Instructions

Parts

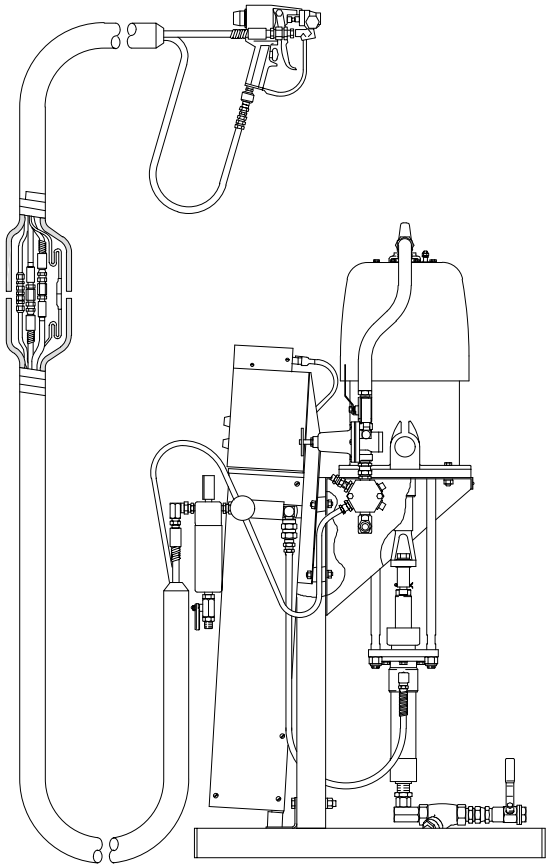
AIR POWERED, BULLDOG® PUMP, 240 Volt, 1 or 3 Phase, 50/60 Hz

FOAM-CAT® 400 SPRAYER 308144G

For use only with two component urethane fluids that are unfilled and non-flammable.

1500 psi (10.5 MPa, 105 bar) Maximum Working Pressure

Read warnings and instructions.
See page 4 for warnings.



7418A

Model 224546 Includes:

- Foam-Cat Heater and Heated Hose Controls
- Bulldog Pump
- Pump Stand
- 50 feet (15 m), 3/8 in. I.D. Heated Hose
- 15 feet (4.6 m), 1/4 in. I.D. Heated Whip Hose
- Spray Gun with 0.114 in. (2.9 mm) Diameter Nozzle Kit

Delivery

30 lb/min. at 48° F temperature rise
(13.5 kg/min. at 27° C temperature rise)

Power Requirements

Electrical: 240 Volt Maximum
208 Volt Minimum
Single phase: 80 Amps
Three phase: 60 Amps

Generator (Optional): See Heater Manual 308219 for size.

Compressed Air: 80–100 psi (550–700 kPa, 5.5–7 bar)
60 CFM (1.68 m^3/min.)

Certification

The heater and heated hoses are CSA certified when used as instructed in the heater or heated hose manuals, 308219 and 307544, respectively .

NOTE: See manual 307544 for installation and assembly of heated hose.

PROVEN QUALITY. LEADING TECHNOLOGY.

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

Table of Contents

Notes

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the spray gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the trigger guard on the spray gun when spraying.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 15 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Do not mend or repair any part of the hose assembly. If the hose is damaged, replace it immediately.

MOVING PARTS HAZARD

Moving parts, such as the air motor piston can pinch or amputate fingers.

- Do not operate the equipment with the air motor plates removed.
- Keep your body and tools clear of any moving parts when starting or operating the equipment.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Improper grounding, poor ventilation, open flames, or sparks can cause a hazardous condition and result in fire, explosion, electric shock or other serious injury.

- Ground the equipment and the object being sprayed. See Wire and electrically ground the system on page 13.
- Do not use the heater with flammable liquids, such as those having flash points below 200° F (93° C).
- All electrical wiring must be done by trained and qualified personnel and comply with all local codes and regulations.
- Do not wrap the heat tape around the hoses. Follow all hose assembly instructions to prevent strain on the heat tape.
- Do not expose the heater to rain.
- Do not operate the heater with any covers removed.
- Shut off the heater and heated hose circuit breakers before installing, checking, or repairing any part of the heater or heated hoses.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Extinguish all the open flames or pilot lights within the spray area.
- Electrically disconnect all the equipment within the spray area.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Do not turn on or off any light switch within the spray area while operating or if fumes are present.
- Do not smoke within the spray area.
- Do not operate a gasoline engine within the spray area.
- If there is any static sparking while using the equipment, **stop spraying immediately**. Identify and correct the problem.

TOXIC FLUID HAZARD

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

- Know the specific hazards of the fluid you are using..
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Wear the appropriate protective clothing, gloves, eyewear and respirator.
- Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.

⚠ WARNING

INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. The lever amplification of the secondary pump enables very high fluid pressures to be achieved. To reduce the risk of overpressurizing the equipment, a relief valve is provided on the secondary pump side which is factory set at **1500 psi (10.5 MPa,105 bar) maximum working pressure.** Do not tamper with this valve adjustment.
- Do not lift pressurized equipment.
- Do not install any fluid shutoff device at the fluid outlet of either heater or filter. Shutting off the fluid at the outlet causes high back pressure.
- Use at least 50 feet (15.2 m) of fluid hose between the fluid outlet and any fluid control device such as a shutoff valve, regulator or spray gun.
- The operating and safety features of this heater are designed to be used only with Graco Foam-Cat® Heated Hoses, Models 218613, 218614, 947514, 947515 and 948723. Never connect other hoses to this heater.
- Do not remove hose spring guards, which help protect the hose from rupture caused by kinks or bends near the couplings.
- Do not use the hose until the couplings are properly insulated and the hose abrasion cover is in place.
- To avoid excessive heat buildup, never operate the hose when it is coiled.
- Route the hoses away from the traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below –40°F (–40°C).
- Do not use the hoses to pull the equipment.
- Use fluids and solvents that are compatible with the equipment wetted parts. See the **Technical Data** section of all the equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not pressurize a supply drum that will not withstand 5.5 psi (38 kPa, 0.38 bar) working pressure.
- Do not use a damaged drum of ISO or RES with the Air Dryer.
- Comply with all applicable local, state and national fire, electrical and other safety regulations.

Introduction

Before you use this equipment

For your personal safety and optimum equipment performance, all users of this equipment must thoroughly read and understand all warnings and instructions in each component manual before using this manual, 308144, as a guide for installing and operating a complete Foam-Cat® 400 Sprayer. Each component manual contains “fine tuning” information and pertinent safety information, which is essential for optimum equipment performance.

This manual also contains instructions for installing and using several recommended accessories. If any recommended accessory is not used, just move on to the next section of the manual. If you are using other similar accessories, see the instructions supplied with that equipment.

Terms

RES is the polyurethane foam chemical Resin.

ISO is the polyurethane foam chemical, Isocyanate.

Ambient Temperature is the surrounding air temperature.

ATC is the Ambient Temperature Compensator feature of the Foam-Cat® Heater. See manual 308219 for more information.

If you are using a generator to power your system

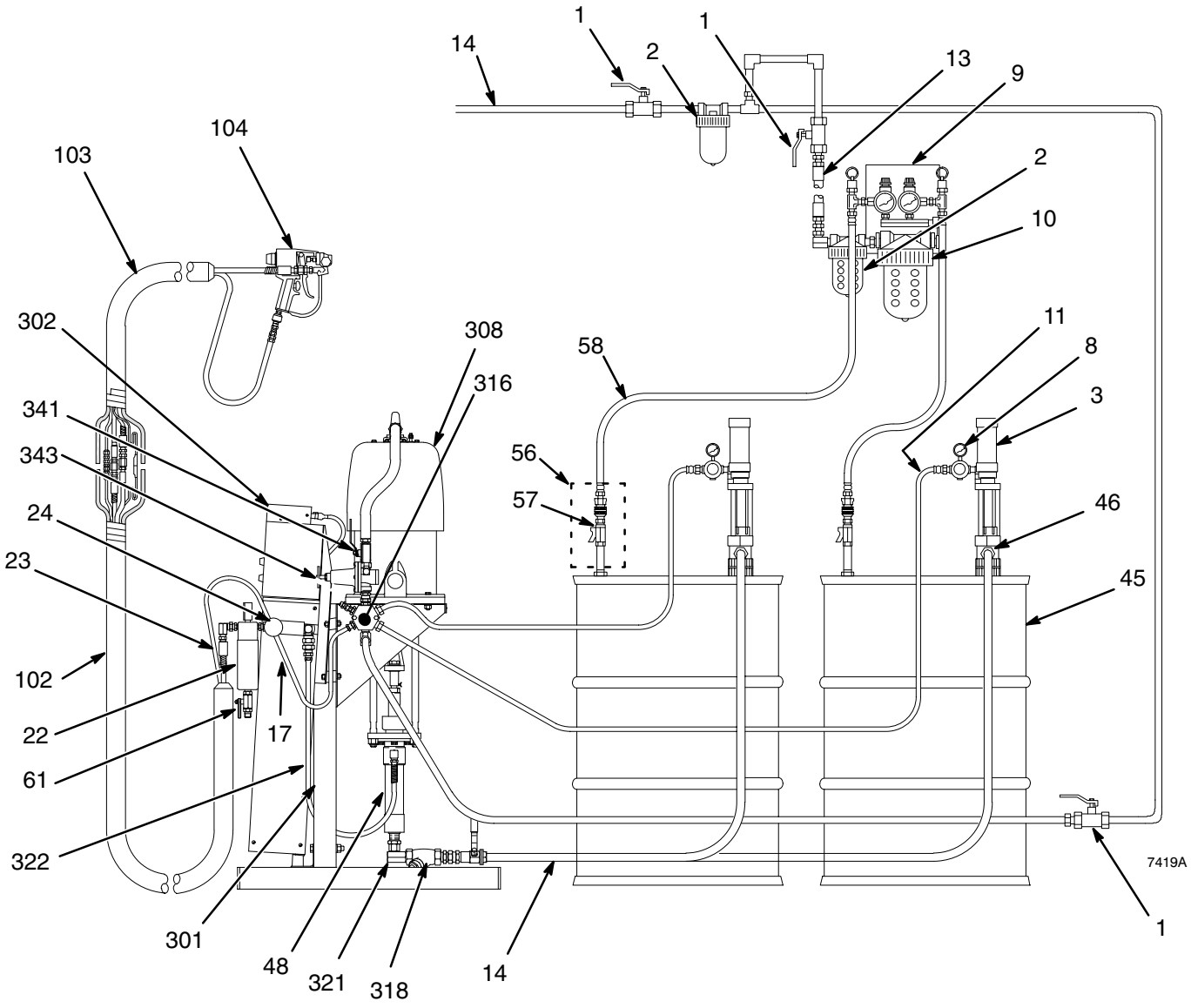
See the Foam-Cat Heater manual, 308219, to determine the correct size.

Component manuals & recommended accessory manuals

Manual No.	Description
307273	Fluid Filter[1]
307430	Displacement Pump[1]
307552	1:1 Ratio Feed Pumps[2]
307551	Pump Stand[1]
307548	Air Dryer[2]
307546	Foam-Cat Gun[1]
307544	Foam-Cat Heated Hose[1]
308145	Bulldog Plural Component Pump[1]
308167	Regulator[1]
308219	Foam-Cat Heater[1]

[1] Component in Model 224556
[2] Accessory component, order separately.

Installation



KEY

1	Master Air Valve	23	Control Box Cable, Heater	104	Foam-Cat Gun
2	Air Line Filter	24	Fluid Outlet, Heater	301	Pump Stand
3	Feed Pump	45	Feed hose, Feed Pump To Disp. Pump	302	Heater
8	Air Regulator Or Air Valve	46	Fluid Outlet, Feed Pump	308	Proportioning Pump
9	Air Dryer	48	Displacement Pump	316	Air Manifold
10	Air Dryer Ring	56	Drum Fittings, Air Dryer	318	Y-line Strainer
11	Air Hose, Feed Pump Kit	57	Shutoff Valve, Drum Fittings	321	Intake Valve, Disp. Pump
13	Air Supply To Dryer	58	Dry Air Hose, Air Dryer	322	Fluid Hose, Disp. Pump To Heater
14	Main Air Supply Line	61	Drain Valve, Heater	341	Pump Air Regulator
17	Gun Air Supply Line	102	Heater Hose	343	Pump Bleed-Type Master Air Valve
22	Fluid Filter	103	Heated Whip Hose		

Fig. 1

The Typical Installation

The Typical Installation in Fig. 1 shows all the components and the minimum recommended accessories for a Foam-Cat® Sprayer, Model 224546, and the correct routing of all air and fluid hoses.

Reference letters and numbers

Parts information for reference numbers 1 to 61 can be found in separate manuals accompanying the sprayer or accessories. These reference numbers do not correspond to those in the separate manuals.

Parts information for reference numbers 101 to 346 can be found on pages 20.

Installation

NOTE: For most steps, if no figure drawing is referenced, see Fig. 1 to locate the parts.

I . Mount the system.

1. Secure the sprayer stand (301) to the floor in a suitable location. See the mounting hole diagram in manual 307551.

2. Install a bleed-type master air shutoff valve (1), Part No. 113218, on the main air supply line to provide a remote shutoff point for all air-powered components, and a main line air filter (2), Part No. 106149, to remove harmful dirt and moisture from the compressed air supply.

3. When operating the proportioning pump at the higher pressure ranges, replace the Y-strainer (318) with a higher capacity Y-strainer, Part No. 101078. The replacement filter is Part No. 180199.

NOTE: The air to the spray gun must be very clean and dry to avoid contaminating the foam.

⚠ CAUTION

To avoid mixing the polyurethane foam chemicals and permanently damaging the hoses, all critical air and fluid connections are clearly labeled ISO or RES. Make only ISO to ISO and RES to RES connections.

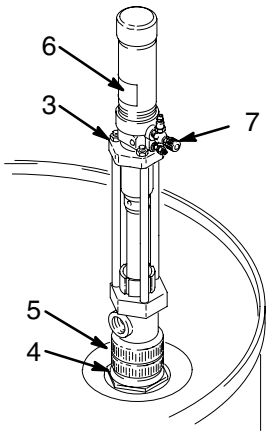


Fig. 2 04438

4. Install the 1:1 ratio feed pumps (3) in 55 gallon drums of ISO and RES. Order Part No. 226946 for the pumps, and Part No. 217381 for the Feed Pump Kit which includes an Air Dryer, two 1:1 Fast–Flo pumps, two feed hoses, three air hoses, and the related fittings. Manual 307552 contains installation and operation information.

   a. Screw the bung adapter (4) and pump tightly into the drum cover. Then tighten the nut (5) firmly to complete the air-tight seal. See Fig. 2.

   b. Separate the ISO/RES identification label (6) along the perforation. Clean the surface of the air motor with solvent and apply the appropriate label (RES or ISO) to identify the chemical being pumped.

   c. We recommend installing an air regulator near the feed pump air inlet to control pump speed. Remove the air valve (7). Install the regulator and pin fitting using suitable adapters and thread sealant on the male threads. Order Part No. 206199 for an air regulator and gauge.

⚠ WARNING

COMPONENT RUPTURE HAZARD
To reduce the risk of a container rupture and serious injury:

- Never pressurize a drum or container that will not withstand 5.5 psi (38 kPa, 0.38 bar) working pressure.
- Never use a damaged drum of ISO or RES with the Air Dryer.

5. Mount the Air Dryer (9) in a suitable location near the ISO and RES drums. See Fig. 1. Order Graco Part No. 217341, if you did not order the Feed Pump Kit mentioned in Step 4. See the mounting hole diagram in manual 307548.

   a. Fill the bowl of the desiccant dryer. Unscrew the ring (10) to remove the dryer bowl.

   b. Remove the filter from the top of the bowl and fill the bowl with the desiccant crystals provided with the kit. Reinstall the filter and bowl.

Installation

II . Connect the air hoses.

1. Connect an air supply hose (11) from the 1/4 npt quick disconnect coupler of each feed pump to the air manifold (316).

2. Connect an air supply hose (13) between the air inlet of the Air Dryer (9) and the main air supply line (14).

3. Connect a grounded 1/2 in. minimum ID main air supply line (14) to the air manifold (316).

4. Be sure all air hose connections are tight.

⚠ WARNING

COMPONENT RUPTURE HAZARD
To reduce the risk of over-pressurizing the heater and pump, which can result in serious injury and equipment damage, follow these precautions:

- Do not install any fluid shutoff device at the fluid outlet of either the heater or filter! See Ref. 24, Fig. 3.
- Use at least 50 ft. (15.2 m) of fluid hose between the fluid outlet and any fluid control device such as a shutoff valve, regulator, or spray gun.

III . Connect the Heated Hose Assembly.

1. For heated hose warnings and assembly instructions, see manual 307544.

2. Connect the fluid hoses to the corresponding 3/8 npt outlet union of the fluid filters (22). See Fig. 3

3. Connect the heat tape connector (16) to the hose control box cable (23). See Fig. 3.

IV . Install a needle/nozzle kit on the gun.

NOTE: This kit includes the parts shown in Fig. 4, except the pin vise (36), which holds the cleaning pin (37), and the nozzle retainer (30), which is part of the gun. The wrenches mentioned in the following instructions are provided with the gun.

1. Use the 3/16" wrench (25) to remove one capscrew (26) from the fluid manifold (27) and two capscrews (26) from the nozzle housing (28). See Fig. 5.

2. Trigger the gun, and then pull the nozzle housing (28) straight off the gun body (29). See Fig. 5.

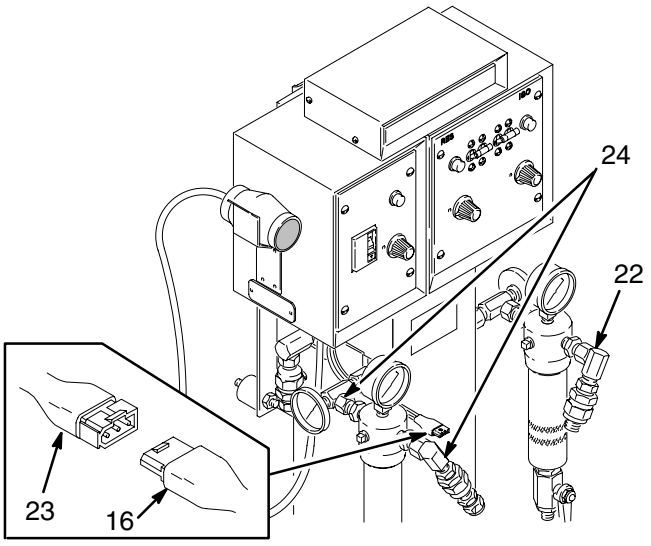


Fig. 3 01294

KEY

30 Nozzle retainer
31 Nozzle
32 Packing nut
33 Packing
34 Needle
36 Pin vise
37 Cleaning pin

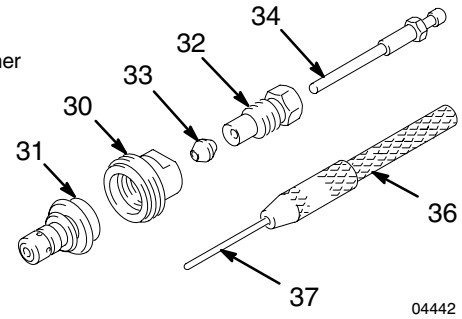


Fig. 4 04442

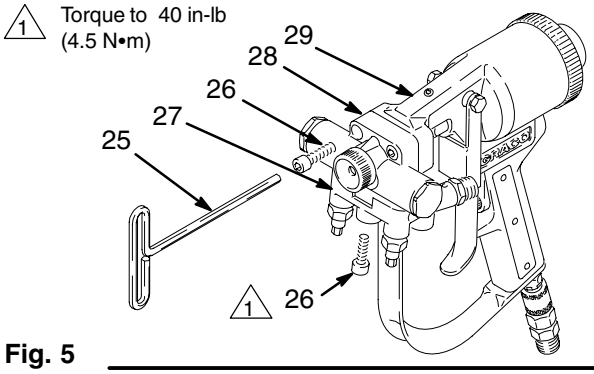


Fig. 5 04443

Installation

3. Use the 1/2” end of wrench (35) to remove the nozzle retainer (30) from the back of the nozzle housing (28). See Fig. 6.

4. Insert the nozzle (31), tapered end first, into the back of the housing. See Fig. 6.

5. Slide the packing nut (32), nozzle retainer (30), and packing (33) onto the needle (34). Screw the packing nut (32) into the nozzle retainer (30) until the top thread of the packing nut is flush with the back of the retainer. See Fig. 7.

6. Slide the needle assembly through the nozzle and into the nozzle housing assembly. See Fig. 6.

7. Adjust the needle so it protrudes 1–3/4 in. (44 mm) from the rear of the housing. See Fig. 8.

8. Screw the nozzle retainer (30) snugly into the back of the housing (28). Torque to 25–35 in-lb (2.8–3.9 N•m) using the 1/2” end of wrench (35). See Fig. 8.

⚠ CAUTION

Do not overtighten the nozzle retainer (30). This can compact the nozzle (31) and damage it, or cause it to seat improperly, resulting in spray pattern distortion.

9. Guide the needle of the nozzle assembly into the front opening (38) of the gun body (29). The socket of the piston rod (39) must face down. Tilt the nozzle assembly up and swing the ball of the needle (34) into the piston rod socket. See Fig. 9.

10. Push the nozzle assembly further into the front opening (38) until the back of the assembly meets the gun body. See Fig. 9.

11. Use the 3/16” wrench (25) to install the two top capscrews (26) firmly into the nozzle housing. Torque to 40 in-lb (4.5 N•m). See Fig. 5, page 10.

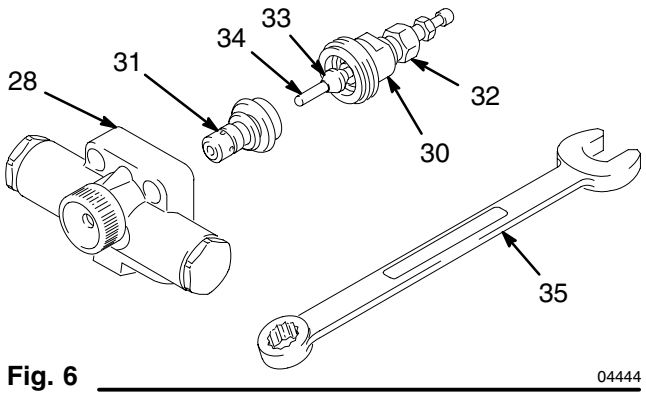


Fig. 6 04444

1 Top thread of packing nut (32) must be flush with back of retainer (30).

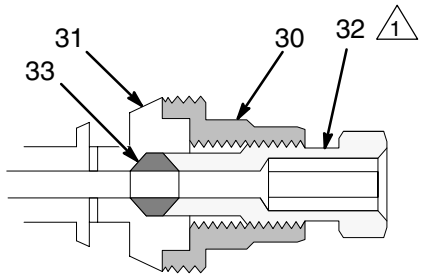


Fig. 7 04445

1 Torque to 25–35 in-lb (2.8–3.9 N•m)

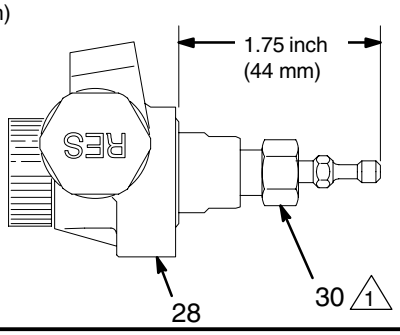


Fig. 8 04446

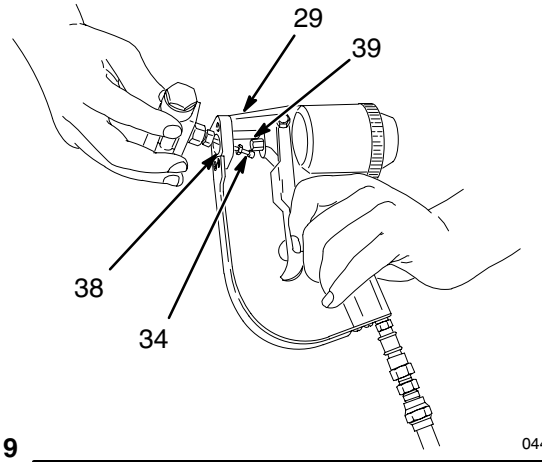


Fig. 9 04447

Installation

⚠ WARNING

INJECTION HAZARD
To reduce the risk of serious injury from injection, be sure the trigger safety (40) is locked before proceeding. See Fig. 10.

12. Screw on the air cap (41). Connect the air hose of the heated hose assembly to the inlet bushing (42) of the gun. See Fig. 10.

13. Use the 7/16" end of wrench (35) to adjust the packing nut (32) until it is *just snug*. Don't over-tighten it! See Fig. 10.

14. Install the plastic shield around the exposed part of the needle assembly (E) to keep foam overspray from collecting on the needle. See Fig. 10.

V . Connect the fluid hoses to the spray gun manifold.

1. The gun manifold (27) has four inlet ports; two ports are plugged with steel plugs (44). See Fig. 11. Relocate the plugs to route the hoses straight down from the manifold, if desired.

2. Connect the fluid hoses to the corresponding inlets of the gun manifold.

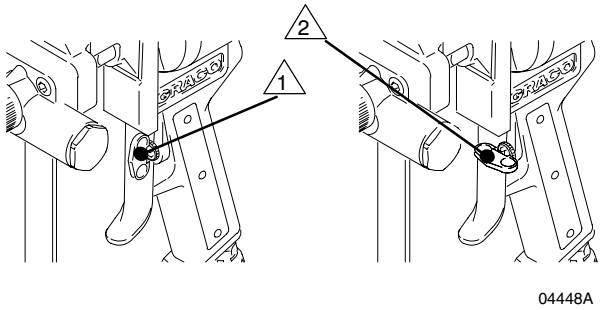
3. Do not connect the manifold to the gun yet.

VI . Connect the feed hose to the displacement pumps.

1. Slide an identification band (ISO or RES) over the end of each feed hose.

2. Connect a feed hose (45) between the feed pump fluid outlet (46) and the 3/4 npt(f) fluid intake valve (321) of each displacement pump (48). See Fig. 1, on page 8.

△1 Unlocked trigger safety.
△2 Locked trigger safety.



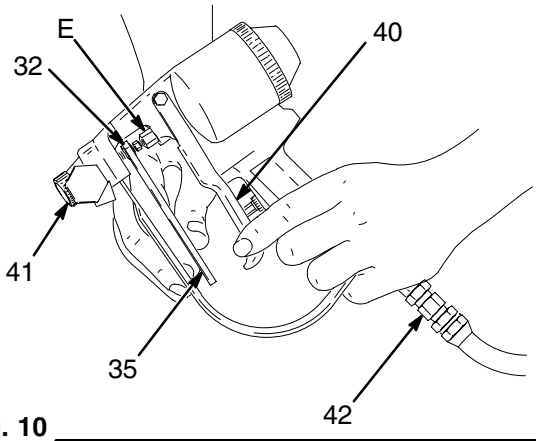


Fig. 10

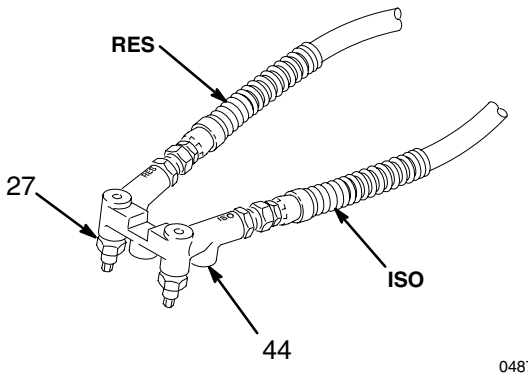


Fig. 11

VII . Position the ATC Sensor.

1. Remove the ATC Sensor (49) from the clamp (50). See Fig. 12.

2. Locate the sensor *outside* in air that is typical of the surface to be sprayed. The sensor has a 15 ft. (4.6 m) cable.

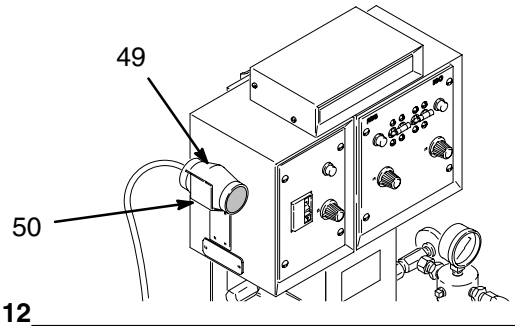


Fig. 12 01294

VIII . Wire and electrically ground the system.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of static sparking, which can cause a fire or explosion and result in serious injury, including electric shock, always follow these precautions.

- Read and follow the warnings in **FIRE, EXPLOSION AND ELECTRIC SHOCK HAZARD** on page 5.
- Provide electrical grounding continuity throughout the entire spray system.
- Have a trained and qualified person perform all electrical wiring.
- Comply with all applicable local, state and national fire, electrical and other safety regulations.

1. Wire the electrical service to the heater junction box. The electrical requirements for the heater are shown on the inside cover to the heater junction box.

NOTE: The heater is grounded through the electrical wiring to a grounding screw on the inside bottom of the junction box. The proportioning pump must also be grounded to provide adequate system electrical grounding.

2. Electrically ground the proportioning pumps and the feed pumps**.** A ground wire and clamp is provided with the proportioning pump. Order a 25 ft. (7.6 m) 12 gauge ground wire and clamp, Part No. 222011, for each feed pump. The grounding lug for the proportioning pump is located on top of the pump stand. The grounding lug for the feed pumps is located at the base of the motor.

   a. Loosen the grounding lug locknut (55) and washer (52). Insert one end the ground wire (53) into the slot in the lug (54) and tighten the locknut securely. See Fig. 13.

   b. Connect the other end of the wire to a true earth ground (check your local code).

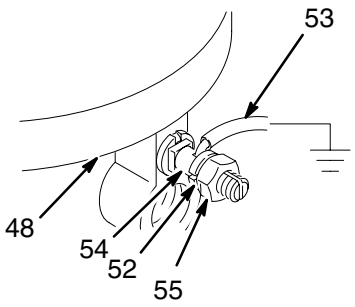


Fig. 13 0720

Continued on the next page.

3. Electrically ground the heater and heated hoses.

   a. Wire the heater to a positively grounded power supply. In a mobile installation, be sure the truck or trailer is connected to a true earth ground.

   b. Connect the heated hose to a properly grounded heater. The Ground Fault Interrupter on the hose control panel of the Foam-Cat Heater senses electrical continuity in the heated hoses; it cannot function unless the heater is positively grounded. In Europe, the hose continuity must comply with VDE 0100.

4. Use only electrically conductive air hoses.

5. Use only Graco Foam-Cat® Heated (fluid) Hoses, Models 218613, 218614, which are electrically conductive.

   NOTE: To ensure positive grounding and further reduce the risk of electric shock, redundant grounding is recommended. The long lines of the shielded-wire heated hose have a higher than normal capacitive leakage current to ground.

6. Obtain electrical grounding for the spray gu**n** by connecting it to a properly grounded fluid hose and pump.

7. Electrically ground the following objects according to your local code.

   - The object being sprayed.
   - The fluid supply container.
   - All solvent pails used when flushing. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.

8. To maintain grounding continuity when flushing or relieving pressure, always hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun.

IX . Install the air dryer drum fittings.

1. Install the drum fittings (56) in the 3/4 in. vent port of the corresponding drum of fluid.

2. Close the shutoff valve (57) and connect the corresponding dry air hoses (58). Use only the special pin fitting (59) and coupler (60) to connect the dry air hoses to the drum fittings. Do not use additional lengths of dry air hose. See Fig. 14.

⚠ WARNING

COMPONENT RUPTURE HAZARD
The special air line pin fitting (59) and coupler (60) are designed to prevent accidentally coupling an unregulated air supply hose to the drum. Unregulated air can over pressurize the drum and cause it to rupture and cause serious injury.

Do not substitute a different type of coupler and fitting! Use genuine Graco replacement parts.

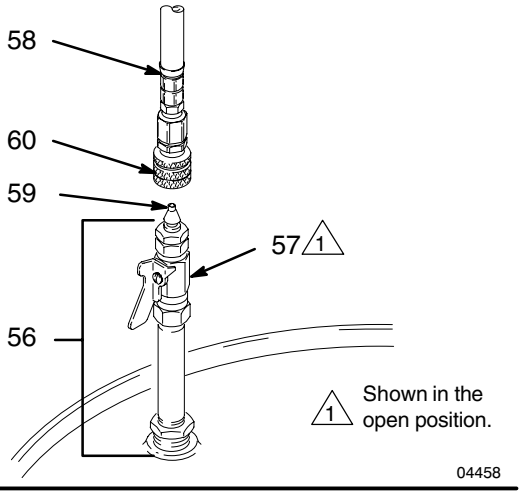


Fig. 14

Operation - First Time Startup

Pressure Relief Procedure

⚠ WARNING

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

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

1. Lock the spray gun trigger safety.
2. Shut off the air to the feed pumps.
3. Turn off the air to the proportioning pump.
4. Close the gun manifold needle valves.
5. Unlock the trigger safety, trigger the gun to relieve pressure, and lock the trigger safety again.
6. If possible, allow the heater to cool before opening the drain valves. This prevents the resin from frothing.
7. Open both fluid filter drain valves, having a container ready to catch the draining fluid.
8. If you are working on any part of the heater, shut off the main electrical power to the heater.
9. If you suspect that the spray tip/nozzle or hose is completely clogged or that pressure has not been fully relieved after following the steps above, very slowly loosen the hose end coupling and relieve pressure gradually, then loosen the coupling completely. Now clear the tip/nozzle or hose obstruction.

I . Prime the sprayer.

⚠ WARNING

ELECTRIC SHOCK HAZARD
Be sure the heater and heated hose circuit breakers (63) are shut off to reduce the risk of electric shock. See Fig. 19, page 18.

NOTE: For each step, if no figure drawing is referred to, see Fig. 1, on page 8, to locate the parts mentioned in the step.

1. Close the feed pump air inlet valves or regulators (8).
2. Close the heater drain valves (61).
3. Close the needle valves (64) of the spray gun manifold. See Fig. 15.

⚠ CAUTION

Do not overtighten the needle valves to avoid cracking the seals.

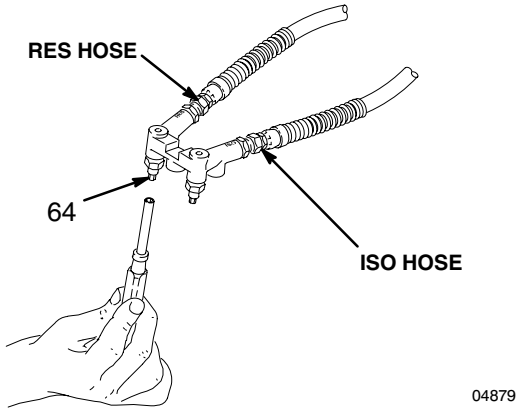


Fig. 15

4. Fill the displacement pump packing nut 2/3 full with IPO (ISO Pump Oil), supplied.
5. Be sure the proportioning pump fluid intake valves (321) are open.
6. Open both main air line shutoff valves (1).

⚠ WARNING

COMPONENT RUPTURE HAZARD
To reduce the risk of overpressurizing the supply drum or container, which could rupture the drum and cause serious injury and property damage follow these precautions.

- Do not operate the Air Dryer with any part removed.
- Do not operate with the restrictor nipple (14) removed. These nipples limit the volume of air to the Air Dryer.
- Do not operate with either pressure relief valves (12) removed. These valves relieve air pressure to the drums if it exceeds 5.5 psi (38 kPa, 0.38 bar).
- Do not operate with the metal power guard (A) removed from the oil filter or desiccant dryer.

Operation - First Time Startup

II . Adjust the air dryer.

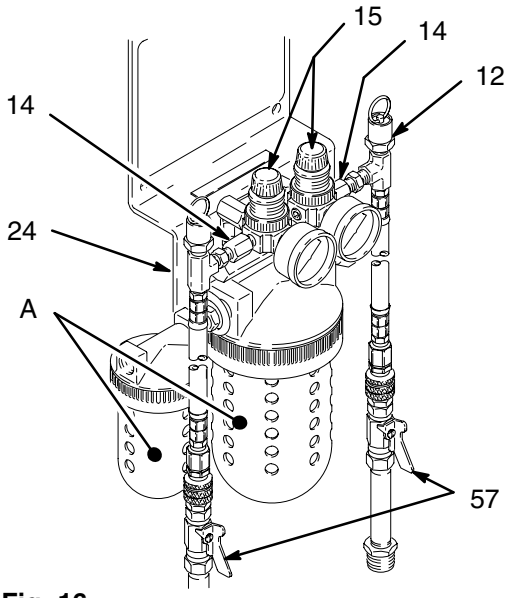


Fig. 16

1. Set both air regulators (15) to the lowest pressure needed to provide adequate dry air to the supply drums. A setting of 2 psi (14 kPa, 0.14 bar) normally provides enough dry air to the drums. See Fig. 16.
2. Open the drum shutoff valves (57). See Fig. 16.
3. To lower the pressure on the gauge, turn the regulator knob counterclockwise and pull up on the pressure relief valve (12) ring until the pressure on the gauge is just below the desired setpoint. Release the ring and then turn the knob to the desired pressure. See Fig. 16.

⚠ WARNING

COMPONENT RUPTURE HAZARD
If either pressure relief valve (12) is not operating properly, or if the drum pressure ever exceeds 5.5 psi (38 kPa, 0.38 bar), replace the valve immediately. A malfunctioning relief valve can allow the drum to over pressurize and rupture, resulting in serious injury and property damage. Never attempt to repair the valve.

4. Check the pressure relief valves daily. To check, close the drum shutoff valves (57) and uncouple the air hoses (58) from the pin fitting. Increase the air pressure slowly. If pressure is not relieved by 5.5 psi (38 kPa, 0.38 bar), replace the valve. See Fig. 16.

NOTE: A minimum pressure of 1 psi (7 kPa, 0.07 bar) is needed to open the check valves (14).

III . Prime the hoses.

1. Open the feed pump air valves (8).
2. With the gun disconnected from the manifold, hold the manifold (27) so each outlet port is directly over a separate waste container as shown in Fig. 17.

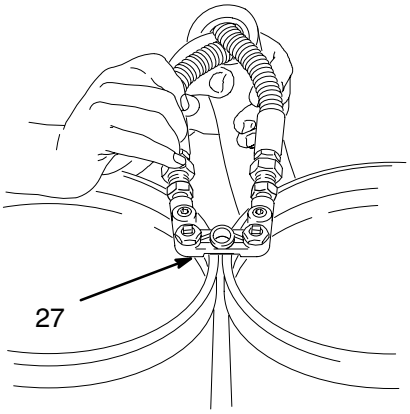


Fig. 17

3. Open the manifold needle valves (64). See Fig. 15, page 15. Allow the material to flow out until all air is purged from the sprayer and the spitting stops.
4. Close the needle valves. Do not connect the manifold and the gun.
5. Throw away the purged material in both waste containers to avoid contaminating your supply containers with test fluid left in the components after factory testing.

IV . Check each fluid connection for leaking.

⚠ WARNING

INJECTION HAZARD
To reduce the risk of a serious injury, always follow the **Pressure Relief Procedure** on page 15 whenever you are instructed to relieve the pressure.

If there are any leaks, relieve the fluid pressure and tighten the connection.

Operation - General Startup Instructions

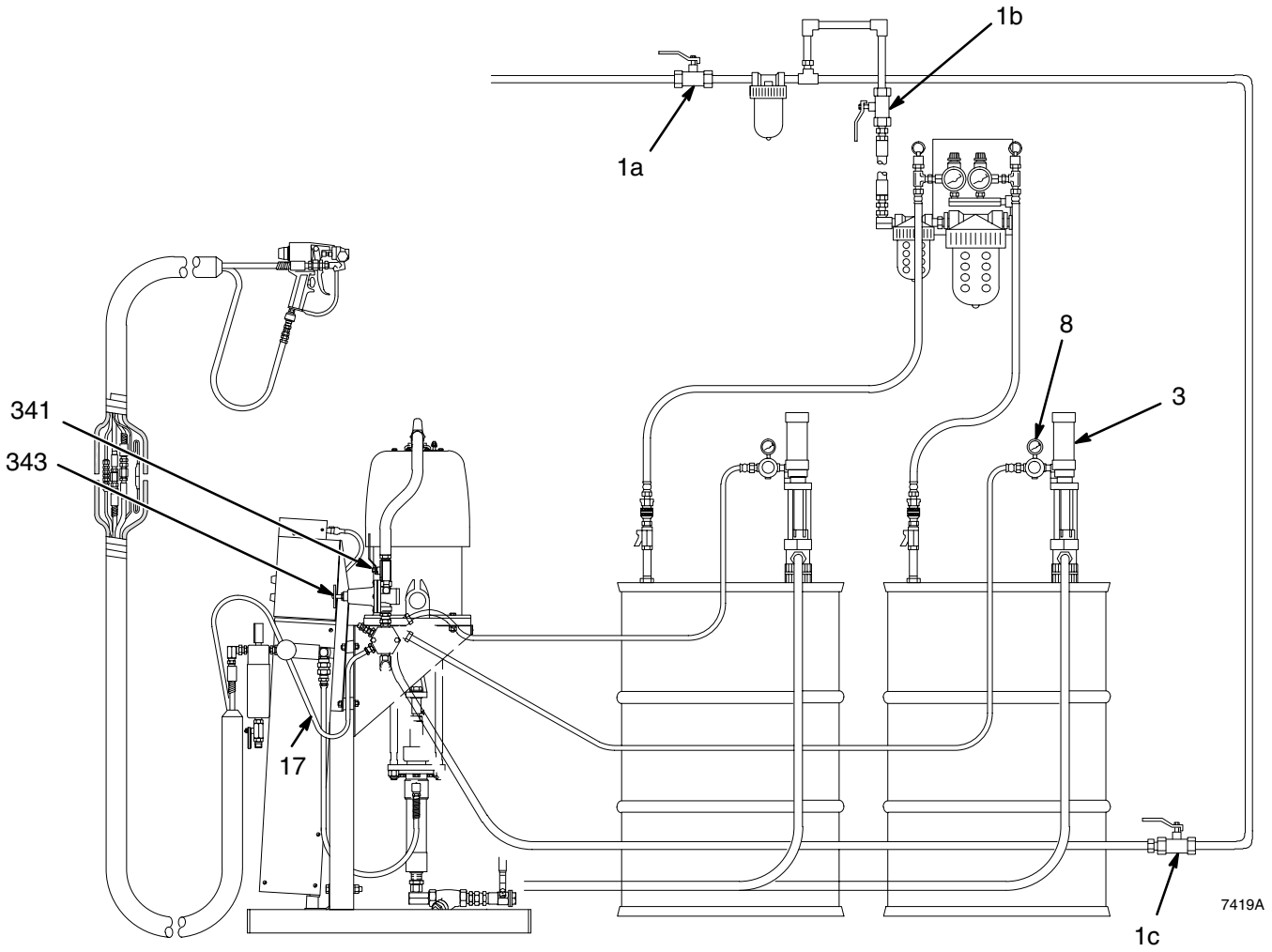


Fig. 18

⚠ WARNING

COMPONENT RUPTURE HAZARD

Never operate the hose when it is coiled. Doing so causes excessive heat buildup which can result in hose rupture and cause serious injury, including injection. The high heat can also cause poor foam development.

⚠ CAUTION

The heater and sprayer must be primed before turning on the heater to reduce the risk of equipment damage.

See **Operation - First Time Startup** on pages 15 through 16 for the priming procedure.

NOTE: The first time you operate the sprayer follow these instructions carefully. Then, as you become familiar with this equipment, you will learn how to quickly adjust the fluid pressure and the fluid temperature to obtain the best results for your spray application.

For each step, if no figure drawing is referred to, see Fig. 18.

I . Start the sprayer.

1. Open the main air supply valves (1a,1b,1c).
2. Open the air valves (8) to the feed pumps (3).
3. Adjust the air regulator (343) to the proportioning pump motor to 50 psi (345 kPa, 3.4 bar).
4. Slowly open the air valve (341) to the proportioning pump.

