

Instructions – Parts List



20 LITER (5 GALLON) PAIL SIZE
76 MM (3 IN.) DUAL POST, HEATED

Therm-O-Flow® 5 & Mini-5™

Air-Powered Ram Heated Pail Unloaders

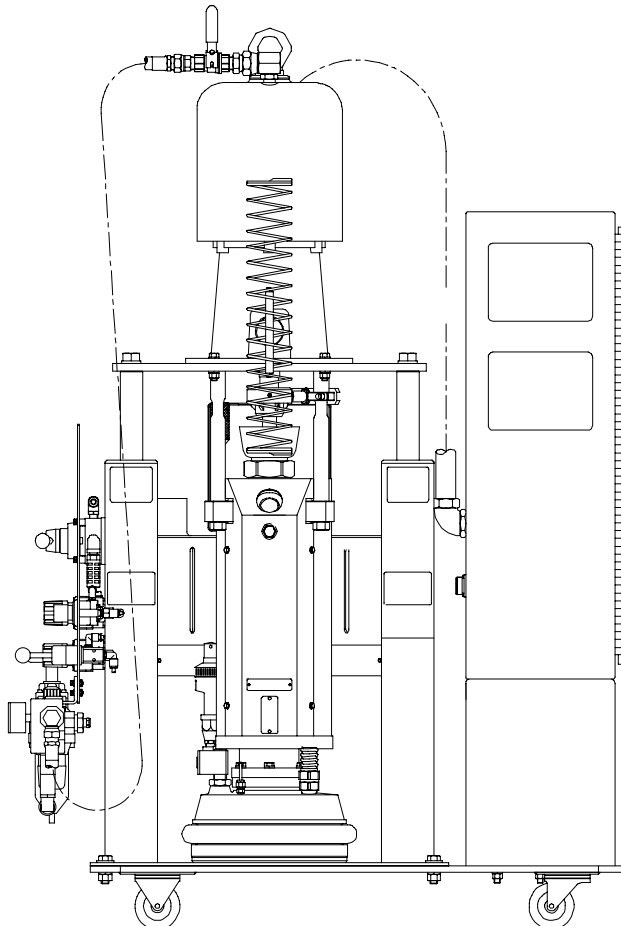
310528 rev.J



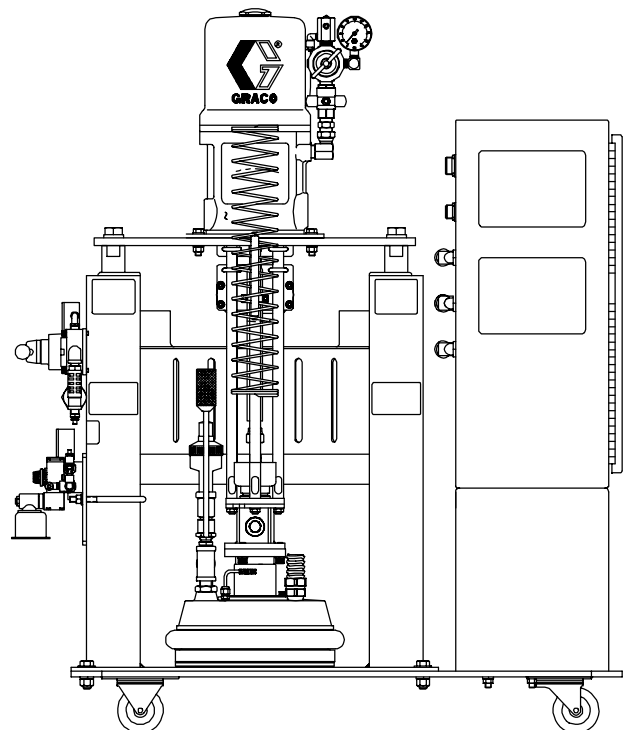
Important Safety Instructions

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

See page 2 for List of Models and page 3 for
Table of Contents.



Model 918343
Therm-O-Flow 5



Model 918337
Mini-5

List of Models

The supply units listed below all include silicone wipers.

Part Number	Motor/Pump	Ratio	Max. Fluid Working Pressure	Voltage	Page
918334*	President™	15:1	126 bar (1800 psi)	480 VAC	42
918337Polyurethane Reactive (PUR)	President	15:1	126 bar (1800 psi)	480 VAC	42
918340 (Swirl)*	President	15:1	126 bar (1800 psi)	480 VAC	42
918522	President	15:1	126 bar (1800 psi)	480VAC	42
918532	President	15:1	126 bar (1800 psi)	240VAC	42
C58630	President	15:1	126 bar (1800 psi)	480VAC	42
C58805	President	15:1	126 bar (1800 psi)	240VAC	42
918343	Senator®/Check-Mate® 800	19:1	131 bar (1900 psi)	480 VAC	46
918352 (PUR)*	Senator/Check-Mate 800	19:1	131 bar (1900 psi)	480 VAC	46
918344*	Bulldog®/Check-Mate 800	31:1	214 bar (3100 psi)	480 VAC	48
918437	Bulldog/Check-Mate 800	31:1	214 bar (3100 psi)	240 VAC	48
918593	Bulldog/Check-Mate 800	31:1	214 bar (3100 psi)	480VAC	48
C59398*	King	65:1	403 bar (5850 psi)	480 VAC	50

* These models are no longer available.

Table of Contents

List of Models	2	Service	31
Symbols	5	Servicing the Ram	31
Warnings	5	Removing a Material Pail from the Supply Unit .	31
Unpacking and Repacking	8	Servicing the Follower	32
Unpacking the Product	8	Servicing the Pump/Motor Assembly	
Repair and Repacking the Product	8	for the Check-Mate 800	34
Typical Installation	9	Servicing the Pump/Motor Assembly	
Selecting a Location for the Ram	10	for the Therm-O-Flow Mini-5 Supply Unit	39
System Accessories and Modules	10	Inspection Frequency	40
Installation	13	Removing/Replacing the CB100 Controller	40
Locating the Ram	13	Parts	42
Electrically Connect Hose to the Electrical		Model 918334, 76 mm (3 in.) Ram,	
Control Panel	13	Therm-O-Flow 15:1 President, w/silicone	
Ground The System	14	follower wipers, 480 VAC	42
Connecting the Electrical Control Panel		Model 918337, 76 mm (3 in.) Ram,	
to a Power Source	15	PUR Therm-O-Flow 15:1 President, w/silicone	
Check the Resistance Between the		follower wipers, 480 VAC	42
Supply Unit and the True Earth Ground	15	Model 918340, 76 mm (3 in.) Ram,	
Checking Resistance	16	PUR Therm-O-Flow 15:1 President, Swirl Valve,	
Overview of the Temperature		w/silicone follower wipers, 480 VAC	42
Controller Settings	18	Model 918522, 76 mm (3 in.) Ram,	
Graco Factory P, I, and D Settings	18	Therm-O-Flow 15:1 President,	
Flushing the System	19	w/silicone follower wipers, 480 VAC	42
Initial Material Loading	20	Model 918532, 76 mm (3 in.) Ram,	
Operation	21	Therm-O-Flow 15:1 President,	
Pressure Relief Procedure	21	w/silicone follower wipers, 240 VAC	42
Raising and Lowering the Ram	21	Model 918343, 76 mm (3 in.) Ram, 19:1 Senator,	
Daily Start-up Procedure	22	Therm-O-Flow Heated Check-Mate 800,	
Changing Empty Pails	23	w/silicone follower wipers, 480 VAC	46
Shutdown	24	Model 918352, 76 mm (3 in.) Ram, 19:1 Senator,	
Emergency Stop	24	PUR Therm-O-Flow Heated Check-Mate 800,	
Reading the Electrical Control Panel Indicators	25	w/silicone follower wipers, 480 VAC	46
Resetting the Ground Fault Interrupt	26	Model 918344, 76 mm (3 in.) Ram, 31:1 Bulldog,	
Flushing Safety	27	Therm-O-Flow PUR Heated Check-Mate 800,	
Ram Troubleshooting	28	w/silicone follower wipers, 480 VAC	48
Heated Pump Troubleshooting	29	Model 918437, 76 mm (3 in.) Ram, 31:1 Bulldog,	
Air Motor Troubleshooting	30	Therm-O-Flow PUR Heated Check-Mate 800,	
Electrical Control Panel Troubleshooting	30	w/silicone follower wipers, 240 VAC	48
		Model 918593, 76 mm (3 in.) Ram, 31:1 Bulldog,	
		Therm-O-Flow PUR Heated Check-Mate 800,	
		w/finned platen, 480 VAC	48
		Model C59398, 76 mm (3 in.) Ram, 65:1 King,	
		Therm-O-Flow PUR Heated Check-Mate 800,	
		w/silicone follower wipers, 240 VAC	50

Table of Contents (Continued)

Model 617318, Vent Hood Kit for use with PUR units	56
Model 617334, Proximity Switch Kit (Pump Activity) for use with Therm-O-Flow 5 units . . .	57
Model 918433, Proximity Switch Kit (Pump Activity) for use with President Pumps . .	58
Model 617325, Heated Follower Plate Kit for use with President pump assemblies	59
Model 617335, Heated Follower Plate Kit for use with Heated Check-Mate 800 pump modules	60
Model 918499, Heated Follower Plate Kit with finned bottom for use with President pump assemblies	61
Model 617300 (standard), 480 VAC 3-zone electrical control panel (interior)	62
Model 617330 (standard), 480 VAC 3-zone electrical control panel (interior)	63
Model 617300 (standard) and 617330 (swirl), 480 VAC 3-zone and 617484 240 VAC 3-zone electrical control panel (exterior)	64
Model 617349 (480 VAC) and 617485 (240 VAC) 4-zone electrical control panel (exterior)	65
Model 617349 (480 VAC) and 617485 (240 VAC) 4-zone electrical control panel (interior)	66

Schematics	67
Electrical Control Panel and Wiring	67
Model C03510, Pump Air Motor Mounting Kit . .	52
Model 918416, 4-Regulator Ram Air Control Module	55
Accessories	75
Dimensions	77
3-Zone Electrical Control Panel Mounting and Clearance Dimensions	77
4-Zone Electrical Control Panel Mounting and Clearance Dimensions	78
Ram Mounting and Clearance Dimensions for Therm-O-Flow 5	79
Ram Mounting and Clearance Dimensions w/15:1 President Air Motor	80
Technical Data	83
Related Publications	84
Appendix	85
Setting List	85
Graco Standard Warranty	88
Graco Information	88

Symbols

Warning Symbol



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

Caution Symbol



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, malfunction, or start unexpectedly and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, warnings, 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 the equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed 100 psi (6.9 bar) maximum inbound air pressure to the ram.
- Never exceed the recommended working pressure or the maximum air inlet pressure stated on your pump or in the **Technical Data** on page 83.
- Be sure that all spray/dispensing equipment and accessories are rated to withstand the maximum working pressure of the pump. Do not exceed the maximum working pressure of any component or accessory used in the system.
- Route the hoses away from the traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose non-heated hoses to temperatures above 82° C (180° F) or below -40° C (-40° F).
- Do not use the hoses to pull the equipment.
- Use fluids and solvents that are chemically compatible with the equipment wetted parts. See the **Technical Data** sections of all the equipment manuals. Always read the material manufacturer's literature before using fluid or solvent in this pump.
- Always wear protective eyewear, gloves, clothing, and respirator as recommended by the fluid and solvent manufacturers.
- Wear hearing protection when operating this equipment.
- Comply with all applicable local, state and national fire, electrical and other safety regulations.

WARNING



HOT SURFACE AND FLUID HAZARD

Heated fluid can cause severe burns and can cause equipment surfaces to become very hot.

- Wear protective gloves and clothing when operating this equipment in a heated system.
- Do not touch the metal heat sink when the surface is hot.
- Allow the equipment to cool thoroughly before servicing.

Some heated systems are designed to dispense PUR heated materials. PUR systems are supplied with ventilation hoods, and require proper ventilation and specially designed system components.



SKIN INJECTION HAZARD

Fluid from the dispense 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 surgical treatment.**
- Do not point the gun/valve 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 fluid leaks with your hand, body, glove, or rag.
- If spraying, always have the trigger guard on the gun when dispensing.
- If the unit is equipped with a gun diffuser, check the gun diffuser operation weekly. Refer to the gun manual.
- Be sure the gun/valve trigger safety operates before dispensing.
- Lock the gun/valve trigger safety when you stop dispensing.
- Follow the **Pressure Relief Procedure** on page 21 if the nozzle clogs, and before cleaning, checking or servicing the equipment.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Do not repair high pressure couplings; you must replace the entire hose.

⚠ WARNING



FIRE, EXPLOSION AND ELECTRIC SHOCK HAZARD

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

- Ground the equipment, the object being dispensed, and all other electrically conductive objects in the dispense area. Proper grounding dissipates static electricity generated in the equipment. See **Ground the System** on page 14.
- Do not use this equipment with flammable liquids.
- Keep the dispense area free of debris, including solvent, rags, and gasoline.
- If there is any static sparking while using the equipment, **stop dispensing immediately**. Identify and correct the problem.
- Make sure all electrical work is performed by a qualified electrician only.
- Make sure all electrical equipment is installed and operated in compliance with applicable codes.
- Make sure power is disconnected when servicing and repairing equipment.
- Have any checks, installation, or service to electrical equipment performed by a qualified electrician only.



MOVING PARTS HAZARD

Moving parts, such as the ram follower plate/pump inlet can pinch fingers.

- Do not operate the equipment with the guard removed.
- Keep clear of all moving parts when starting or operating the equipment.
- Keep hands and fingers away from the priming piston during operation and whenever the pump is charged with air.
- Keep clear of the follower plate, pump fluid inlet, and lip of the fluid container when raising or lowering the ram.
- Before checking or servicing the ram or pump, follow the **Pressure Relief Procedure** on page 21.



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.
- Avoid exposure to heated material fumes.
- Provide adequate ventilation.

Unpacking and Repacking

Unpacking the Product

Your Therm-O-Flow® 5 or Mini-5™ was carefully packaged for shipment by Graco. When the package arrives, perform the following procedure to unpack the units:

1. Inspect the shipping box carefully for shipping damage. Contact the carrier promptly if damage is discovered.
2. Unseal the box and inspect the contents carefully. There should not be any loose or damaged parts in the box.
3. Compare the packing slip against all items included in the box. Any shortages or other inspection problems should be reported immediately.
4. Store the box and packing materials in a safe place for future use. Graco recommends that all packing materials be saved in case the unit needs to be shipped again.

Repair and Repacking the Product

When the Therm-O-Flow® 5 or Mini-5™ requires service, it is the purchaser's responsibility to have the unit repaired. As an option, the purchaser can have the unit repaired by an authorized Graco distributor.

On-site Service

Therm-O-Flow® 5 and Mini-5™ components are customarily serviced by the purchaser or an authorized Graco technician. When service is required, follow the **Service** procedures in this manual.

Typical Installation

- | | | | |
|---|---|---|-----------------------------------|
| A | Air Line Filter | K | Hose Hanger |
| B | Lock-out Master Air Valve (bleed-type) | L | Follower Blow-off Valve Regulator |
| C | Pump Bleed-Type Master Air Valve (required) | M | Follower Plate Bleed Stick |
| D | Pump Air Regulator | P | Depressurization Valve |
| E | Main Air Line Supply | 1 | Pump Assembly |
| F | Electrical Control Panel | 2 | Ram Module |
| G | Follower Blow-off Valve | 3 | Ram Hand Valve |
| H | Pump Air Supply Hose | 4 | Applicator Gun or Valve |
| I | Air Line Lubricator | 5 | Heated Follower Plate Assembly |
| J | Heated Hose | 6 | Wiper |

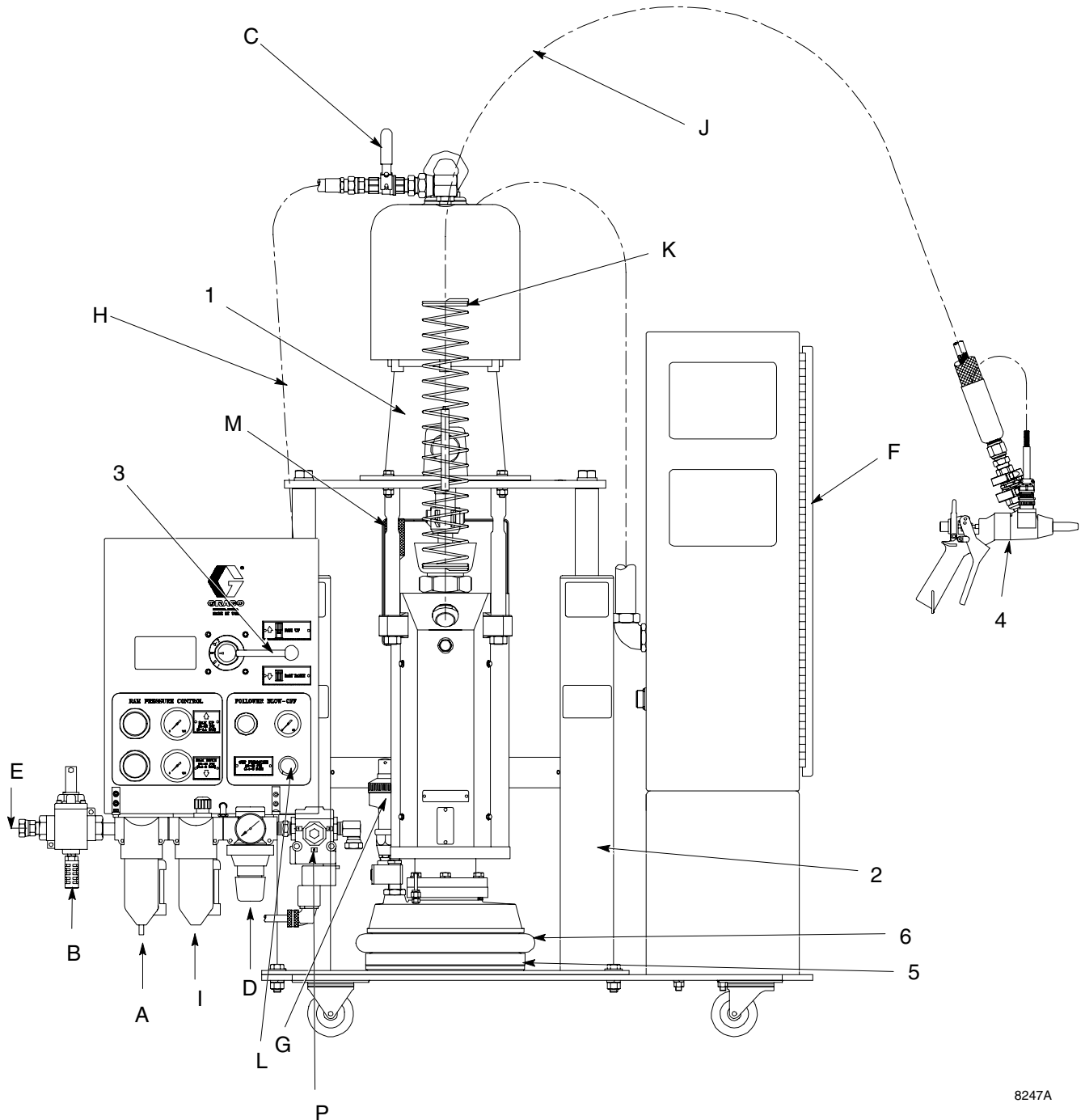


Fig. 1

8247A

Typical Installation

The typical installation discussed below is only a guide for selecting and installing system components and accessories. Contact your Graco representative or Graco Technical Assistance for help in designing a system to suit your particular needs.

