and check for faulty condition of circuit board lamps.</p> <p><b>Condition A</b> Both lamps on; pump won't operate and motor is not running</p>	<ol style="list-style-type: none"> <li>1. Check leads from bridge (308) to motor to be sure they are securely fastened and properly mated.</li> <li>2. Check G1 and G2 connections between circuit board (74) and bridge (308) for damage or loose terminals.</li> <li>3. Check for loose motor brush lead connections and terminals. See page 25.</li> <li>4. Check brush length which should be 1/2" minimum. See page 25. <b>NOTE:</b> The brushes do not wear at the same rate on both sides of the motor. Check both brushes.</li> <li>5. Check for broken or misaligned motor brush springs. Rolled portion of spring must rest squarely on top of brush. See page 25.</li> <li>6. Check motor brushes for binding in brush holders. See page 25.</li> <li>7. Check motor armature commutator for burn spots, gouges and extreme roughness. Remove motor cover and brush inspection plates to check. See page 25.</li> <li>8. Check motor armature for shorts using armature tester (growler) or perform spin test. See page 22.</li> <li>9. Check bridge (308) by substituting with a good bridge or performing bridge test. See page 23.</li> </ol> <p><b>CAUTION:</b> Do not perform this check until armature is determined to be good. A bad armature will immediately burn out a good bridge.</p>	<ol style="list-style-type: none"> <li>1. Replace loose terminals; crimp to leads. Be sure male terminal blades are straight and firmly connected to mating part.</li> <li>2. Clean circuit board male terminals. Replace loose or damaged terminals. Securely reconnect leads.</li> <li>3. Tighten terminal screws. Replace brushes if leads are damaged. See page 25.</li> <li>4. Replace brushes. See page 25.</li> <li>5. Replace spring if broken. Realign spring with brush. See page 25.</li> <li>6. Clean brush holders. Remove carbon with small cleaning brush. Align brush leads with slot in brush holder to assure free vertical brush movement.</li> <li>7. Remove motor and have motor shop resurface commutator if possible. See page 34.</li> <li>8. Replace motor. See page 34.</li> <li>9. Replace bridge. See page 27.</li> </ol>
<p><b>Condition B (continued)</b> Both lamps off</p> <p><i>REFER TO THE WIRING DIAGRAM ON PAGE 20 TO IDENTIFY TP POINTS.</i></p>	<ol style="list-style-type: none"> <li>1. Check circuit breaker (309) button to be sure it has not popped up.</li> <li>2. Check power supply cord (31 1). Disconnect TP6 female and TP1 female and connect volt meter to these leads. Plug in sprayer. Meter should read 105 to 125 VAC. Unplug sprayer. Reconnect TP1.</li> <li>3. Check ON/OFF switch (303). Disconnect TP2 and connect volt meter to TP6 female and TP2 male. Plug in sprayer and turn on. Meter should read 105 to 125 VAC. Turn off and unplug sprayer. Reconnect TP2.</li> <li>4. Check jumper wire (306). Disconnect TP3 and connect volt meter to TP6 female and TP3 female. Plug in sprayer and turn on. Meter should read 105 to 125 VAC. Turn off and unplug sprayer. Reconnect TP3.</li> <li>5. Check circuit breaker (309). Connect volt meter to TP6 female and TP4. Plug in sprayer and turn on. Meter should read 105 to 125 VAC. Turn off and unplug sprayer.</li> <li>6. Check motor thermal cutout switch. Connect volt meter to TP6 female and TP9 female. Plug in sprayer and turn on. Meter should read 105 to 125 VAC. Turn off and unplug sprayer.</li> </ol>	<ol style="list-style-type: none"> <li>1. Depress button to reset. If circuit breaker or fuse continues to open, see "Electrical Short", page 21.</li> <li>2. Replace power supply cord. See page 26.</li> <li>3. Replace ON/OFF switch. See page 26.</li> <li>4. Replace jumper wire. See page 28.</li> <li>5. Replace circuit breaker. See page 27.</li> <li>6. Allow motor to cool. Correct cause of overheating. If switch remains open after motor cools, check continuity between TP9 female and TP10 with ohmmeter. If open, replace motor.</li> </ol>

# MOTOR WON'T OPERATE

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
<p><b>Condition B</b> (continued) Both lamps off</p> <p><i>REFER TO THE WIRING DIAGRAM ON BELOW TO IDENTIFY TEST POINTS (TP).</i></p>	<ol style="list-style-type: none"> <li>7. Check microswitch (302). Reconnect TP6 connectors. Connect volt meter to TP15 male and TP4. Meter should read 50–125 VAC.</li> <li>8. Visually inspect microswitch (302) button. Adjustment stud should not depress the button when fluid pressure is zero. Manually check by depressing button with small screwdriver; an audible click indicates microswitch is in normal position.</li> <li>9. Check microswitch (302) continuity with ohm meter. <i>Be sure sprayer is unplugged!</i> Meter should read zero ohms with no fluid pressure in the sprayer.</li> <li>10. Check all terminals for damage or loose fit. Reconnect TP6 connectors.</li> <li>11. Check circuit board (74) by substituting with a good board. See page 28.</li> </ol>	<ol style="list-style-type: none"> <li>7. Clean microswitch male terminals. Replace loose or damaged terminals. Securely reconnect leads.</li> <li>8. Microswitch is faulty. Return sprayer for repair.</li> <li>9. Microswitch is faulty. Return sprayer for repair.</li> <li>10. Replace damaged terminals and reconnect securely.</li> <li>11. Replace circuit board. See page 28.</li> </ol>



<p><b>Condition C</b> Red lamps on, Clear lamp off <i>Unplug sprayer!</i></p>	<ol style="list-style-type: none"> <li>1. Check circuit board (74) by removing from <i>without</i> disconnecting wires; see page 28 for removal procedure. <b>WARNING:</b> Removing the circuit board while still wired over-rides the optical detector which could cause the sprayer to over-pressurize, if the microswitch does not function properly. Turn the sprayer on <i>ONLY</i> long enough to check lamp condition, then shut off immediately. <b>WARNING:</b> To reduce the risk of electric shock, handle board by edges only! Do not allow any metal objects to touch the board! Plug in and turn on sprayer. Clear lamp should be on now – removing the circuit board over-rides the optical detector. Turn off and unplug the sprayer.</li> <li>2. Check bourdon tube flag and detector position. Reinstall circuit board (see page 28). Turn pressure setting to maximum; flag should extend less than half way into optical detector slot from the bottom.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace circuit board. See page 28.</li> </ol>  <ol style="list-style-type: none"> <li>2. Adjust pressure control to see if that corrects problem. See page 30. If not, replace pressure control (301). See page 29.</li> </ol>
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## LOW OUTPUT

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
	<ol style="list-style-type: none"> <li>1. Check for worn spray tip.</li> <li>2. Check to see that pump does not continue to stroke when gun trigger is released. Plug in and turn on sprayer. Prime with material. Trigger gun momentarily, then release and engage safety latch. Relieve pressure, turn off and unplug sprayer.</li> <li>3. Check electrical supply with volt meter. Meter should read 105–125 VAC.</li> <li>4. Check extension cord size and length; must be at least 12 gauge wire and no longer than 150 ft.</li> <li>5. Check G1 and G2 leads from bridge (308) to circuit board (74) for damaged or loose wires or connectors. Refer to page 28.</li> <li>6. Check stall pressure. Refer to Pressure Control Adjustment on page 30.</li> <li>7. Check bridge (308) + and – leads and terminals to motor. Inspect wiring insulation and terminals for signs of overheating. See page 28.</li> <li>8. Check for loose motor brush leads and terminals. See page 25.</li> <li>9. Check for worn motor brushes which should be 1/2" minimum. See page 25.</li> <li>10. Check for broken and misaligned motor brush springs. Rolled portion of spring must rest squarely on top of brush.</li> <li>11. Check motor brushes for binding in brush holders. See page 25.</li> <li>12. Check circuit board (74) by substituting with a good circuit board. See page 28.</li> <li>13. Check motor armature for shorts by using an armature tester (growler) or perform spin test. See page 22.</li> <li>14. Check bridge (308) by substituting with a good bridge or by performing the bridge test. See page 27 or 23.</li> </ol> <p><b>CAUTION:</b> Do not perform this check until armature is determined to be good. A bad armature will immediately burn out a good bridge.</p>	<ol style="list-style-type: none"> <li>1. Follow <b>Pressure Relief Procedure Warning</b> then replace tip. See your separate gun or tip manual.</li> <li>2. Service pump. See page 36.</li> <li>3. Reset building circuit breaker; replace building fuse. Repair electrical outlet or try another outlet.</li> <li>4. Replace with a correct, grounded extension cord.</li> <li>5. Clean circuit board male terminals. Replace loose or defective lead terminals. Securely reconnect lead terminals to board.</li> <li>6. Adjust pressure control. See page 30.</li> <li>7. Be sure male terminal blades are centered and firmly connected to female terminals. Replace any loose terminal or damaged wiring. Securely reconnect wires to bridge.</li> <li>8. Tighten terminal screws. Replace brushes if leads are damaged. See page 25.</li> <li>9. Replace brushes. See page 25.</li> <li>10. Replace spring if broken. Realign spring with brush. See page 25.</li> <li>11. Clean brush holders, remove carbon dust with small cleaning brush. Align brush lead with slot in brush holder to assure free vertical brush movement.</li> <li>12. Replace circuit board. See page 28.</li> <li>13. Replace motor. See page 32.</li> <li>14. Replace bridge. See page 27.</li> </ol>

## NO OUTPUT

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
Motor runs and pump strokes	<ol style="list-style-type: none"> <li>1. Check material supply.</li> <li>2. Check for clogged intake strainer.</li> <li>3. Check for loose suction tube or fittings.</li> <li>4. Check to see if intake valve ball and piston ball are seating properly. See page 36.</li> <li>5. Check for leaking around throat packing nut which may indicate worn or damaged packings. See page 36.</li> </ol>	<ol style="list-style-type: none"> <li>1. Refill and reprime pump.</li> <li>2. Remove and clean, then reinstall.</li> <li>3. Tighten; use thread sealant or sealing tape on threads if necessary.</li> <li>4. Remove intake valve and clean. Check balls and seats for nicks; replace if necessary. See page 36.</li> <li>5. Replace packings. See page 36. Also check piston valve seat for hardened material or nicks and replace if necessary.</li> </ol>
Motor runs but pump does not stroke	<ol style="list-style-type: none"> <li>1. Check displacement pump connecting rod pin. See page 36.</li> <li>2. Check connecting rod assembly for damage. See page 32.</li> <li>3. Be sure crank in drive housing rotates; plug in sprayer and turn on momentarily to check. Turn off and unplug sprayer. See page 33.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace pin if missing. Be sure retainer spring is fully in groove all around connecting rod. See page 36.</li> <li>2. Replace connecting rod assembly. See page 32.</li> <li>3. Check drive housing assembly for damage and replace if necessary. See page 32.</li> </ol>

## EXCESSIVE PRESSURE FLUCTUATIONS

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
Spray pattern variations.	<ol style="list-style-type: none"> <li>1. Be sure both G1 and G2 leads from bridge (308) to circuit board (74) are firmly connected. See page 28.</li> <li>2. Check pressure control adjustment. Refer to procedure on page 30.</li> <li>3. Check bourdon tube flag and detector position. Turn pressure setting to maximum; flag should not drag or bind in optical detector slot of circuit board.</li> </ol> <div data-bbox="532 1392 886 1625" style="text-align: center;"> <p>The diagram illustrates the mechanical alignment of the pressure control assembly. At the top, a horizontal line represents the 'CIRCUIT BOARD'. Below it, a U-shaped component is the 'OPTICAL DETECTOR'. A vertical 'FLAG' is attached to the detector and is shown protruding into a slot on the circuit board. Arrows point from the labels to their respective parts.</p> </div> <ol style="list-style-type: none"> <li>4. Check circuit board (74) by substituting with a good board. See page 28.</li> <li>5. Check LOW OUTPUT section on page 18.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconnect securely. See page 28.</li> <li>2. Adjust pressure control. See page 30.</li> <li>3. Carefully bend flag into alignment with detector slot to see if that corrects problem. If not, replace pressure control assembly (301). Adjust pressure control after reassembly.</li> <li>4. Replace circuit board. See page 28.</li> </ol>

## MOTOR IS HOT & RUNS INTERMITTENTLY

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
	<ol style="list-style-type: none"> <li>1. Check to see if sprayer has been operating at high pressure with small tips, which causes low motor RPM and results in excessive heat build up.</li> <li>2. Be sure ambient temperature where sprayer is located is no more than 90° F and sprayer is not located in direct sun.</li> <li>3. Check to see if sprayer has been left in a stalled condition (sprayer turned on, pressurized, but not operating) for long periods of time.</li> </ol>	<ol style="list-style-type: none"> <li>1. Decrease pressure setting or increase tip size.</li> <li>2. Move sprayer to shaded, cooler area if possible.</li> <li>3. Turn off sprayer whenever you stop spraying for a while and relieve fluid pressure.</li> </ol>