Operation - General Startup Instructions

5. Start the heaters. See Fig. 19.

   a. Set all three Temp Set dials (73) to “cal” position, approximately 120°F (49°C).

   b. Turn the circuit breakers (63) to“I” for ON.

   c. Let the material heat for 15 minutes.

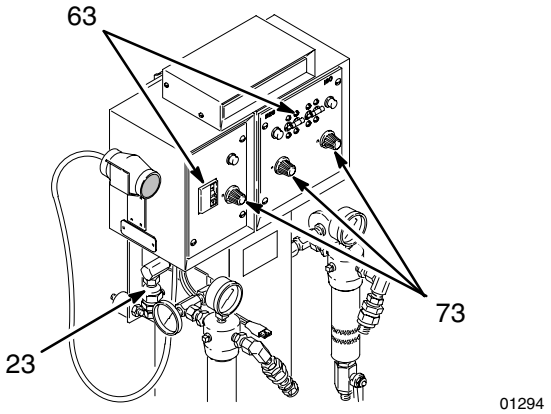


Fig. 19

6. Spray the gun for several seconds, in cold weather, to warm the fluid nozzle.

> **⚠ CAUTION**
>
> Open the RES side needle valve first to prevent damage to the nozzle.

7. To check the spray pattern, point the gun at a piece of scrap cardboard and spray for 1 second. A good pattern should be round and well atomized, and it should harden with a fairly smooth surface. See the **Nozzle Performance Chart** for the proper size of pattern and spray distance for the nozzle being used.

NOTE: Release the gun trigger at least once a minute, while spraying, if you use a no-release triggering method. This is to actuate the mechanical purger and avoid material buildup on the nozzle tip and air cap.

NOZZLE PERFORMANCE CHART

Nozzle Kit Part No.	Needle Diameter in. (mm)	DELIVERY		
		Outlet Pressure psi (MPa, bar)	**Flow Rate**[1] lb/min (kg/min)	**Pattern Diameter**[2] in. (mm)
217421	0.114 (2.90)	1200 (8.4, 84) 950 (6.5, 65) 750 (5.1, 51)	41 (18.4) 35 (15.8) 29 (13.1)	18 (457)
217423	0.089 (2.26)	1000 (7, 70) 750 (5.1, 51)	19 (8.6) 15 (6.6)	17 (432)
217424	0.073 (1.85)	1000 (7, 70) 750 (5.1, 51)	10.5 (4.7) 8.5 (3.8)	12 (305)
217425	0.083 (2.11)	1000 (7, 70) 750 (5.1, 51)	15 (6.6) 12 (5.5)	17 (432)
217426	0.102 (2.59)	1200 (8.4, 84) 950 (6.5, 65) 750 (5.1, 51)	19 (13.1) 25 (11.3) 21.5 (9.7)	17 (432)

1 Flow rate text conditions: 2.7 lb (1.22 kg) foam; ISO viscosity of 200 CPS (200 MPa·s) at 77°F (25°C); RES viscosity of 650 CPS (650 MPa·s) at 68°F (20°C); heater and hose temperature of 115°F (43°C); pump outlet pressure as indicated in chart.

2 At the recommended 30 in. (762 mm) spraying distance.

Operation - General Startup Instructions

8. Adjust the gun's clean-off air.

⚠ WARNING

INJECTION HAZARD
To reduce the risk of an injection injury, always follow the items in Step 8 carefully before adjusting the clean-off air.

a. Lock the trigger safety (40).

b. Close the needle valves (64).

c. Unlock the trigger safety.

d. Trigger the gun to relieve the fluid pressure.

e. Lock the trigger safety again. See Fig. 10.

f. Using a hex key wrench (71), screw in the setscrew (72) of the clean-out hole until no air or almost no air is escaping. See Fig. 10.

g. Regulate the air to the gun to 100 psi (0.7 MPa, 7 bar).

h. Back off the setscrew two turns as a test setting.

i. If the air appears to affect the spray pattern, screw in the setscrew another turn. If build up behind the air cap occurs, back off the setscrew about 1/2 turn at a time.

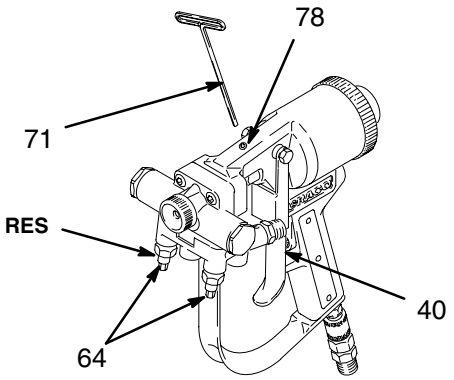


Fig. 20

II . Shutdown

⚠ WARNING

INJECTION HAZARD
To reduce the risk of a serious injury, always follow the **Pressure Relief Procedure** on page 15 whenever you are instructed to relieve the pressure.

1. At the end of each work day, stop the pump with the displacement rod in the *down* position.

2. Shut off the heat and main circuit breakers and relieve the fluid pressure.

3. Disconnect the gun from the fluid manifold, flush the gun as instructed in manual 307546, and store the gun.

III . Maintenance

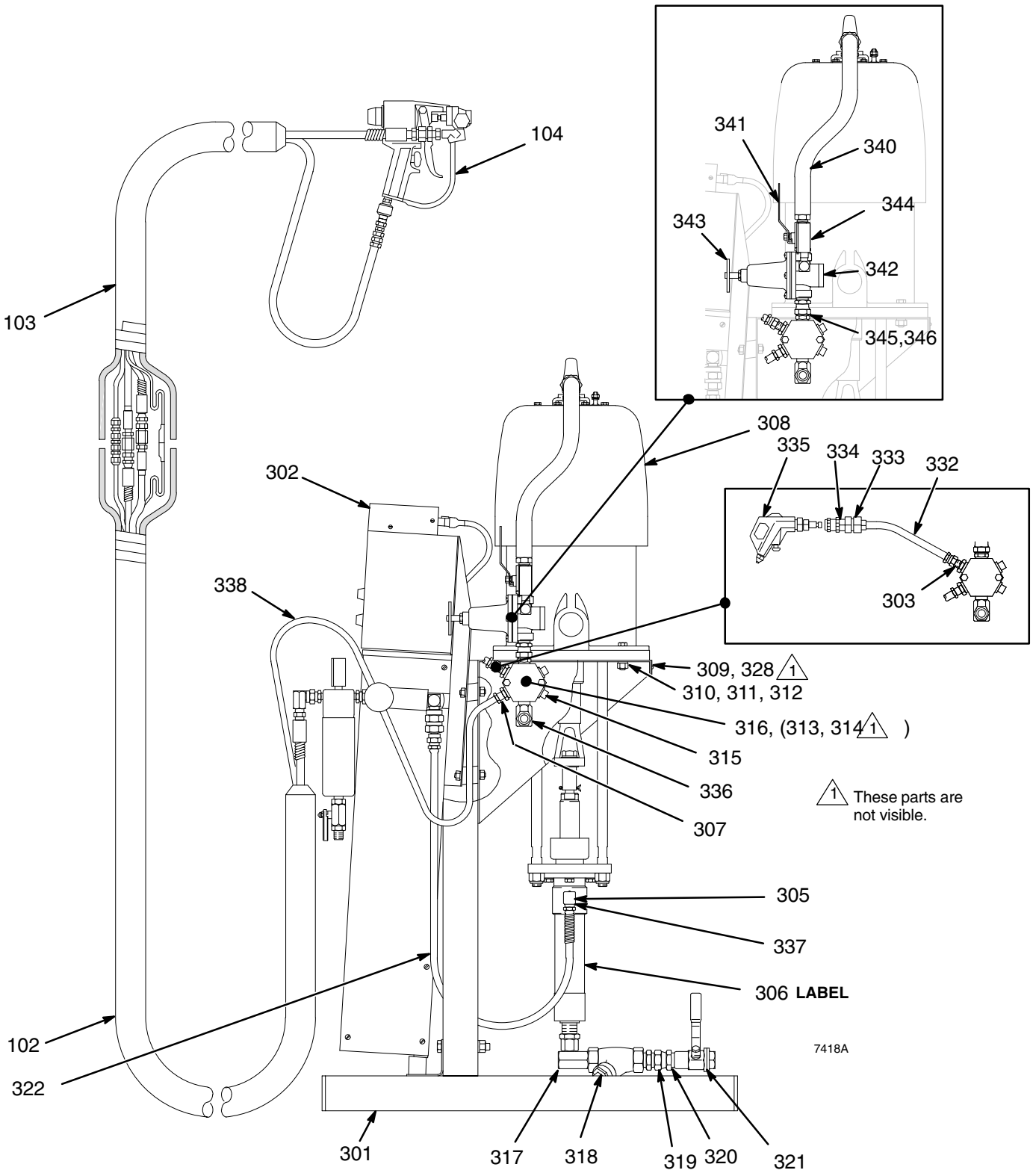
Keep the displacement pump packing nut 2/3 full of IPO at all times to help protect the pump packings.

⚠ CAUTION

Trace amounts of IPO may get into the foam. Before using the IPO make sure that it will not affect the development and appearance of the foam.

See the separate instruction manual for each system component for routine maintenance and repair procedures.

Parts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1 These parts are not visible.
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306 LABEL
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Model 224546, Bulldog® Foam-Cat® 400

Includes items 101 to 105

Ref. No.	Part No.	Description	Qty.
101	224544 Series B	FOAM SPRAYER; See items 301 to 346	1
102	218613	HOSE, heated; See 307544 for parts	1
103	218614	HOSE, heated, whip; See 307544 for parts	1
104	217373	GUN, foam	1
105 ✓	217421	KIT, nozzle, gun, 0.114” dia.; not shown, See 307546 for parts and other available sizes	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 224544, Series B Basic Foam-Cat System

Includes items 301 to 346

Ref. No.	Part No.	Description	Qty.
301	217296	STAND, pump; See 307551 for parts	1
302	235260	HEATER, 30 lb/min. (13.5 kg/min.)	1
303	162449	NIPPLE, reducing, 1/2 to 1/4 npt	1
305	155699	ELBOW, street, 90°, 3/8 npt (m x f)	2
306	178600	LABEL, ISO/RES	1
307	155571	BUSHING, pipe, 1/2 npt(m) x 1/4 npt(f)	1
308	224567	PUMP, foam, Bulldog; See manuals 307049 and 307430 for parts	1
309	150707	LABEL, serial	1
310	100490	CAPSCREW, hex head, 3/8 npt x 1.5” (32 mm)	4
311	100133	LOCKWASHER, spring, 3/8”	4
312	100131	NUT, hex, 3/8 npt	4
313	100333	CAPSCREW, hex head, 1/4 thread x 0.5” (13 mm)	2
314	100016	LOCKWASHER, spring, 1/4”	2
315	100737	PLUG, pipe,1/2 npt	3
316	177117	MANIFOLD, air, six 1/2 npt(f) ports	1
317	160327	ADAPTER, union, 90°, 3/4 npt(m) x 3/4 npt(f) swivel	2
318	101078	STRAINER, “Y”, 20 mesh screen, 3/4 npt(fbe), Includes item 318a	2
318a	180199	.ELEMENT, filter, 20 mesh screen (not shown)	1
319	160032	NIPPLE, 3/4 npt x 1–7/8” (47 mm)	2
320	157785	UNION, straight, 3/4 npsm(f) swivel x 3/4 npt(m)	2
321	108537	BALL VALVE, 3/4 npt(fbe)	2
322	217378	HOSE, cpld 3/8 npt(mbe), 3/8” ID, spring guard one end, 2.5 ft. (780 mm)	2
328	102556	RIVET, blind	2
330✓	217374	OIL, pump, ISO, 1 pt. (0.46 liter); not shown	1
332	212005	HOSE, air, 1/4” ID, cpld 1/4 npsm(f) swivel, 3’9” (1.1 m)	1
333	100030	BUSHING, hex, 1/4 x 1/8 npt	2
334	106552	COUPLING, air line, quick disconnect	1
335	208625	GUN, air blow	1
336	155470	UNION, swivel 90°, 1/2 npt(m) x 1/2 npsm swivel	1
337	100081	BUSHING, pipe, 1/2 npt to 3/8 npt	2
338	200118	HOSE	1
339	218669	KIT, solvent; not shown	1
340	214952	HOSE, 16–3/4” long, 1/2” ID, coupled, 1/2 x 3/4–14 npt (m)	1
341	107142	VALVE, air shutoff, 1/2 npt (m x f)	1
342	100960	GAUGE, air pressure	1
343	206197	REGULATOR	1
344	100840	ELBOW, street	1
345	156684	UNION, adapter, 1/2 npt(m) x 1/2 npt(f) swivel	1
346	158491	NIPPLE, 1/2”	1

✓ *Keep these spare parts on hand to reduce down time.*

Graco Standard Warranty

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.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

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

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

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Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you:

1–800–367–4023 Toll Free

612–623–6921

612–378–3505 Fax

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Sales Offices: Minneapolis, Detroit
International Offices: Belgium, Korea, Hong Kong, Japan

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INSTRUCTIONS-PARTS LIST

308–145

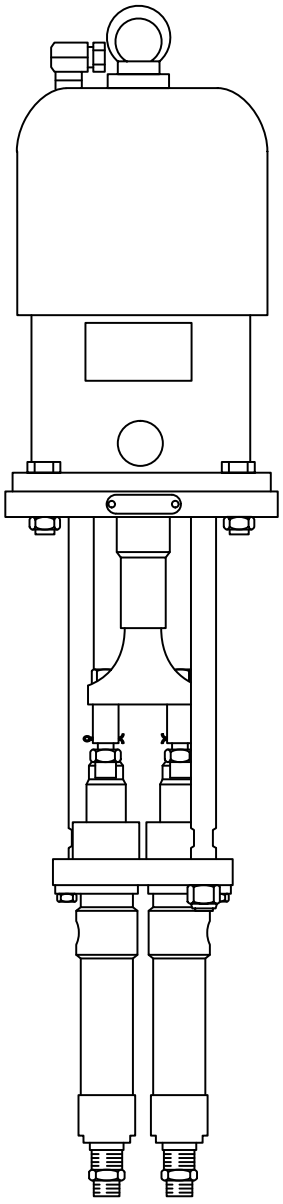
Rev A

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

Bulldog®
PLURAL COMPONENT PUMP

1500 psi (105 bar) MAXIMUM WORKING PRESSURE
100 psi (6.9 bar) MAXIMUM INCOMING AIR PRESSURE

Model 224–567, Series A



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WARNING

Plural Component Chemicals Hazard

Graco Inc. does not manufacture or supply any of the reactive chemical materials that may be used in this equipment and is not responsible for their effects. Because of the vast number of chemicals that could be used and their varying chemical reactions, before using this equipment, the buyer and the user should determine all facts relating to the materials used, including any of the potential hazards involved. Particular inquiry and investigation should be made into potential dangers relating to toxic fumes, fires, explosions, reaction times, and exposure of human beings to the individual components or their resultant mixtures. Graco assumes no responsibility for loss, damage, expense or claims for bodily injury or property damage, direct or consequential, arising from the use of such chemical components.

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

WARNING

High pressure spray can cause serious injury. For professional use only.
Observe all warnings. Read and understand all instruction manuals before operating equipment.

FLUID INJECTION HAZARD

General Safety

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

NEVER point the spray gun as anyone or at any part of the body. NEVER put hand or fingers over the nozzle.

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

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

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

Medical Alert – Airless Spray Wounds

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

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

Spray Gun Safety Devices

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

Safety Latch

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

Trigger Guard

Never operate the gun with the trigger guard removed. This guard helps prevent the gun from triggering accidentally if it is dropped or bumped.

Nozzle Safety

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

PRESSURE RELIEF PROCEDURE

Always relieve the fluid pressure in the sprayer and hoses and shut off the electric power before checking or adjusting the hoses or any other component in the system, and when you stop spraying, to reduce the risk of serious bodily injury from fluid injection or electric shock.

1. Engage the spray gun trigger safety latch.
2. Shut off the air to the feed pumps.
3. Turn off the air to the proportioning pump.
4. Close the gun manifold needle valves.
5. Disengage the trigger safety latch again.
6. Open both fluid filter drain valves, having a container ready to catch the draining fluid.
7. Shut off the main electrical power to the heater if you are working on any part of the heater.

EQUIPMENT MISUSE HAZARD

General Safety

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

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

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

WEAR APPROPRIATE PROTECTIVE CLOTHING, eyewear and respirator as recommended by the fluid and solvent manufacturer.

System Pressure

This system has a *1500 psi (105 bar) MAXIMUM WORKING PRESSURE AT 100 psi 6.9 bar) MAXIMUM INCOMING AIR PRESSURE.* Be sure that all spray equipment and accessories are rated to withstand the maximum working pressure of this heater. DO NOT exceed the maximum working pressure of any component or accessory used in the system.

NEVER install any fluid shut off device at the fluid outlet of either heater or filter. Shutting off the fluid at the outlet causes high back pressure which can cause component rupture and result in serious bodily injury.

Fluid Compatibility

BE SURE all fluids and solvents used are chemically compatible with the wetted parts shown in the Technical Data on page 12. Always read the fluid and solvent manufacturer’s literature before using them in this system.

HOSE SAFETY

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

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

Never use a Graco heated hose until the couplings are properly insulated and the hose abrasion cover is in place.

Never operate a heated hose when it is coiled. Doing so causes excessive heat buildup which can result in hose rupture and cause serious bodily injury, including fluid injection and property damage.

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

HANDLE AND ROUTE HOSES CAREFULLY. Do not pull on the hoses to move equipment. Do not use materials or solvents which are not compatible with the inner tube and cover of the hose.

FIRE OR EXPLOSION HAZARD

Static electricity is created by the high velocity flow or fluid through the pump and hose. if every part of the spray equipment is not properly grounded, sparking may occur, and the system may become hazardous. Sparking may also occur when plugging in or unplugging a power supply cord. Sparks can ignite fumes from solvents and the fluid being sprayed, dust particles and other flammable substances, whether you are spraying indoors or outdoors, and can cause a fire or explosion and serious bodily injury and property damage. Do not plug in or unplug any power supply cords in the spray area when there is any chance of igniting fumes still in the air.

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

Grounding

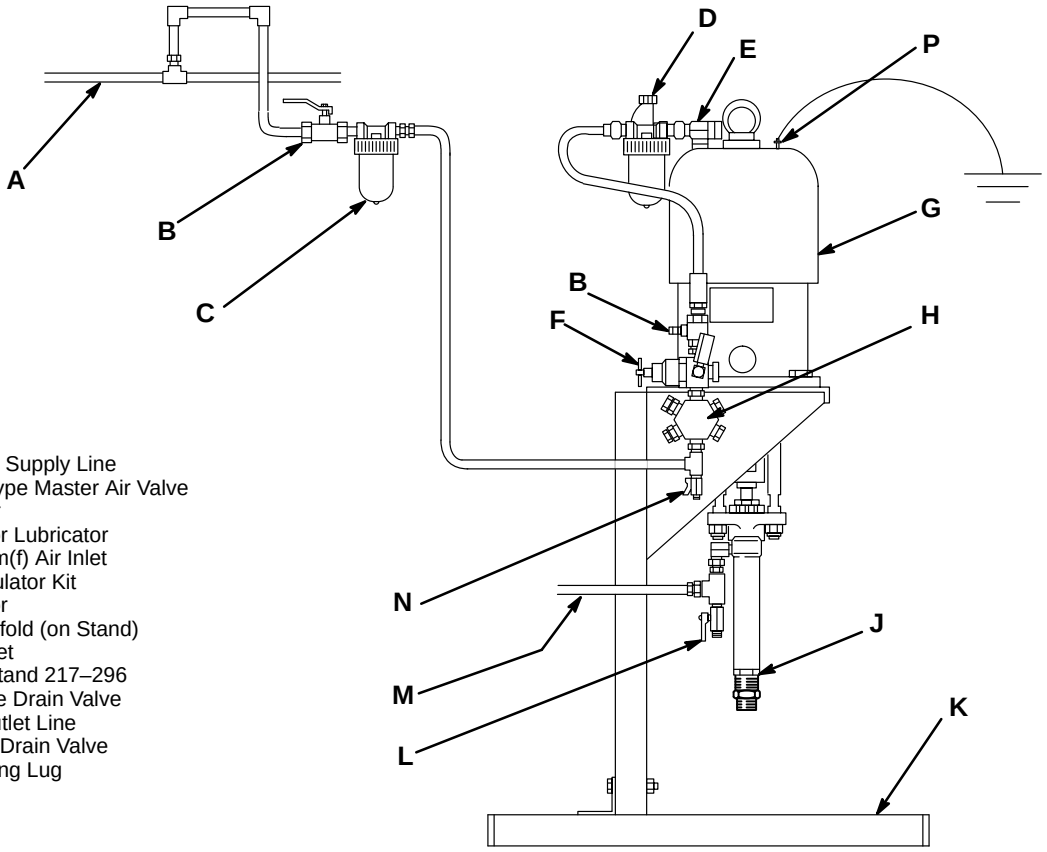
The reduce the risk of static sparking, ground the sprayer and all other spray equipment used or located in the spray area. CHECK your local electrical code for detailed grounding instructions for your area and type of equipment. BE SURE to ground all of this spray equipment:

1. *Sprayer & Plural Component Pump:* by using a ground wire and clamp to connect the sprayer to a true earth ground. See page 12 to order a grounding wire and clamp.
2. *Feed Pumps:* by using a ground wire and clamp to connect the pump to a true earth ground. See separate manual 307–552.
3. *Air Compressors:* according to the manufacturer's recommendations.
4. *Foam–Cat Heater;* by wiring to a positively grounded power supply. In a mobile installation, be sure the truck or trailer is grounded to a true earth ground.
5. *Foam-Cat Heated Hoses:* by connection to a properly grounded heater. The Ground Fault Interrupter on the hose control panel of the Foam-Cat Heater senses electrical continuity in the heated hoses; it cannot function unless the heater is positively grounded.
6. *Air and Fluid Hoses:* use only grounded hoses and check electrical resistance regularly.
7. *Spray Gun:* obtain grounding through connection to a properly grounded fluid hose and sprayer.
8. *Object Being Sprayed:* according to local code.
9. *All pails used when flushing* according to local code. *Use only metal pails*, which are conductive. Place the pail on a grounded surface and do not interrupt the grounding continuity by placing a cloth or paper under the pail.
10. *To maintain grounding continuity when flushing or relieving pressure,* always hold a metal part of the gun firmly to the side of grounded metal pail, then trigger the gun.

IMPORTANT

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

TYPICAL INSTALLATION



KEY

A Main Air Supply Line
B Bleed–type Master Air Valve
C Air Filter
D Air Motor Lubricator
E 3/4 npsm(f) Air Inlet
F Air Regulator Kit
G Air Motor
H Air Manifold (on Stand)
J Fluid Inlet
K Pump Stand 217–296
L Pressure Drain Valve
M Fluid Outlet Line
N Air Line Drain Valve
P Grounding Lug

Fig 4–1

INSTALLATION

The Typical Installation shown above is only a guide. Contact your Graco representative for assistance in designing a system to suit your needs.

If you are using this pump in a Foam–Cat system, refer to manual 308–144 for additional installation information after reading this manual.

Mount the pump to suit the type of installation planned. The pump dimensions and mounting hole diagram are shown on page 11. Recommended system accessories are on page 12.

WARNING

To reduce the risk of serious bodily injury, including electric shock, fire or explosion, read the **FIRE OR EXPLOSION HAZARD** warning section on page 3 and ground all of your equipment as explained there and in the following paragraph.

Grounding

If the pump is mounted on stand 217–296, attach a grounding wire to the grounding lug (P) of the stand. If the pump is mounted on a cart or stand without a grounding lug, attach the grounding wire and clamp to the air motor grounding lug. Connect the clamp to a true earth ground according to your local electrical codes.

WARNING

Two accessories are required in your system: a bleed–type master air valve (B) and a fluid drain valve (L). These accessories help reduce the risk of serious bodily injury, including fluid injection, splashing in the eyes or on the skin, or injury from moving parts, if you are adjusting or repairing the pump.

The bleed-type master air valve (B) relieves air trapped between this valve and the pump after the air regulator is shut off. Trapped air can cause the pump to cycle unexpectedly.

The fluid drain valve (L) assists in relieving fluid pressure in the displacement pumps, hose and gun; triggering the gun to relieve pressure may not be sufficient.

Air Line

Mount the air line accessories in the order shown. Notice the upward loop in the drop from the air line (A), and the tee and low pressure drain valve (N) which have been added where the air line is connected to the manifold (H). These plumbing methods, along with the air filter (C), significantly reduce the chance of harmful dirt and moisture getting into the air motor. Open the drain valve (N) regularly to drain accumulated moisture in the air line.

Install the bleed-type master air valve (B) and use to relieve air pressure in the air line and motor when shutting down the system or isolating it for service.

Install an air regulator (F) to control pump speed and outlet pressure. A regulator kit (p/n 205–712) which includes a regulator, gauge, bleed–type master air valve, hose and mounting adapter, are shown in Fig 4–1. Close to the air motor inlet, install a lubricator (D) to automatically lubricate the air motor (G).

Fluid Outlet Line

Install a drain valve (L) at the fluid outlet to help relieve fluid pressure in the pump during shutdown. See Fig 4–1. If necessary, install a surge tank, with or without a filter, to reduce line vibrations.

Fluid Intake

Connect an appropriate suction tube to the 3/4 npt(m) pump intake. If necessary, use a check valve to prevent backflow into the pump when it is shut off.

Fill the Wetcups

Keep the wetcups 1/3 full of ISO Pump Lube to prevent fluid from drying on the displacement rod and damaging the pump packings. See Fig 6–1.

Each week, relieve pressure and check the tightness of the packing nut. It should be just tight enough to prevent leakage. Too tight an adjustment causes the packings to bind or wear prematurely and leak. See ACCESSORIES, page 12, to order the ISO Pump Lube.

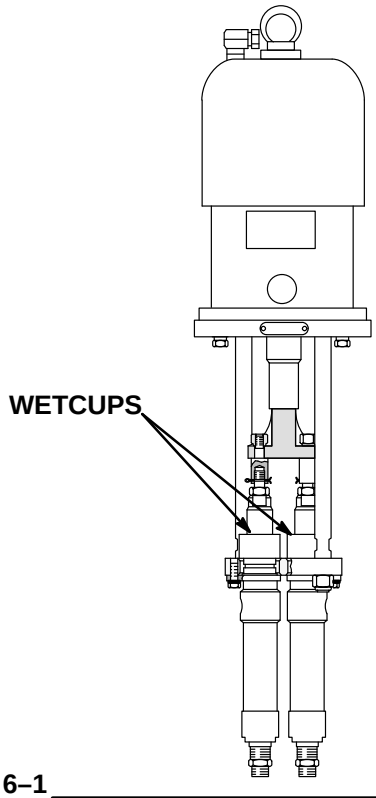
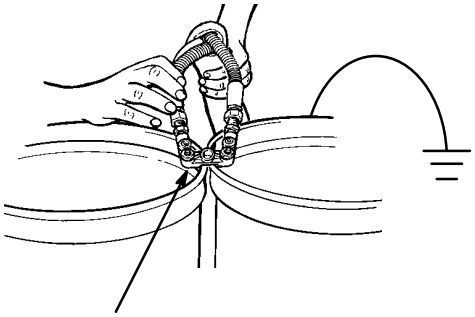


Fig 6–1

Flush the Pump

WARNING

To reduce the risk of splashing and static sparking, which may cause a fire or explosion and serious bodily injury or property damage, always use the lowest possible pressure when flushing. Use only grounded metal flushing containers and maintain firm metal-to-metal contact between the gun and metal flushing container. See Fig 6–2.



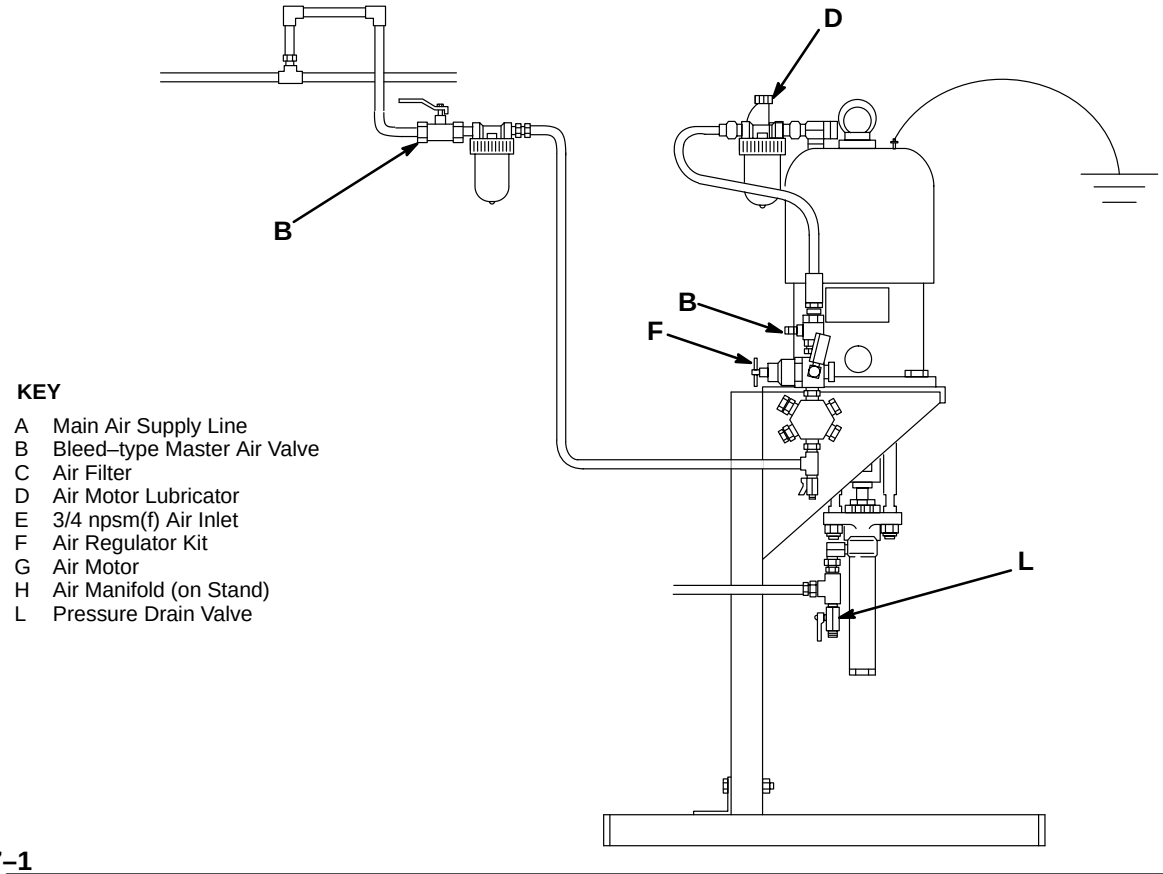
MAINTAIN METAL-TO-METAL CONTACT BETWEEN GUN AND GROUNDED PAIL WHEN FLUSHING

Fig 6–2

The displacement pump was factory tested in light oil, which was left in to protect the pump parts. To prevent contamination of the fluid to be pumped, flush the pumps before using them. Be sure the solvent used is compatible with the fluid being pumped.

In a circulating system, circulate the solvent for about 10 minutes. Then remove the pump intake from the solvent and let the pump force the solvent from the system.

In a dead-end system, trigger the gun into a grounded metal waste container (maintain metal-to-metal contact between the gun and pail) and run solvent through the system until all oil is removed from the system. See Fig 6–2.



KEY

A Main Air Supply Line
B Bleed–type Master Air Valve
C Air Filter
D Air Motor Lubricator
E 3/4 npsm(f) Air Inlet
F Air Regulator Kit
G Air Motor
H Air Manifold (on Stand)
L Pressure Drain Valve

Fig 7–1

Pump Startup

The startup procedure will depend on how your system is set up. If this pump is being used in a Foam-Cat system, refer to manual 308–144 for detailed startup procedures.

For other systems, the general startup procedure is:

1. Put the pump suction tubes in the fluids to be pumped.
2. Place waste containers under each pressure drain valve (L). Open the valves.
3. Close the bleed–type master air valve (B) and the air regulator (F).
4. Turn on the main air supply. Open the bleed–type master air valve (B). If you are using an air regulator kit, be sure its master air valve (B) is open, too.
5. Slowly open the air regulator (F). Run the pump slowly until all air is purged from the pump and fluid is flowing freely from the pressure drain valves (L). Close the valves.
6. Trigger the gun into a grounded waste container until all air is purged from the hose.
7. Adjust the lubricator (D), if used. See the instructions supplied with the lubricator.
8. Adjust the pump speed using the air regulator. Always use the lowest pump speed necessary to get a good spray pattern, which extend spray tip and pump life.

NOTE: Discard purged fluid.

Lubrication and Care

Maintain the wetcups as instructed on page 6.

Carefully monitor the fluid supply. If the supply container is empty and air has been pumped into the system, immediately refill the container and prime the system with fluid. Don't allow air to remain in the system.

Always stop the pump at the bottom of its stroke to prevent fluid from drying on the displacement rod and damaging the packings.

When storing the pump, flush all fluid out of the displacement pumps and hoses and fill with mineral spirits or rust-inhibiting solvent to prevent corrosion. Relieve pressure.

TROUBLESHOOTING

WARNING

Pressure Relief Procedure

Always relieve the fluid pressure in the sprayer and hoses and shut off the electric power before checking or adjusting the hoses or any other component in the system, and when you stop spraying, to reduce the risk of serious bodily injury from fluid injection or electric shock.

1. Engage the spray gun trigger safety latch.
2. Shut off the air to the feed pumps.
3. Turn off the air to the proportioning pump.
4. Close the gun manifold needle valves.
5. Disengage the trigger safety latch again.
6. Open both fluid filter drain valves, having a container ready to catch the draining fluid.
7. Shut off the main electrical power to the heater if you are working on any part of the heater.

WARNING

NEVER operate the pump with the air motor shield removed, to reduce the risk of pinch or amputating your fingers on moving parts, such as the air motor piston.

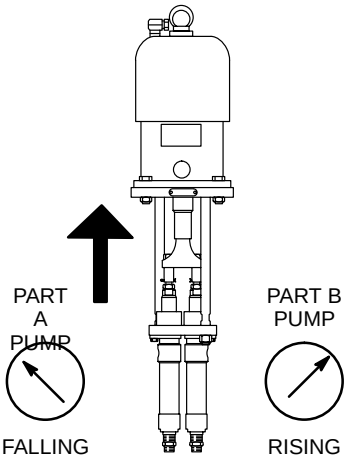
This chart uses the proportioner gauges to determine pump malfunctions.

Faulty manifold checks can mask pump cylinder problems. Always keep these valves operating properly.

Observe the gauge relationships during the stroke direction indicated by the bold arrow, and immediately after closing the manifold.

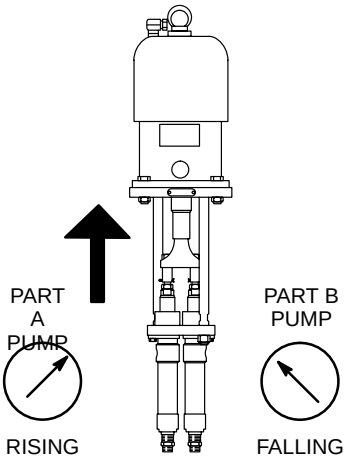
TROUBLE AREA:
PART A PUMP LEAKAGE

1. THROAT PACKING
2. PISTON PACKING
3. PISTON BALL CHECK



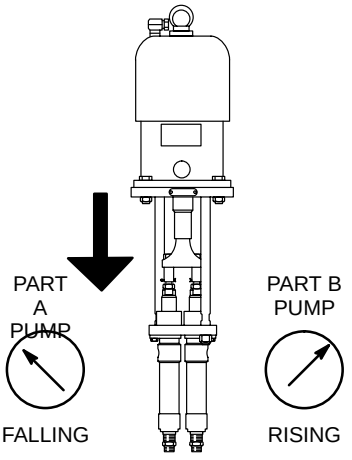
TROUBLE AREA:
PART B PUMP LEAKAGE

1. THROAT PACKING
2. PISTON PACKING
3. PISTON BALL CHECK



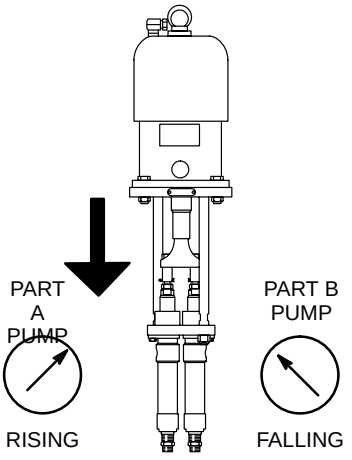
TROUBLE AREA:
PART A PUMP LEAKAGE

1. THROAT PACKING
2. FOOT VALVE BALL CHECK



TROUBLE AREA:
PART B PUMP LEAKAGE

1. THROAT PACKING
2. FOOT VALVE BALL CHECK



Disconnecting the Motor

1. Follow the **Pressure Relief Procedure Warning** on page 8.
2. Disconnect the air hose.
3. Remove the capscrews (27) and lockwashers (26), nuts (14),and bolts (12). Remove the pumps (7).
4. Screw down the coupler (2). Remove the nuts (22).
5. Lift the motor (1) up.

Disconnecting the Displacement Pumps

1. Follow the **Pressure Relief Procedure Warning** on page 8.
2. Remove the cotter pin (11). Unscrew the rod extension nut (14).
3. Remove the capscrews (12) and lockwashers (13).
4. Pull the displacement pump (7) down.
5. Remove the extensions (10).

Reassembly

1. Reassemble in the reverse order of disassembly.
2. Be sure the tie rods are parallel and there is no binding.
3. Tighten the nuts (12) to 40–50 ft–lb (55–68 N.m).

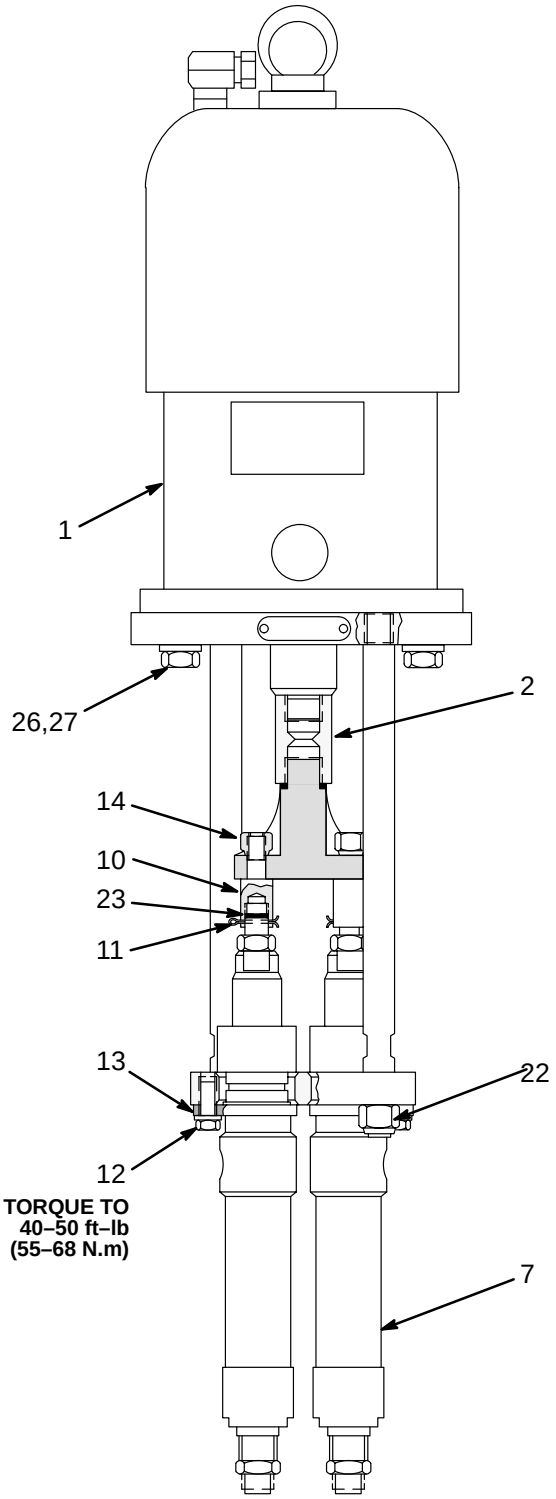
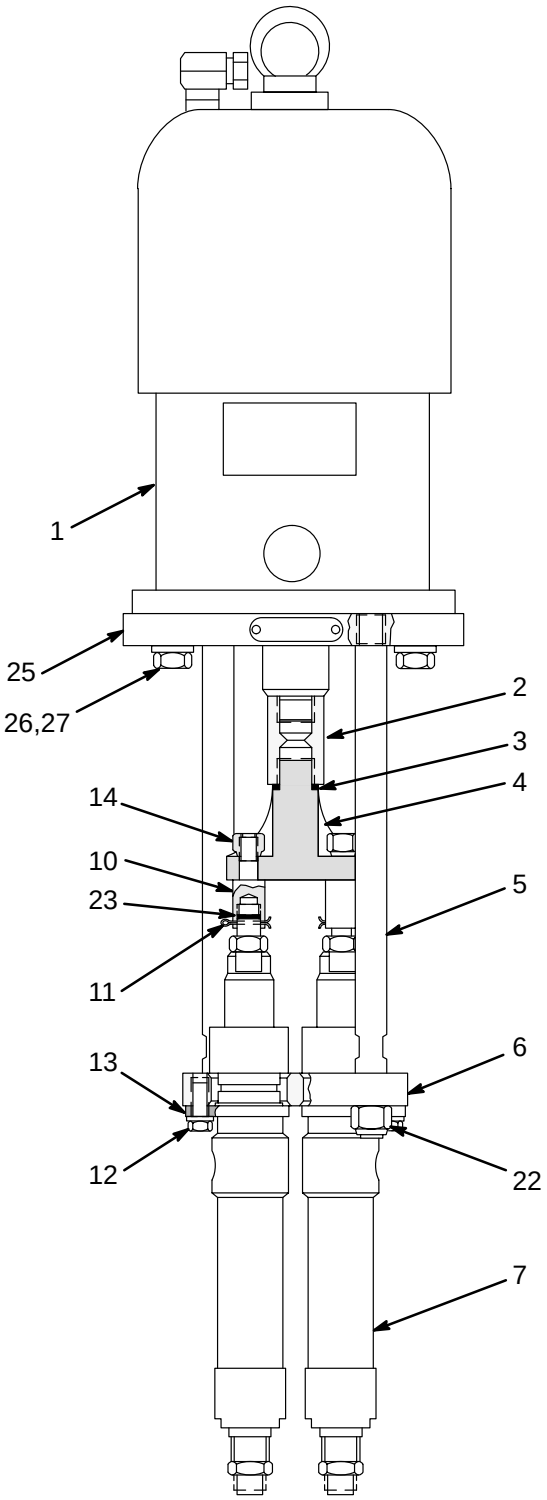


Fig 1 0595

PARTS DRAWING



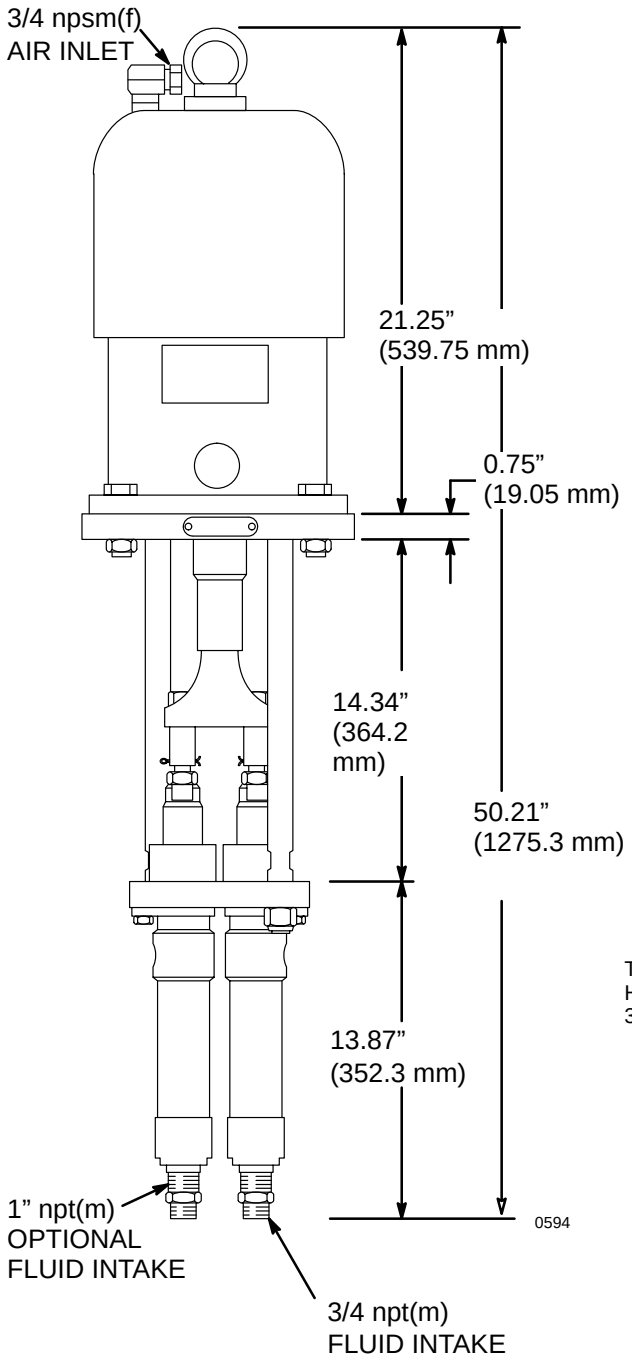
0595

PARTS LIST

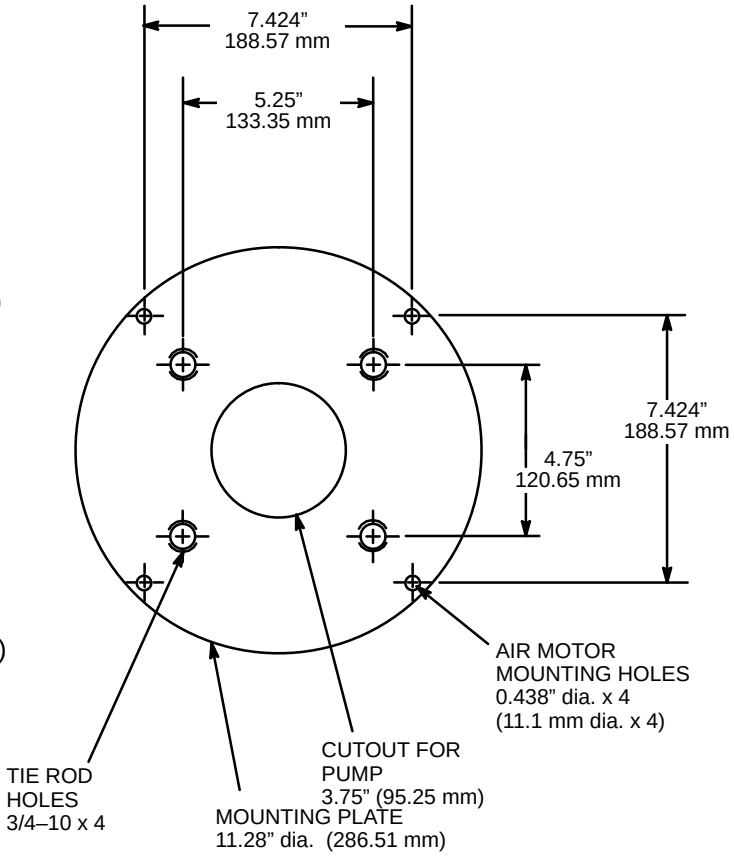
Bulldog Plural Component Pump
Model 224–567
Includes items 1 to 27 as listed.

