



2700 and 3100 Airless Paint Sprayers

- For portable spray application of architectural paints and coatings -

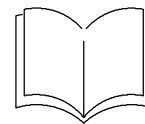
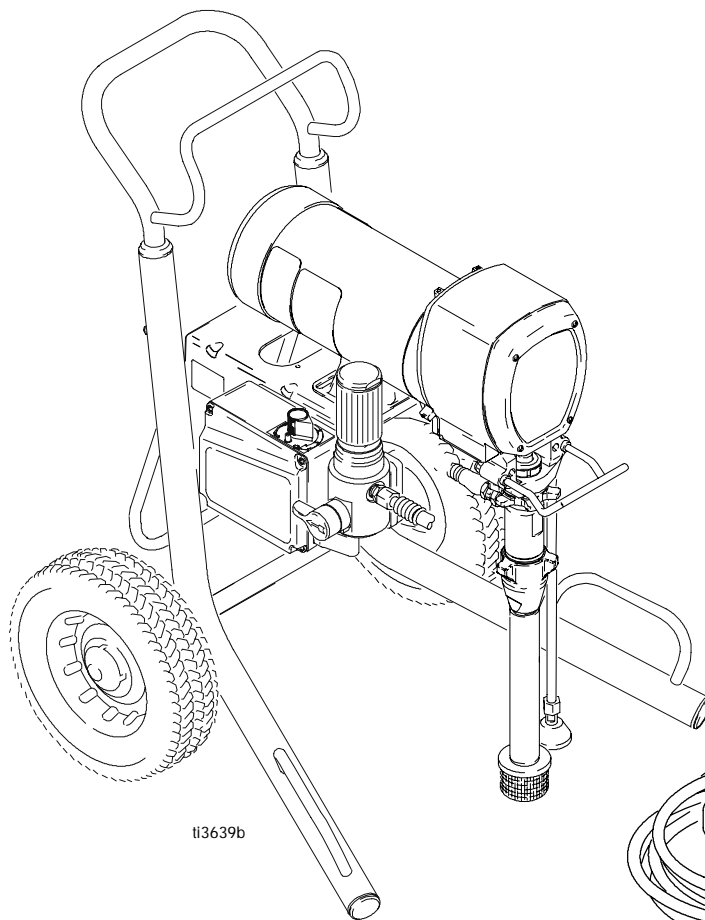
Models 249161, 249162, 249170, 249171

3000 psi (21 MPa, 210 bar) Maximum Working Pressure



Important Safety Instructions

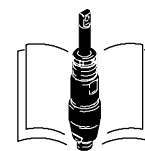
Read all warnings and instructions in this manual.
Save these instructions.



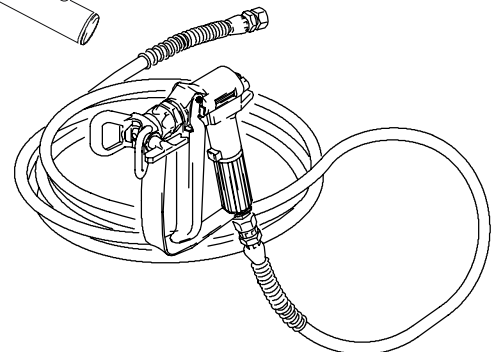
Related Manuals



..... 310939



..... 311061



Models 249170, 249171







Models 249161, 249162

Specifications

This equipment is not intended for use with flammable or combustible materials used in places such as cabinet shops or other "factory" or fixed locations. If you intend to use this equipment in this type of application, you must comply with NFPA 33 and OSHA requirements for the use of flammable and combustible materials.

Warnings

The following are general warnings related to the setup, use, grounding, maintenance and repair of this equipment. Additional, more specific warnings may be found throughout the body of this manual where applicable. Symbols appearing in the body of the manual refer to these general warnings. When these symbols appear through the manual, refer back to these pages for a description of the specific hazard.

 WARNING	
	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none">D Use equipment only in well ventilated area.D Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop clothes (potential static arc).D Sprayer generates sparks. When flammable liquid is used in or near sprayer or for flushing or cleaning, keep sprayer at least 20 ft (6 m) away from explosive vapors.D Keep work area free of debris, including solvent, rags and gasoline.D Do not plug or unplug power cords or turn lights on or off when flammable fumes are present.D Ground equipment and conductive objects in work area. Read Grounding instructions.D If there is static sparking or you feel a shock, stop operating immediately. Do not use equipment until you identify and correct the problem.D Keep a fire extinguisher in the work area.
	<p>ELECTRIC SHOCK HAZARD</p> <p>Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none">D Turn off and disconnect power cord before servicing equipment.D Use only grounded electrical outlets.D Use only 3-wire extension cords.D Ensure ground prongs are intact on sprayer and extension cords.D Do not expose to rain. Store indoors.
	<p>TOXIC FLUID HAZARD</p> <p>Toxic fluid or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none">D Read MSDS's to know the specific hazards of the fluids you are using.D Store hazardous fluid in approved containers and dispose of it according to all applicable guidelines.

⚠ WARNING



SKIN INJECTION HAZARD

High pressure fluid from gun, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. **Get immediate surgical attention.**

- D Do not point gun at anyone or any part of the body.
- D Do not put your hand over the spray tip.
- D Do not stop or deflect leaks with your hand, body, glove, or rag.
- D Engage trigger lock when not spraying.
- D Follow Pressure Relief Procedure in this manual, when you stop spraying and before cleaning, checking or servicing equipment.



INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- D Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. Read **Technical Data** in all equipment manuals.
- D Use fluids and solvents that are compatible with equipment wetted parts. Read **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer.
- D Check equipment daily. Repair or replace worn or damaged parts immediately with genuine ASM replacement parts only.
- D Do not alter or modify equipment.
- D Use equipment only for its intended purpose. Call your ASM distributor for information.
- D Route hoses and cables away from traffic areas, sharp edges, moving parts and hot surfaces.
- D Do not kink or overbend hoses or use hoses to pull equipment.
- D Keep children and animals away from work area.
- D Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- D Comply with all applicable safety regulations.



PRESSURIZED ALUMINUM PARTS HAZARD

Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in this equipment. Such use could result in a serious chemical reaction, with the possibility of explosion, which could cause death, serious injury and/or substantial property damage.



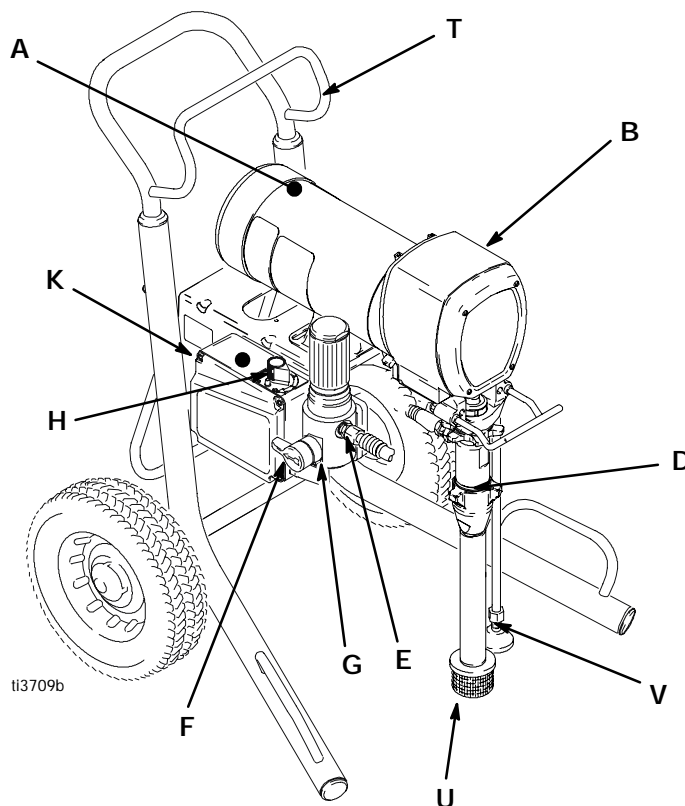
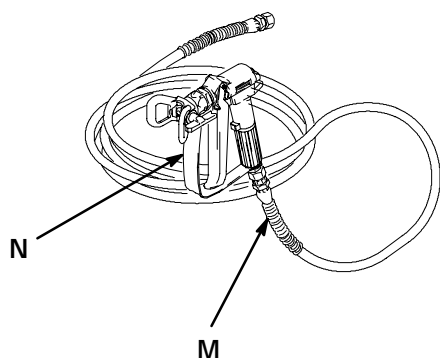
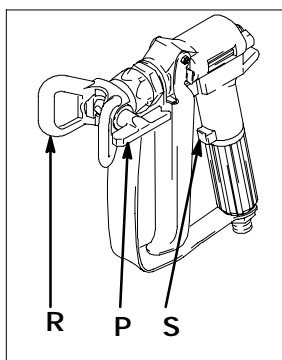
PERSONAL PROTECTIVE EQUIPMENT

You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, inhalation of toxic fumes, burns, and hearing loss. This equipment includes, but is not limited to:

- D Protective eye wear.
- D Clothing and respirator as recommended by the fluid and solvent manufacturer.
- D Gloves.
- D Hearing protection.



Component Identification and Function



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 hose 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
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	Spray Tip	Uses high pressure fluid to clear tip clogs without removing tip from spray gun
R	Reversible Tip Guard	Tip guard reduces risk of injection injury
S	Gun Safety Lock	Gun safety latch inhibits accidental triggering of spray gun
T	Power Cord Rack	Holds wrapped power cord for storage
U	Suction Tube	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



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:

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:

- D Use needle nose pliers to disconnect wire. Never pull on wire, pull on connector.
- D Mate wire connectors properly. Center flat blade of insulated male connector in female connector.
- D 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.

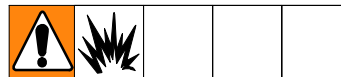


To reduce risk of serious injury, including electric shock, do not touch moving or electrical parts with fingers or tools while testing repair. Shut off and unplug sprayer when inspection is complete. Install all covers, gaskets, screws and washers before operating sprayer.

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 7 - 11, for other possible solutions.



Motor and drive housing may be very hot during operation and could burn skin if touched.



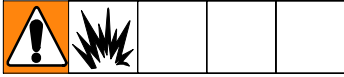
Flammable materials spilled on hot, bare motor could cause fire or explosion. Have motor shroud in place during operation to reduce risk of burns, fire or explosion.

CAUTION

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

4. **Install motor shield before operation** of sprayer and replace if damaged. Motor shield 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



The sprayer must be grounded. Grounding reduces the risk of static and electric shock by providing an escape wire for the electrical current due to static build up or in the event of a short circuit.

1. All models require a grounded outlet for power connection. Circuit must be 50–60 Hz with an ampere rating equal to or greater than the sprayer. See Fig. 1.
2. Do not alter ground prong or use adapter.

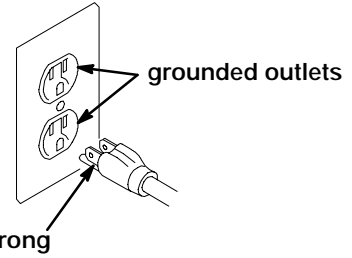


Fig. 1

3. 120 Vac: A 12 AWG, 3 wires with grounding prong, 300 ft (90 m) extension cord may be used.
220–240 Vac: Use a 3-wire 1.0mm (12 AWG) (minimum) extension cord up to 90 m long. Long lengths reduce sprayer performance.

Troubleshooting



Relieve pressure; page 6.

MOTOR WON'T OPERATE

TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
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. Pressure control knob setting.	1. Motor stops running when pressure setting is reached.
	2. Pump (13) for frozen or hardened paint.	2. 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. (Displacement Pump Replacement , page 29.)
	2. Displacement pump connecting rod pin (112). Pin must be completely pushed into connecting rod (76) and retaining spring (27) must be firmly in groove of pump pin.	2. Push pin into place and secure with spring retainer.
	3. Motor (75). Remove drive housing assembly (78). See page 27. Try to rotate fan by hand.	3. Replace motor (75) if fan won't turn. See page 28.

TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
Basic Electrical Problems	1. Motor control board. Board shuts down and displays error code.	1. Motor Control Board Diagnostics, page 24.
	2. Electrical supply. Meter must read 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 (66). Inspect for damage such as broken insulation or wires.	4. Replace power supply cord.
	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. See page 13.	6. Tighten terminal screws. Replace brushes if leads are damaged. See page 13.
	7. Brush length, which must be 1/2 in. minimum. See page 13. NOTE: Brushes do not wear at the same rate on both sides of motor. Check both brushes.	7. Replace brushes. See page 13.
	8. For broken or misaligned motor brush springs. Rolled portion of spring must rest squarely on top of brush. See page 13.	8. Replace spring if broken. Realign spring with brush. See page 13.
	9. Motor brushes may be binding in brush holders. See page 13.	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. See page 13.	10. Remove motor and have motor shop resurface commutator if possible, page 28.
	11. Motor armature for shorts using armature tester (growler) or perform spin test. See page 12.	11. Replace motor, page 28.
Refer to wiring diagram on page 40, to identify test points (TP).	1. Power supply cord (66). Connect volt meter between TP1 (neutral) and TP2 (L2, 120 Vac). Plug in sprayer. Meter must read 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 85-130 Vac for 100-120 Vac models.	2. Replace ON/OFF switch, page 16.
	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 <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
Low Output	1. For worn spray tip.	1. Follow Pressure Relief Procedure , 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 29.
	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 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 circuit board (100) 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 13.	9. Tighten terminal screws. Replace brushes if leads are damaged, page 13.
	10. For worn motor brushes, which must be 1/2 in. minimum, page 13.	10. Replace brushes, page 13.
	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 13.
	12. Motor brushes for binding in brush holders, page 13.	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 12.	14. Replace motor, page 28.

