INSTRUCTIONS-PARTS LIST

308–219

Rev. D
Supersedes C

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

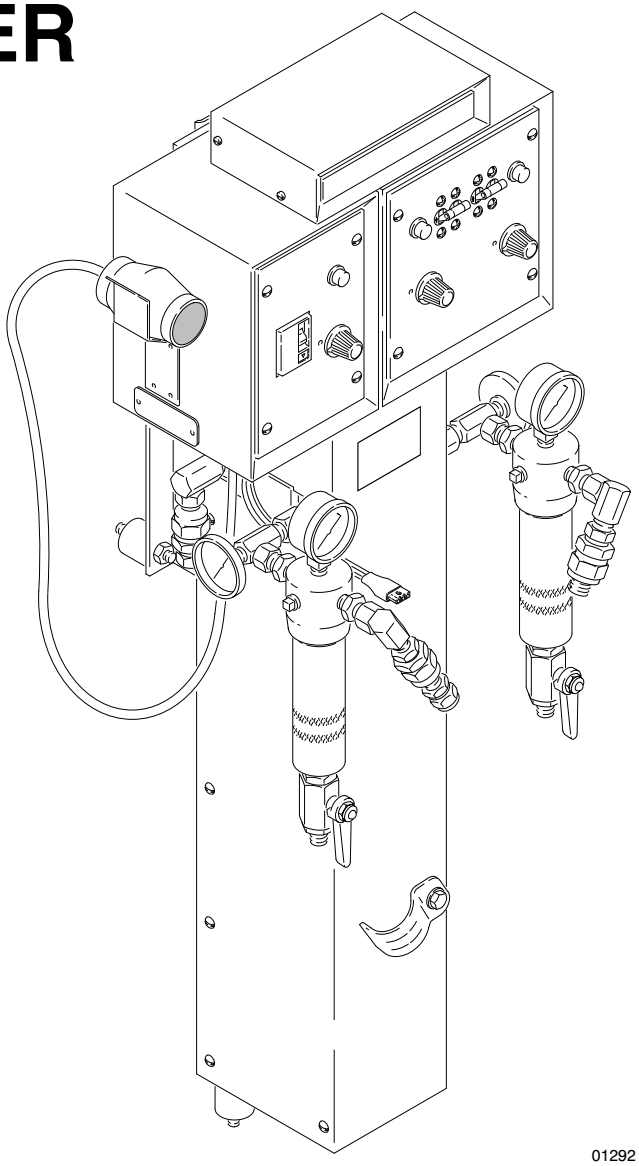
INSTRUCTIONS

FOAM-CAT® HEATER

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 235–259 Series B	With Heated Hose Control 8880 Watt
Model 235–839 Series B	Without Heated Hose Control 5100 Watt

Foam-Cat® 400 30 lb/min

Model 235–260 Series B	With Heated Hose Control 13,980 Watt
Model 235–840 Series B	Without Heated Hose Control 10,200 Watt

⚠ 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 218–613 and 218–614. To reduce the risk of serious injury, never connect other hoses to this heater.

CSA certified for use with 218–613, Series B, and 218–614, Series B, Heated Hoses, and with 218–654 Ambient Temperature Compensator Sensor.

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

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

Graco Inc. is registered to I.S. EN ISO 9001

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 218–613 and 218–614.
- 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.

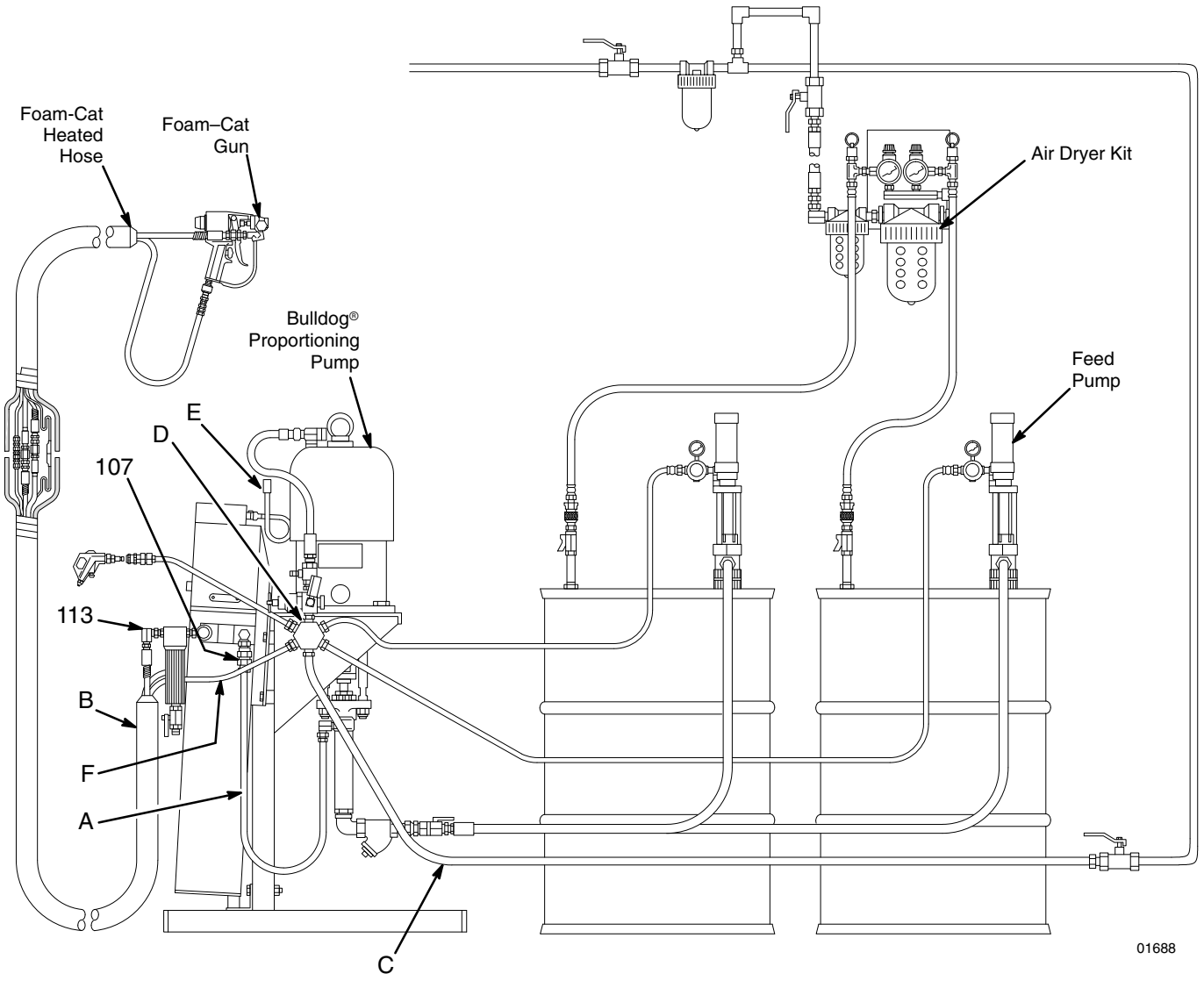
Startup Check List

✓	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 235–260, 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 235–259 and 235–260 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 235–259 and 235–260 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.

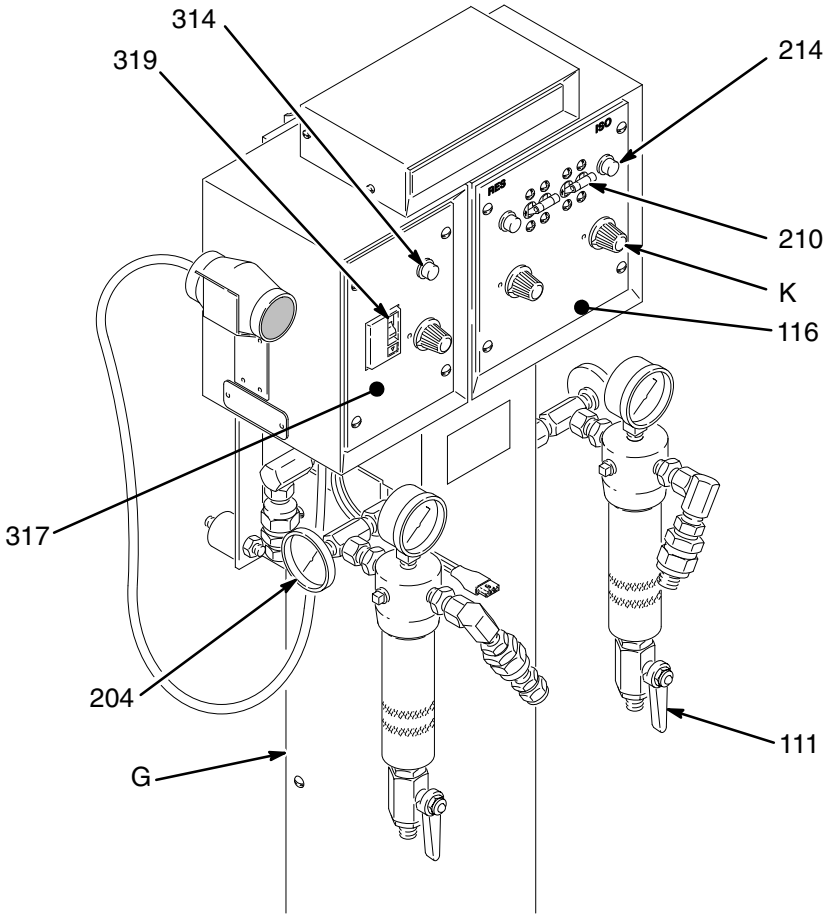


Fig. 2

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, 307–273, 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 218–564. 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.

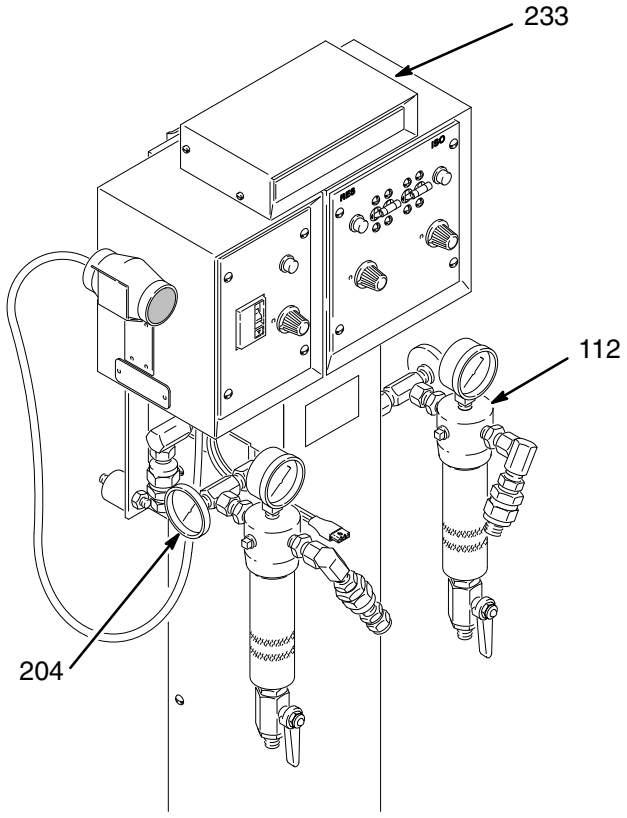


Fig. 3 01294

Installation

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	235–839	NO	5,100	7,650
Foam–Cat 200	YES	235–259	NO	8,880	11,340
Foam–Cat 400	NO	235–840	NO	10,200	15,300
Foam–Cat 400	YES	235–260	NO	13,980	15,300
Foam–Cat 400	YES	235–840	YES	13,980	15,300
Foam–Cat 400	YES	235–260	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. 217–296 (see manual 307–551) or to a wall. A mounting hole diagram is on the back cover of manual 307–551.

⚠ 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 156–173) and plug (P/N 101–754). 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.