REF NO.	PART NO.	DESCRIPTION	QTY
1	208–356	BULLDOG AIR MOTOR see manual 307–049 for parts	1
2	172–726	COUPLER	1
3	150–429	GASKET, copper	1
4	181–887	YOKE, connecting rod	1
5	187–056	ROD, tie, 12” (305 mm) long	4
6	181–890	PLATE, tie	1
7	217–339	DISPLACEMENT PUMP see manual 307–430 for parts	2
10	171–314	EXTENSION, rod, displacement	2
11	101–946	PIN, cotter, 1/8” dia. x 1–1/2”	2
12	100–101	CAPSCREW, hex hd, 3/8 x 1.0”	6
13	100–133	LOCKWASHER, 3/8”	6
14	101–712	LOCKNUT, 5/8–11	2
22	108–540	LOCKNUT, 3/4–10 UNC–2B	2
23	156–082	O–RING	2
25	187–055	PLATE, adapter	1
26	100–128	LOCKWASHER, spring, 5/8”	4
27	100–428	CAPSCREW, hex hd, 5/8–11 x 2”	4

DIMENSIONS



MOTOR MOUNTING DIAGRAM



TECHNICAL DATA

Maximum Working Pressure	1500 psi (105 bar)
Maximum Air Inlet Pressure	100 psi (6.9 bar)
Air to Fluid Ratio	15:1
Mix Ratio	1:1
Maximum Cycle Rate	50
Weight (approximate)	100 lb (45 kg)

Maximum Flow Rate
- *Foam materials* . . . . . 30 lb/min (13.5 kg/min)
- *Other materials* . . . . . 3.0 gpm (11.4 liter/min)

Delivery/Cycle
- *Foam materials* . . . . . 0.6 lb/min (0.27 kg/min)
- *Other materials* . . . . . 0.6 gpm (2.27 liter/min)

Air Consumption
- *Foam materials* . . . . . 60 SCFM (1.68 m^3/min) at 100 psi (6.9 bar) and 30 lb/min (13.5 kg/min)
- *Other materials* . . . . . 60 SCFM (1.68 m^3/min) at 100 psi (6.9 bar) and 3 gpm (11.4 liter/min)

ACCESSORIES

Must be purchased separately.

PUMP MOUNTING STAND 217–296
Bolts to floor. Also holds Graco Foam-Cat Heater and Controls. See Fig 1, page 3, for illustration.

GROUND WIRE 208–950
25 ft (7.6 m) long), 12 ga
CLAMP 103–538

ISO PUMP OIL
Helps protect displacement pump throat packings.

217–374 1 pint (0.47 liter)
218–656 1 gallon (3.8 liter)

THE GRACO WARRANTY AND DISCLAIMERS

WARRANTY
Graco warrants all equipment manufactured by it and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment proven defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

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

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

DISCLAIMERS AND LIMITATIONS
THE TERMS OF THIS WARRANTY CONSTITUTE PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND ARE IN LIEU OF ANY OTHER WARRANTIES (EXPRESS OR IMPLIED), INCLUDING WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY NON–CONTRACTUAL LIABILITIES, INCLUDING PRODUCT LIABILITIES, BASED ON NEGLIGENCE OR STRICT LIABILITY. EVERY FORM OF LIABILITY FOR DIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS IS EXPRESSLY EXCLUDED AND DENIED. IN NO CASE SHALL GRACO'S LIABILITY EXCEED THE AMOUNT OF THE PURCHASE PRICE. ANY ACTION FOR BREACH OF WARRANTY MUST BE BROUGHT WITHIN TWO (2) YEARS OF THE DATE OF SALE.

EQUIPMENT NOT COVERED BY GRACO WARRANTY
GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ACCESSORIES, EQUIPMENT, MATERIALS, OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motor, switches, hose, etc.) are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

Factory Branches: Atlanta, Chicago, Dallas, Detroit, Los Angeles, West Caldwell (N.J.)
Subsidiary and Affiliate Companies: Canada, England, Korea, Switzerland, France, Germany, Hong Kong, Japan

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

PRINTED IN U.S.A. 308–145 9–91

Instructions – Parts List

Parts

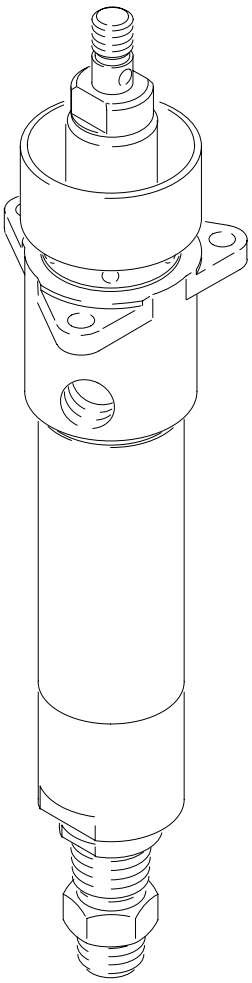
STAINLESS STEEL
Displacement Pump 307430T

Model 215932, Series B
Short Stroke, with PTFE Packings
2000 psi (13.8 MPa, 138 bar) Maximum Working Pressure

Model 217339, Series A
Long Stroke, with PTFE Packings
2000 psi (13.8 MPa, 138 bar) Maximum Working Pressure

Model 904287, Series A
Short Stroke, Modified Intake, with PTFE Packings
1500 psi (10 MPa, 103 bar) Maximum Working Pressure

Model 965084, Series A
Short Stroke, with PTFE Packings
1500 psi (10 MPa, 103 bar) Maximum Working Pressure



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Read warnings and instructions.
See page 2 for **Table of Contents.**

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

PROVEN QUALITY. LEADING TECHNOLOGY.

Table of Contents

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

INSTRUCTIONS

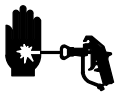
EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. See **Technical Data** on page 16 for the maximum working pressure of this equipment.
- Do not lift pressurized equipment.
- Route the hoses away from the traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below –40°F (–40°C).
- Do not use hoses to pull the equipment.
- Use only Graco approved hoses. Do not remove hose spring guards, which help protect the hose from rupture caused by kinks or bends near the couplings.
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Wear hearing protection when operating this equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

Warnings are continued on the next page.

⚠ WARNING



INJECTION HAZARD

Spray from the gun, hose leaks or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the trigger guard on the gun when spraying.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 6 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.

MOVING PARTS HAZARD

Moving parts, such as the air motor piston, can pinch or amputate your fingers.

- Keep clear of all moving parts when starting or operating the pump.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 6 to prevent the equipment from starting unexpectedly.

Warnings are continued on the next page.

⚠ WARNING

FIRE AND EXPLOSION HAZARD

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

- Ground the equipment and the object being sprayed. Refer to **Grounding** on page 5.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Extinguish all open flames or pilot lights in the spray area.
- Electrically disconnect all equipment in the spray area.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Do not turn on or off any light switch in the spray area while operating or if fumes are present.
- Do not smoke in the spray area.
- Do not operate a gasoline engine in the spray area.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop spraying immediately.** Do not use the equipment until you identify and correct the problem.

PLURAL COMPONENT FLUID HAZARD

Before using this equipment, read the fluid manufacturer's warnings and determine all facts relating to the fluids used, including any of the potential hazards relating to toxic fumes, fires, explosions, reaction times, and exposure of human beings to the individual components or their resultant mixtures.

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
- Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.

Installation

Grounding

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

- *Pump:* use a ground wire and clamp as shown in Fig. 1.
- *Air or hydraulic hoses:* use only electrically conductive hoses.
- *Fluid hoses:* use only electrically conductive hoses.
- *Air compressor or hydraulic supply:* follow the manufacturer's recommendations.
- *Spray gun:* grounding is obtained through connection to a properly grounded fluid hose and pump.
- *Fluid supply container:* according to local code.
- *Object being sprayed:* according to your local code.
- *All solvent pails used when flushing,* according to local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts the grounding continuity.
- *To maintain grounding continuity when flushing or relieving pressure,* always hold a metal part of the spray gun firmly to the side of a grounded metal pail, then trigger the spray gun.

To ground the pump, loosen the grounding lug locknut (W) and washer (X). Insert one end of a 12 ga (1.5 mm^2) minimum ground wire (Y) into the slot in the lug (Z) and tighten the locknut securely. See Fig. 1. Connect the other end of the wire to a true earth ground. Order Part No. 237569, grounding wire and clamp.

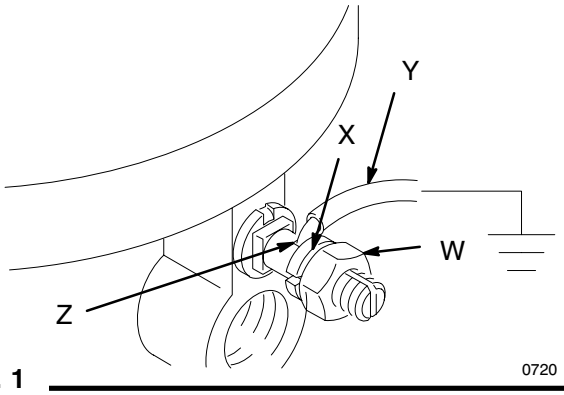
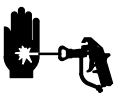


Fig. 1

Operation

Pressure Relief Procedure

⚠ WARNING



INJECTION HAZARD
Fluid under high pressure can be injected through the skin and cause serious injury. To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment,
- or install or clean the fluid tips.

1. Lock the spray gun trigger safety.
2. Shut off the air or hydraulic fluid to the pump.
3. Close the bleed-type master air valve (required in air-powered systems).
4. Unlock the spray gun trigger safety.
5. Hold a metal part of the spray gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
6. Lock the spray gun trigger safety.
7. Open the drain valve (required in your system), having a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly loosen the retaining nut or hose end coupling and relieve pressure gradually, then loosen completely, then clear the tip or hose.

Service

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 6.

Disassembling Pump

NOTE: Packing Repair Kits are available. Refer to the Parts Drawing for your model. For the best results, use all the new parts in the kit. Parts included in the kit are marked with a dagger, for example (4†).

NOTE: For Model 904287, refer to the Parts List and Drawing on pages 12 and 13 when disassembling the pump.

1. Solvent flush the pump, if possible. Stop the pump at the bottom of its stroke and **relieve the pressure**. Disconnect all hoses from the pump. Disconnect the displacement pump from the motor.

2. Place the outlet housing (14) in a vise. Grip the cylinder (13) with a strap wrench, and unscrew the locking ring (9). If the locking ring is seized, squirt penetrating oil around its threads and gently tap around the ring with a light hammer to loosen. See Fig. 2.

⚠ CAUTION

Do not grip the cylinder (13) with a pipe wrench or vise, as this will collapse it.

3. Remove the pin (3), ball (1) and o-ring (6) from the intake housing (10). Clean all parts thoroughly and carefully inspect for damage or wear; replace parts as necessary. Inspect the seat in the intake housing (10); if it is chipped or worn, replace the housing.

4. Loosen the throat packing nut (15). Push the displacement rod (7) down until you can grasp the piston stud (25), then pull the piston and displacement rod out through the bottom of the cylinder (13).

⚠ CAUTION

Be careful not to scratch the polished inner surface of the cylinder, as this will cause premature packing wear.

5. Unscrew the cylinder (13) from the outlet housing (14). Remove the o-ring (4). Check the outer surface of the displacement rod (7) and the inner surface of the cylinder for scoring or damage, by running a finger over the surface or holding the part up to the light at an angle.

6. Unscrew the piston mounting stud (27) from the displacement rod (7). Note the placement of the ball stop pin (22) in the mounting stud (27). Remove one cotter pin (17) from the stop pin. Remove the stop pin and ball (18), then disassemble the piston. Clean all parts thoroughly and carefully inspect for damage or wear; replace parts as necessary. Inspect the seat in the piston stud (25); if it is chipped or worn, replace the stud.

7. Unscrew the throat packing nut (15) from the outlet housing (14). Remove the bearing (8), throat packings (11), and glands (5 and 12). Clean parts and replace worn or damaged parts as necessary.

Service

Assembling the Pump

NOTE: When assembling the pump, coat all o-rings and packings, the displacement rod, and the inside of the cylinder with a lithium-base grease.

NOTE: For Model 904287, refer to the Parts List and Drawing on pages 12–13 when assembling the pump. For Model 965084, refer to pages 14–15.

1. Refer to the Throat Packing Detail in Fig. 2. Install the throat packings, glands, bearing (8†), and packing nut (15) in the outlet housing (14) as shown, leaving the packing nut loose. The lips of the v-packings (11†) must face down.

2. Install the o-ring (4†) in the outlet housing (14). Place the housing in a vise and carefully screw the cylinder (13) into the housing.

3. Refer to the Piston Packing Detail in Fig. 2. Install the parts on the piston stud (25) in the order shown. Make sure the lips of the packings (23†) are facing up. Insert the ball stop pin (22) in the holes of the mounting stud (27), as noted under **Disassembling the Pump**. Secure with the cotter pins (17†).

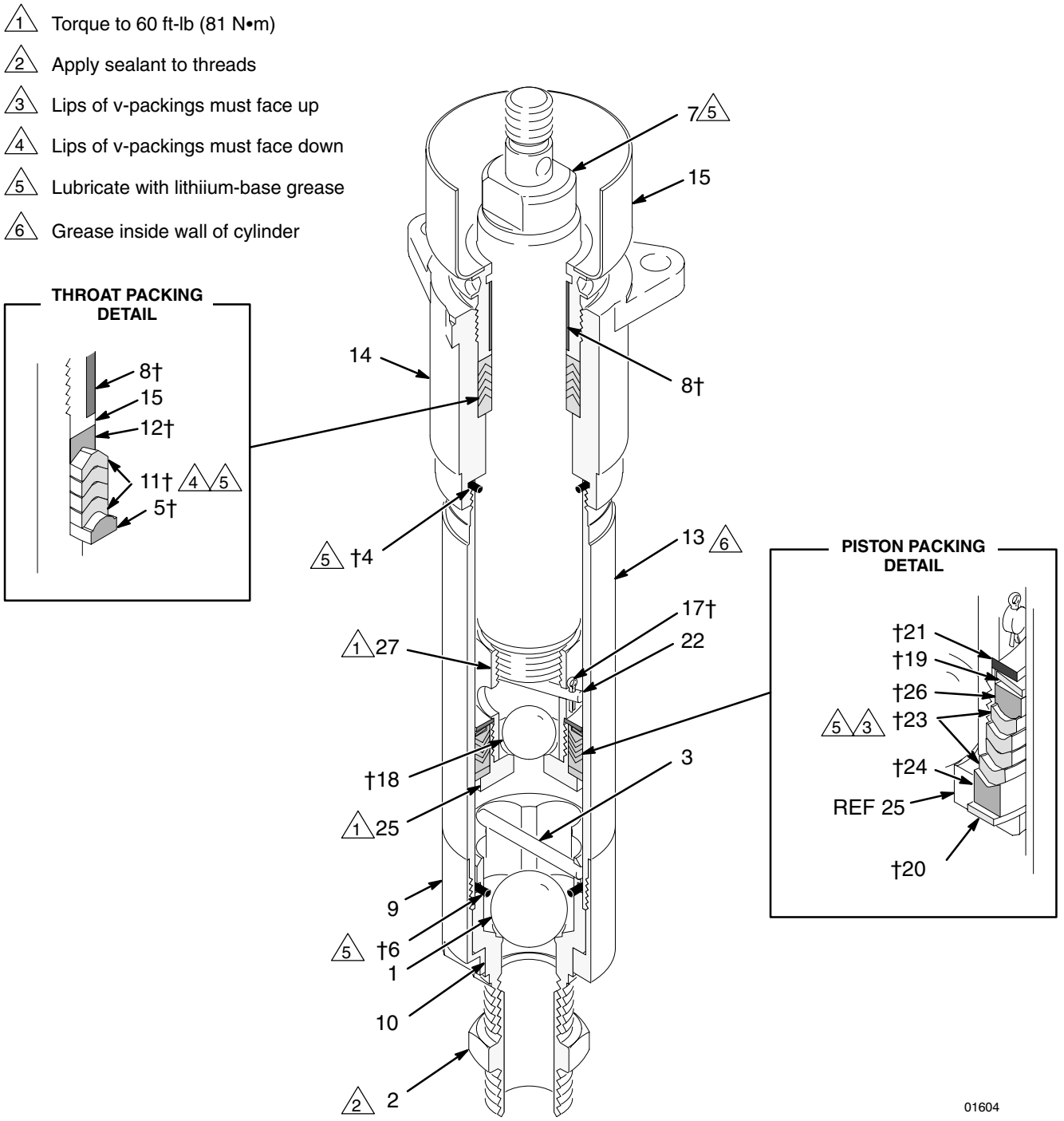
NOTE: The stop pin (22) was factory-set in the lower holes for pumping low to medium viscosity fluids. The upper holes are for pumping high viscosity fluids.

4. Place the ball (18) on the seat of the piston stud (25). Screw the piston stud onto the mounting stud (27) and torque to 60 ft-lb (81 N•m). Screw the mounting stud onto the displacement rod (7) and torque to 60 ft-lb (81 N•m). Carefully slide the rod up through the bottom of the cylinder (13).

5. Place the ball (1) on the seat of the intake housing (10). Install the o-ring (6†) and stop pin (3) in the intake housing. Install the intake housing in the cylinder (13) and screw the locking ring (9) onto the cylinder to secure. Tighten the packing nut (15) just tight enough to stop leakage – no tighter.

6. Install the displacement pump on the motor. Connect all hoses. Reconnect the pump ground wire if it was disconnected during service.

Service



Model 215932 Shown

Fig. 2

Parts

Model 215932, Series B
Short Stroke, with PTFE packings

Model 217339, Series A
Long Stroke, with PTFE packings

Ref No.	Part No.	Description	Qty
1*	104300	BALL, intake; 1–1/8" dia.; sst	1
2	190724	NIPPLE; 3/4 npt; sst	1
3*	162947	PIN; sst	1
4†	164782	O-RING; PTFE	1
5†	164837	GLAND, male; sst	1
6†	164846	O-RING; PTFE	1
7	186997	ROD, displacement; sst	
		Model 215932 only	1
	178517	ROD, displacement; sst	
		Model 217339 only	1
8†	168285	BEARING, sleeve; PTFE	1
9	171311	RING, locking; sst	1
10	171312	HOUSING, intake;	
		3/4 npt(f) x 1" npt(m); sst	1
11†	162866	V-PACKING; PTFE	
		Models 215932 and 217339 only	4
12†	176641	GLAND, female; UHMWPE	1
13	186994	CYLINDER; sst	
		Model 215932 only	1
	178519	CYLINDER; sst	
		Model 217339 only	1
14	206529	HOUSING, outlet; sst	1
15	207708	NUT, packing; sst	1
16	215339	PISTON ASSEMBLY; sst	
		Includes items 17–27	1
17†	100063	. PIN, cotter; sst	2
18†	101917	. BALL, piston; 7/8" dia.; sst	1
19†	105364	. SPRING, wave; sst	1
20†	176633	. WASHER, backup; sst	1
21†	176634	. WASHER; sst	1
22*	176637	. BALL STOP; sst	1
23†	176635	. V-PACKING; PTFE	4
24†	176640	. GLAND, female; UHMWPE	1
25	176642	. STUD, piston; sst	1
26†	176643	. GLAND, male; sst	1
27	176644	. STUD, mounting, piston; sst	1
28▲	172479	TAG, warning (not shown)	1

* *Recommended "tool box" spare parts. Keep on hand to reduce down time.*

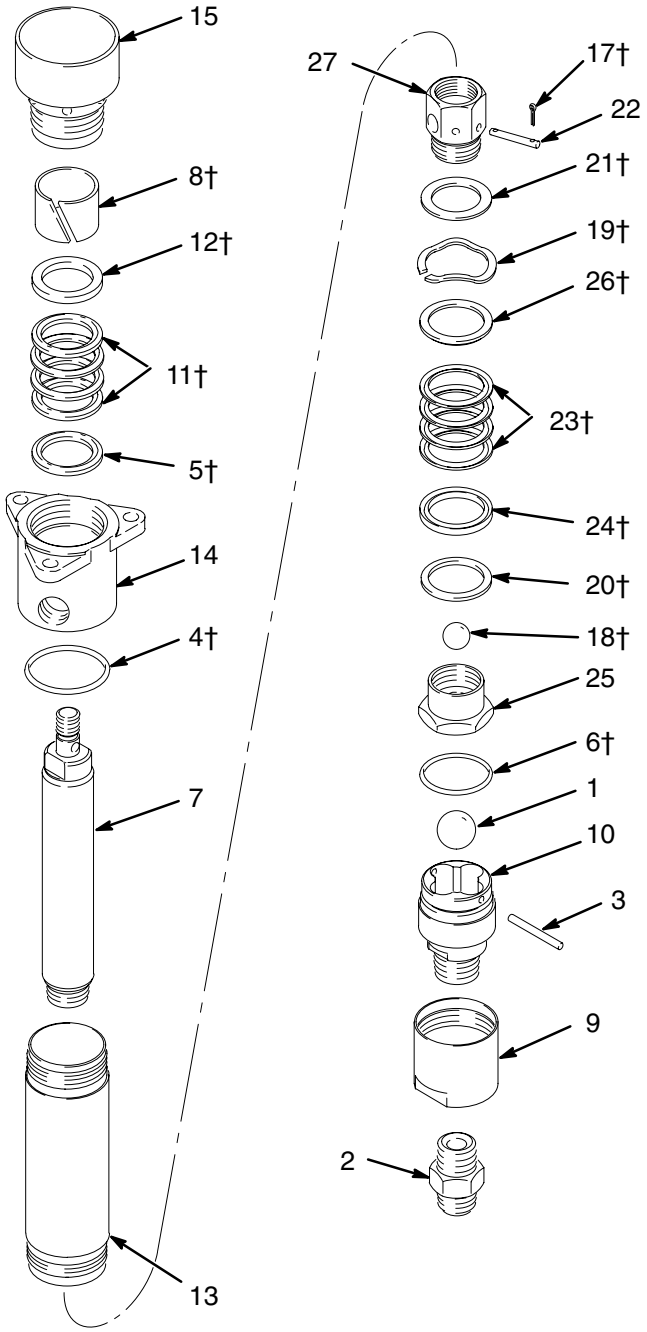
† *Supplied in repair kit 215336, which can be purchased separately.*

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

Parts

Model 215932, Series B
Short Stroke, with PTFE packings

Model 217339, Series A
Long Stroke, with PTFE packings



01603

Parts

Model 904287, Series A
Short Stroke, Modified Intake, with PTFE packings

Ref No.	Part No.	Description	Qty
1†	101178	BALL, intake; 1–1/8" dia.	1
4†	164782	O-RING; PTFE	1
5†	164837	GLAND, male; sst	1
6†	C38225	O-RING; PTFE	1
7	186997	ROD, displacement; sst	1
8†	168285	BEARING, sleeve; PTFE	1
10	620856	HOUSING, intake; 1–1/2" npt(m); cst	1
11†	162866	V-PACKING; PTFE	4
12†	165288	GLAND, female; PTFE	1
13	186994	CYLINDER; sst	1
14	206529	HOUSING, outlet; sst	1
15	207708	NUT, packing; sst	1
17†	100063	PIN, cotter; sst	2
18†	101917	BALL, piston; 7/8" dia.; sst	1
20†	166512	WASHER, backup, seal	1
22*	176637	BALL STOP; sst	1
23†	166026	SEAL, piston; PTFE	1
27	166510	PISTON; sst	1
28▲	172479	TAG, warning (not shown)	1
29	158279	BALL STOP	1
30†	165292	BEARING, piston; PTFE	1

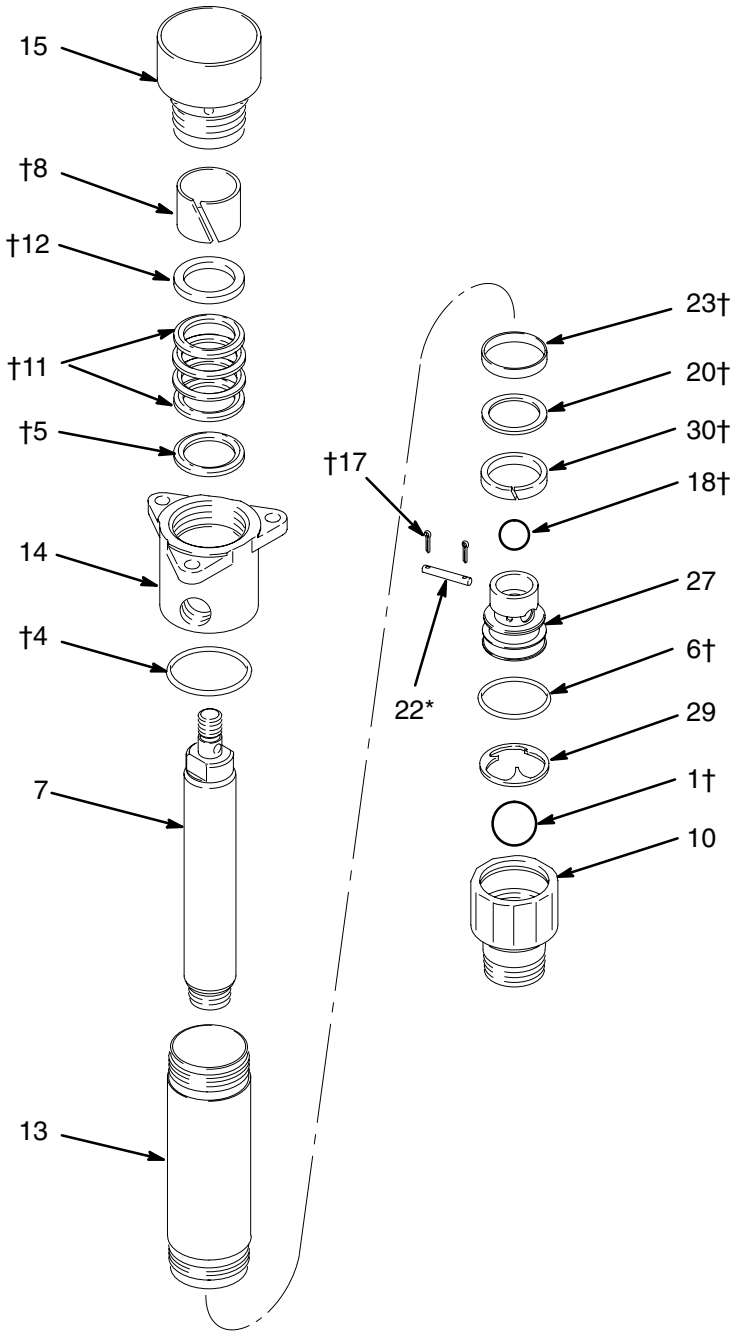
* *Recommended "tool box" spare parts. Keep on hand to reduce down time.*

† *Supplied in repair kit 948336. Purchase the kit separately.*

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

Parts

Model 904287, Series A
Short Stroke, Modified Intake, with PTFE packings



TI0558A

Parts

Model 965084, Series A
Short Stroke, with PTFE packings

Ref No.	Part No.	Description	Qty
1*	104300	BALL, intake; 1–1/8” dia.; sst	1
3*	162947	PIN; sst	1
4†	164782	O-RING; PTFE	1
5†	164837	GLAND, male; sst	1
6†	164846	O-RING; PTFE	1
7	186997	ROD, displacement; sst	1
8†	168285	BEARING, sleeve; PTFE	1
9	171311	RING, locking; sst	1
10	171312	HOUSING, intake; 3/4 npt(f) x 1” npt(m); sst	1
11†	162866	V-PACKING; PTFE	4
12†	176641	GLAND, female	1
13	186994	CYLINDER; sst	1
14	206529	HOUSING, outlet; sst	1
15	207708	NUT, packing; sst	1
17†	100063	PIN, cotter; sst	2
18*	101917	BALL, piston; 7/8” dia.; sst	1
20	605285	WASHER, backup, sst	1
22	605287	BALL STOP; sst	1
23†	605281	PACKING, piston; PTFE	1
28▲	172479	TAG, warning (not shown)	1
30†	605286	BEARING, piston; Delrin®	1
31	605289	ADAPTER, piston head; sst	1
32	605326	SEAT, piston; sst	1

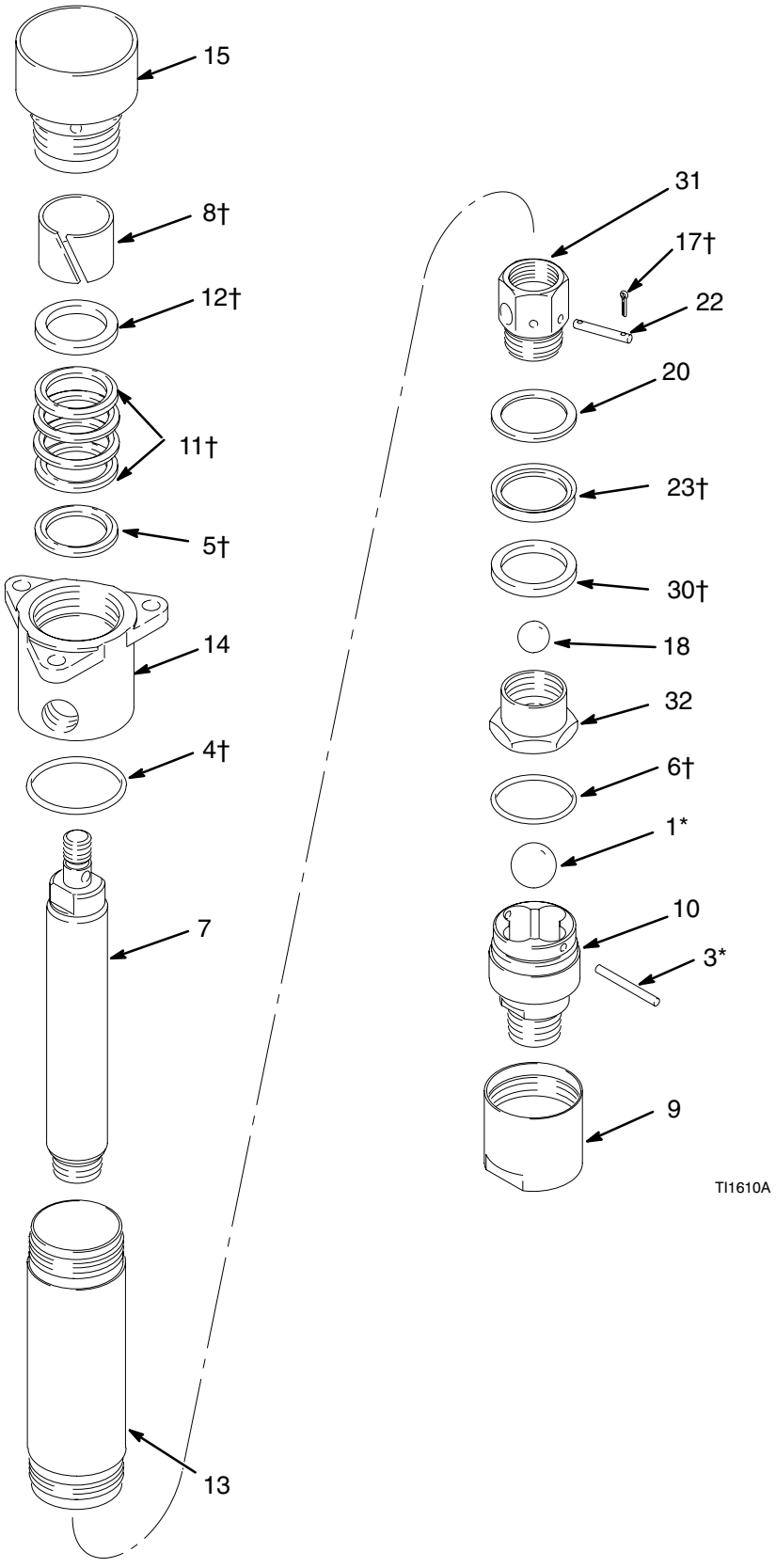
* *Recommended “tool box” spare parts. Keep on hand to reduce down time.*

† *Supplied in repair kit 904555, which can be purchased separately.*

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

Parts

Model 965084, Series A
Short Stroke, with PTFE packings



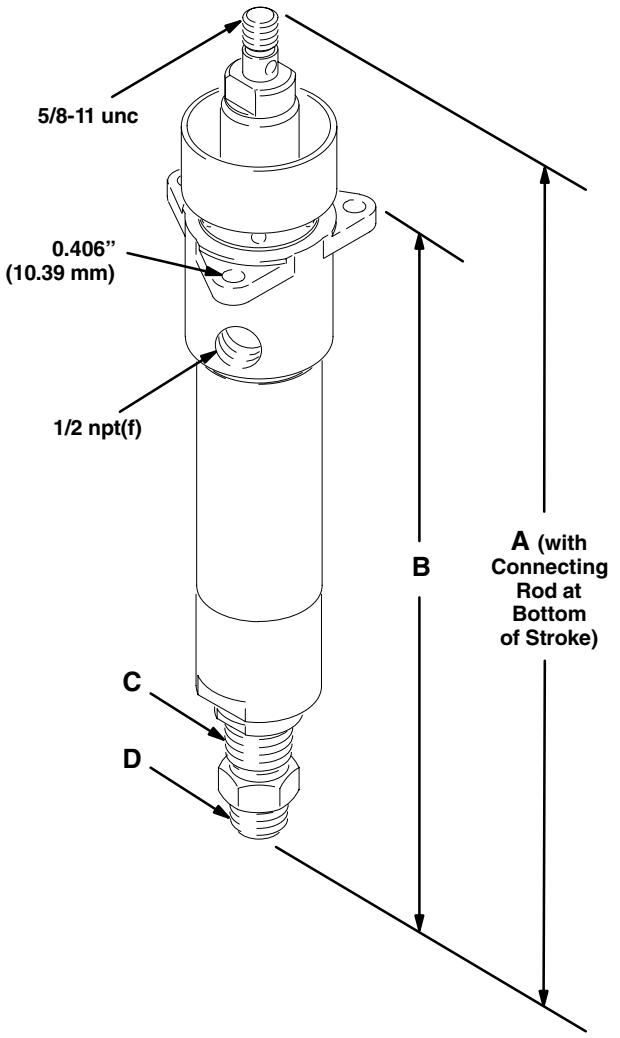
Technical Data

Category	Data
Maximum Working Pressure	*Models 215932 and 217339:* 2000 psi (13.8 MPa, 138 bar) *Models 904287 and 965084:* 1500 psi (10 MPa, 103 bar)
Wetted Parts	Chrome-Plated and Electropolished Stainless Steel, Stainless Steel, PTFE, Delrin®, Ultra-High Molecular Weight Polyethylene

Delrin® is a registered trademark of the DuPont Company.

Displacement Pump Number	Cylinder ID Area in.^{2} (mm^2)	Displacement Rod OD area in.^{2} (mm^2)	% of Difference	Effective Area in.^{2} (mm^2)	Maximum Stroke in. (mm)
215932	2.956 (1907.2)	1.480 (954.9)	0.20	1.478 (953.6)	4.25 (108.0)
217339	2.956 (1907.2)	1.480 (954.9)	0.20	1.478 (953.6)	4.75 (120.65)
904287	2.956 (1907.2)	1.480 (954.9)	0.20	1.478 (953.6)	4.25 (108.0)
965084	2.956 (1907.2)	1.480 (954.9)	0.20	1.478 (953.6)	4.25 (108.0)

Dimensions



Model	A	B	C		D
			Intake Housing Outside Thread	Intake Housing Inside Thread	Intake Nipple Thread
215932	13.69” (348 mm)	11.0” (279 mm)	1” npt (m)	3/4 npt (f)	3/4 npt (m)
217339	15.375” (391 mm)	12.75” (324 mm)	1” npt (m)	3/4 npt (f)	3/4 npt (m)
904287	13.69” (348 mm)	11.0” (279 mm)	1–1/2” npt (m)	none	not used
965084	12.56” (319 mm)	9.87” (251 mm)	1” npt (m)	3/4 npt (f)	not used

Graco Standard Warranty

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 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.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

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

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TO PLACE AN ORDER, contact your Graco distributor, or call one of the following numbers to identify the distributor closest to you:
1–800–367–4023 Toll Free
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612–378–3505 Fax

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Sales Offices: Minneapolis, Detroit
International Offices: Belgium, Korea, Hong Kong, Japan

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

www.graco.com

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Parts

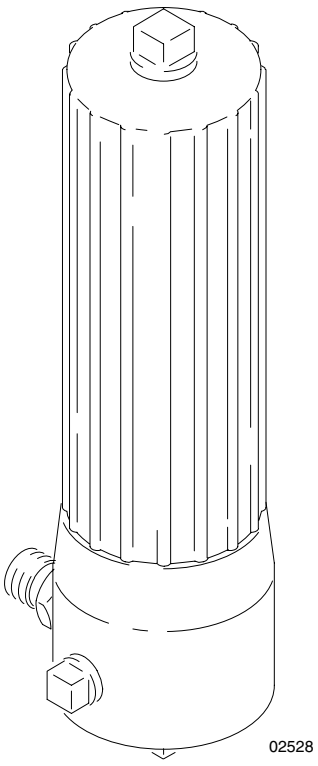
Instructions – Parts List

Fluid Outlet Filter

307273T

Read warnings and instructions.
See page 2 for model numbers and maximum working pressures.

Table of Contents



Model 214570 shown

PROVEN QUALITY. LEADING TECHNOLOGY.

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

List of Models

Part No.	Series	Description	Outlet Size	Maximum Fluid Working Pressure
214570	B	Aluminum bowl, polyethylene support	1/4 npt	3000 psi (21 MPa, 210 bar)
236789	A	Aluminum bowl, polyethylene support	3/8 npt	3000 psi (21 MPa, 210 bar)
237481	A	Aluminum bowl, polyethylene support	3/8 npt	3000 psi (21 MPa, 210 bar)
239286	A	Aluminum bowl, polyethylene support	1/4 npt	3000 psi (21 MPa, 210 bar)
218029	B	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239060	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239244	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
241317	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239962	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239964	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
240169	A	Carbon steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
241107	A	Carbon steel bowl, polyethylene support	3/8 npt	5000 psi (35 MPa, 350 bar)
223160	B	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239063	A	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239300	A	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239800	A	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239961	A	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
239963	A	Stainless steel bowl, polyethylene support	1/4 npt	4000 psi (28 MPa, 280 bar)
240170	A	Stainless steel bowl, polyethylene support	1/4 npt	5000 psi (35 MPa, 350 bar)
238782	A	Stainless steel bowl, polyethylene support	3/8 npt	5000 psi (35 MPa, 350 bar)
248851	A	Stainless steel bowl, polyethylene support	3/8 npt	5000 psi (35 MPa, 350 bar)
240183	A	Stainless steel bowl, polyethylene support	1/2 npt	5000 psi (35 MPa, 350 bar)

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

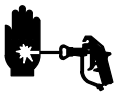
INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. Refer to the **Technical Data** on page 19 for the maximum working pressure of this equipment.
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Never 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.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

⚠ WARNING



INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Follow the **Pressure Relief Procedure** on page 5 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.

TOXIC FLUID HAZARD

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

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.

Installation

Install a suitable adapter in the 3/8 npt filter inlet (Model 240183 has a 1/2 npt inlet). Then install the filter downstream from the pump fluid outlet.

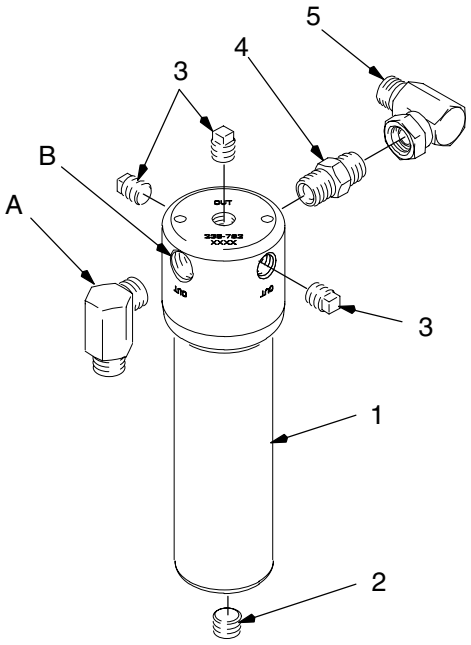
Install a suitable adapter in the filter outlet. Models 236789, 237480, 237481, 238782, 241107, and 248851 have a 3/8 npt outlet, and Model 240183 has a 1/2 npt outlet; the others have a 1/4 npt outlet. Connect the spray hose to the filter outlet.