Troubleshooting

LOW OR FLUCTUATING OUTPUT

TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
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 29.	4. Remove intake valve and clean. Check balls and seats for nicks; replace if necessary, page 29. 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 29.	5. Replace packings, page 29. 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 29.
	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 (112) (damaged or missing), page 29.	1. Replace pump pin if missing. Be sure retainer spring (27) is fully in groove all around connecting rod, page 29.
	2. Connecting rod assembly (76) for damage, page 27.	2. Replace connecting rod assembly, page 27.
	3. Gears or drive housing, page 27.	3. Inspect drive housing assembly and gears for damage and replace if necessary, page 27.

Troubleshooting

MOTOR IS HOT AND RUNS INTERMITTENTLY

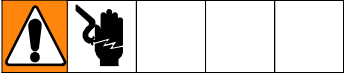
TYPE OF PROBLEM	WHAT TO CHECK <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
Motor is hot and runs intermittently.	1. Determine if sprayer was operated at high pressure with small tips, which causes low motor RPM and excessive heat build up.	1. Decrease 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 <i>If check is OK, go to next check</i>	WHAT TO DO <i>When check is not OK refer to this column</i>
<p>Building circuit breaker opens as soon as sprayer switch is turned on.</p> <p style="text-align: center;">CAUTION</p> <p>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.</p>	1. All electrical wiring for damaged insulation, and all terminals for loose fit or damage. Also wires between pressure control and motor. See page 28.	1. Repair or replace any damaged wiring or terminals. Securely reconnect all wires.
	2. For missing inspection plate gasket, 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 12. Inspect windings for burns.	3. Replace motor, page 28.
	4. Pressure control board (100) by performing motor control board diagnostics, page 24. 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 motor control board (100), page 24.
Building circuit breaker opens as soon as sprayer is plugged into outlet and sprayer is NOT turned on.	1. Basic Electrical Problems, page NO TAG.	1. Perform necessary procedures.
	2. ON/OFF switch (86), page 16. <i>Be sure sprayer is unplugged!</i> 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 16.
	3. For damaged or pinched wires in pressure control, page 24.	3. Replace damaged parts, page 24.
Sprayer quits after sprayer operates for 5 to 10 minutes.	1. Basic Electrical Problems, page NO TAG.	1. Perform necessary procedures.
	2. Electrical supply with volt meter. Meter must read 85-130 Vac for 100-120 Vac models and 210-255 Vac for 220-240 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 29.

Spin Test

Setup



Electric Shock Hazard; page 6.

To check armature, motor winding and brush electrical continuity:



1. Relieve pressure; page 6.
2. Remove drive housing, page 27.
3. Fig. 2. Remove four screws (23) and pressure control cover (56). Disconnect motor leads (F) and (G).
4. Fig. 3. Remove motor shield (1) and inspection covers (A).

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 28.

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 13.
3. If still uneven or no resistance, replace motor, page 28.

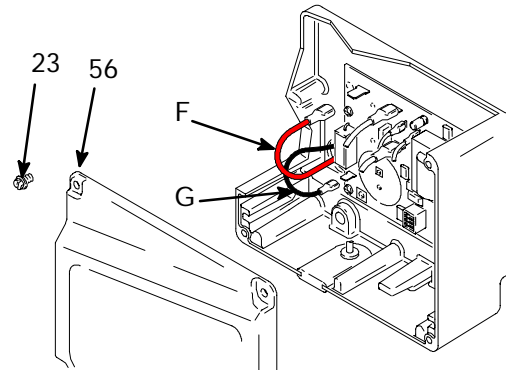


Fig. 2

9578C

Motor Brush Replacement

Motor Brush Removal

Replace brushes worn to less than 1/2 in. Check both sides. Brush Repair Kit 220853 is available. Spring clip, 110816 may be purchased separately.

1. Read General Repair Information, page 6.



2. Relieve pressure; page 6.
3. Fig. 3. Remove motor shield (1). Remove two inspection covers (A) and gaskets on each side of motor.
4. Fig. 4. Push in spring clip (J) to release hook (B) from brush holder (C). Pull out spring clip.
5. Fig. 4. Loosen terminal screw (D). Pull brush lead (E) out of terminal, leaving motor lead (F) in place. Remove brush (G) and spring (H).
6. 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.

(Continued on page 14)

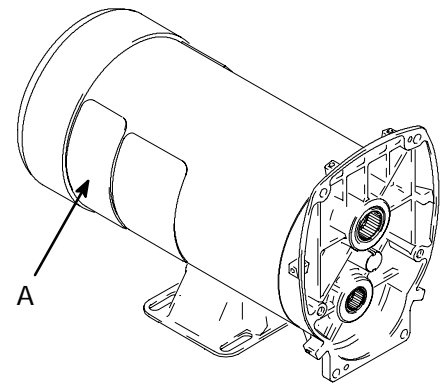


Fig. 3

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⚠ 1 Motor lead; do not disconnect

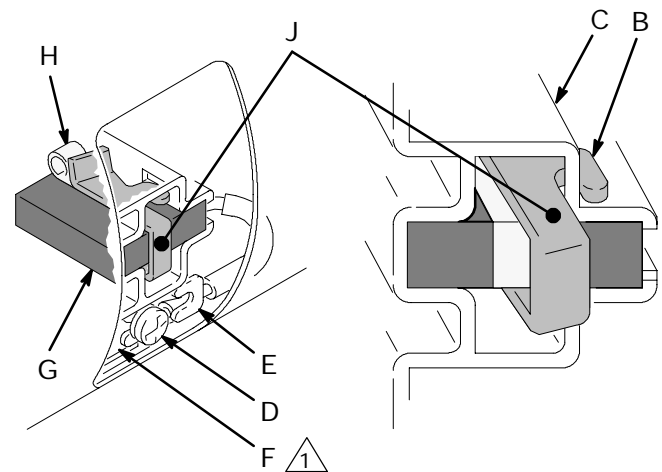


Fig. 4

1227

Motor Brush Replacement

Motor Brush Installation

CAUTION

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

1. Fig. 5. Install new brush (G) with lead into long slot (K) of brush holder (C).
2. Fig. 5. Slide brush lead (E) under washer of terminal screw (D) and tighten screw. Be sure motor lead (F) is connected at terminal screw.
3. Fig. 5. Place spring (H) on brush (G). Install spring clip (J). Push down to hook slots (L) in brush holder (C).
4. Repeat for other side.
5. Test brushes.
 - a. Remove pump connecting rod pin (112); refer to **Removal**, step 5, page 29.
 - 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.
6. Fig. 3. Install gaskets and inspection covers (A) on each side of motor.

CAUTION

To avoid damaging pump packing, do not run sprayer dry for more than 30 seconds while checking brushes.

7. Break in brushes.
 - a. Operate sprayer 1 hour with no load.
 - b. Install pump connecting rod pin (112), refer to **Installation**, step 2, page 29.
8. Install motor shield (1).

 Note spring coil direction

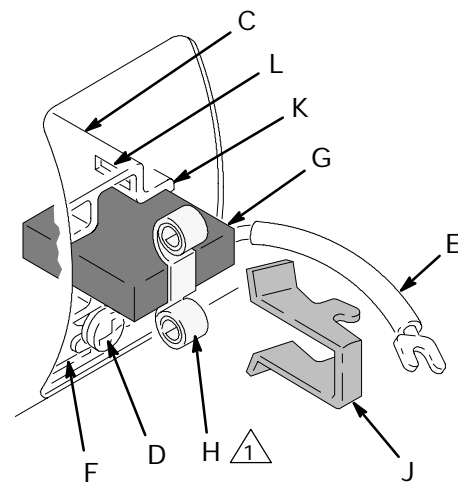


Fig. 5

1227

On/Off Switch Replacement

120 Vac (Model 249161)

Removal



1. Relieve pressure; page 6.
2. Remove four screws (23) and pressure control cover (56).
3. Disconnect two wires (A) from ON/OFF switch (86).
4. Remove toggle boot (42) and locking ring (43). Remove ON/OFF switch (86).

Installation

1. Install new ON/OFF switch (86). Install locking ring (43) and toggle boot (42).
2. Connect two wires (A) to ON/OFF switch. (Wiring diagram, Fig. 7.)
3. Install pressure control cover (56) with four screws (23).