This air-powered ram extruder forces high viscosity fluids into the intake valve of the fluid pump. Wiper rings and other accessory equipment for use with this ram are listed in the **Accessories** section on page 75.

Selecting a Location for the Ram

Refer to the Ram Mounting and Clearance Dimensions drawings on page 79 for ram mounting and clearance dimensions.

When selecting a location for the ram, keep the following in mind:

1. There should be sufficient space for installing and using the equipment.
 - Make sure there is sufficient overhead clearance for the pump and ram when the ram is in the fully raised position.
 - If you are installing a vent hood, make sure there is sufficient horizontal clearance for it.
 - Make sure the air regulators for the pump and ram are fully accessible.
 - Make sure there is easy and safe access to an appropriate electrical power source. The National Electrical Code requires 3 feet of open space in front of the electrical panel.
2. If you are installing a vent hood, make sure the ram is installed or located near a connection to the factory ventilation system.

Refer to the Ram Mounting and Clearance Dimensions drawings on page 79 for ram mounting and clearance dimensions.
3. You need to decide whether you will be bolting the ram to the floor, or bolting it to a mobile platform.
4. If you bolt the ram to the floor, make sure:
 - you will be able to level the base of the ram using metal shims
 - you have anchors long enough to prevent the unit from tipping. Refer to the Dimensional Drawings on page 77 for more information.
5. If you bolt the ram to a mobile platform, make sure:
 - you locate the platform on a surface where it won't roll around.
 - the ram and platform are stable in all operating positions, so the ram won't tip over.

System Accessories and Modules

Before you install the system you should be familiar with the parts discussed below. For more information, refer to Fig. 1, A Typical Installation, on page 9.


Air and Fluid Hoses


When installing a system, make sure:

- all air and fluid hoses are properly sized for your system.
- to use only electrically conductive air and fluid hoses.

Typical Installation

Air Line Modules

**WARNING**



PRESSURIZED FLUID HAZARD AND MOVING PARTS HAZARD

The bleed-type master air valve (C) is required in your system to relieve air trapped between this valve and the pump after the pump air regulator is closed. Trapped air can cause the pump to cycle unexpectedly, which could result in serious bodily injury, including splashing in the eyes or on the skin and injury from moving parts.

4-Regulator Air Control Module (918416) (Fig. 1 on page 9)

See the Typical Installation drawing (Fig. 1). The following components are included with the module:

- Bleed-type Lock-out Master Air Valve (B) is used to shut off and lock out the air supply from the entire supply unit.
- Bleed-type Master Air Valve (C) is required in your system to relieve air trapped between it and the air motor when the valve is closed (see the **Pressurized Fluid Hazard And Moving Parts Hazard WARNING** above). This bleed valve should be easily accessible and located downstream from the air regulator. It can be used for a safety lockout.
- Pump Air Regulator (D) controls pump speed and outlet pressure by adjusting the air pressure to the pump. It is located on the air control panel upstream from the bleed-type master air valve.
- Ram Air Regulator controls the air pressure to the ram. There are separate air regulators to control the ram pressure in the up and down directions.
- Pump Air Supply Hose (H) connects the ram air regulator to the air manifold.
- Follower Blow-off Valve Regulator (L)(N) controls the air pressure to the follower blow-off valve.
- PHYLA (filter, regulator, lubricator) (A), (D), and (I) conditions the air to the ram and the pump. The pump air regulator is located in this assembly. The ram air is taken from this assembly; an air line tube connects the PHYLA and the ram air control module.
- Auto Depressurization Valve (P) exhausts air from the system at shut off. The built in timer delays start up to allow material to heat thoroughly.

2-Regulator Air Control Modules (not shown)

The following components are included with the module:

- Pump Bleed-type Master Air Valve (C) is required in your system to relieve air trapped between it and the air motor when the valve is closed (see the **WARNING** above). Be sure the bleed valve is easily accessible from the pump, and is located downstream from the air regulator.
- Pump Air Regulator (D) controls pump speed and outlet pressure by adjusting the air pressure to the pump. Locate the regulator close to the pump, but upstream from the bleed-type master air valve.
- Ram Air Regulator (not shown) controls the air pressure to the ram.
- Ram Air Supply Hose (H) connects the ram air regulator to the air manifold.
- Air Manifold (F) divides the main air supply into separate lines for the pump and ram.

Air Line Accessories

If you have a 2-Regulator Air Control Module, install the following accessories, using adapters as necessary:

- Pump runaway valve senses when the pump is running too fast and automatically shuts off the air to the motor. A pump that runs too fast can be seriously damaged.
- Air line lubricator provides automatic air motor lubrication (standard on the 4-Regulator Air Control Module).
- Air line filter removes harmful dirt and moisture from the compressed air supply (standard on the 4-Regulator Air Control Module).
- Accessory bleed-type air valve isolates the air line accessories for servicing. Locate upstream from all other air line accessories. This isolates the accessories for servicing.

Vent Hood Kit (617318 on page 56)

The vent hood assembly is designed to efficiently draw fumes to the factory exhaust system during drumpail change-out. This assembly requires connection to a factory ventilation system that draws a minimum air flow of 8.4 m³/min (300 scfm). This kit is required for Polyurethane Reactive (PUR) applications.

Notes

Installation

The installation procedure includes:

- locating and installing the ram
- electrically connecting hoses to the electrical control panel
- grounding the system
- connecting the electrical control panel to a power source
- checking resistance
- setting controls on the electrical control panel
- starting up the system
- initially loading material

Locating the Ram

To locate the ram, follow one of the procedures below. Refer to the Ram Mounting and Clearance Dimensions drawings on page 79 for ram mounting and clearance dimensions.

Bolting the Ram to the Floor

To install the ram in a permanent location:

1. Select a convenient location for the equipment. Check that there is sufficient overhead clearance for the pump and ram when the ram is in the fully raised position. Make sure the air regulators for the pump and ram are fully accessible.
2. Level the base of the ram, using metal shims.
3. Using the holes in the base as a guide, drill holes for 1/2 in. (13 mm) anchors.
4. Bolt the ram to the floor anchors, which must be long enough to prevent the unit from tipping. Refer to the Dimensional Drawings starting on page 77.

Securing the Ram to a Mobile Platform

When performing the following procedure, use the Mobile Platform Kit (918414) to secure the ram to a mobile platform.

To install the ram on a mobile platform:

1. Brace the platform so it remains stationary while you attach the ram to the platform.
2. Place the ram on the platform and line up the holes in its base with the holes in the platform.
3. Secure the ram to the platform with the provided nuts and bolts.

Electrically Connect Hoses to the Electrical Control Panel


Assemble the hose and gun components as needed. For information on connecting the hose and gun components, follow the gun's instructions.


Electrically connect the hoses to the electrical control panel. The connector is located on the back of the electrical control panel.

Connect the plug from hose 1 to the Hose 1/Gun 1 receptacle. Refer to page 64 for connecting the hose to a 3-zone panel, or to page 65 for connecting the hose to a 4-zone panel.

Installation

Grounding the System

**WARNING**



FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD
To reduce the risk of fire, explosion, or electric shock:

- The power source conduit is not an adequate ground for the system. The unit must be bonded to either the building ground or a true earth ground.
- A qualified electrician must complete all grounding and wiring connections and check the resistance as instructed on page 15.
- Refer to your local code for the requirements for a “true earth ground” in your area.
- Also read and follow the warnings on page 7.

To reduce the risk of static sparking, ground the object being dispensed upon and all other spraying/dispensing equipment used or located in the spraying/dispensing area. Check your local electrical code for detailed grounding instructions for your area and type of equipment.

Ground the supply unit as instructed here and in the individual component manuals.

Air and Fluid Hoses

Use electrically conductive hoses only.

Dispensing/Spray Gun

Follow the dispensing/spray gun grounding instructions.

Fluid Supply Container

Ground the container according to your local code.

Object to which Material is Applied

Ground the object according to your local code.

Material Pails

Ground the material pails according to your 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.

Maintain Grounding Continuity When Purging Or Relieving Pressure

Follow the instructions in your separate gun manual for safely grounding your gun while purging.

Installation

Connecting the Electrical Control Panel to a Power Source

The Electrical Control Panel (Fig. 2) comes already attached and wired to the ram, however before the supply unit becomes functional, you must connect the electrical control panel to a power source.

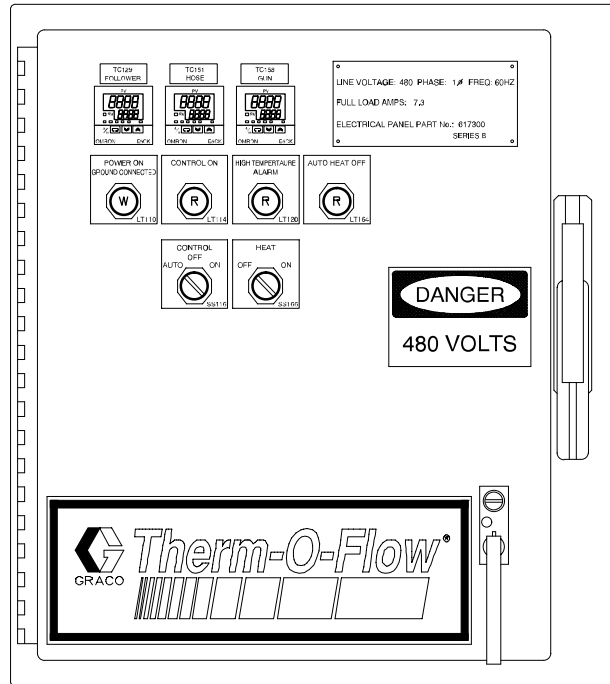


Fig. 2

Have a trained electrician connect the electrical control panel to a grounded electrical source that has the required service ratings:

Control Panel Model:	Zones:	VAC:	Hz:	Phase:	Full Load Amps
617300 (Standard)	3	480	60	1	7.3
617330 (Swirl)					
617349	4	480	60	3	9.8

For information about specific terminal locations and connections, see **Schematics** on page 67 for wiring diagram information.

To connect the control panel to the electrical source:

1. Create an opening in the control panel's housing for the conduit that will enclose the wire from the facility's power source.
2. Thread the wire from the power source into the control panel housing, and then connect the power source wires to the appropriate terminals on the DISCONNECT switch.

Checking Resistance Between the Supply Unit and the True Earth Ground

WARNING




FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

To reduce the risk of fire, explosion, or electric shock the resistance between the supply unit components and true earth ground must be less than 0.25 ohms.

Have a qualified electrician check the resistance between each supply unit component and the true earth ground. The resistance must be less than 0.25 ohms. If the resistance is greater than 0.25 ohms, a different ground site may be required. Do not operate the system until the problem is corrected.

Installation


Checking Resistance

**WARNING**

ELECTRIC SHOCK HAZARD
Do not open the electrical control panel, unless you are a trained professional.

Before opening the control panel, make sure that all power has been removed from the control panel.

Sensor Resistance Checks

**WARNING**

ELECTROCUTION HAZARD
To reduce risk of injury or damage to equipment, conduct these electrical checks with the main disconnect OFF.

The supply unit includes either three or four heat sensors and controllers for each heated zone. To check sensor resistance:

1. Make sure the power is off and that the disconnect switch is in the OFF position.
2. Make electrical resistance checks for the components. Refer to **Schematics** on page 67 for wiring diagram information.
3. Replace any parts whose resistance readings do not comply with the ranges listed in the chart below.

NOTE: Check resistance at ambient room temperature (63°–77° F).

3-Zone RTD Sensors


Zone	Component	Terminals	Value Range
1	Follower	1311 & 1321	107–109 ohms
2	Dispense Hose	1531 & 1541	97.4–102.8 ohms
3	Dispense Gun	1601 & 1611	97.4–102.8 ohms

4-Zone RTD Sensors

Zone	Component	Terminals	Value Range
1	Follower	1311 & 1321	107–109 ohms
2	Dispense Hose	1531 & 1541	97.4–102.8 ohms
3	Dispense Gun	1601 & 1611	97.4–102.8 ohms
4	Pump	1381 & 1391	97.4–102.8 ohms

Installation

Heater Resistance Checks


WARNING

ELECTROCUTION HAZARD

To reduce risk of injury or damage to equipment, conduct these electrical checks with the main disconnect OFF.

To check heater resistance:

1. Make sure the power is off and that the disconnect switch is in the OFF position.
2. Make electrical resistance checks for the components. Refer to **Schematics** on page 67 for wiring diagram information.
3. Replace any parts whose resistance readings do not comply with the ranges listed in the chart below.

NOTE: Check resistance at ambient room temperature (63°–77° F).

Heaters for 3-Zone Control Panels

Zone	Component	Terminals	Value Range
1	Follower	2L1 & 2L2	98–127 ohms
		2L2 & 2L1	
2	Dispense Hose	1532 & 1551	See Technical Data supplied w/Hose
3	Dispense Gun	1602 & 1621	See Technical Data supplied w/Gun

Heaters for 4-Zone Control Panels

Zone	Component	Terminals	Value Range
1	Follower	3L1 & 3L3	98–127 ohms
		3L2 & 3L3	
2	Dispense Gun	1532 & 1551	See Technical Data supplied w/Gun
3	Dispense Hose	1602 & 1621	See Technical Data supplied w/Hose
4	Pump	5L1 & 5L2	187.2 ohms ± 24 ohms

Installation

Overview of the Temperature Controller Settings

The basic program settings for each temperature controller satisfy most application needs. These settings are preset at the factory, but can be changed. The input type, temperature scale, and over temperature alarm point are the critical controller settings that you must check before doing an auto-tune or using any controller in normal operation. See form# 309100 for operation of the temperature controls.

Graco Factory P, I, and d Settings

Table 1 lists the P, I, and d settings for standard control panels. These settings are preset at the factory. See form# 309100 for accessing these values and use the table for reference information only.

Table 1. Graco Factory P, I, and d Settings

Category	P	I	d	Unit Voltage
Follower	2	326	49	480
Hose	.8	63	9	ALL
Pump	4.2	1081	162	480
Gun	2.1	126	19	ALL

These P, I, and d values are usually generated by running an autotune process for each heat zone. The controllers will automatically find the proper P (proportional), I (integral), and d (derivative) values during this autotune process. These are values that allow the heat zones to reach their maximum temperature as fast as possible without significantly exceeding desired temperature.

Installation

Flushing the System

Flushing the system before its initial use can prevent material contamination, which may cause the material to fail or perform poorly.

CAUTION

Flush the system before performing the initial material loading procedure. The system was factory-tested using a light soluble oil, a soybean oil, or some other oil as tagged. Flush the system to avoid contaminating the material that has been designated for initial material loading.

To flush the system, perform the following procedure:

1. Select the material for the initial material load.
2. Verify whether the factory-test oil and the initial material load are compatible:
 - a. If the two substances are compatible, omit the remaining steps in this procedure and perform the **Initial Material Loading** procedure on page 20.
 - b. If the two substances are incompatible, perform the remaining steps in this procedure to flush the system.

WARNING

Use fluids and solvents that are chemically compatible with the equipment wetted parts. See the **Technical Data** sections of all the equipment manuals. Always read the material manufacturer's literature before using fluid or solvent in this pump and always provide adequate ventilation.

3. Select a drum containing solvent that can dissolve, clean, and eliminate the factory-test oil from the system. If necessary, check with Graco or the material supplier for a recommended solvent.
4. Before flushing, be sure the entire system and flushing drums are properly grounded. Refer to **Ground The System**, on page 14.
5. Perform steps 1 through 7 of the **Initial Material Loading** procedure on page 20 to load the drum containing the solvent.
6. Flush the solvent through the system for approximately 1 to 2 minutes.
7. Remove the drum containing the solvent.
8. Perform the **Initial Material Loading** procedure on page 20.

Starting Up the System

WARNING



PRESSURIZED EQUIPMENT HAZARD

To reduce risk of injury or equipment damage:

- Make sure all material hose connections are secure.
- Make sure system is ready to pressurize before pressurizing system.

CAUTION

To help avoid damage to equipment, be sure to open the dispense valve during system heatup to alleviate pressure which might occur in the system due to material expansion.

1. Check all material hoses and fittings to insure tightness and to prevent any material leakage.
2. Check all system air and electrical lines. Make sure that all routing of air and electrical lines will not interfere with any moving components within the fixture.
3. Raise the arm, using the following procedure:
 - a. Close all air regulators.
 - b. Move the ram hand valve lever to the UP position.
 - c. Slowly open the air regulators until the ram starts to move up.
 - d. When the follower plate is above the height of the material drum to be used, move the ram hand valve lever to OFF.
4. Turn the electrical disconnect ON.
5. On the electrical control panel, turn the CONTROL ON switch to ON.
6. Check the temperature controller set points and change them if necessary. See **Changing the Set Point** in form# 309100.
7. Wait until all system zones are heated to the pre-set temperatures. Go to the next section, **Initial Material Loading**.

Installation

Initial Material Loading

WARNING



The material and equipment will be hot! To reduce risk of injury, wear eye protection, gloves and protective clothing when installing, operating, or servicing this dispensing system.

WARNING



PRESSURIZED FLUID HAZARD

To reduce the risk of serious bodily injury, such as fluid injection or splashing fluid in the eyes or on the skin, **ALWAYS** wear eye protection and protective clothing when installing, operating, or servicing this dispensing system.

WARNING



MOVING PARTS HAZARD

Moving equipment parts can cause personal injury, including severing of hands or fingers. Make sure all personnel are clear of moving parts before operating the equipment.

WARNING



To reduce risk of injury or damage to equipment, be sure to tighten the bleed stick after bleeding the air. Otherwise hot material will leak out of the opening.

CAUTION

The use of a non-compatible lubricant can cause material contamination or inadequate performance. Use only a lubricant compatible with the material to be pumped. Check with the material supplier for a recommended lubricant.

CAUTION

To help avoid damage to equipment, **do not** use a drumpail of material that has been dented or otherwise damaged; damage to the follower wipers may result.

1. Make sure the follower plate is high enough to put a drumpail of material under it.
2. Open a drumpail of the proper material and locate it under the elevated follower plate.

NOTE: Whenever drumpail changes are required, remove the cover from the drumpail of new material by holding it level and lifting it straight up. Tipping the cover may allow accumulated dirt to spill into the drumpail, which may result in damage to the equipment.