Installing Filter Kit 248851 on ProMix™ Easy with HydraMix™ Pumps

1. Remove the elbow (A) from the pump outlet. Install it into the filter outlet (B). See Fig. 1.

2. Install the filter assembly onto the pump by screwing the filter elbow (5) into the pump outlet.

3. Rotate the pump and tubing to align and connect the tubing to the filter outlet.



TI15371A

Fig. 1

Operation

Pressure Relief Procedure

⚠ WARNING

INJECTION HAZARD

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

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

1. Lock the gun trigger safety.
2. Turn off the power to the pump.
3. Close any bleed-type master air valves.
4. Unlock the gun trigger safety.
5. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
6. Lock the gun trigger safety.
7. Open the system drain valve(s), having a container ready to catch the drainage.

NOTE: Some models are supplied with a drain valve (12). Refer to the parts list for your model.

8. Leave the drain valve(s) open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, ***very slowly*** loosen the tip guard retaining nut or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the tip or hose.

Maintenance

Cleaning the Filter

Dried paint sediment can clog the filter screen and greatly reduce filtering ability. Dried paint also makes the filter difficult to remove. Clean the filter regularly; daily if needed, following the procedure below.

⚠ CAUTION

To avoid damaging parts, ***never*** force them apart. If any parts are stuck tightly together, soak them in a compatible solvent before disassembling them.

Be careful not to drop or damage the filter housing and bowl. Dirt, paint sediment, nicks or scratches may prevent the o-ring (3) from seating properly.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 5.

1. Relieve the pressure.
2. Carefully remove the drain plug (1) from the bottom of the filter bowl (7) to drain the fluid.

NOTES:

- Some models are supplied with a drain valve (12). Refer to the parts list for your model.
- Drain plug not used with Model 241107.

3. Unscrew the bowl from the filter housing (9).
4. Pull the screen (5) straight out of the bowl. (See **Accessories** for other available screens.)
5. Remove the compression spring (8) from the filter bowl (7).
6. To remove the filter support (6), gently push in on the filter support stud. Replace the filter support if the ridges are worn.
7. Clean all parts thoroughly with a compatible solvent.
8. Place the filter support (6) in the screen (5) so the support stud fits through the small opening in the bottom of the screen.
9. Press fit the compression spring (8) to the bottom of the filter bowl (7).
10. Carefully install the filter support (6) and screen (5) into the filter bowl (7).

⚠ CAUTION

Improper assembly of the filter support, screen and spring will prevent filtering and damage parts.

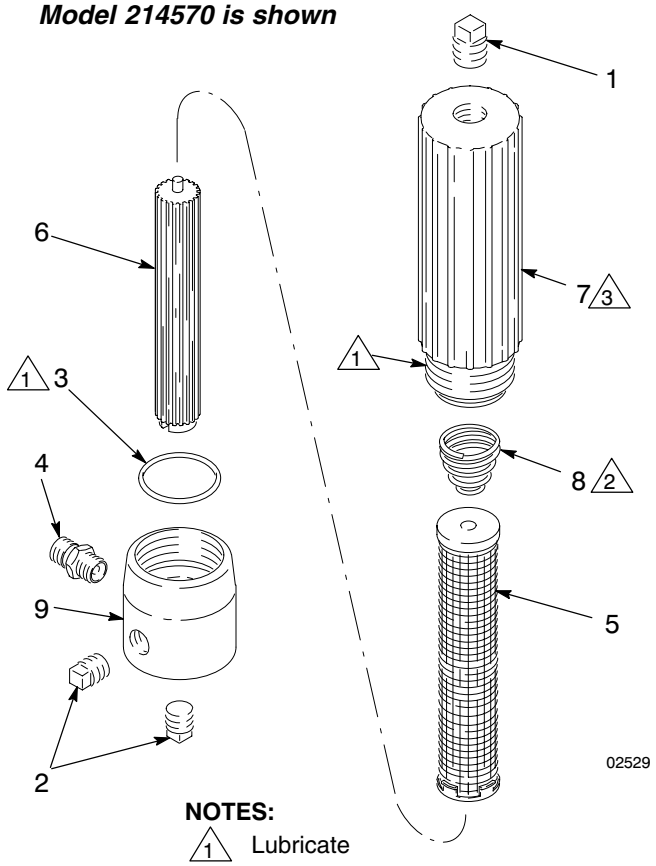
11. Replace the o-ring (3) if damaged or worn. Lubricate the o-ring with No. 2 grease. Bend it into a kidney shape, then carefully push it into the groove to avoid damaging it.
12. Lubricate the filter bowl (7) threads and screw it firmly into the housing (9).

NOTE: Be sure the bottom drain plug or drain valve is closed before starting the pump.

Model 214570, 236789: Apply PTFE tape to all non-swiveling pipe threads.

All other models: Apply anaerobic pipe sealant to all non-swiveling pipe threads.

Model 214570 is shown



NOTES:

1 Lubricate

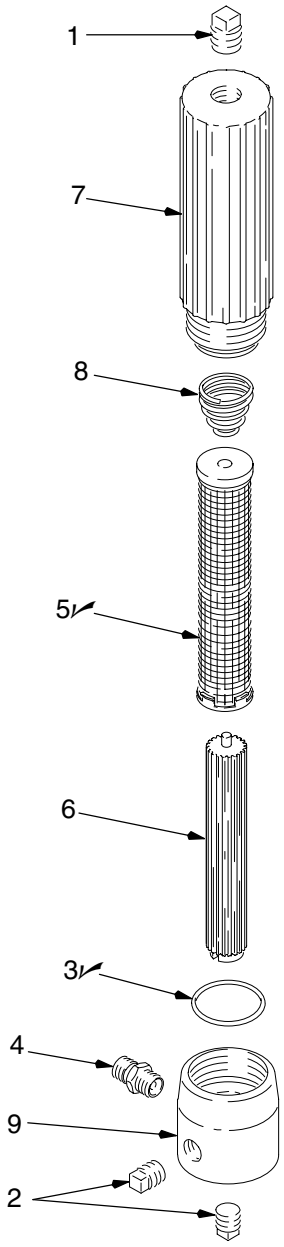
2 Press fit spring to bottom of bowl

3 Screw bowl firmly into housing

Fig. 2

Parts

Model 214570, Series B

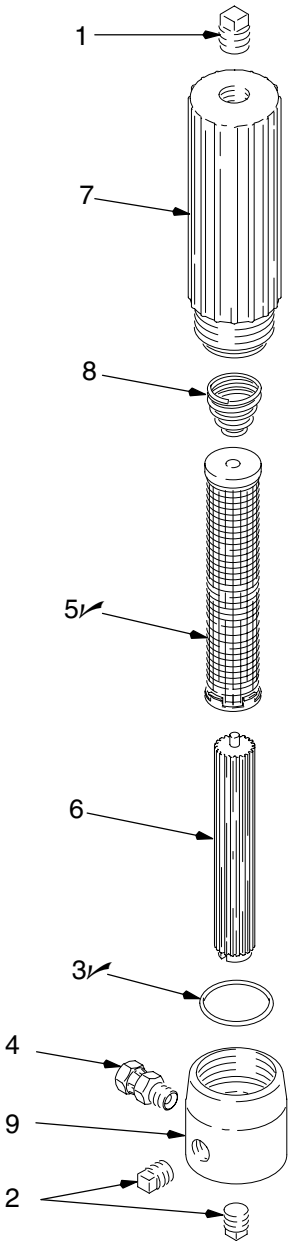


02529

Ref No.	Part No.	Description	Qty.
1	100040	PLUG; 3/8 npt; steel or iron	1
2	100509	PLUG; 1/4 npt; iron	2
3✓	104361	O-RING; PTFE	1
4	162453	NIPPLE; 1/4 npsm x 1/4 npt	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	172831	BOWL, filter; aluminum	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1

✓ *Keep these parts on hand to reduce down time.*

Model 236789, Series A



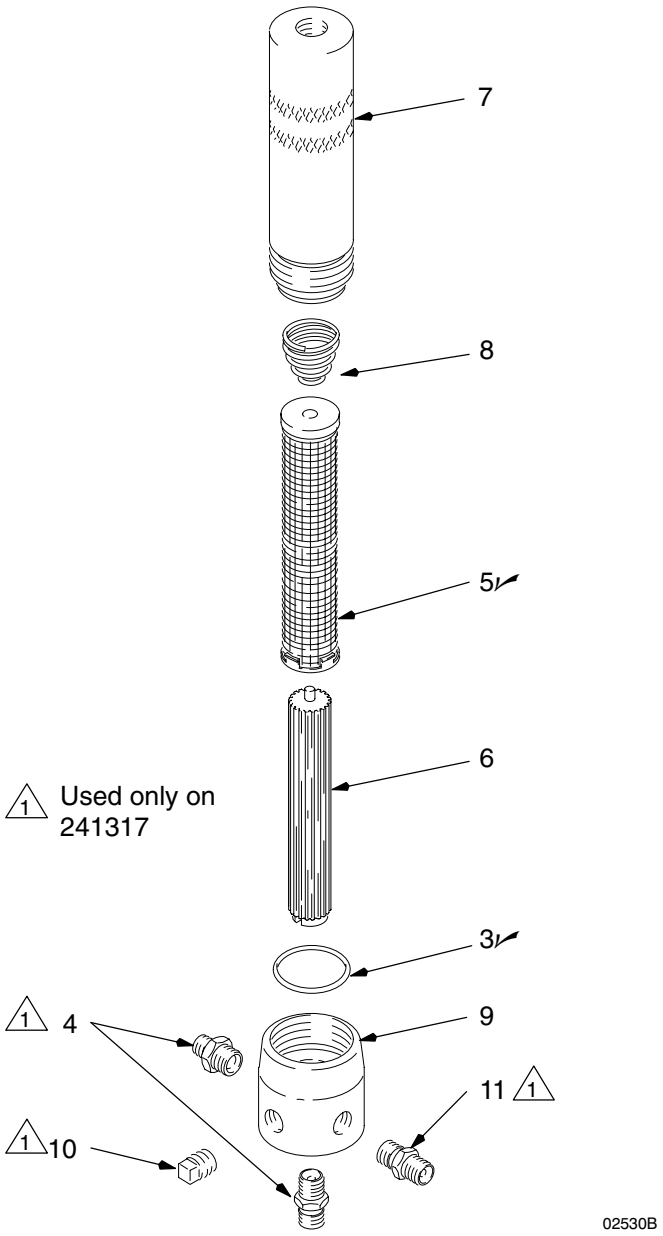
Ref No.	Part No.	Description	Qty.
1	100040	PLUG; 3/8 npt; steel or iron	1
2	100509	PLUG; 1/4 npt; iron	2
3✓	104361	O-RING; PTFE	1
4	155665	SWIVEL	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	172831	BOWL, filter; aluminum	1
8	171941	SPRING, compression; stainless steel	1
9	188562	HOUSING, filter; carbon steel	1

✓ *Keep these parts on hand to reduce down time.*

Parts

Model 218029, Series B

Model 241317, Series A

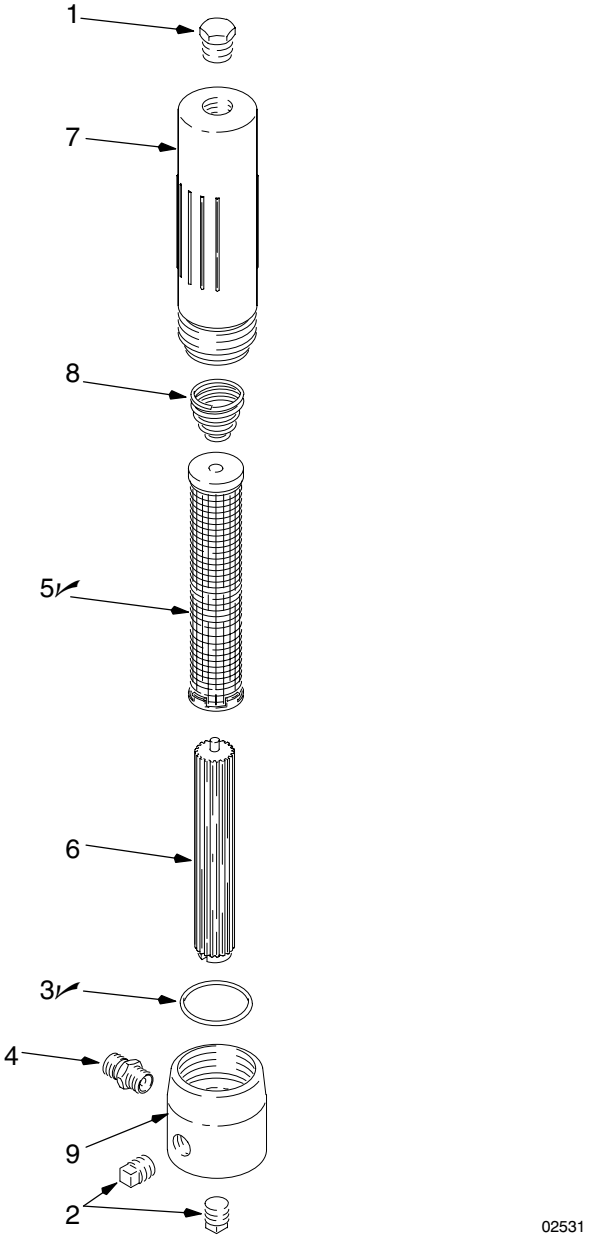


02530B

Ref. No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
4	162453	NIPPLE; 1/4 npsm x 1/4 npt	2
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7		BOWL, filter; carbon steel	1
	179773	Model 218029 (shown)	1
	192706	Model 241317	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
10	100509	PLUG, pipe; 1/4 npt	1
11	157350	ADAPTER, 3/8 npt x 1/4 npt	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 223160, Series B



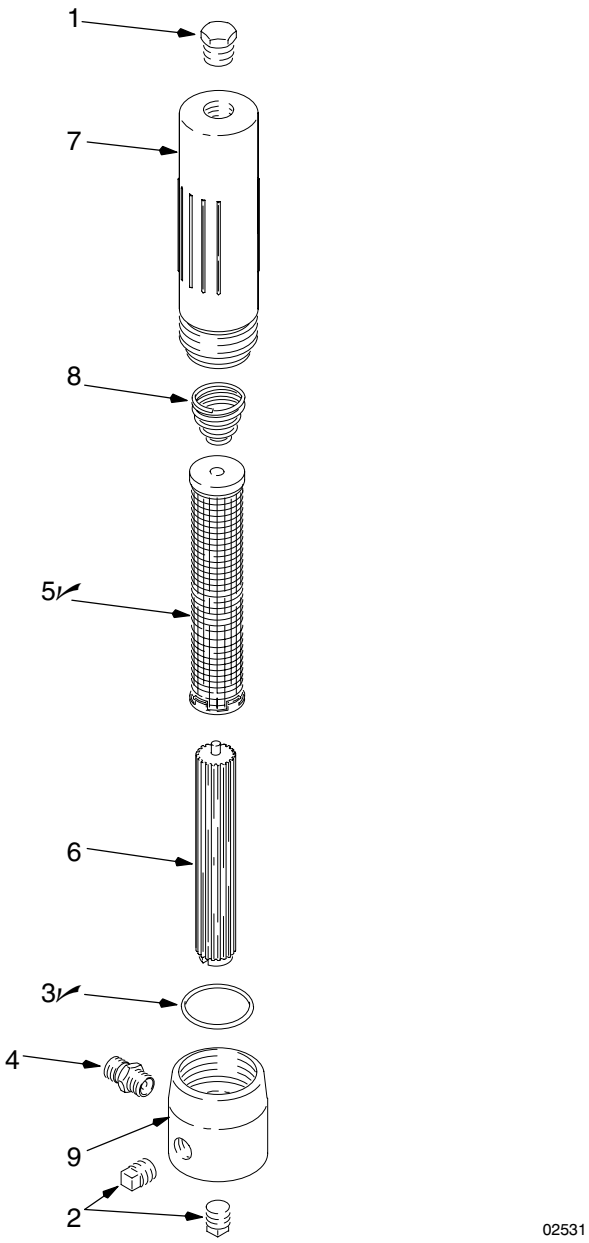
02531

Ref No.	Part No.	Description	Qty.
1	110740	PLUG; 3/8 npt; stainless steel	1
2	111697	PLUG; 1/4 npt; stainless steel	2
3✓	104361	O-RING; PTFE	1
4	166846	NIPPLE; 1/4 npsm x 1/4 npt; stainless steel	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1

✓ *Keep these spare parts on hand to reduce down time.*

Parts

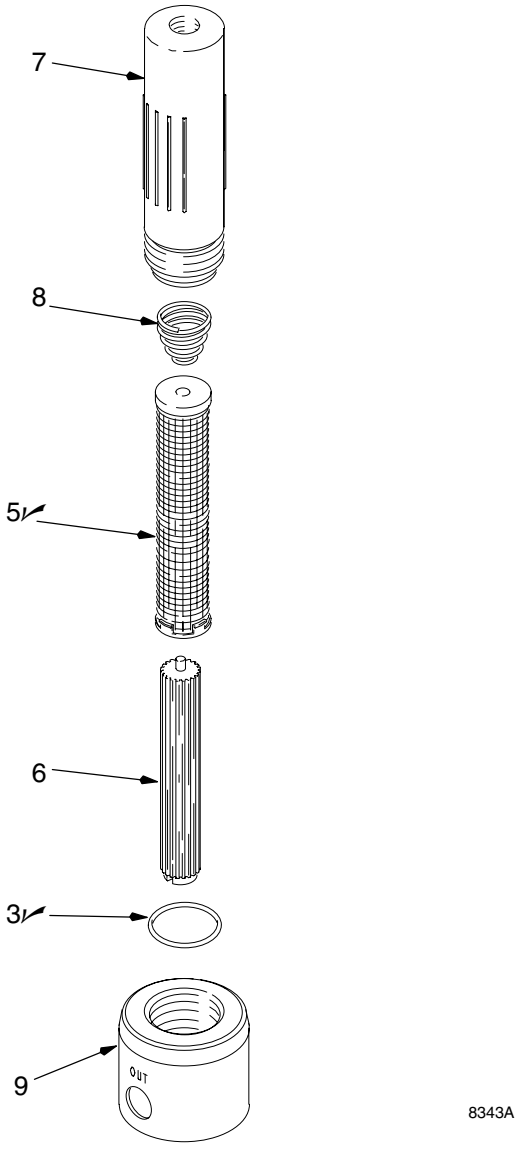
Model 239800, Series A



Ref. No.	Part No.	Description	Qty.
1	110740	PLUG; 3/8 npt; stainless steel	1
2	111697	PLUG; 1/4 npt; stainless steel	2
3✓	104361	O-RING; PTFE	1
4	164856	ADAPTER; 3/8 npt x 1/4 npt (mbe); stainless steel	1
5✓	167026	SCREEN, stainless steel; 100 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 240183, Series A

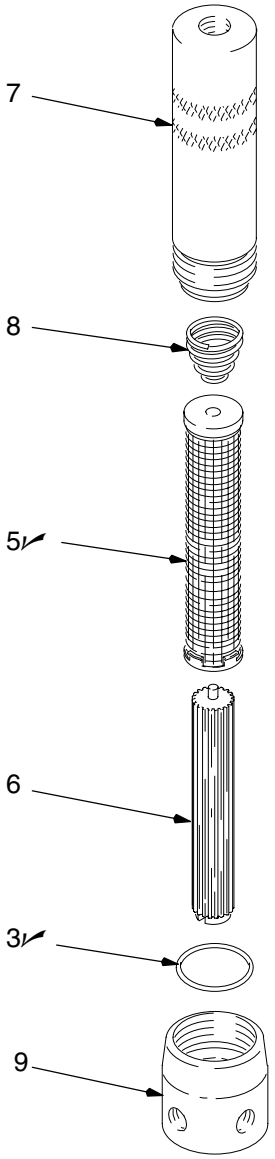


Ref No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	192975	HOUSING, filter; stainless steel	1

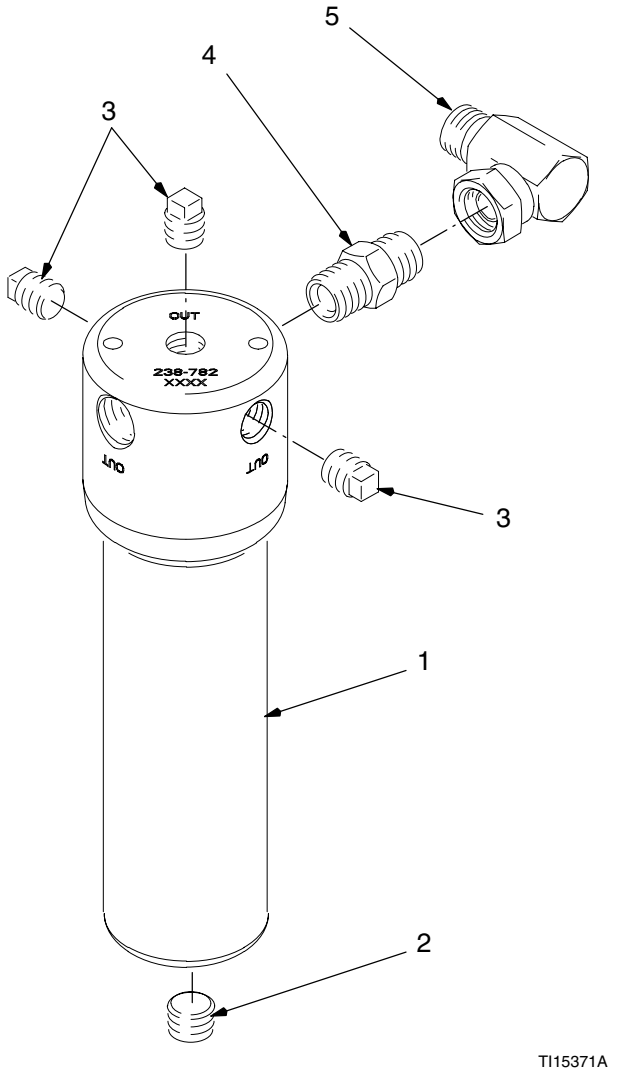
✓ *Keep these spare parts on hand to reduce down time.*

Parts

Model 238782, Series A



Model 248851, Series A



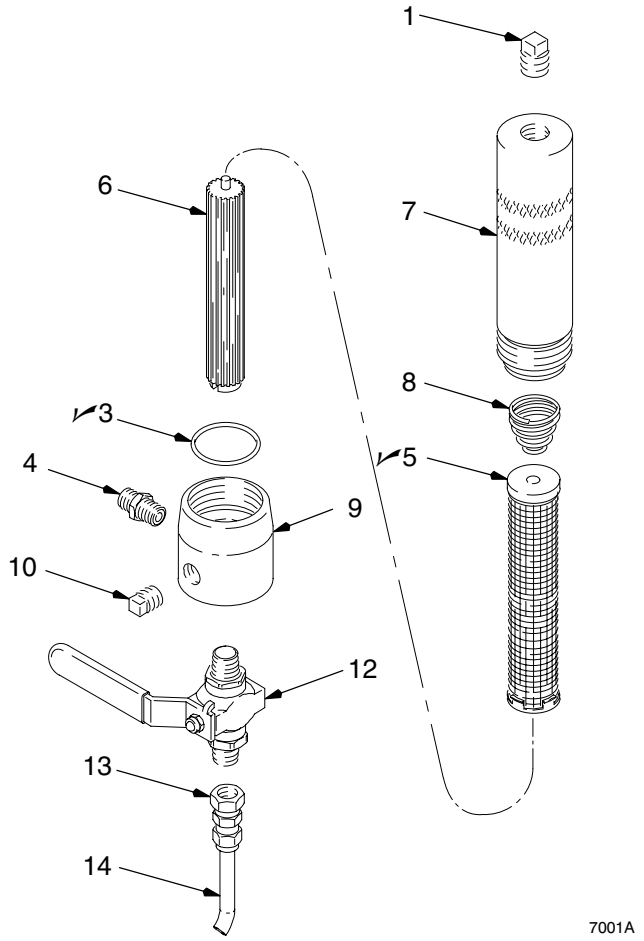
Ref. No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
5✓	167024	SCREEN, stainless steel; 30 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	196290	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	193331	HOUSING, filter; stainless steel	1

Ref No.	Part No.	Description	Qty.
1	238782	FLUID FILTER ASSEMBLY; see parts at left	1
2	101748	PLUG; 3/8 npt; stainless steel	1
3	111697	PLUG; 1/4 npt; stainless steel	3
4	166469	NIPPLE; 3/8 npt; stainless steel	1
5	207123	ELBOW, swivel, 90°	1

✓ *Keep these spare parts on hand to reduce down time.*

Parts

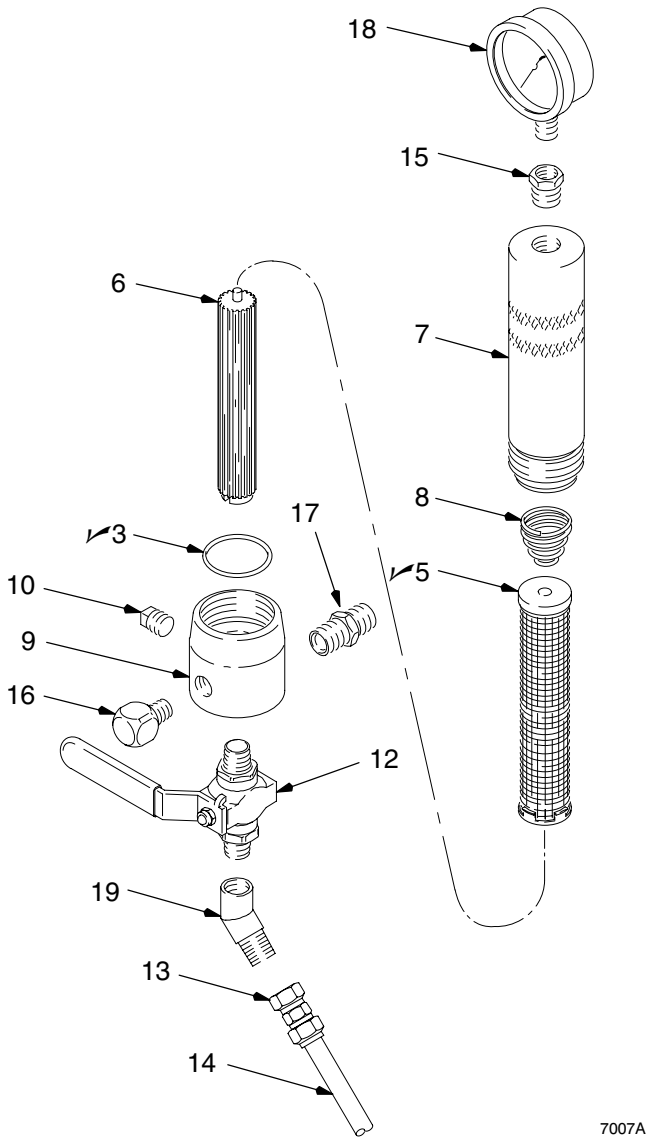
Model 239060, Series A



Ref. No.	Part No.	Description	Qty.
1	100040	PLUG; 3/8 npt; steel or iron	1
3✓	104361	O-RING; PTFE	1
4	162453	NIPPLE; 1/4 npsm x 1/4 npt; carbon steel	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	179773	BOWL, filter; carbon steel	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
10	100509	PLUG, pipe; 1/4 npt	1
12	238635	VALVE, ball; 1/4 npt (mbe); carbon steel	1
13	205447	COUPLING; 1/4 npsm(f)	1
14	061132	TUBE, drain; nylon; 1/4 in. (0.6 mm) ID; 8 in. (203 mm)	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 239244, Series A

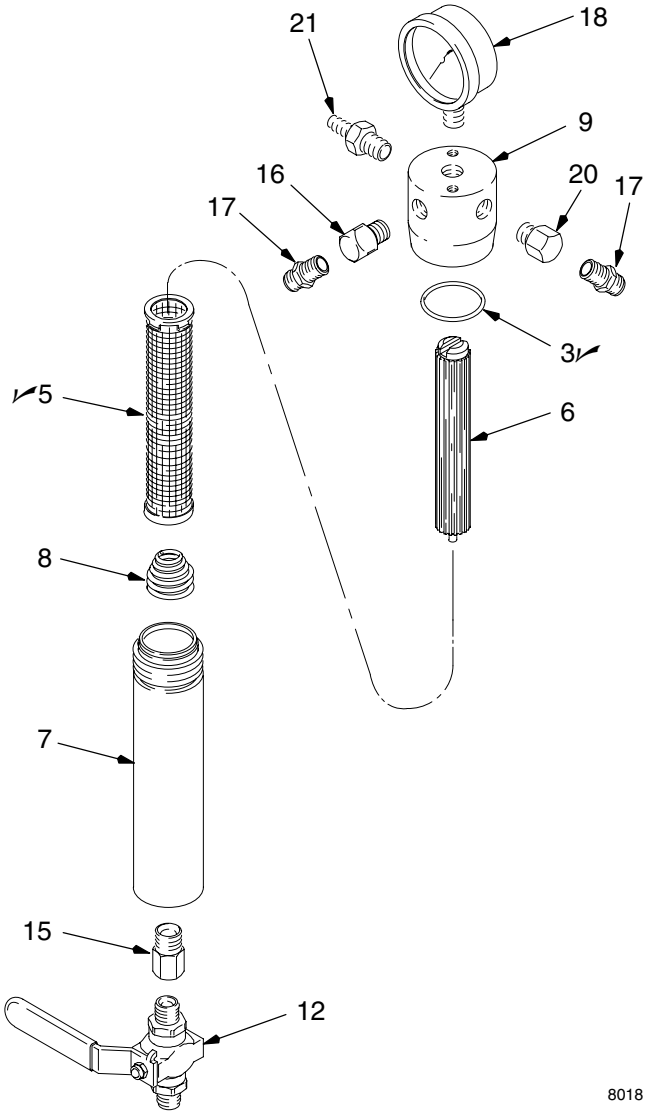


Ref. No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	179773	BOWL, filter; carbon steel	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
10	100509	PLUG, pipe; 1/4 npt	1
12	238635	VALVE, ball; 1/4 npt (mbe); carbon steel	1
13	205447	COUPLING; 1/4 npsm(f)	1
14	061132	TUBE, drain; nylon; 1/4 in. (0.6 mm) ID; 8 in. (203 mm)	1
15	159841	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	100840	ELBOW, 90°; 1/4 npt (m x f); carbon steel	1
17	156849	NIPPLE; 3/8 npt; carbon steel	1
18	102814	GAUGE, pressure	1
19	113444	ELBOW, 45°; 1/4 npt (m x f); brass	1

✓ *Keep these spare parts on hand to reduce down time.*

Parts

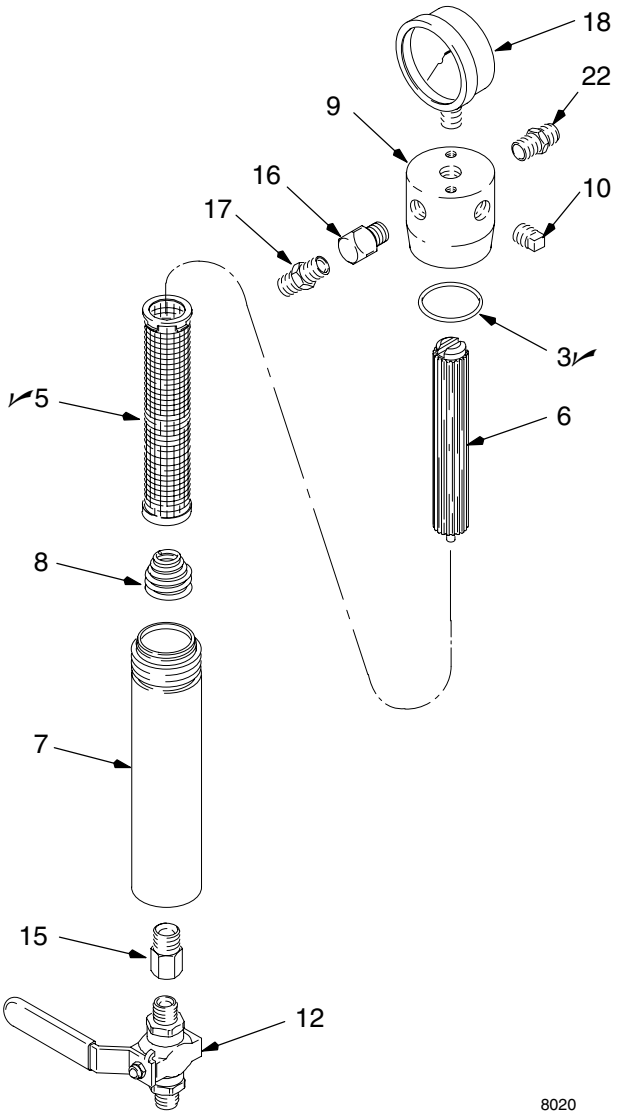
Model 239962, Series A



Ref. No.	Part No.	Description	Qty.
3	104361	O-RING; PTFE	1
5	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	179773	BOWL, filter; carbon steel	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
12	238635	VALVE, ball; 1/4 npt (mbe); carbon steel	1
15	159841	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	100840	ELBOW, 90°; 1/4 npt (m x f); carbon steel	1
17	162453	NIPPLE; 1/4 npt x 1/4 npsm; carbon steel	2
18	102814	GAUGE, pressure	1
20	164259	ELBOW, 90°; 3/8 npt(m) x 1/4 npt (f)	1
21	156953	STUD, mounting	1

Keep these spare parts on hand to reduce down time.

Model 239964, Series A

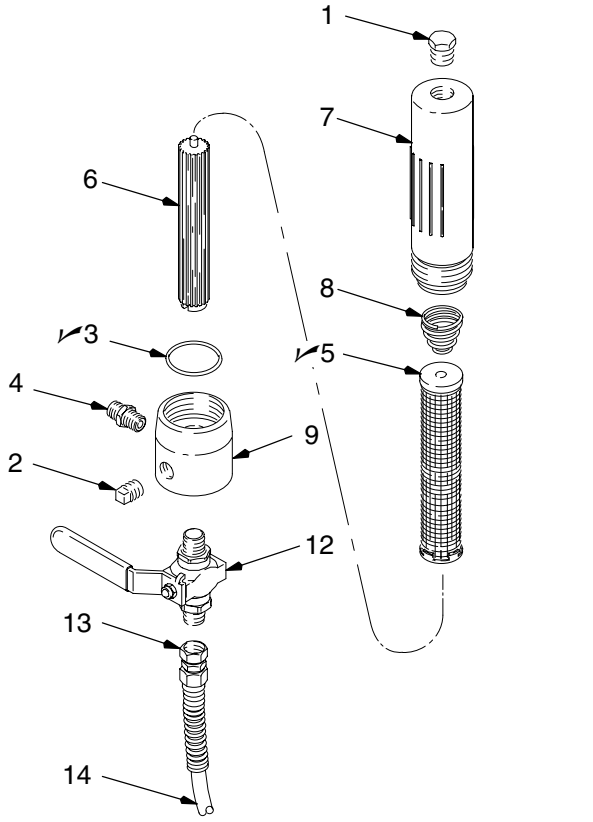


Ref. No.	Part No.	Description	Qty.
3	104361	O-RING; PTFE	1
5	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	179773	BOWL, filter; carbon steel	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
10	100509	PLUG, pipe; 1/4 npt	1
12	238635	VALVE, ball; 1/4 npt (mbe); carbon steel	1
15	159841	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	100840	ELBOW, 90°; 1/4 npt (m x f); carbon steel	1
17	162453	NIPPLE; 1/4 npt x 1/4 npsm; carbon steel	1
18	102814	GAUGE, pressure	1
22	156849	NIPPLE; 3/8 npt; carbon steel	1

Keep these spare parts on hand to reduce down time.

Parts

Model 239063, Series A

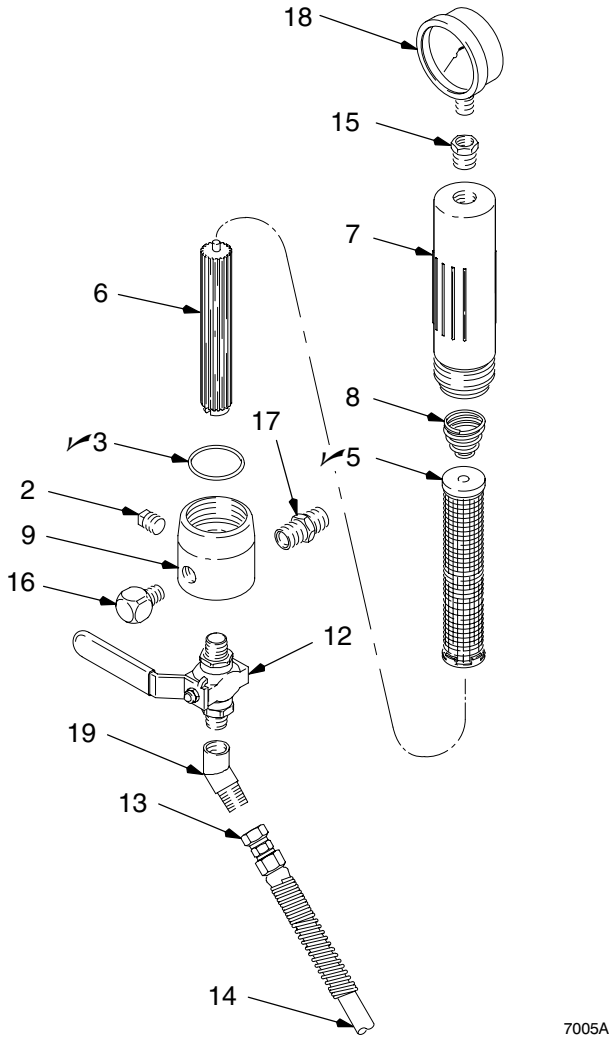


7003A

Ref No.	Part No.	Description	Qty.
1	110740	PLUG; 3/8 npt; stainless steel	1
2	111697	PLUG; 1/4 npt; stainless steel	2
3✓	104361	O-RING; PTFE	1
4	166846	NIPPLE; 1/4 npsm x 1/4 npt; stainless steel	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1
12	239018	VALVE, ball; 1/4 npt (mbe); stainless steel	1
13	111913	COUPLING; 1/4 npsm(f)	1
14	061132	TUBE, drain; nylon; 1/4 in. (0.6 mm) ID; 8 in. (203 mm)	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 239300, Series A



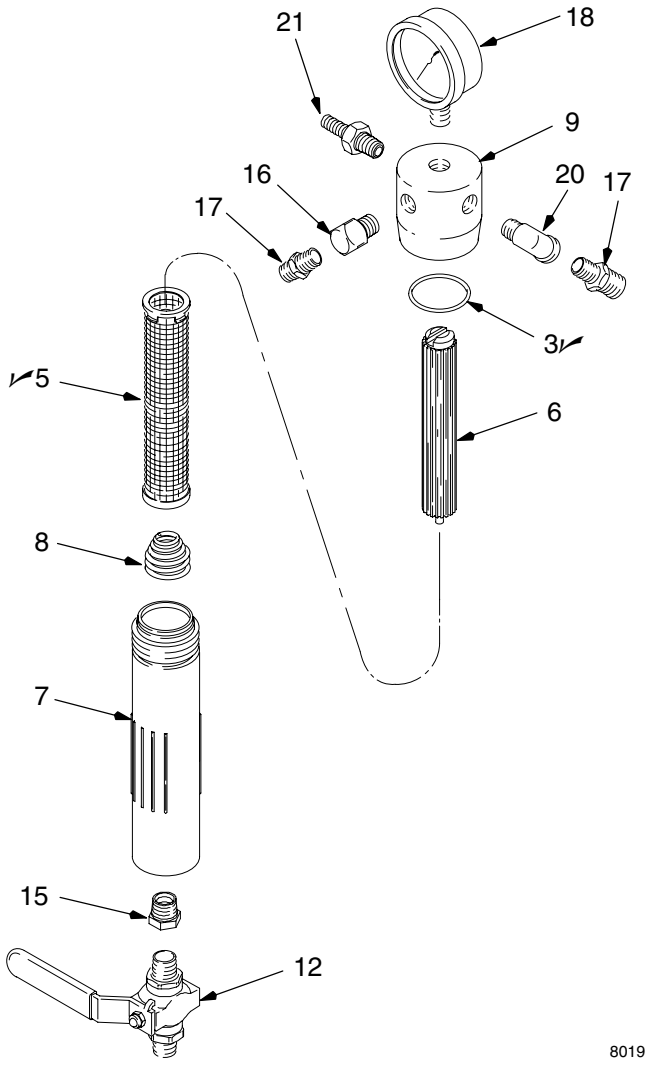
7005A

Ref No.	Part No.	Description	Qty.
2	111697	PLUG; 1/4 npt; stainless steel	2
3✓	104361	O-RING; PTFE	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1
12	239018	VALVE, ball; 1/4 npt (mbe); stainless steel	1
13	111913	COUPLING; 1/4 npsm(f)	1
14	061132	TUBE, drain; nylon; 1/4 in. (0.6 mm) ID; 8 in. (203 mm)	1
15	168160	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	166866	ELBOW, 90°; 1/4 npt (m x f); stainless steel	1
17	166469	NIPPLE; 3/8 npt; stainless steel	1
18	112941	GAUGE, pressure	1
19	113933	ELBOW, 45°; 1/4 npt (m x f); stainless steel	1

✓ *Keep these spare parts on hand to reduce down time.*

Parts

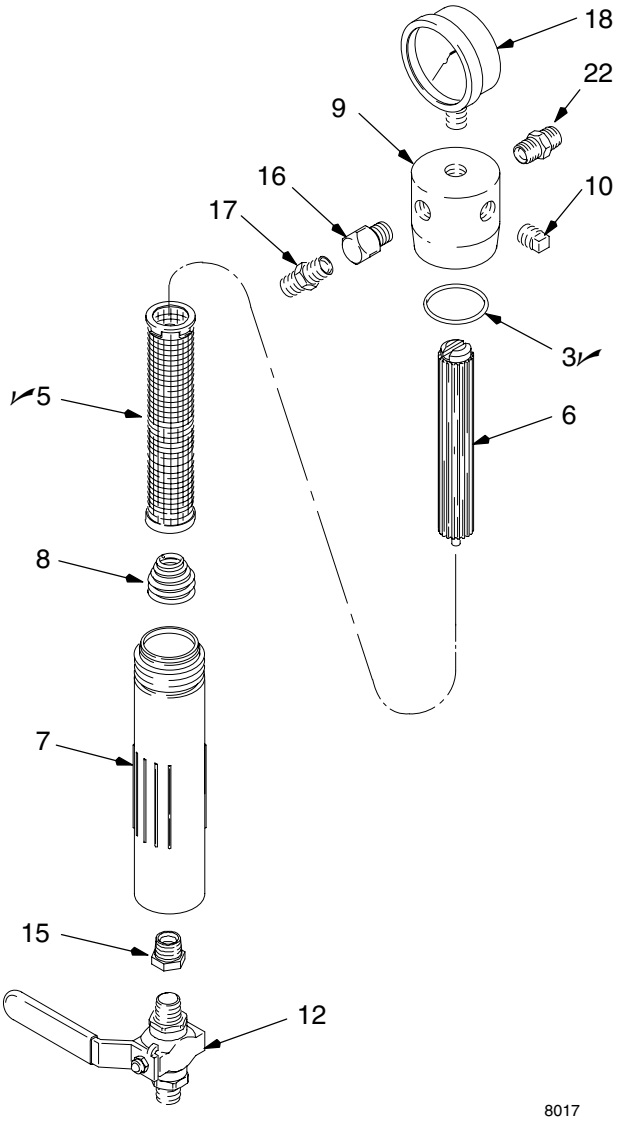
Model 239963, Series A



Ref. No.	Part No.	Description	Qty.
3	104361	O-RING; PTFE	1
5	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1
12	239018	VALVE, ball; 1/4 npt (mbe); stainless steel	1
15	168160	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	166866	ELBOW, 90°; 1/4 npt (m x f); stainless steel	1
17	166846	NIPPLE; 1/4 npt x 1/4 npsm; stainless steel	1
18	112941	GAUGE, pressure	1
20	112026	ELBOW, 90°; 3/8 npt (m x f)	1
21	192661	STUD, mounting	1
22	113070	NIPPLE; 3/8 x 1/4 npt; stainless steel	1

Keep these spare parts on hand to reduce down time.