120 Vac

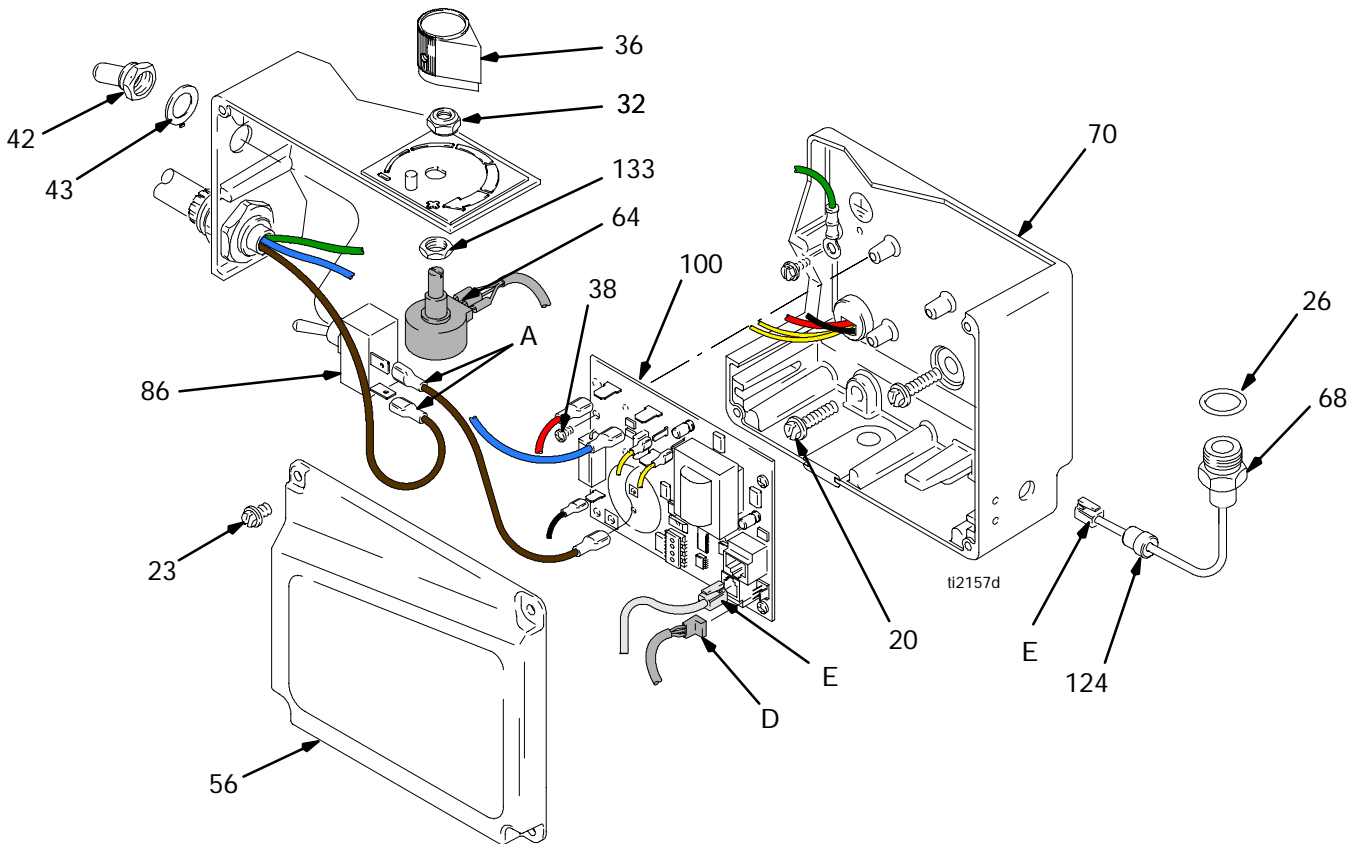


Fig. 6

Wiring Diagram

110 Vac (Model 249170)

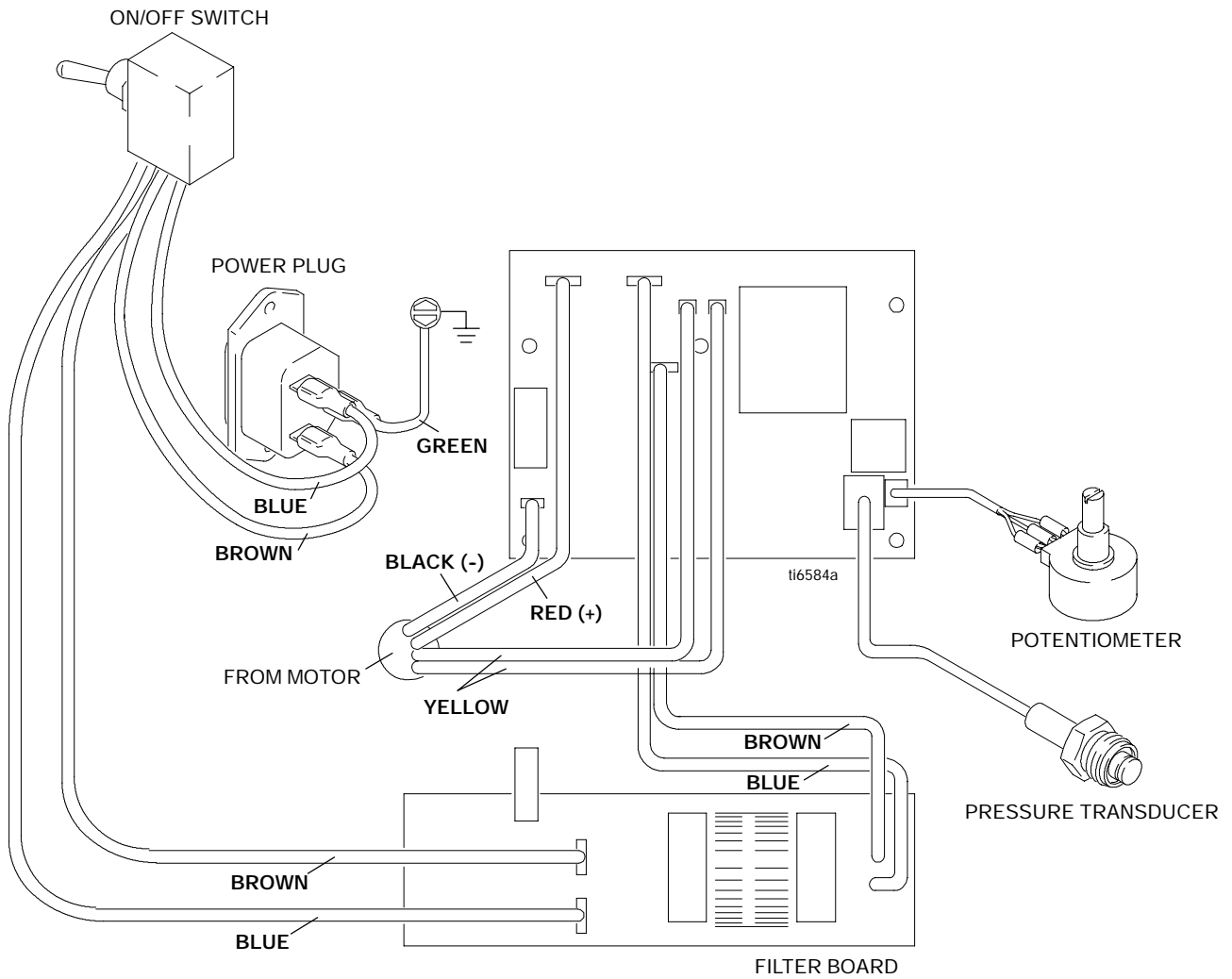


Fig. 9

On/Off Switch Replacement

240 Vac (Model 249171)

Removal



1. Relieve pressure; page 6.
2. Remove pressure control cover (56).
3. Remove display connector (B) from plug (C).
4. Disconnect four wires (A) at ON/OFF switch (18).
5. Remove toggle boot (25) and locking ring (24). Remove ON/OFF switch (18).

Installation

1. Install new ON/OFF switch (18). Install locking ring (24) and toggle boot (25).
2. Connect four wires (A) to ON/OFF switch (18).
3. Install pressure control cover (56).

240 Vac

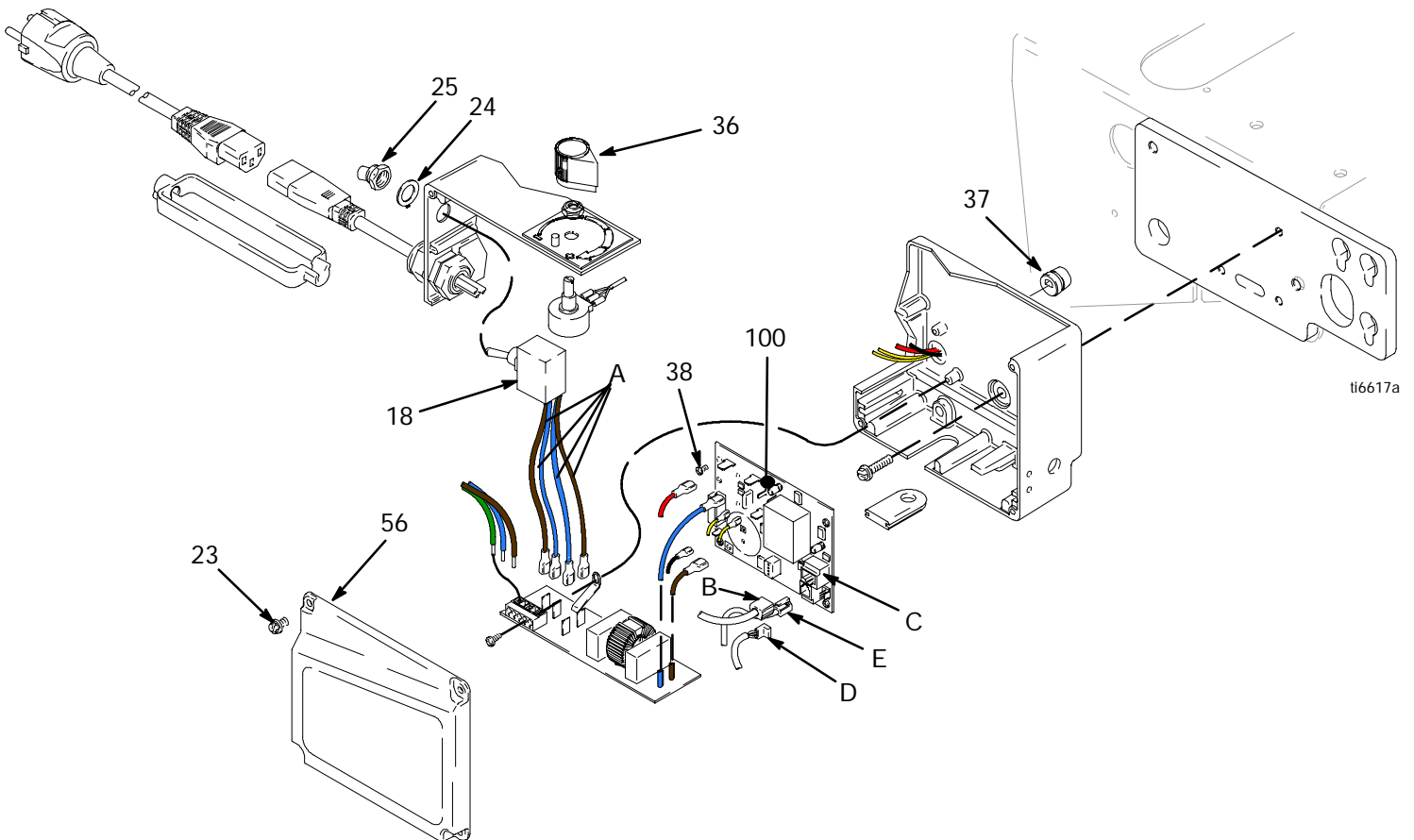


Fig. 10

Wiring Diagram

240 Vac (Model 249171)

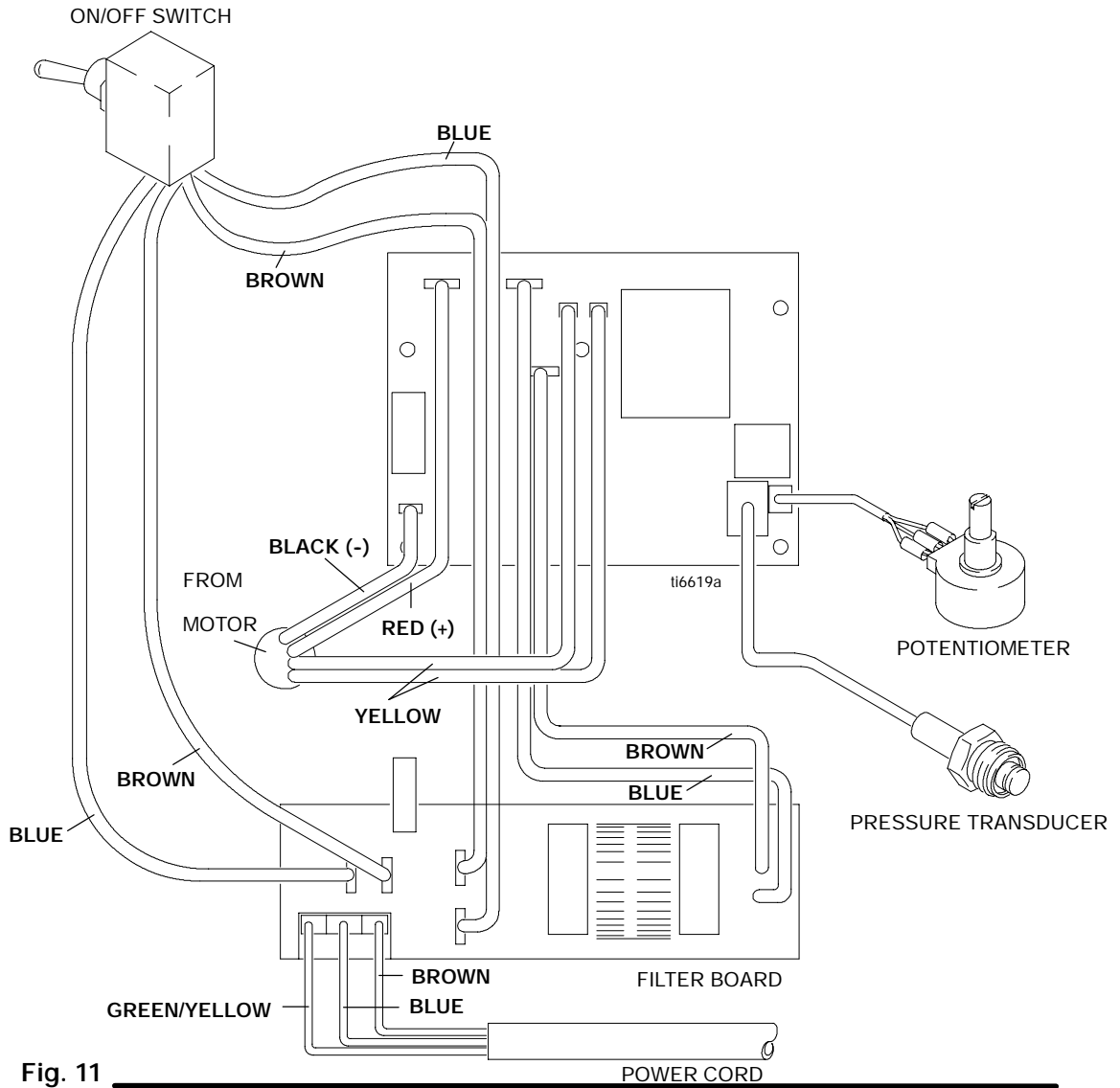


Fig. 11

POWER CORD

On/Off Switch Replacement

120 Vac (Model 249162)

Removal



1. Relieve pressure; page 6.
2. Remove four screws (23) and pressure control cover (56).
3. Remove two screws (108) and control panel (67).
4. Disconnect two wires (A) from ON/OFF switch (18).
5. Squeeze inside tabs on ON/OFF switch (18) and remove from control panel (67).

Installation

1. Push ON/OFF switch (18) into control panel (67) until inside tabs snap in place.
2. Connect two wires (A) to ON/OFF switch (18).
3. Install control panel (67) with two screws (108).
4. Connect display connector (B) (not available on all sprayers). Install pressure control cover (56) with four screws (23).