3. Lubricate the follower wipers with a lubricant compatible with the material to be pumped. Check with your material supplier for compatibility.
4. Before lowering the pump into the drumpail, make sure that nothing is between the follower plate and the drumpail, or between the ram tie bar and the top of the ram posts.
5. Lower the pump into the drumpail of material.
 - a. To lower the pump and follower into the drumpail, move the ram hand valve lever to the **DOWN** position and slowly adjust the air regulator.
 - b. As the follower enters the drumpail, loosen the bleed stick. Removing the bleed stick allows trapped air between the follower plate and the top of the material to escape.
 - c. When air stops exhausting from the bleed stick port, replace and tighten the bleed stick.
6. Place a material waste container under the dispense gun.
7. **Slowly** adjust the pump air regulator. This will start the pump and fill the material passage.
8. Dispense material from the dispense gun until air-free material is dispensed. Allow the system to heat for approximately 30 minutes.

Operation

Pressure Relief Procedure

WARNING



MOVING PARTS HAZARD

Follow the **Pressure Relief Procedure** below before checking or repairing the ram or any other part of the system and when shutting down the system. Keep hands and fingers away from the follower plate, fluid pump inlet, and lip of the fluid container when raising or lowering the ram to reduce the risk of pinching or amputating hands or fingers.

During operation, also keep hands and fingers away from limit switches to reduce the risk of pinching or amputating hands or fingers.

WARNING



The material and equipment will be hot! To reduce risk of injury, wear eye protection, gloves and protective clothing when installing, operating, or servicing this dispensing system.

WARNING



HIGH PRESSURES CAN CAUSE SERIOUS PERSONAL INJURY. Be sure to **OPEN THE DISPENSE VALVE DURING SYSTEM HEATUP** to alleviate pressure which might occur in the system due to material expansion.

WARNING



SKIN 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, moving parts, follow the **Pressure Relief Procedure** whenever you:

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

This procedure describes how to relieve pressure for the supply unit. Use this procedure whenever you shut off the dispenser/sprayer and before checking or adjusting any part of the system, to reduce the risk of serious injury.

1. Lock the gun/valve trigger safety.
2. Shut off the main air supply to the pump.
3. Close all air bleed valves.
4. Unlock the gun/valve trigger safety.
5. Hold a metal part of the gun/valve firmly to the side of a grounded metal drumpail, and trigger the gun/valve to relieve pressure.
6. Lock the gun/valve trigger safety.
7. Have a container ready to catch the drainage, then open the drain valve or pump bleed valve.
8. Leave the drain valve open until you are ready to spray/dispense again.

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 nozzle retaining nut or hose end coupling to relieve pressure gradually, then loosen completely. Now clear the tip/nozzle or hose.

9. If you want to relieve pressure in the ram, see the **Ram Pressure Relief Procedure** on page 31.

Raising and Lowering the Ram

The ram hand valve on the ram air control has 3 positions [Fig. 3 (4-regulator version shown)]:

- Ram UP raises the ram
- Ram DOWN lowers the ram
- Ram OFF puts the ram in “neutral.” Moving the hand valve to OFF does not change the position of the ram, but it stops the air pressure from attempting to move the ram either up or down.

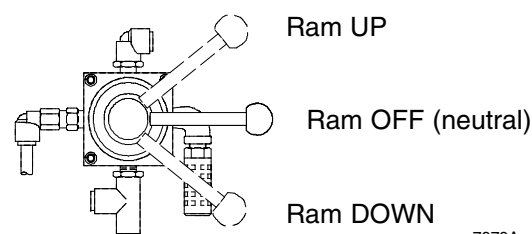


Fig. 3

7979A

Operation

Daily Start-up Procedure

WARNING



PRESSURIZED FLUID HAZARD

To reduce the risk of serious bodily injury, such as fluid injection or splashing fluid in the eyes or on the skin, **ALWAYS** wear eye protection and protective clothing when installing, operating, or servicing this dispensing system.

There are 2 ways to start up the system. You can either:

- manually start the system each day
- use the optional 7-day timer to heat up the system unattended

If you manually start up the system, be sure to allow at least 30 minutes for the material to fully heat up before the system is ready for use.

If you use the optional 7-day timer to heat up the system, you must:

- create a schedule and program it into the 7-day timer (see the documentation that came with the electrical control panel). Be sure to allow at least 30 minutes for the material to heat up before the supply unit is ready for use.
- perform specific procedures each night to make the system ready for automatic operation.

Starting the System Manually

To start the system manually:

1. Verify that the main disconnect is ON.
2. Turn the CONTROL ON switch to ON.
3. Open the dispense valve over a waste container to allow the material to expand. This will prevent damage to the equipment.
4. After each of the dispense zones is heated to operating temperature, wait an additional 30 minutes to allow the material to heat fully.
5. Make sure that all material valves are open.
6. Turn the pump air supply ON and set the regulator for normal operation.

7. Dispense some material into a waste container.
8. Verify the flow rate is correct; adjust if required.

With the material heated, and the flow rate corrected as necessary, the system is ready for operation.

WARNING

Do not over pressurize the system, as this could result in serious injury or damage to the equipment.

NOTE: It is normal for the pump to stop moving if the dispense gun or other fluid valve is closed.

Using the 7-Day Timer

The optional 7-Day Timer allows you to automatically heat the system without having to manually turn on the heat.

Before you can use this feature, you must program the 7-day timer, located on the electrical control panel. For more information about programming the timer, see the documentation that came with the electronic control panel.

Each Night:

Follow this procedure each time you use the 7-day timer:

1. Turn the CONTROL ON (61) switch to AUTO.
2. Turn the HEAT switch (62) on the electrical control panel to ON.

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

3. **Relieve the supply unit pressure.**
4. Leave the dispense valve open and over an empty waste container, to relieve pressure that could build up while the system is heating.
5. Make sure that all material valves are open.
6. Make sure the pump air supply has been turned OFF.

The system is ready for start-up with the 7-day timer.

Operation

Changing Empty Pails

CAUTION

To help avoid damage to equipment, be sure to reload the empty supply unit with a full drumpail of material immediately. Do not allow the supply units to operate when empty, which would cause a pump runaway and cause damage to the system.

CAUTION

To help avoid damage to equipment, **do not** raise the ram and remove the follower plate from the empty pail until you are ready to immediately install the new pail.

CAUTION

Do not raise the ram and remove the follower plate from the empty pail unless the supply unit is at full operating temperature. Pail changes can only be performed when the system is heated. Attempting to change a pail when the supply unit is cold could result in injury or damage to the equipment.

WARNING



MOVING PARTS HAZARD

To reduce risk of injury or damage to equipment, take care when adjusting blow off pressure. Too much pressure can cause the follower plate to rise very quickly or burst the drum. Too little pressure can cause the ram to lift the entire drumpail from the ground.

CAUTION

To help avoid damage to equipment, **do not** use a drumpail of material that has been dented or otherwise damaged; damage to the follower wipers may result.

WARNING



To reduce risk of injury or damage to equipment, be sure to tighten the bleed stick after bleeding the air. Otherwise hot material will leak out of the opening.

WARNING



Bursts of material and air will exit the bleed port! To reduce risk of injury or damage to equipment, wear eye protection, gloves and protective clothing whenever working with this supply system.

Read all warnings and instructions before attempting this procedure!

When a pail of material is empty, follow this procedure to load a new pail of material:

NOTE: Change the pail only while the supply unit is hot.

1. Stop the pump by closing either the bleed-type master air valve or the fluid dispensing valve.
2. Raise the ram out of the pail:
 - a. Set the ram UP air regulator to 15–20 psi.
 - b. Move the hand valve lever to the UP position (Fig. 3 on page 21). At the same time, carefully equalize the pressure in the pail by using the Follower Blow-off Valve Regulator to cycle the follower blow-off valve open and closed.
3. With the follower completely out of the pail, remove the empty pail.
4. Being careful not to damage the follower wiper, scrape any material or material build-up from the follower plate and wiper.
5. Remove the cover from the pail of appropriate material. Remove any other packing materials from the pail, exposing the material. Make sure that there are not any foreign materials on the material surface. Place the pail under the raised follower plate.

NOTE: Whenever pail changes are required, remove the cover from the pail of new material by holding it level and lifting it straight up. Tipping the cover may allow accumulated dirt to spill into the pail, which may result in damage to the equipment.

Operation

Changing Empty Pails (*continued*)

6. Lower the follower into the drumpail:
 - a. Move the ram hand valve lever to the DOWN position.
 - b. Check the pail position as the follower lowers. If necessary, stop lowering the follower before contacting the pail, and adjust the pail position to align the pail with the follower plate.
 - c. Continue lowering the follower. As the follower enters the pail, loosen the air bleed stick. Loosening the bleed stick allows trapped air between the follower plate and the top of the material to escape.
 - d. When air stops exhausting from the bleed stick port, replace and tighten the bleed stick.
7. Adjust the ram air pressure for normal operation.
8. Bleed, from the pump, the air that was introduced during the pail change:
 - a. Place a waste container under the pump bleed port.
 - b. Open the bleed port and turn on pump air pressure.
 - c. Allow material to flow from the bleed port until it is air-free.
 - d. Shut off air to the pump and close the bleed port.
 - e. Turn air on to the pump and set the pump air regulator for normal operation.
9. Resume normal operation.

Shutdown

1. Turn the CONTROL ON switch to OFF.
2. Turn OFF the main electrical disconnect.
3. Move the ram hand valve lever (Fig. 3 on page 21) to the OFF position. Shut off the air supply to the ram and pump.



WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

4. **Relieve the pressure.**

Emergency Stop

1. On the electrical control panel:
 - a. Turn OFF the main electrical disconnect.
 - b. Turn the CONTROL ON switch to OFF.
2. Stop the pump by closing the Bleed-type Master Air Valve closest to the motor's air inlet, (C) in Fig. 1, on page 9.
3. Stop the ram from moving by:
 - a. Closing the ram air lock-out valve.
 - b. Moving the ram hand valve lever (Fig. 3 on page 21) to the OFF position.

Operation

Reading the Electrical Control Panel Indicators

Use the table and Fig. 4 below to read the indicators on the electrical control panel. For information on setting the temperature controllers, see **Setting Temperature Controllers** in Form# 309100.

Light#	Indicator:	Indicator Light is:	Meaning:
61	Power On/ Ground Connected	ON	Power is on and ground is connected.
		OFF	Power is off and/or ground is disconnected.
		DIMLY LIT	There may be a problem with the system power connections. Have connections checked by a qualified electrician before attempting to start the system.
62	Control On	ON	The CONTROL ON switch (65) is set to either the ON or AUTO position and power is being supplied to the electrical control panel components.
		OFF	The CONTROL ON switch (65) is set to the OFF position.
63	High Temperature Alarm	ON	The temperature of any of the heated components is out of range, and the power to all heated components is interrupted.
		OFF	None of the heated components have temperatures that are out of range.
64	Auto Heat Off	ON	The Inactivity Timer has turned off the heat for the supply unit, due to inactivity. See Resetting the Supply Unit After the Inactivity Timer (Worklife Timer) Has Been Triggered , on page 26, for instructions on restarting the supply unit.
		OFF	The supply unit is functioning normally.

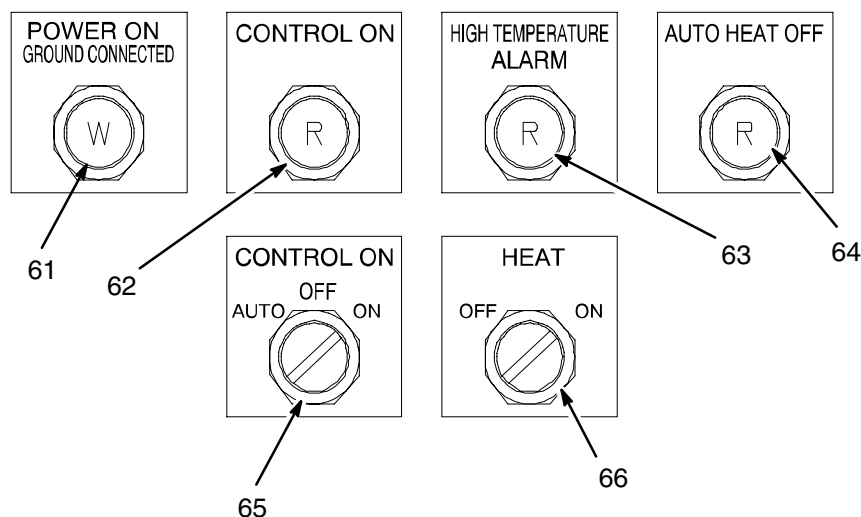


Fig. 4

Operation

Temperature Out of Range

Should any of the temperatures go out of the preset range for any of the zones, power to the heated components is interrupted, and the HIGH TEMPERATURE ALARM light goes ON. The alarm automatically goes OFF and the system resets when the temperature is back in range.

Resetting the Supply Unit After the Inactivity Timer (Worklife Timer) Has Been Triggered

Your system may have an inactivity timer. If the pump has not moved for a set amount of time, the inactivity timer:

- turns off power to the heaters
- lights the AUTO HEAT OFF light

For information about setting the time period on the inactivity timer, see the documentation that came inside the control panel.

To re-heat the supply unit:

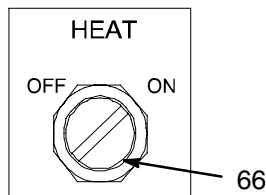


Fig. 5

1. Turn the HEAT switch (66) to the OFF position, then turn it to the ON position.
2. Wait until all components in the supply unit have returned to operating temperature.
3. Resume operation.

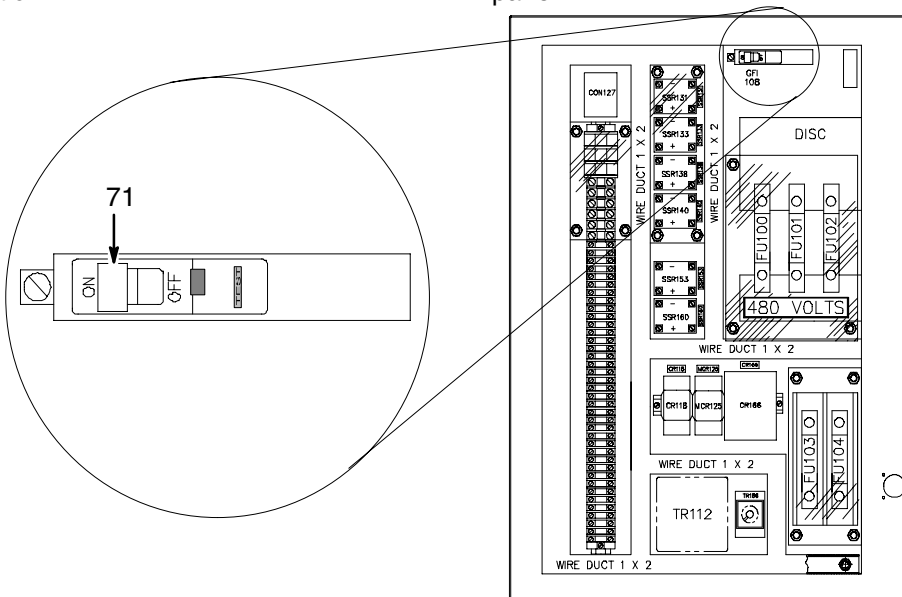



Fig. 6

Resetting the Ground Fault Interrupt

This control panel is equipped with a ground fault interrupt (GFI) circuit breaker (Fig. 6). If the disconnect switch is ON, but all lights on the electrical control panel are off, have a qualified electrician check the ground fault interrupt.

**WARNING**
ELECTROCUTION HAZARD
To reduce risk of injury or damage to equipment, perform this procedure with the main disconnect OFF.

To reset the ground fault interrupt, have a qualified electrician:

1. Turn OFF the electrical disconnect on the electrical control panel.
2. Open the electrical control box and locate the Ground Fault Interrupt switch (71). The GFI should be in a "neutral" position, between the ON and OFF positions.
3. Move the GFI switch to the OFF position, then move it to the ON position.
4. Close the door and turn ON the disconnect switch.

For more information about the GFI switch, see the documentation that came with the electrical control panel.

Operation

Flushing Safety

WARNING

Use fluids and solvents that are chemically compatible with the equipment wetted parts. See the **Technical Data** sections of all the equipment manuals. Always read the material manufacturer's literature before using fluid or solvent in this pump.

1. Before flushing, be sure the entire system and flushing pails are properly grounded. Refer to **Ground The System**, on page 14.

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

2. **Relieve the pressure.**

WARNING



PRESSURIZED FLUID HAZARD

Always use the lowest possible fluid pressure, and maintain firm metal-to-metal contact between the gun/valve and the pail during flushing to reduce the risk of fluid injection injury, static sparking and splashing.


3. Remove the spray tip/nozzle from the spray gun/dispensing valve.

Ram Troubleshooting

Problem	Cause(s)	Solution(s)
Ram won't raise or lower	Closed main air valve or clogged air line	Open air valve, clear air line
	Not enough air pressure	Increase ram pressure
	Worn or damaged piston	Replace piston. See procedure in Form #310523.
	Hand valve closed or clogged	Open, clear hand valve or exhaust
Ram raises or lowers too fast	Ram air pressure too high	Decrease ram air pressure
Air leaks around cylinder rod	Worn rod seal	Replace o-rings in guide sleeve. See procedure in Form #310523.
Fluid squeezes past follower plate wipers	Ram air pressure too high	Decrease ram air pressure
	Worn or damaged wipers	Replace wipers. See procedure on page 32.
Pump won't prime properly, or pumps air	Closed main air valve or clogged air line	Open air valve, clear air line
	Not enough pump air pressure	Increase pump pressure
	Worn or damaged piston	Replace piston. See procedure in Form #310523.
	Hand valve closed or clogged	Open, clear hand valve or exhaust
	Hand valve dirty, worn or damaged	Clean, service hand valve
	Bent drum has stopped follower	Replace drum
Air pressure won't hold drum down or push plate up	Closed main air valve or clogged air line	Open air valve, clear air line
	Not enough ram air pressure	Increase ram air pressure
	Valve passage clogged	Clean valve passage
	Worn piston seal	Replace seal

Heated Pump Troubleshooting

For additional information about the pump, see the pump's documentation.

Problem	Cause(s)	Solution(s)
Rapid down stroke or up stroke (pump cavitation)	Material not heated to proper pumping temperature.	Check and adjust temperature set point.
	Air is trapped in pump.	Bleed air from the pump using this procedure: <ol style="list-style-type: none"> 1. Place a waste container under the pump bleed port. 2. Turn on air to the pump 3. Allow material to flow from the bleed port until it is air-free. 4. Shut off air to the pump and close the bleed port. 5. Turn air on to the pump and set the pump air regulator for normal operation.
	Downstroke: Lower check in pump is worn. Upstroke: Upper check in pump is worn.	Rebuild and replace pump, as necessary.
Material leaks around pump outlet	Outlet fitting is loose.	Tighten outlet fitting.
Material leaks around bleed port	Bleed port fitting is loose.	Tighten bleed port fitting.
Pump won't move up or down	Problem with air motor.	See Air Motor Troubleshooting chart on page 30.
	Foreign object lodged in pump.	Remove object and rebuild pump assembly. <div>  WARNING </div> To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the Pressure Relief Procedure (page 21). Before attempting to dislodge a foreign object: <ol style="list-style-type: none"> 1. Relieve system pressure. 2. Remove the pump from the air motor.
Wet-cup leaks	Worn throat seal	For Therm-O-Flow Mini-5: <ol style="list-style-type: none"> 1. Tighten wet-cup and/or throat seal packings. 2. Replace wet-cup and/or throat seal packings if tightening does not stop leaking. For Therm-O-Flow 5, replace wet-cup and throat seal packings.

