REPAIR

309387

Rev. C

KEEP FOR REFERENCE.
Read this and all related manuals for important warnings and instructions.

INSTRUCTIONS

GRACO

First choice when quality counts.™

295ST ™

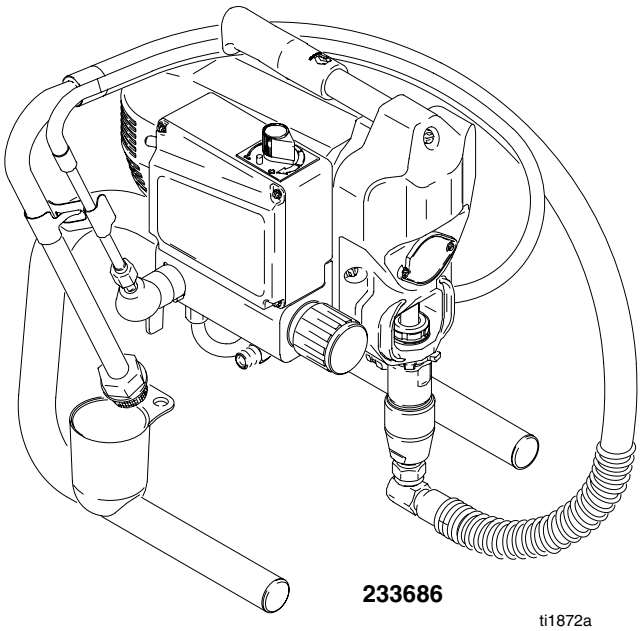
Airless Paint Sprayers

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

120 VAC

Model 233686, A, B, C (Stand)

Model 233823, A, B (Hi-boy)



233686

ti1872a

Related manuals

. 309386

. 309053

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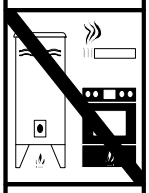
GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440–1441

⚠ WARNING

Fire and explosion hazard: Solvent and paint fumes can ignite or explode.

To help prevent a fire and explosion:

- **Use only in an extremely well ventilated area.**
- Eliminate all ignition sources; such as pilot lights, cigarettes and static arcs from plastic drop cloths. Do not plug or unplug power cords or turn lights on or off in spray area.
- Ground Sprayer, object being sprayed, paint and solvent pails.
- Hold gun firmly to side of grounded pail when triggering into pail.
- Use only conductive airless paint hose.
- Do not use 1,1,1–trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in pressurized aluminum equipment. Such use could result in a chemical reaction, with the possibility of explosion.

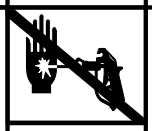


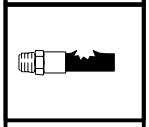
Fluid injection and high pressure hazard: High pressure spray or leaks can inject fluid into the body.

To help prevent injection, always:

- Engage trigger safety latch when not spraying.
- Keep clear of nozzle and leaks.
- Never spray without a tip guard.
- Do **PRESSURE RELIEF** if you stop spraying or begin servicing sprayer.
- Do not use components rated less than sprayer *Maximum Working Pressure*
- Never allow children to use this unit.

If high pressure fluid pierces your skin, the injury might look like "just a cut". But it is a serious wound! Get immediate medical attention.





⚠ ADVERTÊNCIA

Poderá ocorrer **incêndio e explosão** quando for pulverizado ou injetado líquido inflamável numa área onde houver má circulação de ar; vapores inflamáveis poderão incendiar-se a partir de uma chama ou fagulhas a descoberto.

Para ajudar a evitar incêndio e explosão:

- **Utilize no exterior ou numa área muito bem ventilada.**
- Não utilize 1,1,1–tricloroetano, cloreto de metileno, outros solventes de hidrocarbonetos halogenados ou líquidos contendo tais solventes em equipamento de alumínio pressurizado. Tal utilização poderá resultar numa reação química, com possibilidade de explosão.
- Retire, elimine ou desligue todas as fontes de ignição; coloque fita adesiva na tomada da parede. Não fume na área de pulverização.
- Nunca abasteça o depósito de combustível com o motor em funcionamento ou quente.
- Ponha em contato com a terra o pulverizador, o objeto a ser pulverizado, e os baldes de tinta e de solventes.
- Segure a pistola firmemente de encontro ao lado de um balde em contato com a terra, quando estiver descarregando para dentro do mesmo.
- Utilize somente tubos flexíveis condutores para pintura a alta pressão.
- Nunca faça funcionar o motor numa área fechada.

A injeção de líquido é um ferimento grave! Se o líquido a alta pressão penetrar na sua pele, o ferimento poderá parecer "simplesmente um corte". Mas é um ferimento grave! Procure o médico imediatamente.

Para ajudar a evitar injeção de líquido, faça sempre o seguinte:

- Engate o trinco de segurança do gatilho quando não estiver pulverizando.
- Sempre aponte a pistola para longe de você mesmo(a) ou de outras pessoas.
- Alivie a pressão antes de verificar ou reparar qualquer vazamento.
- Alivie a pressão quando desligar o pulverizador ou parar de pulverizar.
- Não utilize componentes classificados para uma pressão nominal inferior à pressão máxima de trabalho dos sistemas.

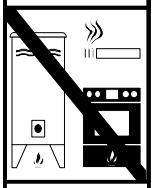
Nunca permita que crianças utilizem esta unidade. Se sofrer algum ferimento durante a utilização deste equipamento, procure o médico imediatamente.

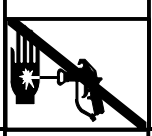
⚠ MISE EN GARDE

Risque d'incendie et d'explosion imminent pendant la pulvérisation ou le rinçage à pression de fluides inflammables dans une zone à mauvaise circulation d'air et en présence de gaz inflammables pouvant s'allumer par une flamme nue ou des étincelles.

Pour éviter les risques d'incendie et d'explosion:

- **Manipuler les fluides à l'air libre ou dans une zone extrêmement bien aérée.**
- Ne jamais utiliser de trichloroéthane 1,1,1, de chlorure de méthylène, d'autres solvants à base d'hydrocarbures halogénés, ni de produits contenant de tels solvants dans un équipement sous pression en aluminium. Cela pourrait provoquer une réaction chimique avec risque d'explosion.
- Retirer, éteindre ou déboucher toute source d'inflammation, recouvrir tout interrupteur mural avec du ruban adhésif. Ne pas fumer dans la zone de pulvérisation.
- Ne jamais remplir le réservoir d'essence lorsque le moteur est chaud ou en marche.
- Mettre à la terre le pulvérisateur, l'objet à pulvériser ainsi que les seaux de peinture et de solvants.
- Tenir le pistolet fermement contre la paroi d'un seau mis à la terre lorsqu'on pulvérise dans le seau.
- N'utiliser qu'un flexible pour peinture pulvérisée sans air.
- Ne jamais mettre en marche un moteur dans une zone fermée.



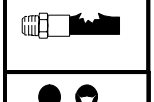


L'injection de fluide constitue une lésion grave! Si un fluide haute pression perce la peau, la blessure peut paraître comme une «simple coupure». Mais il s'agit bien d'une lésion grave! Consulter immédiatement un médecin.

Pour éviter les risques d'injection, toujours:

- Bloquer le loquet de sécurité de la gâchette à la fin de la pulvérisation.
- Pointer le pistolet loin de soi-même et toute autre personne à proximité
- Décharger la pression avant de vérifier ou réparer une fuite.
- Décharger la pression après la mise hors tension du pulvérisateur ou à la fin de la pulvérisation.
- Ne pas utiliser de composants dont la pression nominale est inférieure à la pression maximale de service du système.