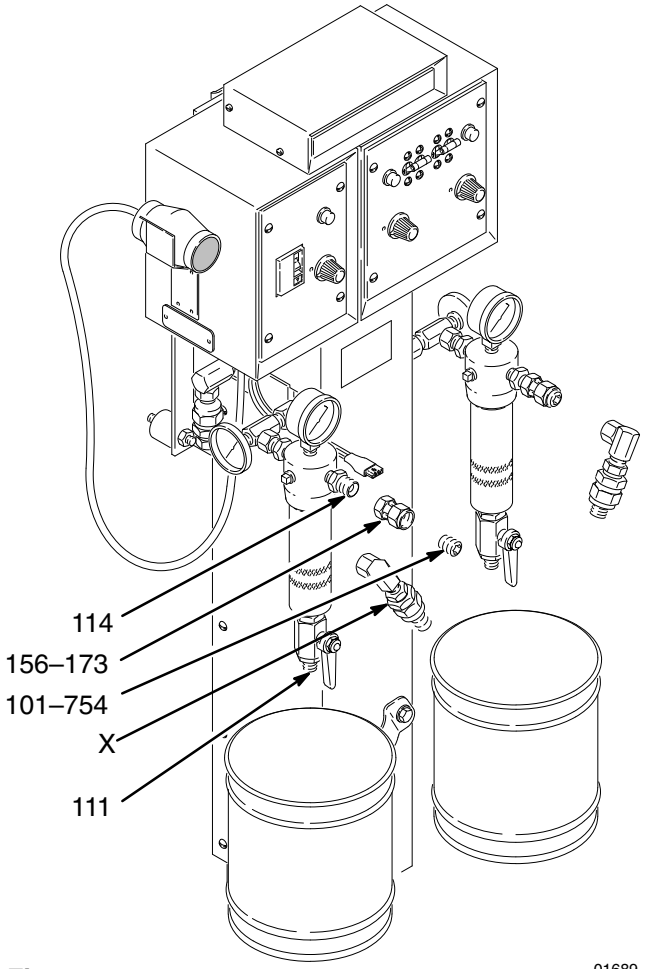


Fig. 4

6. Connect the Electrical Service

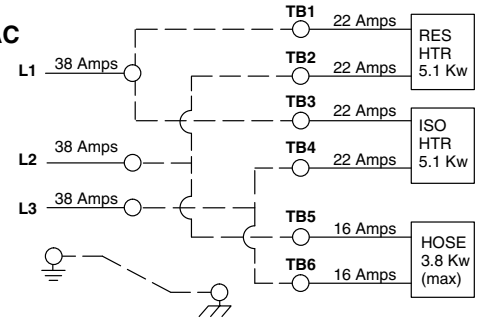
⚠ WARNING

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.

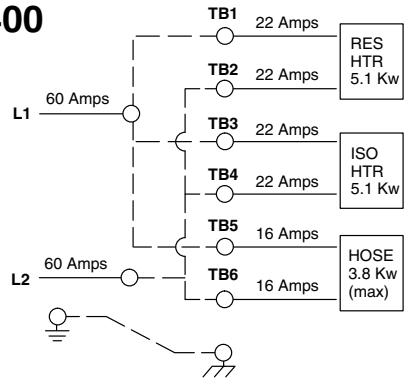
The electrical requirements for the heater and heated hose controls and the wiring diagram are shown on the inside cover of the junction box (233). Wire the heater to your electrical service. Three jumper wires are included.

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

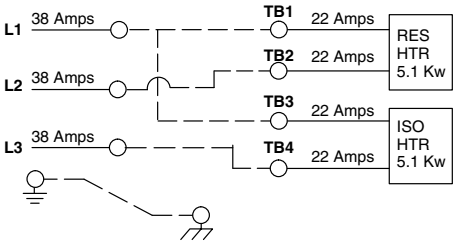
FOAM–CAT 400
Model 235–260
3 phase, 240 VAC



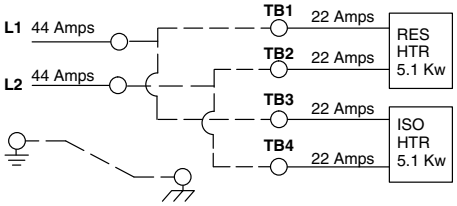
FOAM–CAT 400
Model 235–260
1 phase, 240 VAC



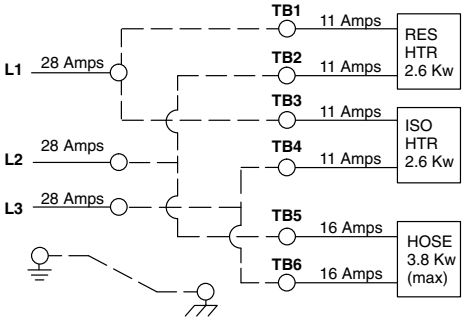
FOAM–CAT 400
Model 235–840
3 phase, 240 VAC



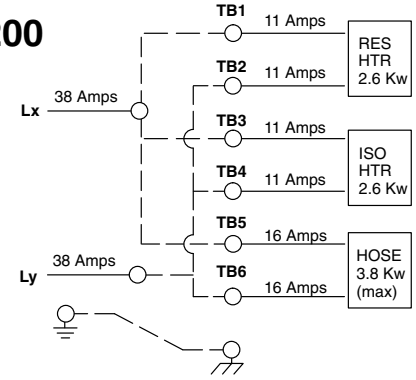
FOAM–CAT 400
Model 235–260
1 phase, 240 VAC



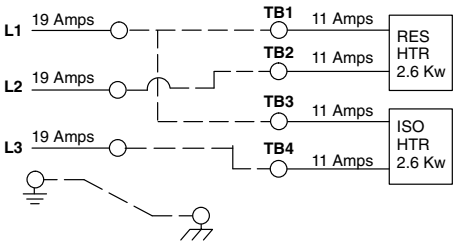
FOAM–CAT 200
Model 235–259
3 phase, 240 VAC



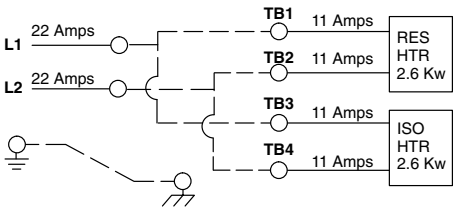
FOAM–CAT 200
Model 235–259
1 phase, 240 VAC



FOAM–CAT 200
Model 235–839
3 phase, 240 VAC



FOAM–CAT 200
Model 235–839
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.

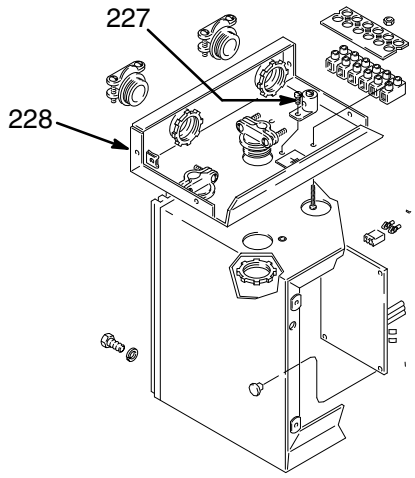


Fig. 5

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, 307–541 or 307–542. 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.

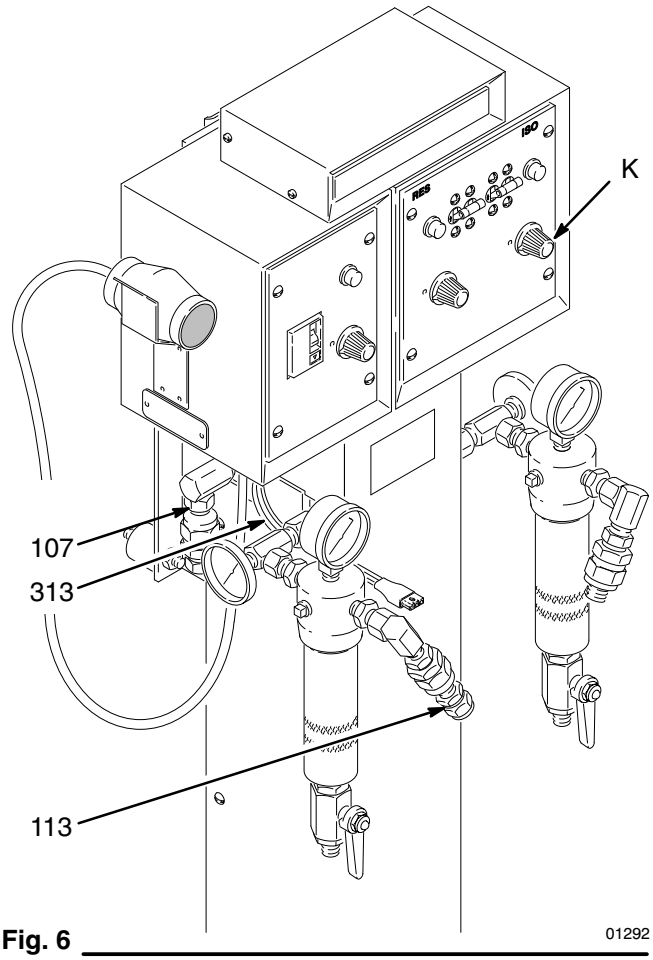


Fig. 6

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 307–544.

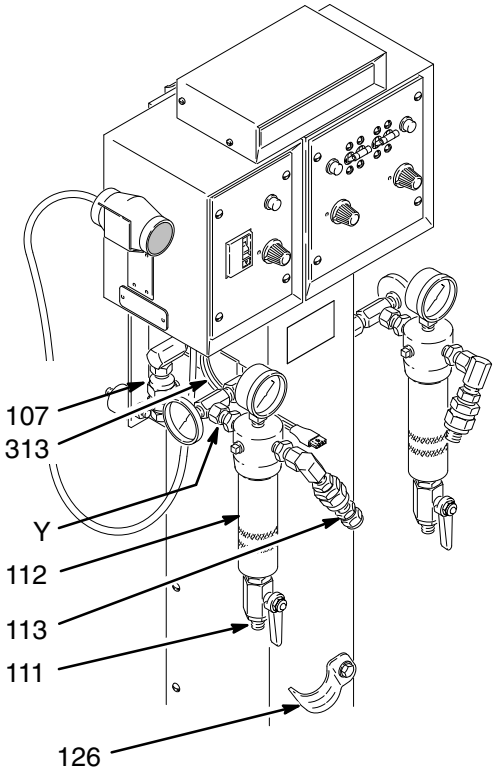


Fig. 7

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.

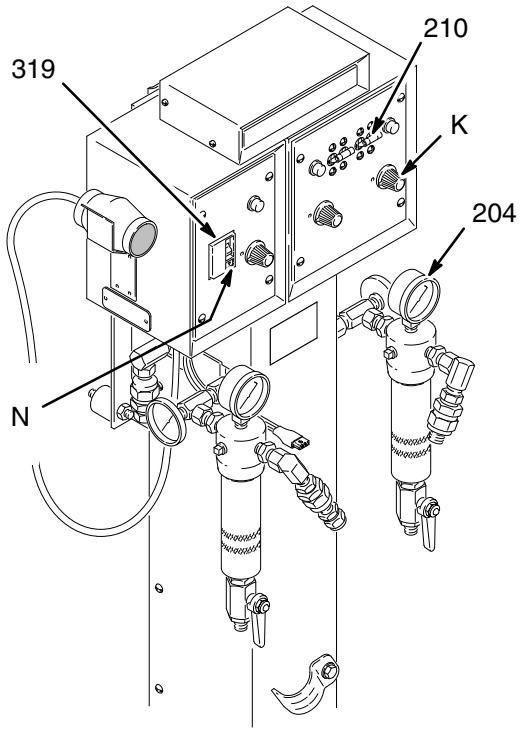


Fig. 8 01691

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.

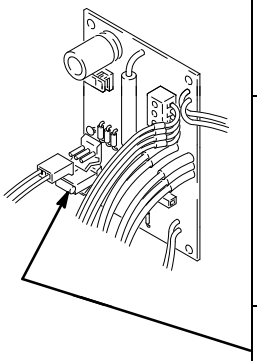
NOTE: Try the recommended solutions in the order given for each problem to avoid unnecessary repairs.

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 307–544.
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 235–260 & 235–840 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 307–546.
	Blocked filters	Check outlet filter (112; also see manual 307–273). Check gun check valve screen. See gun manual 307–546.
	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 110–968 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.

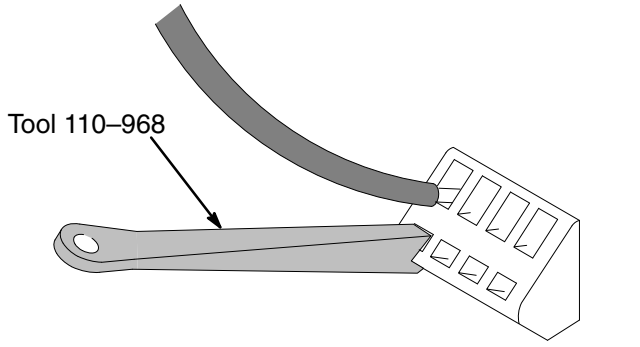


Fig. 9 01698

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.