Air Motor Troubleshooting

For additional information about the air motor, see the air motor's documentation.

Problem	Cause(s)	Solution(s)
Air motor will not shift directions, stalled in DOWN position	Main air valve is dirty or damaged	Clean/rebuild main air valve.
Air motor will not shift directions, stalled in UP position		
Air motor stalled halfway between the top and bottom		
Air continually exhausting around air motor shaft.	Air motor shaft seal is damaged	Replace air motor shaft seal.
Air continually exhausting around the air valve/slide valve	Air valve/slide valve gasket is damaged	Replace the valve gasket.
Air continually exhausting from muffler while the motor is idle	Internal seal damage	Rebuild air motor.
Oil leaking from exhaust port	Too much lubricant mixed in with the air supply	Reduce lubricant supply.
Frost build-up on muffler	Air motor operating at high pressure, or high cycle rate	Reduce pressure, cycle rate, or duty cycle of the air motor.

Electrical Control Panel Troubleshooting

Problem	Cause(s)	Solution(s)
Disconnect is ON, but no indicator lights are lit	The ground fault interrupt has been activated	See procedure on page 26.
	One or more fuses has (have) been blown	Replace the blown fuse(s)
High Temperature Alarm lights	The temperature of a heated component has gone out of range.	Supply unit automatically turns off power to supply unit components. Unit turns power back on when overheated components reach appropriate temperatures.
Heat is turned off after inactivity timer has been triggered.	Pump has not moved within the programmed time period	See procedure on page 26.

Service

Servicing the Ram

To relieve ram air pressure, follow the procedure below. For more information about servicing the ram, see Form# 310525, **76 mm (3 in.) Global Ram Module**.

Ram Pressure Relief Procedure

WARNING

To reduce the risk of serious injury whenever you service the ram, always follow the procedure below.

To relieve air pressure in the ram:

1. **Relieve the supply unit pressure.**

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

2. Using the ram hand valve lever on the pump air control (Fig. 3 on page 21), move the ram to the DOWN position.
3. To stop the ram from moving (Fig. 7):
 - a. Close the master air lock-out valve (B).
 - b. Move the hand valve (3) to the OFF position. This valve shuts off the air supply to the ram.

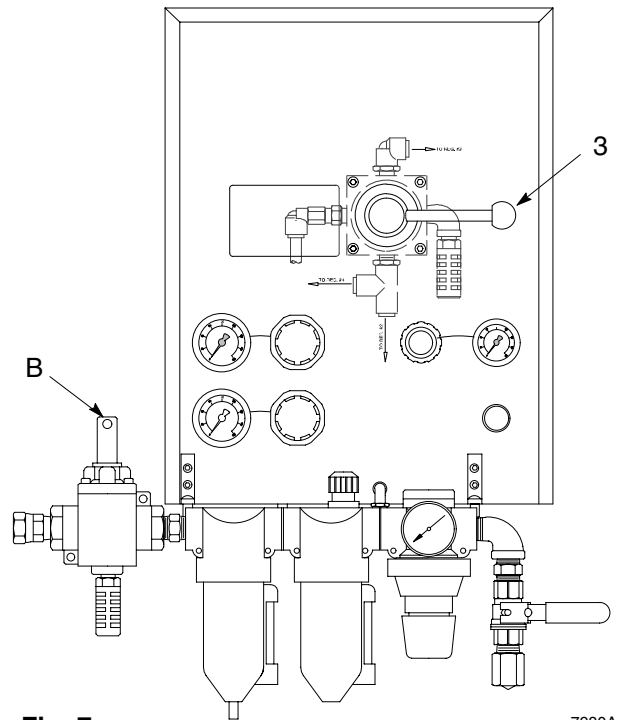


Fig. 7

7980A

4. Exhaust air from both sides of the ram:
 - a. Move the ram hand valve lever to the DOWN position until all air is exhausted from one side of the ram.
 - b. Move the ram hand valve lever to the UP position until all air is exhausted from the other side of the ram.

Removing a Material Pail from the Supply Unit

WARNING



The material and equipment will be hot! To reduce risk of injury, wear eye protection, gloves and protective clothing when installing, operating, or servicing this dispensing system.

Before you perform the procedures in this section, remove the material pail from the supply unit. *Only remove the pail from the supply unit while the supply unit is hot.* Observe the cautions and warnings, then follow steps 1 through 4 of the procedure for **Changing Empty Pails** on page 23.

Service


Servicing the Follower

This section describes service procedures for the follower:

- servicing wipers
- replacing heat sensors

For information about replacing wires connecting the follower to the pump, see Form# 310530 or contact your Graco technical service representative.

Servicing Wipers



WARNING

The material and equipment will be **hot!** To reduce risk of injury, wear eye protection, gloves and protective clothing when installing, operating, or servicing this dispensing system.

To replace a worn or damaged wiper (W):

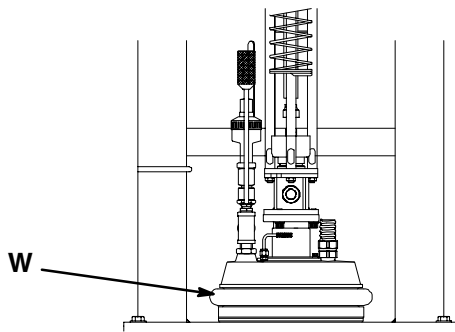


Fig. 8

2. Raise the follower plate up out of the drumpail by observing the cautions and warnings, then following steps 1 through 4 of the procedure for **Changing Empty Pails** on page 23.
3. Separate the wiper butt joint and bend back the strapping that covers the clamp. Loosen the clamp by unscrewing the worm gear, then remove the wiper.
4. Thread the strapping through the new wiper.
5. Insert the end of the strap through the clamp and tighten.
6. Use a rubber mallet to pound the wiper all the way around the follower plate until the wiper's ends are butted tightly together.
7. Apply a lubricant to the wipers. The lubricant should be compatible with the material to be pumped. (Check with the material supplier for a compatible lubricant.)

Service

Replacing Heat Sensors


For more information about the follower plate, refer to pages 59 and 60. To replace a sensor:



! WARNING

The material and equipment will be hot! To reduce risk of injury, wear eye protection, gloves and protective clothing when installing, operating, or servicing this dispensing system.

1. If the material drumpail has already been removed from the supply unit, go to step 2. If you need to remove the material drumpail, perform steps 1 through 4 of the procedure in **Changing Empty Pails** on page 23.
2. Make sure the ram hand valve is in the OFF position.



! WARNING

ELECTROCUTION HAZARD

To reduce risk of injury or damage to equipment, make sure the main disconnect is OFF before continuing with this procedure.

3. Turn the system CONTROL ON switch to OFF.
4. Turn OFF the main electrical disconnect.
5. Loosen the conduit locknut (120).
6. Remove the sensor (90) from the follower plate.

7. Loosen the cord grip (100), located under the junction box.
8. Remove the junction box's cover.
9. Disconnect the 2 sensor wires from the junction box. See Fig. 9.

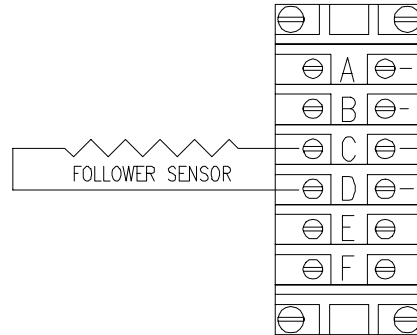


Fig. 9

10. Connect the 2 wires from the new sensor to the terminals in the junction box.
11. Replace the junction box cover.
12. Coat the sensor with non-silicone heat-sink compound.
13. Slide the cord grip o-ring back into the cord grip and then tighten the cord grip underneath the junction box.
14. Slide the new sensor into the sensor opening in the follower plate.
15. Tighten the conduit locknut (120).

Service

Servicing the Pump/Motor Assembly for the Check-Mate 800

For specific information about servicing the Check-Mate 800 pump, see either Form# 308570 or 310530. The sections below describe how to:

- remove/re-install the pump from the ram
- separate the pump from the air motor
- re-attach the air motor to the pump
- remove the follower from the pump

Removing/Re-installing the Check-Mate 800 Pump from the Ram

To remove the pump assembly from the ram, follow this procedure:

1. If the material drumpail has already been removed from the supply unit, go to step 2. If you need to remove the material drumpail, perform the procedure in **Changing Empty Pails** on page 23.
2. Make sure the ram hand valve is in the OFF position.

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

3. **Relieve the supply unit pressure.**

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve ram pressure, always follow the **Ram Pressure Relief Procedure** (page 31).

4. **Relieve the ram air pressure.**

5. Turn off the electrical power to the supply unit. Follow all applicable safety procedures and lockout rules.
6. Turn OFF the main electrical disconnect.

WARNING



ELECTROCUTION HAZARD

To reduce risk of injury or damage to equipment, make sure the main disconnect is OFF before continuing with this procedure.

7. Bleed off pressure in the system and excess material by opening the dispense gun and catching the material in a waste container.
8. Turn the system CONTROL ON switch to OFF.
9. Disconnect all material hoses.
10. RTV sealant on the pump shroud may make it difficult to remove individual shroud pieces. Using a knife or a razor, scrape the sealant off of the seams of the shrouds.
11. Disconnect the junction box from the pump by:
 - a. Removing the cover of the junction box.
 - b. Disconnecting the heater wires and sensor wires that come from the pump.
 - c. Removing the wires from the junction box.
 - d. Disconnecting the pump's back shroud and moving it backwards out of the way.
12. Remove the follower from the pump, using the procedure described in the **Removing the Follower from the Check-Mate 800 Pump** section on page 35.
13. Separate the pump from the air motor, using the procedure described in the **Separating the Check-Mate 800 Pump from the Air Motor** section on page 35.
14. Remove the pump and service it as needed. See Form# 308570 and 310530 for more information about the pump.
15. Reverse this procedure to reinstall the pump. Be sure to re-apply RTV sealant to the seams of the shrouds before replacing them on the pump.

Service

Separating the Check-Mate 800 Pump from the Air Motor

See page 52 for more information. To separate the pump from the air motor:

1. Perform steps 1–11 of the **Removing/Reinstalling the Pump Assembly** procedure, on page 34.
2. Remove the remaining sheet-metal shrouds from the pump.
3. Remove the coupling nut (40), which attaches the pump to the air motor. Be careful not to lose the collar couplings(30).
4. Remove the nuts from the stand-off rods (20). You can now separate the pump from the air motor.
5. To access the bare pump, remove the pump's:
 - insulation
 - 2 heater bands
 - sensor block

Re-attaching the Air Motor to the Check-Mate 800 Pump

Reverse the above procedure to re-attach the pump to the air motor.

Be sure that:

- when you reinsert the collar couplings (30) into the coupling nut the large flanges point upwards
- you re-apply RTV sealant to the pump shrouds before re-assembling them

For more information, see Form# 310530, or call your Graco technical support representative.

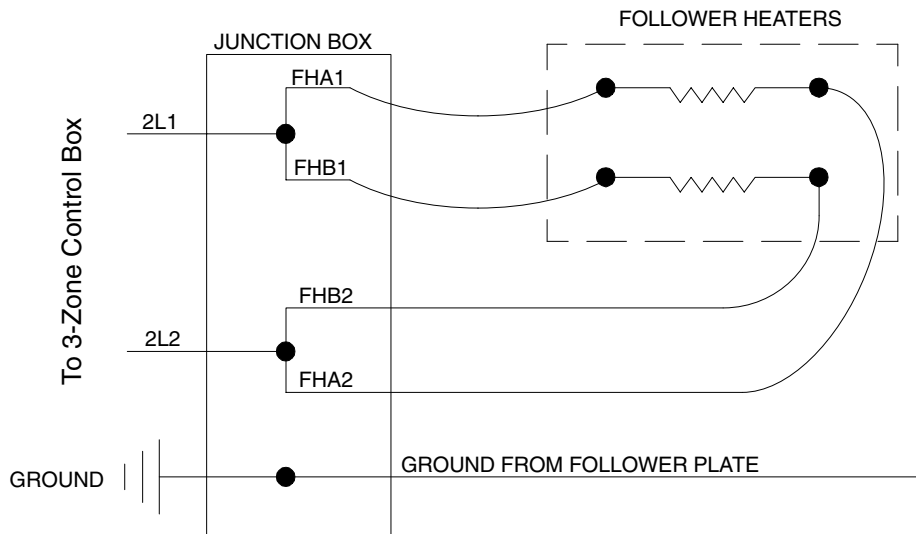
Removing the Follower from the Check-Mate 800 Pump

See page 60 for more information about the follower. To remove the follower from the pump assembly:

1. Remove the pump assembly by following steps 1–12 of the **Removing the Pump Assembly** procedure.
2. Remove the sensor wires from the follower plate.
3. Disconnect the follower-plate wires from the junction box (Fig. 10, 11 or 12).
4. Loosen the coupling nuts from the follower conduits and from the sensor conduit.
5. Remove the air line from the blow-off valve.
6. Remove the 6 screws (170) and washers (160) from the follower adapter.
7. Slide off the follower.

Service

240 Volt Ram Plate Assembly Wiring (3 Zone Control)



480 Volt Ram Plate Assembly Wiring (3 Zone Control)

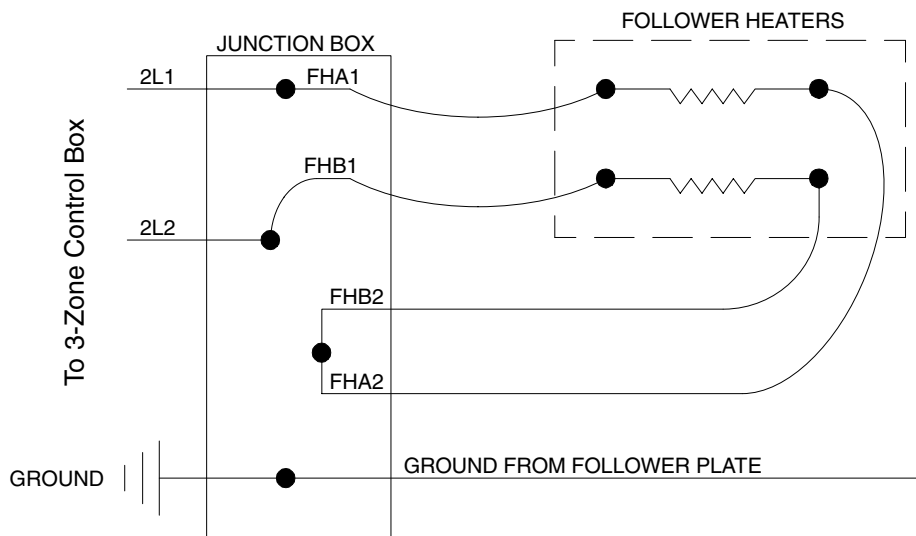


Fig. 10

Service

240 Volt Ram Plate Assembly Wiring (4 Zone Control)

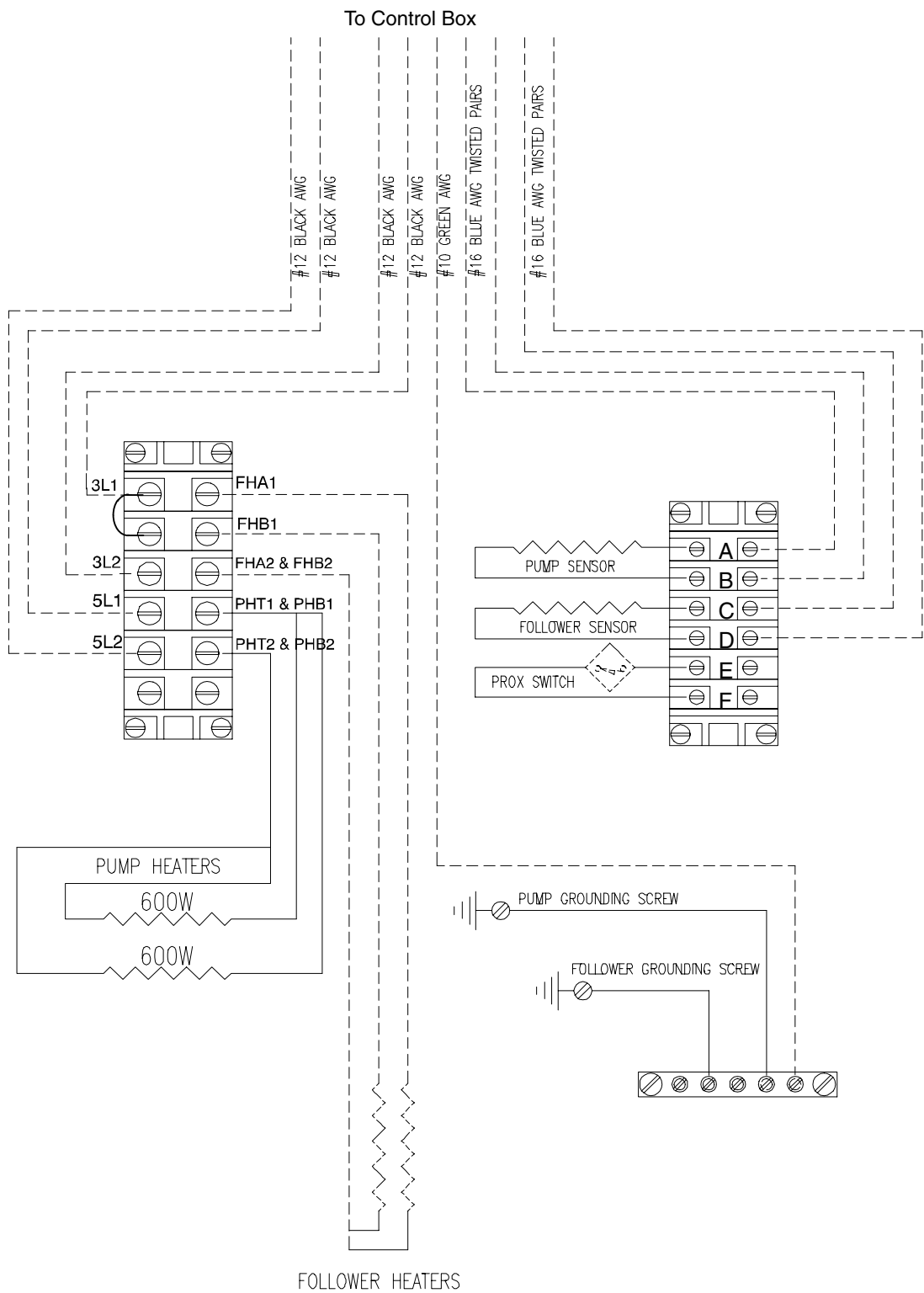


Fig. 11

Service

480/575 Volt Ram Plate Assembly Wiring (4 Zone Control)