Ne jamais permettre aux enfants d'utiliser cet appareil. En cas de blessure pour avoir utilisé cet appareil, consulter immédiatement un médecin.



⚠ ADVERTENCIA

Pueden ocurrir **incendios y explosiones** cuando se pulveriza fluido inflamable o cuando se lava con este tipo de fluido en un área donde la circulación de aire es deficiente y los vapores inflamables se pueden encender al contacto con el fuego o chispas.

Para prevenir incendios y explosiones:

- **Use en espacios abiertos o en un área muy bien ventilada.**
- No utilice nunca tricloretano–1,1,1, cloruro de metileno, u otros disolventes a base de hidrocarburos halógenos o fluidos que contengan tales disolventes en un equipo a presión de aluminio. El uso de estas sustancias puede provocar una intensa reacción química, con riesgos de explosión.
- Retire, apague o desconecte todas las fuentes de ignición; asegure el interruptor de la pared con cinta. No fume en el área de pulverización.
- Nunca llene el estanque de combustible mientras el motor esté en marcha o caliente.
- Ponga a tierra el pulverizador, el objeto que recibe el chorro pulverizado, las cubetas de pintura y disolvente.
- Sostenga firmemente la pistola a un lado de la cubeta puesta a tierra cuando dispare dentro de ella.
- Use solamente mangueras para pintura conductora sin aire.
- Nunca haga andar el motor dentro de un área cerrada.

¡La inyección de fluido en la piel es una lesión seria! Si fluido de alta presión le penetra la piel, la lesión podría parecer "sólo un corte". ¡Es una lesión seria! Consulte de inmediato al médico.

Para prevenir la inyección en la piel, siempre:

- Enganche el seguro del gatillo cuando no use el pulverizador.
- No apunte la pistola ni a sí mismo ni a los demás.
- Alivie la presión antes de inspeccionar o reparar cualquier filtración.
- Alivie la presión cuando apague el pulverizador o deje de usarlo.
- No use componentes cuya capacidad nominal sea inferior a la presión máxima de operación del sistema.

No permita que niños usen esta unidad. Si se lesiona usando este equipo, sométase de inmediato a tratamiento médico.

Component Identification and Function

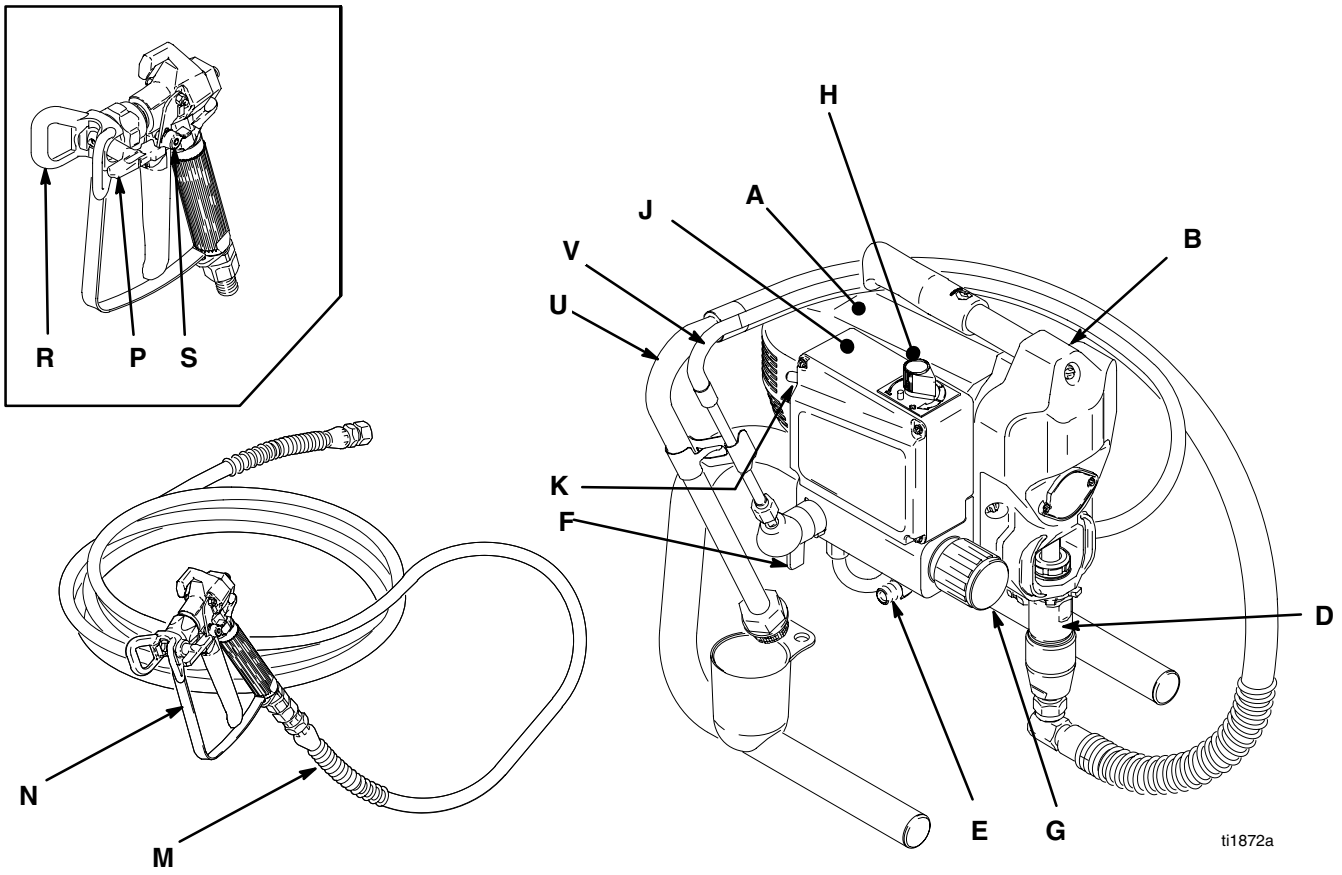


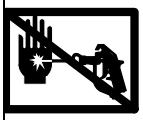
Fig. 1

A	Motor	DC motor, permanent magnet, fan cooled
B	Drive Assembly	Transfers power from DC motor to displacement pump
D	Displacement Pump	Transfers fluid to be sprayed from source through spray gun
E	Fluid Outlet	Spray gun is connected here
F	Prime Valve	Used to prime and drain sprayer (also relieves fluid outlet pressure) when open
G	Fluid Filter	Final filter of fluid to spray gun
H	Pressure Adjusting Knob	Controls fluid outlet pressure
J	Pressure Control	Controls motor speed to maintain fluid outlet pressure at displacement pump outlet. Works with pressure adjusting knob.
K	ON/OFF Switch	Power switch that controls main power to sprayer
M	50 ft (15 m) Main Hose	1/4 in. ID, grounded, nylon hose with spring guards on both ends
N	Spray Gun	High pressure spray gun with gun safety latch
P	RAC 5 Switch Tip	Uses high pressure fluid to clear tip clogs without removing tip from spray gun
R	Tip Guard	Tip guard reduces risk of injection injury
S	Thumb Lock Safety	Gun safety latch inhibits accidental triggering of spray gun
T	Power Cord Rack	Holds wrapped power cord for storage (not shown)
U	Suction Hose	Transfers fluid to be sprayed from source to pump
V	Drain Tube	Fluid outlet used to drain and prime the sprayer

General Repair Information

Pressure Relief Procedure

⚠ WARNING



INJECTION HAZARD
System pressure must be manually relieved to prevent system from starting or spraying accidentally. Fluid under high pressure can be injected through skin and cause serious injury. To reduce risk of injury from injection, splashing fluid, or moving parts, follow **Pressure Relief Procedure** whenever you:

- are instructed to relieve pressure,
- stop spraying,
- check or service any system equipment,
- or install or clean spray tip.