## ELECTRICAL SHORT

TYPE OF PROBLEM	WHAT TO CHECK If check is OK, go to the next check.	WHAT TO DO If check is not OK, refer to this column.
<p>Building circuit breaker opens as soon as sprayer switch is turned on.</p> <p><b>CAUTION</b> Any short in any part of the motor power circuit, which is connected to the output side of the bridge, will cause the bridge to burn out immediately. Correctly diagnose and repair all shorts before checking and replacing bridge.</p>	<ol style="list-style-type: none"> <li>1. Check all electrical wiring for damaged insulation, and all terminals for loose fit or damage. Also check wires between pressure control and motor which are encased in conduit (21). See page 34.</li> <li>2. Check for missing inspection plate gasket (see page 25), bent terminal forks or other metal to metal contact points which could cause a short.</li> <li>3. Check motor armature for shorts by using an armature tester (growler) or perform spin test. See page 22. Inspect windings for burns.</li> <li>4. Check bridge (308) by substituting with a good bridge or by performing bridge test. See page 23.</li> </ol> <p><b>CAUTION:</b> Do not perform this check until armature is determined to be good. A bad armature will immediately burn out a good bridge.</p>	<ol style="list-style-type: none"> <li>1. Repair or replace any damaged wiring or terminals. Securely reconnect all wires.</li> <li>2. Correct faulty conditions.</li> <li>3. Replace motor. See page 34.</li> <li>4. Replace bridge. See page 28.</li> </ol>
<p>Building circuit breaker opens as soon as sprayer is plugged into outlet and sprayer is NOT turned on.</p>	<ol style="list-style-type: none"> <li>1. Check 'Basic Electrical Problems' on page 16.</li> <li>2. Check ON/OFF switch (302) See page 26. <i>Be sure the sprayer is unplugged!</i> Disconnect wires from switch. Check switch with ohmmeter. The reading should be infinity with the ON/OFF switch OFF, and zero with the switch ON.</li> </ol> <p><b>CAUTION:</b> A short in the motor circuit will burn the bridge out immediately, which in turn usually causes the ON/OFF switch to fail in the closed mode.</p>	<ol style="list-style-type: none"> <li>2. Replace ON/OFF switch. See page 26.</li> </ol>
<p>Sprayer circuit breaker opens after sprayer operates for only 5 to 10 minutes.</p>	<ol style="list-style-type: none"> <li>1. Check electrical supply with volt meter. Meter should read 105 to 125 VAC.</li> <li>2. Check tightness of pump packing nut. Over-tightening nut tightens packings on rod, restricts pump action, and damages packings.</li> <li>3. Check pressure control adjustment. See page 30. Turn off and unplug sprayer.</li> <li>4. After determining that there is no short in system, reset circuit breaker button.</li> </ol>	<ol style="list-style-type: none"> <li>1. If voltage is too high, do not operate sprayer until corrected.</li> <li>2. Loosen packing nut. Check for leaking around throat. Replace pump packings, if necessary. See page 36.</li> <li>3. Adjust pressure control. See page 30.</li> <li>4. If circuit breaker continues to open (button pops up), replace the circuit breaker. See page 27.</li> </ol>

## SPIN TEST

### WARNING

#### Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, injury from splashing fluid or solvent in the eyes or on the skin, moving parts or electric shock, always follow this procedure whenever you shut off the sprayer, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the power supply cord.
4. Disengage the gun safety latch. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.

5. Engage the gun safety latch.
6. Open the pressure drain valve, having a container ready to catch the drainage. Leave the pressure drain valve open until you are ready to spray again.

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

For checking armature, motor winding and brush electrical continuity.

#### Setup

Remove the drive housing from the sprayer as described in **DRIVE HOUSING REPLACEMENT**, Steps 1–6, page 35.

Remove the pressure control cover and screws, the motor cover and screws (14,64), the fan cover (F), and the screws (H), inspection covers (J), and gaskets (K). See Fig 22–1.

Disconnect the two leads from the motor to the bridge (308). See Fig 22–2.

#### Armature Short Circuit Test

Quickly turn the motor fan by hand. If there are no shorts, the motor will coast two or three revolutions before coming to a complete stop.

If the motor does not spin freely and resists rotation, the armature is shorted and the motor must be replaced. See page 32.

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

Connect the two black motor leads together with a test lead.

Turn the motor fan by hand at about two revolutions per second.

If there is uneven or no turning resistance, check the following and repair parts as needed. See page 25.

- a) broken brush springs
- b) broken brush leads
- c) loose brush terminal screws
- d) worn brushes
- e) broken motor leads
- f) loose motor lead terminals

If there is still uneven or no turning resistance, replace the motor. See page 32.

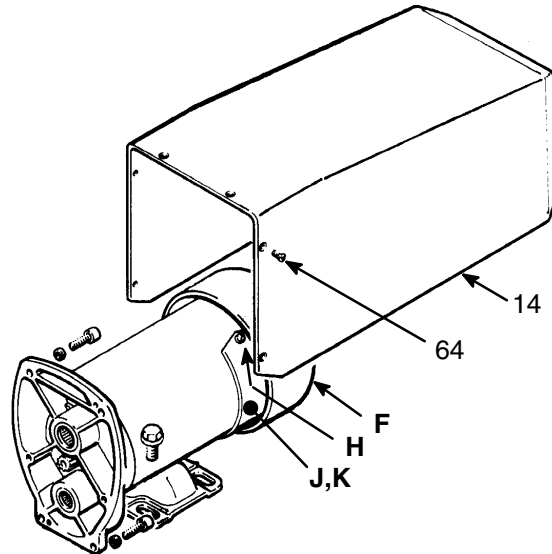


Fig 22–1

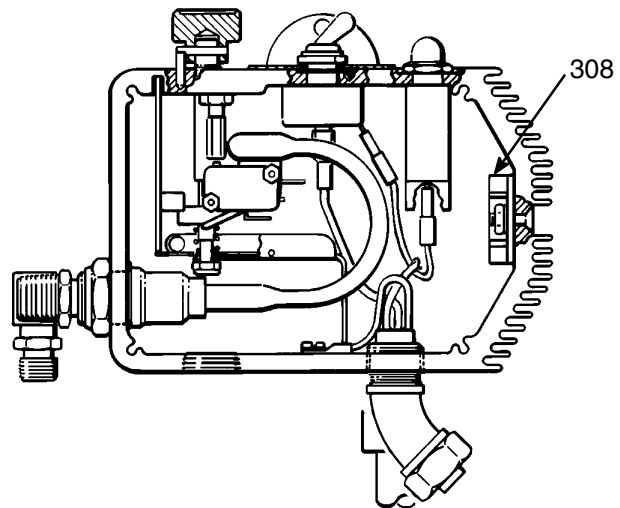


Fig 22–2

# BRIDGE TEST

Remove the bridge from the pressure control box and perform this test to determine if the bridge is functional. See **BRIDGE RECTIFIER REPLACEMENT**, page 27. Use a continuity tester, such as multi-meter set on the X1 ohms scale.

All tests must be performed. If the bridge fails even one test, it must be replaced.

Fig 23-1 shows the position of the wires on the bridge. Using the chart at the right, connect the meter wires as indicated by the black dots for each test, and then check the continuity.

In Tests 1, 2 and 3, there should be NO continuity.

In Tests 4, 5 and 6, connect the + and - meter wires as indicated, check continuity, then switch the meter wire connections and check continuity again. You should get NO continuity one way and YES continuity the other way.

In Tests 7 and 8, connect the meter wires as indicated by the black dots. Touch the indicated "G" wire to one meter wire, and then to the other. You should get NO continuity one way and YES continuity the other way.

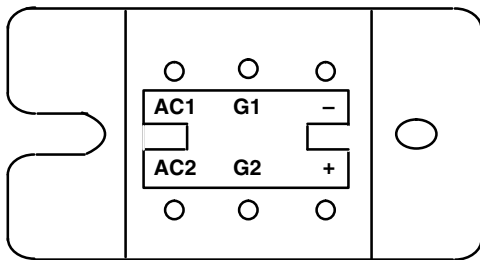


Fig 23-1

## BRIDGE WIRES

		G2	G1	-	+	AC1	AC2	
NO	NO					•	•	TEST 1
NO	NO				•		•	TEST 2
NO	NO				•			TEST 3
YES	NO			•	•	•	•	TEST 4
NO	NO			•	•	•	•	
YES	NO			•	•	•	•	TEST 5
NO	NO			•	•	•	•	
YES	NO			•	•	•	•	TEST 6
NO	NO			•	•	•	•	
YES	NO		○	OR	•		•	TEST 7
NO	NO		○	OR	•		•	
YES	NO		○	OR	•		•	TEST 8
NO	NO		○	OR	•		•	

## GENERAL REPAIR NOTES

### WARNING

#### Pressure Relief Procedure

To reduce the risk of serious bodily injury, including fluid injection, injury from splashing fluid or solvent in the eyes or on the skin, moving parts or electric shock, always follow this procedure whenever you shut off the sprayer, when checking or servicing any part of the spray system, when installing, cleaning or changing spray tips, and whenever you stop spraying.

1. Engage the gun safety latch.
2. Turn the ON/OFF switch to OFF.
3. Unplug the power supply cord.
4. Disengage the gun safety latch. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
5. Engage the gun safety latch.
6. Open the pressure drain valve, having a container ready to catch the drainage. Leave the pressure drain valve open until you are ready to spray again.

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

### Tool List

Phillips screwdriver	3/16" hex key wrench
Small flat blade screwdriver	5/8" socket wrench
Needle nose pliers	3/8" open end wrench
Plastic mallet	1/2" open end wrench
Adjustable wrench	3/4" open end wrench
2" adjustable wrench	7/8" open end wrench
Torque wrench	High quality motor oil
1/4" hex key wrench	Bearing grease

1. **When disconnecting wires** in the pressure control assembly, use needle nose pliers to separate mating connectors.

**When reconnecting the wires**, be sure the flat blade of the insulated male connector is centered in the wrap-around blade of the female connector.

### CAUTION

To reduce the risk of a pressure control malfunction, be sure to properly mate connectors, and never pull on a wire to disconnect it. Pulling on a wire could loosen the connector from the wire.

2. **Route wires carefully** in the pressure control assembly, guiding them through the legs of the U-shaped bourdon tube. This is to avoid interfering with the bourdon tube, which moves as the pressure setting changes, and to avoid pinching the wires between the pressure control and cover.

### CAUTION

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

3. **Keep all screws, nuts, washers, gaskets, and electrical fittings** removed during repair procedures. These parts are not normally provided with replacement assemblies.
4. **Test your repair before regular operation** of the sprayer to be sure the problem is corrected.

**If the sprayer does not operate properly**, review the repair procedure again to verify that everything was done correctly. If necessary, refer to the Troubleshooting Guide, pages 16–21, to help identify other possible problems and solutions.

### WARNING

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

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

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

### CAUTION

Do not run the sprayer dry for more than 30 seconds to avoid damaging the pump packings.

5. **Reinstall the motor cover before regular operation** of the sprayer and replace it if it is damaged. The cover directs cooling air around the motor to help prevent overheating. It can also help reduce the risk of burns, fire or explosion; see the **WARNING**, below.

### WARNING

During operation, the motor becomes very hot and could burn your skin if touched. Flammable materials spilled on the hot, bare motor could cause a fire or explosion. Always have the motor cover in place during regular operation to reduce the risk of burns, fire or explosion.



## MOTOR BRUSH REPLACEMENT

**NOTE:** Replace the brushes when they have worn to less than 1/2 in. See STEP 1, Fig 25-3. Note that the brushes wear differently on each side of the motor, so check them both. Brush Repair Kit 220-853 is available.

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

1. Remove the motor cover (14) and screws (64). Remove the screws (H), inspection covers (J) and gaskets (K) on each side of the motor. See Fig 25-1.

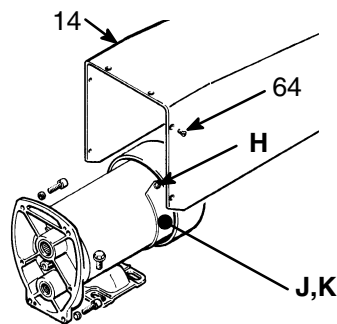


Fig 25-1

2. Push in the spring clip to release its hooks from the brush holder. Pull out the spring clip. See Fig 25-2.
3. Loosen the brush lead terminal screw. Pull the brush lead away, being careful to ensure the motor lead terminal remains in place. Remove and discard the brush and spring. See Fig 25-3.
4. Inspect the commutator for excessive pitting, burning or gouging.

**NOTE:** A black color on the commutator is normal. Have the commutator resurfaced by a qualified motor repair shop if the brushes seem to wear too fast.

5. Repeat for the other side.

### CAUTION

When installing the brushes, follow all steps carefully. Improper installation damages parts beyond use.

6. Place a new brush in the holder so the lead is in the long slot of the holder. Slide the terminal under the terminal screw washer. Make sure the motor lead is still connected at the screw. See Fig 25-4.
7. Place the spring on the brush as shown in Fig 25-4. If the spring is installed backwards, it will be damaged when the spring clip is installed.
8. Install the spring clip and push it down until its hooks catch the short slots in the housing. See Fig 25-4. Incorrect installation may jam the clip.
9. Repeat for the other side.

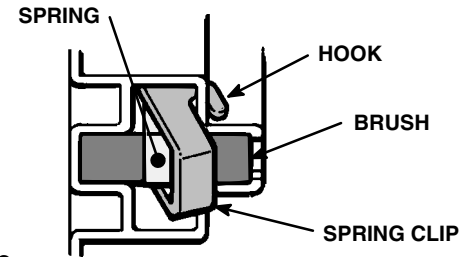


Fig 25-2

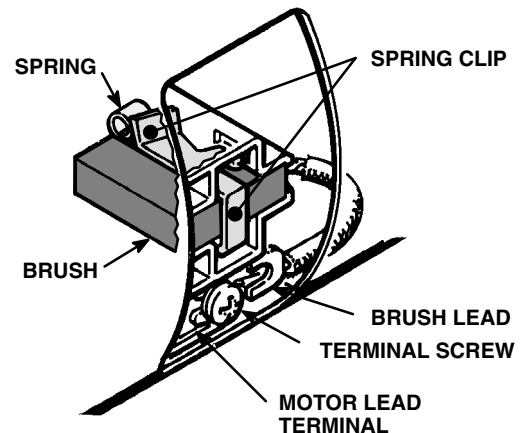


Fig 25-3

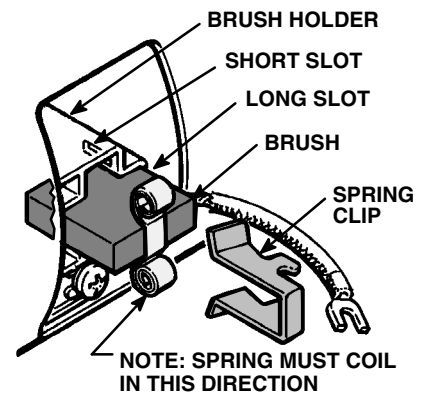


Fig 25-4

### 10. Test the brushes.

- a. With the ON/OFF switch OFF, turn the pressure control knob fully counterclockwise to minimum pressure. Plug in the sprayer.
- b. Turn the ON/OFF switch ON. Slowly increase the pressure until the motor comes up to full speed.
- c. Inspect the brush and commutator contact area for excessive arcing. Arcs should not "trail" or circle around the commutator surface.