120 Vac

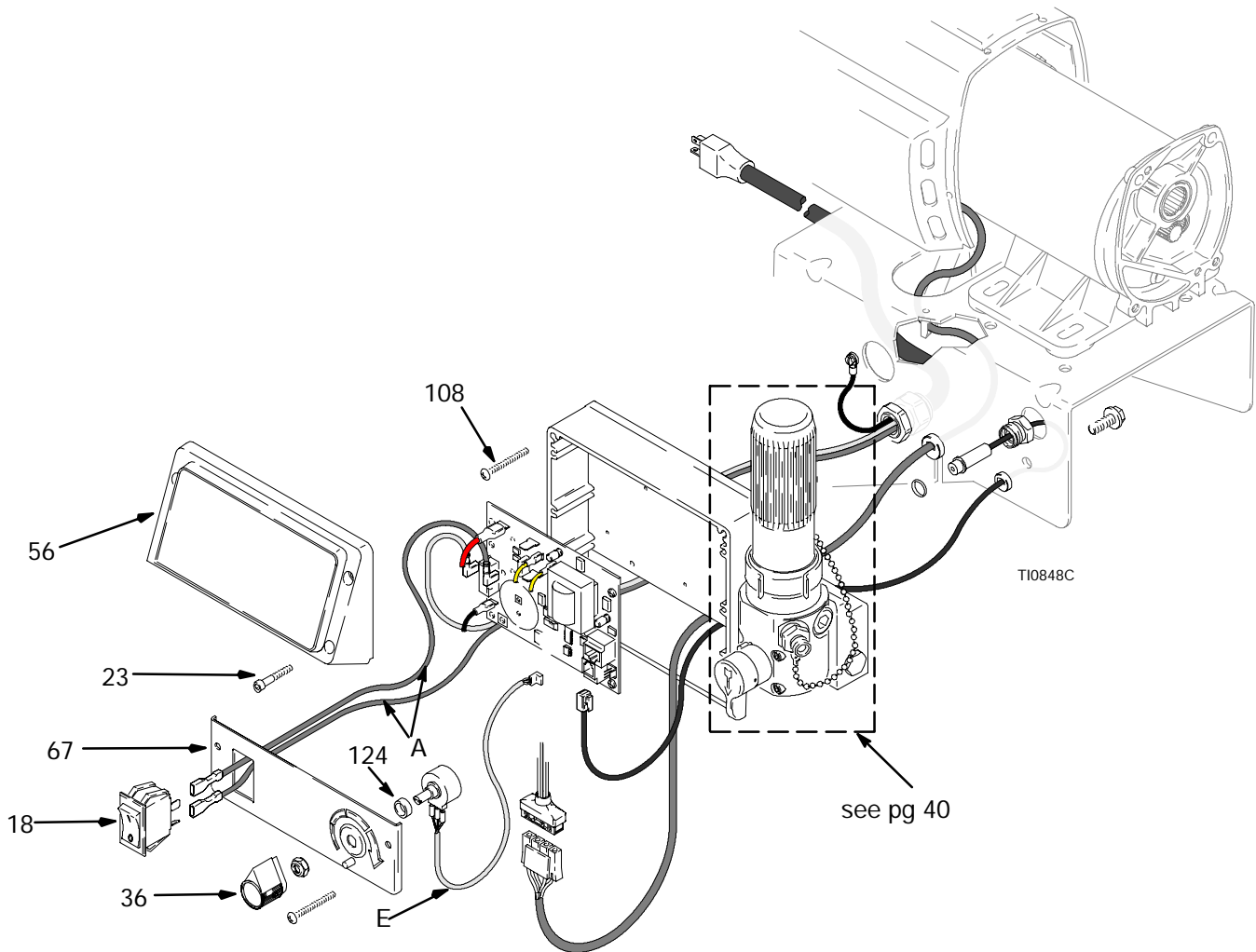


Fig. 12

Wiring Diagram

120 Vac (Model 249162)

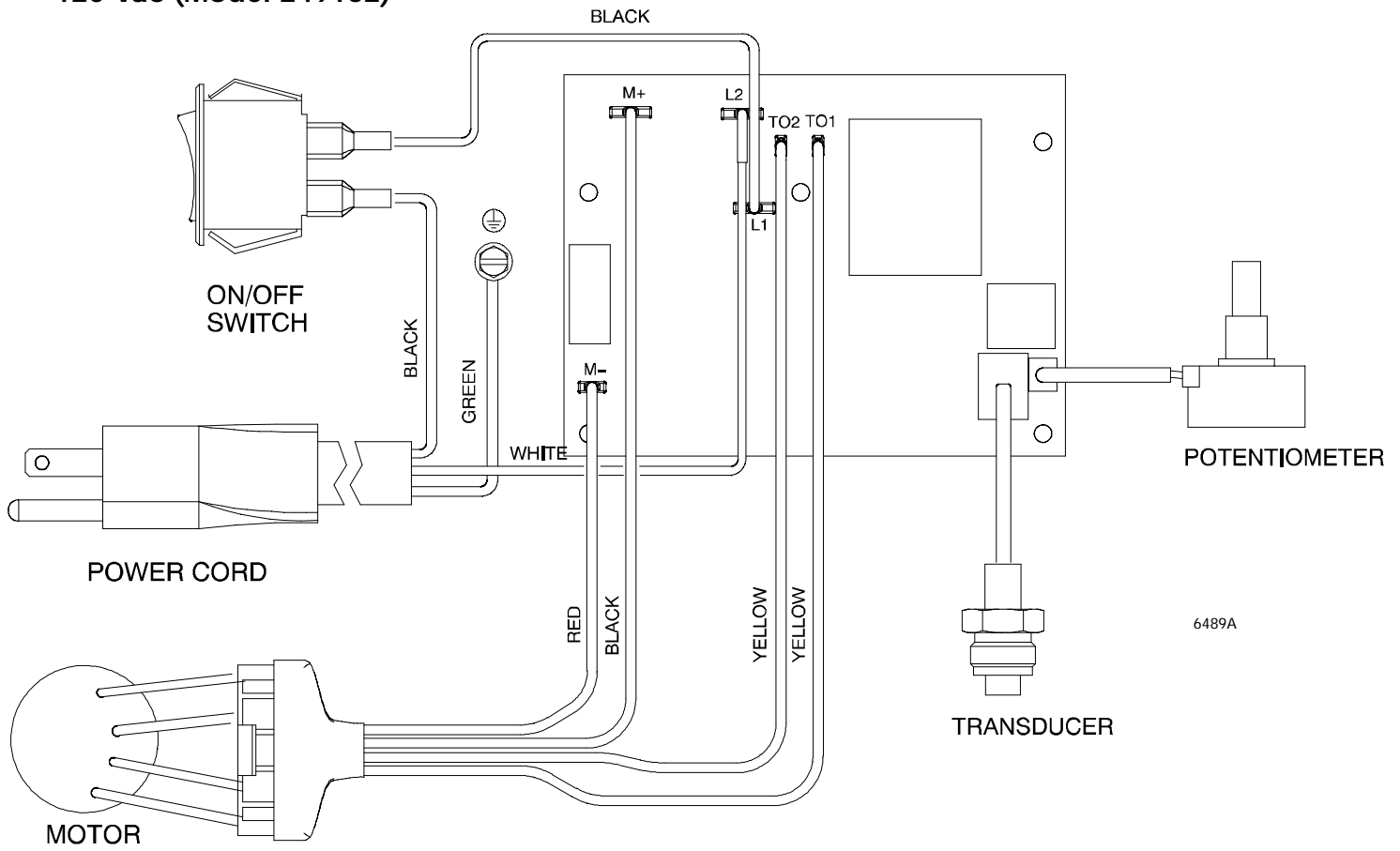


Fig. 13

Pressure Control Repair

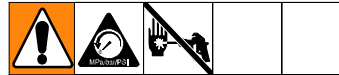
Motor Control Board Diagnostics

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. Fig. 6-13. Remove four screws (23) and cover (56).
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 6.

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 following Motor Control Board 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. 6-13 depending on sprayer and voltage.



1. Relieve pressure; page 6.
2. Remove four screws (23) and cover (56).
3. Disconnect at motor control board (100):
 - D Four motor leads: two yellow, black (-) and red (+).
 - D Two line voltage leads.
 - D Lead (D) from potentiometer.
 - D Lead (E) from transducer.
4. Remove five screws (38) and control board (100).

Installation

1. Clean pad on rear of motor control board. Apply small amount of thermal compound 073019 to pad.
2. Install motor control board (100) with five screws (38).
3. Connect to motor control board (100):
 - D Lead (E) to transducer.
 - D Lead (D) to potentiometer.
 - D Two line voltage leads.
 - D Four motor leads: two yellow, black (-) and red (+).
4. Install cover (56) with four screws (23).

Pressure Control Repair

Pressure Control Transducer

Removal

Refer to Fig. 6-13 depending on sprayer and voltage.



1. Relieve pressure; page 6.
2. Remove four screws (23) and cover (56).
3. Disconnect lead (E) from control board (100).
4. Disconnect hose (65). Remove three screws (98) and filter housing (69). Refer to page Fig. 6-13 depending on sprayer and voltage.
5. Thread transducer lead (E) plastic connector through transducer grommet (124).
6. Remove pressure control transducer (68) and o-ring (26) from filter housing (69).

Installation

1. Install o-ring (26) and pressure control transducer (68) in filter housing (69). Torque to 30-35 ft-lb.
2. Thread transducer lead (E) plastic connector up through transducer grommet (124).
3. Install filter housing (69) with three screws (98). Connect hose (65).
4. Connect lead (E) to control board (100).
5. Install cover (56) with four screws (23).

Pressure Adjust Potentiometer

Removal

Refer to Fig. 6-13 depending on sprayer and voltage.



1. Relieve pressure; page 6.
2. Remove four screws (23) and cover (56).
3. Disconnect all leads from control board (100).
4. Remove five screws (38) and board (100)
5. Remove potentiometer knob (36), sealing shaft nut (32) and pressure adjust potentiometer (64).
6. Remove and save panel nut (133).

Installation

1. Install panel nut (133) on potentiometer (64).
2. Install pressure adjust potentiometer (64), sealing shaft nut (32) and potentiometer knob (36).
 - a. Turn potentiometer fully clockwise.
 - b. Install knob at full clockwise position.
3. Install board (100) with five screws (38).
4. Connect all leads to control board (100).
5. Install cover (56) with four screws (23).

Drive Housing Replacement

CAUTION

Do not drop gear cluster (77) when removing drive housing (78). Gear cluster may stay engaged in motor front end bell or drive housing.

Removal

Refer to Fig. 14.



1. Relieve pressure; page 6.
2. Remove pump (79), Displacement Pump Replacement, page 29, Fig 16.
3. Remove screws (23) and shield (1).
4. Remove four screws (101) and cover (41).
5. Remove nuts (33) and pail hanger (54).

6. Remove screws (19), lockwashers (17), and bearing housing (67).
7. Remove two screws (20) and washers (15).
8. Remove four back screws (10) and lockwashers (15), and pull drive housing (78) off of motor (75).

Installation

1. Push drive housing (78) onto motor (75). Install screws (10) and lockwashers (15).
2. Install bearing housing (67) with screws (19) and lockwashers (17).
3. Secure pail hanger (54) with nuts (33).
4. Install cover (41) with screws (101), page 30.
5. Install shield (1) with screws (23).
6. Install pump (79) Displacement Pump Replacement, page 29.

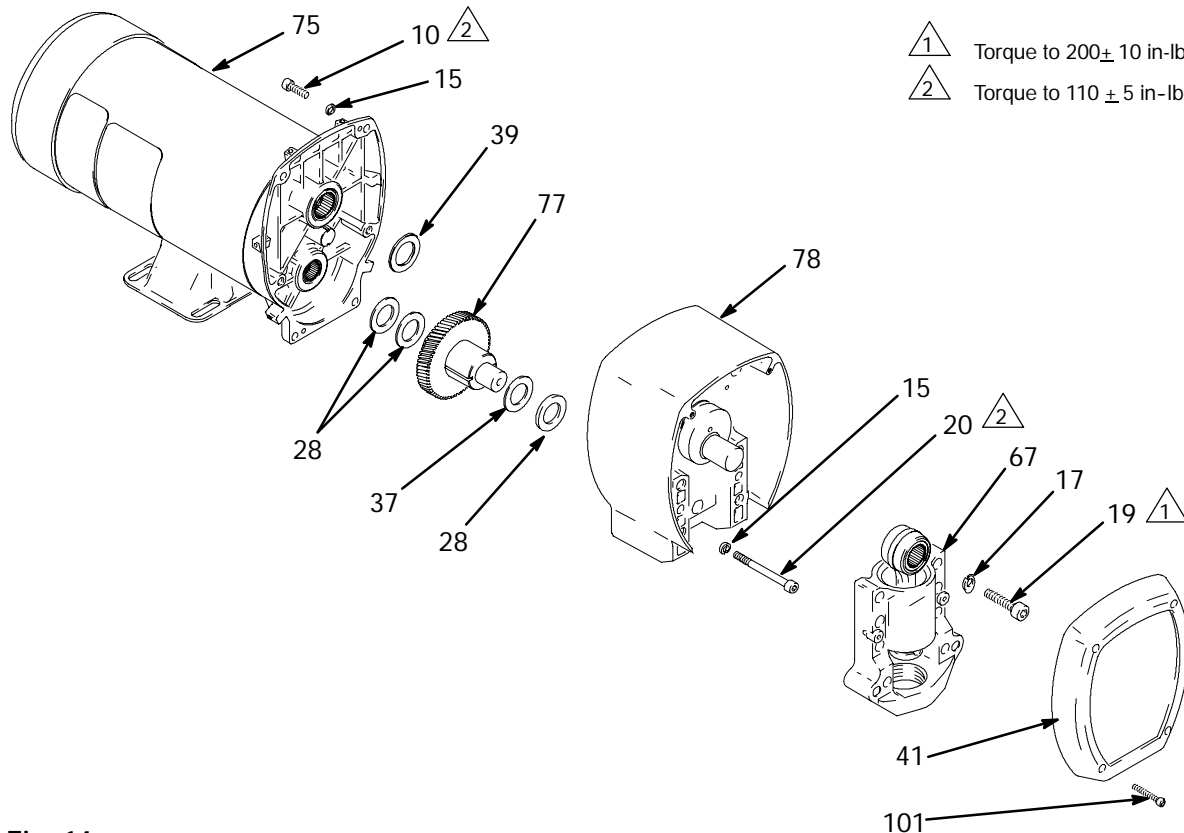


Fig. 14

ti3674a

Motor Replacement

Disassembly



1. Relieve pressure; page 6.
2. Remove pump (79), Displacement Pump Replacement, page 29.

CAUTION

Do not drop gear cluster (77) when removing drive housing (78). Gear cluster may stay engaged in motor front end bell or drive housing.