1. Lock gun safety latch.
2. Turn ON/OFF switch to OFF.
3. Unplug power supply cord.
4. Unlock gun safety latch. Hold metal part of gun firmly to grounded metal pail. Trigger gun to relieve pressure.
5. Lock gun safety latch.
6. Open pressure drain valve. Leave pressure drain valve open until ready to spray again.

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

⚠ CAUTION

To reduce risk of pressure control malfunction:

- Use needle nose pliers to disconnect wire. Never pull on wire, pull on connector.
- Mate wire connectors properly. Center flat blade of insulated male connector in female connector.
- Route wires carefully to avoid interference with other connections of pressure control. Do not pinch wires between cover and control box.

1. **Keep all screws, nuts, washers, gaskets, and electrical fittings** removed during repair procedures. These parts are not normally provided with replacement assemblies.

⚠ WARNING

ELECTRIC SHOCK HAZARD
MOVING PARTS HAZARD
To reduce risk of serious injury, including electric shock, do not touch moving or electrical parts with fingers or tools while testing repair. Shut off and unplug sprayer when inspection is complete. Install all covers, gaskets, screws and washers before operating sprayer.

2. **Test repair** after problem is corrected.
3. **If sprayer does not operate properly**, review repair procedure to verify procedure was done correctly. If necessary, see Troubleshooting Guide, pages 5 – 9, for other possible solutions.

⚠ WARNING

HOT SURFACES HAZARD
EXPLOSION HAZARD
Motor and drive housing may be very hot during operation and could burn skin if touched.
Flammable materials spilled on hot, bare motor could cause fire or explosion.
Have motor shroud in place during operation to reduce risk of burns, fire or explosion.

⚠ CAUTION

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

4. **Install motor shroud before operation** of sprayer and replace if damaged. Motor shroud prevents overheating, and protects operator from possible electrical shock by touching terminals of capacitor. It can also reduce risk of burns, fire or explosion; see preceding **WARNING**.

Grounding

⚠ WARNING

Improper installation or alteration of grounding plug results in risk of electric shock, fire or explosion that could cause serious injury or death.

1. All models require 60 Hz, 15A circuit with a 120 Vac grounding receptacle. Fig. 2.
2. Do not alter ground prong or use adapter.

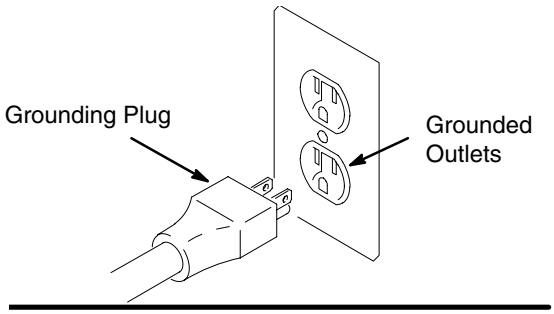
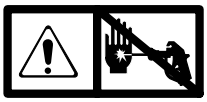


Fig. 2

3. A 12 AWG, 3 wire with grounding prong, 300 ft (90 m) extension cord may be used. Long lengths reduce sprayer performance.

Troubleshooting



Relieve pressure; page 4.

MOTOR WON'T OPERATE

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Basic Fluid Pressure Problems	1. Pressure control knob setting. Motor will not run if at minimum setting (fully counterclockwise).	1. Slowly increase pressure setting to see if motor starts.
	2. Spray tip or fluid filter may be clogged.	2. Relieve pressure and clear clog or clean filter; refer to separate gun or tip instruction manual.
Basic Mechanical Problems	1. Pump (13) for frozen or hardened paint.	1. Thaw sprayer if water or water-based paint has frozen in sprayer. Place sprayer in warm area to thaw. Do not start sprayer until thawed completely. If paint hardened (dried) in sprayer, replace pump packings. Page 19 (**Displacement Pump Replacement**).
	2. Displacement pump connecting rod pin (9a). Pin must be completely pushed into connecting rod (9) and retaining spring (9b) must be firmly in groove of pump pin. Fig. 10.	2. Push pin into place and secure with spring retainer.
	3. Motor (1). Remove drive housing assembly (10). Page 17. Try to rotate fan by hand.	3. Replace motor (1) if fan won't turn. Page 18.
Basic Electrical Problems	1. Motor control board. Board shuts down and displays error code.	1. See **Motor Control Board Diagnostics**, page 14.
	2. Electrical supply. Meter must read: 210–255 Vac for 220–240 Vac models. 85–130 Vac for 100–120 Vac models.	2. Reset building circuit breaker; replace building fuse. Try another outlet.
	3. Extension cord. Check extension cord continuity with volt meter.	3. Replace extension cord.
	4. Sprayer power supply cord (79). Inspect for damage such as broken insulation or wires.	4. Replace power supply cord.

Troubleshooting

MOTOR WON'T OPERATE (Continued)

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Basic Electrical Problems (continued)	*5.* That motor leads are securely fastened and properly mated.	5. Replace loose terminals; crimp to leads. Be sure terminals are firmly connected. Clean circuit board terminals. Securely reconnect leads.
	6. For loose motor brush lead connections and terminals. Page 10.	6. Tighten terminal screws. Replace brushes if leads are damaged. Page 10.
	7. Brush length which must be 1/2 in. minimum. Page 10. **NOTE:** Brushes do not wear at the same rate on both sides of motor. Check both brushes.	7. Replace brushes. Page 10.
	8. For broken or misaligned motor brush springs. Rolled portion of spring must rest squarely on top of brush. Page 10.	8. Replace spring if broken. Realign spring with brush. Page 10.
	9. Motor brushes may be binding in brush holders. Page 10.	9. Clean brush holders. Remove carbon with small cleaning brush. Align brush leads with slot in brush holder to assure free vertical brush movement.
	10. Motor armature commutator for burn spots, gouges and extreme roughness. page 10.	10. Remove motor and have motor shop resurface commutator if possible. Page 18.
	11. Motor armature for shorts using armature tester (growler) or perform spin test. Page 10.	11. Replace motor. Page 18.
Refer to wiring diagram on page 13.	1. Power supply cord (79). Connect volt meter between TP1 (neutral) and TP2 (L2, 120 Vac). Plug in sprayer. Meter must read: 210–255 Vac for 220–240 Vac models. 85–130 Vac for 100–120 Vac models. Unplug sprayer.	1. Replace power supply cord.
	2. ON/OFF switch (23). Connect volt meter between L1 or L and L2 or N terminal on ON/OFF switch. Plug in sprayer and turn ON. Meter must read: 210–255 Vac for 220–240 Vac models. 85–130 Vac for 100–120 Vac models.	2. Replace ON/OFF switch. Page 12.
	3. Motor thermal cutoff switch. Turn sprayer OFF. Check for continuity between TO1 and TO2 with ohmmeter.	3. If thermal switch is open (no continuity), allow motor to cool. If switch remains open after motor cools, replace motor. If thermal switch closes after motor cools, correct cause of overheating.
	4. All terminals for damage or loose fit.	4. Replace damaged terminals and reconnect securely.