### WARNING

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

### CAUTION

Do not run the sprayer dry for more than 30 seconds while checking the brushes to avoid damaging the displacement pump.

11. Reinstall the brush inspection covers, gaskets, and screws. Reinstall the motor cover, screws and washers.

## POWER SUPPLY CORD REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 26-1.

1. Remove the pressure control cover and screws.
2. Disconnect the power supply cord lead from the ON/OFF switch (303), the white wire going to the bridge (308), and the green wire to the grounding screw (343) and lockwasher (327).
3. Loosen the strain relief bushing (328). Remove the power supply cord (311).
4. Install the new cord (311) in the reverse order of disassembly.
5. Reinstall the cover and screws.

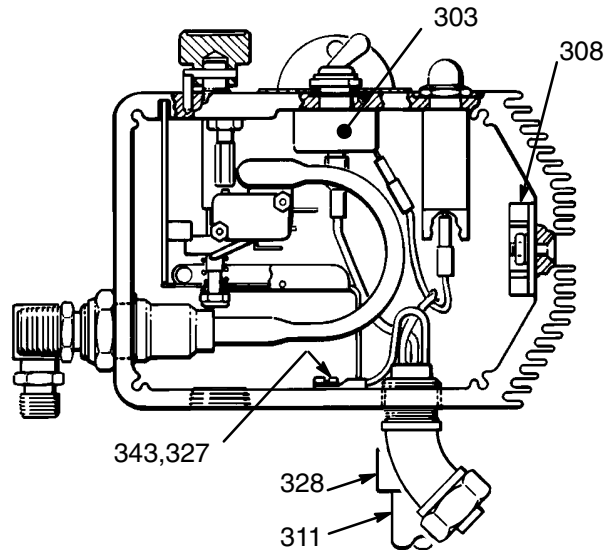


Fig 26-1

## ON/OFF SWITCH REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 26-2 except where noted.

1. Remove the pressure control cover and screws.
2. Use a needle nose pliers to disconnect the upper terminal wire from the microswitch (302) for ease in removing the ON/OFF switch (303). See Fig 26-1.
3. Use pliers to disconnect the two black wires from the ON/OFF switch (303). Refer to Fig 26-1.
4. Use a 5/8" socket wrench to loosen and remove the nut and rubber boot (304) from the top of the pressure control. Remove the switch guard (305).
5. Remove the ON/OFF switch.
6. Install the new switch so the internal tab of the anti-rotation ring (W) engages with the vertical groove in the threads of the switch, and the external tab engages with the blind hole (D) of the pressure control.
7. Install the switch guard (305), aligning the internal tab with the groove in the threads.

8. Powder the inside of the rubber boot (304) with talcum, then shake excess out of boot.
9. Install the nut and rubber boot and tighten.
10. Reconnect the wires to the ON/OFF switch (303) and reconnect the wire to the microswitch (302).
11. Reinstall the pressure control cover and screws.

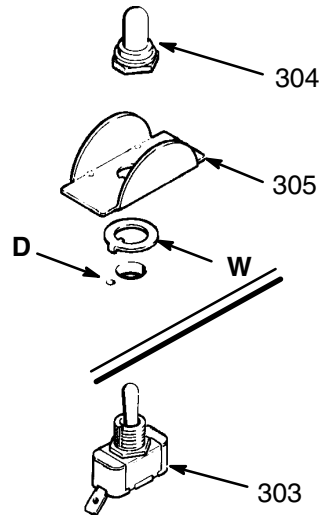


Fig 26-2

## BRIDGE RECTIFIER REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 27-1.

**NOTE:** *The most common cause of bridge failure is a faulty motor.* Check the motor before replacing the bridge to prevent damaging the new bridge.

1. Remove the pressure control cover and screws.
2. Disconnect all wires from the bridge (308) at the appropriate terminals.
3. Outside the pressure control are two screws (331). *Loosen*, but don't remove the screw near the back of the pressure control. Then loosen and remove the front screw. Slide the bridge out.
4. Slide the slotted end of the new bridge (308) into the pressure control so the lockwasher (333) on the rear screw (331) is IN FRONT of the bridge. See the DETAIL below.

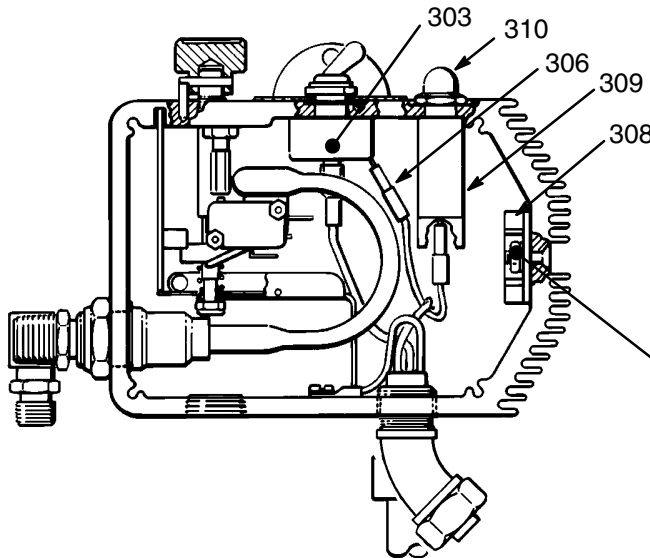


Fig 27-1

5. Install the front screw (331), lockwasher (333) and nut (332). Make sure the bridge is flush with the side of the pressure control and tighten the screws securely.

### CAUTION

The lockwashers (333) must be in front of the bridge to avoid overheating which will result in bridge failure. Refer to the DETAIL in Fig 27-1.

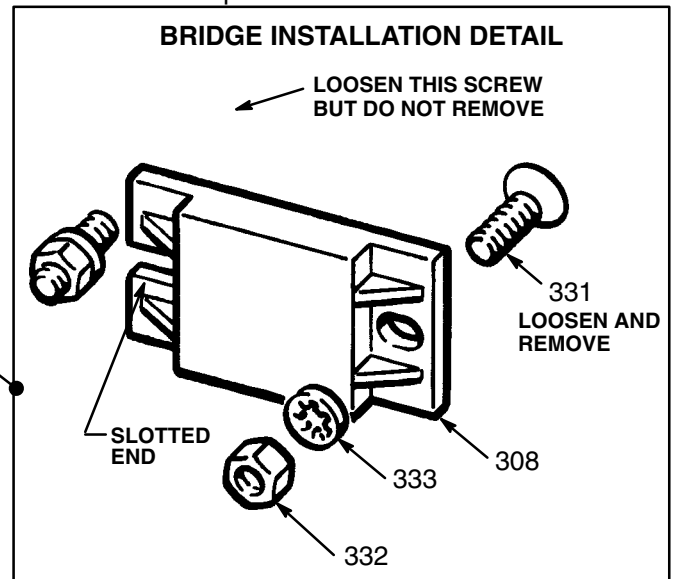
6. Connect all wires. Carefully route the wires.

### CAUTION

Be sure the flat blade of the insulated male connector is centered in the wrap-around blade of the female connector when the connections are made. Improper connections may cause the sprayer to malfunction.

Route all wires carefully to avoid interference with the movement of the bourdon tube, circuit board, or pressure control cover which could cause a malfunction.

7. Reinstall the pressure control cover and screws.



## CIRCUIT BREAKER REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 27-1.

1. Remove the pressure control cover and screws.
2. Use a small screwdriver to slide the terminal adapter off the circuit breaker terminal.
3. Disconnect the single black wire from the circuit breaker (309) to the ON/OFF switch (303).

4. Use a 5/8" socket wrench to loosen the nut and boot (310) on the circuit breaker button.
5. Push down on the top of the circuit breaker and pull it out of the pressure control.
6. Install the new circuit breaker in the reverse order.
7. Reinstall the pressure control cover and screws.

### CAUTION

Do not allow the circuit breaker contacts to touch the bourdon tube, which will cause a short. Tighten the circuit breaker nut firmly to prevent the circuit breaker from turning.

6. Reinstall the cover and screws.

## CIRCUIT BOARD REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 28-1 and 28-2.

1. Remove the pressure control cover and screws.
2. Turn the pressure control knob all the way counter-clockwise to the minimum setting to release spring tension on the board. Also check to be sure only three or four threads of the pressure control knob shaft are exposed below the pressure adjustment nut (S). Back down the nut, if necessary. See Fig 28-1.

### CAUTION

Step 2 is essential to reduce the risk of damaging the circuit board while removing or installing it.

3. Disconnect ALL wires from the board, including the two heavy black wires. Pay close attention to where connections are made. See Fig 28-2.
4. To remove the board from the box, pull out the black plastic-tipped pin (330). Push the bottom of the circuit board toward the wall of the box and carefully slide the board out.
5. Install the board in the box at the same angle as it was removed.

6. Reconnect all wires. Refer to the wiring diagram in Fig 28-2. Ease the pin (330) into the retainer.

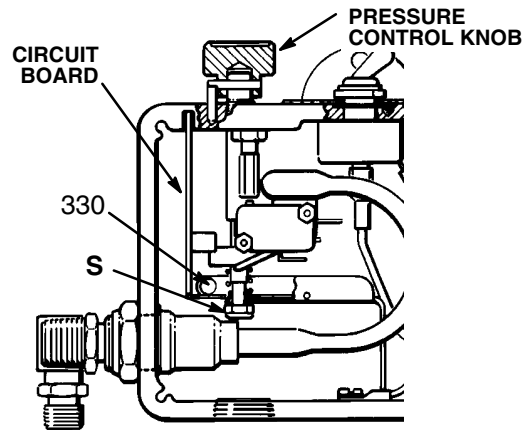


Fig 28-1

### CAUTION

Be sure the flat blade of the insulated male connector is centered in the wrap-around blade of the female connector when the connections are made.

Route all wires carefully to avoid interference with the circuit board, bourdon tube, or pressure control cover.

These precautions are essential to reduce the risk of a malfunction.

7. Perform the **PRESSURE CONTROL ADJUSTMENT** starting on page 30, if you installed a new board.

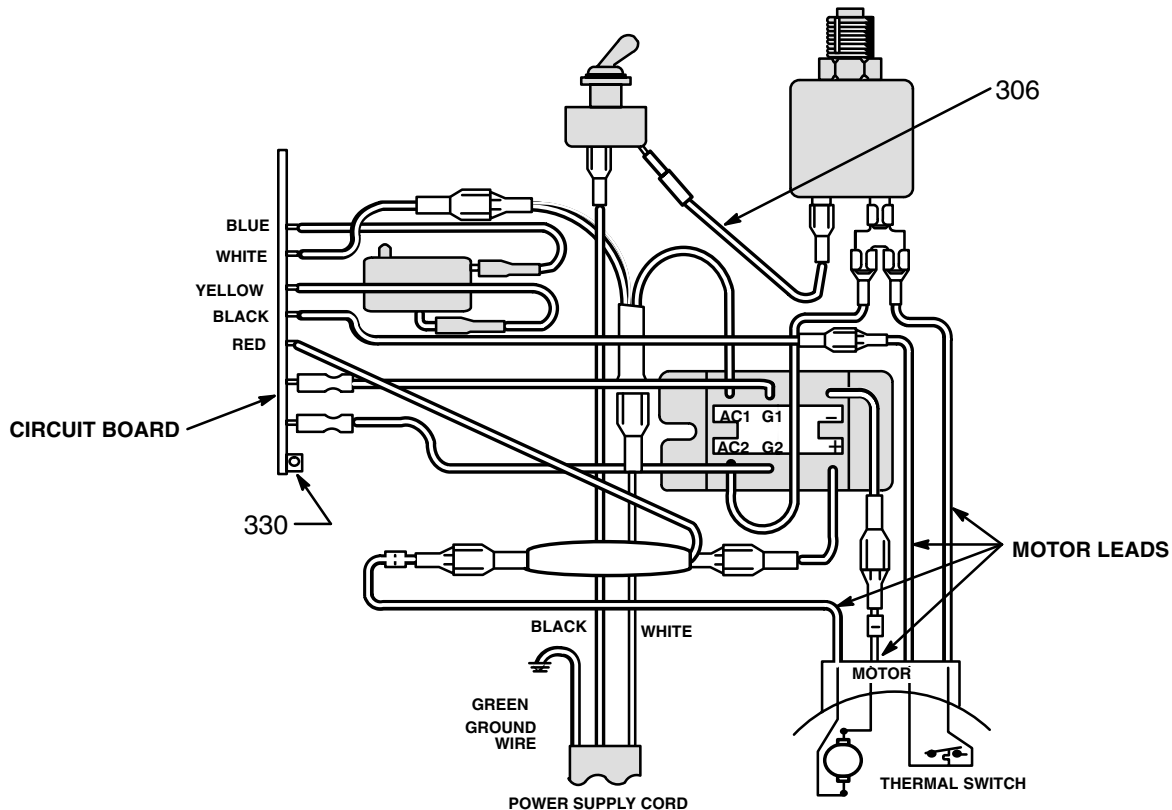


Fig 28-2

## PRESSURE CONTROL REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or on the skin, injury from moving parts, or electric shock. *Unplug the sprayer!*

Refer to Fig 29-1.