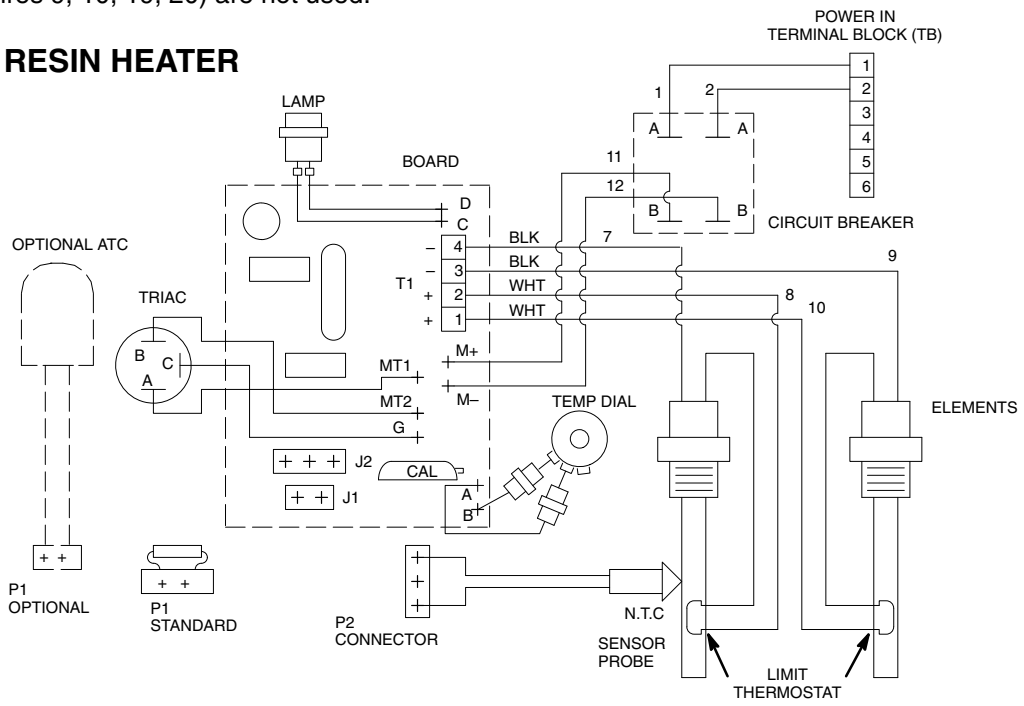
4. If there is no continuity, replace the thermostat. See page 26.

Troubleshooting – Electrical Resistance Checks

Heater Wiring Schematics

Heater No. 235–840 is shown in Fig. 10. The wiring for Heater No. 235–839 is identical *except* the second set of elements (wires 9, 10, 19, 20) are not used.

RESIN HEATER



ISO HEATER

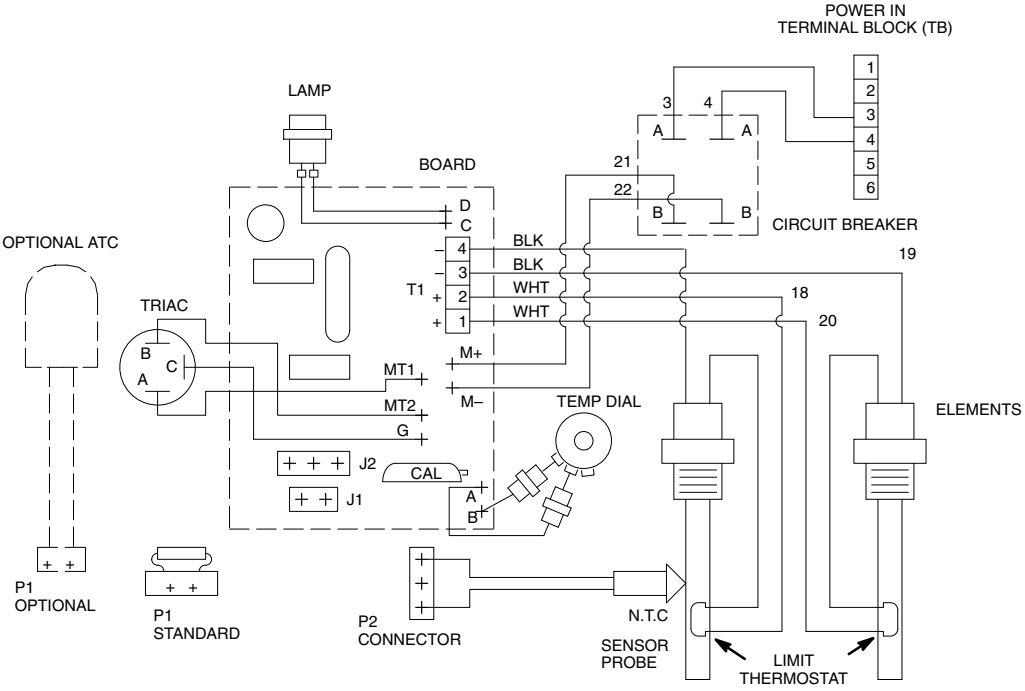


Fig. 10

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
235–260 235–840	30 lb/min (13.5 kg/min)	235–840	7,8,9,10 RES 17,18,91,20 ISO
235–259 235–839	15 lb/min (6.75 kg/min)	235–839	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

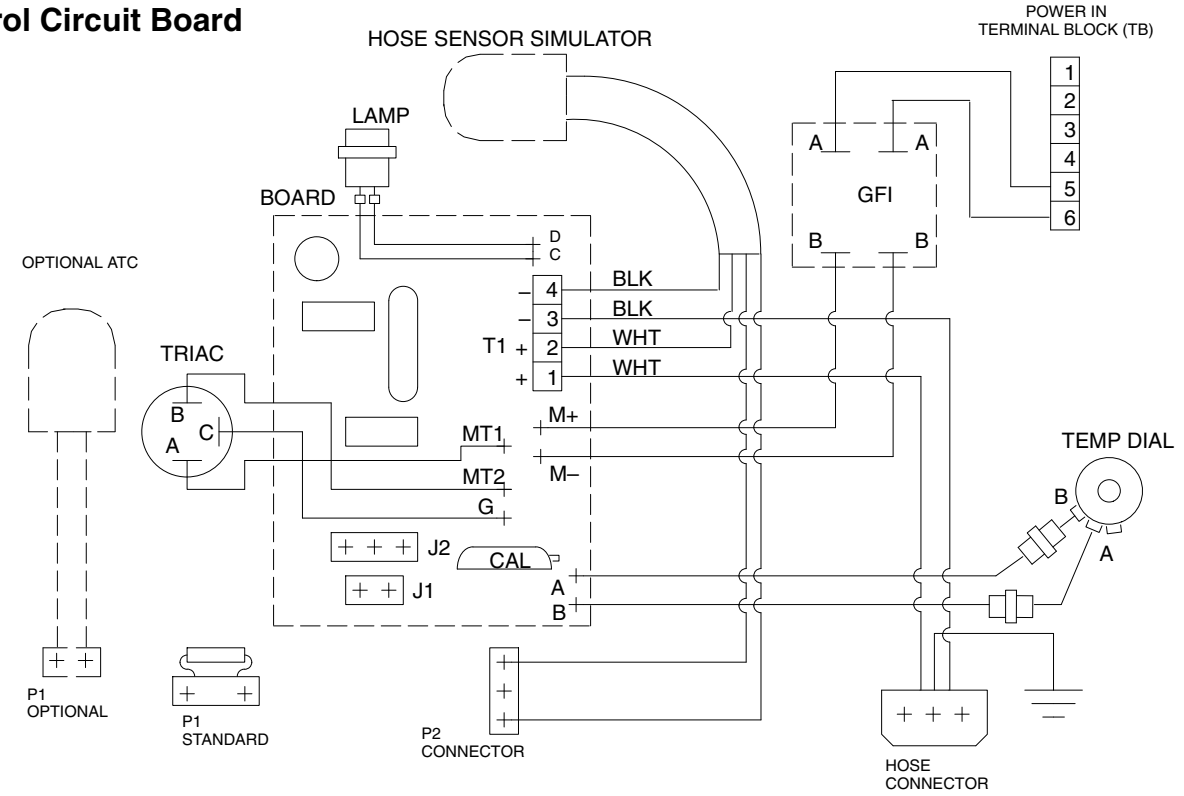


Fig. 11

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.

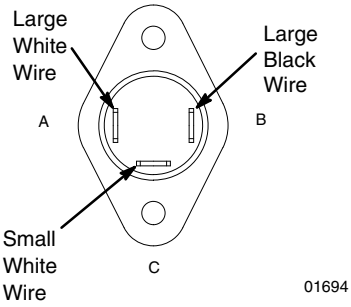
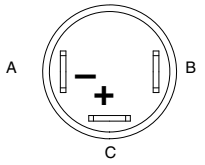
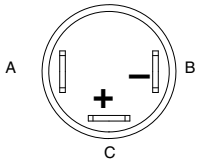
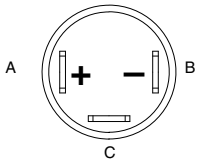
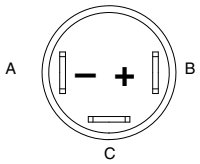
	+ POSITIVE METER LEAD TO PIN	– NEGATIVE LEAD TO PIN	CORRECT READING	OHMMETER SETTING
	**C**	**A**	0–100 ohms	200 ohms
	**C**	**B**	Infinity	200K ohms
	**A**	**B**	Infinity	200K ohms
	**B**	**A**	Infinity	200K ohms

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 110–009) 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.

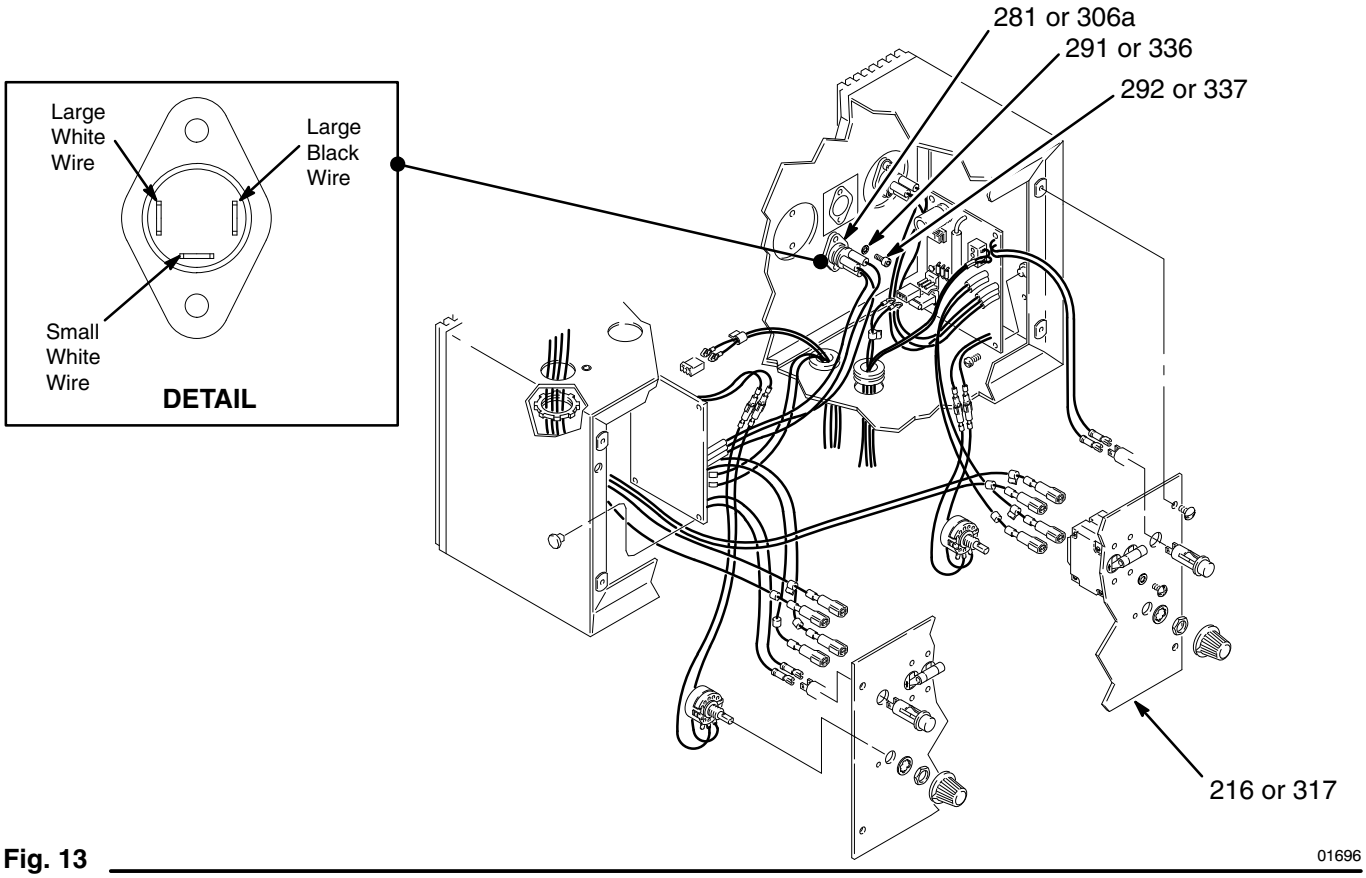


Fig. 13

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 110–009) 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).