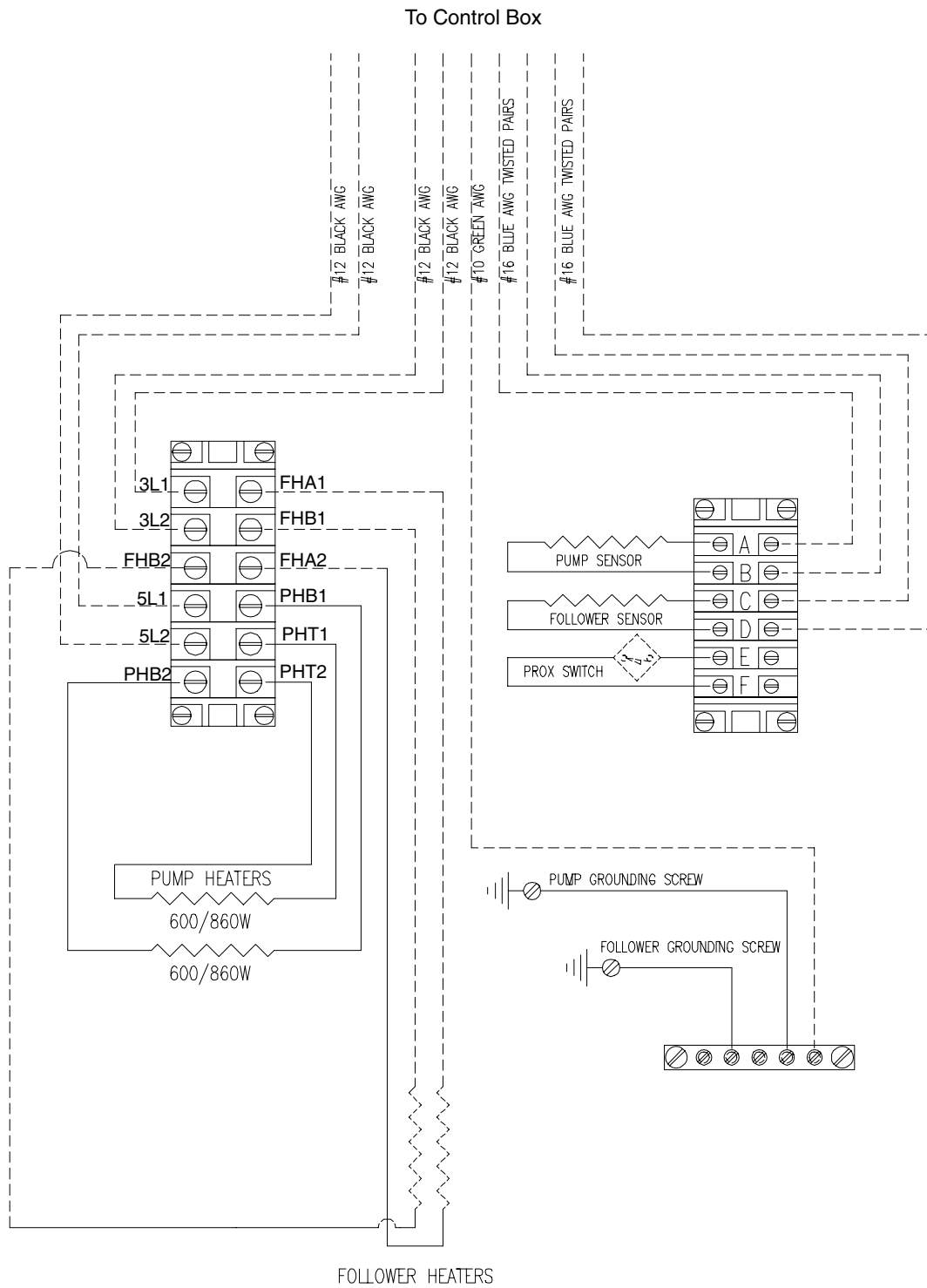


Fig. 12

Service

Servicing the Pump/Motor Assembly for the Therm-O-Flow Mini-5 Supply Unit

The sections below describe how to:

- remove the pump lower assembly from the air motor
- re-attach the pump lower assembly to the air motor
- remove the follower from the pump lower assembly

Removing the Pump Lower Assembly from the Air Motor

For more information about the pump lower assembly, refer to document number 310555.

To remove the pump lower assembly from the ram, follow this procedure:

1. If the material drumpail has already been removed from the supply unit, go to step 2. If you need to remove the material drum, perform the procedure in **Changing Empty Pails** on page 23.
2. Make sure the ram hand valve is in the OFF position.

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** (page 21).

3. **Relieve the supply unit pressure.**

WARNING

To reduce the risk of serious injury whenever you are instructed to relieve ram pressure, always follow the **Ram Pressure Relief Procedure** (page 31).

4. **Relieve the ram air pressure.**
5. Turn off the electrical power to the supply unit. Follow all applicable safety procedures and lockout rules.
6. Turn the system CONTROL ON switch to OFF.

7. Turn OFF the main electrical disconnect.

WARNING



ELECTROCUTION HAZARD

To reduce risk of injury or damage to equipment, make sure the main disconnect is OFF before continuing with this procedure.

8. Bleed off pressure in the system and excess material by opening the dispense gun and catching the material in a waste container.
9. Disconnect all material hoses.
10. Remove the connecting rod nut (100) from the connecting rod.
11. Remove the 3 nuts (170) and 3 washers (160) from the stand-off rods (70).
12. Remove the pump and service it as needed.

Re-attaching the Pump Lower Assembly to the Air Motor

Reverse the above procedure to re-attach the pump to the air motor. Make sure you torque the connecting rod nut to 40.67–54.23 N.m (30–40 ft-lb).

Removing the Follower from the Pump Lower Assembly

See page 59 for more information. To remove the follower from the pump assembly:

1. Remove the pump by following steps 1–9 of the **Removing the Pump Lower Assembly from the Air Motor** procedure, above.
2. Remove the sensor from the follower plate.
3. Loosen the coupling nuts from the follower conduit.
4. Remove the air line from the blow-off valve.
5. Remove the screws (180) and washers (170) from the follower adapter.
6. Slide off the follower.

Service

Inspection Frequency

Ram

Periodically (once a month), inspect the ram guide sleeves, rods and cylinders for wear or damage, replace all worn parts. See the **Service** section of Form# 310523, 310525, 310533 for instructions on replacing worn parts.

Pump

See the pump's instructions for its inspection frequency.

Ground Fault Interrupt

Periodically (once a month) test the ground fault interrupt switch by pushing the TEST button. See the literature that came with the electrical control panel for more information.

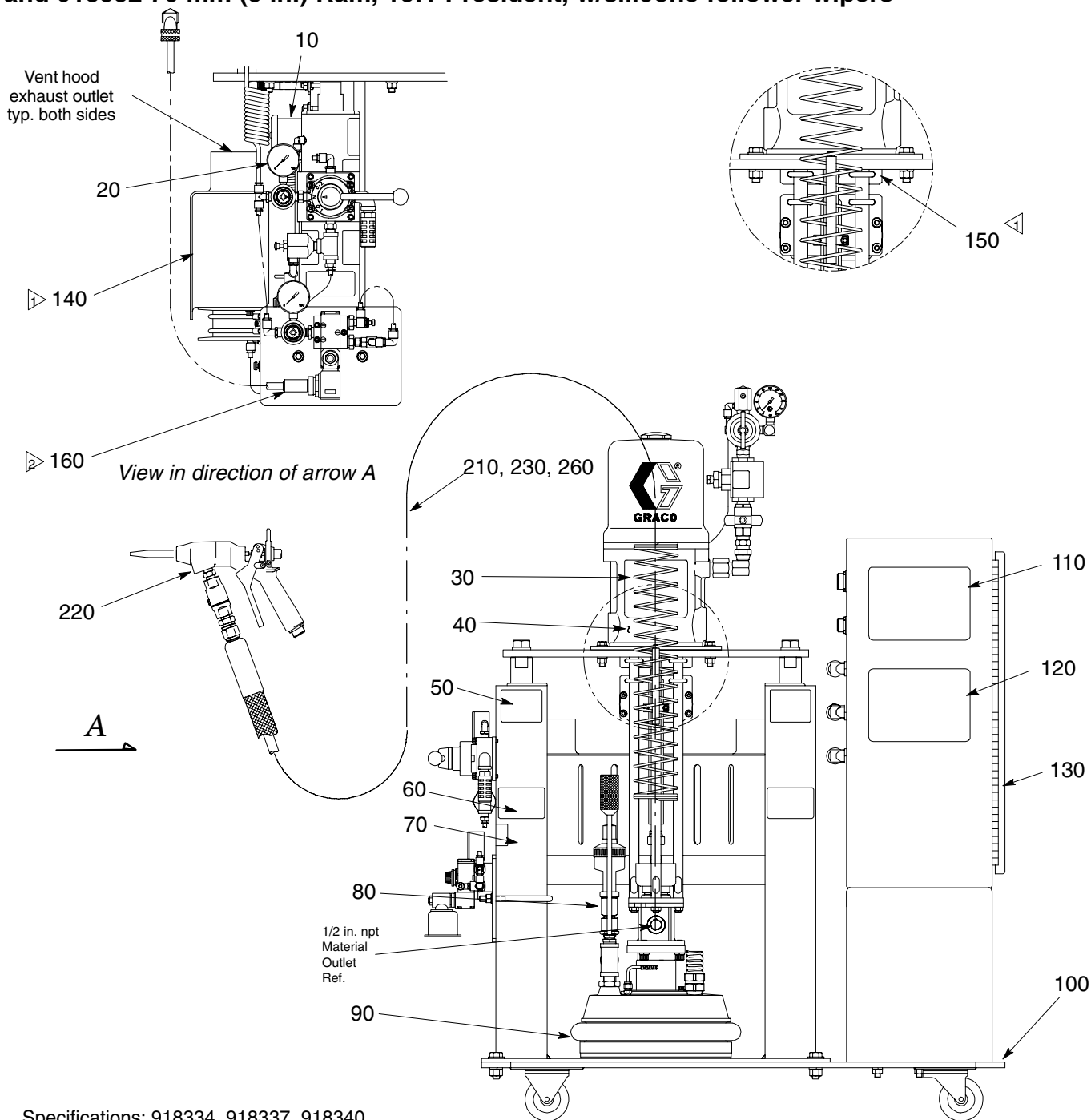
Removing/Replacing the CB100 Controller

See Form# 309100 for instructions on removing and/or replacing the temperature controllers on the system.

[illegible]

Parts

Therm-O-Flow Mini-5 Models 918334 (standard), 918337 (PUR), 918340 (Swirl), 918522, and 918532 76 mm (3 in.) Ram, 15:1 President, w/silicone follower wipers



Specifications: 918334, 918337, 918340

Pump Air supply: 8.2 bar (120 psi)
 Pump: 70 Cycles/Min. Max.: 7.57 lpm (2 gpm)
 Max Fluid Working Pressure: 126 bar (1800 psi) max.
 Volts: 480/3 phase
 Full Load Amps: 7.3
 Floor Space Dimensions: 914.4 mm (36 in.) Wide x 609.6 mm (24 in.) Deep
 Vent Hood Connections (918337 and 918340 only): (2) 76.2 mm (3 in.) flexible duct
 Approx. Weight: 295 kg (650 lbs)

Notes

- 1 Models 918337 and 918340 only
- 2 Model 918340 only

8248B

Parts

Model 918334, 76 mm (3 in.) Ram, Therm-O-Flow 15:1 President, w/silicone follower wipers, 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617321	Assembly, junction box	1	80	C31203	Kit, blow-off/bleed	1
20	918505	Control, air	1	90	617325	Follower, TFE coated, heated 20 liter (5 gal.)	1
30	C31197	Kit, hose support	1	100	918414	Base, portable ram 20 liter (5 gal.)	1
40	C31202	Pump, President assembly 15:1*	1	110	C14004	Label, caution	1
50	C14043	Label, pinch point	4	120	C14003	Label, warning	1
60	C14005	Label, warning hot surface	4	130	617300	Control, 480 VAC, electrical 3-zone	1
70	918405	Ram, 76 mm (3 in.)	1	160	918506	Kit, air motor depressurization	1

Model 918337, 76 mm (3 in.) Ram, PUR Therm-O-Flow, 15:1 President, w/silicone follower wipers, 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617321	Assembly, junction box	1	90	617325	Follower, TFE coated, heated 20 liter (5 gal.)	1
20	918505	Control, air	1	100	918414	Base, portable ram 20 liter (5 gal.)	1
30	C31197	Kit, hose support	1	110	C14004	Label, caution	1
40	C31202	Pump, President assembly 15:1*	1	120	C14003	Label, warning	1
50	C14043	Label, pinch point	4	130	617300	Control, 480 VAC, electrical 3-zone	1
60	C14005	Label, warning hot surface	4	140	617318	Hood, 20 liter, (5 gal.) vent	1
70	918405	Ram, 76 mm (3 in.)	1	150	918433	Kit, prox. switch pump inactivity	1
80	C31203	Kit, blow-off/bleed	1	160	918506	Kit, air motor depressurization	1

Model 918340, 76 mm (3 in.) Ram, PUR Therm-O-Flow, 15:1 President, Swirl Valve, w/silicone follower wipers 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617321	Assembly, junction box	1	90	617325	Follower, TFE coated, heated 20 liter (5 gal.)	1
20	918505	Control, air	1	100	918414	Base, portable ram 20 liter (5 gal.)	1
30	C31197	Kit, hose support	1	110	C14004	Label, caution	1
40	C31202	Pump, President assembly 15:1*	1	120	C14003	Label, warning	1
50	C14043	Label, pinch point	4	130	617330	Control, 480 VAC, electrical 3-zone	1
60	C14005	Label, warning hot surface	4	140	617318	Hood, 20 liter, (5 gal.) vent	1
70	918405	Ram, 76 mm (3 in.)	1	150	918433	Kit, prox. switch pump inactivity	1
80	C31203	Kit, blow-off/bleed	1	160	918506	Kit, air motor depressurization	1
				170	617328	Kit, swirl valve	1

Parts

Models 918522 and C58630

76 mm (3 in.) Ram, Therm-O-Flow, 15:1 President, w/silicone follower wipers 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617321	Assembly, junction box	1	210	C34093	Hose, heated; 10'; 7/8–14 JIC (Model C58630 only)	1
20	918505	Control, air	1	220	C34005	Gun, hot melt (Model C58630 only)	1
30	C31197	Kit, hose support	1	230	C20679	Fitting, elbow; 1/2 npt (Model C58630 only)	1
40	C31202	Pump, President assembly 15:1*	1	240	C33049	Tape, adhesive; fiberglass (Model C58630 only)	4.2'
50	C14043	Label, pinch point	4	250	C34137	Insulator; fiberglass (Model C58630 only)	8.3'
60	C14005	Label, warning hot surface	4	260	110332	Adapter; 1/2 npt (m x f) (Model C58630 only)	1
70	918405	Ram, 76 mm (3 in.)	1				
80	C31203	Kit, blow-off/bleed	1				
90	918499	Inductor, heated, PTFE 20 liter (5 gal.)	1				
100	918414	Base, portable ram 20 liter (5 gal.)	1				
130	617330	Control, 480 VAC, electrical 3-zone	1				
160	918506	Kit, air motor depressurization	1				

Models 918532 and C58805

76 mm (3 in.) Ram, Therm-O-Flow, 15:1 President, w/silicone follower wipers 240 VAC

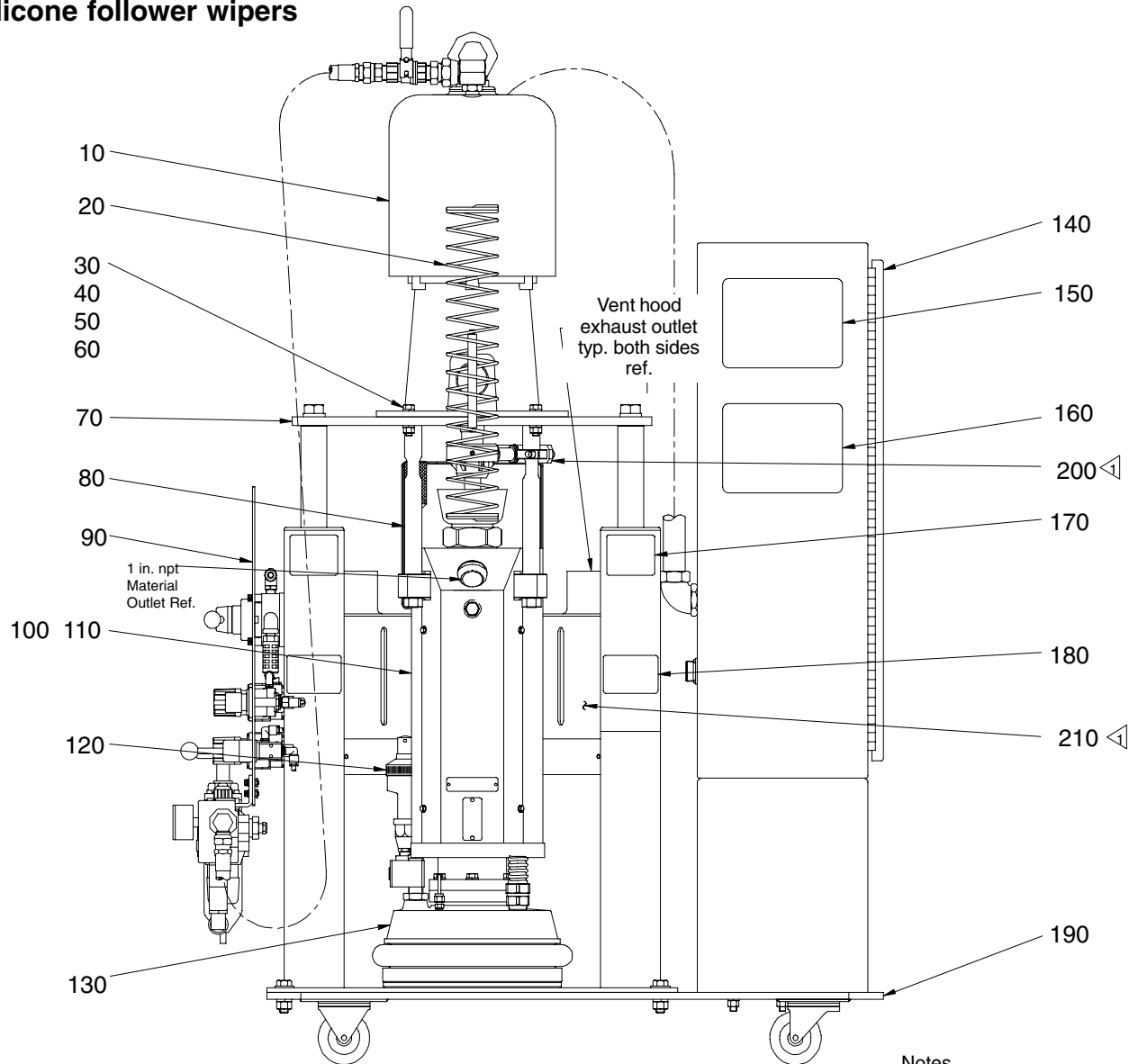
Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617321	Assembly, junction box	1	160	918506	Kit, air motor depressurization	1
20	918505	Control, air	1	210	C34093	Hose, heated; 10'; 7/8–14 JIC (Model C58805 only)	1
30	C31197	Kit, hose support	1	220	C34005	Gun, hot melt (Model C58805 only)	1
40	C31202	Pump, President assembly 15:1*	1	230	C20679	Fitting, elbow; 1/2 npt (Model C58805 only)	1
50	C14043	Label, pinch point	4	240	C33049	Tape, adhesive; fiberglass (Model C58805 only)	4.2'
60	C14005	Label, warning hot surface	4	250	C34137	Insulator; fiberglass (Model C58805 only)	8.3'
70	918405	Ram, 76 mm (3 in.)	1				
80	C31203	Kit, blow-off/bleed	1				
90	918499	Inductor, heated, PTFE 20 liter (5 gal.)	1				
100	918414	Base, portable ram 20 liter (5 gal.)	1				
130	617484	Control, 240 VAC, electrical 3-zone	1				

* Refer to instruction manual 307431 to obtain C31202 pump assembly parts information on the 918417 fluid pump.