1. Disconnect the main fluid outlet hose and the secondary fluid hose, if used. Disconnect the fluid hose (30) between the adapter (31) and the nipple (344).
2. Loosen the nut (69) which holds the threaded end of the adapter (55) to the pressure control mounting bracket (7).
3. Hold the hex of the pressure control adapter (341) firmly with a 3/4" open end wrench. Use an adjustable wrench to unscrew the swivel union (12), and then remove the fluid filter assembly (10).
4. Remove the pressure control cover and screws. Disconnect the four motor leads at the appropriate terminals. See Fig 28-2.
5. Refer to **CIRCUIT BOARD REPLACEMENT** on page 28, remove the circuit board and retain.

6. Remove the conduit (21).
7. Remove the screws (27), lockwashers (44) and nuts (45) located below the pressure control.
8. Remove the screws (8) holding the back mounting bracket (7) to the pressure control.
9. Remove items 306 to 345 from the pressure control and reinstall them in the new pressure control.
10. Install the new pressure control assembly in the reverse order of disassembly. Be sure to reinstall the conduit seal (78) around the wires in the conduit connector (345) to prevent motor contamination from entering the pressure control.
11. Perform the **PRESSURE CONTROL ADJUSTMENT** starting on page 30, before regular operation of the sprayer.

### CAUTION

Do not allow the adapter (341) to turn while installing the new pressure control assembly. Turning it can damage the sensitive bourdon tube. Hold the adapter firmly with a 3/4" open end wrench while screwing in the swivel union (12).

### DETAIL

Shows position of conduit seal (78) in conduit connector (345)

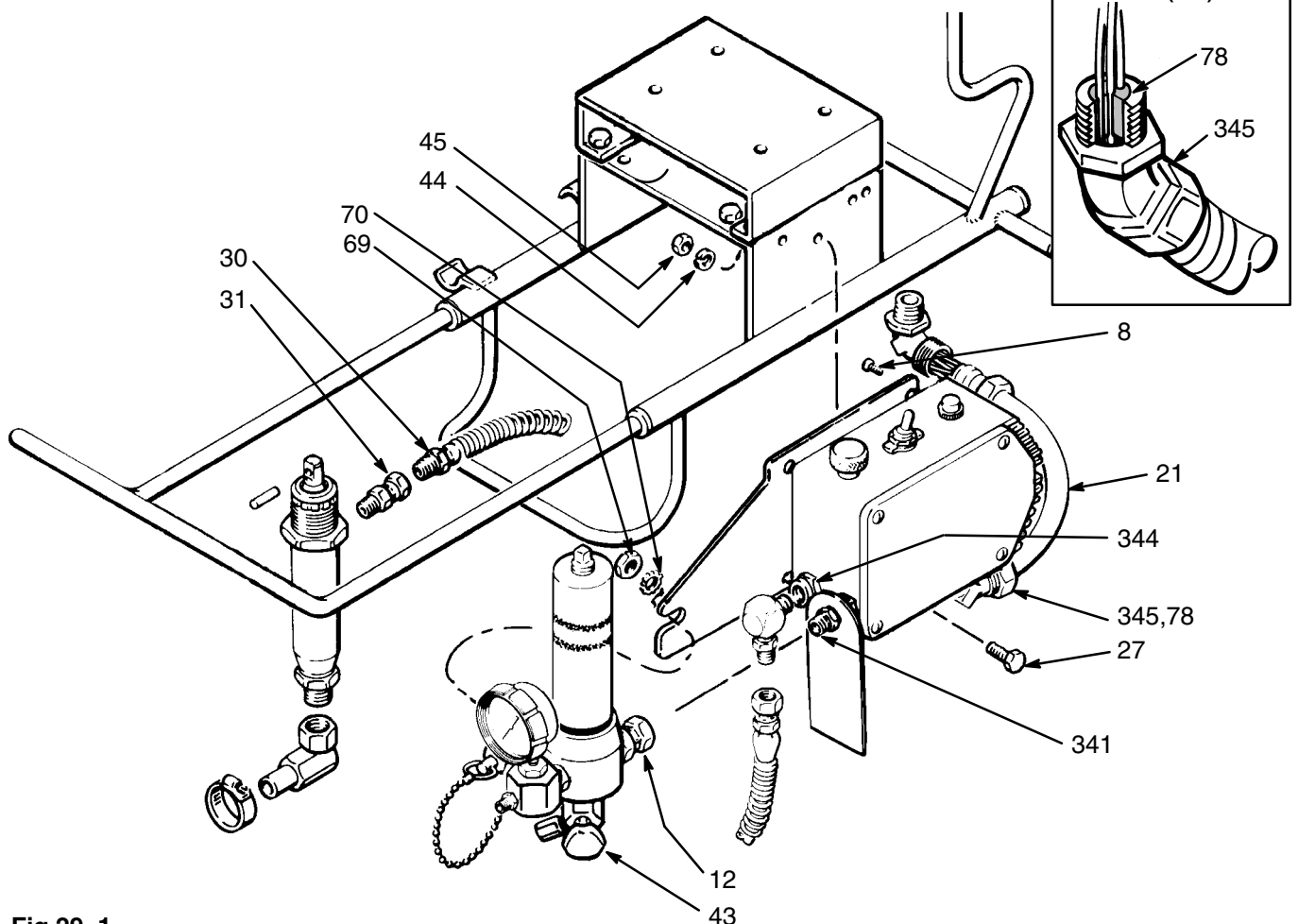


Fig 29-1

## PRESSURE CONTROL ADJUSTMENT

### WARNING

**USE EXTREME CAUTION WHEN PERFORMING THIS ADJUSTMENT PROCEDURE** to reduce the risk of a fluid injection injury or other serious bodily injury which can result from component rupture, electric shock, fire, explosion, or moving parts.

This procedure sets the sprayer to 3000 psi (210 bar) **MAXIMUM WORKING PRESSURE** and sets the overpressurization switch (microswitch) to approximately 3600 psi (242 bar).

Perform this procedure whenever the pressure control assembly is removed and reinstalled or replaced, or a new circuit board is installed.

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

**NEVER** try to increase the sprayer's maximum working pressure of 3000 psi (210 bar) by performing these adjustments in any other way. Normal operation of the sprayer at higher pressures may result in component rupture, fire or explosion. To perform this adjustment, however, the sprayer pressure must be *temporarily* increased above the normal working pressure.

Use a *new* 50 ft (15.2 m) spray hose rated for at least 3000 psi (210 bar) **MAXIMUM WORKING PRESSURE**. A used, under-rated hose could develop a high pressure leak or rupture.

**NOTE:** The following tools and equipment are required for this procedure.

3/8 in. nut driver or 3/8 in. socket wrench  
1/4 in. open end wrench  
7/16 in. open end wrench  
Pail of clean water  
Mineral spirits  
0–5000 psi, oil-filled test gauge, Part No. 102–814  
NEW high pressure spray hose, Part No. 214–915

### CAUTION

**DO NOT** use the gauge supplied with this sprayer to perform this adjustment. The gauge is rated for 3000 psi (210 bar), and will be damaged if the system pressure is raised to 3800 psi (266 bar) as required for this adjustment. Use gauge 102–814 or the equivalent.

1. Follow the **Pressure Relief Procedure Warning** on page 24.
2. Refer to the above list of tools and equipment needed. Remove the standard gauge and install the 5000 psi (350 bar) gauge. Connect the gun to the **new** test hose and connect the hose to the sprayer outlet.
3. Remove the pressure control cover.

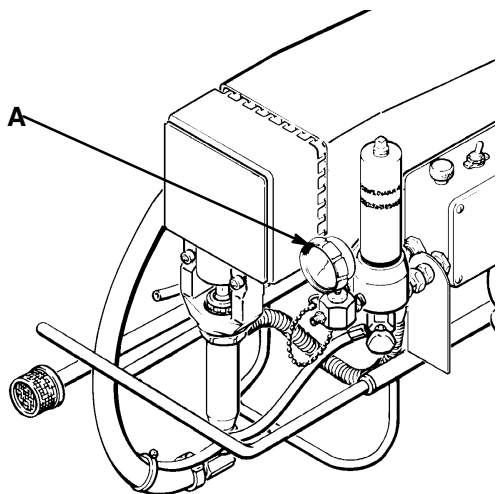


Fig 30–1

4. Place the pump suction tube in a pail of clean water.
5. Be sure the gun safety latch is engaged.

**NOTE:** For Steps 6 through 18, refer to Fig 31–1.

6. Plug in the sprayer.
7. Turn the pressure control knob (B) to the *minimum* setting (fully counterclockwise), and turn the sprayer **ON**. **THE DISPLACEMENT PUMP SHOULD NOT CYCLE**

**If it does cycle**, remove the plug (346) from the bottom of the pressure control. Insert a 3/8 in. nut driver through the opening, and unscrew the pressure adjustment nut (T) just until the sprayer stops running.

### Adjust the Overpressurization Switch

8. With the spray gun triggered, **slowly** turn the pressure control knob clockwise just until the sprayer starts. Prime the pump and hose. Release the trigger.
9. Slowly turn the pressure control knob to the maximum setting. While watching the red light on the circuit board and the pressure gauge (A), turn the nut (T) **slowly** to increase pressure until the red light goes out **and** the gauge reads between 3400–3800 psi (238–266 bar).

**If the red light does not go out by 3800 psi (266 bar)**, loosen the nut (P) and adjust the stud (Q) until the light goes out.

**If the red light goes out before 3400 psi (238 bar)**, loosen the nut (P) and adjust the stud (Q) until the light goes out between 3400–3800 psi (238–266 bar).

10. Tighten the nut (P) if it was loosened in Step 9.
11. Trigger the gun to relieve pressure. Release the trigger and engage the safety latch. Repeat Step 9 to verify your results.
12. Install the pressure control cover.

## PRESSURE CONTROL ADJUSTMENT

### Maximum Working Pressure Adjustment

13. Turn the sprayer OFF . Disengage the gun safety latch. Trigger the gun into a grounded waste container until pressure is relieved. Engage the gun safety latch.
14. Use the 3/8 in. nut driver to turn the pressure adjustment nut (T) counterclockwise one full turn.
15. With the pressure control knob at the *minimum* setting, turn the sprayer ON.
16. **Slowly** turn the pressure control knob (B) clockwise to the maximum setting and hold it there. Use a 3/8 in. nut driver or socket wrench to slowly turn the pressure adjustment nut (T) clockwise until the gauge reads EXACTLY 3000 psi (210 bar).
17. Turn the pressure control knob to the minimum setting. Release the gun safety latch and trigger the gun into a grounded waste container until pressure is relieved. Engage the gun safety latch. Slowly increase the pressure to verify that the maximum working pressure is set at 3000 psi (210 bar).
18. Install the plug (346) in the bottom of the pressure control. Remove the gauge assembly and reinstall the plug. Flush out the water with mineral spirits.

### CAUTION

To prevent pump corrosion, flush the water out of the pump, hose and gun with mineral spirits. Be sure to close the drain valve, first. Use the lowest pressure necessary to flush. Follow the **Pressure Relief Procedure Warning** on page 24. Leave the mineral spirits in the pump to protect it until you are ready to spray again.

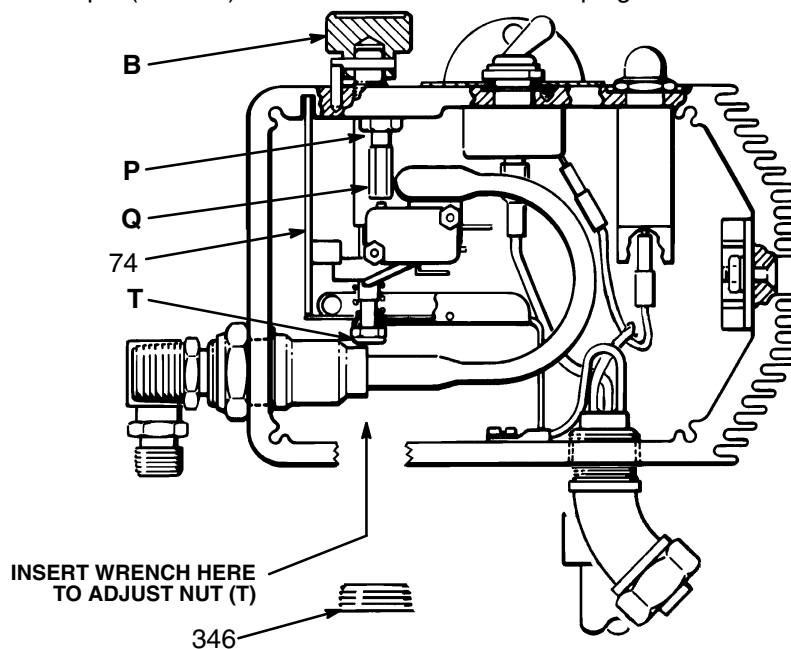


Fig 31-1

## MOTOR REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or in the skin, injury from moving parts or electric shock. *Unplug the sprayer!*

Refer to Fig 33-1.

1. Remove the motor cover (17) and screws (3).
2. Disconnect the pump outlet hose (40) from the displacement pump outlet adapter (31).
3. Remove the pressure control cover and screws (19,72). Disconnect the four motor leads. See the wiring diagram in Fig 33-1.
4. Use an adjustable wrench to loosen the conduit connector nut (345) at the pressure control assembly (15).
5. Swing the conduit (21) away from the pressure control.
6. Remove the conduit seal (78) from around the conduit elbow coming into the control box. Pull the motor leads through the elbow, one at a time.