Troubleshooting

LOW OR FLUCTUATING OUTPUT

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Low Output	1. For worn spray tip.	1. Follow **Pressure Relief Procedure Warning,** then replace tip. See your separate gun or tip manual.
	2. Verify pump does not continue to stroke when gun trigger is released.	2. Service pump. Page 19.
	3. Filter clogged.	3. Relieve pressure. Check and clean filter.
	4. Prime valve leaking.	4. Relieve pressure. Repair prime valve.
	5. Suction hose connections.	5. Tighten any loose connections.
	6. Electrical supply with volt meter. Meter must read: 210–255 Vac for 220–240 Vac models. 85–130 Vac for 100–120 Vac models. Low voltages reduce sprayer performance.	6. Reset building circuit breaker; replace building fuse. Repair electrical outlet or try another outlet.
	7. Extension cord size and length; must be at least 12 gauge wire and no longer than 300 ft. Longer cord lengths reduce sprayer performance.	7. Replace with a correct, grounded extension cord.
	8. Leads from motor to pressure control circuit board (35) for damaged or loose wires or connectors. Inspect wiring insulation and terminals for signs of overheating.	8. Be sure male terminal blades are centered and firmly connected to female terminals. Replace any loose terminal or damaged wiring. Securely reconnect terminals.
	9. For loose motor brush leads and terminals. Page 10.	9. Tighten terminal screws. Replace brushes if leads are damaged. Page 10.
	10. For worn motor brushes which must be 1/2 in. minimum. Page 10.	10. Replace brushes. Page 10.
	11. For broken and misaligned motor brush springs. Rolled portion of spring must rest squarely on top of brush.	11. Replace spring if broken. Realign spring with brush. Page 10.
	12. Motor brushes for binding in brush holders. Page 10.	12. Clean brush holders, remove carbon dust with small cleaning brush. Align brush lead with slot in brush holder to assure free vertical brush movement.
	13. Low stall pressure.	13. Do either or both: a. Turn pressure control knob fully clockwise. Make sure pressure control knob is properly installed to allow full clockwise position. b. Try a new transducer.
	14. Motor armature for shorts by using an armature tester (growler) or perform spin test. Page 10.	14. Replace motor. Page 18.

Troubleshooting

LOW OR FLUCTUATING OUTPUT

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Motor runs and pump strokes	1. Paint supply.	1. Refill and reprime pump.
	2. Intake strainer clogged.	2. Remove and clean, then reinstall.
	3. Suction tube or fittings loose.	3. Tighten; use thread sealant or sealing tape on threads if necessary.
	4. To see if intake valve ball and piston ball are seating properly. Page 19.	4. Remove intake valve and clean. Check balls and seats for nicks; replace if necessary, page 19. Strain paint before using to remove particles that could clog pump.
	5. Leaking around throat packing nut which may indicate worn or damaged packings. Page 19.	5. Replace packings, page 19. Also check piston valve seat for hardened paint or nicks and replace if necessary. Tighten packing nut/wet-cup.
	6. Pump rod damage.	6. Repair pump, page 19.
	7. Capacitor failure. Visually inspect capacitor near terminals. Ensure that orange safety relief plug is intact.	7. Replace capacitor.
Motor runs but pump does not stroke	1. Displacement pump pin (9a) (damaged or missing), page 19.	1. Replace pump pin if missing. Be sure retainer spring (9b) is fully in groove all around connecting rod, page 19.
	2. Connecting rod assembly (9) for damage, page 17.	2. Replace connecting rod assembly, page 17.
	3. Gears or drive housing, page 17.	3. Inspect drive housing assembly and gears for damage and replace if necessary, page 17.

Troubleshooting

MOTOR IS HOT AND RUNS INTERMITTENTLY

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Motor is hot and runs intermittently.	1. Determine if sprayer was operated at high pressure with small tips, which causes low motor RPM and excessive heat build up.	1. Decrease pressure setting or increase tip size.
	2. Be sure ambient temperature where sprayer is located is no more than 90°F and sprayer is not located in direct sun.	2. Move sprayer to shaded, cooler area if possible.

ELECTRICAL SHORT

TYPE OF PROBLEM	WHAT TO CHECK *If check is OK, go to next check*	WHAT TO DO *When check is not OK refer to this column*
Building circuit breaker opens as soon as sprayer switch is turned on. **CAUTION** Any short in any part of the motor power circuit will cause the control circuit to inhibit sprayer operation. Correctly diagnose and repair all shorts before checking and replacing control board.	1. All electrical wiring for damaged insulation, and all terminals for loose fit or damage. Also wires between pressure control and motor. Page 18.	1. Repair or replace any damaged wiring or terminals. Securely reconnect all wires.
	2. For missing inspection plate gasket (page 18), bent terminal forks or other metal to metal contact points which could cause a short.	2. Correct faulty conditions.
	3. Motor armature for shorts. Use an armature tester (growler) or perform spin test. Page 10. Inspect windings for burns.	3. Replace motor. Page 18.
	4. Motor control board (35) by performing motor control board diagnostics on page 14. If diagnostics indicate, substitute with a good board. **CAUTION:** Do not perform this check until motor armature is determined to be good. A bad motor armature can burn out a good board.	4. Replace with a new pressure control board (35). Page 14.
Building circuit breaker opens as soon as sprayer is plugged into outlet and sprayer is NOT turned on.	1. Basic Electrical Problems on page 5.	1. Perform necessary procedures.
	2. ON/OFF switch (23) page 12. *Be sure sprayer is unplugged!* Disconnect wires from switch. Check switch with ohmmeter. Reading must be infinity with ON/OFF switch OFF, and zero with switch ON.	2. Replace ON/OFF switch. Page 12.
	3. For damaged or pinched wires in pressure control. Page 14.	3. Replace damaged parts. Page 14.
Sprayer quits after sprayer operates for 5 to 10 minutes.	1. Basic Electrical Problems on page 5.	1. Perform necessary procedures.
	2. Electrical supply with volt meter. Meter must read: 210–255 Vac for 220–240 Vac models. 85–130 Vac for 100–120 Vac models.	2. If voltage is too high, do not operate sprayer until corrected.
	3. Tightness of pump packing nut. Over tightening tightens packings on rod, restricts pump action, and damages packings.	3. Loosen packing nut. Check for leaking around throat. Replace pump packings, if necessary. Page 19.

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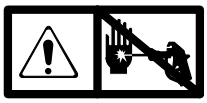
Spin Test

Setup

Electric Shock Hazard; page 4.

To check armature, motor winding and brush electrical continuity:

1.  Relieve pressure**;** page 4.
2. Remove drive housing; page 17.
3. Fig. 3. Remove pressure control cover (39). Disconnect motor leads (F) and (G).
4. Fig. 4. Remove motor shroud (74).

Armature Short Circuit Test

Quickly turn motor fan by hand. If no electrical shorts, motor coasts two or three revolutions before complete stop. If motor does not spin freely, armature is shorted. Replace motor; page 18.

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

1. Connect red and black motor leads together with test lead. Turn motor fan by hand at about two revolutions per second.
2. If uneven or no resistance, check for: broken brush springs, brush leads, motor leads; loose brush terminal screws, motor lead terminals; worn brushes. Repair as needed; page 10.
3. If still uneven or no resistance, replace motor; page 18.

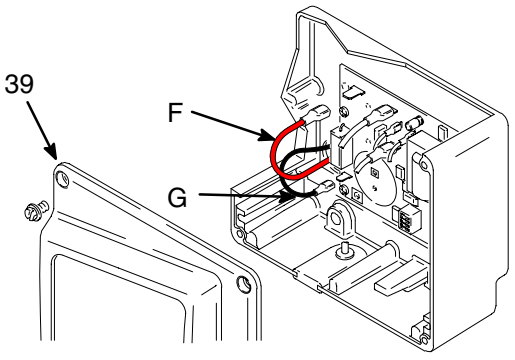


Fig. 3

Motor Brush Replacement

Motor Brush Removal

Replace brushes worn to less than 1/2 in. Check both sides. Brush Repair Kit 243215.