Notes

Parts

Therm-O-Flow 5 Models 918343, 918352 (PUR)
76 mm (3 in.) Ram, 19:1 Senator, Heated Check-Mate 800,
w/silicone follower wipers



Notes

▶ Model 918352 only

Specifications 918343, 918352

Pump Air supply: 6.9 bar (100 psi)

Pump: 60 Cycles/Min. Max., 2.24 m³/min (80 scfm)

Max Fluid Working Pressure: 131 bar (1900 psi) max.

Volts: 480/3 phase

Full Load Amps: 9.8

Floor Space Dimensions: 914.4 mm (36 in.) Wide x 609.6 mm (24 in.) Deep

Vent Hood Connections (918352 only): (2) 76.2 mm (3 in.) flexible duct

Approx. Weight: 318 kg (700 lbs)

8249A

Parts

Model 918343, 76 mm (3 in.) Ram, 19:1 Senator, Therm-O-Flow Heated Check-Mate 800, w/silicone follower wipers 480 VAC

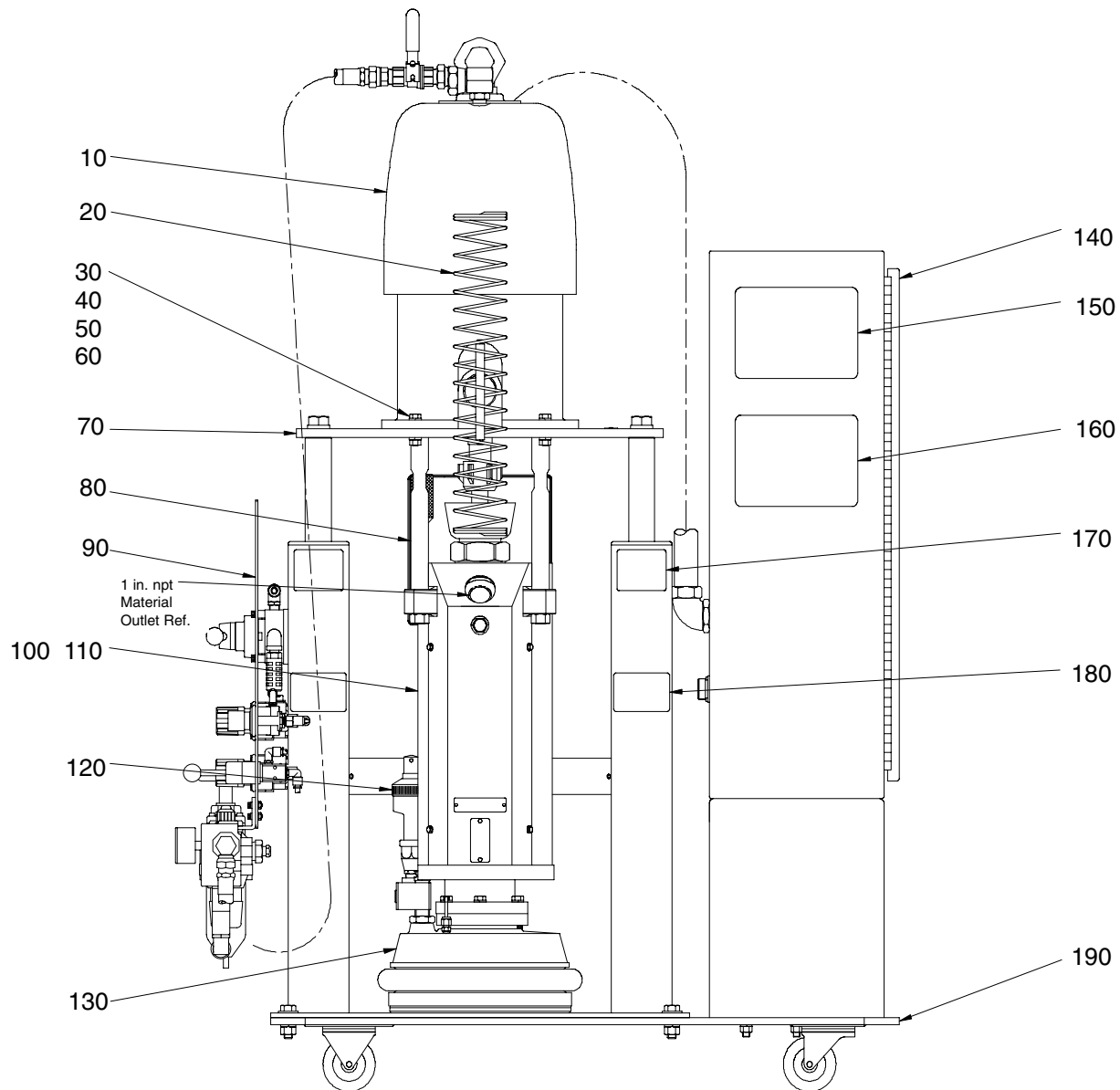
Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	217540	Motor, Senator air 5-1/2 in.	1	120	617347	Kit, follower blow-off/bleed	1
20	C31197	Kit, hose support	1	130	617335	Follower, heated, tfe coated, 20 liter (5 gal.)	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	140	617349	Control, 480 VAC electrical 4-zone	1
40	C19200	Washer, flat 3/8 in.	4	150	C14004	Label, caution	1
50	C19213	Washer, lock 3/8 in.	4	160	C14003	Label, warning	1
60	C19185	Nut, hex 3/8-16	4	170	C14043	Label, pinchpoint	4
70	918405	Ram, 76 mm (3 in.) global	1	180	C14005	Label, warning hot surface	4
80	C03510	Kit, pump/air motor mounting	1	190	918414	Base, portable ram 20 liter (5 gal.)	1
90	918416	Control, air	1				
100	517453	Sealer, RTV	A/R				
110	C03509	Pump, HCM-800, assembly 480/575 VAC	1				

Model 918352, 76 mm (3 in.) Ram, 19:1 Senator, PUR Therm-O-Flow Heated Check-Mate 800, w/silicone follower wipers 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	217540	Motor, Senator air 5.5 in.	1	120	617347	Kit, follower blow-off/bleed	1
20	C31197	Kit, hose support	1	130	617335	Follower, heated, tfe coated, 20 liter (5 gal.)	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	140	617349	Control, 480 VAC electrical 4-zone	1
40	C19200	Washer, flat 3/8 in.	4	150	C14004	Label, caution	1
50	C19213	Washer, lock 3/8 in.	4	160	C14003	Label, warning	1
60	C19185	Nut, hex 3/8-16	4	170	C14043	Label, pinchpoint	4
70	918405	Ram, 76 mm (3 in.) global	1	180	C14005	Label, warning hot surface	4
80	C03510	Kit, pump/air motor mounting	1	190	918414	Base, portable ram 20 liter (5 gal.)	1
90	918416	Control, air	1	200	617334	Kit, prox. switch pump activity	1
100	517453	Sealer, RTV	A/R	210	617318	Hood, vent assembly 20 liter (5 gal.)	1
110	C03509	Pump, HCM-800, assembly 480/575 VAC	1				

Parts

**Therm-O-Flow 5 Models 918344, 918437 and 918593
76 mm (3 in.) Ram, 31:1 Bulldog, Heated Check-Mate 800,
w/silicone follower wipers**



8250A

Specifications 918344

Pump Air supply: 6.9 bar (100 psi)

Pump: 60 Cycles/Min. Max., 2.8 m³/min (100 scfm)

Max Fluid Working Pressure: 214 bar (3100 psi) max.

Volts: 480/3 phase

Full Load Amps: 9.8

Floor Space Dimensions: 914.4 mm (36 in.) Wide x 609.6 mm (24 in.) Deep

Approx. Weight: 318 kg (700 lbs)

Parts

Model 918344, 76 mm (3 in.) Ram, 31:1 Bulldog, Therm-O-Flow PUR Heated Check-Mate 800, w/silicone follower wipers 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	208356	Motor, Bulldog air 7 in.	1	110	C03512	Pump, HCM-800, assembly 240 VAC	1
20	C31197	Kit, hose support	1	120	617347	Kit, follower blow-off/bleed	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	130	617335	Follower, heated, tfe coated, 20 liter (5 gal.)	1
40	C19200	Washer, flat 3/8 in.	4	140	617485	Control, 240 VAC electrical 4-zone	1
50	C19213	Washer, lock 3/8 in.	4	150	C14004	Label, caution	1
60	C19185	Nut, hex 3/8-16	4	160	C14003	Label, warning	1
70	918405	Ram, 76 mm (3 in.) global	1	170	C14043	Label, pinchpoint	4
80	C03510	Kit, pump/air motor mounting	1	180	C14005	Label, warning hot surface	4
90	918416	Control, air	1	190	918414	Base, portable ram 20 liter (5 gal.)	1
100	517453	Sealer, RTV	A/R				

Model 918437, 76 mm (3 in.) Ram, 31:1 Bulldog, Therm-O-Flow PUR Heated Check-Mate 800, 240 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	208356	Motor, Bulldog air 7 in.	1	110	C03512	Pump, HCM-800, assembly 240 VAC, 5 gal	1
20	C31197	Kit, hose support	1	120	617347	Kit, follower blow-off/bleed	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	130	617335	Follower, heated, tfe coated, 20 liter (5 gal.)	1
40	C19200	Washer, flat 3/8 in.	4	140	617485	Control, 240 VAC electrical 4-zone	1
50	C19213	Washer, lock 3/8 in.	4	170	C14043	Label, pinchpoint	4
60	C19185	Nut, hex 3/8-16	4	180	C14005	Label, warning hot surface	4
70	918405	Ram, 76 mm (3 in.) global	1	190	918414	Base, portable ram 20 liter (5 gal.)	1
80	C03510	Kit, pump/air motor mounting	1				
90	918416	Control, air	1				

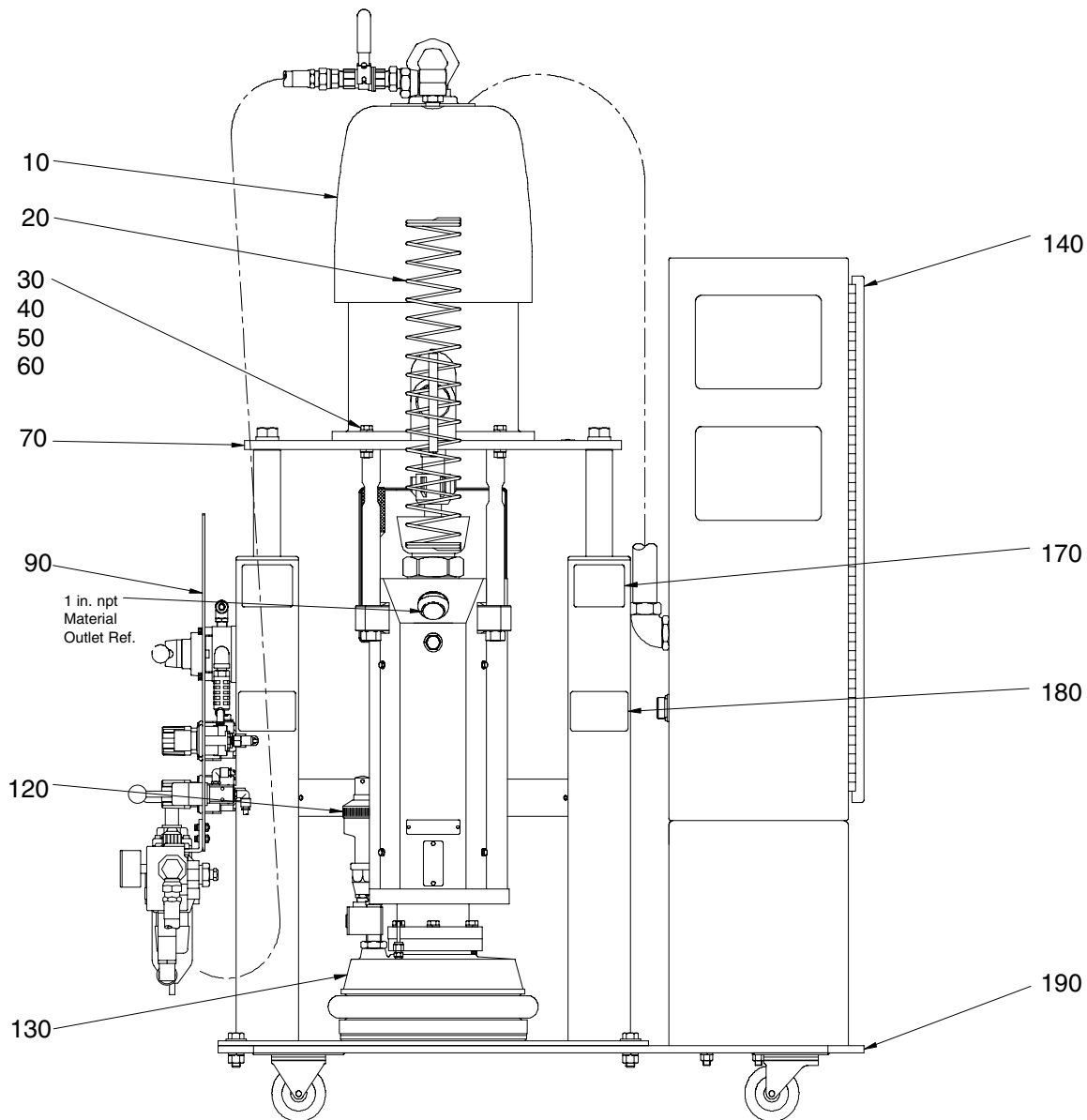
Model 918593, 76 mm (3 in.) Ram, 31:1 Bulldog, Therm-O-Flow PUR Heated Check-Mate 800, w/Finned Platen 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	241201	Motor, Bulldog	1	110	C03509	Pump, HCM-800, 480 VAC (5 gal.)	1
20	C31197	Kit, hose support	1	120	617347	Kit, follower blow-off/bleed	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	140	617349	Control, 480 VAC electrical 4-zone	1
40	C19200	Washer, flat 3/8 in.	4	170	C14043	Label, pinchpoint	4
50	C19213	Washer, lock 3/8 in.	4	180	C14005	Label, warning hot surface	4
60	C19185	Nut, hex 3/8-16	4	190	918414	Base, portable ram 20 liter (5 gal.)	1
70	918405	Ram, 76 mm (3 in.) global	1				
80	C03510	Kit, pump/air motor mounting	1				
90	918416	Control, air	1				

Parts

Therm-O-Flow 5 Model C59398

76 mm (3 in.) Ram, 65:1 King, Heated Check-Mate 800,
w/silicone follower wipers



8250A

Specifications 918344

Pump Air supply: 4.2 bar (60 psi)

Pump: 50 Cycles/Min. Max., 4.4 m³/min (150 scfm)

Max Fluid Working Pressure: 214 bar (3100 psi) max.