### CAUTION

Always pull the motor leads one at a time to avoid loosening the terminals, which could result in a bad connection and poor sprayer performance.

7. Loosen the nut of the connector (73) at the motor and pull the conduit (21) away from the motor, then pull the leads through the conduit, one at a time.
8. Unscrew the connector (73) from the motor.
9. Pull the wires through the connector, one at a time.
10. Remove the front cover and screws (4,3).
11. Use a 1/4" hex key wrench to remove:  
  
two screws (61) and washers (57) from the recess of the drive housing (59),  
  
two screws (67) and washers (57) from the lower rear of the motor front end bell (P),

two screws (58) and washers (57) from the upper rear of the motor front end bell (P).

12. Use a plastic mallet to gently tap the displacement pump (42) from the rear to loosen the drive housing (59) from the front end bell. Then pull the drive housing away from the end bell.

### CAUTION

DO NOT allow the gear cluster (66) to fall when removing the drive housing (59). It is easily damaged if dropped. The cluster may stay engaged in either the front end bell or the drive housing.

DO NOT lose the thrust balls (68) located at each end of the gear cluster (66) or allow them to fall between gears. The ball, which is heavily covered with grease, usually stays in the gear recesses, but could be dislodged. If caught between gears and not removed, the balls will seriously damage the drive housing. If the balls are not in place, the bearings will wear prematurely.

13. While supporting the motor to keep the sprayer from tipping, use a 1/4" hex key wrench to remove the four screws (27), lockwashers (44) and nuts (45) holding the motor (56) to the frame. Lift off the old motor. Install the new motor and secure it to the frame.
  14. Liberally grease the gear cluster (66) and pinion gear (B) and pack all bearings in the motor front end bell. Check to be sure the thrust balls (68) are in place.
  15. Place the bronze-colored washer (59b) and THEN the silver-colored washer (59a) on the shaft protruding from the big gear in the drive housing (59).
  16. Align the gears and push the drive housing (59) straight onto the front end bell and locating pins.
  17. Starting at Step 11 and working backwards, continue to reassemble the sprayer.
- NOTE:** Use a turning motion on the conduit (21) when feeding wires through it.
18. Reinstall the conduit seal (78) around the wires in the conduit elbow (345) at the pressure control to keep contaminants from entering the pressure control.
  19. Reinstall the motor cover and pressure control cover.



**WIRING DIAGRAM**

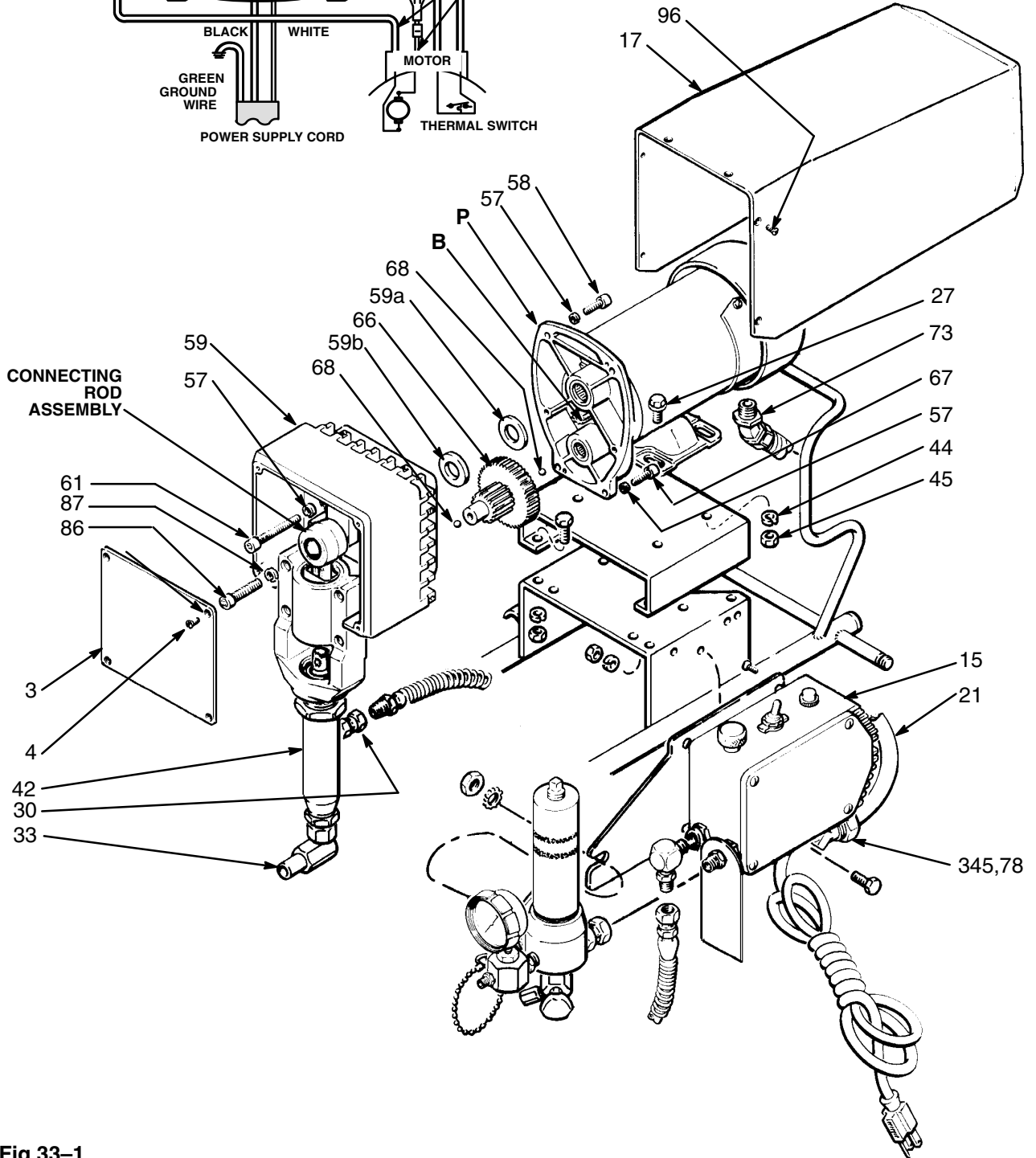
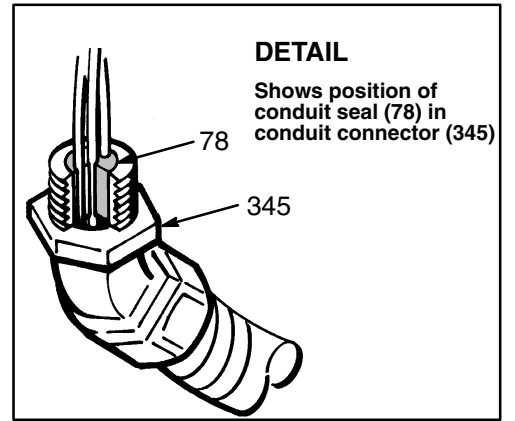
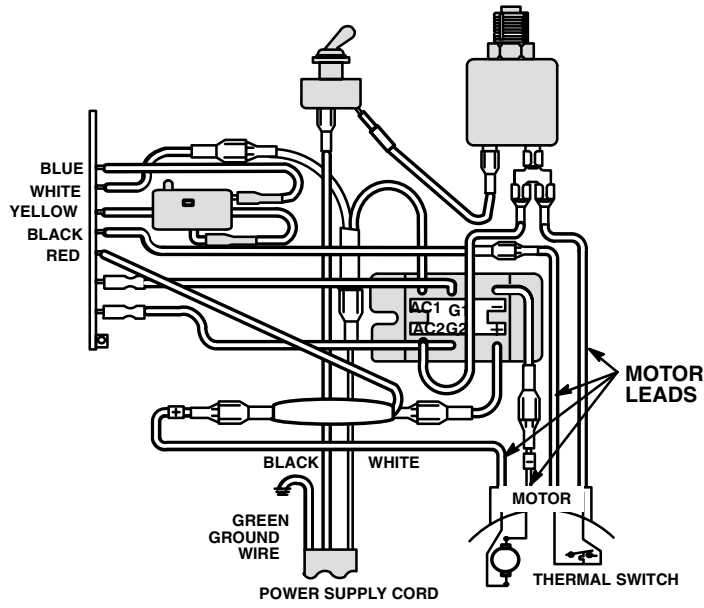


Fig 33-1

## BEARING HOUSING & CONNECTING ROD REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or in the skin, injury from moving parts or electric shock. *Unplug the sprayer!*

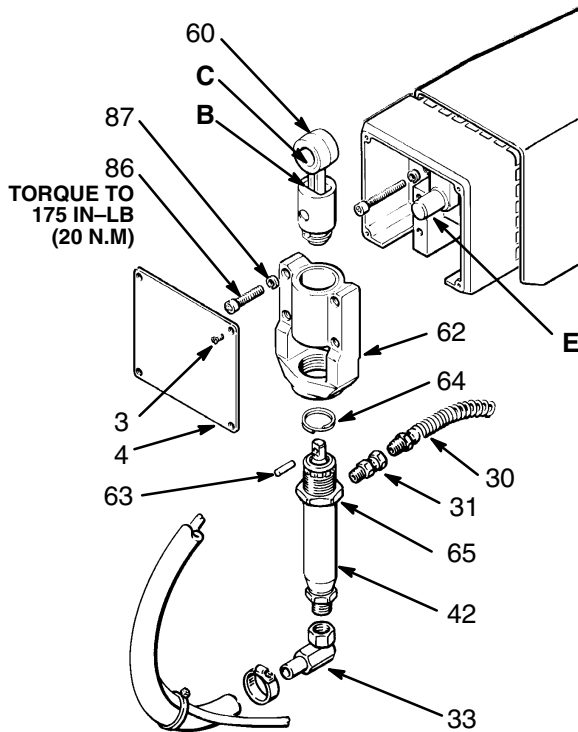


Fig 34-1

Refer to Fig 34-1 unless otherwise indicated.

**NOTE:** Stop the sprayer at the bottom of its stroke to get the crank (E) in its lowest position. To lower the crank manually, carefully rotate the blades of the fan with a screwdriver.

1. Remove the front cover and screws (4,3). Hold a wrench on the pump intake valve and unscrew the swivel union (33) from the pump intake. Disconnect the pump outlet hose (40).
2. Use a screwdriver to push aside the retaining spring (64). Push the pin (63) out the rear.
3. Loosen the pump jam nut (65) with an adjustable wrench. Unscrew the displacement pump (42).
4. Use a 3/16" hex key wrench to remove the four screws (86) and lockwashers (87) from the bearing housing (62).
5. Lightly tap the lower rear of the bearing housing (62) with a plastic mallet to loosen it from the drive housing (59). Pull the bearing housing and the connecting rod assembly (60) straight off the drive housing.
6. Inspect the crank (E) for excessive wear and replace parts as needed. Evenly lubricate the inside of the bronze bearing (B) with high quality motor oil. Liberally pack the roller bearing (C) with bearing grease.

7. Assemble the connecting rod (60) and bearing housing (62).
8. Clean the mating surfaces of the bearing and drive housings.
9. Align the connecting rod with the crank (E) and carefully align the locating pins in the drive housing with the holes in the bearing housing (62). Push the bearing housing onto the drive housing or tap it into place with a plastic mallet.

### CAUTION

DO NOT use the bearing housing screws (86) to try to align or seat the bearing housing; the bearing and drive housing will not align properly and will result in premature bearing wear.

10. Install the screws (86) and lockwashers (87) on the bearing housing and tighten evenly to 175 in-lb (20 N.m).

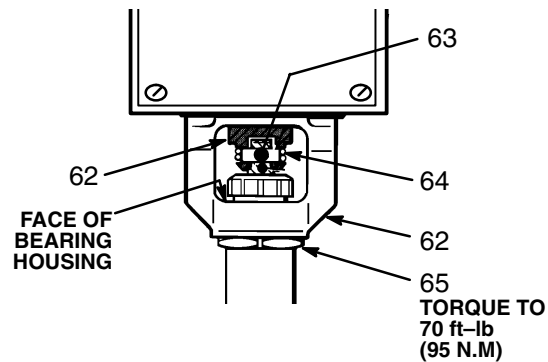


Fig 34-2

11. Screw the displacement pump 3/4 of the way into the bearing housing (62). Hold the pin (63) up to the pin hole in the connecting rod (60). Screw in the pump until the pin slides easily into the hole. Back off the pump until the top threads of the pump cylinder are flush with the face of the bearing housing and the outlet adapter (31) is facing back. Push the retaining spring (64) into the groove all the way around the connecting rod. Tighten the locknut (65) very tight – about 70 ft-lb (95 N.m) – with a 2-1/4 in. open end wrench and a light hammer. See Fig 34-2.

### WARNING

Be sure the retaining spring (364) is firmly in the groove all the way around, to prevent the pin (63) from working loose due to vibration. See Fig 34-2.

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

12. Reinstall the front cover and screw (4,3). Reconnect the swivel union (33) and pump outlet hose (30). See Fig 34-1.

## DRIVE HOUSING REPLACEMENT

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or in the skin, injury from moving parts or electric shock. *Unplug the sprayer!*

**NOTE:** Stop the sprayer at the bottom of its stroke to get the crank (E) in its lowest position. To lower it manually, carefully rotate the blades of the fan with a screwdriver.