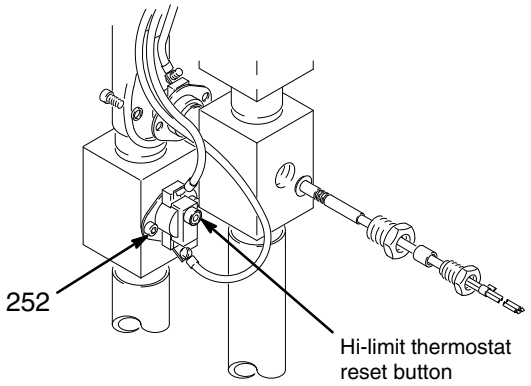


Fig. 14

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 220–650.

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.

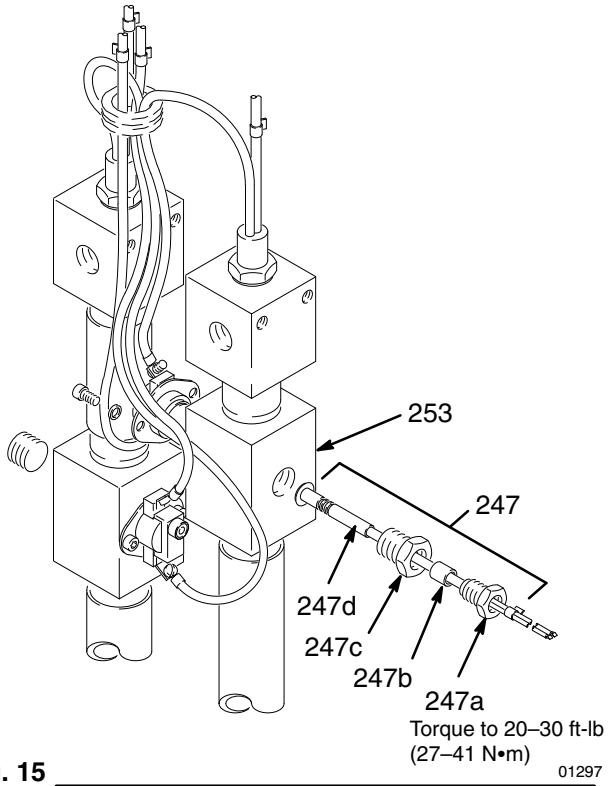


Fig. 15

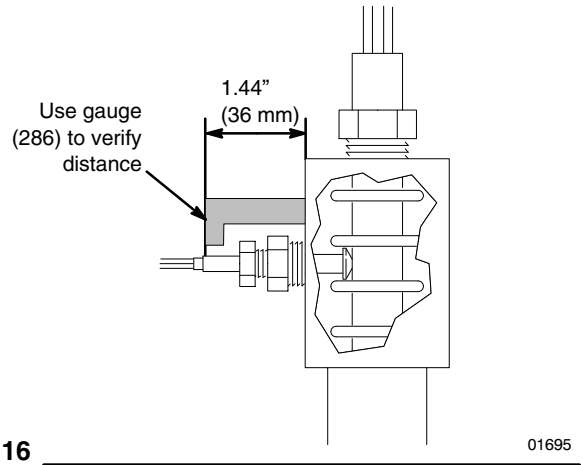


Fig. 16

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.

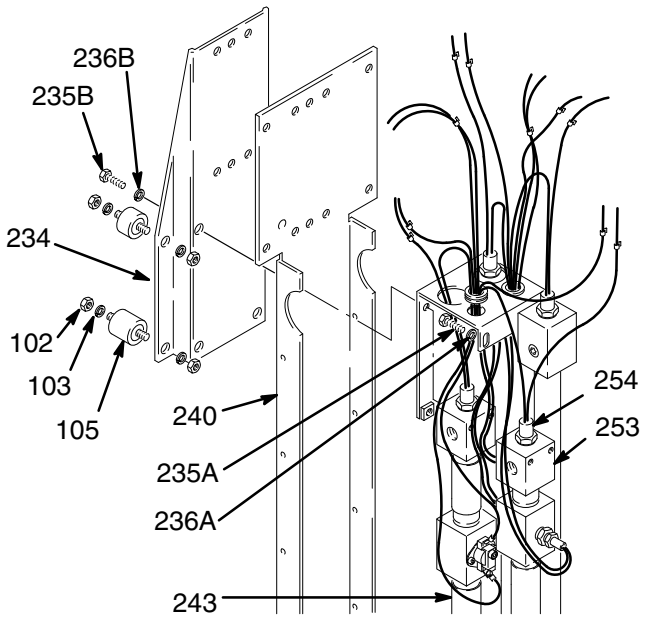


Fig. 17 01296

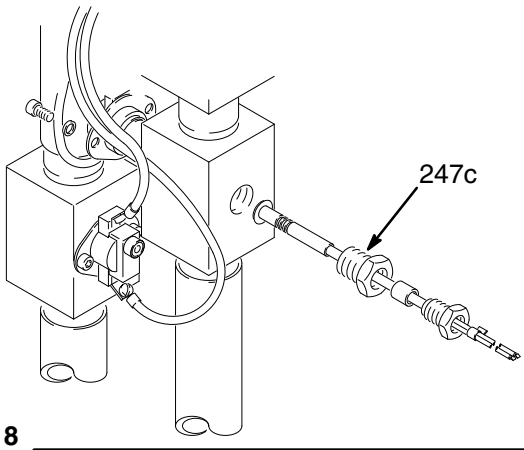


Fig. 18 01692

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. 235–840 is shown in Fig. 19. The wiring for Heater No. 235–839 is identical *except* the second set of elements (wires 9, 10, 19, 20) are not used.

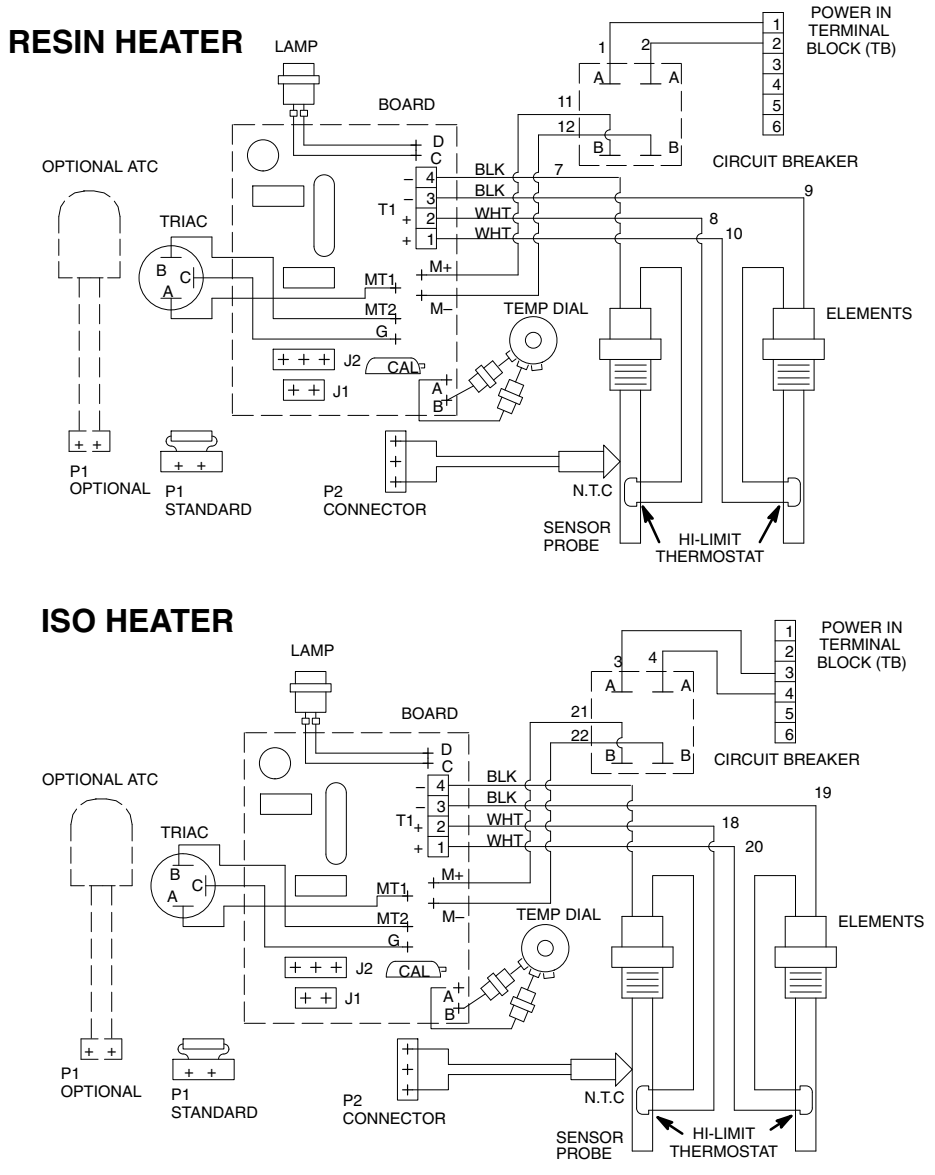


Fig. 19

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 235–255.

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).

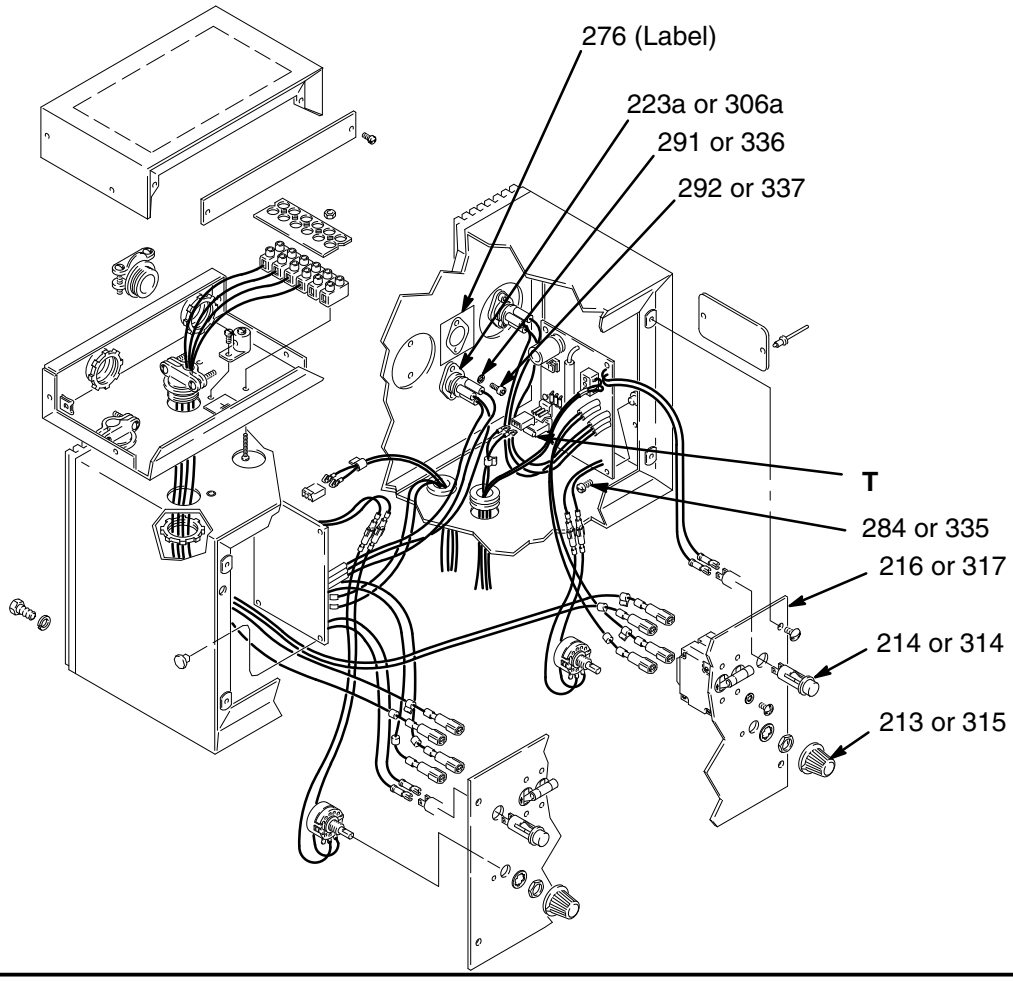


Fig. 20

Service – Circuit Board

Reassembly

1. Apply conductive paste (Graco P/N 110–009) 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.

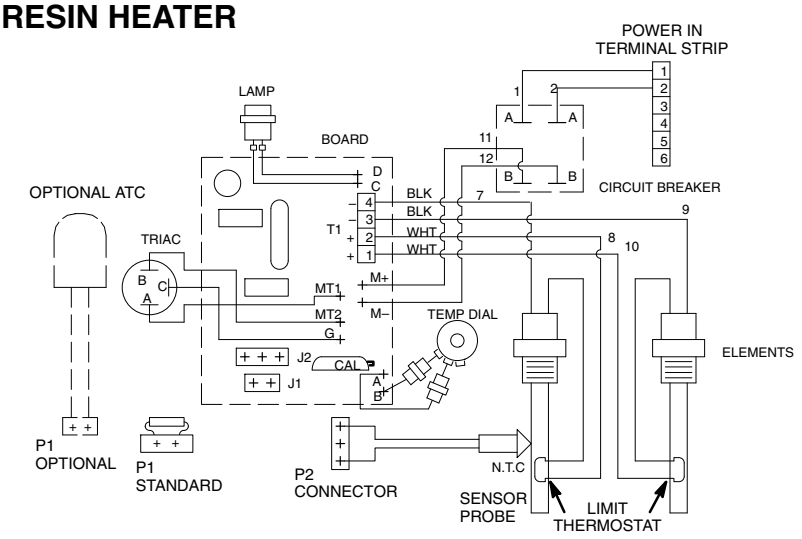
8. Plug the sensor probe connector P2 into the circuit board at position J2. See Fig. 20 and 21.