1. Read **General Repair Information**; page 4.
2.  Relieve pressure**;** page 4.
3. Fig. 4. Remove four screws (18) and motor shroud (74).
4. Pry off two brush caps (A). Tag locations of red (+) and black (–) motor leads.
5. Fig. 5. Remove screw (C) and discard brush (B) for motor with capacitor attached. Remove brush lead from control box for motor without capacitor attached.

(Continued on page 11)

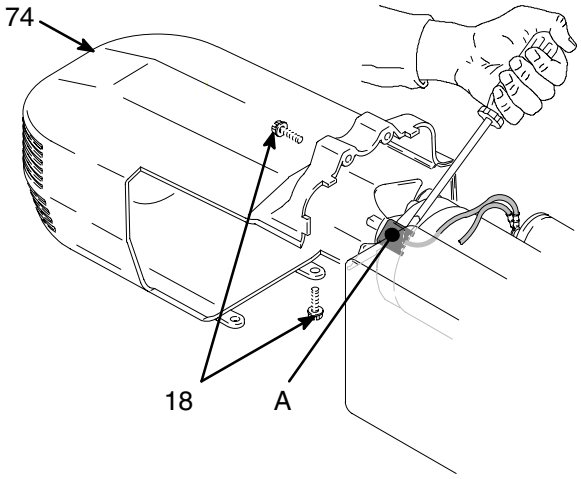


Fig. 4

Motor Brush Replacement

6. Fig. 5. Insert brush (B). Push clip (A) until it snaps into place and secures brush.

⚠ CAUTION

When installing brushes, follow all steps carefully to avoid damaging parts.

7. Fig. 5. Install red (+) and black (–) motor leads according to tags. Install brush lead end with screw (C) to motor-mounted capacitor or route lead into control box and connect to board.

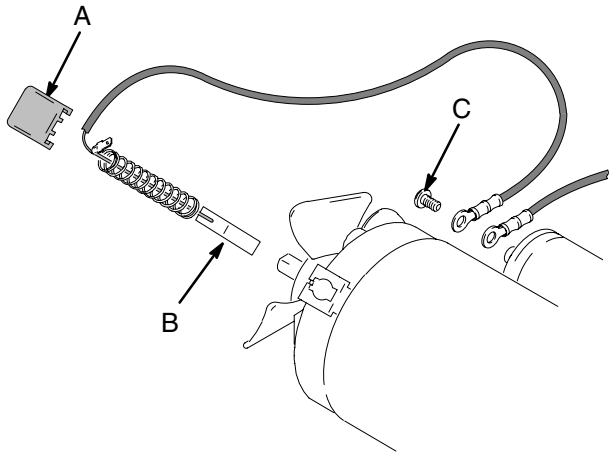


Fig. 5

8. Inspect commutator for excessive pitting, burning or gouging. A black color on commutator is normal. Have commutator resurfaced by a motor repair shop if brushes wear too fast.

9. Test brushes.

   a. Remove pump (13); **Displacement Pump Replacement**, page 19.

   b. With sprayer OFF, turn pressure control knob fully counterclockwise to minimum pressure. Plug in sprayer.

   c. Turn sprayer ON. Slowly increase pressure until motor is at full speed.

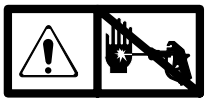
10. Break in brushes.

    a. Operate sprayer 1 hour with no load.

    b. Install pump (13); **Displacement Pump Replacement**, page 19.

On/Off Switch Replacement

Removal

1.  Relieve pressure; page 4.
2. Fig. 6. Remove four screws (18) and pressure control cover (39).
3. Disconnect two wires (A) from ON/OFF switch (23).
4. Remove toggle boot (25) and locking ring (24). Remove ON/OFF switch (23).

Installation

1. Install new ON/OFF switch (23). Install locking ring (24) and toggle boot (25).
2. Connect two wires (A) to ON/OFF switch.
3. Install pressure control cover (39) with four screws (18).