1. Remove the front cover and screws (4,3).
2. Disconnect the pump outlet hose from the displacement pump outlet adapter. Remove the suction tube assembly at the swivel union.
3. Remove the four screws (86) and lockwashers (87) from the connecting rod assembly.
4. Lightly tap the lower rear of the bearing housing (62) with a plastic mallet to loosen it from the drive housing (59). Then pull the bearing housing and connecting rod assembly straight off the drive housing.
5. Remove the two screws (61) and lockwashers (57) from the recess of the drive housing, the two screws (67) and lockwashers (57) from the bottom rear of the motor front end bell (56b), and the two screws (58) and lockwashers (57) from the upper rear of the motor front end bell (56b).

6. Lightly tap the drive housing (59) with a plastic mallet to loosen it from the front end bell, then pull it straight off.

### CAUTION

DO NOT allow the gear cluster (66) to fall when removing the drive housing (59). It is easily damaged if dropped. The gear may stay engaged in either the front end bell or the drive housing.

DO NOT lose the thrust balls (68) located at each end of the gear cluster (66) or allow them to fall between gears. The balls, which are heavily covered with grease, usually stay in the shaft recesses, but could be dislodged. If caught between gears and not removed, the balls will seriously damage the drive housing. If the balls are not in place, the bearings will wear prematurely.

7. Liberally apply bearing grease to the gear cluster (66). Use approximately 6 oz. of the grease supplied with the drive housing replacement kit. Check to be sure the thrust balls (68) are in place.
8. Place the bronze-colored washer (59b) THEN the silver-colored washer (59a) on the shaft protruding from the big gear in the drive housing (59). Align the gears and push the new drive housing straight onto the front end bell and locating pins.
9. Starting at Step 5 and working backwards, continue to reassemble the sprayer.

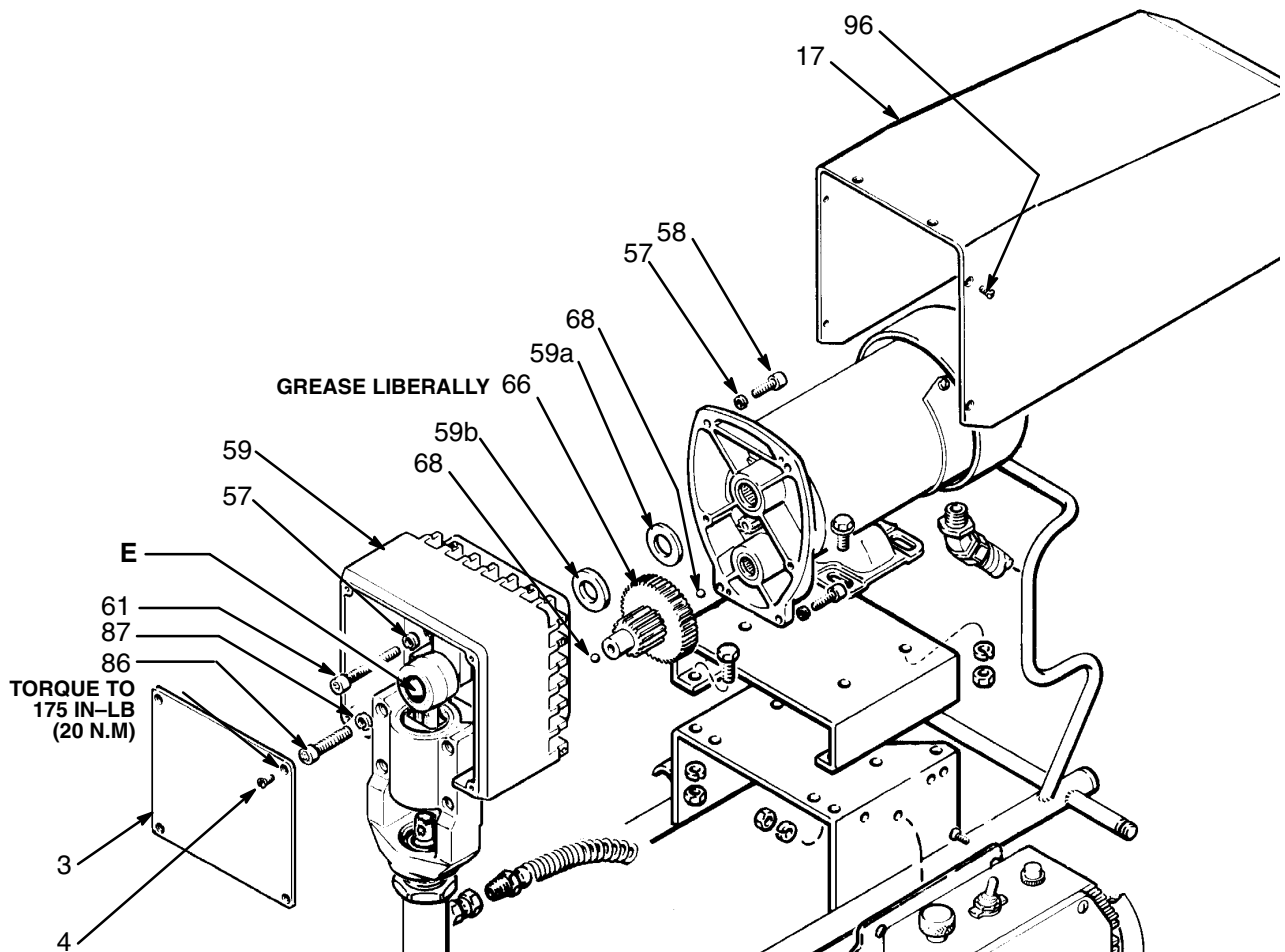


Fig 35-1

## DISPLACEMENT PUMP REPAIR

### WARNING

Before doing this procedure, follow the **Pressure Relief Procedure Warning** on page 24 to reduce the risk of a fluid injection injury, splashing in the eyes or skin, injury from moving parts or electric shock.

**NOTE:** Packing Repair Kit 222–343 is available. For the best results use all the parts in the kit. Parts included in the kit are marked with an asterisk, for example (212\*) in the text and drawings.

### Removing the Pump Refer to Fig 36–1.

1. Flush the pump, if possible, and relieve pressure again. Stop the pump with the piston rod (223) in its lowest position.
2. Unscrew the swivel union (33) from the pump intake. Hold the wrench on the pump intake valve (222) to keep the pump from loosening.
3. Unscrew the hose (30) from the swivel union (31).
4. Use a screwdriver to push the retaining spring (64) up and push out the pin (63).
5. Loosen the locknut (65) and unscrew the pump from the bearing housing (62).
6. Go to **Disassembling the Pump** on the bottom right side of this page.

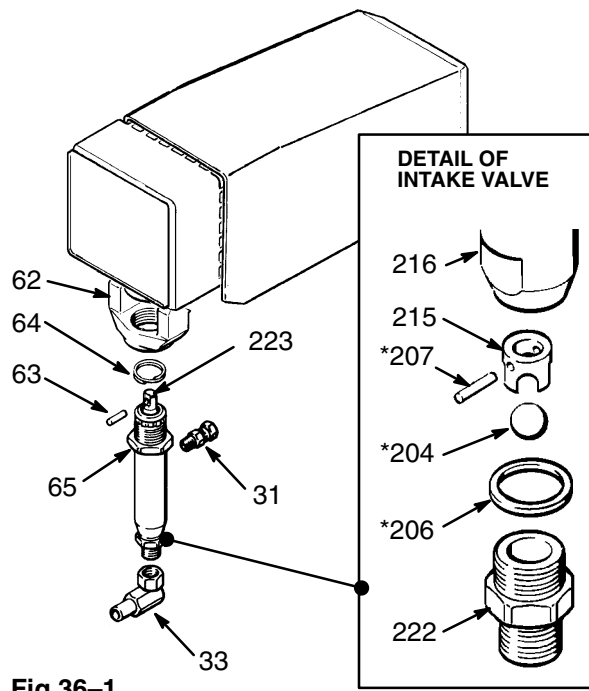


Fig 36–1

### Reinstalling the Pump Refer to Fig 36–2.

1. Rotate the crankshaft so the connecting rod (60) is in its lowest position. Push the pump piston rod (223) all the way down into the pump cylinder (216). Screw the pump into the bearing housing (62) until you feel the piston rod pressing against the connecting rod. Now, unscrew the pump until the swivel union (31) is straight back, and then unscrew one more complete turn.

2. Torque the locknut (65) to 70 ft–lb (95 N.m). Refer to the **CAUTION**, below.

### CAUTION

If the locknut loosens during operation, the threads of the bearing housing (62) will be permanently damaged. Be sure to tighten the locknut firmly.

3. Align the holes in the piston rod (223) and the connecting rod (60), and install the pin (63). Push the retaining spring (64) into the groove all the way around the coupling. Refer to the **WARNING**, below.

### WARNING

Be sure the retaining spring (64) is firmly in the groove of the connecting rod, *all the way around*, to prevent it from working loose due to vibration. See Fig 36–1.

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

4. Tighten the packing nut (221) just enough to stop leakage, but no tighter. Fill the wet-cup/packing nut 1/3 full with Graco TSL.

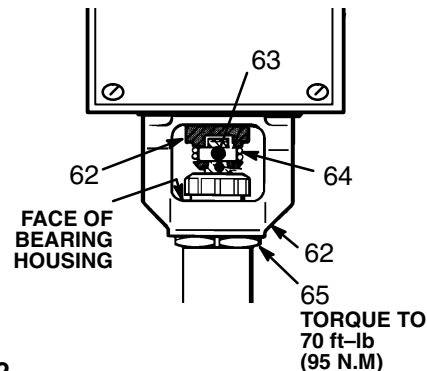


Fig 36–2

### Disassembling the Pump Refer to Fig 36–1.

1. Unscrew the intake valve (222) from the cylinder (216). Remove the gasket (206\*), ball guide (215), stop pin (207\*) and ball (204\*) from the valve. Clean and inspect the parts for wear or damage, replacing parts as needed. **Always** use a new gasket (206\*), provided in the repair kit.
2. Unscrew and remove the packing nut (221) and plug (201).
3. Use a plastic mallet to tap the piston rod *down*. Pull the rod out through the *bottom* of the cylinder.
4. Remove the throat packings (218) and glands (211, 212).
5. Clamp the flats of the piston rod in a vise. Use a 7/8 in. wrench to loosen the retaining nut (214), and then to unscrew the piston valve (224) from the rod.
6. Remove the backup washer (219), seal (205), packings (217) and glands (213, 220).

## DISPLACEMENT PUMP REPAIR

### Reassembling the Pump

**NOTE:** The lips of the *throat V-packings* **MUST face DOWN**. The lips of the *piston V-packings* **MUST face up**. The lips of the U-cup seal (205) **MUST face down**. Incorrect installation damages the packings and results in pump leakage.

Coat the piston rod, inside of the cylinder, and the packings with lightweight oil to help prevent packing damage when inserting the piston rod.

1. Check the outside of the piston rod (223) and the inside of the cylinder (216) for scoring or scratches. If the parts are damaged, new packings will not seal properly. Replace these parts if needed.
2. Stack the backup washer (219\*), u-cup seal (205\* – lips down), female gland (220\*), packings (217\* – lips up) and male gland (213\*) onto the piston valve (224). See Fig 37–1.
3. Tighten the packing retaining nut (214) onto the piston valve (224) and torque to 10.5 in–lb (1.2 N.m). Then unscrew the nut and retighten, finger tight only.

**Note the alignment** of the piston (D) to the nut (B) and maintain this alignment through Steps 3 to 7.

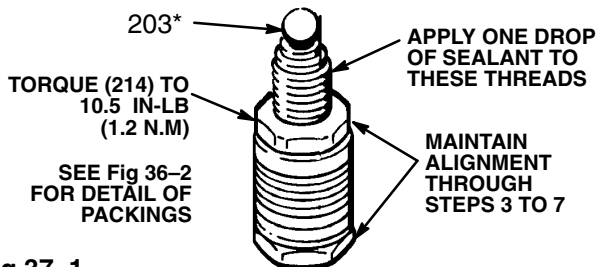


Fig 37–1

4. Apply *only 1 drop* of adhesive, supplied with the repair kit, to the threads of the piston valve. Place the small ball (203\*) on the piston valve (224). See Fig 37–1.
5. Hand tighten the valve assembly into the piston rod just until the nut (214) contacts the face of the rod. See Fig 37–1.

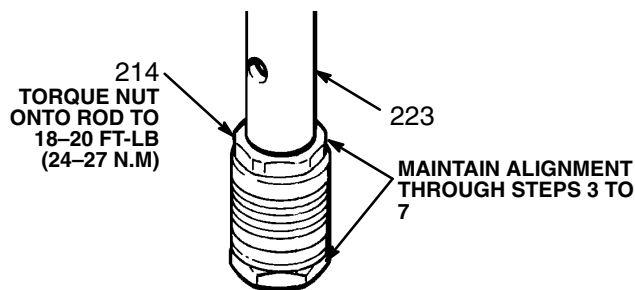


Fig 36–2

6. Place the piston rod flats in a vise.
7. Tighten the piston nut (214) onto the piston rod (223). Torque to 19 ft–lb (25 N.m). Use two wrenches to maintain the alignment mentioned in Step 3.
8. Stack the male gland (211\*), packings (218\* – lips down) and female gland (212\*), one at a time into the top of the cylinder. See Fig 37–1.
9. Install the packing nut (221) and plug (201), but leave loose for now.
10. Insert the piston rod (223) through the *bottom* of the pump cylinder. See Fig 37–1.

11. Screw down the cylinder locknut (238) until it is finger tight at the bottom of the external cylinder threads.
12. Place the flats of the intake valve in a vise. Assemble the intake valve using a new gasket (206\*) and screw the pump cylinder onto the valve. See Fig 37–1. Torque to 80 ft–lb (107 N.m).
13. Tighten the packing nut (121) just enough to stop leakage, but no tighter. Fill the wet-cup/packing nut 1/3 full with Graco TSL.
14. See **Reinstalling the Pump**, on page 36.