3. Remove drive housing (78), Drive Housing Replacement, page 27.
4. Fig. 6-13. Remove four screws (23) and cover (56).
5. Disconnect all leads from board (100). Remove five screws (38) and board (100).

6. Remove strain relief (73). Refer to page 32. Thread motor leads out through hole in frame.
7. Remove four screws (31), nuts (89), and motor (75).

Assembly

1. Install new motor (75) on frame with four screws (31) and nuts (89).
2. Thread motor leads through hole in frame and into control box (70).
3. Install strain relief (73).
4. Fig. 6-13. Install board (100) with five screws (38). Connect all leads to board.
5. Fig. 14. Install drive housing (78), Drive Housing Replacement, page 27.
6. Install pump (79), Displacement Pump Replacement, page 29.

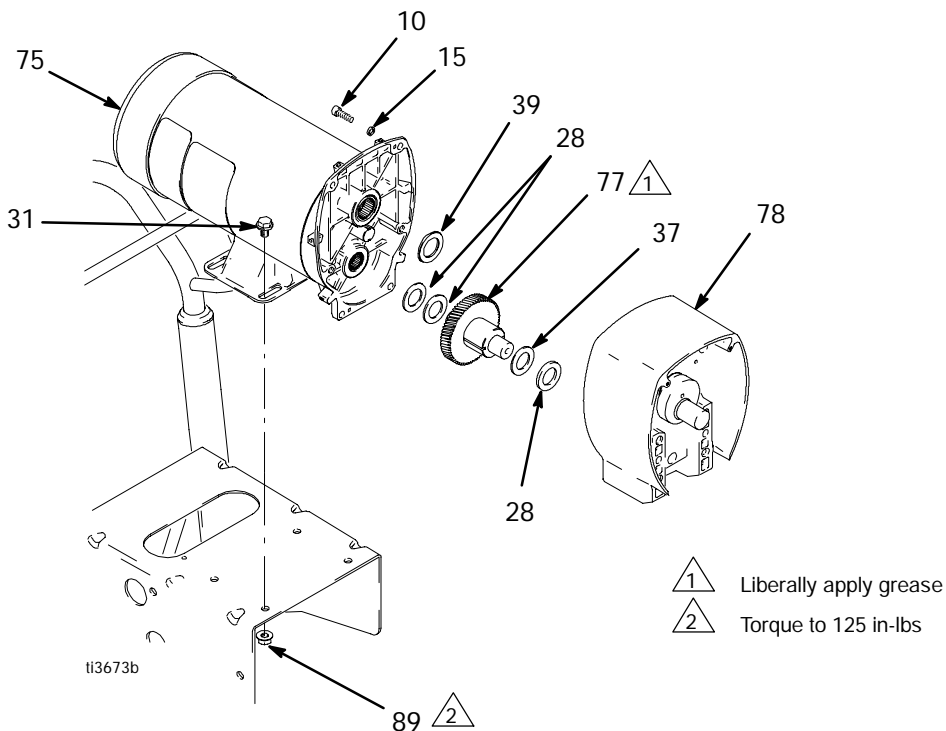


Fig. 15

Displacement Pump Replacement

Removal

1. Flush pump (79).



2. Relieve pressure; page 6.
3. Fig. 16. Cycle pump with piston rod (A) in its lowest position.
4. Fig. 16. Remove suction tube (97) and hose (65).

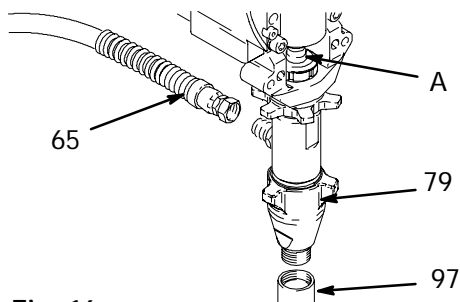


Fig. 16

5. Fig. 17. Use screwdriver: push retaining spring (27) up and push out pin (112) from connection rod cross link.

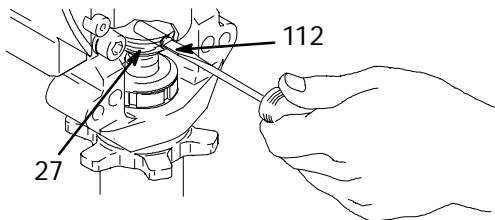


Fig. 17

6. Fig. 18. Loosen locknut with a hammer. Unscrew pump.

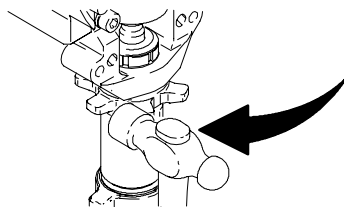


Fig. 18

Repair

See manual 311061 for pump repair instructions.

Installation



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. Make sure pin and retaining spring are properly installed.

CAUTION

If the pump locknut loosens during operation, the threads of the bearing housing will be damaged. Make sure locknut is properly tightened.

1. Fig. 12. Pull piston rod out 1.5 in. Screw in pump until holes in connecting rod cross link and piston rod align.

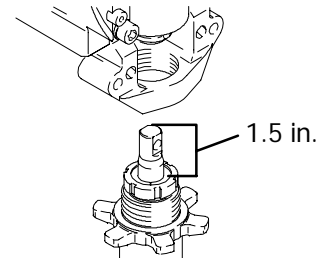


Fig. 19

2. Fig. 17. Push pin (112) into hole. And push retaining spring (27) into groove all the way around connecting rod.
3. Fig. 20. Screw locknut down onto pump until nut stops. Screw pump into bearing housing until locknut stops it. Back off pump and locknut to align pump outlet to best position of hose to filter housing (69). Tighten locknut by hand, then tighten with a hammer to approximately 75 ± 5 ft-lb (102 NSm).

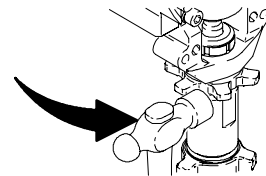


Fig. 20

4. Fig. 21. Fill packing nut with ASM TSL until fluid flows onto the top of seal.

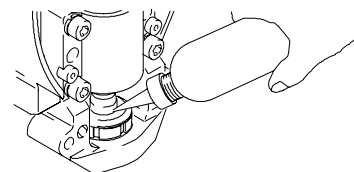
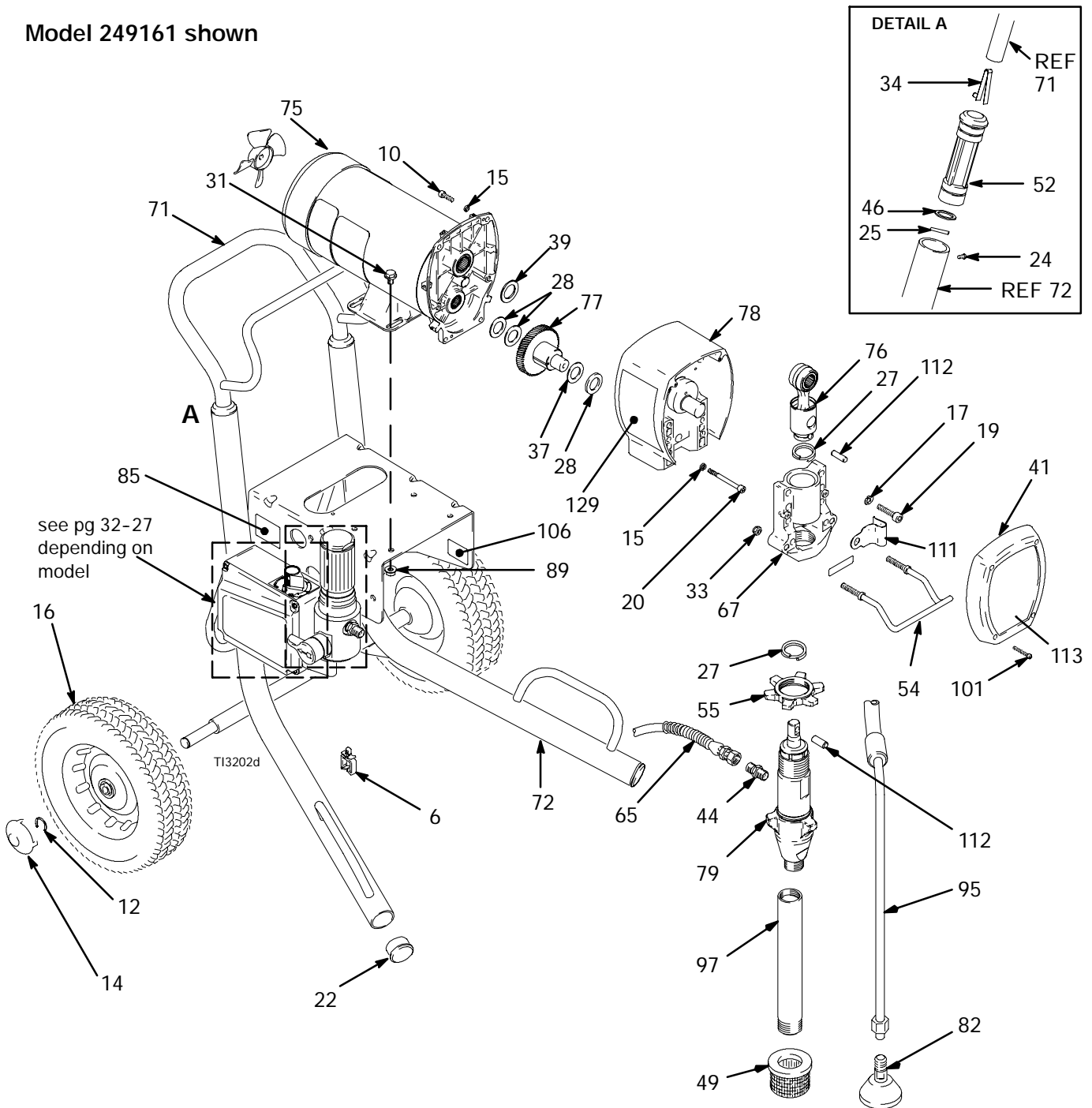