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

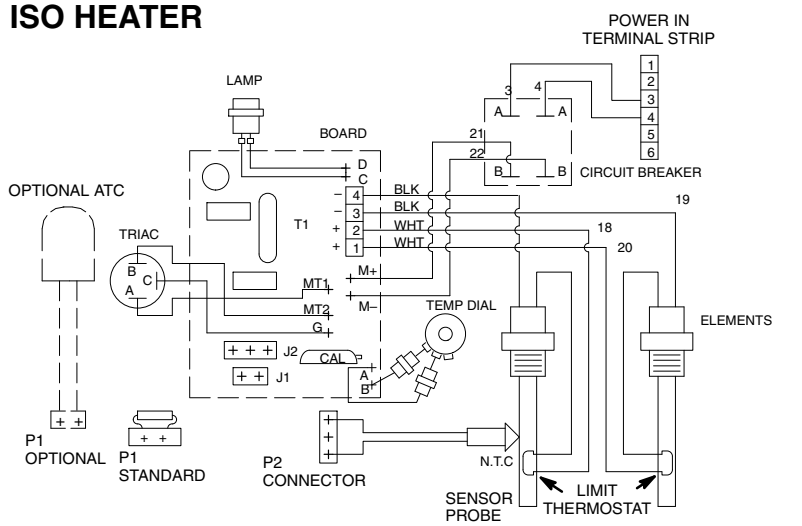
Wiring Schematics

Heater No. 235–840 is shown in Fig. 21. The wiring for Heater No. 235–839 is identical *except* the second set of elements (wires 9, 10, 19, 20) are not used.

RESIN HEATER



ISO HEATER



HOSE HEATER

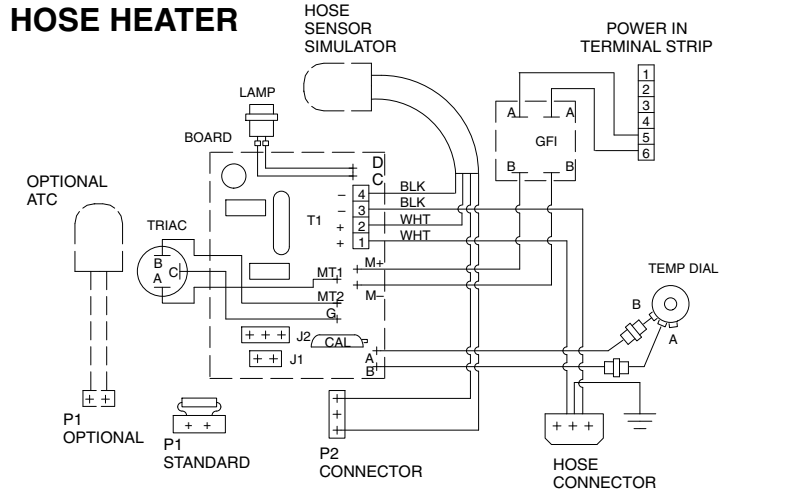


Fig. 21

Service – Calibrating the Controls

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).

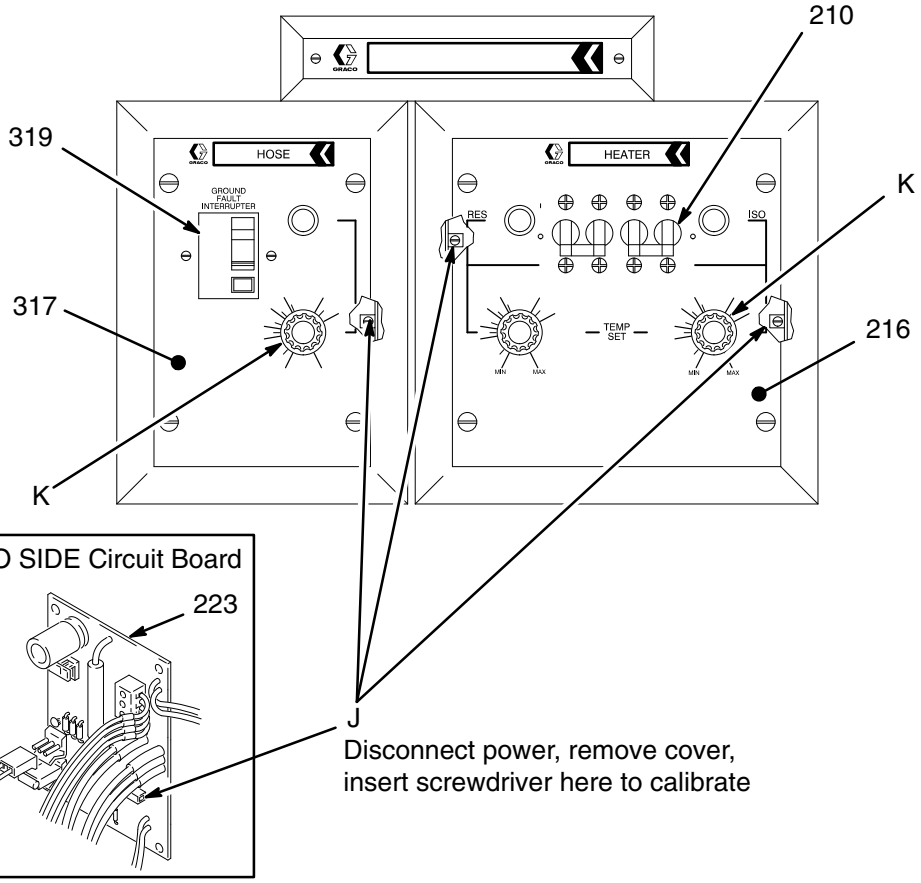
   d. Insert a small screwdriver into the calibrate resistor (J) and adjust as follows:

      (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 218–655.

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 218–613, 218–614, 947–514, 947–515 and 948–723) 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.

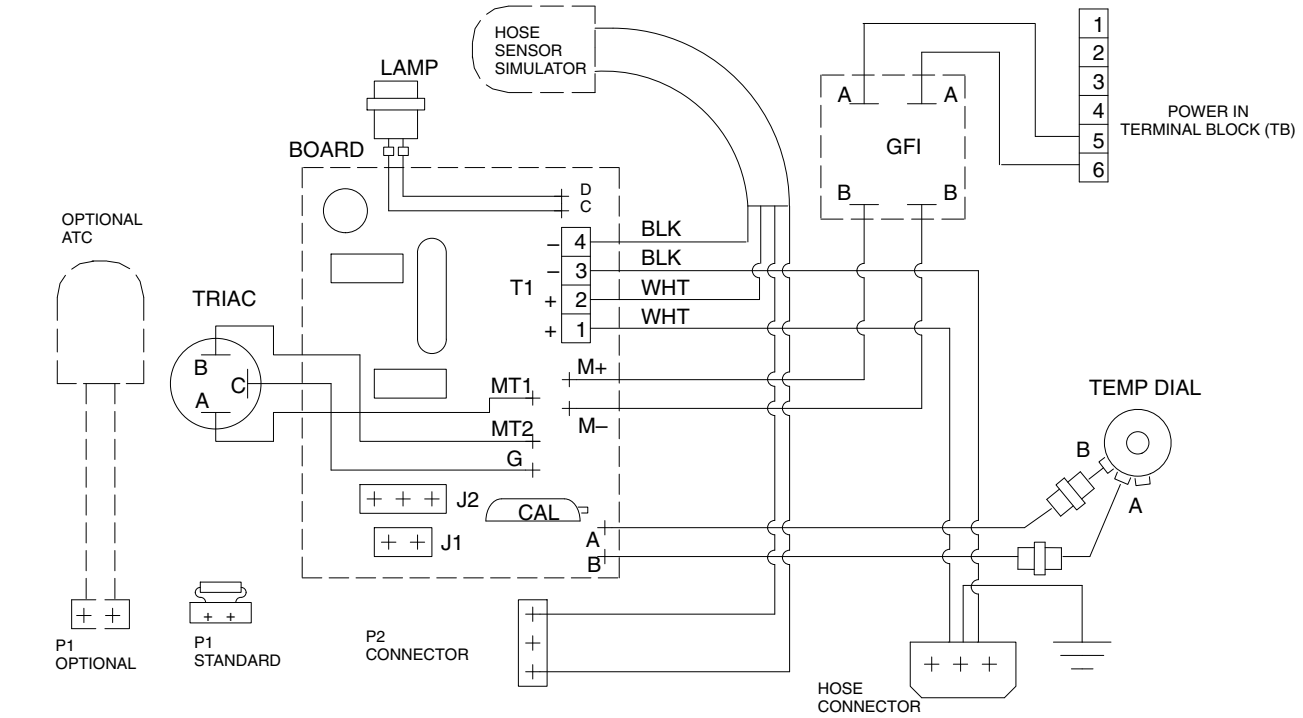
   Insert two connectors (P1) of the ATC sensor through the cable clamp (207) that holds the junction box (228) to the heater control box (224).