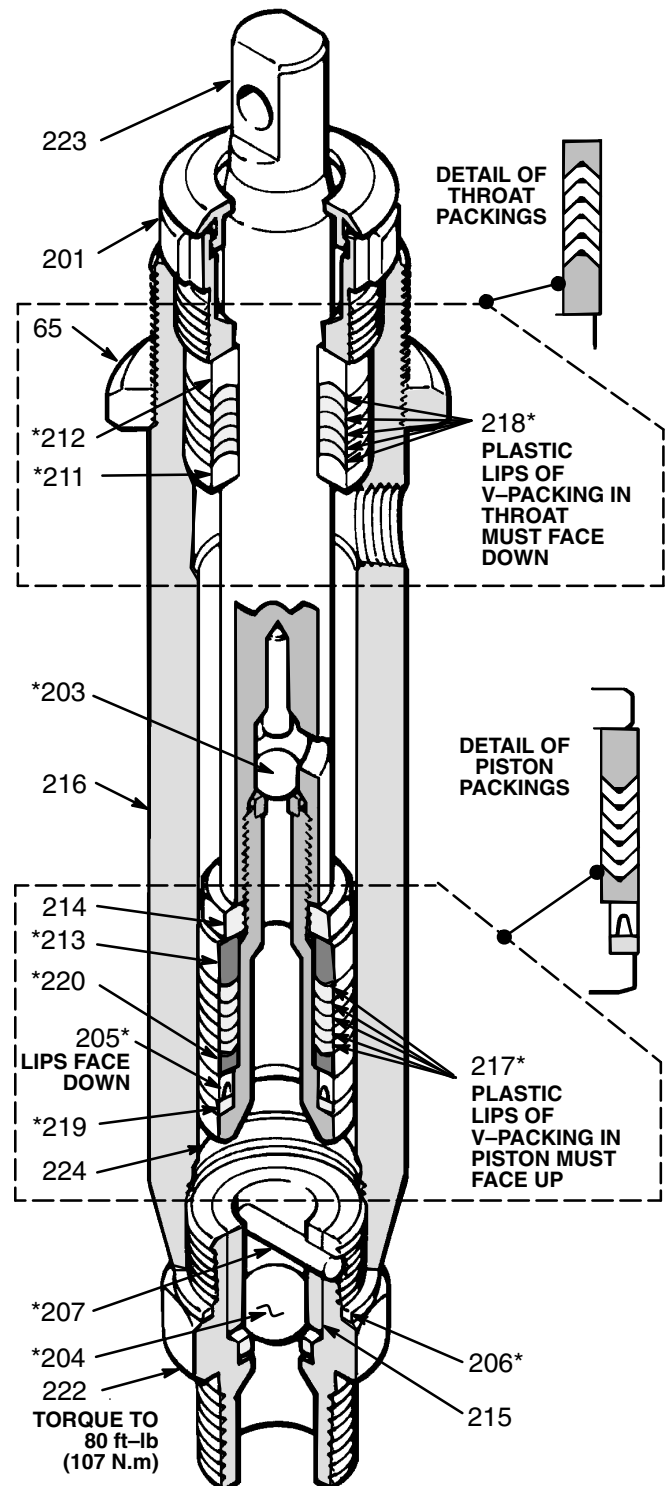


Fig 37–1



# PARTS LIST

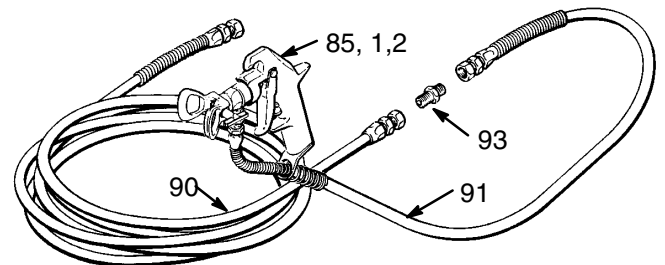
## Model 231-094, Series A

Includes items 1 to 96

REF NO.	PART NO.	DESCRIPTION	QTY
1	221-621	SPRAY TIP, .021 size	1
2	221-625	SPRAY TIP, .025 size	1
3	100-259	SCREW, mach, filh, no. 8-32 x 3/8"	4
4	183-092	PLATE, cover	1
5	185-438	LABEL, identification	1
6	220-285	CAP	1
7	183-365	BRACKET, mounting	1
8	106-078	SCREW, mach, No. 10-24 x .375"	4
9	110-338	PRESSURE GAUGE	1
10	100-040	PLUG	1
11	218-029	FLUID FILTER <i>see 307-273 for parts</i>	1
12	155-665	UNION, adapter, 3/8" npsm swivel x 3/8 npt(m)	1
14	185-437	LABEL, identification	1
15	222-240	PRESSURE CONTROL ASSY <i>see page 40 for parts</i>	1
16	185-598	MANIFOLD, adapter, 1/4-18 npt x 3/4-18 npt	1
17	222-682	SHIELD, motor	1
19	185-447	COVER, pressure control	1
20	177-762*	LABEL, WARNING	1
21	065-099	CONDUIT, electrical, <i>specify length when ordering</i>	0.79 FT
22	154-636	WASHER, flat	2
23	101-242	RING, retaining	2
24	220-678	FRAME, SPRAYER <i>includes replaceable items 22 &amp; 23</i>	1
25	106-062	WHEEL, semi-pneumatic	2
26	104-811	HUBCAP	2
27	110-963	SCREW, serrated flange, hex head, 5/16-18 unc-2a x .75"	11
30	223-767	HOSE, grounded, nylon, 1/4" ID, cpld 1/4 npt(m) x 1/4 npsm (f), 21.75" (552 mm) long, spring guards both ends	1
31	156-823	UNION, swivel, 1/4 npt(m) x 1/4 npt(f)	1
32	183-281	HOSE, drain	1
33	110-229	UNION, swivel, 3/4 npsm x hose stud	1
35	103-927	CLAMP, hose, 1.25" ID	2
36	176-920	HOSE, suction, 30" (762 mm)	1
37	103-473	TIE, strap	2
38	162-453	NIPPLE, 1/4 npt(m) x 1/4 npsm	1
40	178-034*	TAG, WARNING	1
41	183-568	SPACER	1
42	222-342	DISPLACEMENT PUMP <i>see page 42 for parts</i>	1
43	223-886	VALVE, pressure relief	1
44	100-214	LOCKWASHER, spring, 5/16"	6
45	100-188	NUT, heavy hex, 5/16-18 unc-2a	11
47	183-770	STRAINER	1
49	183-275	SPACER	2
50	178-342	CLIP, SPRING	2
51	185-951*	LABEL, DANGER	2
53	183-769	TUBE, suction	1
55	179-945	ADAPTER, elbow, special, 1/4-18 npt (m x f)	1
56	222-376	MOTOR, ELECTRIC <i>includes replaceable items 56a to 56c, 68</i>	1
56a	107-267	TERMINAL, female ( <i>see page 41</i> )	2
56b	107-504	TERMINAL, female ( <i>see page 41</i> )	1
56c	596-421	TERMINAL, wire, female, snap-on ( <i>see page 41</i> )	1

REF NO.	PART NO.	DESCRIPTION	QTY
57	105-510	LOCKWASHER, spring, 1/4"	6
58	100-644	SCREW, socket head, no. 1/4-20 x 0.62"	2
59	223-098	DRIVE HOUSING KIT <i>Includes items 59a and 59b and one of 68</i>	1
59a	178-967	.WASHER, silver-colored	1
59b	107-089	.WASHER, bronze-colored	1
60	218-034	ROD, connecting	1
61	107-218	CAPSCREW, sch, 1/4-20 x 2.75"	2
62	222-683	HOUSING, bearing	1
63	176-818	PIN, straight	1
64	176-817	SPRING, retaining	1
65	178-941	NUT, hex	1
66	179-961	GEAR REDUCER	1
67	100-643	SCREW, socket head, no. 1/4-20 x 1"	2
68	100-069	BALL, steel, 1/4" dia.	2
69	150-513	NUT, jam, 7/16"	1
70	100-322	LOCKWASHER, ext., shakeproof, 7/16"	1
71	206-994	THROAT SEAL LIQUID, 8 OZ.	1
72	110-037	SCREW, mach, pnh, 10-24 Type "C" x .50"	4
73	108-460	CONNECTOR, conduit, 45°	1
74	218-405	BOARD, circuit, 115V <i>see page 40</i>	1
78	107-447	SEAL, conduit <i>see page 40</i>	2
85	220-956	SPRAY GUN <i>see 307-614 for parts</i>	1
86	110-141	CAPSCREW, sch, 3/8-16 unc-3a x 1-1/2"	4
87	106-115	LOCKWASHER, spring, 3/8"	4
90	223-541	HOSE, grounded, nylon, 1/4" ID, cpld 1/4 npsm(f), 50 ft (15 m), spring guards both ends	1
91	214-699	HOSE, grounded, nylon, 3/16" ID, cpld 1/4 npsm(f), 6 ft (1.8 m), spring guards both ends	1
93	156-971	NIPPLE, 1/4-18 npt, 1.375" long	2
94	185-498	LABEL, identification	1
95	185-512	LABEL, identification	1
96	110-346	SCREW, mach bdgh, 8-32 unc-2a x .375"	6

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



## MOTOR REPAIR KIT

Purchase separately.

Motor Brush Repair Kit 220-853

# PARTS – PRESSURE CONTROL

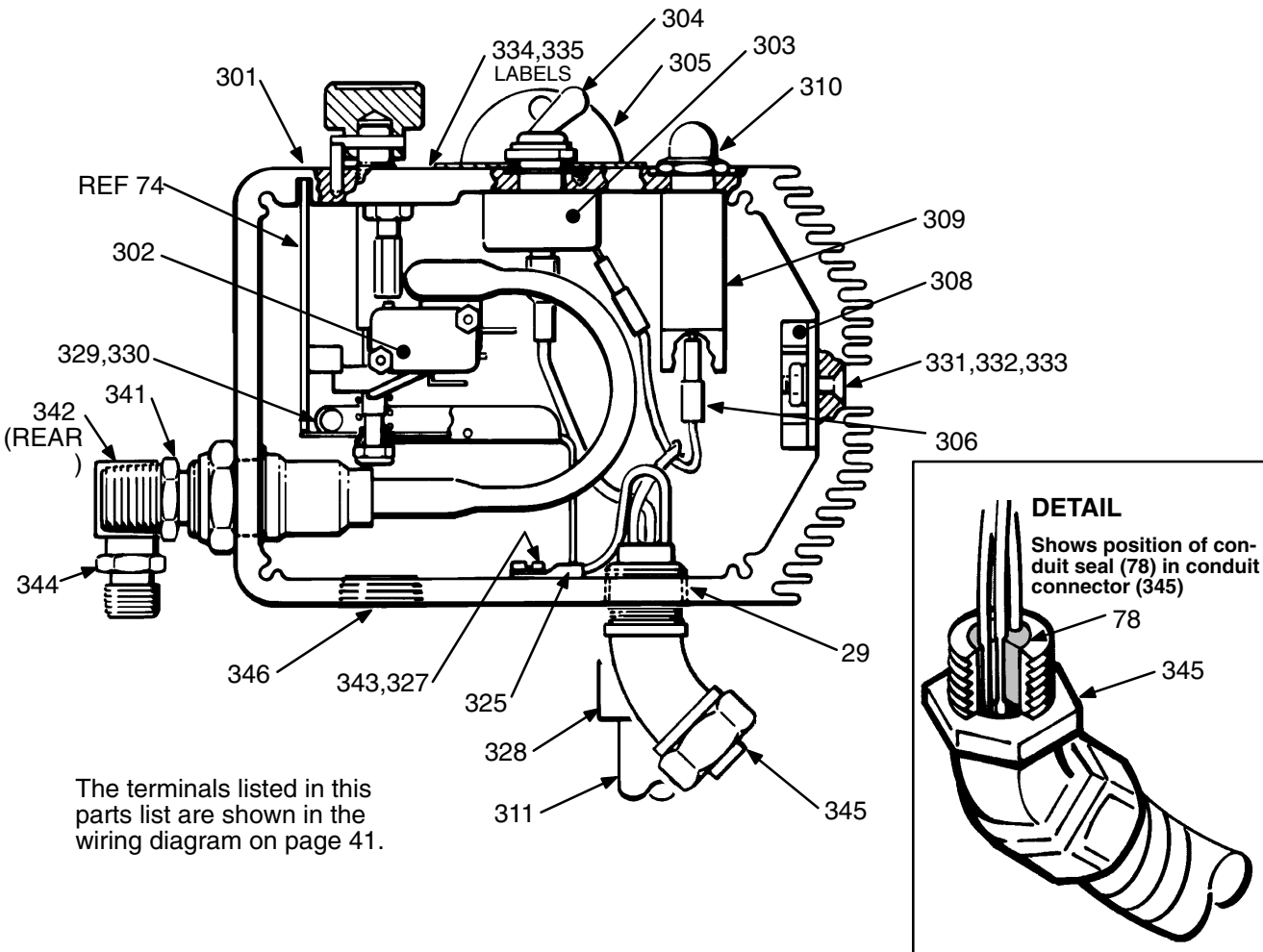
## PRESSURE CONTROL ASSEMBLY 220-455

The terminals are included with the circuit board (item 74). The terminals listed in this parts list are shown on the wiring diagram on page 41.

Part numbers for items 27, 56a, 56b, 57, 74 and 78 are shown in the drawings below and on page 41 and are listed on page 39.