Model 239961, Series A

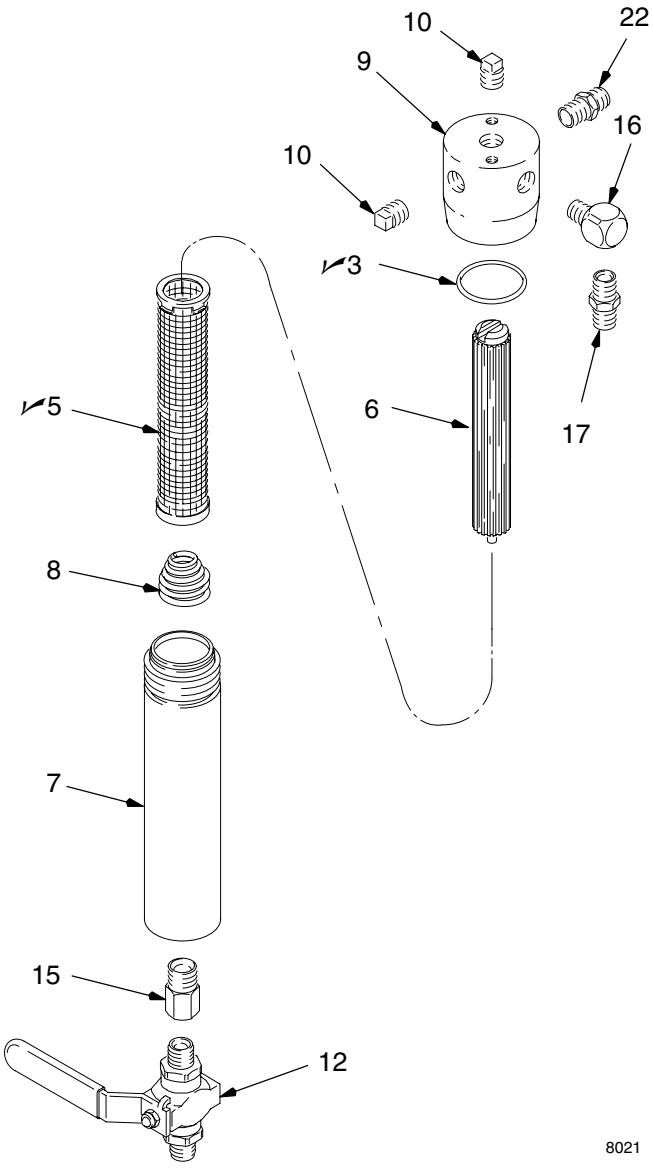


Ref. No.	Part No.	Description	Qty.
3	104361	O-RING; PTFE	1
5	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1
10	111697	PLUG; 1/4 npt; stainless steel	1
12	239018	VALVE, ball; 1/4 npt (mbe); stainless steel	1
15	168160	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	166866	ELBOW, 90°; 1/4 npt (m x f); stainless steel	1
17	166846	NIPPLE; 1/4 npt x 1/4 npsm; stainless steel	1
18	112941	GAUGE, pressure	1
22	111873	NIPPLE; 3/8 npt; stainless steel	1

Keep these spare parts on hand to reduce down time.

Parts

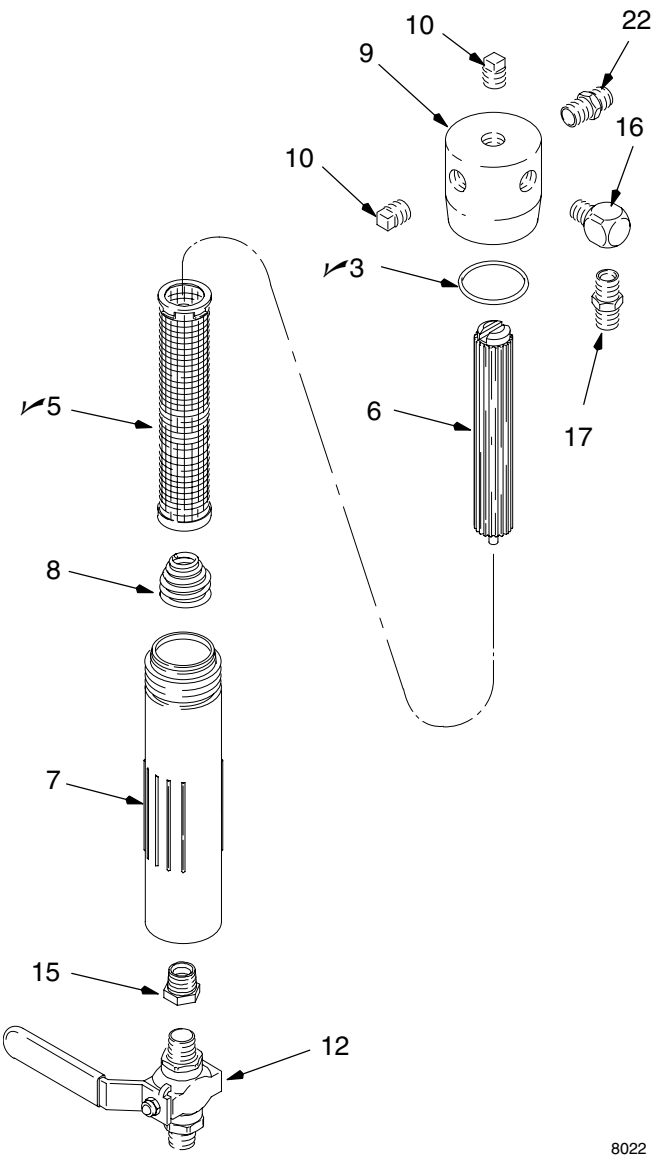
Model 240169, Series A



Ref. No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	179773	BOWL, filter; carbon steel	1
8	171941	SPRING, compression; stainless steel	1
9	171942	HOUSING, filter; carbon steel	1
10	100509	PLUG, pipe; 1/4 npt	2
12	238635	VALVE, ball; 1/4 npt (mbe); carbon steel	1
15	159841	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	100840	ELBOW, 90°; 1/4 npt (m x f); carbon steel	1
17	162453	NIPPLE; 1/4 npt x 1/4 npsm; carbon steel	1
22	156849	NIPPLE; 3/8 npt; carbon steel	1

✓ *Keep these spare parts on hand to reduce down time.*

Model 240170, Series A

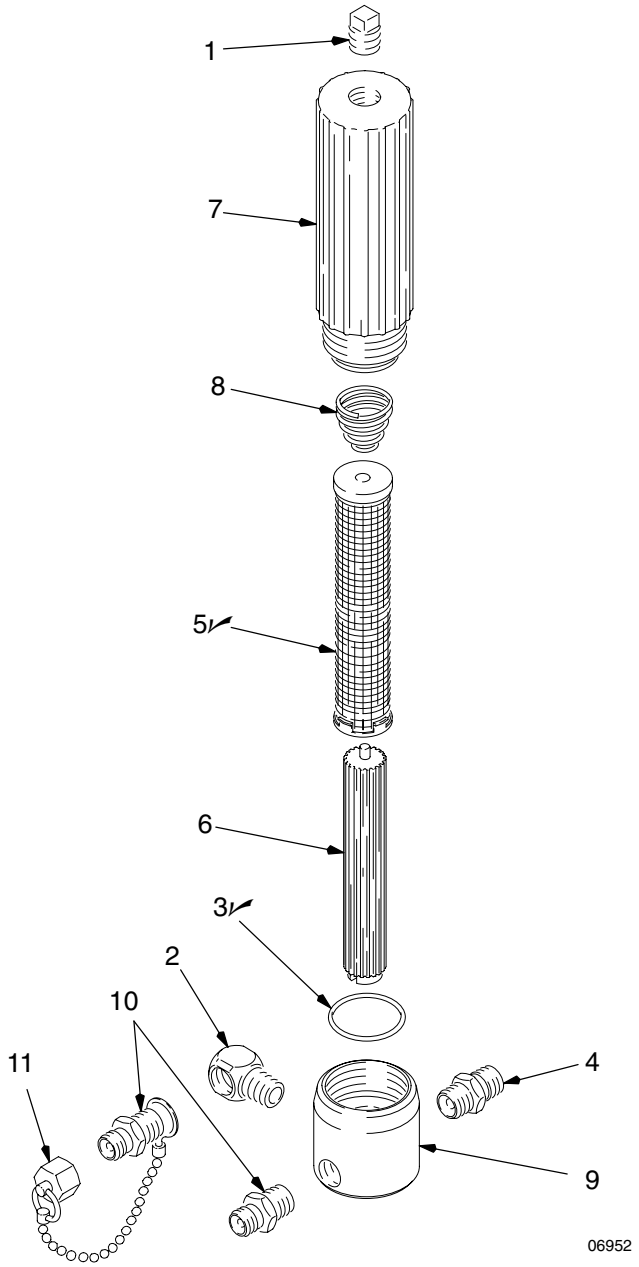


Ref. No.	Part No.	Description	Qty.
3✓	104361	O-RING; PTFE	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	185632	BOWL, filter; stainless steel	1
8	171941	SPRING, compression; stainless steel	1
9	185631	HOUSING, filter; stainless steel	1
10	111697	PLUG; 1/4 npt; stainless steel	2
12	239018	VALVE, ball; 1/4 npt (mbe); stainless steel	1
15	168160	BUSHING; 3/8 npt(m) x 1/4 npt(f)	1
16	166866	ELBOW, 90°; 1/4 npt (m x f); stainless steel	1
17	166846	NIPPLE; 1/4 npt x 1/4 npsm; stainless steel	1
22	111873	NIPPLE; 3/8 npt; stainless steel	1

✓ *Keep these spare parts on hand to reduce down time.*

Parts

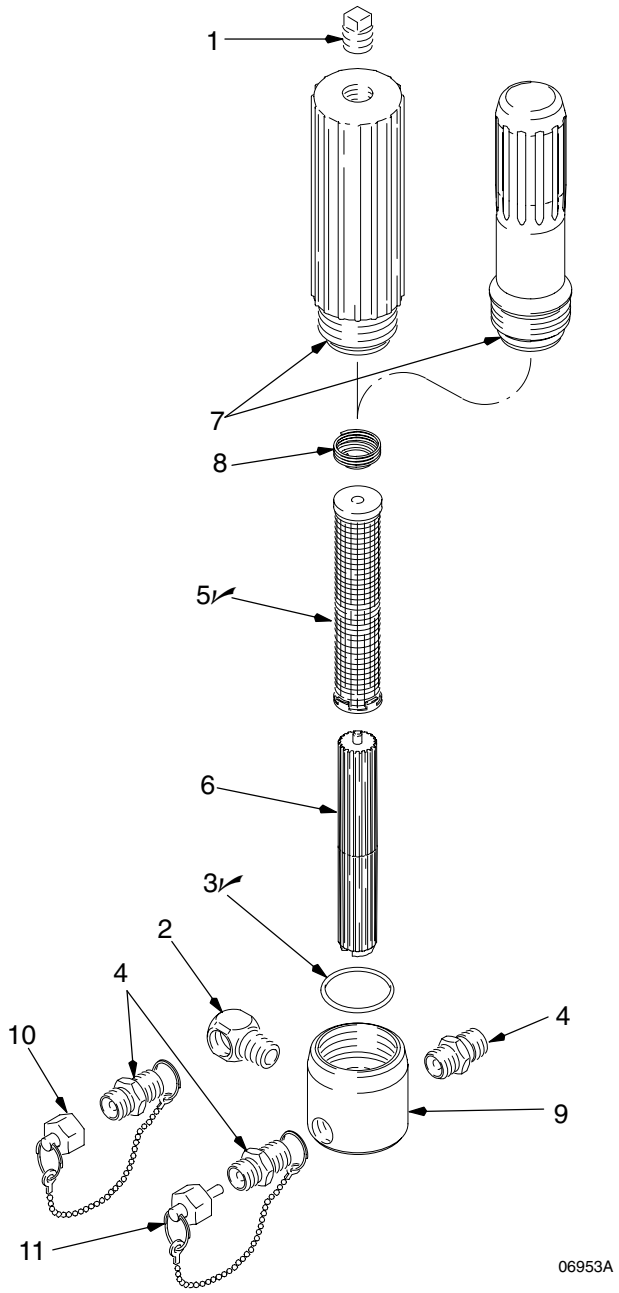
Model 239286, Series A



Ref No.	Part No.	Description	Qty.
1	100040	PLUG; 3/8 npt; steel or iron	1
2	155699	ELBOW, street, 3/8–18 (m x f)	1
3✓	104361	O-RING; PTFE	1
4	162485	NIPPLE; 3/8 npt(m) x 3/8 npsm(m)	1
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	172831	BOWL, filter; aluminum	1
8	171941	SPRING, compression; stainless steel	1
9	190097	HOUSING, filter; carbon steel	1
10	164672	NIPPLE, hex, 3/8 npt x 1/4 npsm; 1–15/16 in. long	2
11	239285	CAP, filter	1

✓ *Keep these parts on hand to reduce down time.*

Model 237481, Series A
Model 241107, Series A



Ref No.	Part No.	Description	Qty.
1	100040	PLUG; 3/8 npt; steel or iron; (231481)	1
2	155699	ELBOW, street, 3/8–18 (m x f)	1
3✓	104361	O-RING; PTFE	1
4	162485	NIPPLE; 3/8 npt(m) x 3/8 npsm(m)	3
5✓	167025	SCREEN, stainless steel; 60 mesh	1
6	186075	SUPPORT, filter; polyethylene	1
7	172831	BOWL, filter; aluminum; Model 237481	1
	192706	BOWL, filter; zinc-plated steel; Model 241107	1
8	171941	SPRING, compression; stainless steel	1
9	190097	HOUSING, filter; carbon steel	1
10	237479	CAP, filter; Model 237481	1
11	240987	PLUG, packless; Model 241107	1

✓ *Keep these parts on hand to reduce down time.*

Accessories

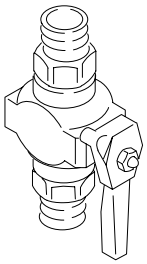
Use Only Genuine Graco Parts and Accessories

High Pressure Ball Valves

5000 psi (350 bar) Maximum Working Pressure

Install in outlets for individual line control or install in bottom of filter bowl for draining fluid.

210657	1/4 npt(mbe), Viton® seals
210659	3/8 x 1/4 npt(mbe), Viton seals
210658	3/8 npt(mbe), Viton seals
214037	1/4 npt(mbe), PTFE seals
240410	3/8 npt(mbe), PTFE seals



Stainless Steel Screens

167024	595 micron (30 mesh)
167025	250 micron (60 mesh)
167026	149 micron (100 mesh)
167027	74 micron (200 mesh)

Optional Filter Support 179801

Zinc-plated steel

Notes

Technical Data

Category	Data
Maximum Working Pressure	*Model 214570, 236789, 237481, 239286:* 3000 psi (21 MPa, 210 bar) *Model 239963:* 4000 psi (28 MPa, 280 bar) *All other models:* 5000 psi (35 MPa, 350 bar)
Fluid Inlet	*Model 240183*: 1/2 npt *All other models:* 3/8 npt
Fluid Outlets	*Model 240183*: 1/2 npt *Model 236789, 237481, 238782, 241107, 248851*: 3/8 npt *All other models:* 1/4 npt
Diameter	*All models:* 2.25 in. (60 mm)
Height	*All models:* 8.5 in. (220 mm)
Weight	*Model 214570, 236789:* 3.2 lb (1.45 kg) *Model 237481, 239286 :* 3.53 lb (1.60 kg) *All other models:* 4.63 lb (2.10 kg)
Wetted Parts	*Models 214570, 236789, 237481, 239286:* Aluminum, carbon steel, passivated 304 & 313 stainless steel, PTFE, polyethylene *Models 218029, 239060, 239244, 239962, 239964, 240169, 241107:* Carbon steel, PTFE, polyethylene, passivated 304 & 313 stainless steel *Model 241317:* Carbon steel, zinc, PTFE, polyethylene, passivated 304 & 313 stainless steel *Models 223160, 238782, 239063, 239300, 239800, 239961, 239963, 240170, 240183, 248851:* PTFE, polyethylene, passivated 303, 304, 313 & 316 stainless steel

Viton® is a registered trademark of the Du Pont Company.

The Graco Standard Warranty

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 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.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

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

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS
The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procedures concernées.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call to identify the distributor closest to you:
Phone: 612–623–6921 **or Toll Free:** 1–800–328–0211 **Fax:** 612–378–3505

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Graco reserves the right to make changes at any time without notice.

Graco Headquarters: Minneapolis
Foreign Offices: Belgium, China, Japan, Korea

GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440–1441
www.graco.com
PRINTED IN USA 307273 January 1977 Revised July 2004

Instructions – Parts List

Parts

Foam-Cat® Heated Hose

307544M

3000 psi (21 MPa, 207 bar) Maximum Working Pressure

Model 218613, Series B
50 foot (15.2 m) Hose, 3/8 in. ID

Model 218614, Series B
15 foot (4.6 m) Whip Hose, 1/4 in. ID

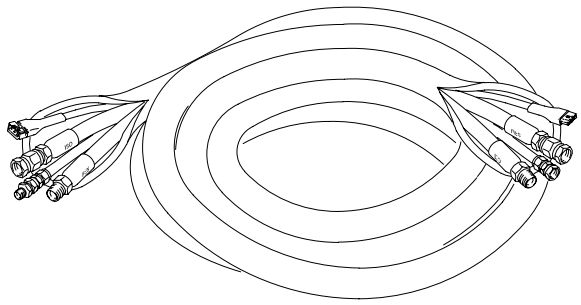
The heated hose maintains proper fluid temperature between the heater and gun during spraying operations, and it raises the temperature of fluid left in the hose when the heater is turned on after a shutdown period.

The Series B Heated Hoses include a 75°C (167°F) high limit thermostat. This limits the maximum temperature to less than the 82°C (180°F) rating of the hoses, allowing use at a full 3000 psi (21 MPa, 207 bar) pressure rating.

U.S. Patent No. 4,725,713
United Kingdom Patent No. 2,138,601
Brevete 1986 Canada

Read warnings and instructions.
See page 2 for table of contents.

CSA certified for use with Models 235259, Series B, 235839, Series B, 235260, Series B, and 235840, Series B Foam-Cat Heaters.



Model 218613

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD
The operating and safety features of these hoses are designed for use **only** with the Graco Foam-Cat® Heater and Heater Hose Controls: Models 235259, 235839, 235260, and 235840. To reduce the risk of serious injury, never connect these hoses to any other device.

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

PROVEN QUALITY. LEADING TECHNOLOGY.

Table of Contents

Introduction

Understanding how the Foam Cat® Heater functions and how to adjust it properly for your application conditions, is the key to easy operation and early detection of possible equipment problems.

Read this manual and the manuals for all of the components in your spray system thoroughly before installing or operating the equipment.

Reference letters and numbers

Reference numbers and letters in parentheses in the text refer to the illustrations or the parts drawings. Information on parts referenced with letters can usually be found in the separate instruction manuals accompanying those components.

Terms

RES and ISO refer to the foam chemicals Resin and Isocyanate, respectively.

Ambient Temperature is the surrounding air temperature.

ATC is the optional Ambient Temperature Compensator feature of the Foam-Cat Heater.

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Use the hose **only** with the Graco Foam-Cat® Heater and Heater Hose Controls: Models 235259, 235839, 235260, and 235840.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. This equipment has a **3000 psi (21 MPa, 207 bar) maximum working pressure**.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces.
- To avoid excessive heat buildup, never operate the hose when it is coiled.
- Do not use the hoses to pull the equipment.
- Use fluids and solvents that are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

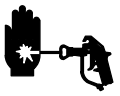
TOXIC FLUID HAZARD

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

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
- Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.

Continued on the next page.

⚠ WARNING



INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the spray gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the trigger guard on the spray gun when spraying.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 9 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Do not mend or repair any part of the hose assembly. If the hose is damaged, replace it immediately.

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Improper grounding, poor ventilation, open flames, or sparks can cause a hazardous condition and result in fire, explosion, electric shock or other serious injury.

- Ground the equipment and the object being sprayed according to the system component manuals and local code.
- All electrical wiring must be done by trained and qualified personnel and comply with all local codes and regulations.
- Do not use the hose until the couplings are properly insulated and the hose abrasion cover is in place.
- Do not expose the hose to rain.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- If there is any static sparking while using the equipment, **stop spraying immediately**. Identify and correct the problem.

Installation

Each hose assembly is 50 feet (15 m) long. A maximum combined length of 300 feet (92 m) can be used, in addition to a 15 foot (4.6 m) whip hose assembly.

The whip hose assembly is smaller in diameter, which makes maneuvering the hose easier for the operator.

The fluid hoses are marked ISO or RES and are oppositely coupled to prevent incorrect connection, which can cause fluid crossover and permanently damage the hose. Refer to Fig. 1.

⚠ WARNING

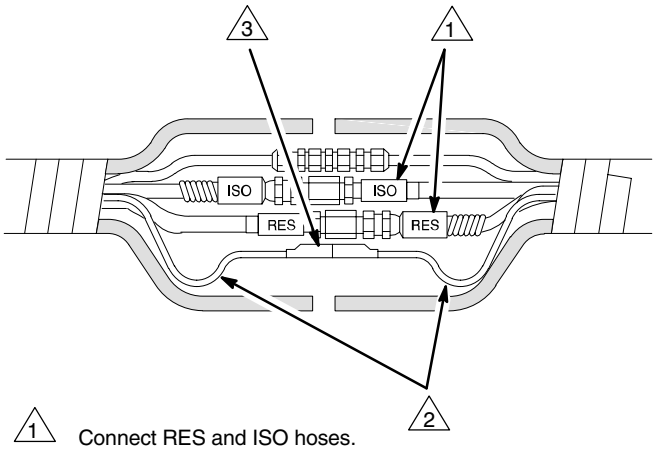
ELECTRIC SHOCK HAZARD

Strain on the heat tape wires can pull them loose from the connectors when the hose is moved or coiled. To reduce the risk of an electric shock from loose or damaged wires, follow these precautions.

- Make the bend in the heat tape as instructed below.
- Do not wrap the heat tape around the hoses.

Connecting the 50 foot (15.2 m) Hoses

1. Connect the corresponding fluid hoses of each 50 foot (15.2 m) assembly. See Fig. 1.
2. Gently bend the slack in the heat tape on both sides of the tape connectors as shown in Fig. 1.
3. Couple the heat tape connectors.
4. Cut the uncoupled air hoses (B) to a length that will be easy to couple to the next air hose. See Fig. 2.
5. Attach a coupling to the air hose.
   a. Slide the male end of the sleeve (A) over the hose (B).
   b. Grease the barbed end of the stud (C) and push it into the hose until it seats properly.
   c. Tighten the sleeve until it bottoms on the fitting.
   d. Connect the air hose.



1 Connect RES and ISO hoses.
2 Bend the slack in heat tape
3 Couple heat tape connector

Fig. 1 04439A

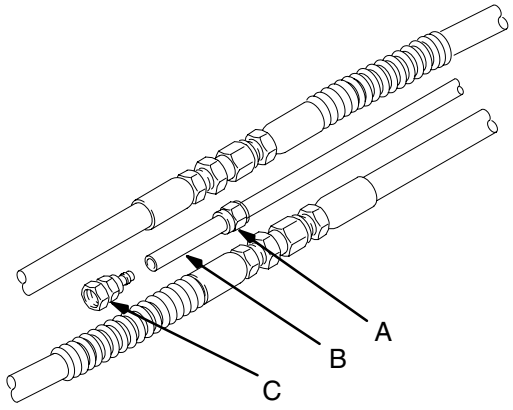


Fig. 2 04440

Installation

6. Check the continuity of the heat tapes.

   a. Use an ohmmeter to check the electrical resistance of the two outer prongs of the connector (D) that attaches to the heated hose control. See Fig. 3. The resistance for the various lengths of coupled hose assemblies is given in the following coupled hose chart.

Coupled Hose Length	Resistance Range
315 feet (96 m)	11–15 ohms
215 feet (66 m)	20–25 ohms
115 feet (35 m)	37–46 ohms
65 feet (20 m)	65–80 ohms
50 feet (15.2 m)	84–124 ohms

   b. Between the middle and outer prong of the connector, the resistance should be more than 1 megohm. If it is less, there is a fault in one of the connectors (D) or the heat tapes, which will cause the Ground Fault Interrupter of the Foam-Cat Heater hose control to shut off electric power to the hose. If there is a fault, check each 50 foot (15.2 m) hose section individually and replace the faulty section.

   c. Check the continuity of the middle prong of the connector (D) from one end of the coupled hoses to the other. The resistance should be less than 10 ohms.

   d. Check the continuity of the whip hose between the two outer prongs and then between the outer and middle prongs of the exposed connector as instructed in steps 6a. and 6b. The resistance between the outer prongs should be 300 to 400 ohms.

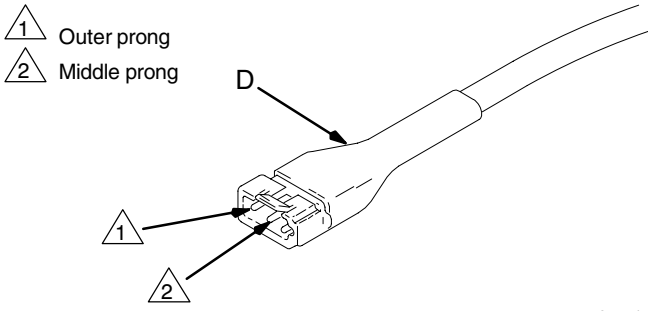


Fig. 3 04441

7. Connect the whip hose to the main hose assembly.

   a. Connect the corresponding fluid hoses.

   b. Connect the hose electrical connector to the control box cable.

   c. Connect the air hoses. Do not alter the air hose length at this connection. Loop it down from the gun as shown in Fig. 4.

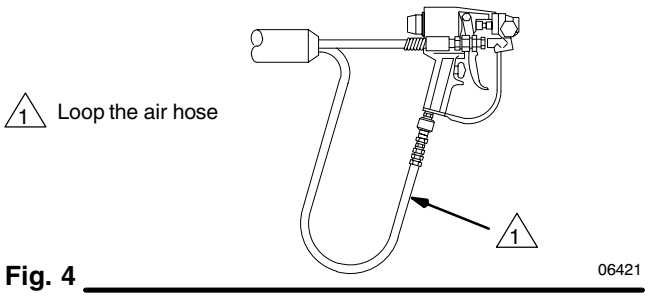


Fig. 4 06421

8. Check all hose connections to be sure they are securely tightened.

9. Connect the main hose(s) to the heater and the whip hose to the gun.

10. Ground the system.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Before operating the system, ground it as explained in your separate component manuals and local code. Also read the section **FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD**, page 4.

The Foam-Cat Heated Hose is grounded through connection to a properly grounded Foam-Cat Heater. In a mobile installation, be sure the truck or trailer is grounded to a true earth ground.

In Europe, the hose continuity must comply with VDE 0100.

Installation

⚠ WARNING

INJECTION HAZARD
To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 9 whenever you are instructed to relieve pressure.

11. Pressure check the hose assemblies. Refer to the heater manual 308219 for priming and pressurizing the fluid hoses. Check carefully for leaks at the hose connections. If there are leaks, relieve the pressure as instructed on page 9. Tighten the connections, then pressurize the sprayer and hoses again to make sure the leaks have stopped. Shut off the sprayer and relieve the pressure.
12. Insulate the hose connections.
    a. Wrap electrical tape securely around the fluid and air hose connectors only, so the sharp metal edges of the connectors cannot damage the plastic connectors of the heat tapes. See Fig. 5.
    b. Tape the heat tape connectors together separately to help prevent the connectors from pulling apart. Then tape the heat tape connectors to the air and fluid hose connectors; leave the wires free to move slightly to prevent strain on the wires at the connectors. See Fig. 6.
    c. Wrap the insulation tubing (E) around the hose connections, overlapping at the seam. See Fig. 7. Wrap the tape (F) continuously around the tubing, beginning and ending about 2 inches (51 mm) past the slit in the insulation.

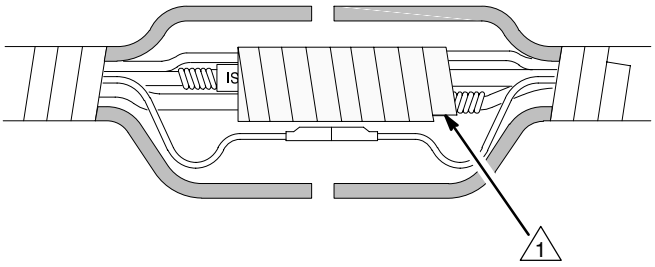
NOTE: Standard black electrical tape can be used if additional tape is needed to secure the tubing.

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or electric shock:

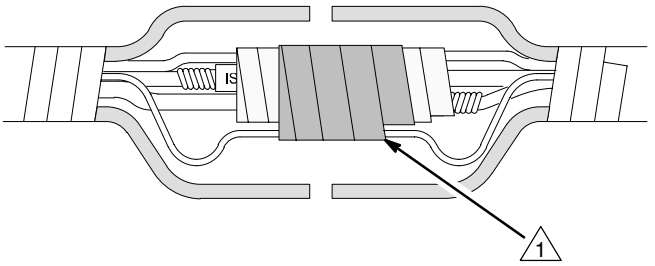
- Do not use the heated hoses for spraying without the insulation tubing in place (see Step 12) and the abrasion cover installed (see Step 13).

- Replace the insulation immediately if any portions of it are worn away.



1 Wrap hose connections with electrical tape

Fig. 5 04453A



1 Tape heat tape connectors to hose connections with electrical tape

Fig. 6 04454A

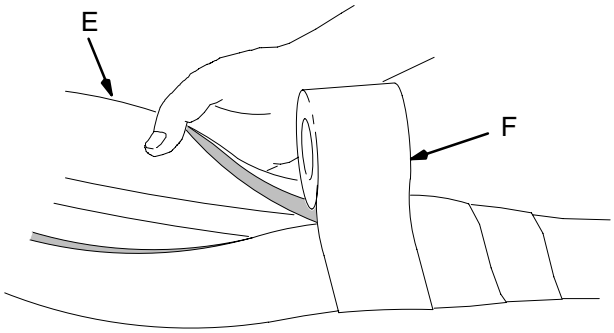


Fig. 7

Installation

13. To install the cover:

    a. Lay the abrasion cover (G) and assembled heated hose (H) end to end. Refer to Fig. 8.

    b. With the gun disconnected from the gun manifold (J) and the air hose disconnected from the gun, pull a couple of inches of the cover (G) over the manifold and hoses and tape the cover to the hoses.

    c. Push the cover (G) onto the hoses. See Fig. 8. The cover will double over itself and be turned inside out as it slides over the hoses.

    d. Secure the other end of the cover (G) with tape.

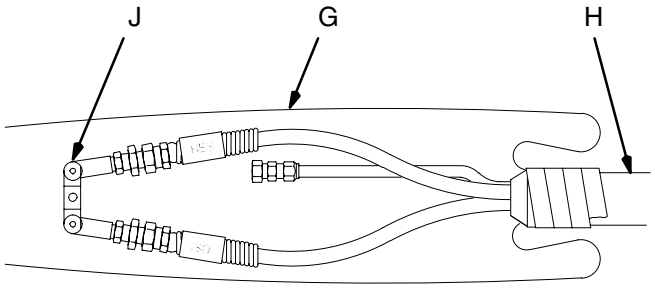


Fig. 8

14. Install hose abrasion cover before spraying. The abrasion cover protects the heated hose from damage caused by rough surfaces. It also minimizes heat loss and protects the couplings from damage. Order part no. 070411 and specify the total length of your hose times 1.25.

Operation and Maintenance

Pressure Relief Procedure

⚠ WARNING

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

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

1. Lock the gun trigger safety.
2. Shut off the air to the feed pumps.
3. Turn off the power (air or electric motor switch) to the proportioning pump.
4. Close the gun manifold fluid valves.
5. Unlock the spray gun trigger safety.
6. Hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun to relieve pressure.
7. Lock the trigger safety again.
8. Open both fluid filter drain valves; have a container ready to catch the draining fluid.
9. *If you suspect that the spray tip/nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly* loosen the tip/nozzle retaining nut or hose end coupling to relieve pressure gradually, then loosen completely. Wear protective gloves to avoid skin injection or burns. Now clear the tip/nozzle or hose.
10. Be sure the fluid is cool before disconnecting the hoses.

Operation

⚠ WARNING

INJECTION HAZARD
Never operate the hose when it is coiled. A coiled hose creates excessive heat buildup which can result in hose rupture and cause serious injury, including injection. The high heat can also cause poor foam development.

Refer to your system manual for complete startup and operating instructions.

Maintenance

⚠ WARNING

INJECTION HAZARD
Do not mend or repair any part of a hose assembly. If the hose is damaged, replace it immediately to avoid serious injury from fluid injection and electric shock.

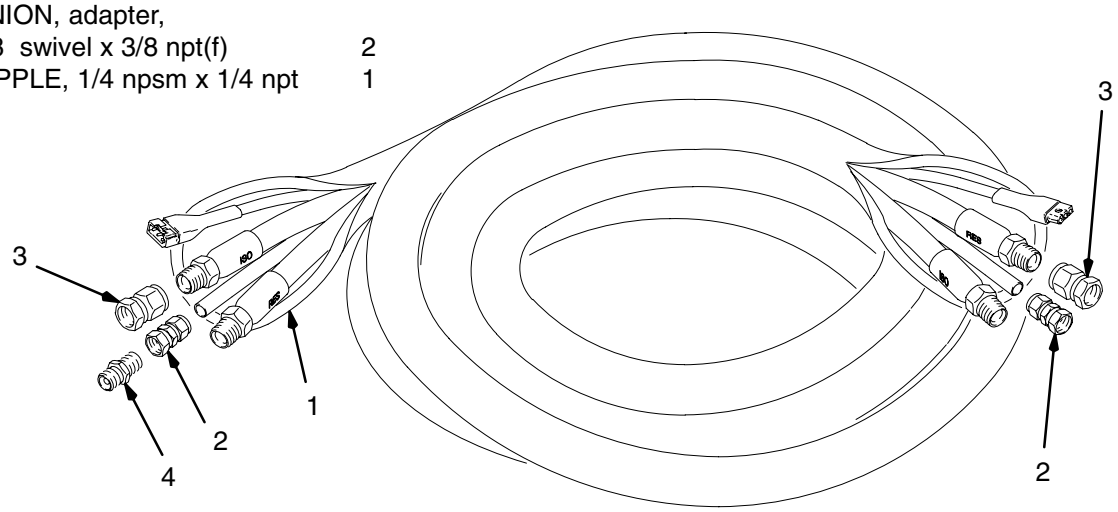
If a section of hose is not heating, be sure the connector at the hose control box is firmly plugged in. If that does not correct the problem, relieve the fluid pressure in the sprayer and hoses, as instructed at left. Remove the abrasion cover and the insulation tubing on each end of the hose in question. Make sure the heat tape connections are secure and repeat the continuity check in Step 6, page 6. If the hose is faulty or the problem not corrected, replace the hose.

Parts

Model 218613, Series B

50 foot (15.2 m) Hose.
Replaceable parts include items 1–4 only.

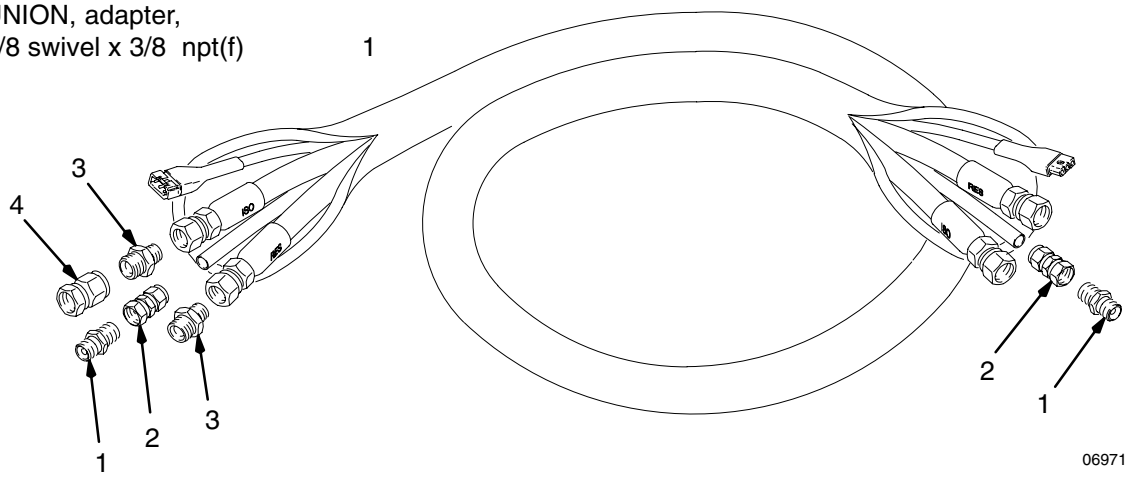
Ref. No.	Part No.	Description	Qty.
1	178540	TUBE, insulation, 50 ft. (15.2 m)	1
2	205447	COUPLING, 1/4 npt(m x f)	2
3	156173	UNION, adapter, 3/8 swivel x 3/8 npt(f)	2
4	162453	NIPPLE, 1/4 npsm x 1/4 npt	1



Model 218614, Series B

15 foot (4.6 m) Hose.
Replaceable parts include items 1–4 only.

Ref. No.	Part No.	Description	Qty.
1	162453	NIPPLE, 1/4 npsm x 1/4 npt	2
2	104415	COUPLER, hose	2
3	157350	NIPPLE, reducing, 3/8 x 1/4 npt(mbe)	2
4	156173	UNION, adapter, 3/8 swivel x 3/8 npt(f)	1



Technical Data

Maximum Working Pressure	3000 psi (210 MPa, 207 bar)
Wattage	12 Watts/foot (39.4 Watts/meter) at 240 VAC, 50/60 cycle
Wetted Parts	Nylon; Steel, zinc or cadmium plated; Carbon Steel, zinc plated

Graco Standard Warranty

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 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.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

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

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS
The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procedures concernées.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you:
1–800–367–4023 Toll Free

All written and visual data contained in this document reflects the latest product information available at the time of publication.
Graco reserves the right to make changes at any time without notice.

Sales Offices: Minneapolis, Detroit
International Offices: Belgium, Korea, Hong Kong, Japan

GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440–1441
www.graco.com
PRINTED IN USA 307544 05/1982, Revised 11/2003

Instructions – Parts List

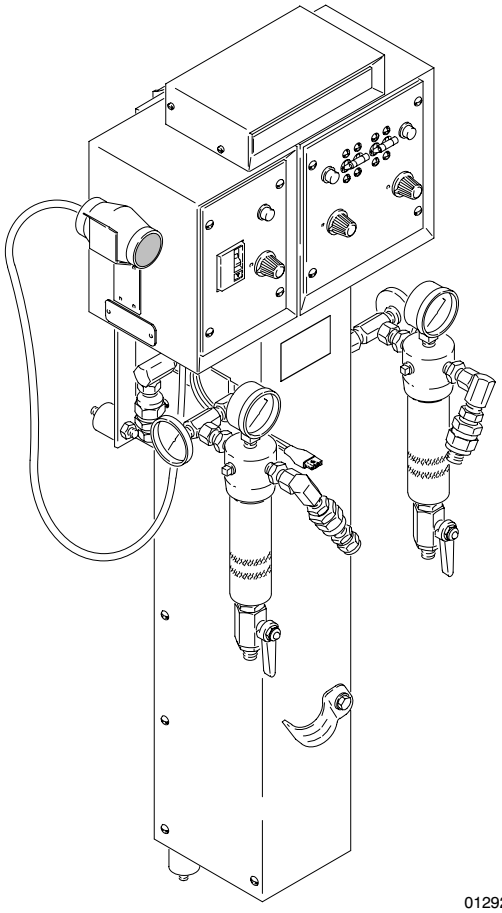
FOAM–CAT® HEATER

308219G

For use ONLY with two component urethane fluids that are unfilled and non–flammable.

3000 psi (21 MPa, 210 bar) Maximum Working Pressure
Temp. Class T2C (230° C) Maximum Fault Temperature
Nominal Operating Temperature: 95–158° F (35–70° C)
Ambient Temperature Range: 40–104° F (5–40° C)

This heater includes a heating element and an independent temperature for each of two fluids, Isocyanate and Resin, and an independent temperature control for the Foam–Cat® Heated Hose.



01292

Foam-Cat® 200 — 15 lb/min

Model 235259 Series B	With Heated Hose Control 8880 Watt
Model 235839 Series B	Without Heated Hose Control 5100 Watt

Foam-Cat® 400 — 30 lb/min

Model 235260 Series B	With Heated Hose Control 13,980 Watt
Model 235840 Series B	Without Heated Hose Control 10,200 Watt

U.S. Patent No. 4,501,952; 4,725,713
U.K. Patent No. 2,138,601
Patented Bréveté 1986 Canada

CSA certified for use with 218613, Series B, and 218614, Series B, Heated Hoses.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

The operating and safety features of this heater are designed for use **only** with the Graco Foam-Cat® Heated Hoses: Models 218613 and 218614. To reduce the risk of serious injury, never connect other hoses to this heater.

Read warnings and instructions.
See page 2 for Table of Contents.

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

PROVEN QUALITY. LEADING TECHNOLOGY.

Table of Contents

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

EQUIPMENT MISUSE HAZARD

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

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- The heater is very hot. Cool the heater before removing heater panels.
- Do not install a fluid shutoff device at the fluid outlet of the heater or filter as this will cause high back pressure.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. This equipment has a **3000 psi (21 MPa, 210 bar) maximum working pressure**.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces.
- To avoid excessive heat buildup, never operate the hose when it is coiled.
- Do not use the hoses to pull the equipment.
- Use only Graco Foam-Cat® Heated Hoses: Models 218613 and 218614.
- Use fluids and solvents that are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

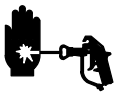
TOXIC FLUID HAZARD

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

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
- Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.

Continued on the next page.

⚠ WARNING



INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin might look like just a cut, but it is a serious injury. **Get immediate medical attention.**
- Do not point the spray gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the trigger guard on the spray gun when spraying.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 6 whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Do not mend or repair any part of the hose assembly. If the hose is damaged, replace it immediately.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

Improper grounding, poor ventilation, open flames, or sparks can cause a hazardous condition and result in fire, explosion, electric shock or other serious injury.

- Ground the equipment and the object being sprayed. See **Grounding** on page 13.
- All electrical wiring must be done by trained and qualified personnel and comply with all local codes and regulations.
- Do not operate the heater with any heater panels removed.
- Disconnect the main power to the heater before removing heater panels or servicing the equipment.
- Keep liquids away from the electrical components. Do not expose the heater to rain.
- Do not use the heater with flammable liquids, such as fluids having flash points below 200° F (93° C).
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Before operating this equipment, electrically disconnect all equipment in the spray area.
- Before operating this equipment, extinguish all open flames or pilot lights in the spray area.
- Do not smoke in the spray area.
- Do not turn on or off any light switch in the spray area while operating or if fumes are present.
- Do not operate a gasoline engine in the spray area.
- If there is any static sparking while using the equipment, **stop spraying immediately**. Identify and correct the problem.

Introduction

Understanding how the Foam-Cat® Heater functions and how to adjust it properly for your application conditions, is the key to easy operation and early detection of possible equipment problems.

Read this manual and the manuals for all of the components in your spray system thoroughly before installing or operating the equipment.

Reference letters and numbers

Information on parts referenced with letters can usually be found in the separate instruction manuals accompanying those components.

Terms:

RES and ISO refer to the foam chemicals Resin and Isocyanate, respectively.

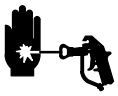
Ambient Temperature is the surrounding air temperature.

ATC is the optional Ambient Temperature Compensator feature of the Foam-Cat Heater. See page 9 for further explanation.