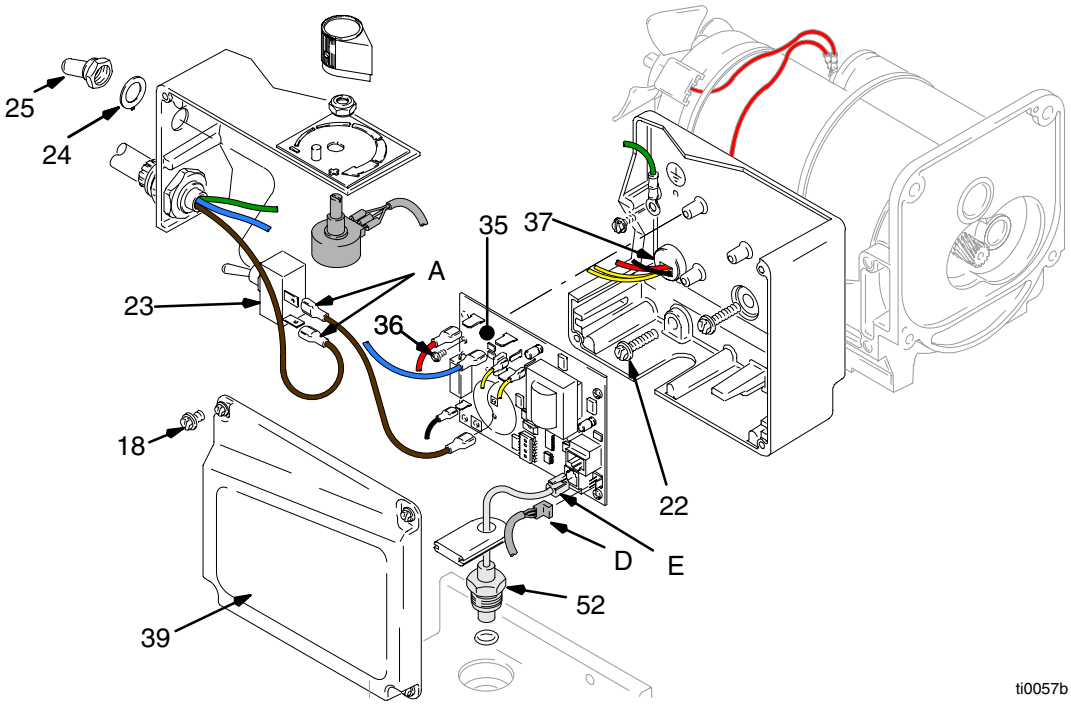


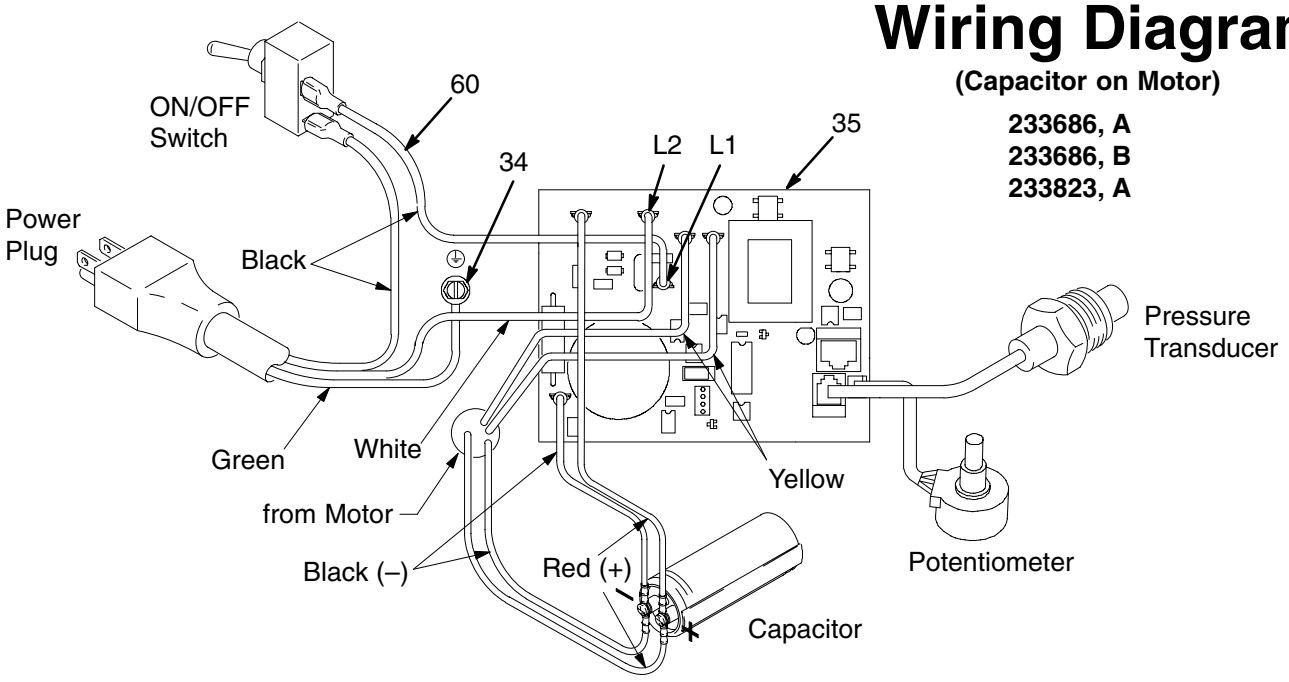
Fig. 6

On/Off Switch Replacement

Wiring Diagram

(Capacitor on Motor)

233686, A
233686, B
233823, A



Wiring Diagram

(Capacitor on Board)

233686, C
233823, B

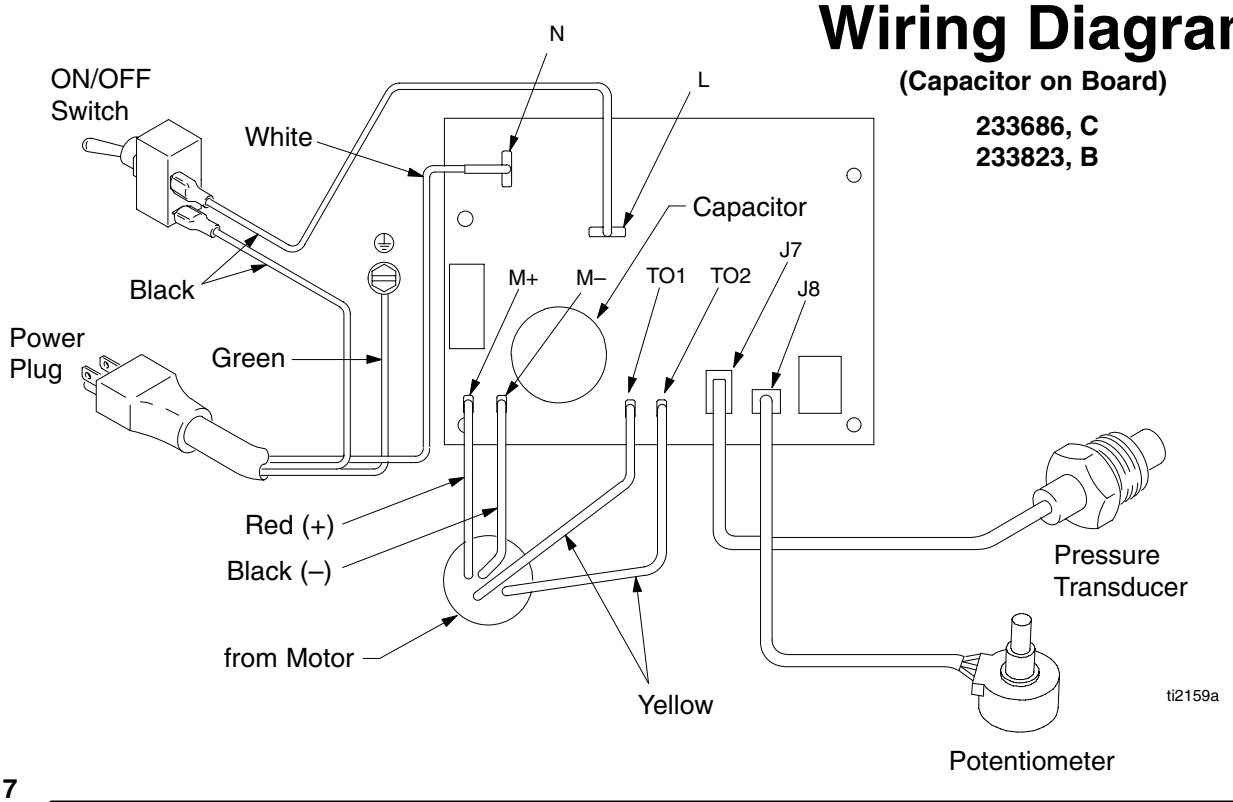


Fig. 7

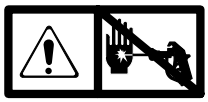
Pressure Control Repair

Motor Control Board Diagnostics

Note: Keep a new transducer on hand to use for test.

⚠ CAUTION

Do not allow sprayer to develop fluid pressure without transducer installed. Leave drain valve open if test transducer is used.

1. Remove four screws (18) and cover (39). Fig. 6.
2. Turn ON/OFF switch ON.
3. Observe LED operation and reference following table:
4.  Relieve pressure and unplug sprayer before servicing control board**;** page 4.

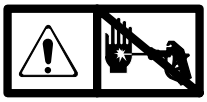
LED BLINKS	SPRAYER OPERATION	INDICATES	WHAT TO DO
Once	Sprayer runs	Normal operation	Do nothing
Once and stays ON	Sprayer shuts down and LED stays ON	Motor open circuit or bad control board	Check motor brushes and armature. If OK, replace motor control board.
Two times repeatedly	Sprayer shuts down and LED continues to blink two times repeatedly	Run away pressure. Pressure greater than 4500 psi (310 bar, 31 MPa).	Replace motor control board. See preceding Motor control board removal procedure.
Three times repeatedly	Sprayer shuts down and LED continues to blink three times repeatedly	Pressure transducer is faulty or missing	Check transducer connection. Open drain valve. Substitute new transducer for transducer in sprayer. If sprayer runs, replace transducer.
Four times repeatedly	Sprayer shuts down and LED continues to blink four times repeatedly	Line voltage is too high	Check for voltage supply problems
Five times repeatedly	Sprayer shuts down and LED continues to blink five times repeatedly	Too much current	Check for locked rotor, shorted wiring or motor. Repair or replace failed parts.
Six times repeatedly	Sprayer shuts down and LED continues to blink six times repeatedly	Motor thermal switch open circuit	Check for binding in pump or drive. Check for bad motor.