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
301	218-126	BARE PRESSURE CONTROL Includes replaceable items 302 to 305	1	325	102-799	TERMINAL, ring	1
302	180-043	.MICROSWITCH	1	327	157-021	LOCKWASHER, no. 8, internal	1
303	105-679	.ON/OFF SWITCH	1	328	108-295	BUSHING, strain relief	1
304	105-659	.BOOT, switch	1	329	107-258	TIP, pin	1
305	107-255	.GUARD, locking	1	330	180-041	PIN	1
306	218-168	JUMPER WIRE	1	331	101-273	SCREW, mach; flat hd; no. 10-24 x 5/8"	2
308	218-170	RECTIFIER, bridge	1	332	100-179	NUT, hex, mscr, no. 10-24 thd	2
309	107-256	CIRCUIT BREAKER	1	333	100-718	LOCKWASHER, internal, shakeproof, no. 10	2
310	107-254	BOOT, circuit breaker	1	334	178-797**	LABEL, WARNING	1
311	218-169	CORD, power supply	1	335	178-035**	LABEL, WARNING	1
312	107-268	ADAPTER, terminal	1	336	107-261	TERMINAL, male	2
314	107-267	TERMINAL, female	1	337	107-503	TERMINAL, female	1
315	107-293	TERMINAL, female	2	338	107-504	TERMINAL, male	1
316	107-264	TERMINAL, male	1	341	157-350	ADAPTER, 3/8 npt(m) x 1/2 npt (m)	1
317	107-396	TERMINAL, male	1	342	100-840	ELBOW, street; 1/4 npt(m x f)	1
318	107-262	TERMINAL, female	1	343	100-035	SCREW, mach; slotted pan hd; no. 8 x 5/16"	1
319	107-260	TERMINAL, female	1	344	162-453	NIPPLE, 1/4 npt(m) x 1/4 npsm	1
320	107-266	TERMINAL, female	1	345	108-460	CONNECTOR, conduit	1
321	103-885	TERMINAL, male	1	346	101-754	PLUG, pipe	1
322	103-886	TERMINAL, female	3				
323	107-265	TERMINAL, female	1				
324	107-263	TERMINAL, female	1				

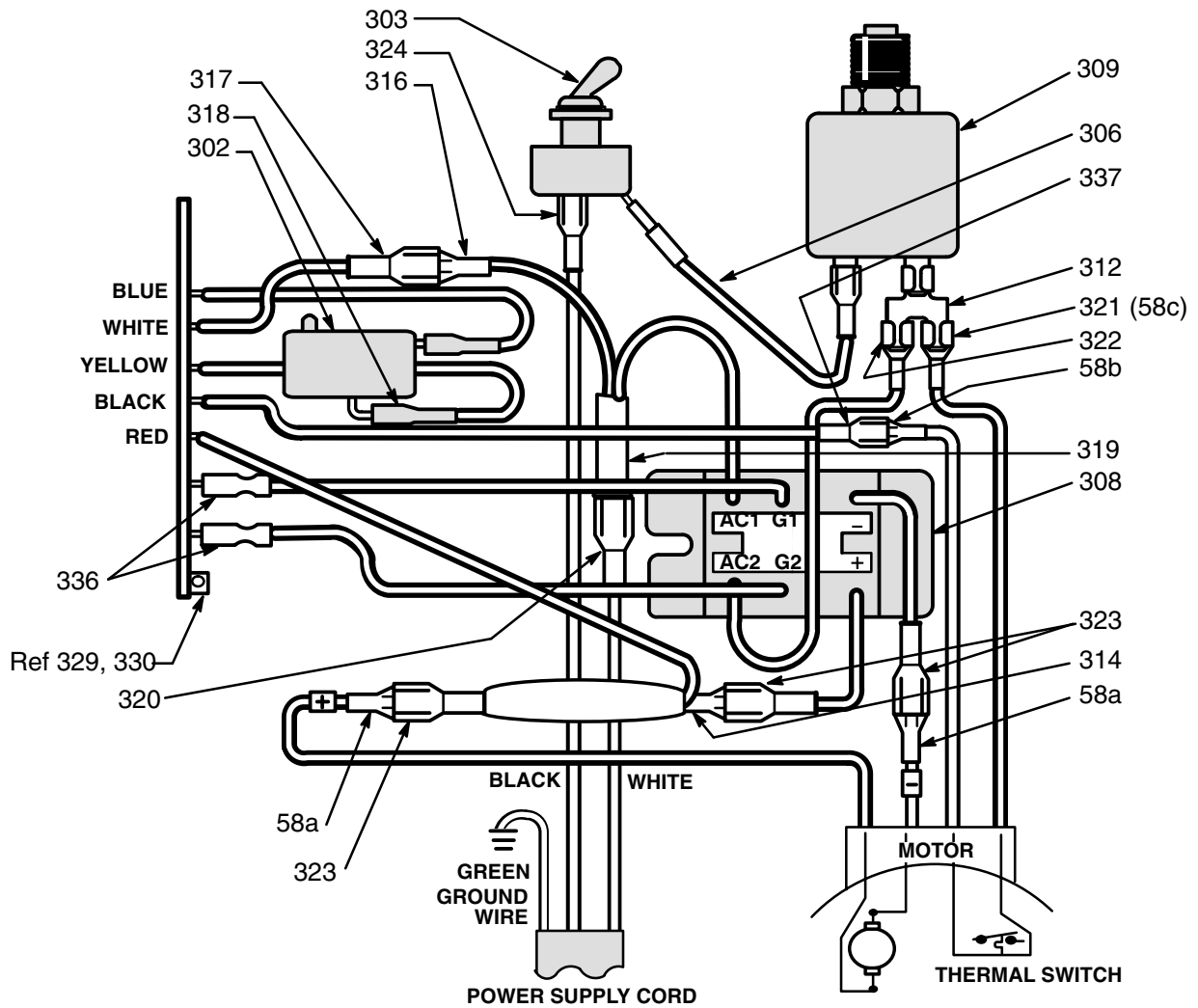
\*Extra warning labels available free.



The terminals listed in this parts list are shown in the wiring diagram on page 41.



# WIRING DIAGRAM



## SERVICE INFORMATION

Listed below by the assembly changed are OLD, NEW, ADDED and DELETED parts. Old and new parts are directly interchangeable.

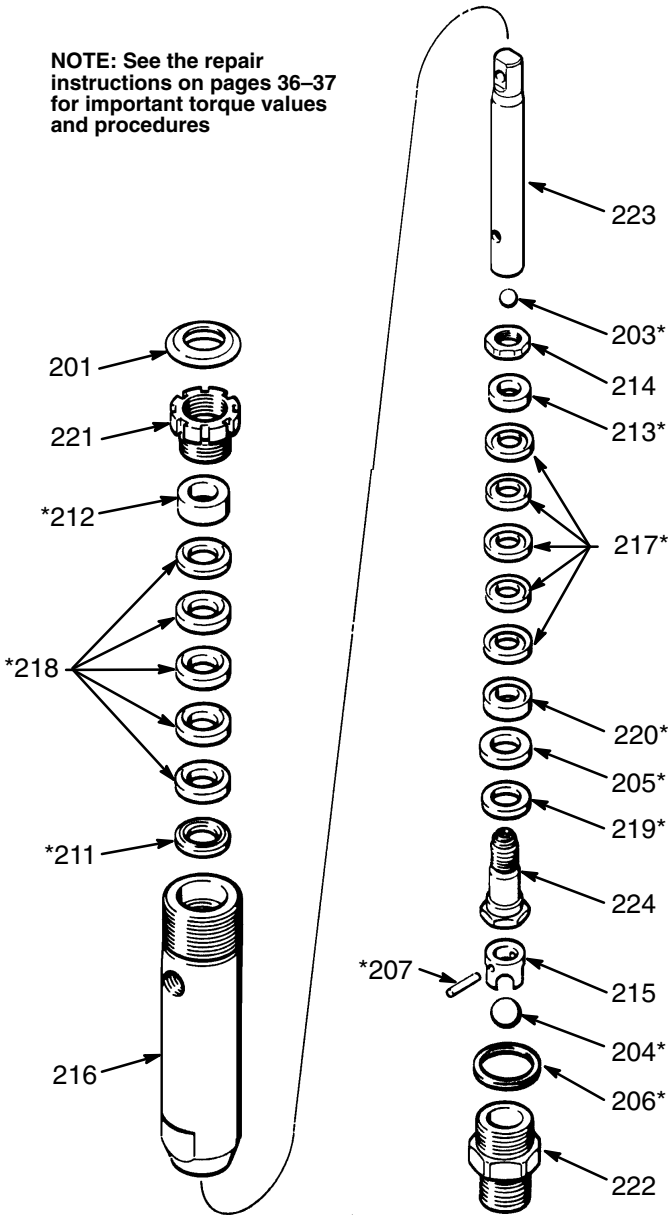
Assembly Changed	Part Status	Ref No.	Part No.	Name
231-094	Old	11	222-016	Filter
	New		218-029	Filter
	Old	27	100-057	Screw
	New		110-963	Screw
	Old	30	220-680	Hose
	New		223-767	Hose
	Old	33	221-101	Union
	New		110-229	Union
	Old	39	108-982	Connector
	Old	43	221-077	Relief Valve
	New	43	223-886	Relief Valve
	Old	51	183-716	Warn Label
	New		185-951	Danger Lbl
	Old	90	210-541	Hose
	New		223-541	Hose

## PARTS DRAWING

### Model 222-341, Series A Displacement Pump

Includes items 201 to 224

**NOTE:** See the repair instructions on pages 36-37 for important torque values and procedures



## PARTS LIST

REF NO.	PART NO.	DESCRIPTION	QTY
201	179-810	PLUG	1
203	105-444*	BALL, SST	1
204	105-445*	BALL, sst	1
205	108-706*	SEAL, u-cup, PTFE®	1
206	150-429*	GASKET, copper	1
207	178-938*	PIN, ball stop	1
211	178-942*	GLAND, male, carbon steel	1
212	183-232*	GLAND, female, brass	1
213	183-231*	GLAND, male, brass	1
214	178-945	NUT, hex	1
215	178-948	GUIDE, ball, sst	1
216	183-234	CYLINDER, hard chrome over stainless steel	1
217	178-964*	V-PACKING, polyethylene	5
218	178-965*	V-PACKING, polyethylene	5
219	181-338*	WASHER, backup	1
220	178-969*	GLAND, packing	1
221	178-809	NUT, packing/wet-cup	1
222	217-574	VALVE, intake	1
223	220-645	ROD, piston, hard chrome over stainless steel	1
224	218-036	VALVE, piston	1

\*Included in Repair Kit 222-343 sold separately.

## REPAIR KIT

### Displacement Pump Repair Kit 222-343

(Must be purchased separately)

Includes:

Ref No.	Qty
203	1
204	1
205	1
206	1
207	1
211	1
212	1
213	1
217	5
218	5
219	1
220	1

## TECHNICAL DATA

Power Requirements	120 VAC, 60Hz, 1 phase, 15 amp minimum
Working Pressure Range	0–3000 psi (0 – 210 bar)
Cycles/Gallon (liter)	260 (70)
Maximum Delivery	0.6 GPM (2.3 liter/min)
Power Cord	No. 14 AWG, 3 wire, 8'6" (2.6 m)
Inlet Paint Strainer	16 mesh (1190 micron) Stainless Steel Screen, reusable
Outlet Paint Filter	60 mesh (250 micron) Stainless Steel Screen, reusable
Pump Inlet Size	3/4 npt(m) with 20° ID chamfer
Fluid Outlet Size	1/4 npsm from fluid filter
Wetted Parts:	
<i>Displacement Pump</i>	Stainless steel, PTFE®, plated steel, polyethylene, brass
<i>Filter</i>	Plated steel

PTFE®

## DIMENSIONS

Weight (dry w/o packaging)	95 lb (43 Kg)
Height	20 in. (508 mm)
Length	29 in. (737 mm)
Width	18 in. (457 mm)

## DIMENSIONS

### DANGER LABELS

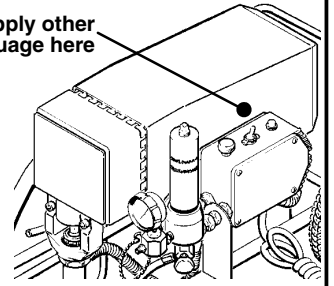
The English language DANGER label shown on page 1 is also on your sprayer. If you have painters who do not read English, order one of the following labels to apply to your sprayer. The drawing below shows the best placement of these labels for good visibility.

Order the labels directly from Graco, free of charge.

Toll Free: 1-800-423-8594  
In Minnesota: 1-612-623-6921

Apply other  
language here

<b>French</b>	<b>185-957</b>
<b>Spanish</b>	<b>185-959</b>
<b>German</b>	<b>186-039</b>
<b>Greek</b>	<b>186-043</b>
<b>Korean</b>	<b>186-047</b>
<b>English</b>	<b>185-591</b>



## THE GRACO ULTRA™ -LINE 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, with the exception of defects in parts on the drive train/gear box, which will be repaired or replaced for twenty-four months from the date of sale and the electric motor (excluding brush replacement, which is routine maintenance) or pressure control assembly which will be repaired or replaced for twenty-four months from the date of sale. 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.

### DISCLAIMERS AND LIMITATIONS

**The terms of this warranty constitute purchaser's sole and exclusive remedy and are in lieu of any other warranties (express or implied), including warranty of merchantability or warranty of fitness for a particular purpose, and of any non-contractual liabilities, including product liabilities, based on negligence or strict liability. Every form of liability for direct, special or consequential damages or loss is expressly excluded and denied. In no case shall Graco's liability exceed the amount of the purchase price. Any action for breach of warranty must be brought within two (2) years of the date of sale.**

### EQUIPMENT NOT COVERED BY GRACO WARRANTY

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

**Factory Branches:** Atlanta, Chicago, Dallas, Detroit, Los Angeles, West Caldwell (N.J.)

**Subsidiary and Affiliate Companies:** Canada; England; Korea; Switzerland; France; Germany; Hong Kong; Japan

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