Installation

Pressure Relief Procedure

⚠ WARNING



INJECTION HAZARD

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

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

1. Lock the spray gun trigger safety.
2. Shut off the air to the feed pumps.
3. Turn off the electric motor switch in a hydraulic system.
4. Turn off the air to the proportioning pump in an air-powered system.
5. Close the gun manifold fluid valves.
6. Unlock the spray gun trigger safety.
7. Hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun to relieve pressure.
8. Lock the trigger safety again.
9. If possible, allow the heater to cool before opening the drain valves. This prevents the Resin from frothing.
10. Open both fluid filter drain valves; have a container ready to catch the draining fluid.
11. *If you suspect that the spray tip/nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly* loosen the tip/nozzle retaining nut or hose end coupling to relieve pressure gradually, then loosen completely. Wear protective gloves to avoid skin injection or burns. Now clear the tip/nozzle or hose.
12. If you are working on any part of the heater, shut off the main electrical power to the heater.

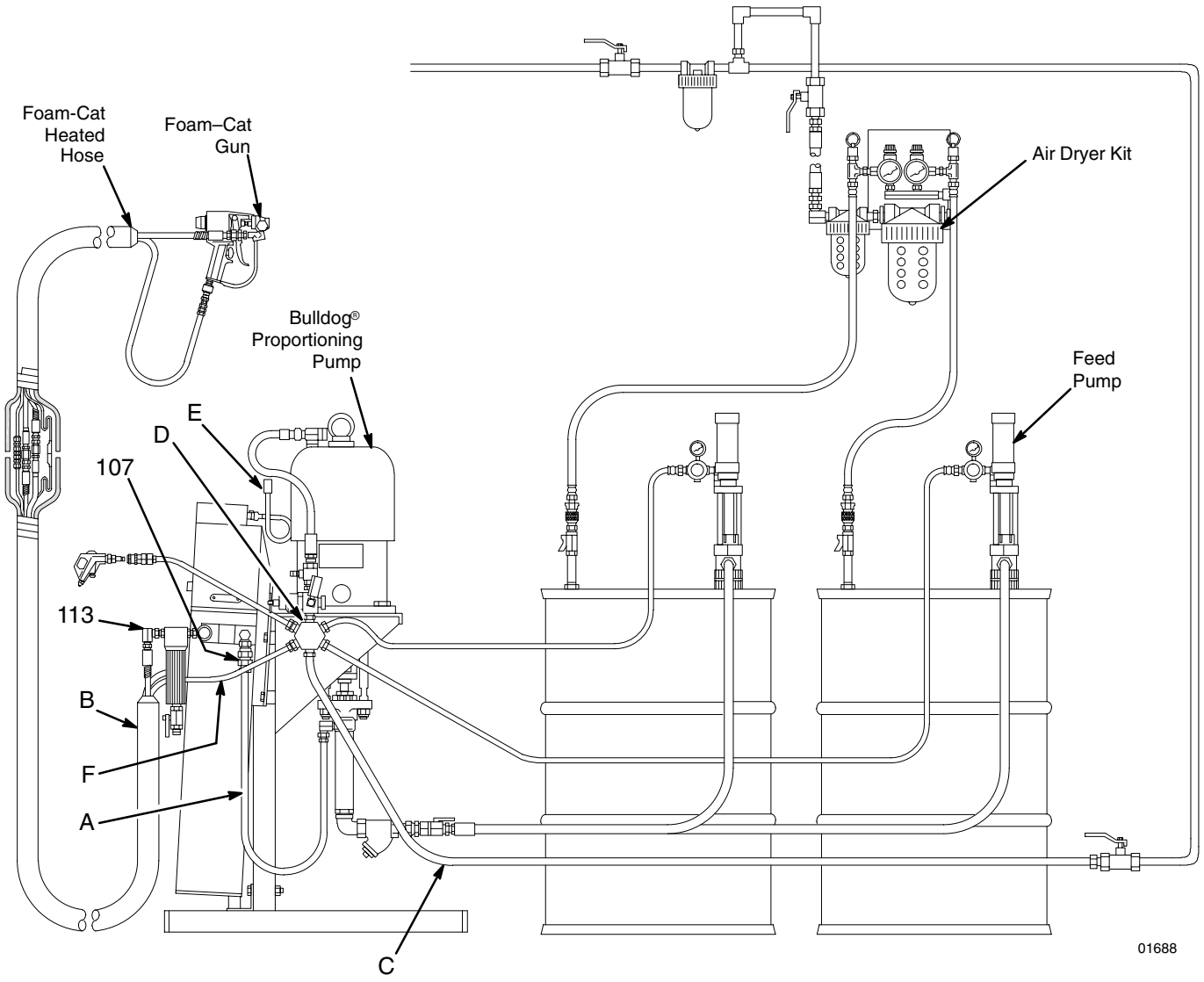
Startup Check List

✓	Installation Steps	Page
	1. Fig. 1 shows a typical Foam-Cat® system. It is not an actual system design. The particular type and size system for your operation must be custom designed for your needs. For assistance in designing a system, contact your Graco distributor.	1
	2. Read the **Component Descriptions** to learn how each control operates and to help you choose the correct settings when you operate the equipment.	8
	3. When using a generator to power your system, see page 10 to determine the correct size.	10
	4. Mount the heater in its permanent location.	10
	5. Flush the test oil from the heater.	11
	6. Connect the electrical service.	12
	7. Ground the system.	13
	8. Prime the heater.	14
	9. Connect the hoses.	15
	10. Prime the hoses.	15
	11. Adjust the heater.	16

Installation

1. Typical Installation

This drawing shows all the components and recommended accessories for a Foam-Cat 400 Sprayer, Model 235260, and the correct routing of all air and fluid hoses.



KEY

A	Fluid Hose Displacement Pump to Heater	C	Main Air Supply Hose	F	Air Hose, Heated Hose
B	Heated Hose	D	Air Manifold	107	Inlet Swivel Union
		E	Optional ATC Sensor	113	Fluid Outlet Union

Fig. 1

2. Component Description

Fluid heater and control

The fluid heater (G) is actually two separate heaters, one for Resin and one for Isocyanate. The heaters have independent controls on the heater control panel (116); see **Control panel**, below. Each heater also has a thermometer (204).

A sensor probe (256 – see page 27) in each heater senses fluid temperature and turns the heater element on and off as needed. The heaters include a safety limit thermostat, which shuts off the power if the fluid gets too hot.

Heated hose control (Models 235259 and 235260 only)

The heated hose control panel (317) controls power to the heat tape in the heated hose assembly. The function of the heated hose is to *maintain* the proper fluid temperature. The heated hose control panel is discussed in the following **Control Panel** section.

Control panel

Each side of the heater, and the heated hose, has an independent Temperature Set dial (K), a main power circuit breaker (210 and 319) and an indicator light (214 and 314) on the control panel.

The independent circuit breakers turn on or off the main electrical power from the junction box. The heated hose circuit breaker (319) (Models 235259 and 235260 only) includes a ground fault interrupter (GFI) which shuts off the electrical power to the heat tape if it detects a fault. The GFI is a 30 mA trip international version that meets IEC 479.

NOTE: The circuit breakers use the international symbols, **I** for ON and **O** for OFF.

Each side of the heater control (116) and the heated hose control (317) has an indicator light (214 and 314) on the control panel, which indicates when the heater element is actually heating. The light blinks at about 1 second intervals. Its on–off time ratio indicates power consumption.

The TEMP SET dial (K) is used to select the desired fluid temperature. The range is approximately 95°F (35°C) at **MIN** *(minimum)* to 158°F (70°C) at **MAX** *(maximum)* settings.

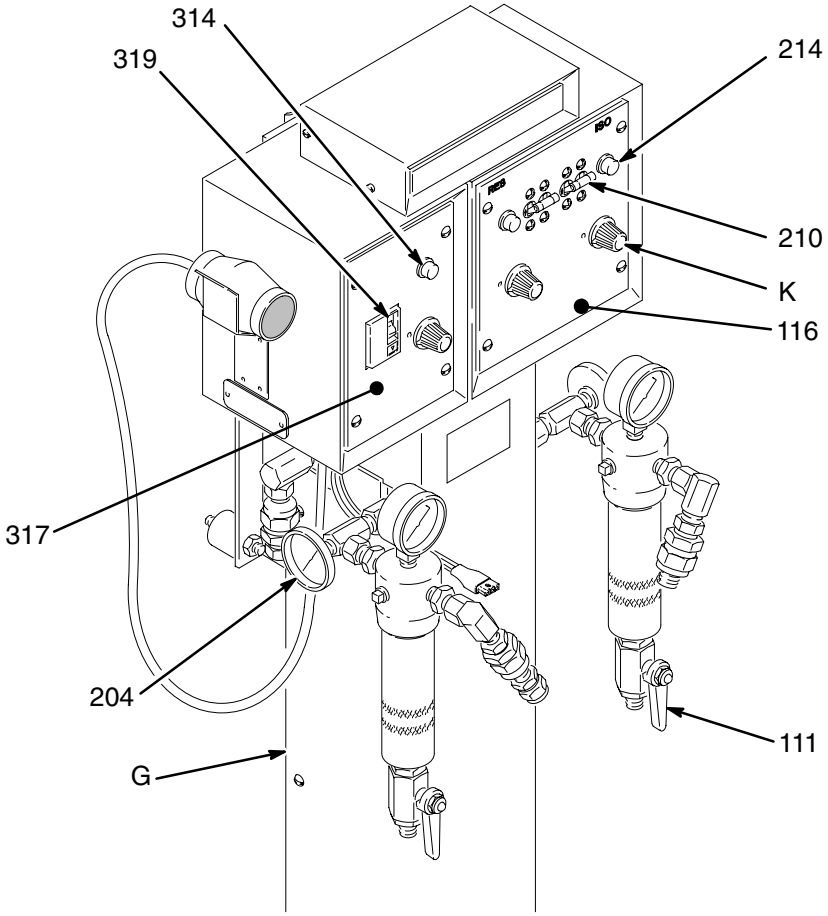


Fig. 2

2. Component Description (continued)

Thermometer gauges

Each heater has an independent thermometer (204). Because of the effect on the surrounding metal exposed to the air, the thermometer usually reads far below the selected fluid temperature during no-flow conditions. The thermometer reading is only valid when fluid is flowing.

Fluid filter

A fluid filter (112) at the outlet of each heater removes particles from the foam chemicals that could clog the spray nozzle or distort the spray pattern. Refer to the separate instruction manual, 307273, for maintenance instructions.

Junction box

Electrical power to the Foam-Cat Heater is wired directly to the junction box (233), which supplies power to the heater and heated hose controls.

The optional **Ambient Temperature Compensator** senses change in ambient temperature and increases or decreases the amount of heat produced by the heater or heated hose tape. The fluid is heated higher on cold days than on hot days. The part number for this accessory is 218564. See page 34 to install it.

How to use the OPTIONAL Ambient Temperature Compensator (ATC)

Most fluid heaters produce, or output, just the amount of heat selected on its TEMP SET dial, regardless of ambient temperature changes during the day. So, in order to maintain good foam development in outdoor foam applications, the operator must continually adjust the fluid temperature as ambient temperature changes.

The optional Foam-Cat Heater ATC feature automatically checks and adjusts the fluid temperature. The ATC Sensor (E–Fig. 1) which is designed to have no effect on heater output at 80°F (27°C), senses ambient temperature above or below 80°F (27°C) and automatically raises or lowers the heater output.

With the Heater TEMP SET at 115°F (46°C), and at an ambient temperature of 60°F (16°C), the heater output automatically rises to 125°F (52°C). As the ambient temperature rises to 80°F (27°C), no compensation is needed and the fluid is heated to just 115°F (46°C). As the ambient temperature rises to 100°F (38°C), the heater output is automatically lowered to 108°F (42°C).

Keep in mind these points when using the ATC:

1. An ATC is needed only when the ambient temperature varies more than 20° above or below 80°F (27°C).

2. At an ambient temperature of about 80°F (27°C), the heater heats the fluid only to the selected temperature.

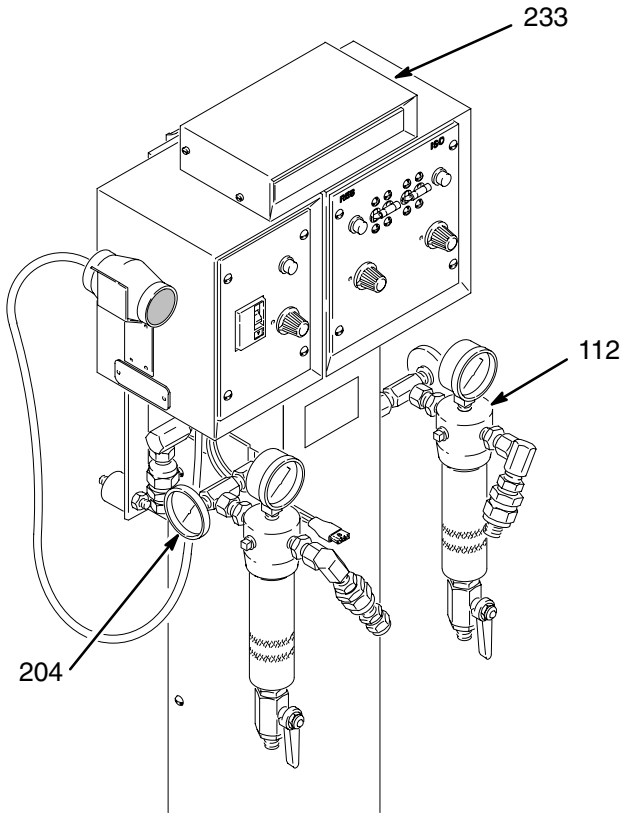


Fig. 3 01294

3. How to Size a Generator for outdoor remote applications

Style	Hose Control	Model	With Hydraulic Pump Motor	WATTS (240 VAC)	
				1 Phase	3 Phase
Foam–Cat 200	NO	235839	NO	5,100	7,650
Foam–Cat 200	YES	235259	NO	8,880	11,340
Foam–Cat 400	NO	235840	NO	10,200	15,300
Foam–Cat 400	YES	235260	NO	13,980	15,300
Foam–Cat 400	YES	235840	YES	13,980	15,300
Foam–Cat 400	YES	235260	YES	13,980	15,300

4. Mount the Heater

⚠ WARNING

ELECTRIC SHOCK HAZARD
To reduce the risk of electric shock, do not expose the heater to rain.

If you have purchased the heater module separately, bolt it securely to the Graco Pump Stand, part no. 217296 (see manual 307551) or to a wall. A mounting hole diagram is on the back cover of manual 307551.

⚠ CAUTION

All critical air and fluid connections in the Foam-Cat equipment are clearly labeled ISO or RES. Make only ISO to ISO and RES to RES connections to avoid fluid crossover which will permanently damage the components.

⚠ CAUTION

If you are using a Freon injector, mount it down-stream from the heater so it does not pass through the heater.

5. Flush the Heater

⚠ WARNING

INJECTION HAZARD
To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 6 before flushing the heater or spray system and whenever you are instructed to relieve pressure.

⚠ WARNING

FIRE AND EXPLOSION HAZARD
Before flushing, disconnect the electrical power to the heater to reduce the risk of static sparking, which can cause fire or explosion.

⚠ CAUTION

The heater was tested in lightweight oil which was left in to protect the parts during shipment. The oil must be flushed or purged from the system to avoid material contamination.

NOTES

1. Use a solvent that is recommended by your material supplier, and be sure it is compatible with the heater's wetted parts.
2. Some material will be contaminated whether you simply purge the oil from the heater or use a solvent to thoroughly flush. Discard that material.
3. For long term shutdown or storage, flush with a compatible solvent and then flush with a lightweight oil. Leave the oil in the system to protect it during shutdown.
4. Some material suppliers provide maintenance services which include flushing and storage.
5. Never flush the hoses. It is very difficult to remove all moisture from hoses which have been flushed, and the moisture will contaminate the ISO and RES.

Procedure

1. Relieve the pressure.
2. Disconnect the material hoses, if connected.
3. Remove the outlet fittings (X) from both fluid filter outlet nipples (114).
4. Plug each outlet nipple (114) with a swivel (P/N 156173) and plug (P/N 101754). These parts are shown exploded on the left side of Fig. 4 and assembled on the right side of Fig. 4.
5. Connect your flushing system supply hose to the IN port of one of the heaters.
6. Open the filter drain valve (111). Have a waste container ready to catch the draining solvent.
7. Turn on the flushing system and use the lowest possible pressure to flush the heater for several seconds.
8. Shut off the flushing system and close the drain valve.
9. Repeat this procedure for the other side of the heater.
10. Continue the setup by connecting the electrical service. When you are ready to prime the system, the procedure on page 14 tells how to purge the remaining solvent from the heater.

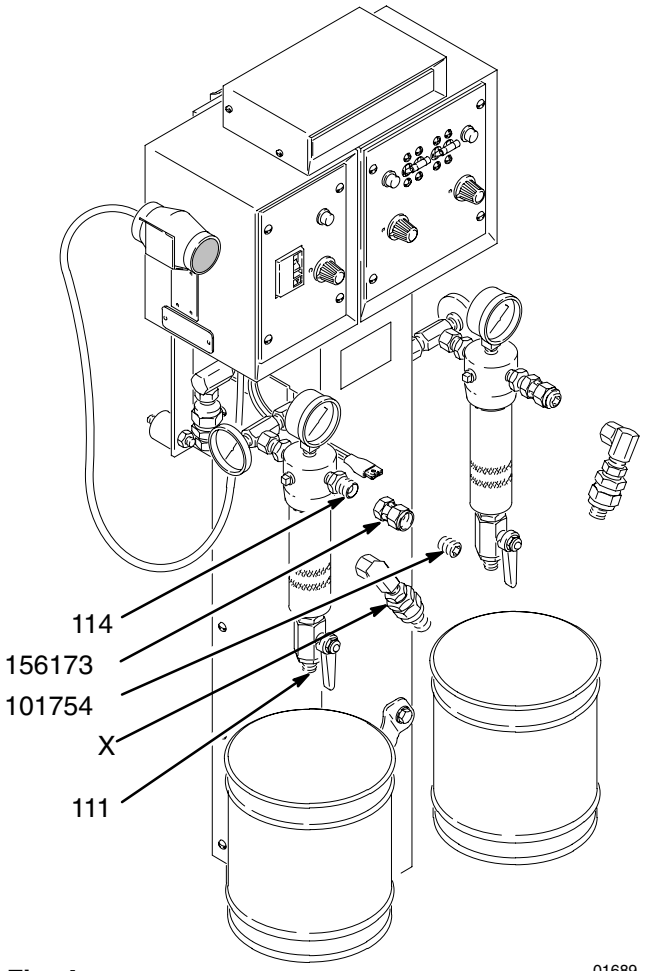


Fig. 4

Installation

6. Connect the Electrical Service

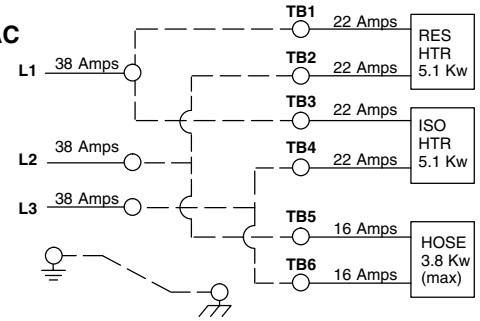
⚠ WARNING

ELECTRIC SHOCK HAZARD
To reduce the risk of serious injury, including electric shock, all electrical wiring must be done by trained and qualified personnel and comply with all local codes and regulations.

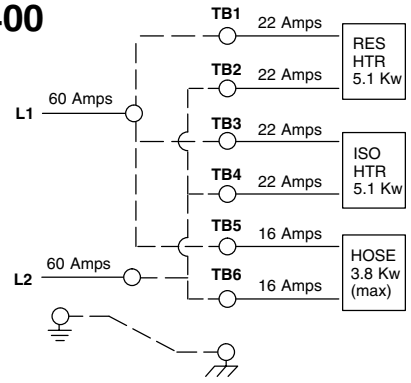
The electrical requirements for the heater and heated hose controls and the wiring diagram are shown on the inside cover of the junction box (233). Wire the heater to your electrical service. Three jumper wires are included.

This is the information on the label (205) under the junction box cover.

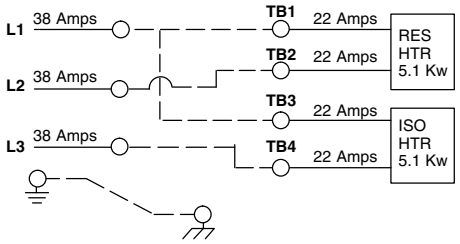
FOAM–CAT 400
Model 235260
3 phase, 240 VAC



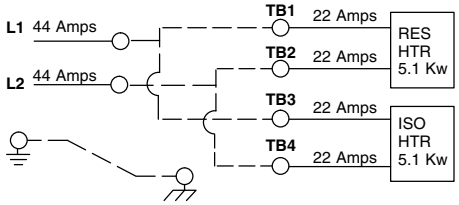
FOAM–CAT 400
Model 235260
1 phase, 240 VAC



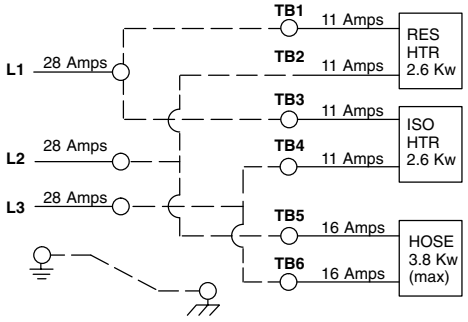
FOAM–CAT 400
Model 235840
3 phase, 240 VAC



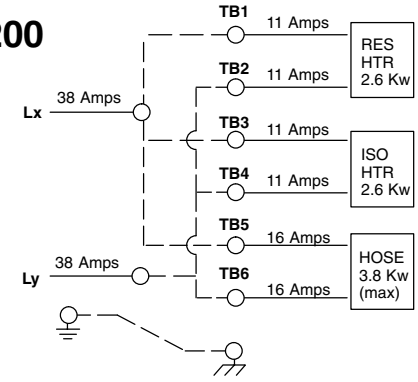
FOAM–CAT 400
Model 235260
1 phase, 240 VAC



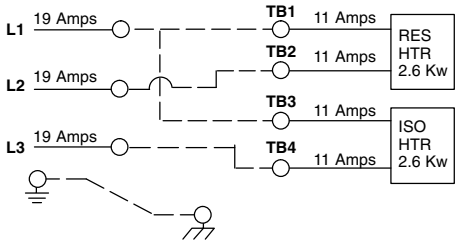
FOAM–CAT 200
Model 235259
3 phase, 240 VAC



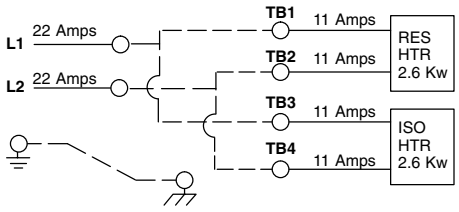
FOAM–CAT 200
Model 235259
1 phase, 240 VAC



FOAM–CAT 200
Model 235839
3 phase, 240 VAC



FOAM–CAT 200
Model 235839
1 phase, 240 VAC



7. Ground the System

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD
Before operating the heater, ground the system as explained below. Also read the section **FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD** on page 5.

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

1. *Heater:* wire the heater to a positively grounded power supply. The heater is grounded through the electrical wiring to a grounding screw (227) in the junction box base (228). See Fig. 5.

   Redundant grounding is recommended to further reduce the risk of electric shock. The long lines of the shielded-wire heated hose have higher than normal capacitive leakage current to ground.

   In a mobile installation, be sure the truck or trailer is grounded to a true earth ground.

2. *Pump:* connect a ground wire and clamp to a true earth ground as shown in your separate pump manual.

3. *Fluid hoses:* use only grounded hoses with a maximum of 500 ft. (150 m) combined hose length to ensure grounding continuity.

4. *Air hoses:* use only Graco heated hose, which are electrically conductive.

5. *Spray gun:* obtain grounding through connection to a properly grounded fluid hose and pump.

6. *Object being sprayed:* ground according to local code.

7. *Fluid supply container:* ground according to local code.

8. *All solvent pails used when flushing:* ground according to local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.

9. *To maintain grounding continuity when flushing or relieving pressure*, always hold a metal part of the gun firmly to the side of a grounded metal pail, then trigger the gun.

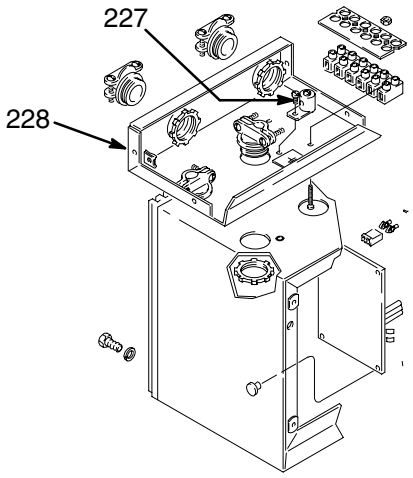


Fig. 5

8. Prime the Heater

⚠ CAUTION

Prime the heater and sprayer with fluid before turning on the heater to reduce the risk of overheating and burning out the heater element.

⚠ WARNING

FIRE AND EXPLOSION HAZARD
To reduce the risk of fire or explosion, do not use the heater with flammable liquids, such as fluids having flash points below 200° F (93° C).

Specific priming instructions for the Foam-Cat Sprayers are given in the sprayer manual, 307541 or 307542. If the heater is used in other spray systems, use the following priming guidelines together with your system priming instructions.

NOTE: Refer to Fig. 1, page 7 to identify the parts mentioned in this section, except where noted otherwise.

1. Be sure the heater has been flushed.
2. Close the feed pump air inlet valves.
3. Put a waste container under each heater drain valve.
4. Be sure the heater and heated hose controls (K) are turned OFF. See Fig. 6.
5. Open each pump's fluid intake valve.
6. Open the main air shutoff valve.
7. Adjust the supply container air dryer equipment. See the air dryer manual.
8. Open the feed pump air valve.
9. With the air or hydraulic power to the proportioning pump set at a low pressure, turn on the pump.
10. When the solvent has been thoroughly purged from both sides of the heater and ISO and RES appear, shut off the proportioning pump and close the heater drain valves.
11. Remove the swivel and plug from each filter fluid outlet.

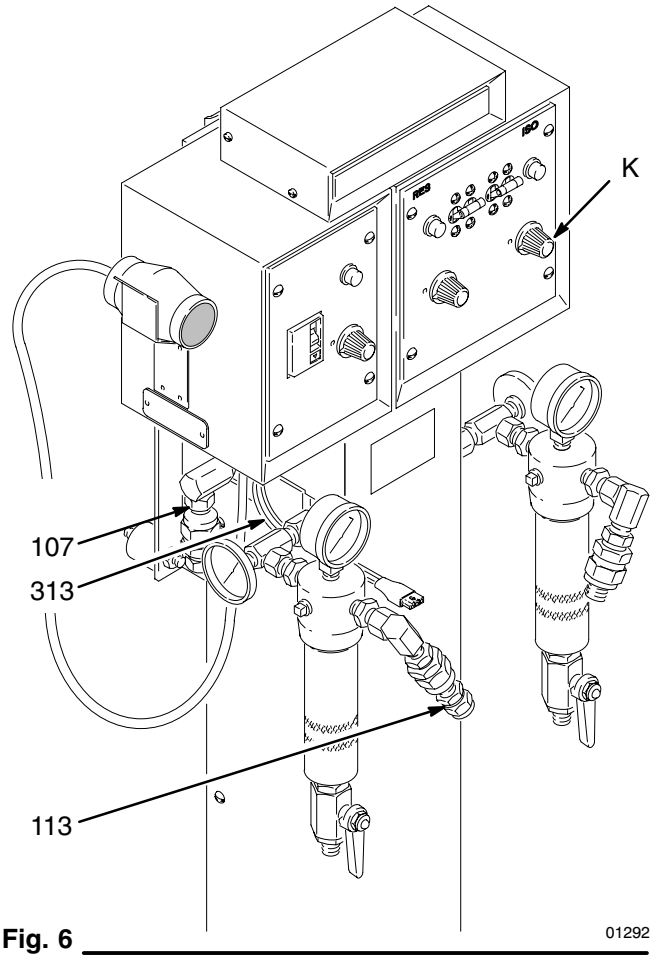


Fig. 6

Installation

9. Connect the Hoses

⚠ WARNING

INJECTION HAZARD
To reduce the risk of overpressurizing the heater and pump, which can cause component rupture, serious injury or property damage, follow these precautions:

1. Do not install any fluid shutoff device at the fluid outlet (Y) of either the heater or filter (112). See Fig. 7.
2. Use at least 15 ft. (4.5 m) of fluid hose between the fluid outlet and any fluid control device such as a shutoff valve, regulator, or spray gun.
3. To reduce strain on the hose near the hose couplings, route the heated hoses through the clamp (126) on the front of the heater.
4. Turn hose heat on 15 minutes before turning pump on to reduce heat expansion pressure.

1. Connect the fluid supply hoses from the displacement pump to the proper fluid inlet union (107) on each side of the heater. See Fig. 7.

2. Connect the fluid dispense hoses of the heated hose assembly to the fluid outlet union (113) of each fluid filter.

3. Connect a main air supply hose (C) to the manifold (D) on the side of the pump stand. See Fig. 1, page 7.

4. Connect the heat tape connector of the heated hose assembly to the heated hose control box cable (313). See Fig. 7.

5. Connect the heated hose assembly air hose (F) to the jumper hose from the air manifold (D). See Fig. 1.

10. Prime the Hoses

1. Tightly close the spray gun fluid valves and disconnect the gun from its manifold. Refer to the gun manual.

2. Hold each side of the gun manifold over a separate grounded waste container, open the fluid valves and allow fluid to flow out until all air is purged. Close fluid valves. See the gun manual.

3. Check for fluid connection leaks. Relieve fluid pressure and correct.

4. Increase pressure and check again for leaks.

5. Insulate hose connections and install the abrasion cover as instructed in manual 307544.

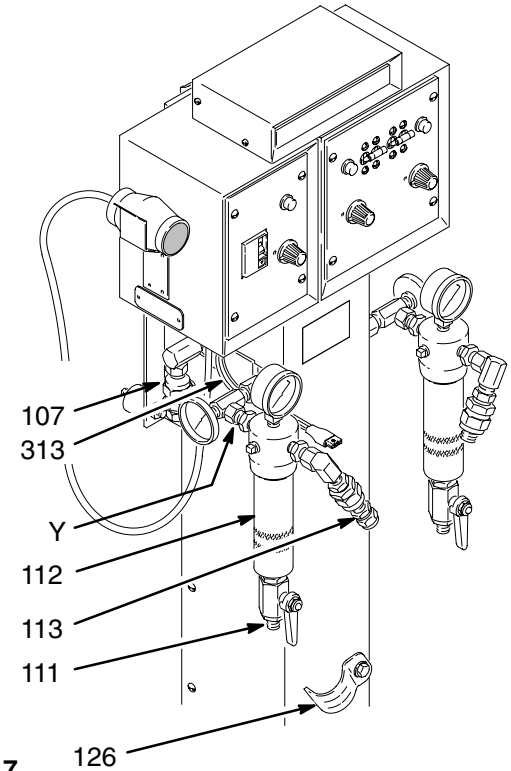


Fig. 7

11. Adjust the Heater

1. Measure the incoming voltage on the junction box power in terminal block from pins 1 to 2, pins 3 to 4, and pins 5 to 6. See Fig. 10 or 11, pages 21 and 23. Voltage must read 200 to 240 VAC rms between each set of pins.

2. Set all three Temperature Set dials (K) to **CAL**. See Fig. 8.

3. Turn the circuit breakers (210 and 319) to **I** (ON). See Fig. 8.

4. Check that the input voltage is still correct.

5. The heater lamps should blink within 10 seconds after turning on the circuit breakers. With fluid flowing only, check the heater thermometers (204) regularly and manually adjust the fluid temperature as needed. See Fig. 8.

6. The heated hose control lamp should start blinking soon after turning on the circuit breaker. The duration of ON versus OFF time indicates power applied.

NOTE: If the lamps do not start blinking in the time specified above, check for possible problems and solutions in the Troubleshooting guide, starting on page 18.

7. If using a heated hose control, test the Ground Fault Interrupter (GFI) daily. To test, depress the button (N). See Fig. 8. If the circuit breaker shuts off, the GFI is working properly.

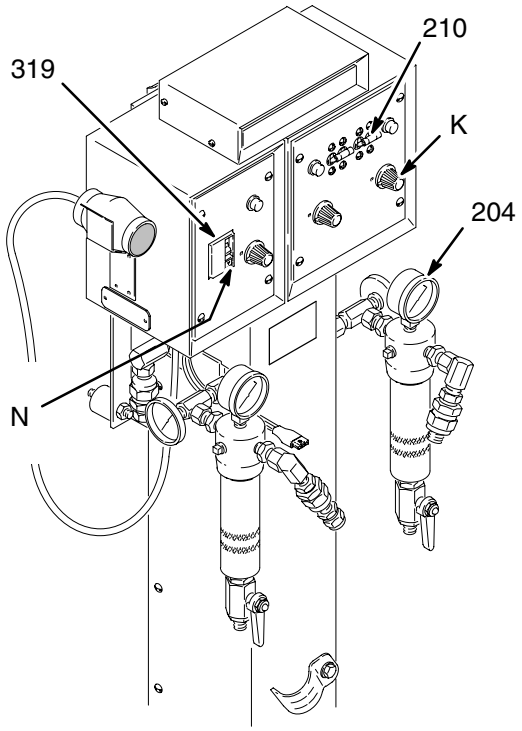


Fig. 8

Troubleshooting

⚠ WARNING

To reduce the risk of injury from burns or electric shock, never operate the heater with any heater shield or panel removed. Disconnect the main electrical power to the heater before removing any heater panels.

To reduce the risk of serious injury, including injection, follow the **Pressure Relief Procedure** on page 6 before checking or repairing any part of the heater or spray system.

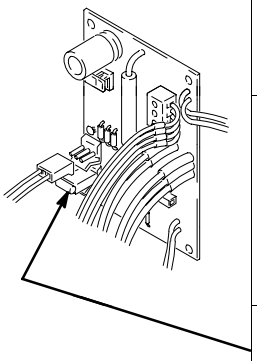
NOTE: Try the recommended solutions in the order given for each problem to avoid unnecessary repairs.

Heated Hose

Problem	Cause	Solution
Heated Hose Control indicator lamp stays on	Faulty triac (281)	Check triac wiring. See Fig. 13, page 25.
	Faulty circuit board (223 or 306)	Replace. See page 30.
	Faulty Hose Sensor Simulator (304)	Be sure simulator is firmly plugged into circuit board. Check simulator resistance. See page 23.
	Hose Sensor Simulator (304) not plugged in	Plug in.
Heated Hose Control indicator lamp stays off	Heated hose not plugged into control box	Check, plug in.
	Wiring or voltage problem	Check the wiring and the voltage: 200–240 VRMs during fluid flow and at stall. See **Adjust the Heater**, Step 1, page 16.
	Faulty circuit board	Replace. See page 30.
	Hose thermostat is bad	Check. See manual 307544.
Hose temperature fluctuates	Hose Sensor Simulator (304) out of calibration	Be sure simulator is firmly plugged into circuit board. Check calibration. See page 34.
	Faulty Hose Sensor Simulator (304)	Replace. See page 34.

Troubleshooting

Heater

Problem	Cause	Solution
Heater Control indicator lamp stays on 	Flow rate too high to maintain set temperature	Decrease flow rate; using smaller orifice nozzle reduces flow rate. Release gun trigger; lights should go off in a few seconds. Maximum flow rates are: Foam-Cat® 200: 15 lb/min (6.8 kg/min) Foam-Cat® 400: 30 lb/min (13.5 kg/min)
	Faulty Sensor Probe (256)	Check the following for both sides of heater: 1. Probe connector is aligned properly into all 3 male pins of circuit board. 2. Probe protrudes 1.44” (36 mm) from manifold. See Fig. 16, page 27. 3. Check resistance. See page 20.
	P1 connector unplugged; *see drawing to the left*	Plug in. Check resistance. See page 20.
	Faulty Triac	Check triac wiring. See Fig. 12, page 24. Check resistance. See page 24.
	The ATC, if used, is not plugged in	Be sure ATC connector, if used, is properly plugged into circuit board. Check resistance. See page 22.
	Circuit board out of calibration	See page 32. Calibration procedure is included in replacement procedure.
	Sensor Probe (256) not plugged in	Plug in. See page 27.
Heater Control indicator lamp stays off – no heat.	Thermostat(s) (252) open (normally closed)	Reset thermostat by pushing reset button. See Fig. 14, page 26.
	Triac wires not connected properly	Check triac detail. See Fig. 13, page 25.
	TEMP SET dial wires not connected	Check wiring. See Fig. 10, page 21.
	Faulty circuit board	Replace. See page 30.
	AC power wiring or voltage problem	Check for 200–240 VRMs. See **Adjust the Heater**, Step 1, page 16.
	Elements burned out or not plugged in	Check element resistance. See page 22.

Troubleshooting

Problem	Cause	Solution
Temperature erratic or inaccurate	Sensor probe (256) out of position	Probe must protrude 1.44” (36 mm) from manifold. See Fig. 16, page 27. Indicator light should go out within 5 seconds of shutting gun off after flowing.
	Heater out of calibration	Calibrate controls. See page 32.
	Improper incoming voltage	Check the wiring and the voltage: 200–240 VRMs during fluid flow and at stall. See **Adjust the Heater**, Step 1, page 16.
	One thermostat open (normally closed), ***Model 235260 & 235840 only***	Reset thermostat by pushing reset button. See Fig. 14, page 26.
	Faulty sensor probe (256)	Check resistance. See page 20. Replace. See page 27.
Large pressure difference between ISO and RES side, For example: 600 psi (4.2 MPa, 42 bar) ISO 1000 psi (7 MPa, 70 bar) RES ⚠ **WARNING:** As this problem can be caused by clogged or blocked parts, take special care and follow the **Pressure Relief Procedure**, page 6, before checking, cleaning or clearing parts to help reduce the risk of serious injury, including injection.	Thermostat(s) (252) open	Reset thermostat by pushing reset button. See Fig. 14, page 26.
	Fluid on high pressure side is too thick	Increase heater temperature on high pressure side to reduce viscosity, which should level the pressure, OR lower the temperature on the low pressure side.
	Gun nozzle impingers clogged or damaged	Clean nozzle. Using an oversized cleanout pin or damaging nozzle during cleaning may increase impinger hole size and cause an imbalance of fluid. See gun manual 307546.
	Blocked filters	Check outlet filter (112; also see manual 307273). Check gun check valve screen. See gun manual 307546.
	Clogged hoses	Flush clean, if possible, or replace hose. Use and clean filters regularly. Don’t allow mixed fluid to back up into hoses.
	Fluid supply low or empty	Refill; prime system to remove air.
	Fluid pump or hose connections leaking	Check for leaks and repair or tighten as needed. See pump manual also.

Troubleshooting Electrical Resistance Checks

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or electric shock:

1. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

2. Disconnect the main electrical power to the heater before removing any heater panels.

Measuring the resistance of a part helps determine if it is working properly. If you get a measurement other than those given in the following procedures, replace the faulty part.

Setup

1. Relieve the pressure, and shut off the main power to the heater.
2. Remove the appropriate control panels.
3. Determine the approximate temperature of the part; if the heater was operated recently, the temperature will be high.
4. To remove wires, use the accessory tool, P/N 110968 or a 3/16 in. wide screwdriver. Insert the tool into the slot below each wire on the terminal block, push the tool away from the wire and pull out the wire. See Fig. 9.
5. To reconnect the wires, push the tool into the slot, slide in the wire and release the tool.

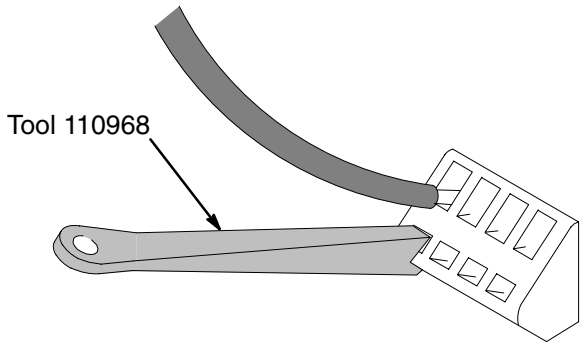


Fig. 9 01698

Heater Sensor Probe

1. Follow the previous **Setup** instructions.
2. Remove the heater control panel (216). See Fig. 13, page 25.
3. Unplug the connector P1 at position J2 on the heater circuit board in question. See Fig. 10.
4. Check the resistance across the two outside terminals of connector P2. The resistance should be:

   45K to 55K ohms at 77° F (26° C), or
   10K to 20K ohms at 120° F (49° C)

5. To replace the sensor probe (256), see page 22.

Thermostat *(normally closed)*

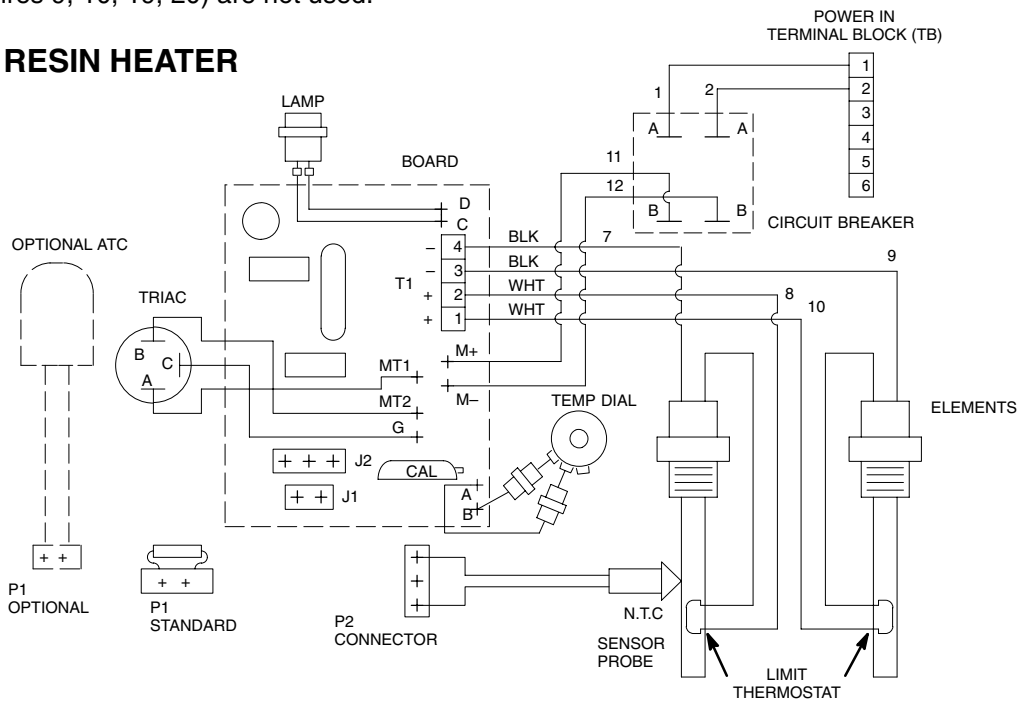
1. Follow the previous **Setup** instructions.
2. To check continuity from inside the wiring junction box, remove the wires from connector T1 and check continuity across the wires. See Fig. 10.
3. To check continuity at the thermostat, remove the front heater element shroud (238). Check for continuity across the terminals at each switch, with one lead disconnected and after pushing the reset button. See Fig. 13, page 25.
4. If there is no continuity, replace the thermostat. See page 26.

Troubleshooting – Electrical Resistance Checks

Heater Wiring Schematics

Heater No. 235840 is shown in Fig. 10. The wiring for Heater No. 235839 is identical *except* the second set of elements (wires 9, 10, 19, 20) are not used.