   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



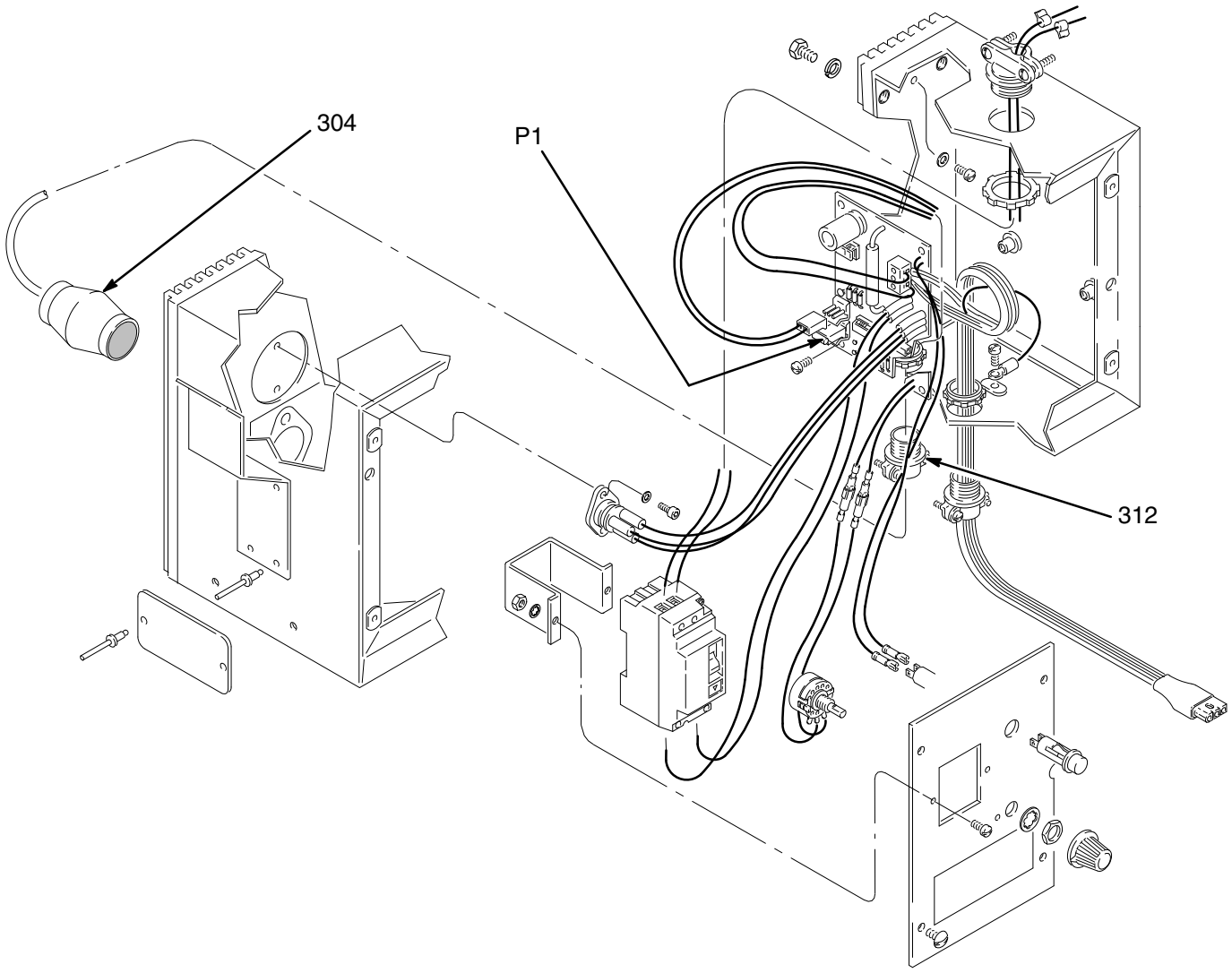
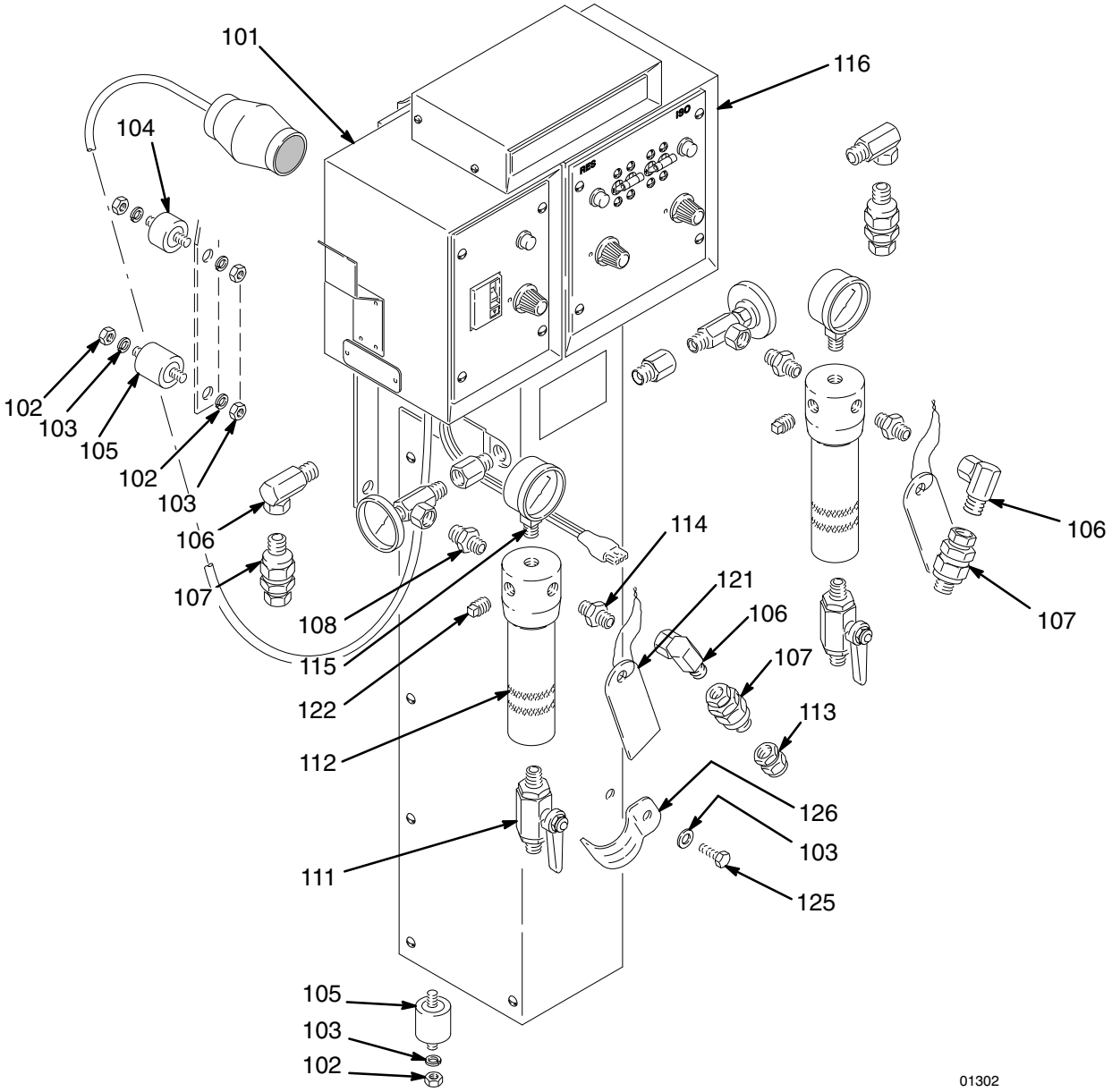


Fig. 23

01309

Parts – Heater Assembly

235–259 Foam-Cat Heater, 15 lb/min (6.75 kg/min)
235–260 Foam-Cat Heater, 30 lb/min (13.5 kg/min)



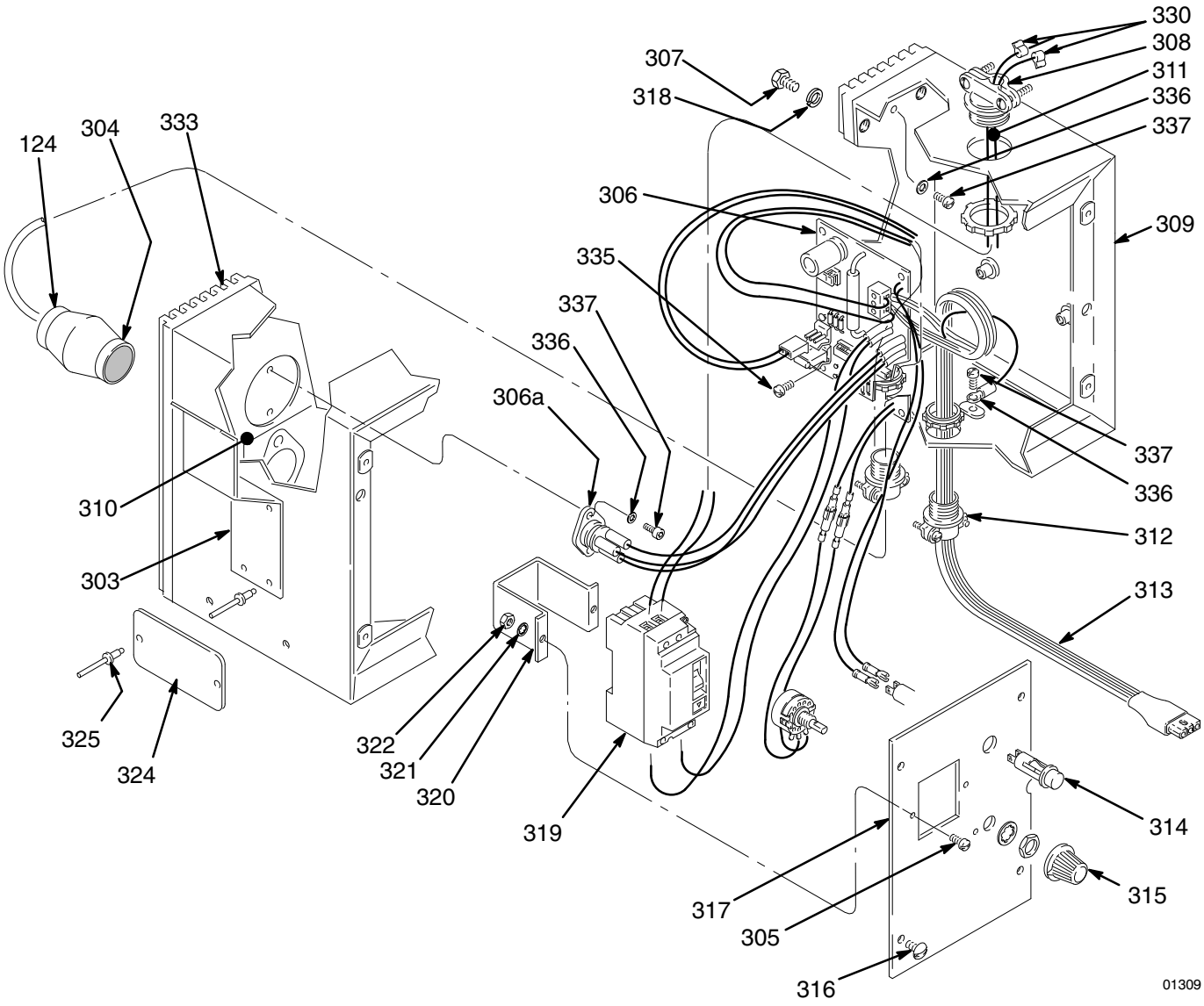
Ref No.	Part No.	Description	Qty
101	235–256	CONTROL, heated hose	1
102	100–188	NUT, heavy, hex, 5/16”	10
103	100–214	LOCKWASHER	11
104	106–515	MOUNT, cylindrical; 5/16–18 x 0.75”	2
105	106–516	MOUNT, cylindrical; 5/16–18 x 1.25”	4
106	155–494	UNION, swivel, 90°, 3/8 npt swivel x 3/8 npt(f)	4
107	206–831	CHECK VALVE, 3/8 npsm swivel x 3/8 npt(m)	4
108	168–696	NIPPLE, adapter, 3/8 npsm x 3/8 npt(f)	2
110	215–623	BALL VALVE, 3/8 npt(mbe)	2
111	178–747	LEVER, valve	2
112	218–029	FLUID FILTER; see 307–273 for parts	2
113	156–173	UNION, swivel, 3/8 npt(f) x 3/8 npsm	1
114	157–350	ADAPTER, 3/8 npt x 1/4 npt(mbe)	2

Ref No.	Part No.	Description	Qty
115	102–814	GAUGE, pressure, fluid; 0–3000 psi (0–20.7 MPa, 0–207 bar) range	2
116		FOAM HEATER	
	235–257	15 lb/min (6.75 kg/min); for Model 235–259	1
	235–258	30 lb/min (13.5 kg/min); for Model 235–260	1
118	162–453	NIPPLE, 1/4 npsm x 1/4 npt(f)	1
121	179–789	TAG	2
122	100–509	PLUG	2
124	054–174	TUBING, shrink	6 ft.
125	100–538	CAPSCREW	1
126	108–191	CLAMP, conduit	1
127	188–065	GAUGE, probe (not shown)	1