Fig. 21

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Parts Drawing

Model 249161 shown



Parts List

H2700 Sprayer

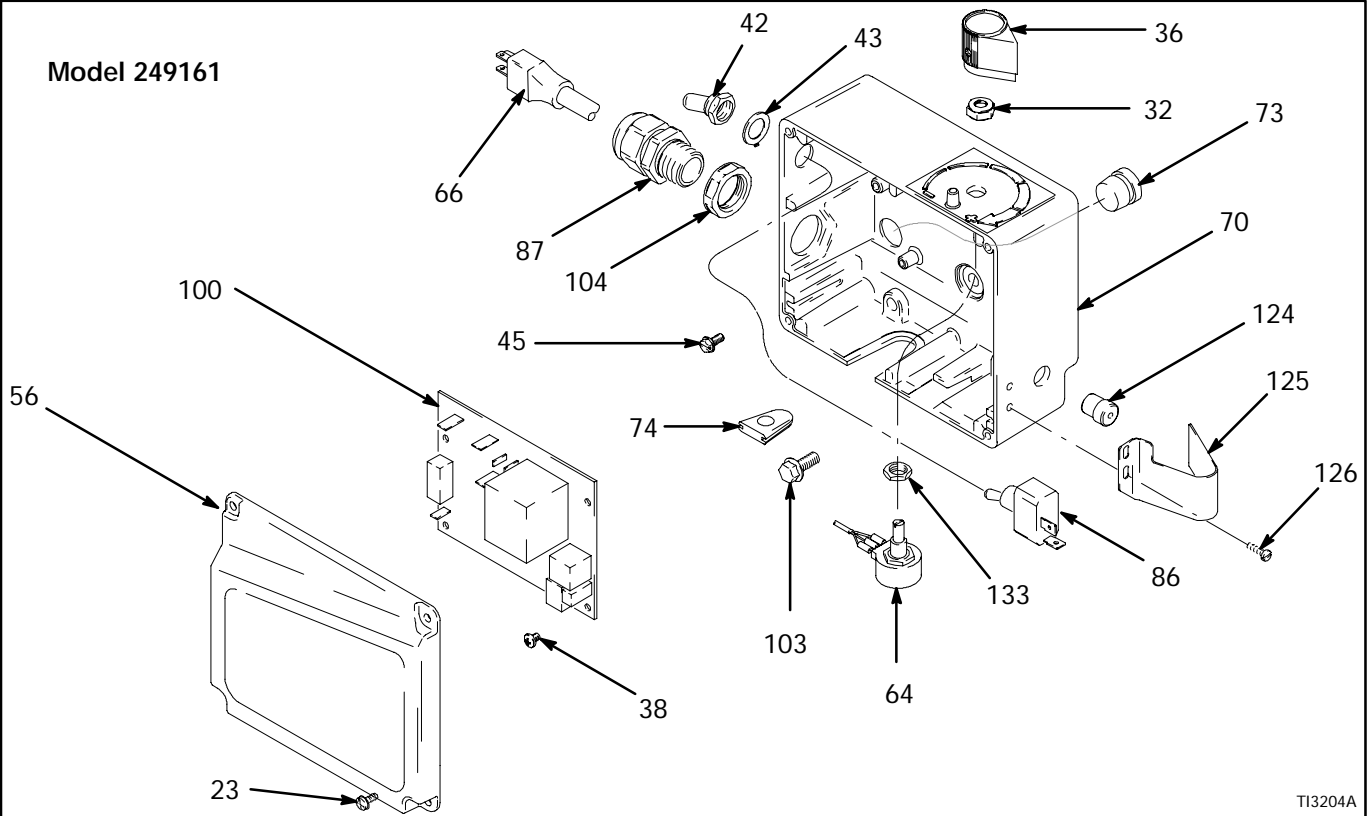
Model 249161, 249170, 249171

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
1	287702	SHIELD (not shown) (249170, 249171)	1	55	192723	NUT, retaining	1
2	15F566	LABEL, left side (not shown)	1	65	243994	HOSE, coupled 1/4 in. x 13 in.	1
6	114687	CLIP, retainer	1	67	246709	HOUSING, bearing	1
10	100644	SCREW, cap	4	71	245245	HANDLE, cart	1
12	101242	RING, retaining	2	72	196617	FRAME, cart	1
14	104811	CAP, hub	2	75	246500	MOTOR, electric, 1-hp, 110V (249161, 249170)	1
15	105510	WASHER, lock, spring	6		243722	KIT, repair, 1-hp, 220V (249171)	
16	119730	WHEEL, semi pneumatic, orange	2	76	241008	ROD, connecting	1
	106062	WHEEL, semi pneumatic (249161)		77	244264	GEAR, combination	1
17	106115	WASHER, lock spring	4	78	246708	HOUSING, drive	1
19	107210	SCREW, cap, socket	4	79	248204	PUMP, displacement Manual 310643	1
20	107218	SCREW, cap, sch	2	82	287668	KIT, repair, return line (249170, 249171) (249161)	1
22	277091	PLUG, tubing	2		241920		
	108691	PLUG, tubing (249161)		85	195833Y	LABEL, WARNING	1
24	109032	SCREW, mach, pnh	4	89	110996	NUT, hex, flanged	4
25	101354	PIN, spring, straight	4	95	243993	HOSE, coupled	1
	108068	PIN, spring, straight(249161)		97	15F597	TUBE, intake	1
27	176817	SPRING, retaining	1	101	114418	SCREW, self tap, fil hd	4
28	114672	WASHER, thrust	3	105	222385Y	TAG, WARNING (not shown)	1
31	110963	SCREW, cap	4	106	190774	KIT, label, blank	1
33	112746	NUT, hex	2	111	197124	CLIP, spring	1
34	112827	BUTTON, snap	2	112	176818	PIN, str, hdls	1
37	114699	WASHER, thrust	1	113	15F300	LABEL, ID (249161)	1
39	116191	WASHER, thrust	1		15F571	LABEL, ID (249170, 249170)	
41	287708	COVER (249161)	1	129	194125Y	LABEL, DANGER	1
	287707	COVER (249170, 249171)		130	248239	GUN, ASM 400 (249161) (not shown)	1
44	162453	NIPPLE	1				
46	183350	WASHER	2				
49	112604	STRAINER	1				
52	192027	SLEEVE, cart	2				
54	192719	HANGER, pail	1				

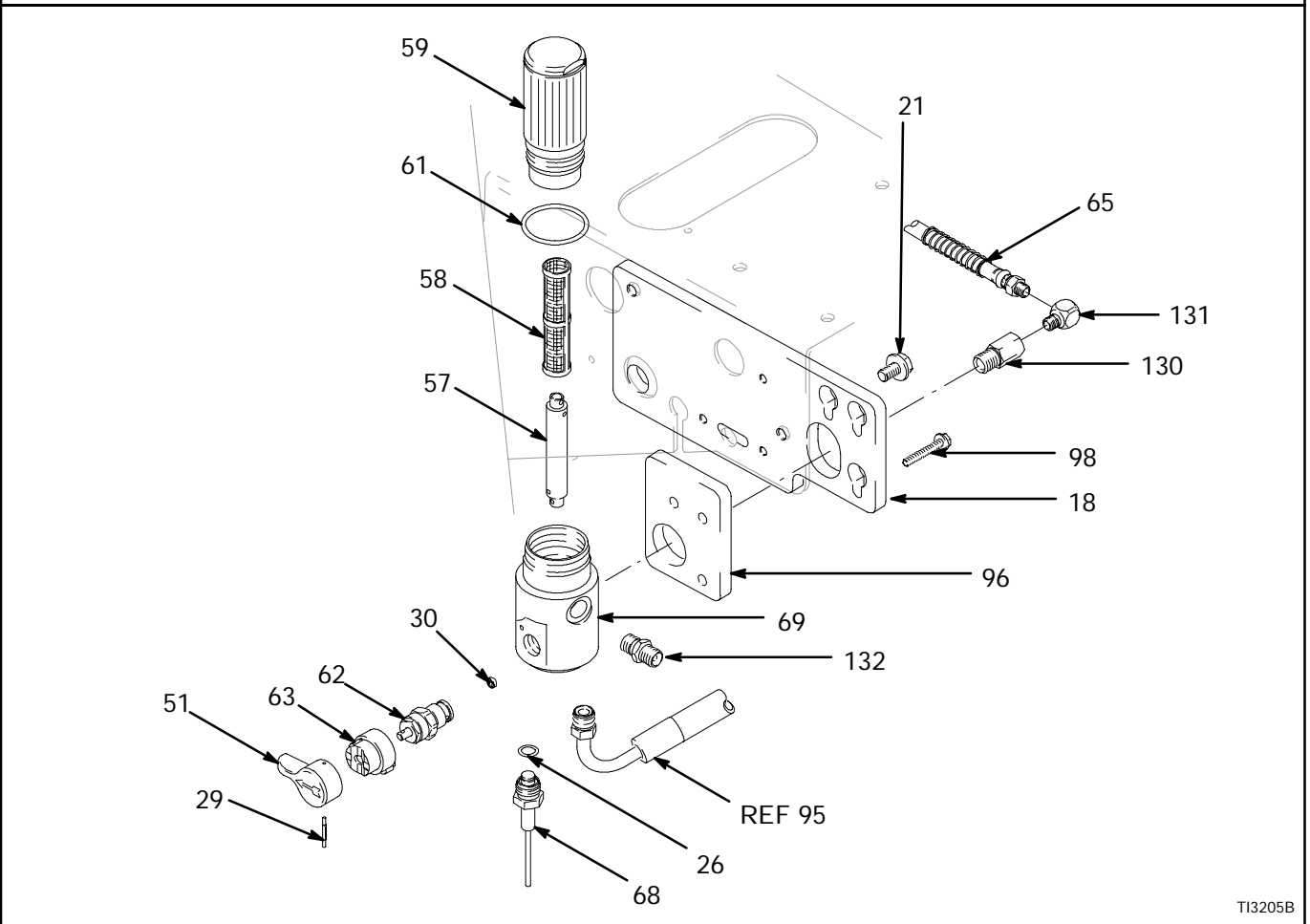
Y Replacement Danger and Warning labels, tags, and cards are available at no cost..

Parts Drawing

Model 249161



TI3204A



TI3205B

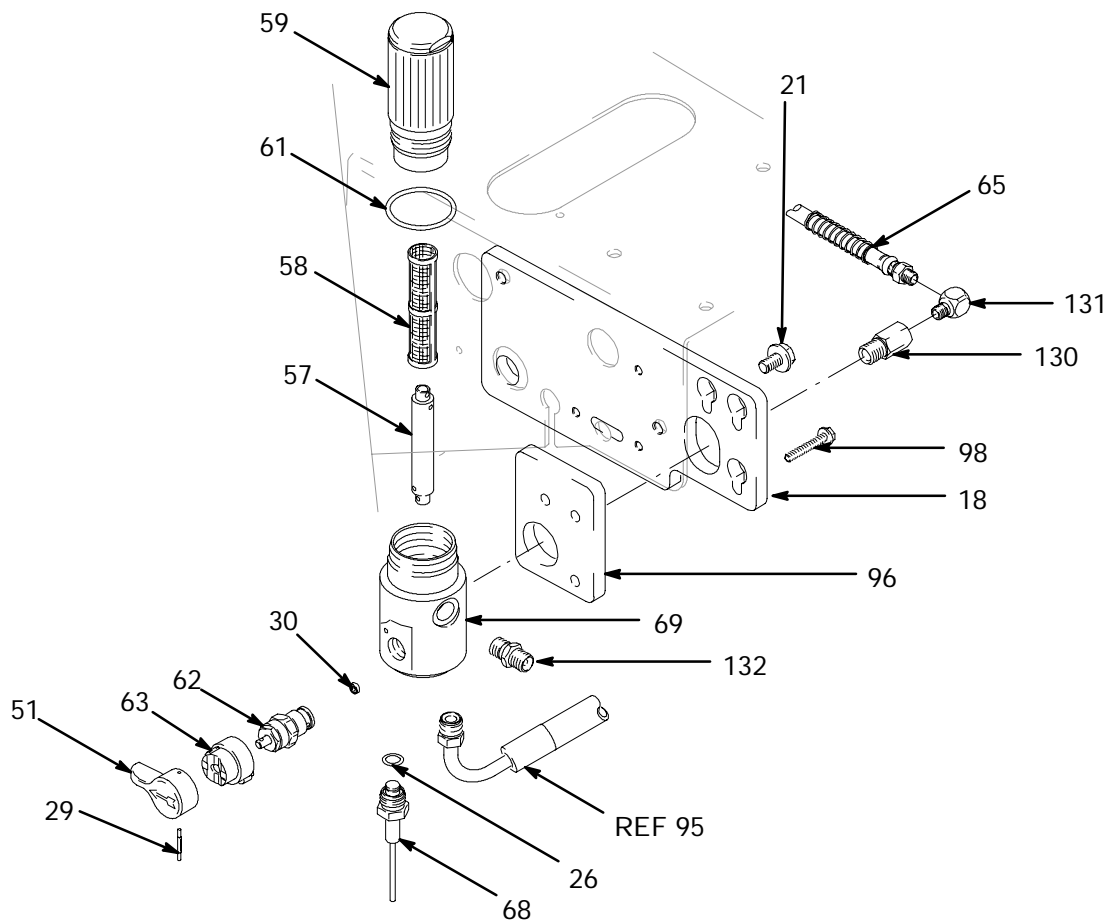
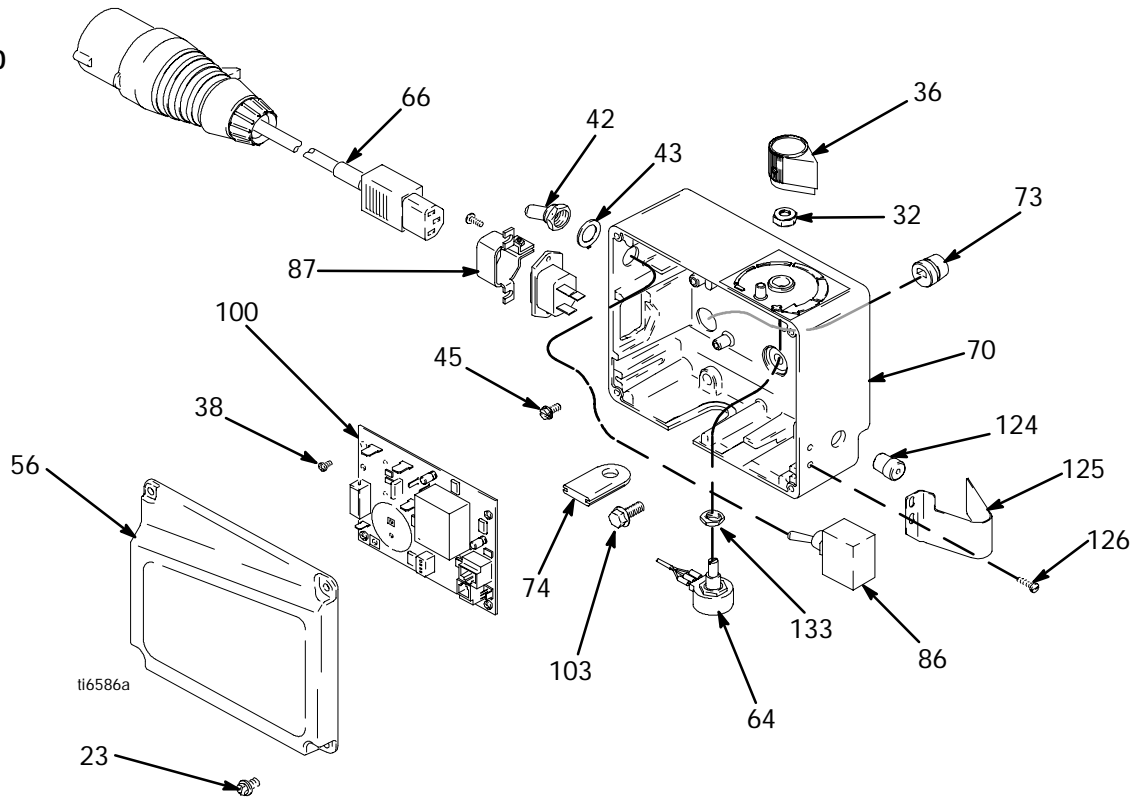
Parts List