Volts: 480/3 phase

Full Load Amps: 9.8

Floor Space Dimensions: 914.4 mm (36 in.) Wide x 609.6 mm (24 in.) Deep

Approx. Weight: 318 kg (700 lbs)

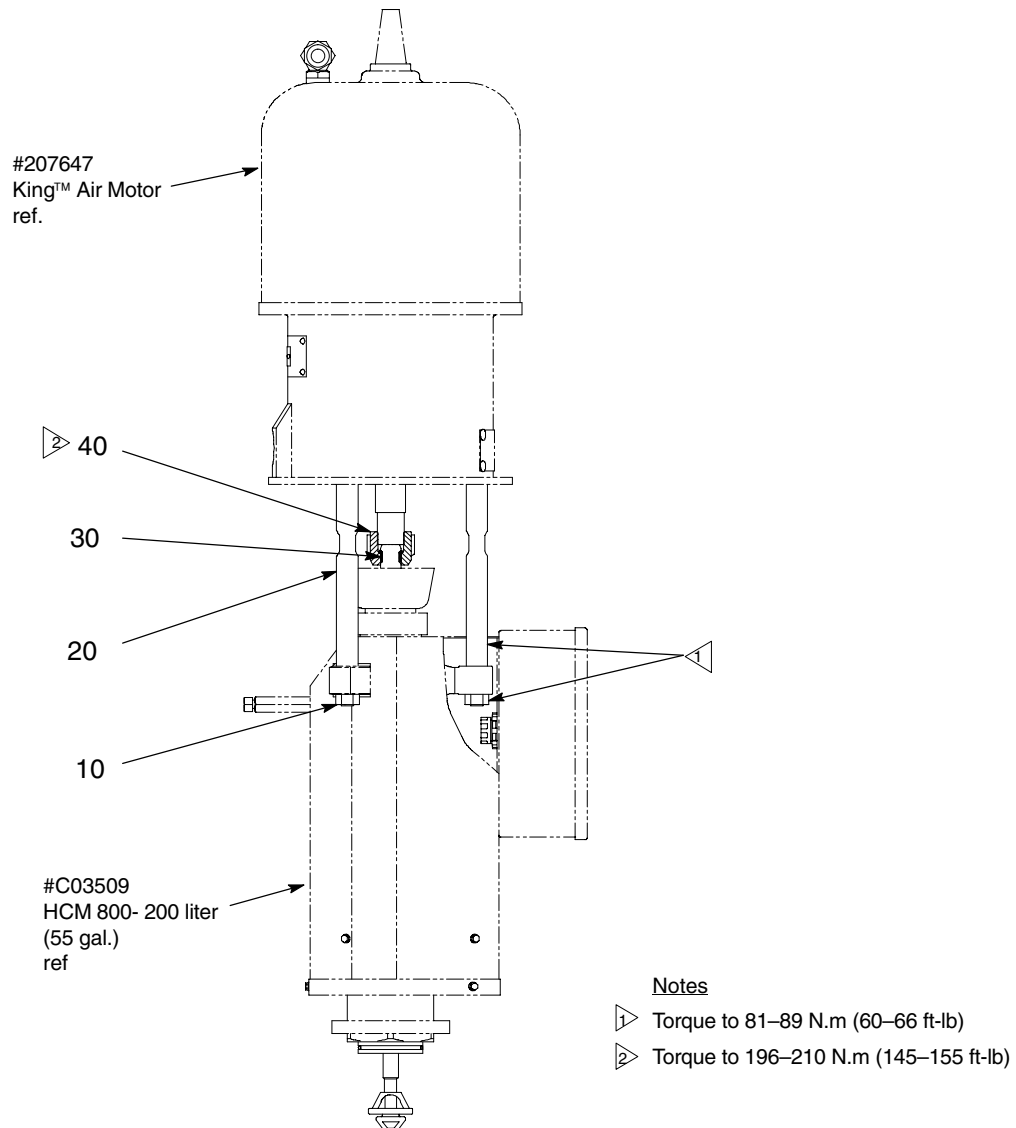
Parts

Model C59398, 76 mm (3 in.) Ram, 65:1 King, Therm-O-Flow PUR Heated Check-Mate 800, w/silicone follower wipers 480 VAC

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	241200	Motor, King 8cm SST	1	120	617347	Kit, follower blow-off/bleed	1
20	C31197	Kit, hose support	1	130	617335	Follower, heated, tfe coated, 20 liter (5 gal.)	1
30	100003	Screw, hex; 3/8-16 UNC x 1.5 in.	4	140	617349	Control, 480 VAC electrical 4-zone	1
40	C19200	Washer, flat 3/8 in.	4	170	C14043	Label, pinchpoint	4
50	C19213	Washer, lock 3/8 in.	4	180	C14005	Label, warning hot surface	4
60	C19185	Nut, hex 3/8-16	4	190	918414	Base, portable ram 20 liter (5 gal.)	1
70	918405	Ram, 76 mm (3 in.) global	1				
90	918416	Control, air	1				

Parts

Model C03510, Pump Air Motor Mounting Kit



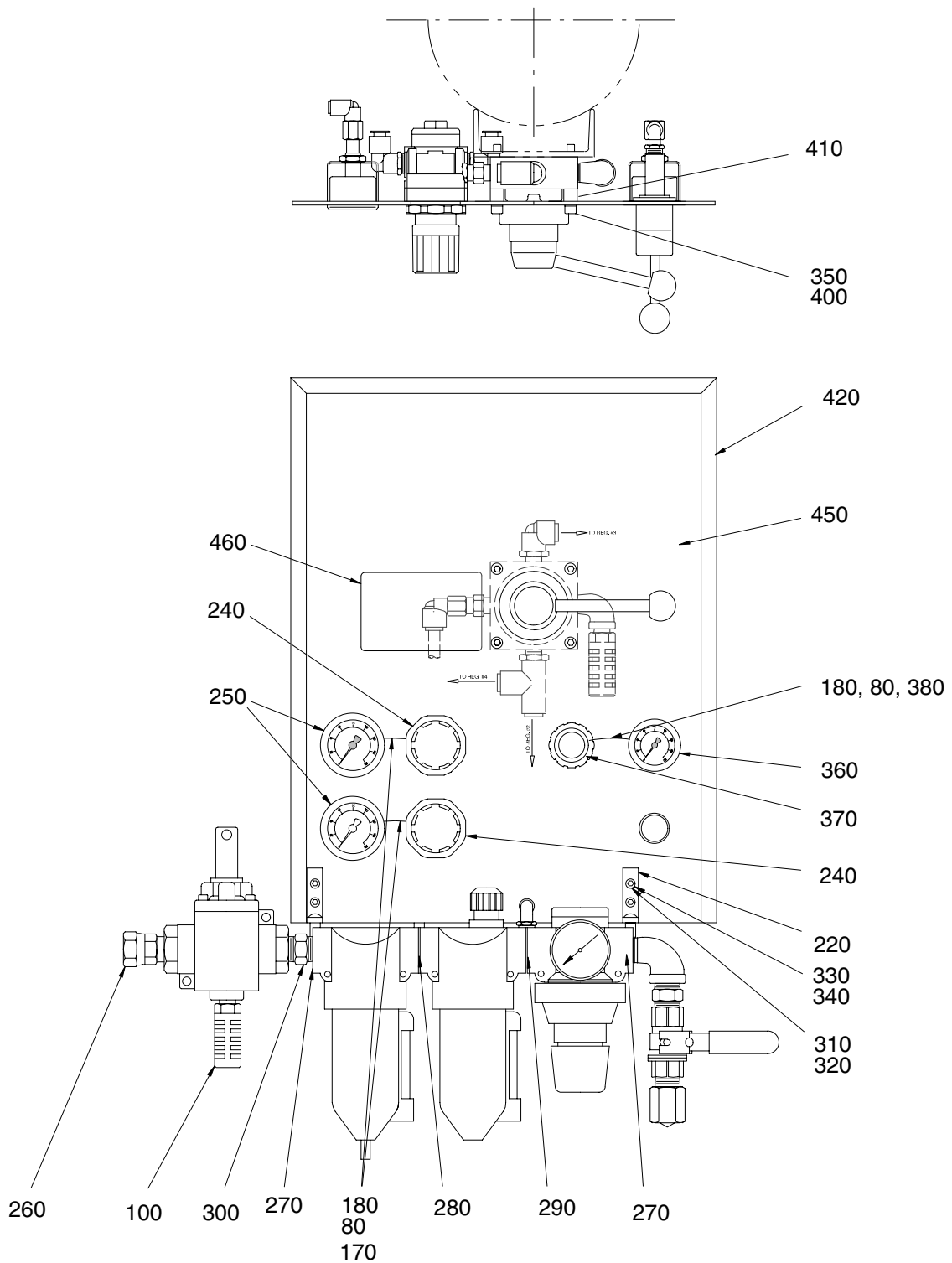
7990A

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	106166	Nut, hex M16 x 2	3	30	184129	Collar, coupling	2
20	190000	Rod, stand-off	3	40	186925	Nut, coupling	1

Notes

Parts

Model 918416, 4-Regulator Ram Air Control Module



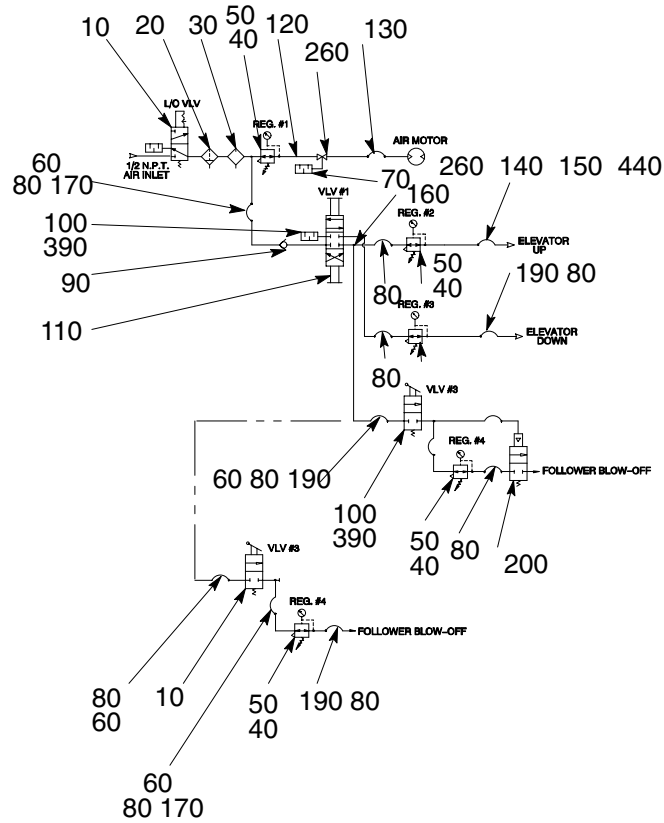
7980A

Parts

Model 918416, 4-Regulator Ram Air Control Module

ALTERNATE
SCHEMATIC

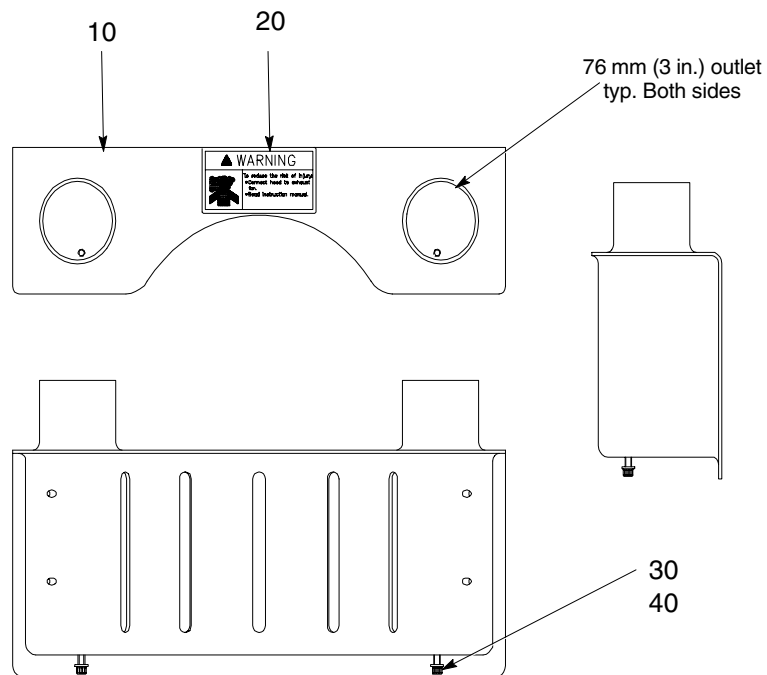
7991A



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	C06021	Valve, lockout 1/2 npt	1	260	C19019	Union, swivel 1/2 npt	2
20	C11033	Filter, air	1	270	C11037	Insert, pipe port 1/2 npt	2
30	C11034	Lubricator	1	280	C11039	Connector, air interface	1
40	C11029	Regulator, air	1	290	C11040	Insert, ported 1/4 npt	1
50	C36260	Gauge, pressure 160 psi	1	300	C20485	Nipple, hex 1/2 npt	1
60	C19391	Elbow, connector 1/4P x 1/4T	4	310	C19204	Washer, lock #10	4
70	C06299	Muffler 10-32 unf	1	320	100179	Nut, hex #10-24	4
80	C12509	Tubing, nylon black Ø 1/4	126"	330	C19981	Screw. soc. hd. cap #10-24 x 0.62	4
90	C06093	Valve, check 1/4 npt	1	340	C19197	Washer, flat #10	4
100	C36183	Muffler, 1/4 npt	2	350	C19209	Washer, lock 1/4	4
110	C06015	Valve, hand	1	360	C06090	Gauge, air pressure 60 psi	1
120	C19024	Union, 90° 1/2 npt	1	370	C06116	Regulator, air 50 psi	1
130	C12021	Hose, air 1/2	60"	380	C20349	Elbow, connector female 1/8P x 1/4T	1
140	C06297	Valve, ball lockable 1/2 npt	1	390	C19445	Elbow, street 1/4 npt	1
150	157191	Nipple red, hex 3/4 x 1/2	1	400	C19815	Screw, soc. hd. cap 1/4-20 x 2	4
160	C20365	Tee, run-male 1/4P x 1/4T	1	410	C51978	Spacer	4
170	C20350	Elbow, connector female 1/4P x 1/4T	3	420	C32436	Plate, mounting	1
180	597151	Elbow, connector 1/8P x 1/4T	4	430	C20382	Ferrule	2
190	C19382	Elbow, connector 3/8P x 1/4T	4	440	C20362	Fitting, tube tee 1/8P x 1/4T	1
200	517413	Valve, toggle	1	450	C14042	Label, panel	1
210	C20372	Insert 1/2 npt	2	460	918506	Kit, auto depressurization	1
220	C11055	Kit. FRL mounting	1	470	617714	Trim, black vinyl edge	51"
230	C14043	Label, pinch point	1	480	617718	Plug, .25 OD tube	1
240	C11057	Regulator, air	2	490	617717	Fitting, nipple .25 OD	1
250	C07585	Gauge, air pressure 160 psi	2	500	C20341	Fitting, union, female 1/4Px1/4T	1

Parts

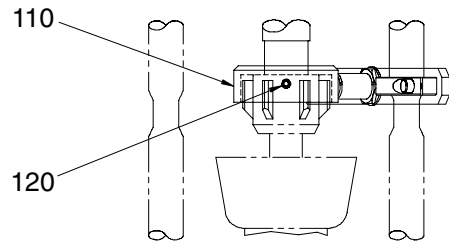
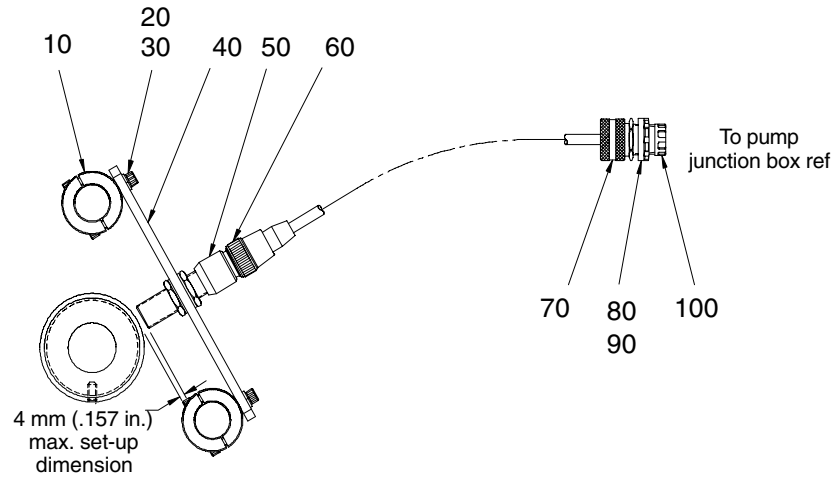
Model 617318, Vent Hood Kit for use with PUR units



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	C56022	Hood, vent 20 liter (5 gal.)	1	30	C19802	Screw, shc 1/4-20 x 3/4 in.	2
20	C14038	Label	1	40	C19198	Washer, flat 1/4 in.	2

Parts

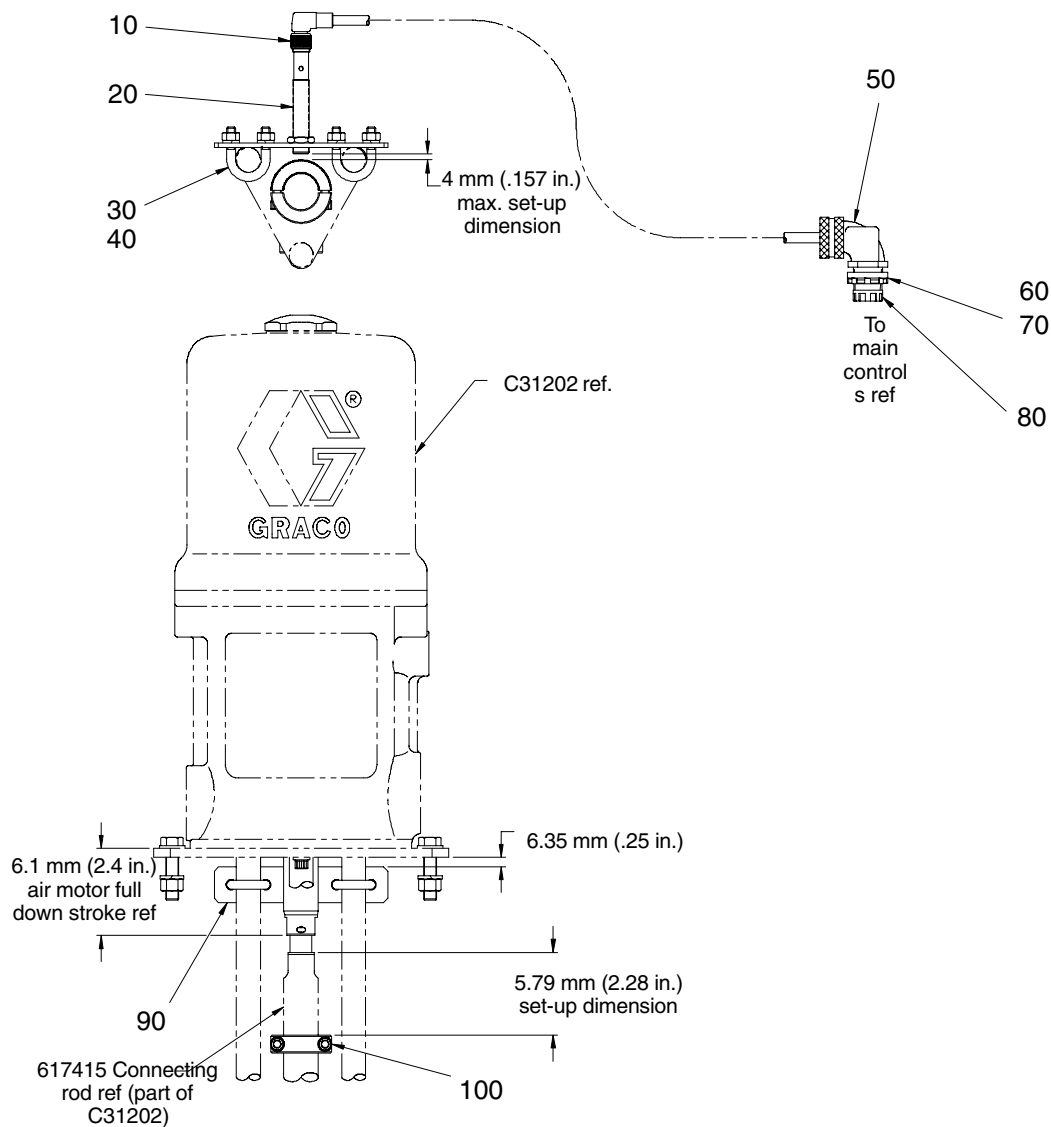
Model 617334, Proximity Switch Kit (Pump Activity) for use with Therm-O-Flow 5 units



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617337	Collar, clamp	2	80	C20874	Seal, conduit 1/2 in.	1
20	C19209	Washer, lock 1/4 in.	2	90	C20715	Nut, conduit lock 1/2 in. npt	1
30	C19800	Screw, shc 1/4-20 x 1/2 in.	2	100	C20865	Bushing, conduit 1/2 in. npt	1
40	617338	Bracket, prox switch mounting	1	110	617339	Housing, coupling nut	1
50	517455	Switch, proximity 18 mm	1	120	C19363	Screw, cup point set 1/4-20 x 1/2 in.	1
60	C56572	Cable, prox 2 meters lg.	1	130	C78342	Timer (not shown)	1
70	C20575	Fitting, cord grip 1/2 in. npt	1	140	C78552	Socket, 8-receptacle (not shown)	1