Parts – Heated Hose Control

235–256 Foam-Cat Heated Hose Control

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

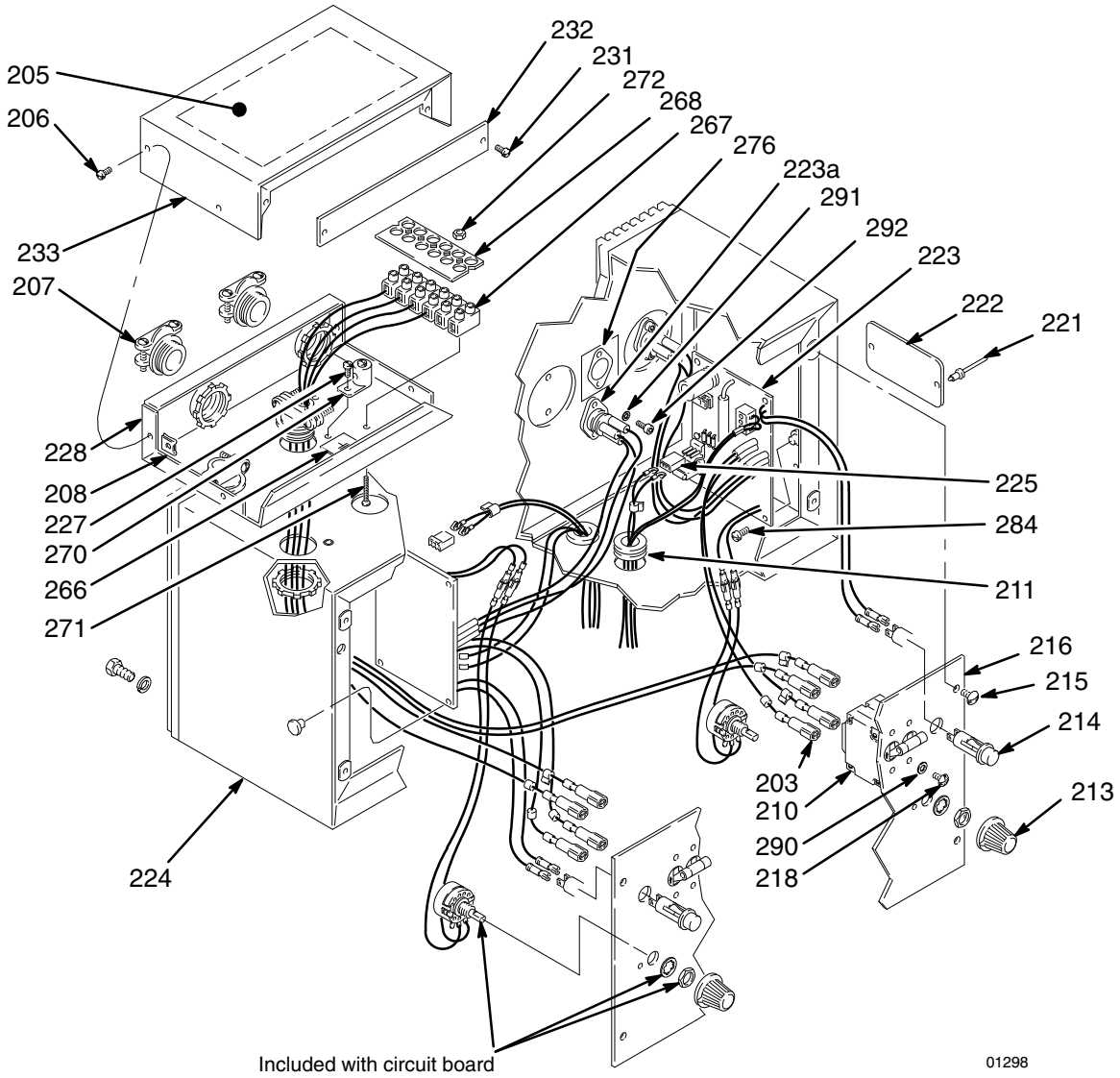


Ref No.	Part No.	Description	Qty
303	188–168	CLAMP, component	1
304	218–655	SENSOR, hose simulator	1
305	100–903	SCREW, pnh, 8–32 x 1/2”	2
306	235–255	CIRCUIT BOARD,	
		includes item 306a	1
306a	106–594	.TRIAC	1
307	100–642	CAPSCREW	4
308	101–662	CONNECTOR, cable clamp	1
309	235–253	CONTROL BOX, heated hose	1
310	188–053	LABEL, instruction	1
311	065–278	COPPER WIRE, 14 AWG	24 in.
312	105–362	CLAMP, cable	2
313	217–384	CABLE, power	1
314	104–340	LAMP, indicating	1
315	103–083	KNOB, selector	1
316	100–710	SCREW, 10–24 x 3/8”	4

Ref No.	Part No.	Description	Qty
317	188–060	PANEL, control	1
318	100–016	LOCKWASHER	4
319	106–490	CIRCUIT BREAKER, 125–240V, 16 amp	1
320	178–486	BRACKET, mounting	1
321	157–021	LOCKWASHER, internal	2
322	100–284	NUT, hex, 8–32 x 0.130	2
324	180–254	PLATE, designation, 50/60 cycle	1
325	102–472	RIVET, blind	6
330	104–615	LABEL, designation, electrical	1
333	188–063	HEAT SINK	1
335	110–891	THUMBSCREW nylon, 10–24 x 3/8”	4
336	100–272	LOCKWASHER	7
337	102–410	CAPSCREW, sch, 6–32 x 3/8”	7
338	110–890	TOOL, allen wrench (not shown)	1

Parts – Heater

235–839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235–840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



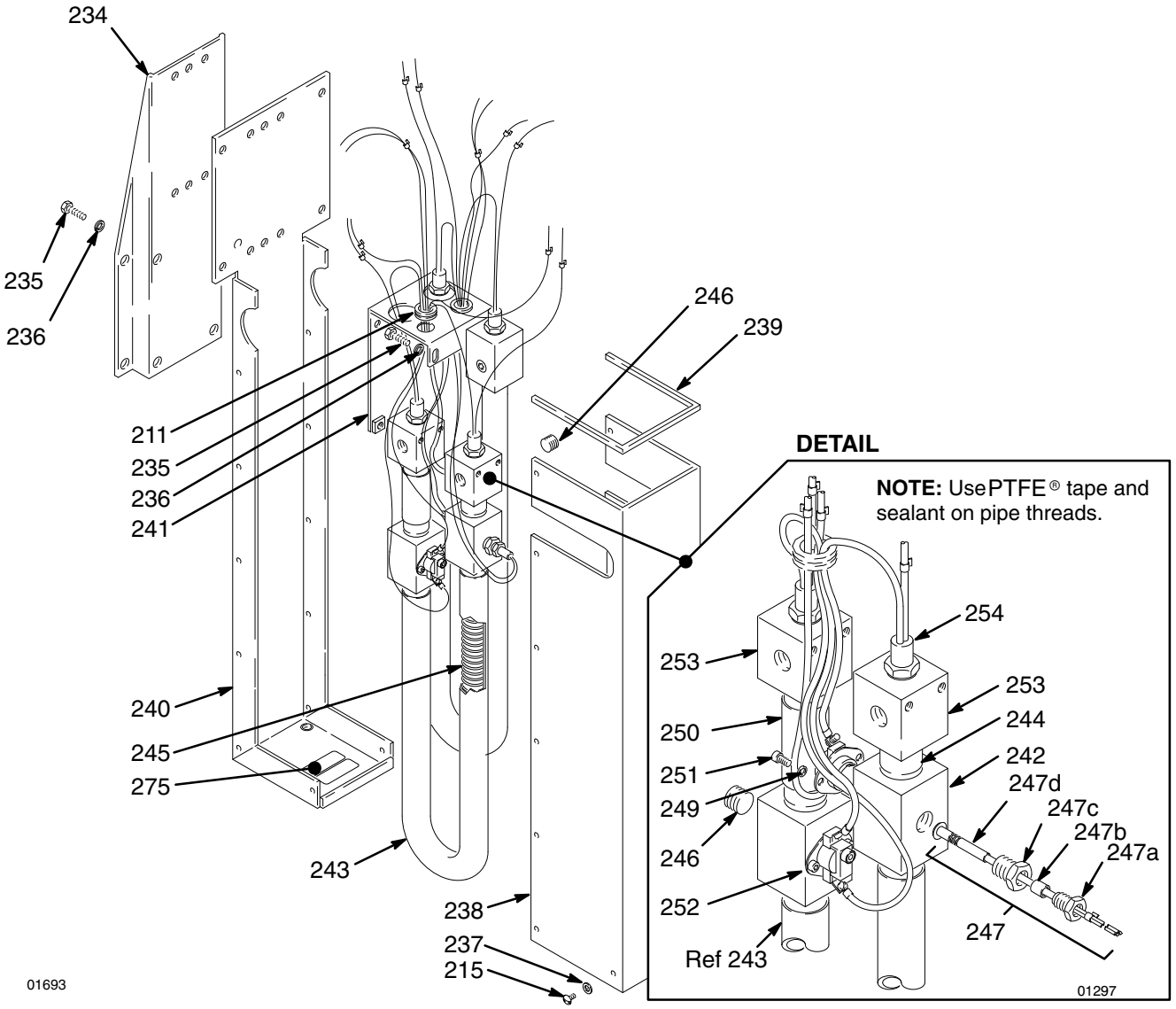
NOTE: For additional parts of Heater, see pages 39 and 40.

Ref No.	Part No.	Description	Qty
203	105–768	CONNECTOR	8
205	178–527	LABEL, wiring diagram	1
206	100–518	SCREW, panhd, 6–32 x 3/8”	8
207	101–662	CONNECTOR, cable clamp	4
208	104–620	NUT, self retaining, No. 6–32	4
210	111–757	CIRCUIT BREAKER, 250V, 50–60 Hz, 30 amp	2
211	101–765	GROMMET, buna–s	6
213	103–083	KNOB, selector	2
214	104–340	LAMP, indicating	2
215	100–710	SCREW, 10–24 x 3/8”	18
216	188–056	COVER, heater control panel	1
218	103–854	SCREW, bdgh, 6–32 x 1/4”	8
221	102–556	RIVET, blind	2
222	180–254	PLATE, serial, 240 V	1
223	235–255	CIRCUIT BOARD, includes item 223a	2
223a	106–594	.TRIAC	2
224	217–240	CONTROL BOX, foam heater	1

Ref No.	Part No.	Description	Qty
225	106–501	CONNECTOR, electrical	2
227	100–700	SCREW, pnh, 4–40 x 1”	1
228	178–289	BASE, junction box	1
231	100–979	SCREW, 10–24 x 5/8”	2
232	178–602	PLATE, identification	1
233	178–467	COVER, junction box	1
266	172–953	LABEL, designation, ground	1
267	108–033	STRIP, terminal	1
268	108–032	MARKER, terminal strip	1
269	101–674	TERMINAL, 16–14 AWG	8
270	107–154	LUG, grounding	1
271	105–656	SCREW, filh, 6–32 x 1.0”	2
272	100–072	NUT, hex, no. 6–32	2
276	188–053	LABEL, triac	1
284	110–891	THUMBSCREW nylon, 10–24 x 3/8”	8
290	103–836	SCREW, bdgh, 10–32 x 3/4”	1
291	100–272	LOCKWASHER, No. 6	16
292	102–410	CAPSCREW, sch, 6–32 x 3/8”	8
293	110–890	TOOL, allen wrench, (not shown)	1

Parts – Heater

235–839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235–840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



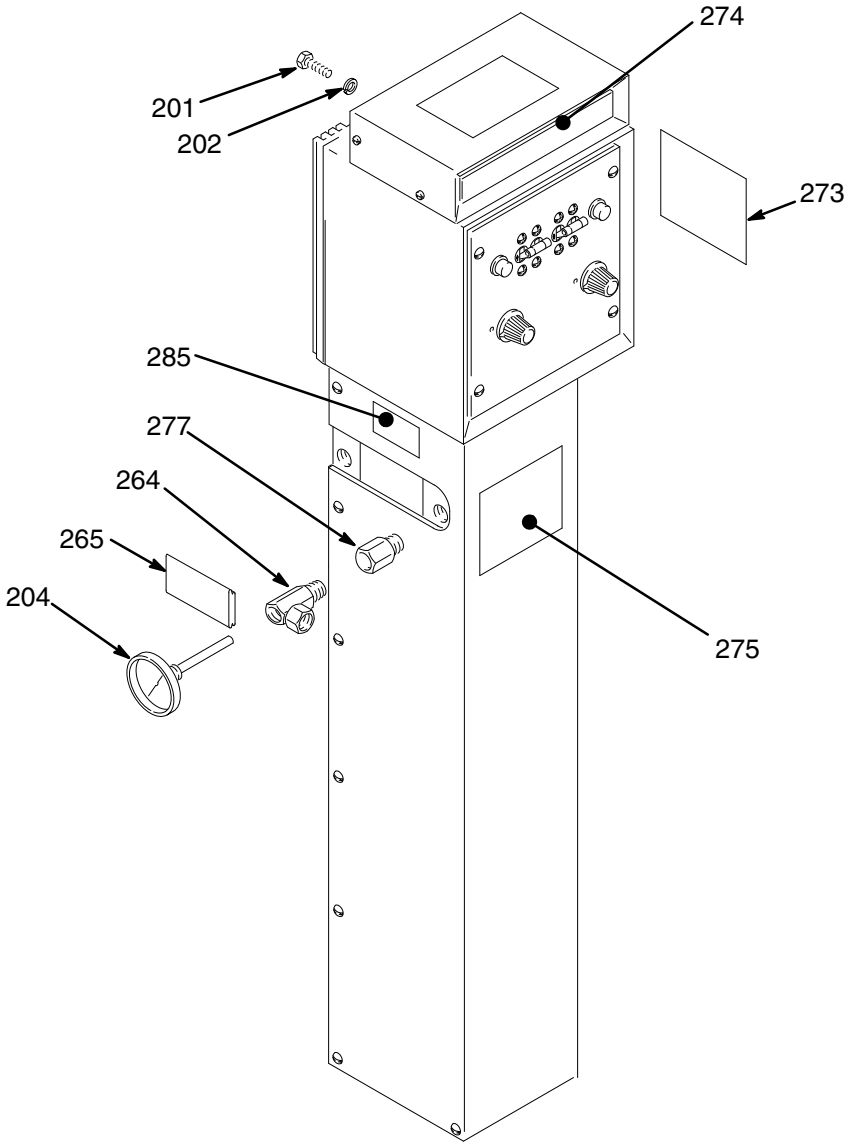
NOTE: For additional heater parts, see pages 38 and 40.