Model 249161

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
18	15B906	PLATE, control	1	66	246447	CORD SET, power	1
21	111801	SCREW, cap, hex hd	2	68	243222	TRANSDUCER, pressure	1
23	115492	SCREW, mach	12	69	15C140	HOUSING, filter	1
26	111457	PACKING, o-ring	1	70	15B961	BOX, control	1
29	111600	PIN, grooved	1	73	114689	BUSHING, strain relief	1
30	111699	GASKET, seat, valve	1	74	195423	GROMMET, transducer	1
32	112382	NUT, shaft, sealing	1	86	111930	SWITCH, toggle	1
36	116167	KNOB, potentiometer	1	87	117745	BUSHING, strain relief	1
38	115494	SCREW, mach, phillips	5	96	15C141	PLATE, spacer	1
42	195428	BOOT, toggle	1	98	117794	SCREW, mach, sltd, hex hd	3
43	105658	RING, locking	1	100	287703	BOARD, control	1
45	115498	SCREW, mach, slot, hex	1	103	110997	SCREW, flange, hex	2
51	187625	HANDLE, valve, drain	1	104	117625	NUT, locking	1
56	198935	COVER, control box	1	124	114296	BUSHING, step	1
57	196773	INSERT, filter	1	125	198994	GUARD, transducer	1
58	245527*	FILTER, fluid, 60 mesh	1	126	109575	SCREW, threadforming hexhead	1
59	15C139	BOWL, filter	1	130	118138	FITTING, adapter, reducer	1
60	15C008	CORD, jumper (not shown)	1	131	118137	FITTING, elbow, street, 89_	1
61	104361	PACKING, o-ring	1	132	164672	ADAPTER	1
62	235014	VALVE, drain	1	133	118335	NUT, panel	1
63	224807	BASE, valve	1	* Also available:			
64	236352	POTENTIOMETER, adjustment	1		245528	100 mesh filter	
65	243994	HOSE, coupled	1		245526	200 mesh filter	

Parts Drawing

Model 249170



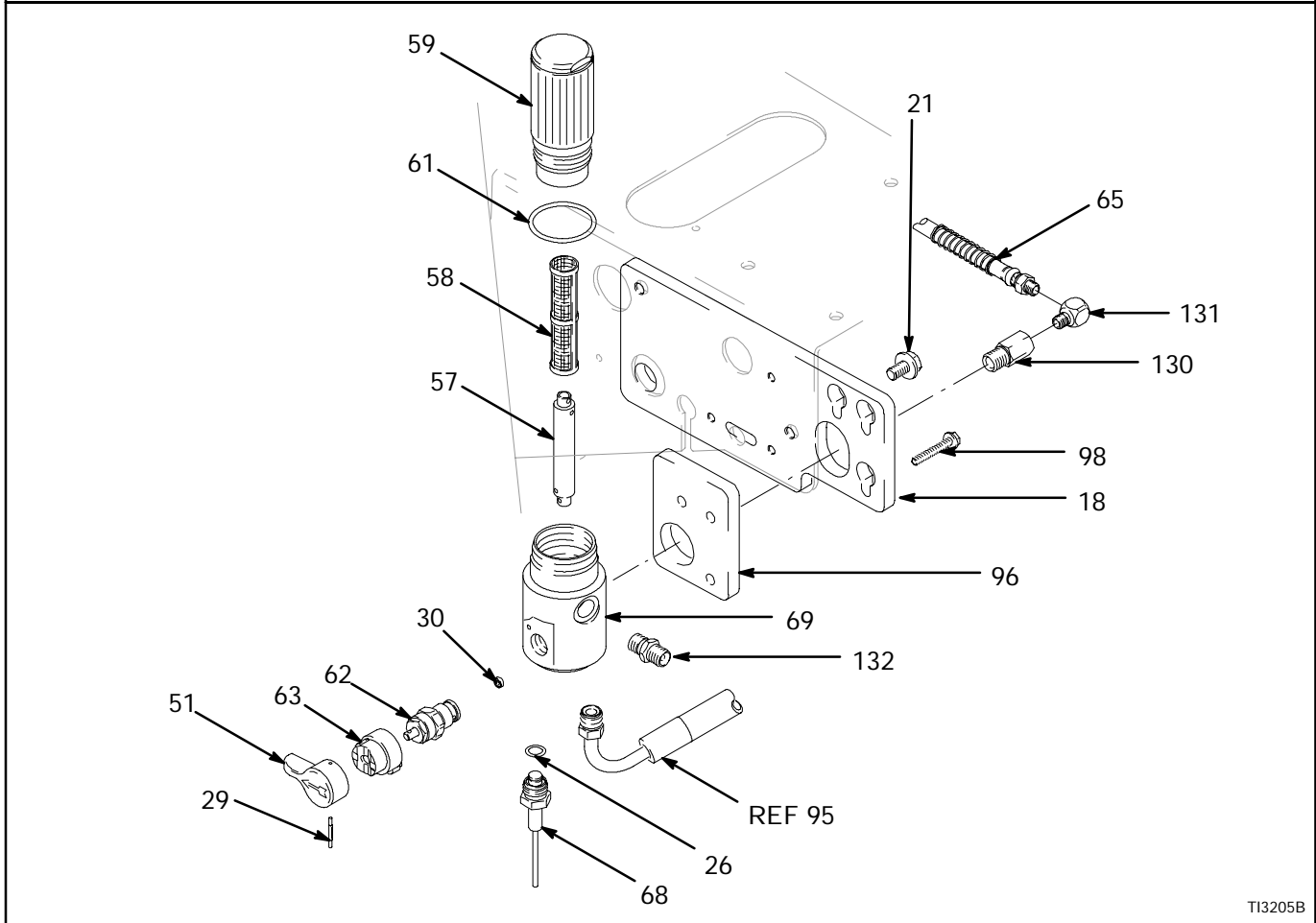
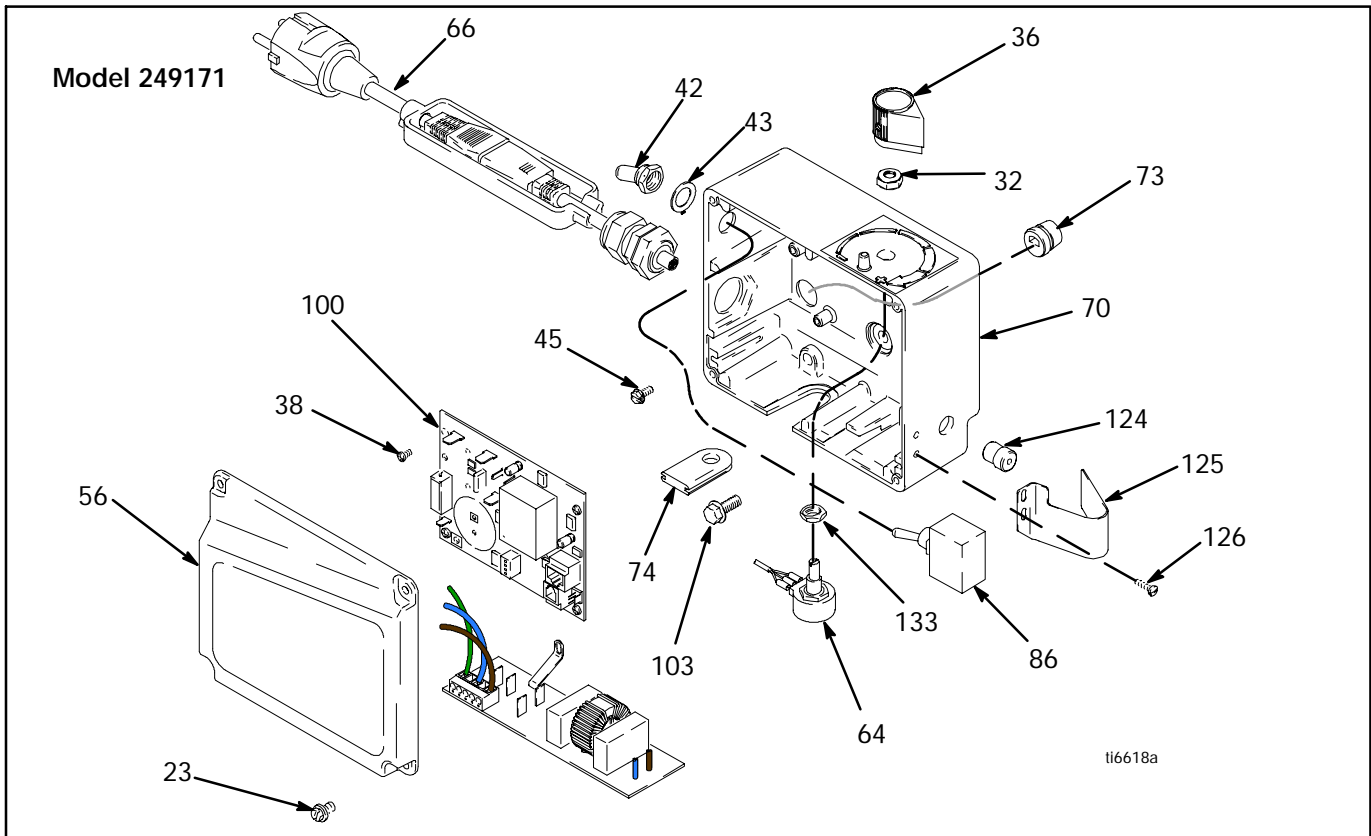
T13205B

Parts List

Model 249170

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
18	15B906	PLATE, control	1				
21	111801	SCREW, cap, hex hd	2	66	241996	CORD SET, power	1
23	115492	SCREW, mach	12	68	243222	TRANSDUCER, pressure	1
26	111457	PACKING, o-ring	1	69	15C140	HOUSING, filter	1
29	111600	PIN, grooved	1	70	15F625	BOX, control	1
30	111699	GASKET, seat, valve	1	73	114689	BUSHING, strain relief	1
32	112382	NUT, shaft, sealing	1	74	195423	GROMMET, transducer	1
36	15F537	KNOB, potentiometer	1	86	115810	SWITCH, toggle	1
38	115494	SCREW, mach, phillips	5	87	115632	RETAINER, power cord	1
42	195428	BOOT, toggle	1	96	15C141	PLATE, spacer	1
43	105658	RING, locking	1	98	117794	SCREW, mach, sltd, hex hd	3
45	115498	SCREW, mach, slot, hex	1	100	287704	BOARD, control	1
51	277089	HANDLE, valve, drain	1	103	110997	SCREW, flange, hex	2
56	198935	COVER, control box	1	120	241993	KIT, repair, filter board (see pg 18)	1
57	196773	INSERT, filter	1	123	243539	CONDUCTOR, ground (see pg 18)	1
58	243080	FILTER, fluid	1	124	114296	BUSHING, step	1
59	15C139	BOWL, filter	1	125	198994	GUARD, transducer	1
61	104361	PACKING, o-ring	1	126	109575	SCREW, threadforming hexhead	1
62	235014	VALVE, drain	1	130	118138	FITTING, adapter, reducer	1
63	224807	BASE, valve	1	131	118137	FITTING, elbow, street, 89_	1
64	236352	POTENTIOMETER, adjustment	1	132	164672	ADAPTER	1
65	243994	HOSE, coupled	1	133	118335	NUT, panel	1

Parts Drawing



Parts List

Model 249171

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
18	15B906	PLATE, control	1				
21	111801	SCREW, cap, hex hd	2	66	245906	CORD SET, jumper, IEC320	1
23	115492	SCREW, mach	12	68	243222	TRANSDUCER, pressure	1
26	111457	PACKING, o-ring	1	69	15C140	HOUSING, filter	1
29	111600	PIN, grooved	1	70	15B961	BOX, control	1
30	111699	GASKET, seat, valve	1	73	114689	BUSHING, strain relief	1
32	112382	NUT, shaft, sealing	1	74	195423	GROMMET, transducer	1
36	15F537	KNOB, potentiometer	1	86	115810	SWITCH, toggle	1
38	115494	SCREW, mach, phillips	5	87	114421	BUSHING, strain relief (not shown)	1
42	195428	BOOT, toggle	1	96	15C141	PLATE, spacer	1
43	105658	RING, locking	1	98	117794	SCREW, mach, sltd, hex hd	3
45	115498	SCREW, mach, slot, hex	1	100	241943	BOARD, control	1
51	277089	HANDLE, valve, drain	1	103	110997	SCREW, flange, hex	2
56	198935	COVER, control box	1	120	241994	KIT, repair, filter board (see pg 20)	1
57	196773	INSERT, filter	1	123	243539	CONDUCTOR, ground (see pg 20)	1
58	243080	FILTER, fluid	1	124	114296	BUSHING, step	1
59	15C139	BOWL, filter	1	125	198994	GUARD, transducer	1
61	104361	PACKING, o-ring	1	126	109575	SCREW, threadforming hexhead	1
62	235014	VALVE, drain	1	130	118138	FITTING, adapter, reducer	1
63	224807	BASE, valve	1	131	118137	FITTING, elbow, street, 89_	1
64	236352	POTENTIOMETER, adjustment	1	132	164672	ADAPTER	1
65	243994	HOSE, coupled	1	133	118335	NUT, panel	1