RESIN HEATER



ISO HEATER

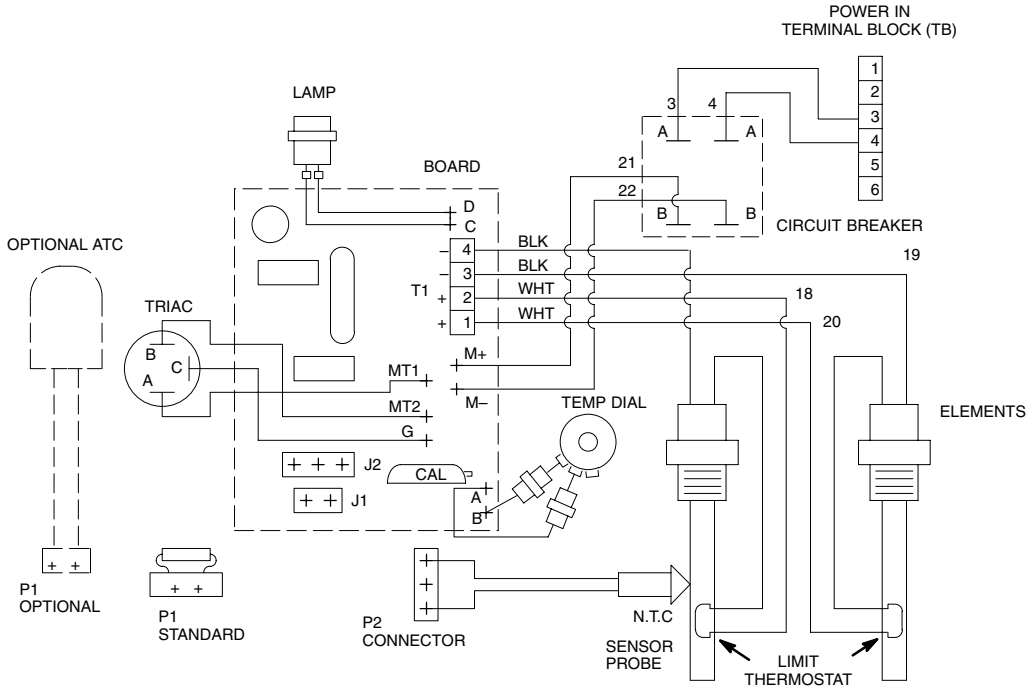


Fig. 10

Troubleshooting – Electrical Resistance Checks

Optional ATC (Ambient Temperature Compensator)

1. Follow the **Setup** instructions on page 20.
2. Remove the heater control panel (216). See Fig. 13, page 25.
3. Unplug the connector P1 at position J1 on both heater circuit boards and the hose circuit board. See Fig. 10 and 11.
4. Check resistance across the two terminals of each connector P1. The resistance should be:

   45K to 55K ohms at 77° F (26° C), or
   10K to 20K ohms at 120° F (49° C)
5. To replace the ATC, see page 34.

Heater Element

Use this chart to identify the heater assembly and heater element wires used in your Foam-Cat® Heater.

Foam-Cat Heater Model No.	Flow Capacity	Heater Assy. No.	Heater Element Wire Numbers
235260 235840	30 lb/min (13.5 kg/min)	235840	7,8,9,10 RES 17,18,91,20 ISO
235259 235839	15 lb/min (6.75 kg/min)	235839	7,8 RES 17,18 ISO

1. Follow the **Setup** instructions on page 20.
2. Remove the heater control panel (216). See Fig. 13, page 25.
3. Use the procedure in **Setup** to disconnect the wires in step 4.
4. Check the resistance across wires 7 and 8, and 9 and 10, on the RES board. Check the resistance across wires 17 and 18, and then 19 and 20 on the ISO board. The resistance should be as follows. If an open conditions exists, check the hi-limit thermostat. See Fig. 10, page 21.

   20 to 25 ohms at 77° F (26° C)
5. To replace the heater element, see page 28.

Hose Sensor Simulator

1. Follow the **Setup** instructions on page 20.
2. Remove the heated hose control panel (317). See Fig. 13, page 25.
3. Unplug the connector P2 at position J2 on the hose circuit board. See Fig. 11.
4. Using the procedure in **Setup,** page 20, disconnect the two leads from the hose sensor simulator (304) connect to the circuit board connector T1 at positions 2 and 4.
5. Check the resistance across the two outside terminals of connector P2. The resistance should be:

   45K to 55K ohms at 77° F (26° C), or
   10K to 20K ohms at 120° F (49° C)
6. Check the resistance across the two leads removed from T1. The resistance should be:

   13K TO 17K ohms
7. To replace the simulator, see page 34.

Troubleshooting – Electrical Resistance Checks

Hose Control Circuit Board

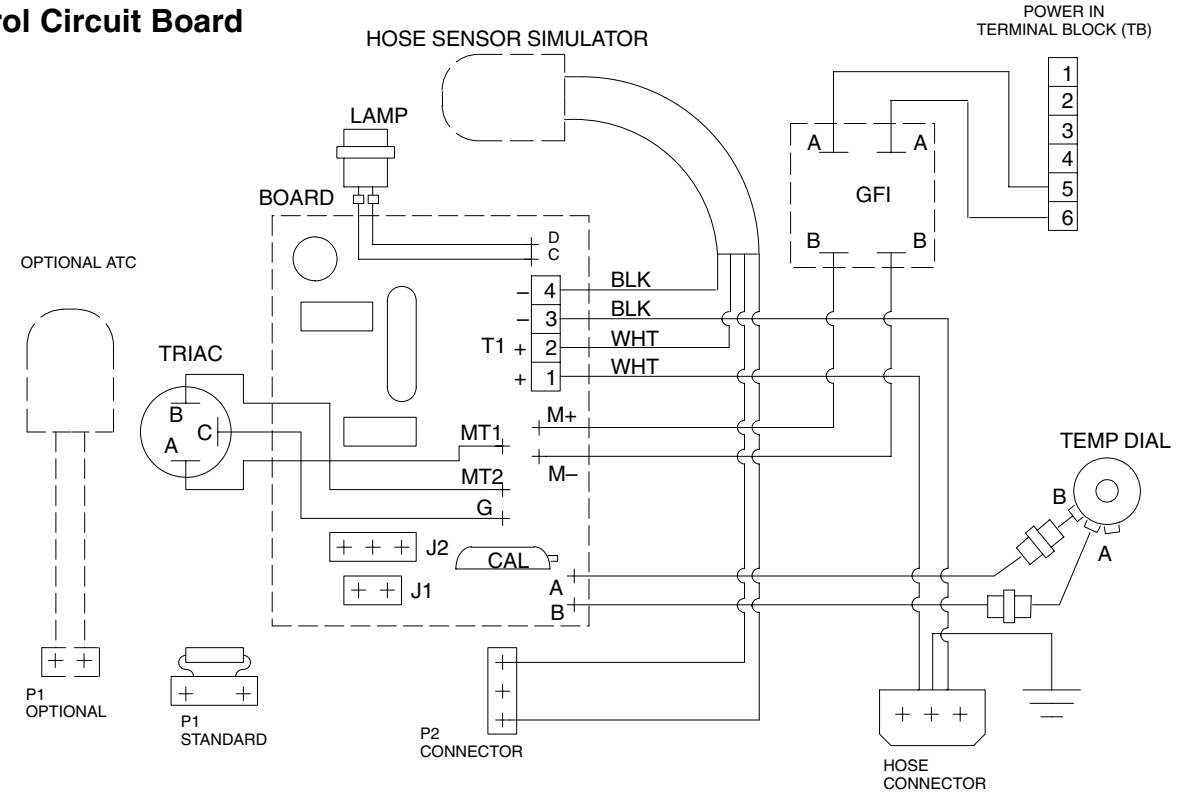


Fig. 11

Troubleshooting – Electrical Resistance Checks

Triac

1. Follow the **Setup** instructions on page 20.

2. Grasp the connector of each triac lead and unplug them from the triac (281). See Fig. 13, page 25.

3. Clamp the positive and negative meter leads to the pins indicated in the chart in Fig. 12. Replace the triac if any one of the readings is incorrect.

NOTE: When using a digital V.O.M. with automatic range, for example, a Model 77 Fluke, infinity = 10 megohms or greater.

4. To replace the triac, see page 25.

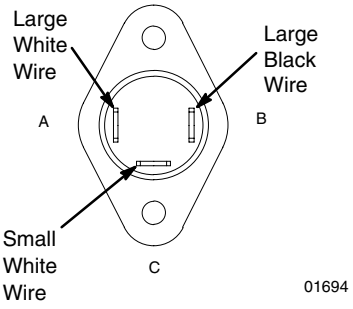
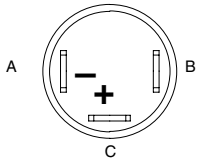
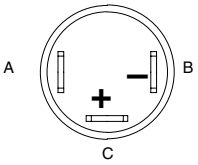
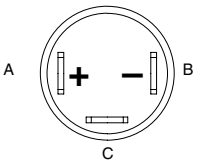
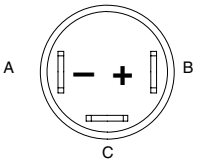
	+ POSITIVE METER LEAD TO PIN	– NEGATIVE LEAD TO PIN	CORRECT READING	OHMMETER SETTING
	**C**	**A**	0–100 ohms	200 ohms
	**C**	**B**	Infinity	200K ohms
	**A**	**B**	Infinity	200K ohms
	**B**	**A**	Infinity	200K ohms

Fig. 12

Service – Triac, Hi-Limit Thermostat

⚠ WARNING

To reduce the risk of serious injury, including burns from hot fluid or hot metal; fluid injection; or electric shock:

1. Cool the fluid in the heater by pumping unheated fluid through it for two minutes before removing the front heater panel (238).

2. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

3. Disconnect the main electrical power to the heater before removing any heater panels.

Replacing the Triac

1. Relieve the pressure, and shut off the main power to the heater.
2. The triac leads should be disconnected if you performed the **Electrical Resistance** check. If not, see the procedure on page 24.
3. Remove the screws (292 or 337), lockwashers (291 or 336) and the triac (281 or 306a).
4. Apply conductive paste (order Graco P/N 110009) to the bottom flange of the new triac. Position the triac as shown in Fig. 13.
5. Reconnect the leads firmly to the triac. See the DETAIL in Fig. 13.
6. Reinstall the control panel cover.

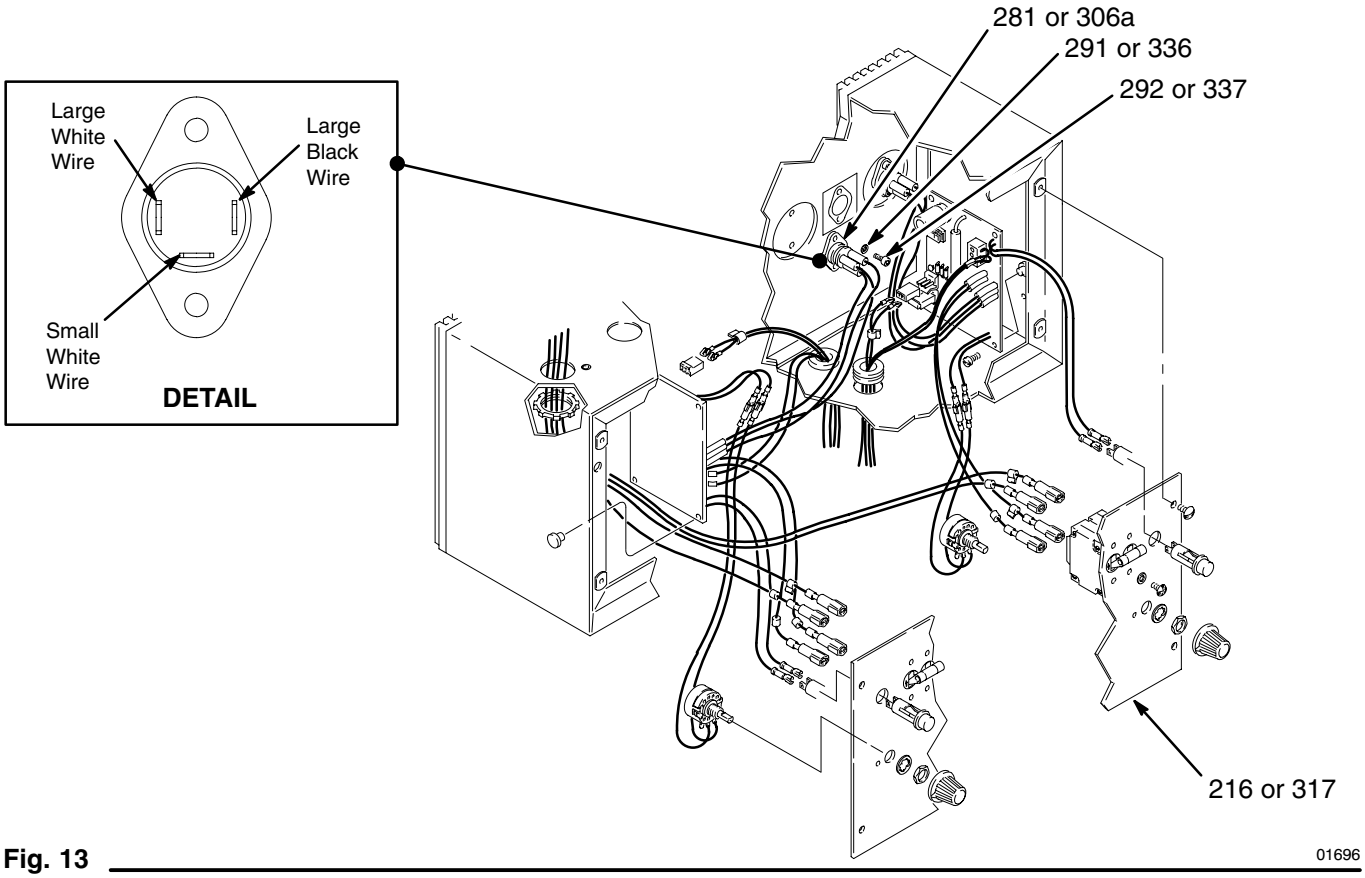


Fig. 13

Service – Triac, Hi-Limit Thermostat

Replacing the Hi-Limit Thermostat

1. Relieve the pressure, and shut off the main power to the heater.
2. Remove the front heater shroud (238). See page 39.
3. Disconnect the wires to the thermostat (252). See Fig. 14.
4. Remove the screws, lockwashers and the thermostat.
5. Apply conductive paste (order Graco P/N 110009) to the bottom flange of the new thermostat.
6. Install a new thermostat and tighten the screws.
7. Reconnect the wires.
8. Be sure the reset button is pushed in. See Fig. 14.
9. Reinstall the heater shroud (238).

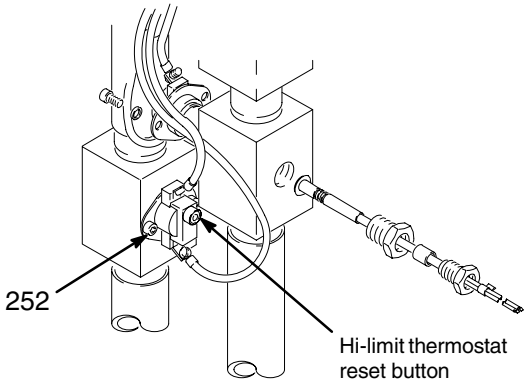


Fig. 14 01692

Service – Heater Sensor Probe

⚠ WARNING

To reduce the risk of serious injury, including burns from hot fluid or hot metal; fluid injection; or electric shock:

1. Cool the fluid in the heater by pumping unheated fluid through it for two minutes before removing the front heater panel (238).

2. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

3. Disconnect the main electrical power to the heater before removing any heater panels.

Replacing the Heater Sensor Probe

NOTE: Use Repair Kit 220650.

1. Relieve the pressure, and shut off the main power to the heater.
2. Perform the electrical resistance check on page 20.
3. Disconnect the power cord. Remove the front heater panel (238).
4. Cut the probe wires close to the connector P2 in the control box. Using a screwdriver, push the pins in the connector down and out. Save the connector.
5. Unscrew the adapter (247c) and remove the probe assembly (247) from the manifold (253). See Fig. 15.
6. Push the probe (247d) through the adapter (247c). Feed the probe wires through the seal (247b) and packing nut (247a). Push the seal into the adapter (247c) and then apply PTFE tape to its threads.
7. Use needle nose pliers to push the probe into the manifold (253) so it is between two heater element coils, is touching the heater element cord, and protrudes 1.44 in. (36 mm) from the manifold. A gauge (286) can be used to verify this distance. Finger-tighten the packing nut (247a). See Fig. 16.
8. Tighten the adapter (247c) fully into the manifold.
9. Tighten the packing nut (247a) to 20–30 ft-lb (27–41 N•m).
10. Guide the probe wires through the opening in the bottom of the control box.
11. Insert the new probe wires into the outer slots of the connectors P2. See Fig. 19, page 29. Do not connect a wire to the center.
12. Calibrate the probe.

Calibrating the Heater Sensor Probe

1. Monitor the temperature of the fluid flowing at the thermometers.
2. If the temperature does not go low enough at the MIN setting, turn the calibrate potentiometer as instructed on page 32.

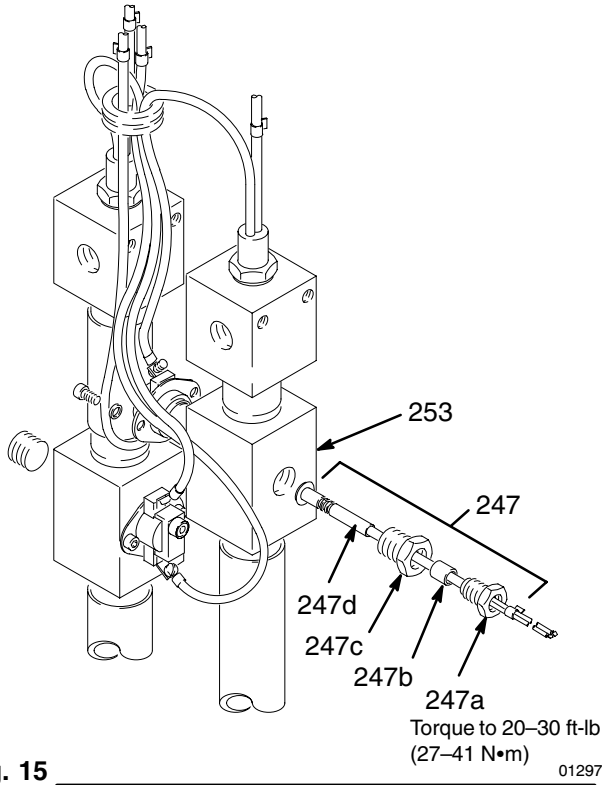


Fig. 15

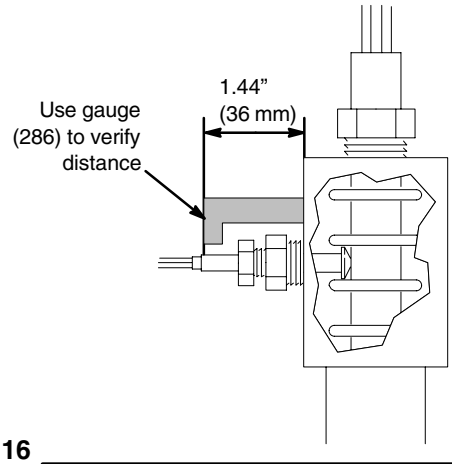


Fig. 16

Service – Heater Element

⚠ WARNING

To reduce the risk of serious injury, including burns from hot fluid or hot metal; fluid injection; or electric shock:

1. Cool the fluid in the heater by pumping unheated fluid through it for two minutes before removing the front heater panel (238).

2. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

3. Disconnect the main electrical power to the heater before removing any heater panels.

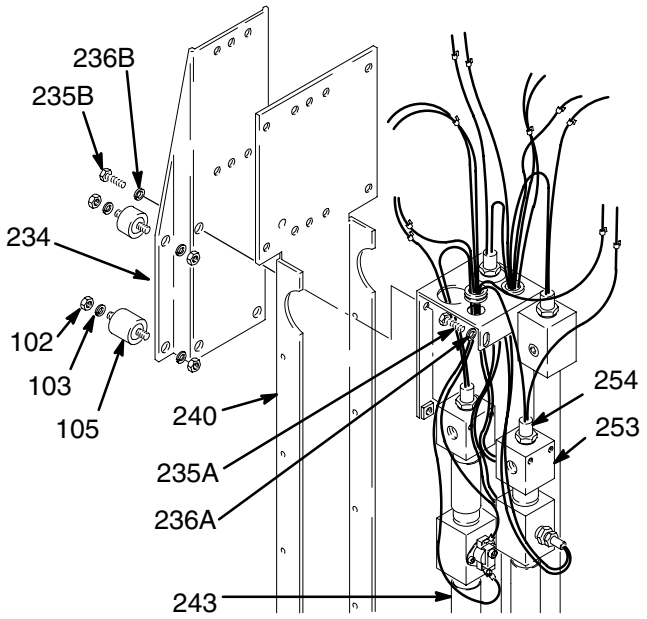


Fig. 17 01296

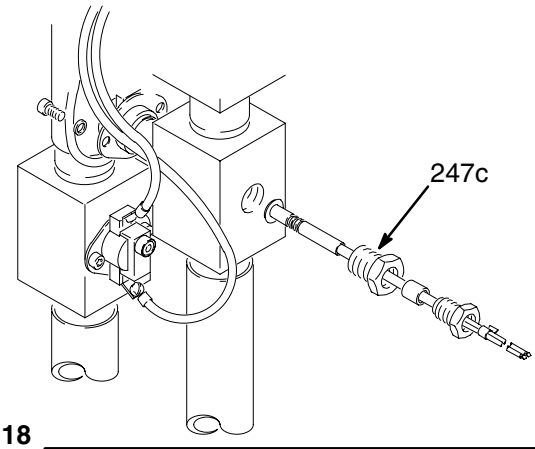


Fig. 18 01692

NOTE: Refer to Fig. 17 except where noted.

1. Relieve the pressure, and shut off the main power to the heater.
2. The heater element wires and sensor probe wires should already be disconnected since doing the electrical resistance check. If not, see the procedure on page 20.
3. Connect the control panel cover (216) to the control box with one screw to keep it out of the way. See Fig. 20, page 30.
4. Remove the front heater cover (238). See page 39. Disconnect the heating element wire from the thermostats.
5. Pull the disconnected wires out the bottom. Be careful not to pull the connectors off the wires.
6. Remove all four nuts (102) and lockwashers (103) from the side flanges of the heater mounting bracket (234). See Fig. 17.
7. Lift up slightly on the heater and pull it a few inches away from the heater mounting bracket. Lean the top of the heater toward the pump stand and use a strap wrapped around the control box and the proportioning pump motor to hold the heater at an angle of about 4 in. (101 mm) from the pump stand.
8. Remove the screw (235A) and lockwasher (236A) from behind the front flange of the manifold.
9. From the back of the heater mounting bracket (234) remove the top screws (235B) and lockwasher (236B) only from the side of the heater you are working on.
10. Push the heater element tube (243) up slightly, tip the bottom of the tube out and away from the rear panel, and then pull it away from the heater. Keep the tube upright to avoid spilling any fluid left in the tube.
11. *If the front heater element is bad,* loosen the adapter (247c) one turn. Refer to Fig. 18. Unscrew the heater element and pull it out of the tube.

    If the rear heater element is bad, unscrew it and pull it out of the tube.
12. Install a new heater element (254).

Service – Heater Element

NOTE: If replacing the rear element, go to Step 16.

13. If the front heater element was replaced, tighten the probe adapter (247c) just one turn.

14. Reposition the heater element tube on the rear panel (240). Install the screw (235A) and lockwasher (236A) into the manifold (253) through the back of the manifold bracket front flange. Engage a couple of threads.

15. Reinstall the screw (235B) and lockwasher (236B) through the rear of the mounting bracket (234). Tighten firmly and then finish tightening the front screw and lockwasher.

NOTE: You may find it easier to position and install the screws (235A and 235B) if one person holds up the heater element tube while another person installs the screws.

16. Remove the control panel cover (216). Guide the wires of the heater up through the bottom of the control box.

17. Remove the strap holding the heater. Position the heater mounting bracket over the threaded shafts of the cylindrical mounts (104 and 105). Install the lockwashers (103) and nuts (102).

18. Connect the heating element wire to the Hi-Limit Thermostat.

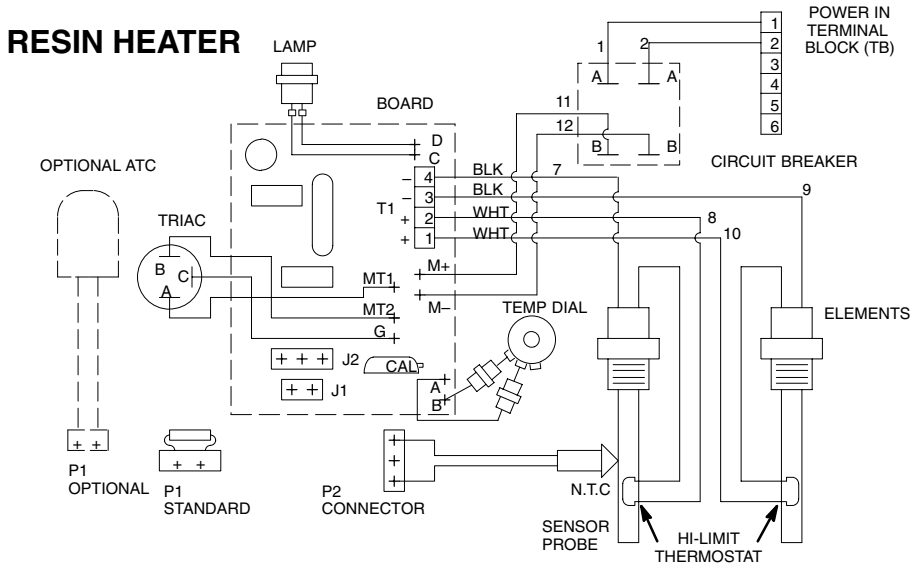
19. Reinstall the heater element and thermostat wires at terminal block T1 of the circuit board. See Fig. 19 for the proper wire positions.

20. Reinstall the control panel cover (216).

Wiring Schematics

Heater No. 235840 is shown in Fig. 19. The wiring for Heater No. 235839 is identical *except* the second set of elements (wires 9, 10, 19, 20) are not used.

RESIN HEATER



ISO HEATER

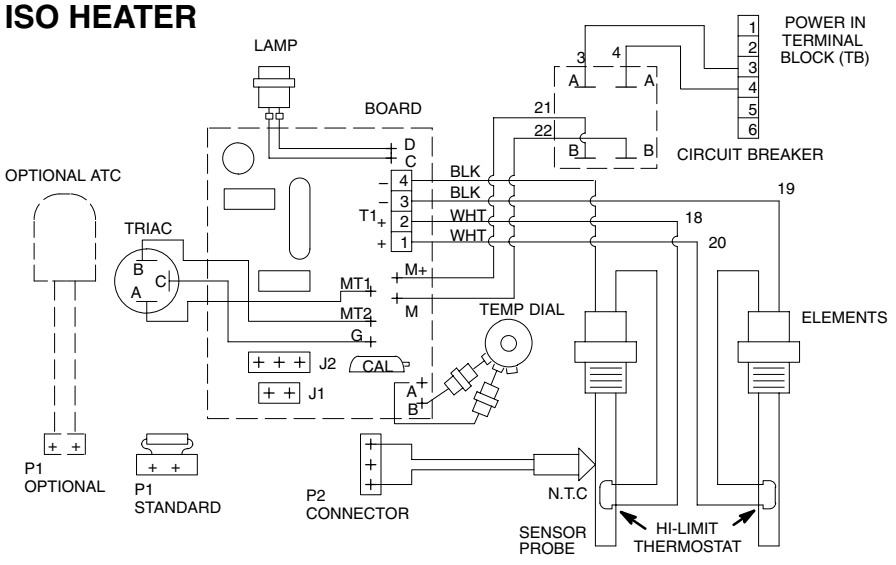


Fig. 19

Service – Circuit Board

Replacing a Circuit Board

⚠ WARNING

Have a person qualified in electrical repair replace a circuit board. An incorrectly installed circuit board can bypass built-in safety features or cause the heater to overheat. This can result in serious injury or can cause a circuit board to fail immediately.

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or electric shock:

1. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.
2. Disconnect the main electrical power to the heater before removing any heater panels.

NOTE: Use replacement part 235255.

Disassembly

1. Relieve the pressure, and shut off the main power to the heater.
2. Remove the control panel cover (216 or 317).
3. Unplug the wires leading to the TEMP SET dial.
4. Unplug the wires of the indicator light (214 or 314) from behind the control panel (216 or 317). Unplug the wires from the triac (223a or 306a), noting the position of the wires. See Fig. 20 and 21.
5. Disconnect the heater element wires at terminal block T1. See Fig. 21.
6. Unplug the power wires (RES wire no. 11 and 12; ISO wire no. 21 and 22) from the circuit breaker (210 or 319). See Fig. 21.
7. Remove and keep the screws (284 and 335) from each corner of the circuit board. Remove the board. See Fig. 20.
8. Remove the screws (291 or 336) and washers (292 or 337) from the triac (223a or 306a).

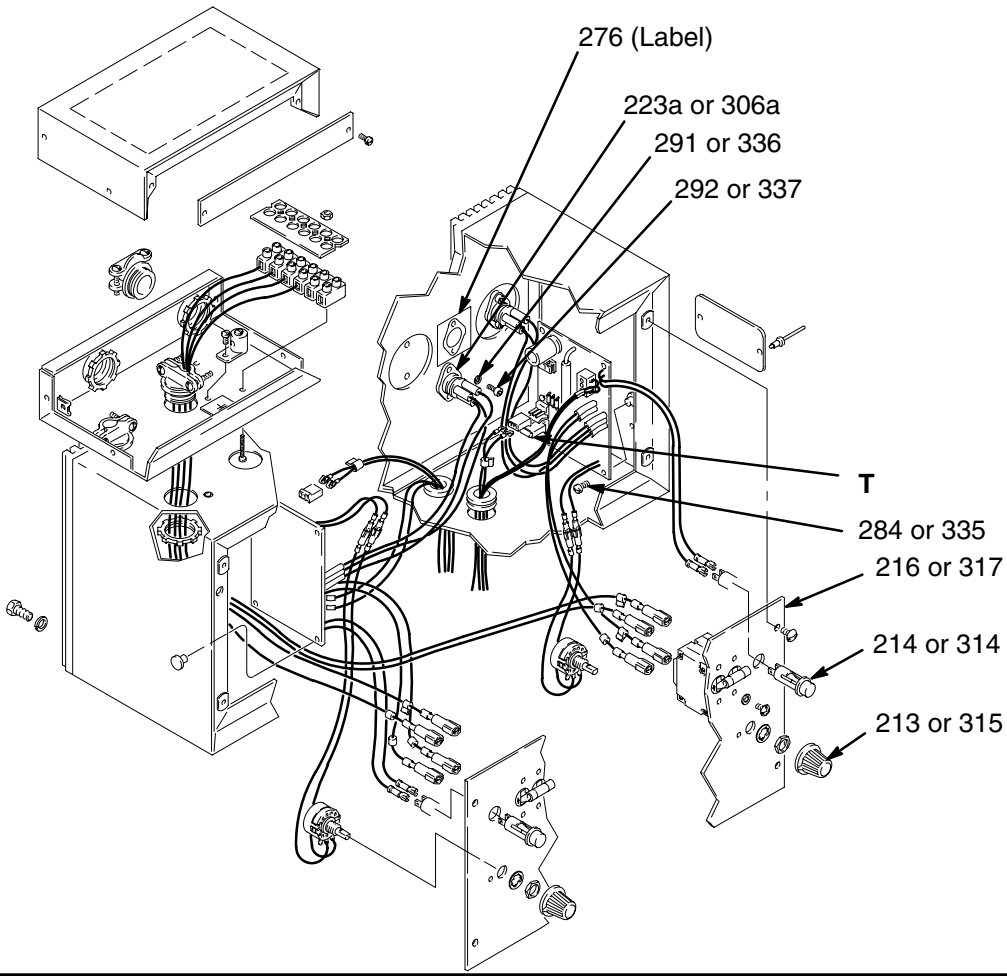


Fig. 20

Service – Circuit Board

Reassembly

1. Apply conductive paste (Graco P/N 110009) to the bottom flange of the triac (223a or 306a). Position the triac as shown in Fig. 20. Use the screws (291 or 336) and lockwashers (292 or 337) to mount the triac to the back of the control.

2. Position the new circuit board in the control box. Install the screws (284 or 335), starting the first screw at the lower front corner. After each screw is started, snug them tightly.

3. Plug in the triac wires, if not plugged in. See Fig. 13, page 25. Verify the triac wiring with the label (276) located inside the control box. See Fig. 20, page 30.

NOTE: See **Setup** on page 20 for how to reconnect the wires.

4. If used, plug the ATC connector (T) into the circuit board position J1. Otherwise, make sure the 2 pin connector is installed at J1 with the 47.5K resistor. See Fig. 20 and 21.

5. Reinstall the heater element wires into terminal block T1, in the positions indicated in Fig. 21.

6. Plug the indicator light leads (214 or 314) into the rear of the indicator light. See Fig. 20 and 21.

7. Plug in the wires leading to the TEMP SET dial (213 or 315). See Fig. 20 and 21.

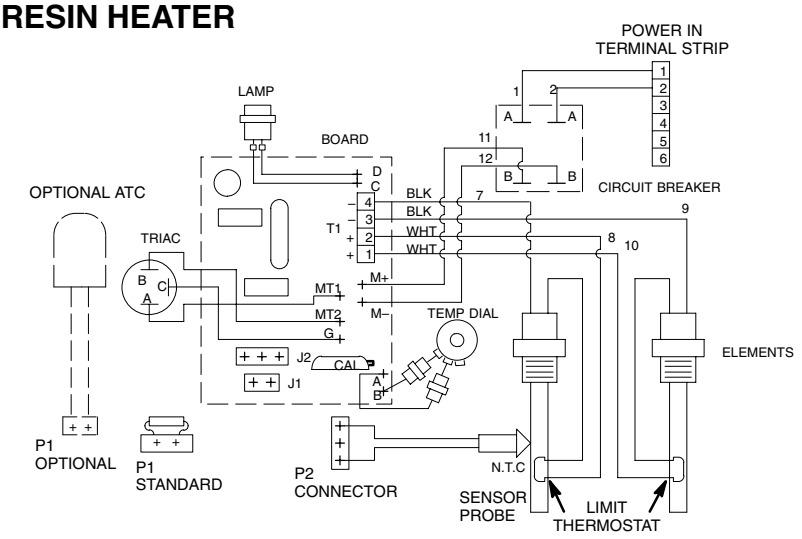
8. Plug the sensor probe connector P2 into the circuit board at position J2. See Fig. 20 and 21.

9. Reinstall the control panel cover (216 or 317) and tighten the screws firmly.

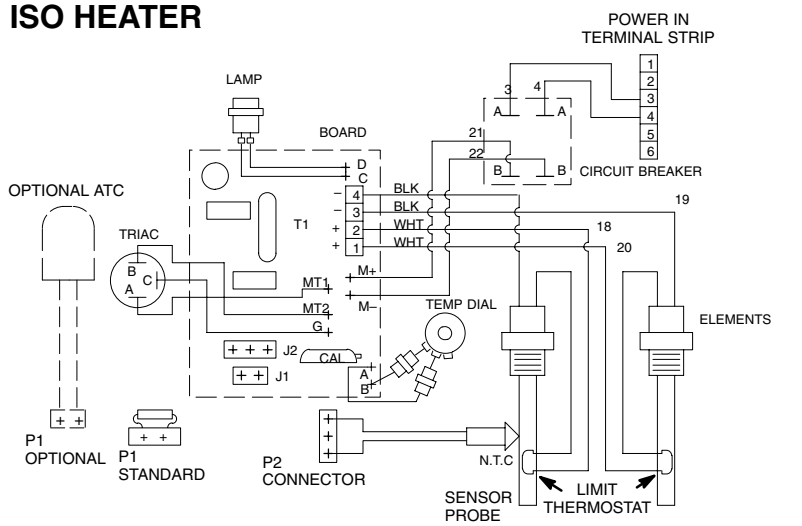
Wiring Schematics

Heater No. 235840 is shown in Fig. 21. The wiring for Heater No. 235839 is identical *<u>except</u>* the second set of elements (wires 9, 10, 19, 20) are not used.

RESIN HEATER



ISO HEATER



HOSE HEATER

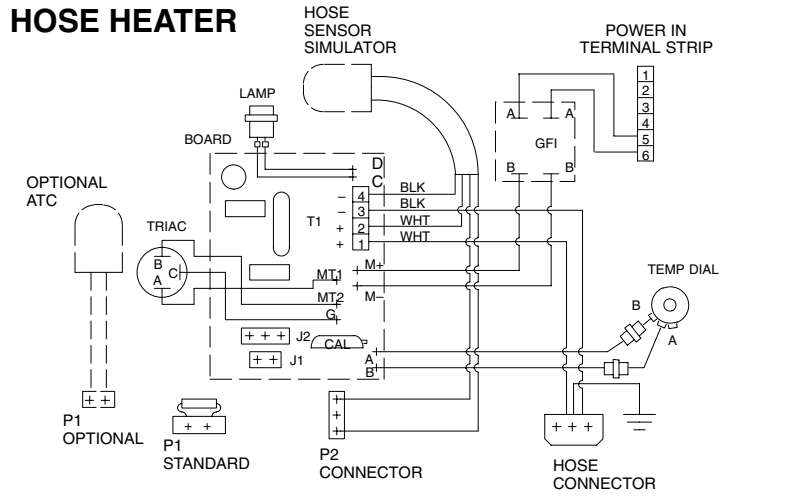


Fig. 21

Calibrating the Controls

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or electric shock:

1. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

2. Disconnect the main electrical power to the heater before removing any heater panels.

1. Relieve the pressure.

2. Set the heater TEMP SET dials (K) to **MIN**.

3. Turn the heater circuit breakers (210) to **I** (ON).

4. Let the fluid heat for 5 minutes at no flow.

5. Check the heater thermometers (204) at a flow rate of approximately 10 lb/min. The minimum temperature should be 90° to 100° F (32° to 38° C).

NOTE: The thermometers normally read very low during no-flow conditions. This is due to the influence of the metal surrounding the gauge which is exposed to the air.

6. If the temperature is not within range:

   a. Turn the circuit breakers (210 or 319) to **O** (OFF).

   b. Shut off the main power to the heater.

   c. Remove the control panel cover (216 or 317).

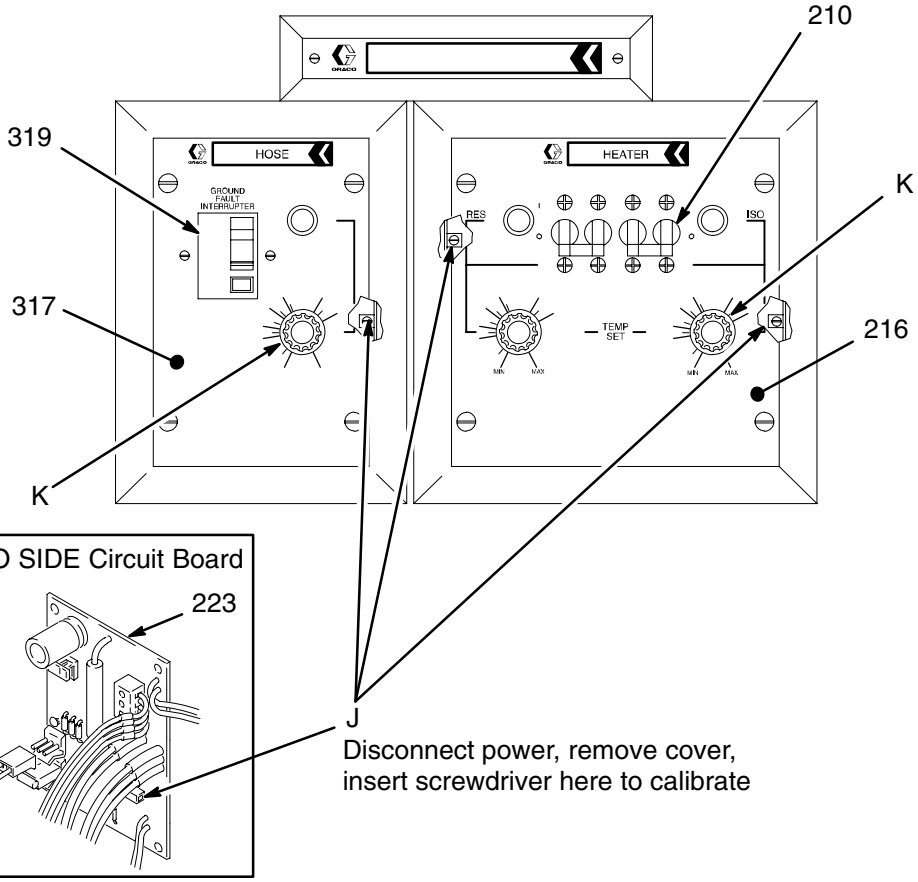
   d. Insert a small screwdriver into the calibrate resistor (J) and adjust as follows:

      (1) *To increase temperature,* turn the screwdriver counterclockwise 1 complete turn for every 4° of increase needed.

      NOTE: If the temperature is set too high the thermostats will trip and will have to be manually reset.

      (2) *To decrease the temperature,* turn the screwdriver clockwise 1 complete turn for every 4° of decrease needed.

7. Wait for 5 minutes and check the temperature again. If it is still incorrect, repeat step 5 again.



01323
01310

Fig. 22

Notes

Service Hose Sensor Simulator, Optional ATC

⚠ WARNING

To reduce the risk of serious injury, including fluid injection or electric shock:

1. Follow the **Pressure Relief Procedure** on page 6 before checking or adjusting any part of the system or any component and whenever you are instructed to relieve pressure.

2. Disconnect the main electrical power to the heater before removing any heater panels.

Hose Sensor Simulator Replacement

NOTE: Use replacement part 218655.

1. Relieve the pressure, and shut off the main power to the heater.
2. Check the resistance of the simulator (304) before replacing it. See the procedure on page 23. That procedure also tells you how to disconnect the simulator leads.
3. Loosen the cable clamp (312) screws and pull out the simulator leads.
4. Install the new simulator through the clamp. Be sure that about 1/4 in. (7 mm) of insulation is cut away from the lead ends. Using the procedure in **Setup,** page 20, insert the leads.
5. Calibrate the hose sensor simulator.

⚠ CAUTION

Calibrate the simulator as instructed below before continuing to reassemble the heater. Calibration ensures proper temperature.

Hose Sensor Simulator Calibration

1. A Graco heated hose (P/N 218613, 218614, 947514, 947515 and 948723) must be connected to the heater.
2. Turn on the electrical power, turn on the hose circuit breaker, and set the temperature dial to **CAL**. Allow the heater to warm up.
3. If adjusted properly, the light on the hose control panel should be ON about 80% of the time and OFF about 20% of the time for 15 to 20 minutes and then start to decrease its ON time.

⚠ WARNING

ELECTRIC SHOCK HAZARD
To reduce the risk of electric shock, turn off the main power to the heater before adjusting the potentiometer.

4. **If a fluid sample is too cold after 30 minutes,** turn the potentiometer counterclockwise 2 turns and recheck.
5. **If a fluid sample is too hot after 30 minutes,** turn the potentiometer clockwise 2 turns at a time and recheck.

Installing the Optional ATC (Ambient Temperature Compensator)

1. Relieve the pressure, and shut off the main power to the heater.
2. Remove connector P1 from each circuit board. See Fig. 23.
3. Install the new ATC through the cable clamp (207) of the main junction box (228). See page 38.