Ref No.	Part No.	Description	Qty
229	103–711	CONNECTOR, wire	0 or 3
234	178–274	BRACKET, mounting	1
235	100–001	CAPSCREW, hex hd, 5/16–18 x 5/8”	6
236	100–214	LOCKWASHER, .583	6
237	100–718	LOCKWASHER, No. 10	14
238	188–057	SHROUD, front heating element	1
239	062–035	MOLDING	14 in.
240	217–237	PANEL, rear enclosure	1
241	217–239	BRACKET, manifold	1
242	188–058	MANIFOLD, probe/thermostat	4
243	188–064	U–TUBE, fluid	2
244	188–054	NIPPLE, 2.8”	2
245	217–236	COIL, heater element	2 or 4
246	101–754	PLUG, pipe, 3/8 npt	6

Ref No.	Part No.	Description	Qty
247	220–650	PROBE REPLACEMENT KIT *Includes items 247a – 247d*	1
247a	178–282	NUT, packing	2 or 1
247b	178–276	SEAL, probe	2 or 1
247c	178–279	ADAPTER, thermistor	1
247d	235–254	PROBE, sensor, thermistor	1
249	103–229	CAPSCREW. sch, 8–32 x 3/8”	4 or 8
250	188–055	NIPPLE	2
251	100–079	LOCKWASHER, No. 8	8
252	111–759	THERMOSTAT *normally closed*	2 or 4
253	188–059	MANIFOLD, outlet heater	4
254	178–483	ELEMENT HEATER, immersion, SST, 240 VAC, 2550 Watts	2 or 4
258	106–535	MARKER, wire, designation	1
275▲	179–788	LABEL, warning	1
279	180–255	LABEL, instruction	1
286	188–065	GAUGE, probe (not shown)	1

Parts – Heater

235–839 Foam-Cat Heater Assembly, 15 lb/min (6.75 kg/min)
235–840 Foam-Cat Heater Assembly, 30 lb/min (13.5 kg/min)



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

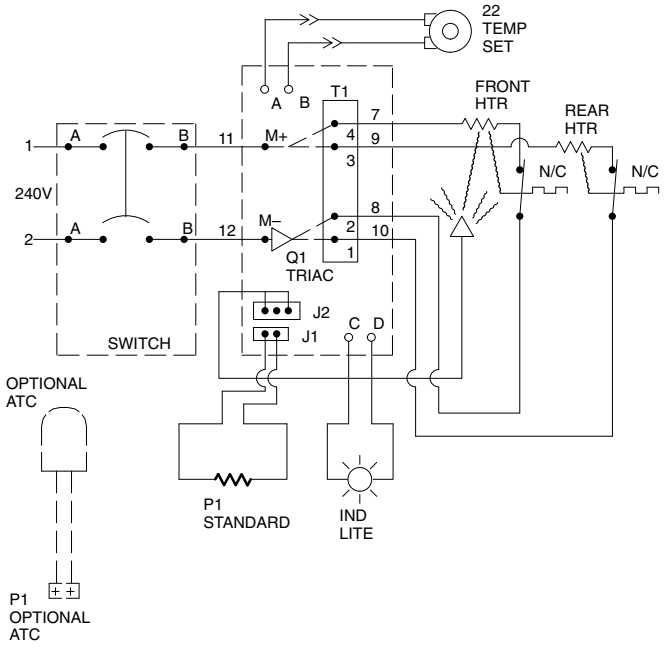
Ref No.	Part No.	Description	Qty
201	100–642	CAPSCREW, hex hd; 1/4–20 x 1-1/4"	4
202	100–016	LOCKWASHER	4
204	102–124	THERMOMETER, dial, 50–250° F (10–120° C) range	2
264	178–825	UNION, 90°, 1/4–18 (F) x 3/8–18(m) x 3/8 (F) swivel	2
265	178–849	INSERT, slot	2
273▲	179–786	LABEL, warning	1
274▲	179–787	LABEL, warning	1
275▲	179–788	LABEL, warning	1
277	150–286	ADAPTER, male to female, 3/8 npt	2
285	178–600	LABEL, instruction	1

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

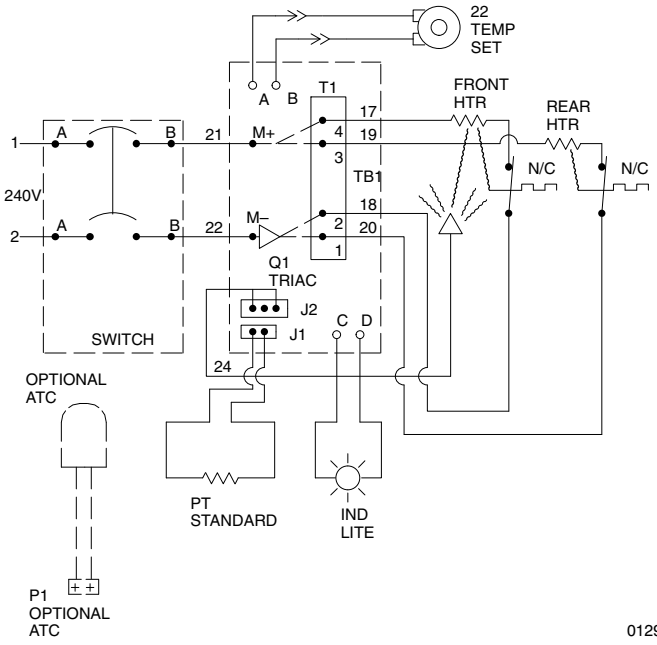
Electrical Schematics

Model 235–840

RESIN HEATER



ISO HEATER



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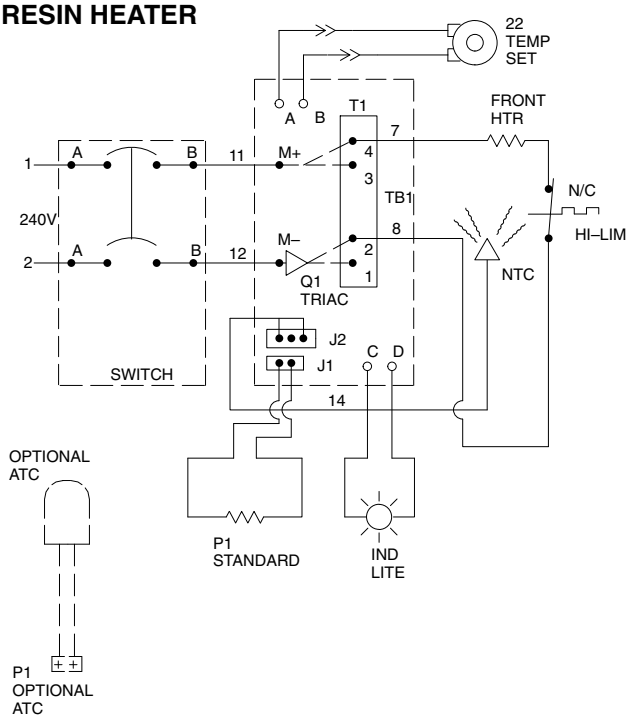
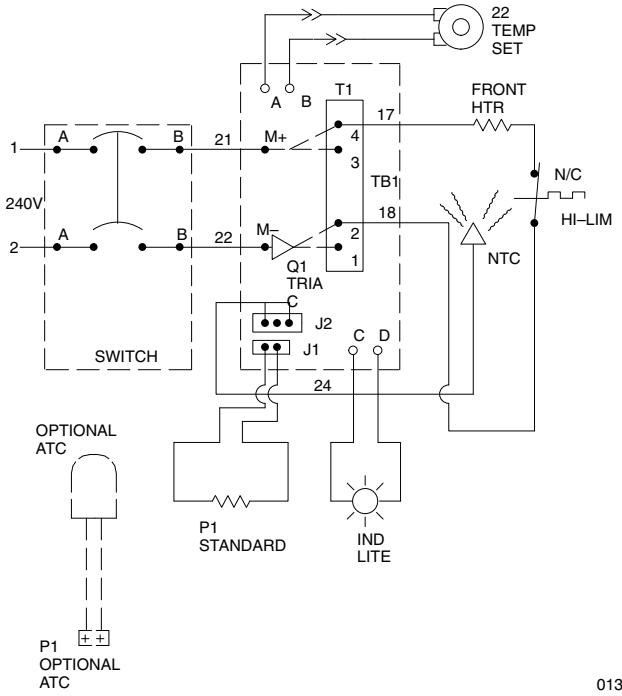
Model 235–839

RESIN HEATER



ISO HEATER



01300

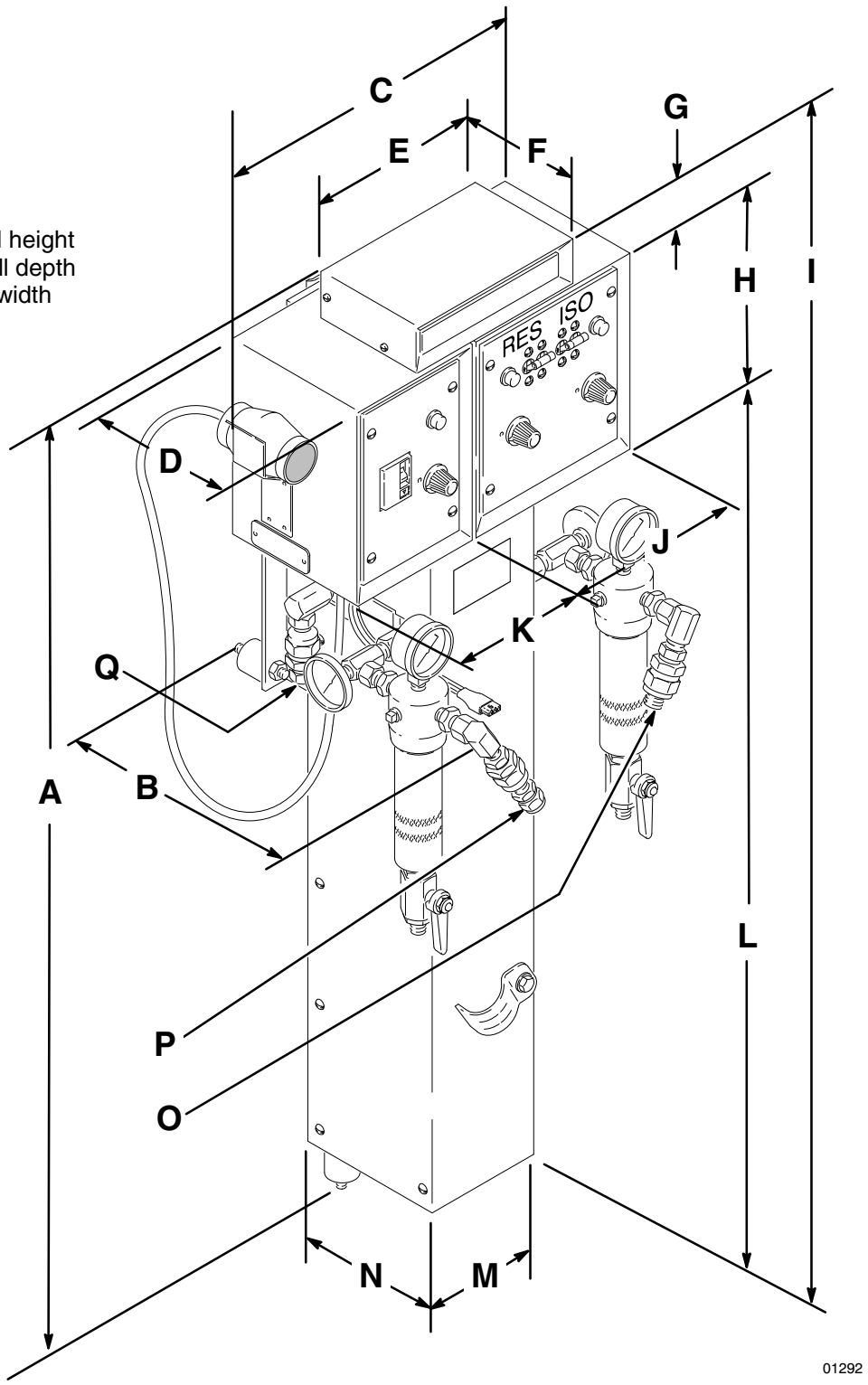
Dimensions

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 235–260)



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 235–839 . . . . . 7 psi pressure drop/gpm tested with 55 centipoise oil
Model 235–840 . . . . . 14 psi pressure drop/gpm tested with 55 centipoise oil
Approximate Temperature Rise Capabilities
Model 235–839 . . . . . 70° to 120°F at 1.5 gpm of oil (31° to 49°C at 5.7 l/min of oil)
Model 235–840 . . . . . 70° to 120°F at 3.0 gpm of oil (31° to 49°C at 11.4 l/min of oil)
Electrical Requirements
Model 235–839 . . . . . 8880 watt, 240 volt
Model 235–260 . . . . . 13,980 watt, 240 volt
Model 235–839 . . . . . 5100 watt, 240 volt
Model 235–840 . . . . . 10,200 watt, 240 volt
Maximum Fault Temperature
NEC T2C Standard . . . . . 446°F (230°C)

Accessories

218–654 Ambient Temperature Compensator See page 34.
110–009 Conductive Paste
217–296 Pump Stand
110–968 Terminal Block Tool

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

218–613 50 ft. (15.2 m) long
218–614 15 ft. (4.6 m) long
948–723 25 ft. (7.6 m) long

Manual Change Summary

Updated manual to new warning template.

Graco Warranty and Limitation of Liability

WARRANTY

Graco warrants all equipment listed in this manual which is 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. 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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Graco Phone Number

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**

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Foreign Offices: Belgium, Canada, England, Korea, Switzerland, France, Germany, Hong Kong, Japan

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