Pressure Control Repair

Motor Control Board

Removal

Refer to Fig. 6 and 7.

1.  Relieve pressure; page 4.
2. Remove four screws (18) and cover (39).
3. Disconnect at motor control board (35):
   - Four motor leads: two yellow, black (–) and red (+).
   - Two line voltage leads.
   - Lead (D) from potentiometer.
   - Lead (E) from transducer.
4. Remove five screws (36) and circuit board (35).

Installation

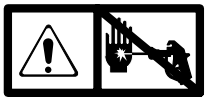
1. Clean pad on rear of motor control board. Apply small amount of thermal compound 073019 to pad.
2. Fig. 6 and 7. Install motor control board (35) with five screws (36).
3. Connect to motor control board (35):
   - Lead (E) to transducer.
   - Lead (D) to potentiometer.
   - Two line voltage leads.
   - Four motor leads: two yellow, black (–) and red (+).
4. Bundle and tie all loose wires.
5. Install cover (39) with four screws (18).

Pressure Control Repair

Pressure Control Transducer

Removal

Refer to Fig. 6 and 7.

1.  Relieve pressure; page 4.
2. Remove four screws (18) and cover (39).
3. Disconnect lead (E) from motor control board (35).
4. Remove two screws (22) and filter housing (45).
5. Thread transducer lead plastic connector down through transducer grommet (28).
6. Remove pressure control transducer (52) and packing o-ring (51) from filter housing.

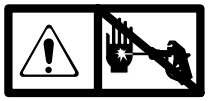
Installation

1. Install packing o-ring (51) and pressure control transducer (52) in filter housing (45). Torque to 30–35 ft-lb.
2. Thread transducer lead plastic connector up through transducer grommet (28).
3. Install filter housing (45) with two screws (22).
4. Connect lead (E) to motor control board (35).
5. Install cover (39) with four screws (18).

Pressure Adjust Potentiometer

Removal

Refer to Fig. 6 and 7.

1.  Relieve pressure; page 4.
2. Remove four screws (18) and cover (39).
3. Disconnect all leads from motor control board (35).
4. Remove five screws (36) and board (35)
5. Remove potentiometer knob (27), sealing shaft nut (33) and pressure adjust potentiometer (26).

Installation

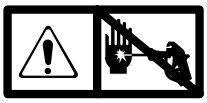
1. Install pressure adjust potentiometer (26), sealing shaft nut (33) and potentiometer knob (27).
   a. Turn potentiometer fully clockwise.
   b. Install knob at full clockwise position.
2. Install board (35) with five screws (36).
3. Connect all leads to motor control board (35).
4. Install cover (39) with four screws (18).

Drive Housing Replacement

⚠ CAUTION

Do not drop gear cluster (7) when removing drive housing (10). Gear cluster may stay engaged in motor front end bell or drive housing.

Disassembly

1.  Relieve pressure**;** page 4.
2. Remove pump (13); **Displacement Pump Replacement**, page 19.
3. Fig. 8. Remove two screws (18a).Tip sprayer up. Remove two screws (18b) and remove shroud (74).
4. Remove two front screws (22).
5. Remove two back screws (22).
6. Pull drive housing (10) off of motor (1).

Assembly

1. Push drive housing (10) onto motor (1)
2. Install two front screws (22).
3. Install two back screws (22).
4. Fig. 8. Install shroud (74) with two screw (18a).Tip sprayer up. Install two screws (18b).
5. Install pump (13); **Displacement Pump Replacement**, page 19.
6. Install new access cover (10a) with two screws (10b).

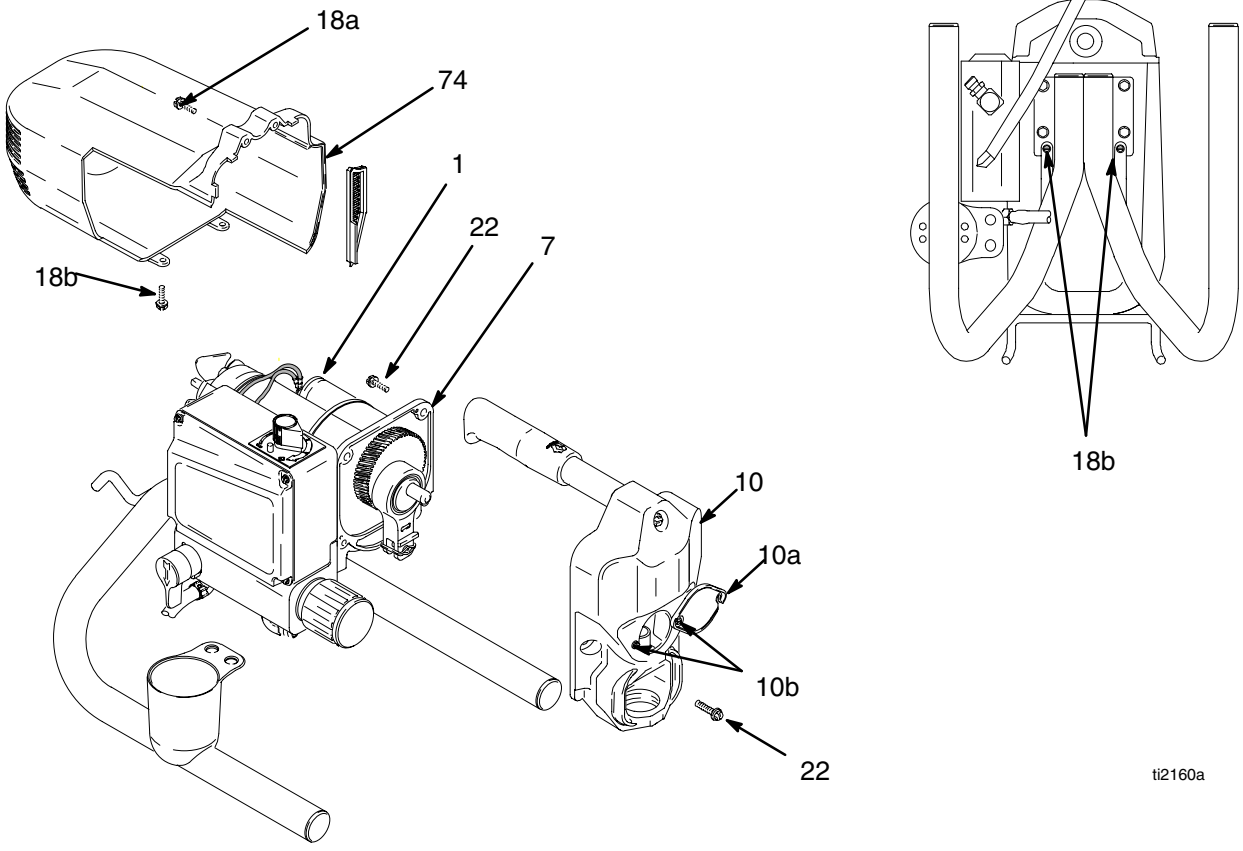
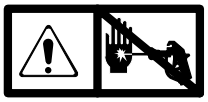


Fig. 8

Motor Replacement

Disassembly

1.  Relieve pressure**;** page 4.

2. Remove pump (13); **Displacement Pump Replacement**, page 19.

⚠ CAUTION

Do not drop gear cluster (7) when removing drive housing (10). Gear cluster may stay engaged in motor front end bell or drive housing.