Parts List

Model 249162

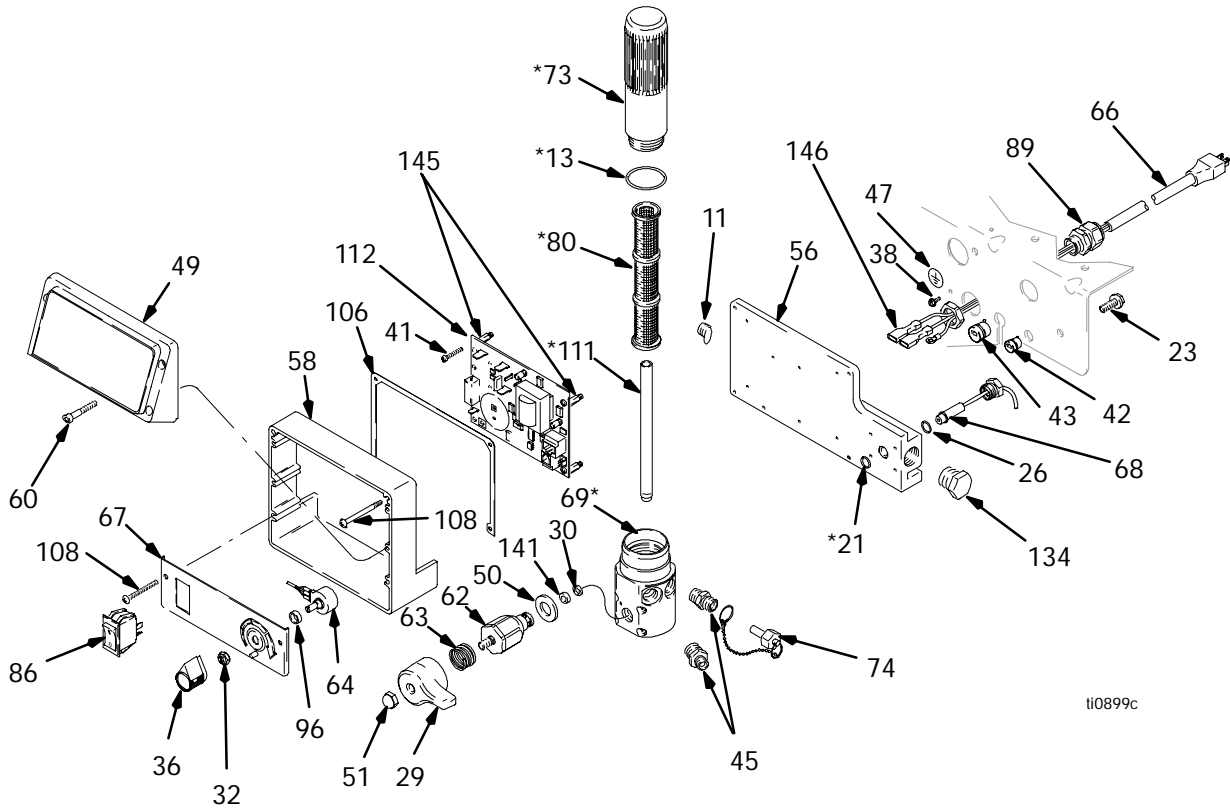
REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
6	114687	CLIP, retainer	1	61	206994	FLUID, ts1 8 oz bottle	1
10	100644	SCREW, cap, sch	4	65	243994	HOSE, coupled, 1/4 in. x 13 in.	1
12	101242	RING, retaining, ext.	2	67	246709	HOUSING, bearing	1
14	104811	CAP, hub	2	71	239998	HANDLE, cart	1
15	105510	WASHER, lock, spring (hi-collar)	6	72	196617	FRAME, cart	1
16	106062	WHEEL, semi pneumatic	2	75	243723*	MOTOR, electric	1
17	106115	WASHER, lock spring (hi-collar)	4	76	241008	ROD, connecting	1
19	107210	SCREW, cap, socket hd	4	77	244264	GEAR, combination	1
20	107218	SCREW, cap, sch	2			includes 28 and 37	
22	108691	PLUG, tubing	2	78	287829	HOUSING, drive	
24	109032	SCREW, mach, pnh	5	79	287161	PUMP, displacement	1
25	110243	RING, retaining	2			Manual 311061	
27	176817	SPRING, retaining	1	82	241920	DEFLECTOR, threaded	1
28	114672	WASHER, thrust	3	85	195833Y	LABEL, WARNING	1
31	111801	SCREW, cap,hex hd	6	89	110996	NUT, hex, flanged	1
33	112746	NUT, hex	2	91	15F301	LABEL, front	1
34	112827	BUTTON, snap	1	95	244240	HOSE, drain	1
37	114699	WASHER, thrust	1	97	15F597	TUBE, intake	1
39	161191	WASHER, thrust	1	101	114418	SCREW, self tap, fil hd	4
41	287710	COVER, housing	1	111	197124	CLIP, spring	1
44	162453	NIPPLE	1	112	176818	PIN, str, hdls	1
46	183350	WASHER	2	113	248239	GUN, ASM 400 (not shown)	1
49	112604	STRAINER	1	114	116986	HOSE, airless (not shown)	
52	192027	SLEEVE, cart	2				
53	195805Y	LABEL, DANGER, ST	1				
54	192719	HANGER, pail	1				
55	192723	NUT, retaining	1				
57	15F302	LABEL, crtl box cover	1				

Y Replacement Danger and Warning labels, tags, and cards are available at no cost.

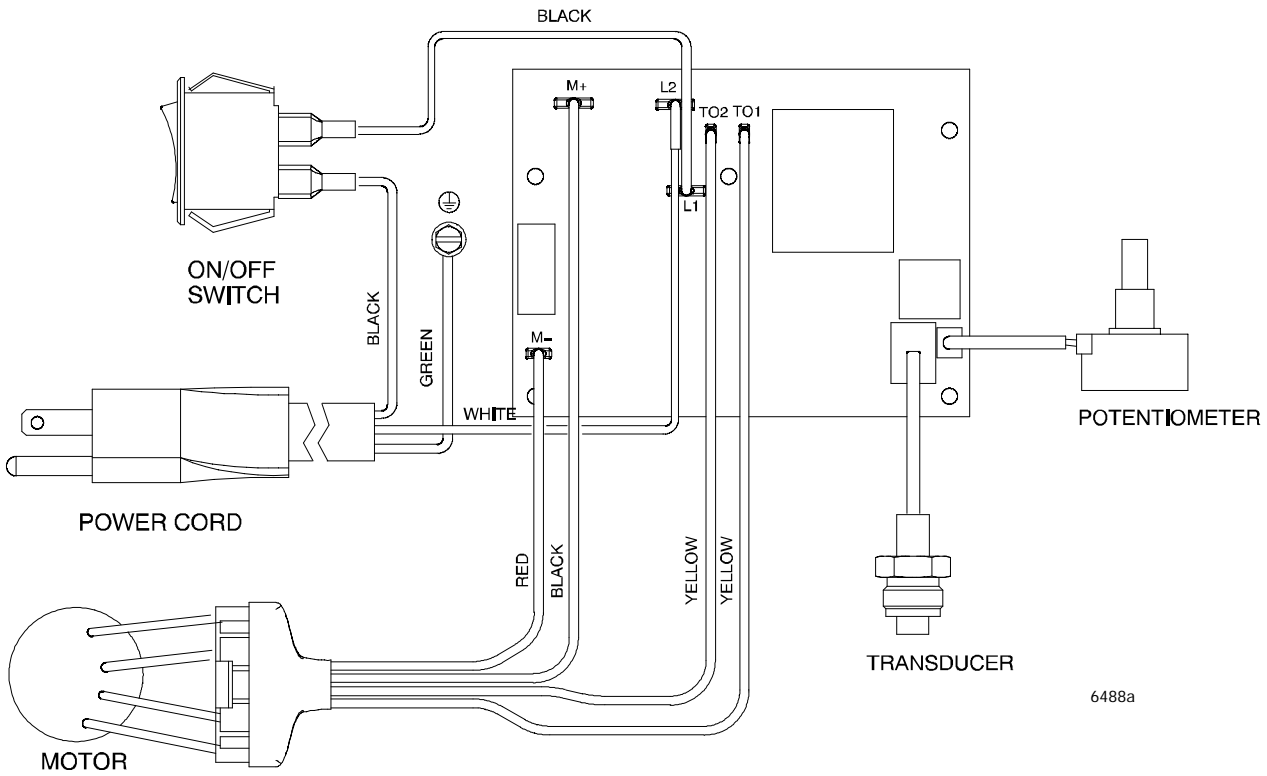
**Motor Brush Repair Kit 220853 is available. Order separately.*

Parts Drawing

Model 249162



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Parts List

Model 249162

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
11	100721	PLUG, pipe	1	68	243222	TRANSDUCER, pressure contl	1
13*	104361	PACKING, o-ring	1			includes 26	
21*	107505	PACKING, o-ring	1	69*	196676	HOUSING, filter	1
23	111801	SCREW, cap,hex hd	2	73*	196675	BOWL, filter	1
26	111457	PACKING, o-ring	1	74	196676	CAP	1
29	194102	HANDLE, valve	1	80*	243984	FILTER, FLUID, 60-mesh	1
30	193710	SEAL, seat, valve	1	86	116098	SWITCH, power	1
32	112382	NUT, shaft, sealing	1	89	116171	BUSHING, strain relief	1
36	116167	KNOB, pot	1	96	116200	SPACER, shaft	1
38	114391	SCREW, grounding	1	106	196707	GASKET, control, ULTRA	1
41	114420	SCREW, mach, pnh, sems, phillips	6	108	116304	SCREW, mach, pan hd	4
42	116354	BUSHING, strain relief	1	111*	196786	DIFFUSER, tube	1
43	114689	BUSHING, strain relief	1	112	246710	BOARD, control	1
45	164672	ADAPTER	2	134	196781	PLUG, power bar	1
47	186620	LABEL, symbol, ground	1	141	193709	SEAT, valve	1
49	277110	COVER, control housing	1	145	119786	SPACER, al, 6-32 unc x .375"	1
50	114797	GASKET	1	146	15F743	HARNESS, wire, motor	1
51	114688	NUT, cap	1			* Included in Filter Repair Kit 244513	
56	15F742	PLATE, power bar	1				
58	196191	HOUSING, control	1			Also available	
60	116252	SCREW, #8 taptite phil	4			244070 30 mesh	
62	245103	VALVE, drain	1			244065 100 mesh	
		includes 29, 30, 50, 51, 63, 141				244066 200 mesh	
63	114708	SPRING, compression	1				
64	236352	POTENTIOMETER, adjust, pressure	1				
66	196836	CORD, power	1				
67	196678	PANEL, control	1				

Technical Data

Model	100-120V, Ø, A, Hz	220-240V, Ø, A, Hz	Generator Minimum W	Motor HP (W)	Cycles per gallon (liter)	Maximum Delivery gpm (lpm)	Maximum Tip size		Fluid Outlet npsm
							1 gun	2 guns	
2700	1, 15, 50/60	1, 10, 50/60	4000	1.0 (466)	244 (64.6)	0.8 (3.0)	0.027	0.019	1/4 in
3100	1, 15, 50		4000	1.2 (560)	200 (53)	1.1 (3.8)	0.031	0.021	1/4 in

Basic Sprayer Wetted Parts:
zinc-plated carbon steel, polyurethane, polyethylene,
stainless steel, PTFE, acetal, chrome plating, leath-
er, V-Max[™] UHMWPE, aluminum, stainless steel,
tungsten carbide

Dimensions

Model	Style	Weight lb (kg)	Height in. (cm)	Width in. (cm)	Length in. (cm)
2700	Hi-Boy	107 (48.5)	30 (76)	20.5 (52.1)	28 (71)
3100	Hi-Boy	120 (54)	30 (76)	22.5 (57)	29 (74)

ASM Standard Warranty

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

This warranty does not cover, and ASM 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-ASM component parts. Nor shall ASM be liable for malfunction, damage or wear caused by the incompatibility of ASM equipment with structures, accessories, equipment or materials not supplied by ASM, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by ASM.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized ASM distributor for verification of the claimed defect. If the claimed defect is verified, ASM 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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or call 1-800-854-4025 to identify the nearest distributor.

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