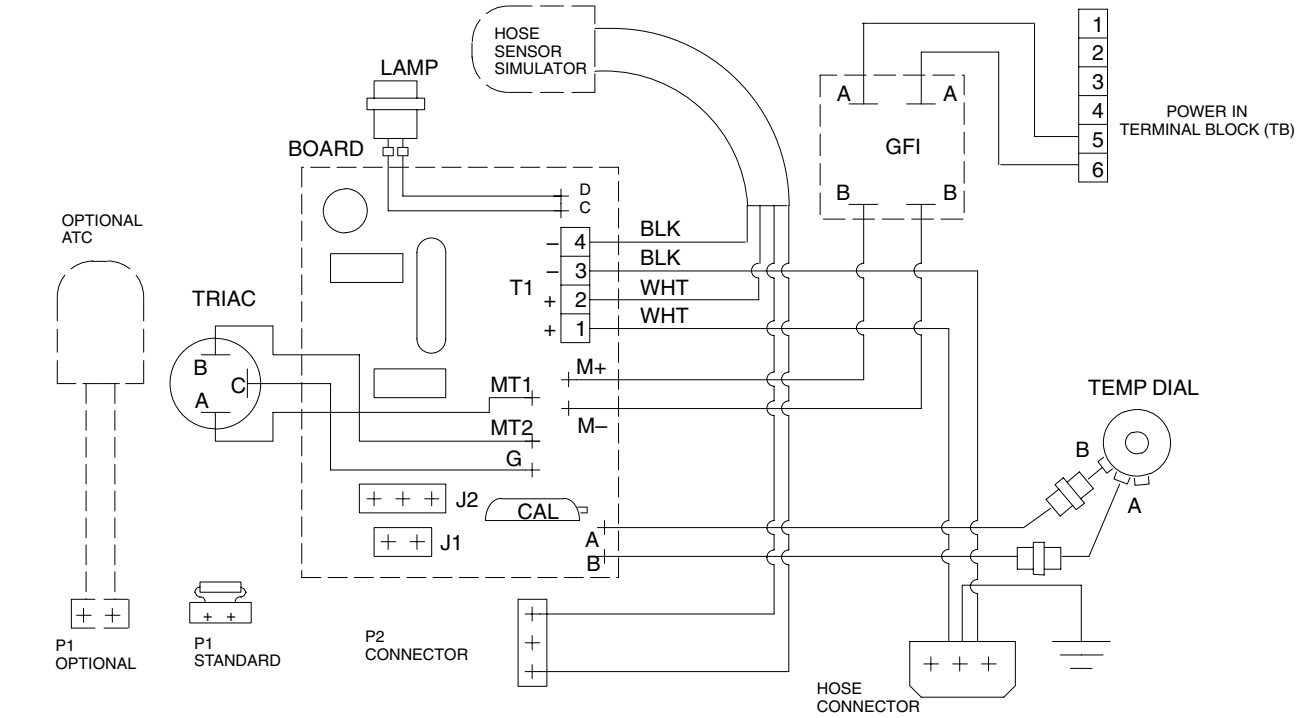
   Insert two connectors (P1) of the ATC sensor through the cable clamp (207) that holds the junction box (228) to the heater control box (224).

   Insert the third connector (P1) of the ATC sensor through the cable clamp (207) that holds the junction box (228) to the hose control box (309).

   Connect one connector to each circuit board at position J1 of the heater and hose controls.
4. Tighten the cable clamp screws and reinstall the control panel covers and junction box cover.

NOTE: If your system does not include a hose control box, one set of leads and its connector will not be used. Tape these parts inside the box.

Service – Hose Sensor Simulator, Optional ATC



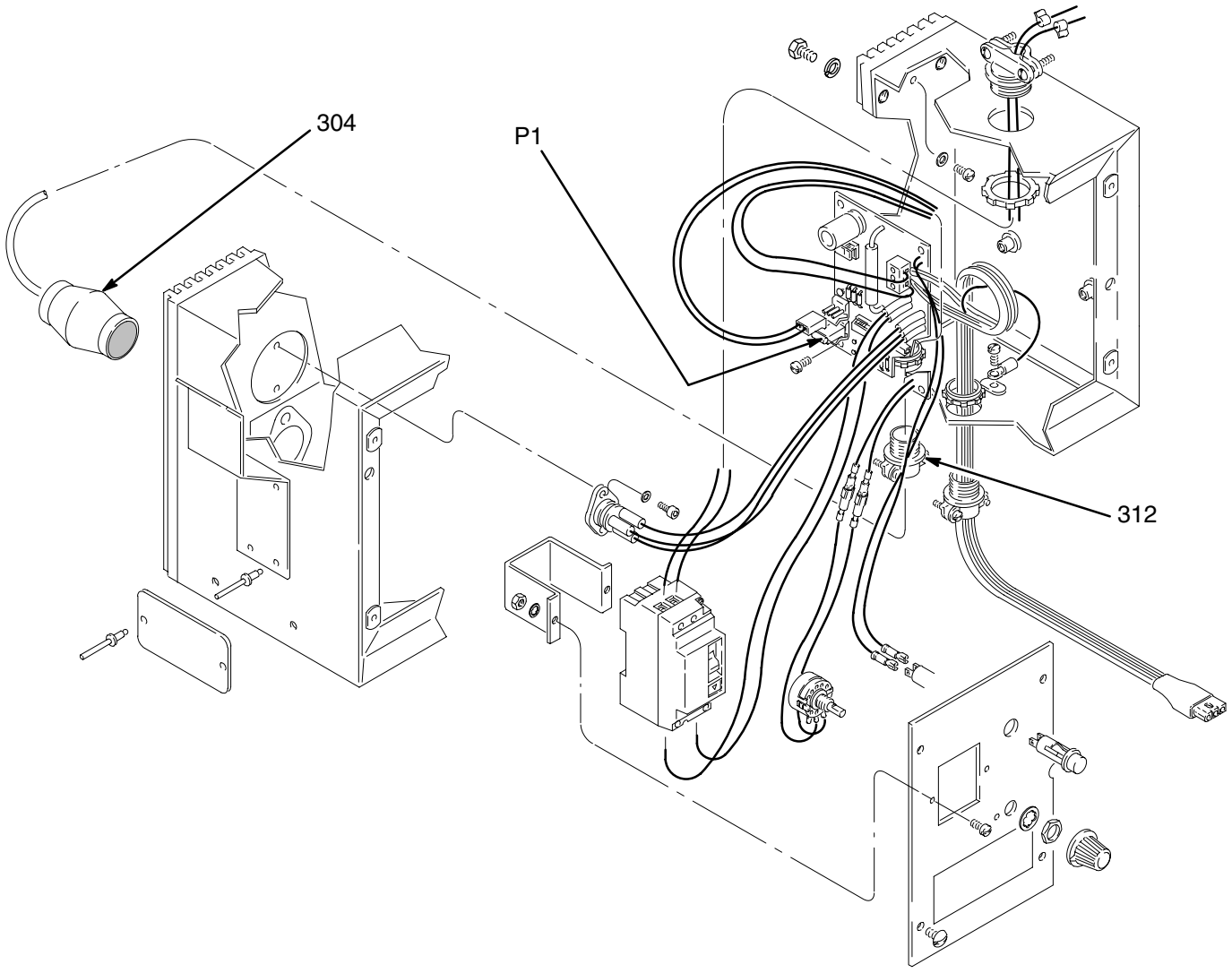
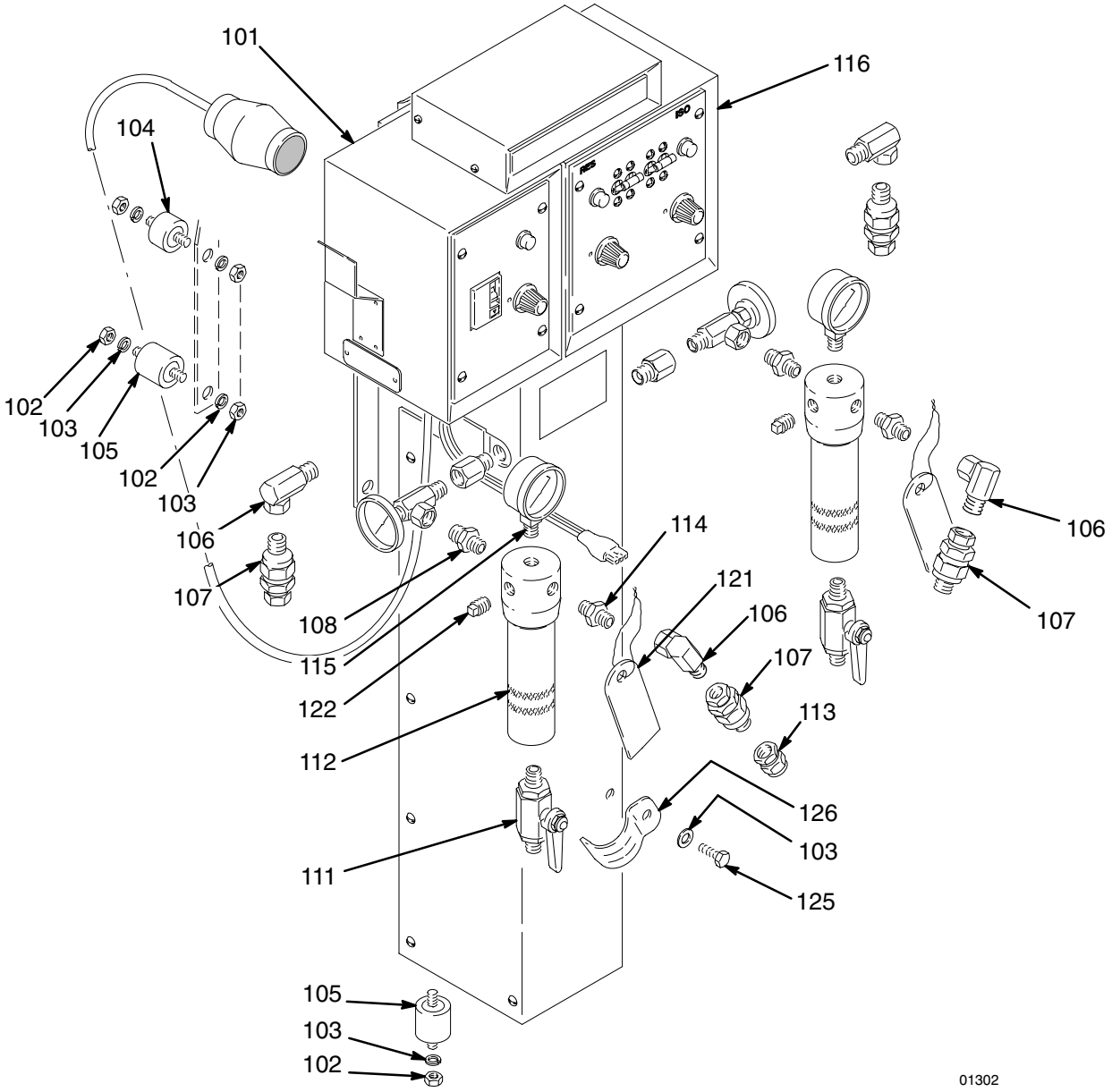


Fig. 23

01309

Parts – Heater Assembly

235259 Foam-Cat Heater, 15 lb/min (6.75 kg/min)
235260 Foam-Cat Heater, 30 lb/min (13.5 kg/min)



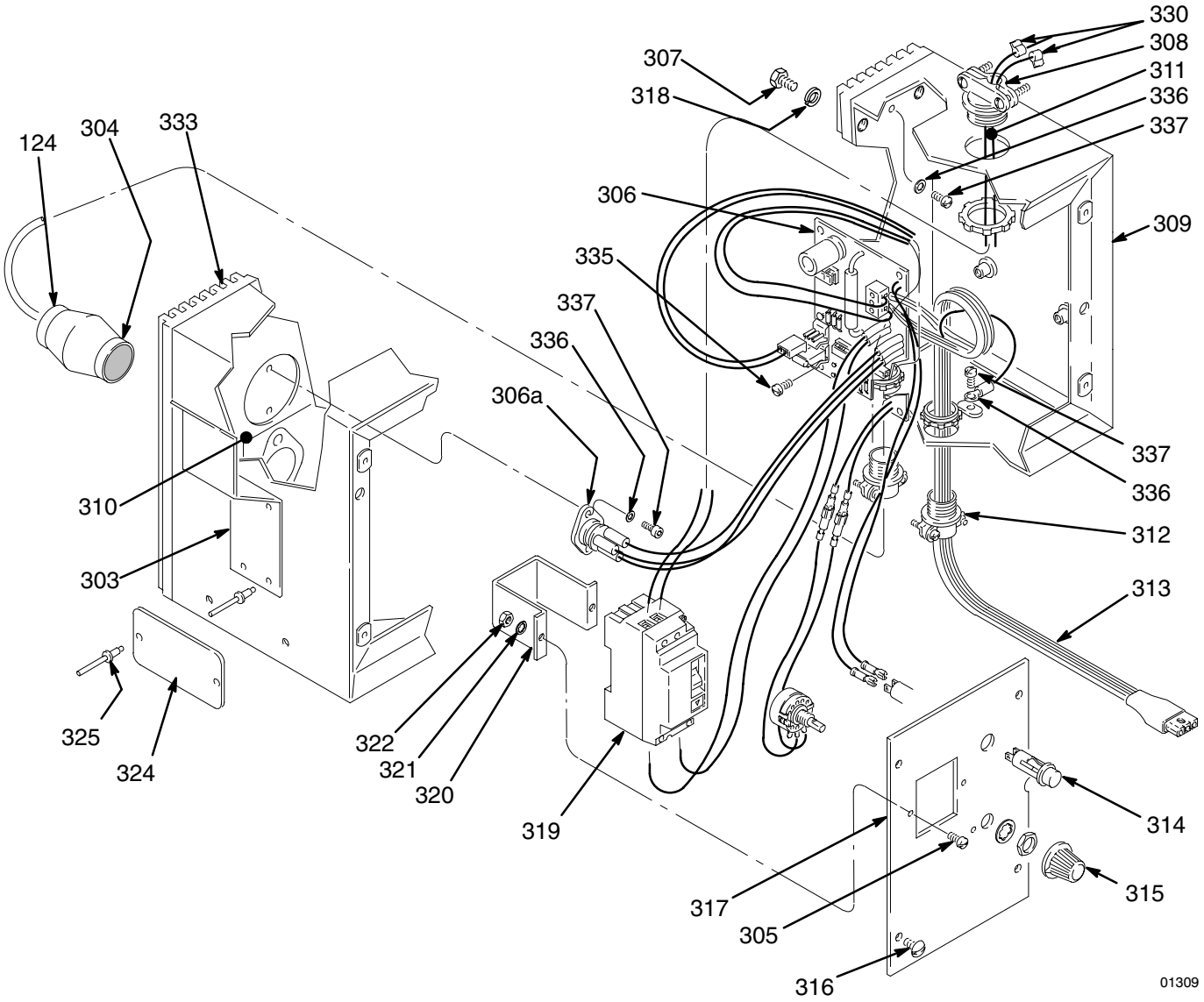
Ref No.	Part No.	Description	Qty
101	235256	CONTROL, heated hose	1
102	100188	NUT, heavy, hex, 5/16”	10
103	100214	LOCKWASHER	11
104	106515	MOUNT, cylindrical; 5/16–18 x 0.75”	2
105	106516	MOUNT, cylindrical; 5/16–18 x 1.25”	4
106	155494	UNION, swivel, 90°, 3/8 npt swivel x 3/8 npt(f)	4
107	206831	CHECK VALVE, 3/8 npsm swivel x 3/8 npt(m)	4
108	168696	NIPPLE, adapter, 3/8 npsm x 3/8 npt(f)	2
110	215623	BALL VALVE, 3/8 npt(mbe)	2
111	178747	LEVER, valve	2
112	218029	FLUID FILTER; see 307273 for parts	2
113	156173	UNION, swivel, 3/8 npt(f) x 3/8 npsm	1
114	157350	ADAPTER, 3/8 npt x 1/4 npt(mbe)	2

Ref No.	Part No.	Description	Qty
115	102814	GAUGE, pressure, fluid; 0–3000 psi (0–20.7 MPa, 0–207 bar) range	2
116		FOAM HEATER	
	235257	15 lb/min (6.75 kg/min); for Model 235259	1
	235258	30 lb/min (13.5 kg/min); for Model 235260	1
118	162453	NIPPLE, 1/4 npsm x 1/4 npt(f)	1
121	179789	TAG	2
122	100509	PLUG	2
124	054174	TUBING, shrink	6 ft.
125	100538	CAPSCREW	1
126	108191	CLAMP, conduit	1
127	188065	GAUGE, probe (not shown)	1

Parts – Heated Hose Control

235256 Foam-Cat Heated Hose Control

NOTE: The control does not include wiring junction box (233) shown on page 38.

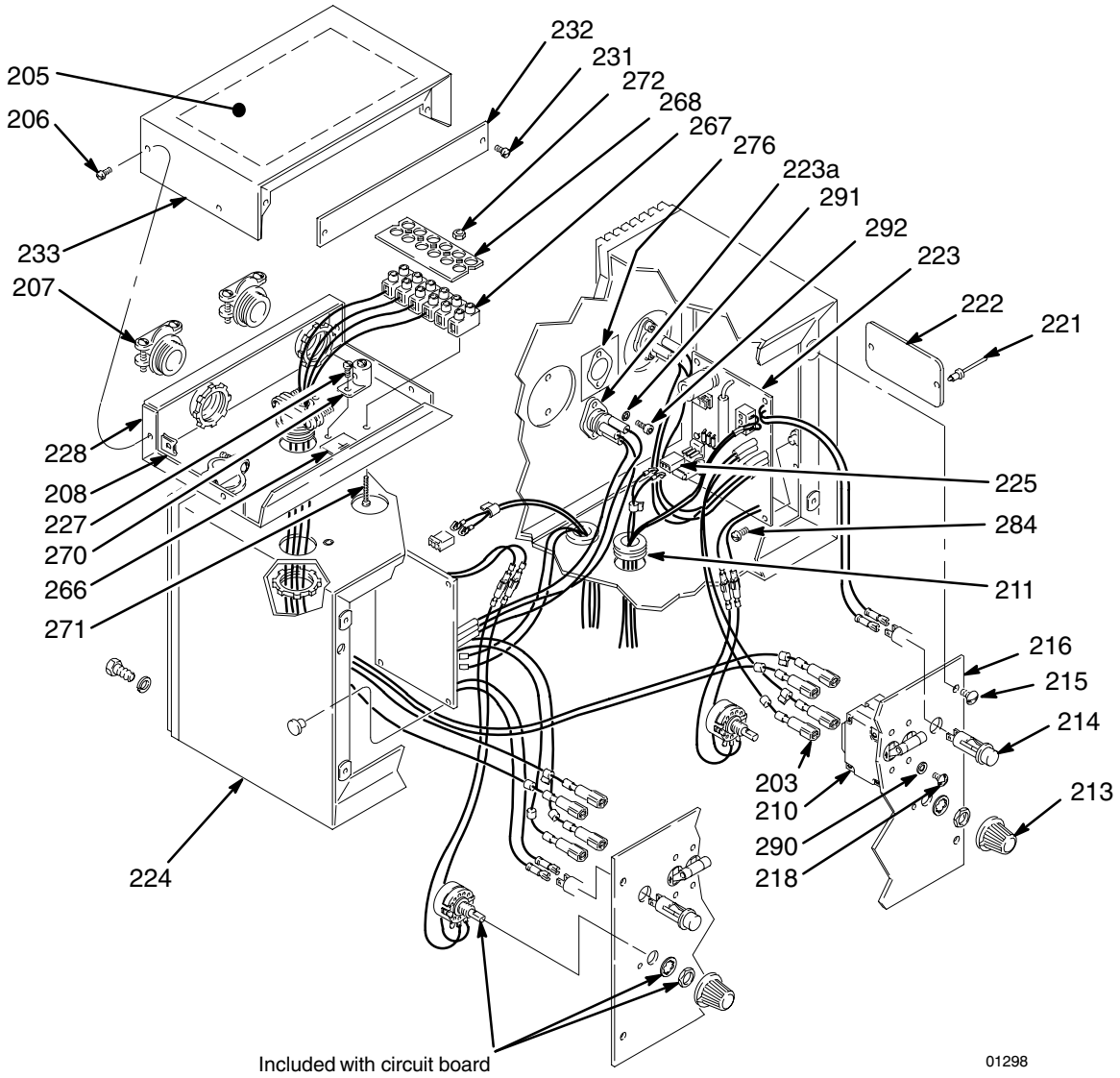


Ref No.	Part No.	Description	Qty
303	188168	CLAMP, component	1
304	218655	SENSOR, hose simulator	1
305	100035	SCREW, pnh, 8–32 x 1/2”	2
306	235255	CIRCUIT BOARD, *includes item 306a*	1
306a	106594	.TRIAC	1
307	100642	CAPSCREW	4
308	101662	CONNECTOR, cable clamp	1
309	235253	CONTROL BOX, heated hose	1
310	188053	LABEL, instruction	1
311	065278	COPPER WIRE, 14 AWG	24 in.
312	105362	CLAMP, cable	2
313	217384	CABLE, power	1
314	104340	LAMP, indicating	1
315	103083	KNOB, selector	1
316	100710	SCREW, 10–24 x 3/8”	4

Ref No.	Part No.	Description	Qty
317	188060	PANEL, control	1
318	100016	LOCKWASHER	4
319	106490	CIRCUIT BREAKER, 125–240V, 16 amp	1
320	178486	BRACKET, mounting	1
321	157021	LOCKWASHER, internal	2
322	100284	NUT, hex, 8–32 x 0.130	2
324	180254	PLATE, designation, 50/60 cycle	1
325	102472	RIVET, blind	6
330	104615	LABEL, designation, electrical	1
333	188063	HEAT SINK	1
335	110891	THUMBSCREW nylon, 10–24 x 3/8”	4
336	100272	LOCKWASHER	7
337	102410	CAPSCREW, sch, 6–32 x 3/8”	7
338	110890	TOOL, allen wrench (not shown)	1

Parts – Heater

235839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



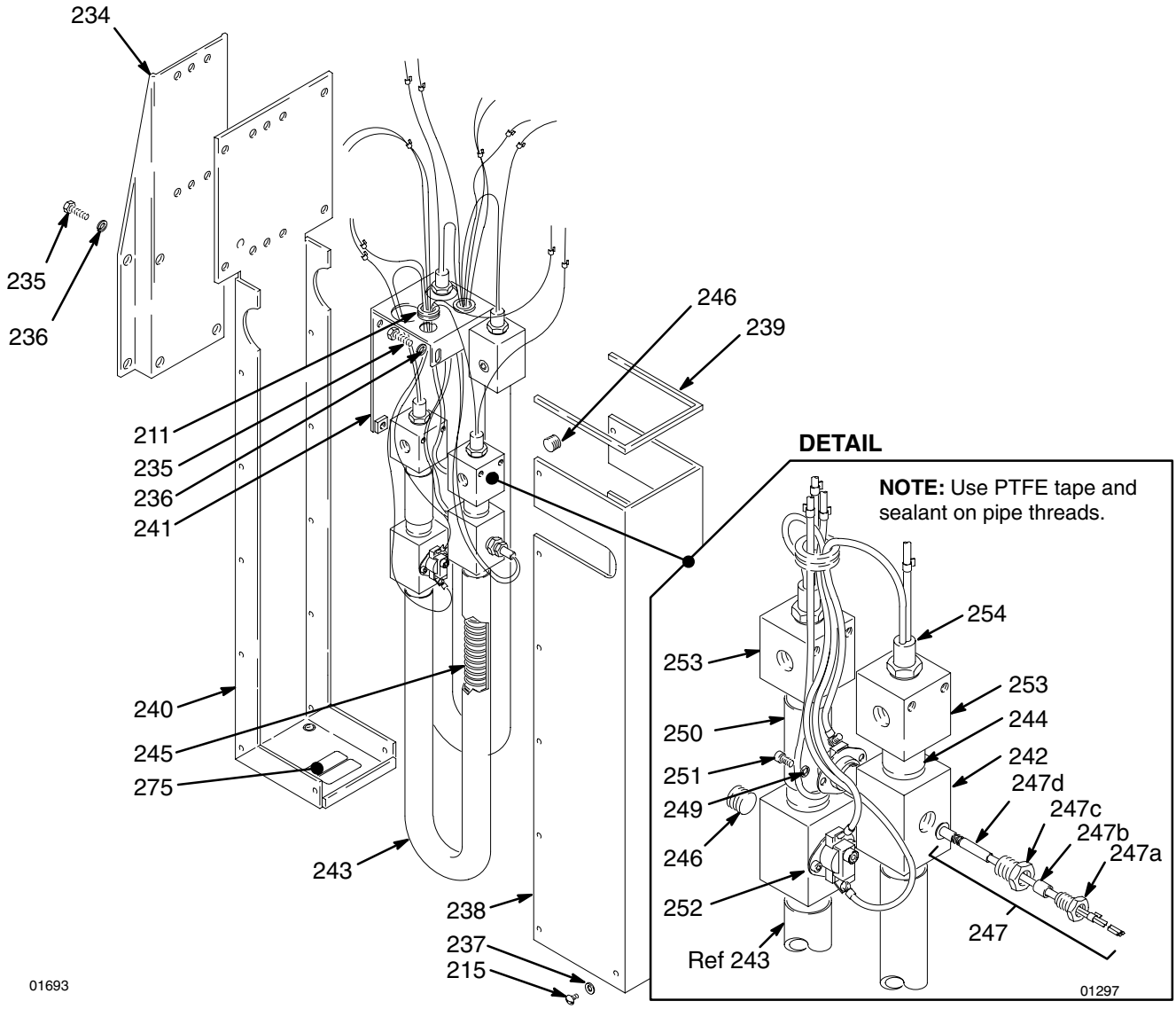
NOTE: For additional parts of Heater, see pages 39 and 40.

Ref No.	Part No.	Description	Qty
203	105768	CONNECTOR	8
205	178527	LABEL, wiring diagram	1
206	100518	SCREW, panhd, 6–32 x 3/8”	8
207	101662	CONNECTOR, cable clamp	4
208	104620	NUT, self retaining, No. 6–32	4
210	111757	CIRCUIT BREAKER, 250V, 50–60 Hz, 30 amp	2
211	101765	GROMMET, buna–s	6
213	103083	KNOB, selector	2
214	104340	LAMP, indicating	2
215	100710	SCREW, 10–24 x 3/8”	18
216	188056	COVER, heater control panel	1
218	103854	SCREW, bdgh, 6–32 x 1/4”	8
221	102556	RIVET, blind	2
222	180254	PLATE, serial, 240 V	1
223	235255	CIRCUIT BOARD, includes item 223a	2
223a	106594	.TRIAC	2
224	217240	CONTROL BOX, foam heater	1

Ref No.	Part No.	Description	Qty
225	106501	CONNECTOR, electrical	2
227	100700	SCREW, pnh, 4–40 x 1”	1
228	178289	BASE, junction box	1
231	100979	SCREW, 10–24 x 5/8”	2
232	178602	PLATE, identification	1
233	178467	COVER, junction box	1
266	172953	LABEL, designation, ground	1
267	108033	STRIP, terminal	1
268	108032	MARKER, terminal strip	1
269	101674	TERMINAL, 16–14 AWG	8
270	107154	LUG, grounding	1
271	105656	SCREW, filh, 6–32 x 1.0”	2
272	100072	NUT, hex, no. 6–32	2
276	188053	LABEL, triac	1
284	110891	THUMBSCREW nylon, 10–24 x 3/8”	8
290	103836	SCREW, bdgh, 10–32 x 3/4”	1
291	100272	LOCKWASHER, No. 6	16
292	102410	CAPSCREW, sch, 6–32 x 3/8”	8
293	110890	TOOL, allen wrench, (not shown)	1

Parts – Heater

235839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



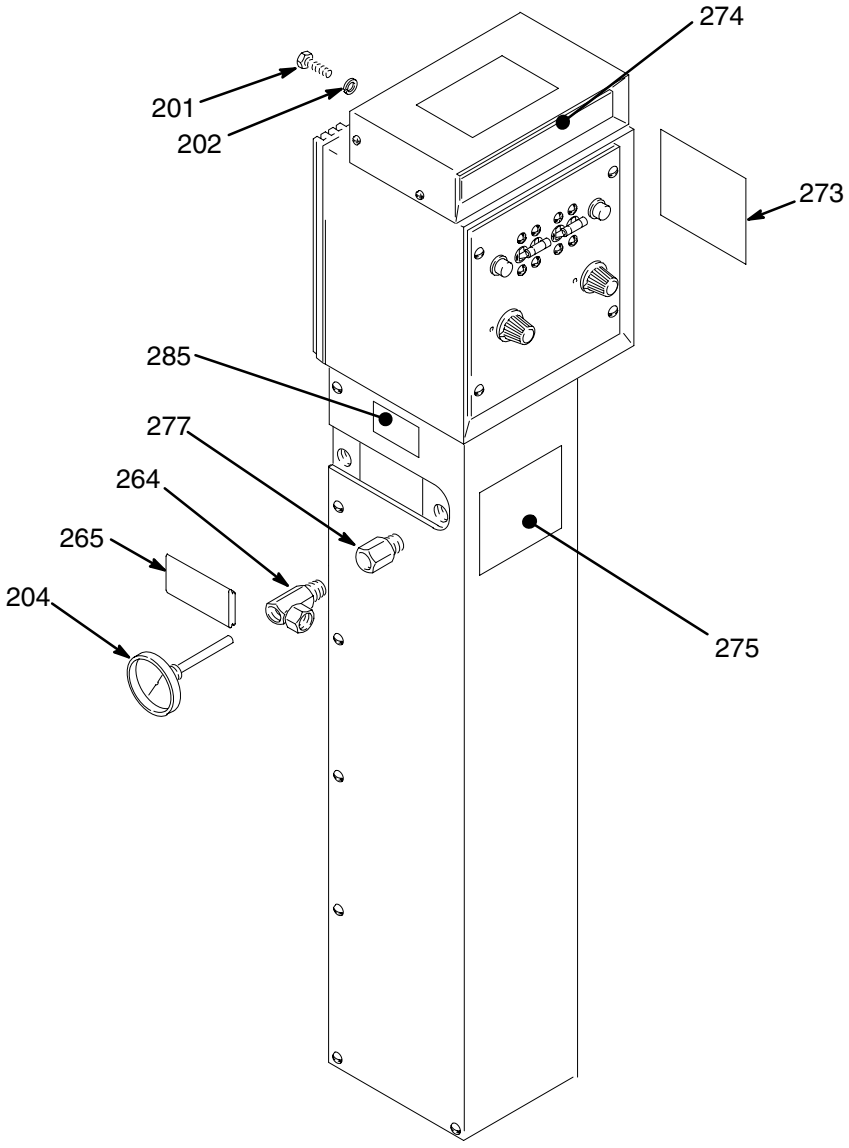
NOTE: For additional heater parts, see pages 38 and 40.

Ref No.	Part No.	Description	Qty
229	103711	CONNECTOR, wire	0 or 3
234	178274	BRACKET, mounting	1
235	100001	CAPSCREW, hex hd, 5/16–18 x 5/8”	6
236	100214	LOCKWASHER, .583	6
237	100718	LOCKWASHER, No. 10	14
238	188057	SHROUD, front heating element	1
239	062035	MOLDING	14 in.
240	217237	PANEL, rear enclosure	1
241	217239	BRACKET, manifold	1
242	188058	MANIFOLD, probe/thermostat	4
243	188064	U–TUBE, fluid	2
244	188054	NIPPLE, 2.8”	2
245	217236	COIL, heater element	2 or 4
246	101754	PLUG, pipe, 3/8 npt	6

Ref No.	Part No.	Description	Qty
247	220650	PROBE REPLACEMENT KIT *Includes items 247a – 247d*	1
247a	178282	NUT, packing	2 or 1
247b	178276	SEAL, probe	2 or 1
247c	178279	ADAPTER, thermistor	1
247d	235254	PROBE, sensor, thermistor	1
249	103229	CAPSCREW. sch, 8–32 x 3/8”	4 or 8
250	188055	NIPPLE	2
251	100079	LOCKWASHER, No. 8	8
252	111759	THERMOSTAT *normally closed*	2 or 4
253	188059	MANIFOLD, outlet heater	4
254	15B138	ELEMENT HEATER, immersion, SST, 240 VAC, 2550 Watts	2 or 4
258	106535	MARKER, wire, designation	1
275▲	179788	LABEL, warning	1
279	180255	LABEL, instruction	1
286	188065	GAUGE, probe (not shown)	1

Parts – Heater

235839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



NOTE: For additional parts included in the Heater, see pages 38 and 39.

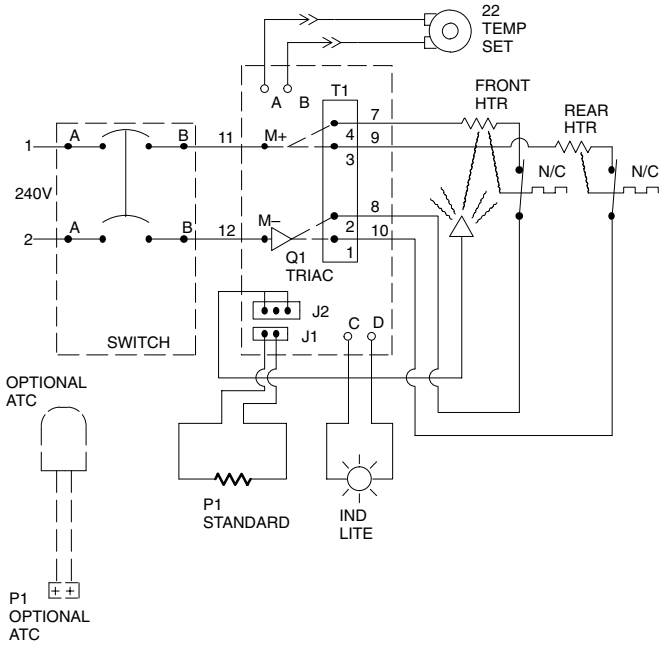
Ref No.	Part No.	Description	Qty
201	100642	CAPSCREW, hex hd; 1/4–20 x 1-1/4"	4
202	100016	LOCKWASHER	4
204	102124	THERMOMETER, dial, 50–250° F (10–120° C) range	2
264	178825	UNION, 90°, 1/4–18 (F) x 3/8–18(m) x 3/8 (F) swivel	2
265	178849	INSERT, slot	2
273▲	179786	LABEL, warning	1
274▲	179787	LABEL, warning	1
275▲	179788	LABEL, warning	1
277	150286	ADAPTER, male to female, 3/8 npt	2
285	178600	LABEL, instruction	1

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

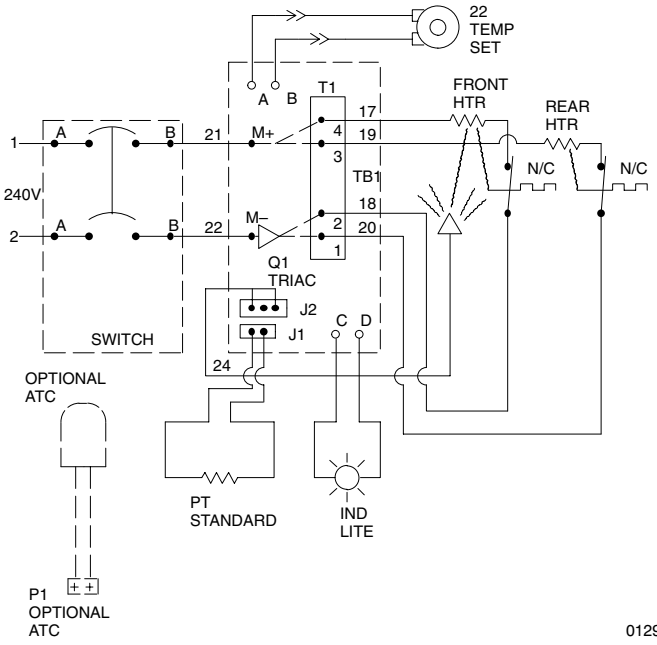
Electrical Schematics

Model 235840

RESIN HEATER



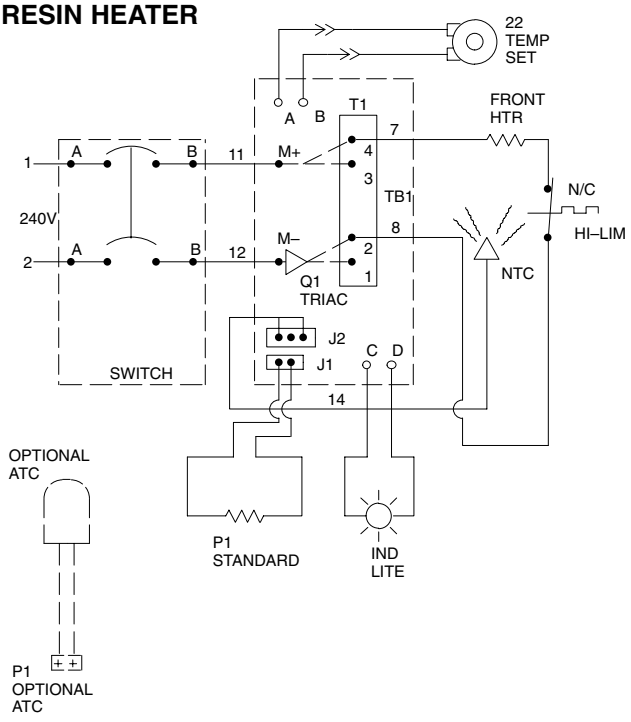
ISO HEATER



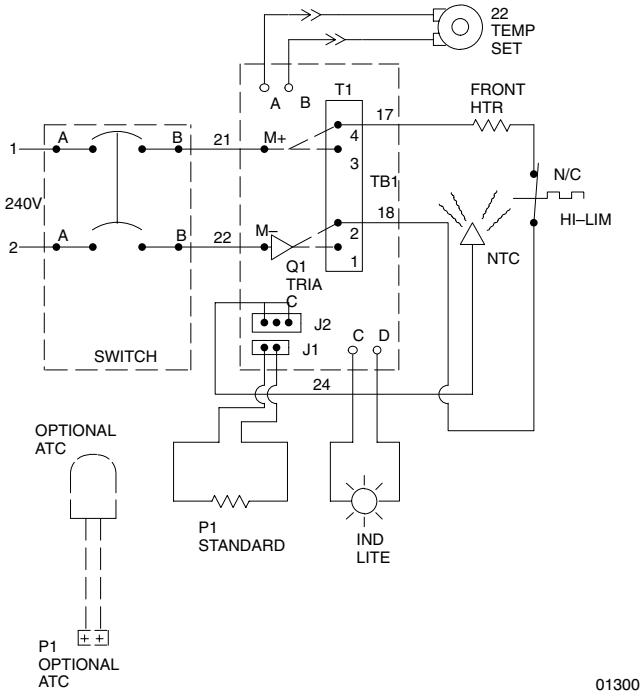
01299

Model 235839

RESIN HEATER



ISO HEATER



01300

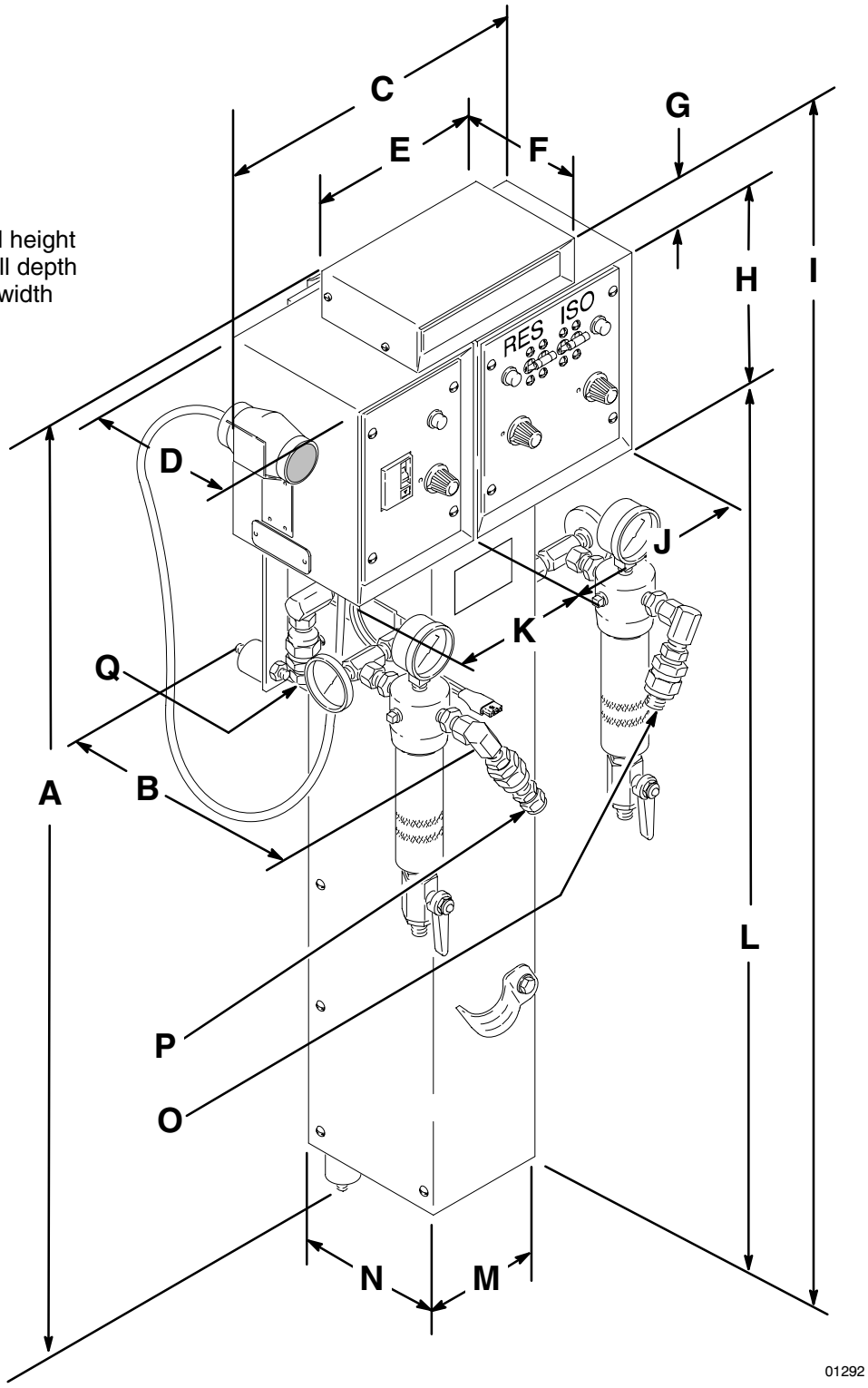
Dimensions

A	42” (1067 mm) Overall height
B	12.5” (318 mm) Overall depth
C	17” (432 mm) Overall width
D	8.1” (205 mm)
E	8.1” (205 mm)
F	5.1” (129 mm)
G	2.0” (51 mm)
H	8.6” (217 mm)
I	39.6” (1005 mm)
J	8.1” (205 mm)
K	6.1” (154 mm)
L	29.0” (736.5 mm)
M	5.2” (132 mm)
N	8.5” (216 mm)

Fittings

O	3/8 npt(m) **ISO**
P	3/8 npt(f) **RES**
Q	3/8 npsm swivel

Weight 94 lb (42 kg)
(Model 235260)



Technical Data

Maximum Fluid Working Pressure . . . . . 3000 psi (21 MPa, 210 bar)
Fluid Temperature Operating Range . . . 95–158°F (35–70°C)
Wetted Parts . . . . . Zinc-plated steel, 303 and 321 Stainless steel, Zinc-plated brass
Ambient Temperature Operating Range . 40–104°F (5–40°C)
Approximate Pressure Drop
Model 235839 . . . . . 7 psi pressure drop/gpm tested with 55 centipoise oil
Model 235840 . . . . . 14 psi pressure drop/gpm tested with 55 centipoise oil
Approximate Temperature Rise Capabilities
Model 235839 . . . . . 70° to 120°F at 1.5 gpm of oil (31° to 49°C at 5.7 l/min of oil)
Model 235840 . . . . . 70° to 120°F at 3.0 gpm of oil (31° to 49°C at 11.4 l/min of oil)
Electrical Requirements
Model 235839 . . . . . 8880 watt, 240 volt
Model 235260 . . . . . 13,980 watt, 240 volt
Model 235839 . . . . . 5100 watt, 240 volt
Model 235840 . . . . . 10,200 watt, 240 volt
Maximum Fault Temperature
NEC T2C Standard . . . . . 446°F (230°C)

Accessories

110009 Conductive Paste

217296 Pump Stand

110968 Terminal Block Tool

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

218613 50 ft. (15.2 m) long
218614 15 ft. (4.6 m) long
948723 25 ft. (7.6 m) long

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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 to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

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612–623–6921
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International Offices: Belgium, Korea, Hong Kong, Japan

www.graco.com

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