3. Remove drive housing (10); **Drive Housing Replacement**, page 17.

4. Remove four screws (18) and cover (39).

5. Disconnect all leads from board (35). Remove five screws (36) and board.

6. Remove strain relief (37; Fig. 6) and motor fan (2).

7. Remove three screws (22) behind board and remove control housing (21).

8. Remove four screws (22) and motor (1) from frame (63).

Assembly

1. Install new motor (1) on frame (63) with four screws (22).

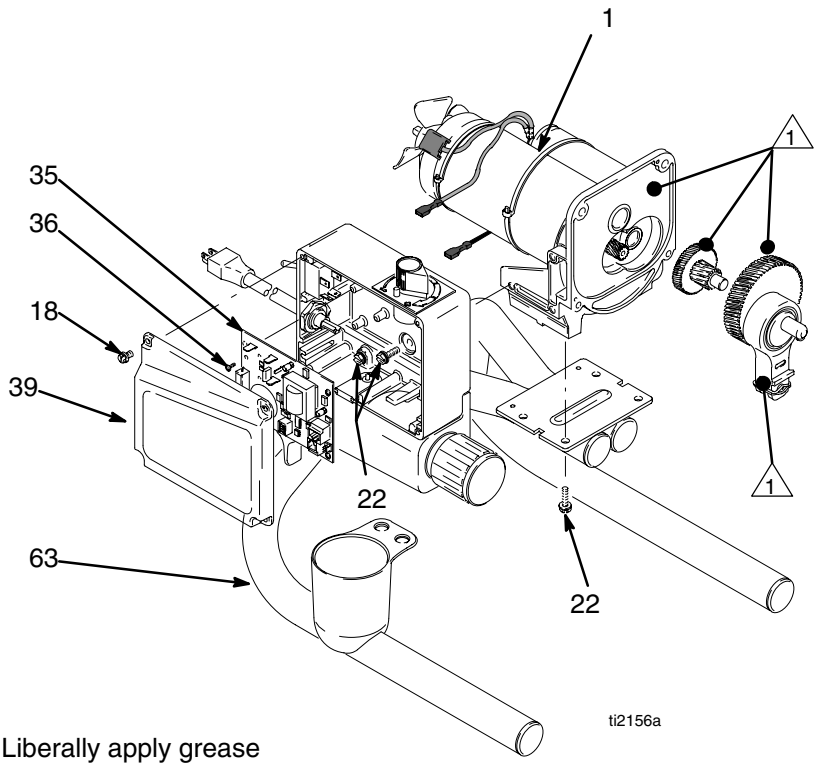
2. Install control housing (21) with three screws (22).

3. Install strain relief (37; Fig. 6) and motor fan (2).

4. Install board (35) with five screws (36). Connect all leads to board (35).

5. Install drive housing (10); **Drive Housing Replacement**, page 17.

6. Install pump (13); **Displacement Pump Replacement**, page 19.



1 Liberally apply grease

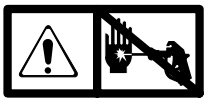
Fig. 9

Displacement Pump Replacement

See manual 309053 for pump repair instructions.

See manual 309385 for sprayer part number references.

Removal

1. Flush pump (13).
2.  Relieve pressure; page 4.
3. Fig. 10. Loosen two screws (10b) and rotate cover (10a).

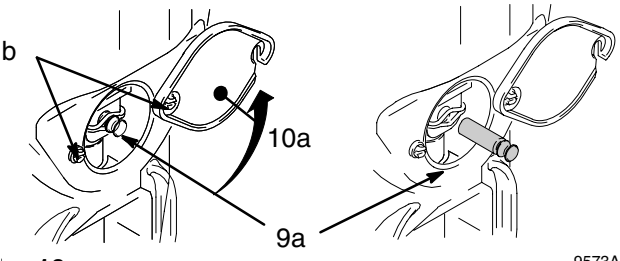


Fig. 10

4. Cycle pump until pump pin (9a) is in position to be removed. Remove pump pin (9a).
5. Fig. 11. Remove suction tube (78) and hose (19).
6. Loosen pump jam nut (12). Unscrew pump.

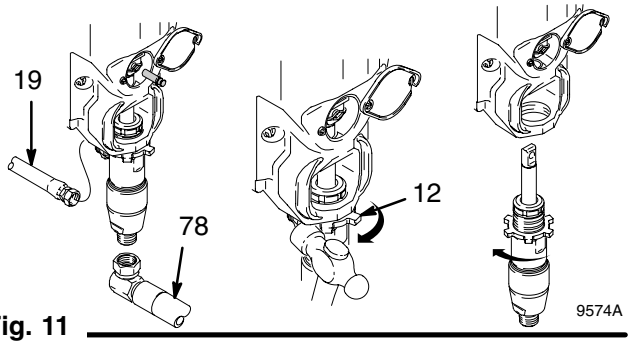


Fig. 11

Installation

⚠ WARNING

If pin works loose, parts could break off due to force of pumping action. Parts could project through the air and result in serious injury or property damage.

⚠ CAUTION

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

1. Fig. 12. Extend pump piston rod fully. Apply grease to top of pump rod at (A) or inside connecting rod.

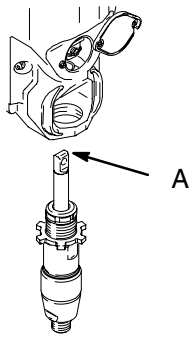


Fig. 12

2. Fig. 10. Install pump pin (9a). Verify retainer spring (9b) is in groove of pump pin.
3. Push pump up until pump threads engage.
4. Screw in pump until threads are flush with drive housing opening. Align pump outlet to back.
5. Fig. 11. Install suction tube (78) and hose (19).
6. Fig.13. Screw jam nut (12) up onto pump until nut stops. Tighten jam nut by hand, then tap 1/8 to 1/4 turn with a 20 oz (maximum) hammer to approximately 75 +/–5 ft-lb (102 N·m).

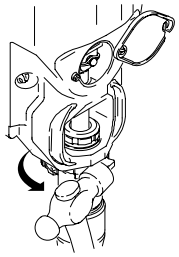


Fig. 13

7. Fig. 14. Fill packing nut with Graco TSL until fluid flows onto top of seal.

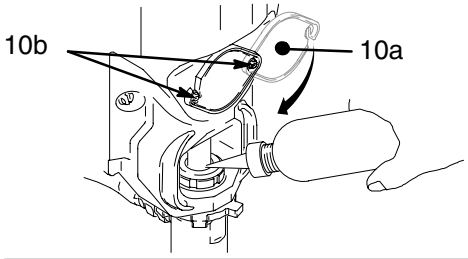


Fig. 14

8. Fig. 10. rotate cover (10a); tighten screws (10b).

Technical Data

100–120V, ∅, A, Hz	Generator Minimum W	Motor HP (W)	Cycles per gallon (liter)	Maximum Delivery gpm (lpm)	Maximum Tip size	Fluid Outlet npsm
1, 15, 50/60	3000	7/8 (653)	680 (180)	0.38 (1.25)	0.019	1/4 in.

Basic Sprayer Wetted Parts: . . . . . zinc-plated carbon steel, polyurethane, polyethylene, stainless steel, Teflon®, Delrin®, chrome plating, leather, V-Max™ UHMWPE, aluminum, stainless steel, tungsten carbide

NOTE: Delrin® and Teflon® are registered trademarks of the DuPont Co.

Dimensions

Model	Weight lb (kg)	Height in. (cm)	Length in. (cm)	Width in. (cm)
Stand	36.0 (16.3)	17.75 (45.1)	14.5 (36.8)	13.5 (34.3)
Hi-boy	54 (24)	29.5 (74.9) Handle down; 39.5 (100.3) Handle up	21.0 (53.3)	20.5 (52.1)

Notes

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

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

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

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