Parts

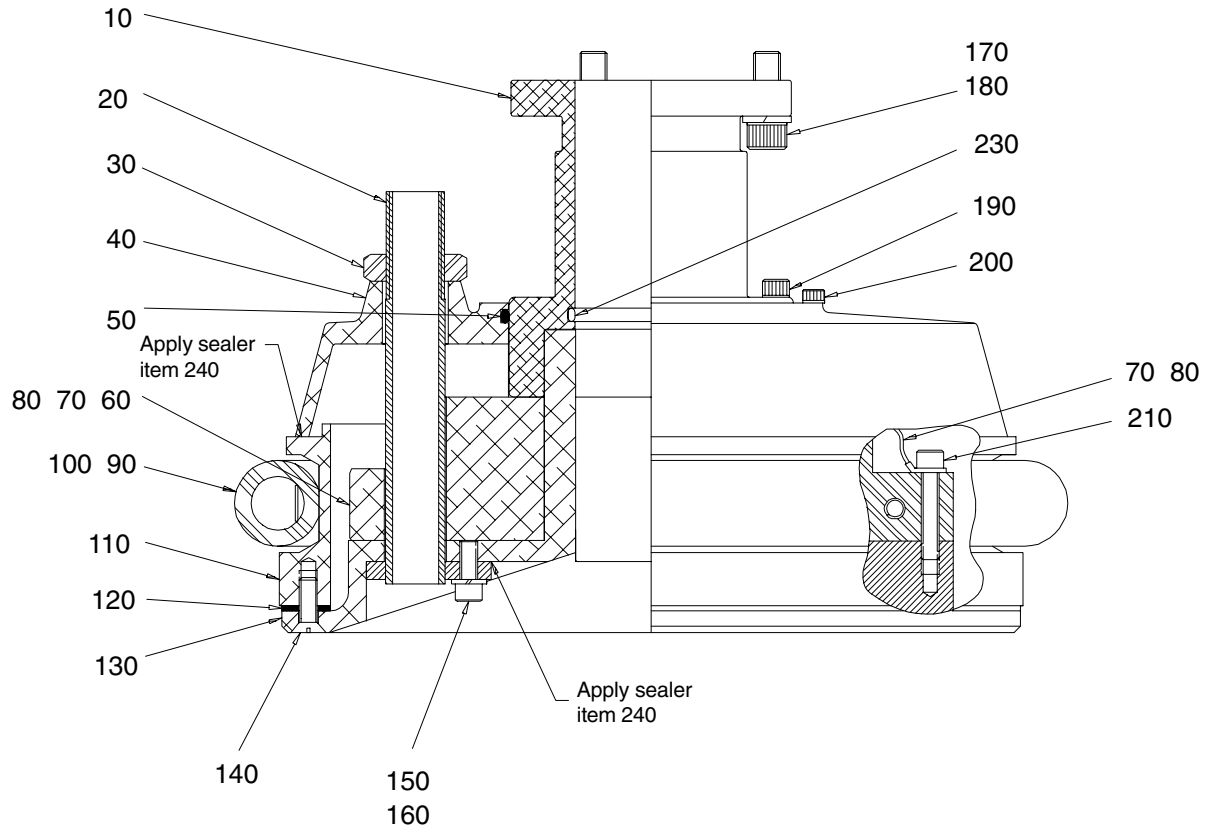
Model 918433, Proximity Switch Kit (Pump Activity) for use with President Pumps



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	C50174	Cable assembly 1.83 m (6')	1	70	C20715	Nut, conduit lock 1/2 in. npt	1
20	517469	Switch, proximity	1	80	C20865	Bushing, conduit 1/2 in. npt	1
30	C19209	Washer, lock 1/4 in.	4	90	617417	Bracket, prox switch mounting	1
40	C20452	Bolt, U 1/4-20	2	100	517470	Collar, clamp	1
50	C20571	Fitting, cord grip 1/2 in. npt	1	110	C78342	Timer (not shown)	1
60	C20874	Seal, conduit 1/2 in.	1	120	C78552	Socket, 8-receptacle (not shown)	1

Parts

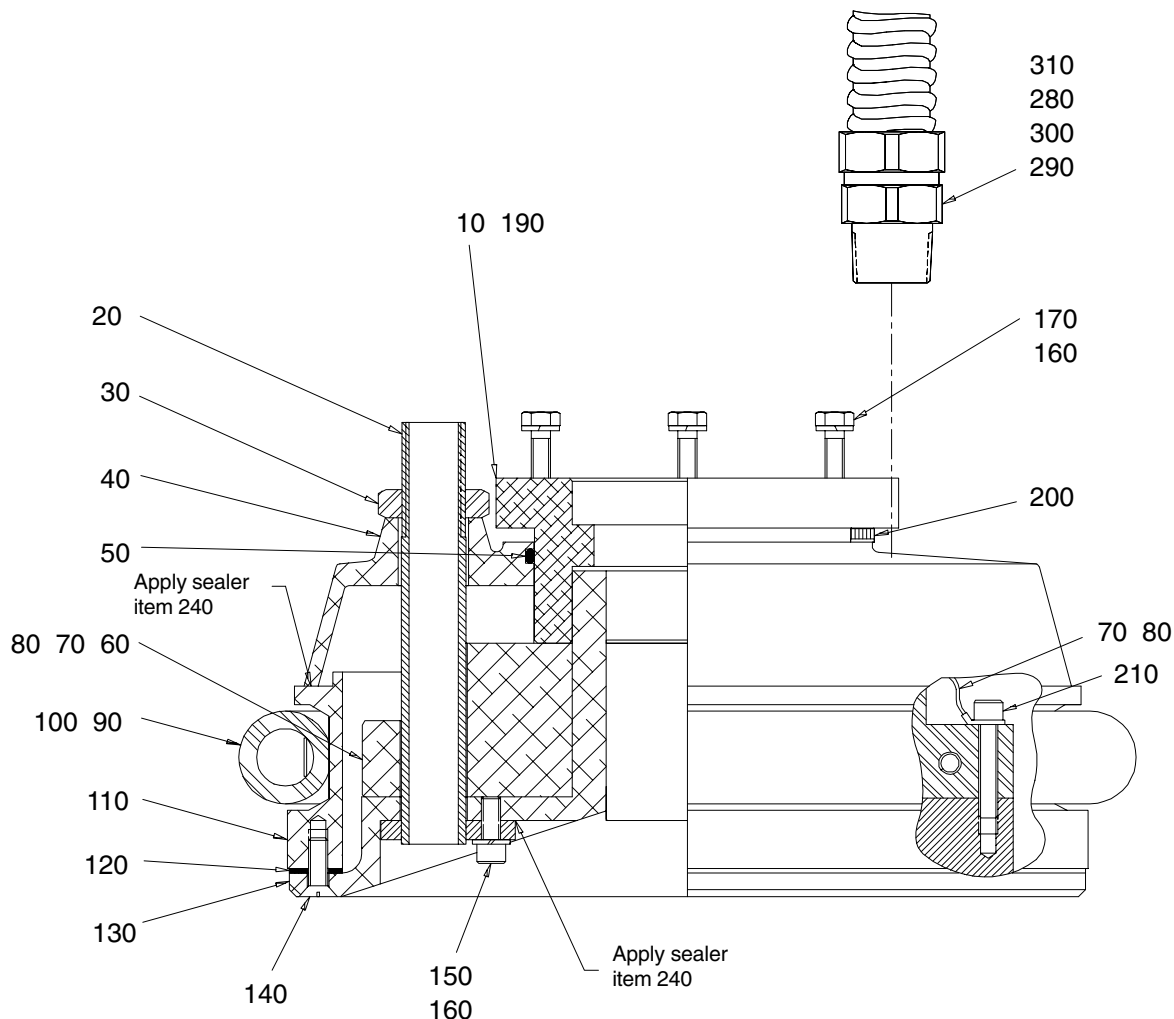
**Model 617325, Heated Follower Plate Kit with smooth bottom
for use with President pump assemblies**



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617396	Adapter, pump/follower	1	180	C19837	Screw, shc 3/8-16 x 1 in.	3
20	C31092	Tube, blow-off/bleed	1	190	C19815	Screw, shc 1/4-20 x 2 in.	3
30	C31093	Nut	1	200	C19986	Screw, shc #10-24 x 1-3/4 in.	1
40	617324	Cover, follower	1	210	C19812	Screw, shc 1/4-20 x 1-1/2 in.	4
50*	C20240	Seal, o-ring	1	220	517428	Sensor, RTD (not shown)	1
60	C31088	Element, heater	1	230*	C38225	Seal, o-ring	1
70	C32386	Wire, hi-temp 10 awg 4572 mm	180"	240	C31056	Sealer RTV (not shown)	
80	C32256	Ring, terminal 10 awg x 1/4 in.	5	250	C07664	Compound, heat sink (not shown)	
90	C31052	Seal, follower	1	260	C20571	Grip, 1/2 in. npt 90° cord (not shown)	1
100	C31154	Clamp, worm-gear	2	270	C20874	Seal, 1/2 in. conduit (not shown)	1
110	C31153	Ring, seal tfe coated	1	280	C20715	Nut, 1/2 in. npt conduit lock (not shown)	1
120*	C31062	Gasket	1	290	150707	Plate, designation (not shown)	1
130	C31152	Inductor plate tfe coated	1	300	100508	Screw, drive (not shown)	2
140	C19743	Screw, flat head 1/4-20 x 5/8 in.	6	* Included in Follower Repair Kit 918443			
150	C19800	Screw, shc 1/4-20 x 1/2 in.	1				
160	C19209	Washer, lock 1/4 in.	1				
170	C19213	Washer, lock 3/8 in.	3				

Parts

**Model 617335, Heated Follower Plate Kit with smooth bottom
for use with Heated Check-Mate 800 pump modules**

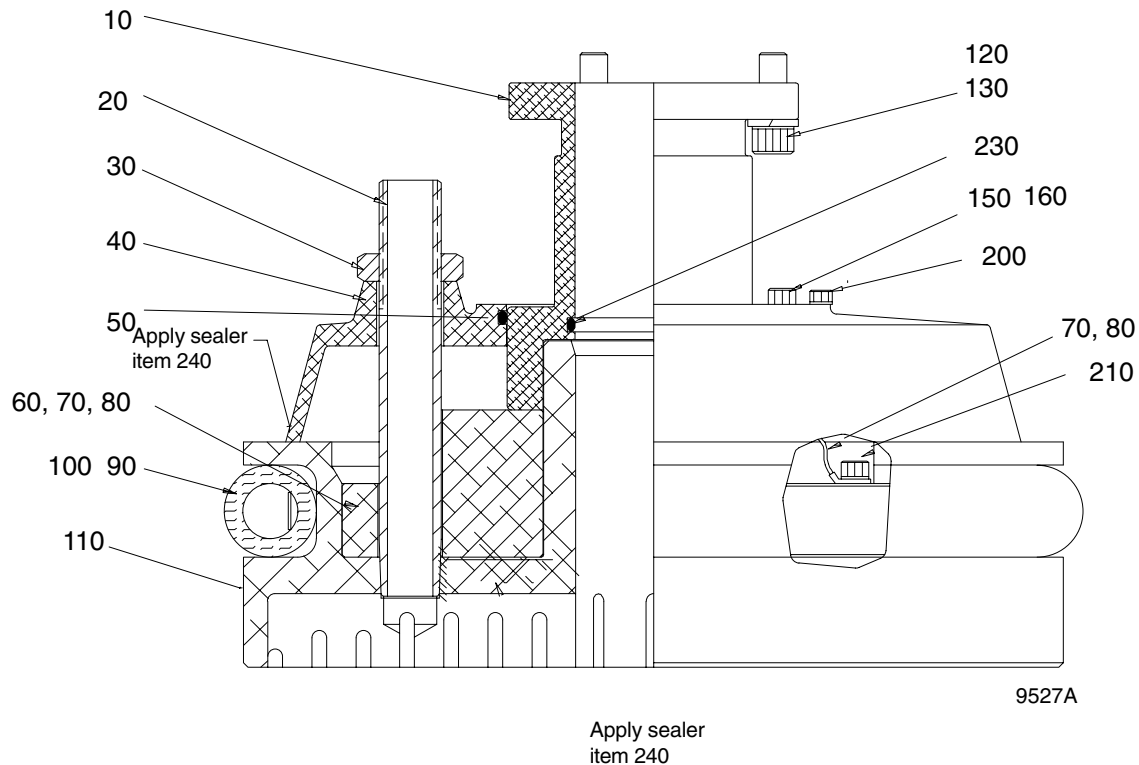


Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	C32339	Adapter, pump/follower	1	180	100508	Screw, drive (not shown)	2
20	C31092	Tube, blow-off/bleed	1	190	C19818	Screw, shc 1/4-20 x 2-1/2 in.	3
30	C31093	Nut	1	200	C19986	Screw, shc #10-24 x 1-3/4 in.	1
40	617324	Cover, follower	1	210	C19812	Screw, shc 1/4-20 x 1-1/2 in.	4
50*	C20240	Seal, o-ring	1	220	517428	Sensor, RTD (not shown)	1
60	C31088	Element, heater	1	230	C31056	Sealer RTV (not shown)	
70	C32386	Wire, hi-temp 10 awg 4572 mm	180"	240	C07664	Compound, heat sink (not shown)	
80	C32256	Ring, terminal 10 awg x 1/4 in.	5	250	C20571	Grip, 1/2 in. npt 90° cord (not shown)	1
90	C31052	Seal, follower	1	260	C20874	Seal, 1/2 in. conduit (not shown)	1
100	C31154	Clamp, worm-gear	2	270	C20715	Nut, 1/2 in. npt conduit lock (not shown)	1
110	C31153	Ring, seal tfe coated	1	280	C20726	Fitting, 90° conduit 3/4 in. npt	1
120*	C31062	Gasket	1	290	C20727	Fitting, conduit 3/4 in. npt	2
130	C31152	Inductor plate tfe coated	1	300	C38202	Conduit, flexible steel 3/4 in. (610mm)	24"
140	C19743	Screw, flat head 1/4-20 x 5/8 in.	6	310	C20875	Seal, conduit 3/4 in.	1
150	C19800	Screw, shc 1/4-20 x 1/2 in.	1	330	150707	Plate, designation (not shown)	1
160	C19209	Washer, lock 1/4 in.	7				
170	C19096	Screw, hex head 1/4-20 x 1-1/2 in.	6				

* Included in Follower Repair Kit C31087

Parts

**Model 918499, Heated Follower Plate Kit with finned bottom
for use with President pump assemblies**



Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10	617396	Adapter, pump/follower	1	150	C19815	Screw, shc 1/4-20 x 2 in.	3
20	617539	Tube, blow-off/bleed	1	160	C19986	Screw, shc #10-24 x 1-3/4 in.	1
30	C31093	Nut	1	170	517428	Sensor, RTD (not shown)	1
40	617324	Cover, follower	1	180	C19812	Screw, shc 1/4-20 x 1-1/2 in.	4
50*	C20240	Seal, o-ring	1	190	C31056	Sealer RTV (not shown)	
60	C31088	Element, heater	1	200	C07664	Compound, heat sink (not shown)	
70	C32386	Wire, hi-temp 10 awg 4572 mm	180"	210	C20571	Grip, 1/2 in. npt 90° cord (not shown)	1
80	C32256	Ring, terminal 10 awg x 1/4 in.	5	220	C20874	Seal, 1/2 in. conduit (not shown)	1
90	C31052	Seal, follower	1	230	C20715	Nut, 1/2 in. npt conduit lock (not shown)	1
100	C31154	Clamp, worm-gear	2	240	150707	Plate, designation (not shown)	1
110	617540	Plate, finned follower PTFE coated	1	250	100508	Screw, drive #4 x 3/16 in. (not shown)	2
120	C19213	Washer, lock 3/8 in.	3				
130	C19837	Screw, shc 3/8-16 x 1 in.	3				
140*	C38225	Seal, o-ring	6				

* Included in Follower Repair Kit 918502

Parts

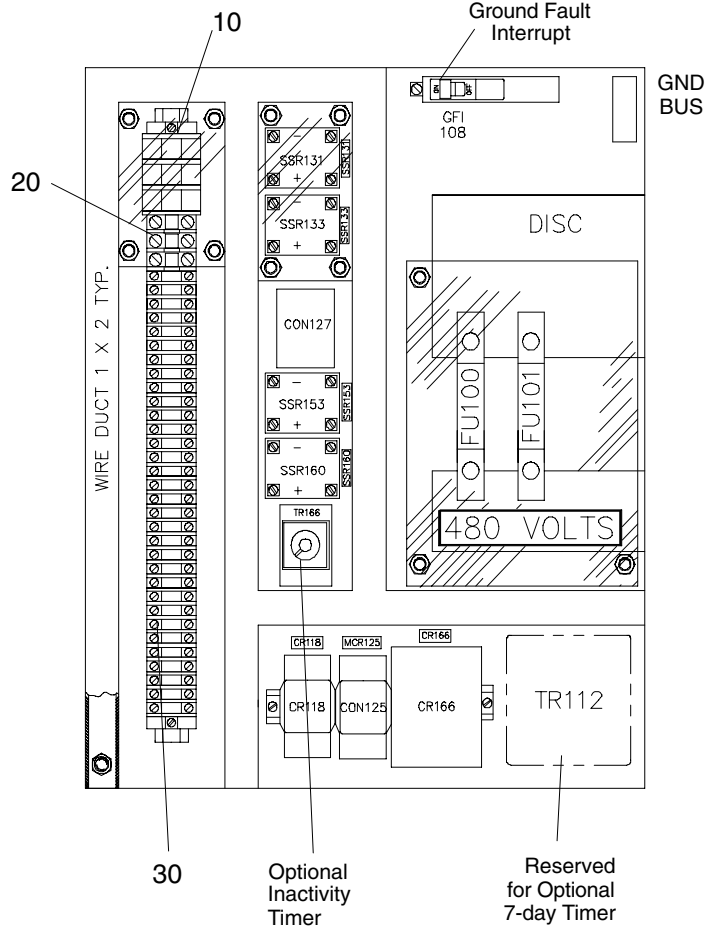
Model 617300 (Standard), 480 VAC 3-zone Electrical Control Panel (interior)

TERMINALS

120 V Fuses
FU109
FU175
FU177
FU179
TOTAL(4) Type CE6

480 V Terminals
2L1
2L2
GND
(1) SPARE
Total (4) TYPE CD2

120V Terminals
1081
1082
1082
1082
1101
1141
1142
1181
1311
1312
1321
1331
1531
1532
1541
1551
1601
1602
1611
1621
1641
1661
1662
1711
1752
1772
1792
GND
GND
(5) Spares
TOTAL (34) Type CA1



Spare Parts

Part Number

Temperature Controller	195764
Solid State Relay (for SSRs 153 & 160)	C78082
Timer, 7-day	C78167
Timer, Inactivity	C78342

For information about other parts, contact your Graco technical support representative.

Parts

Model 617330 (Swirl), 480 VAC 3-zone Electrical Control Panel (interior)

TERMINALS

120 V Fuses

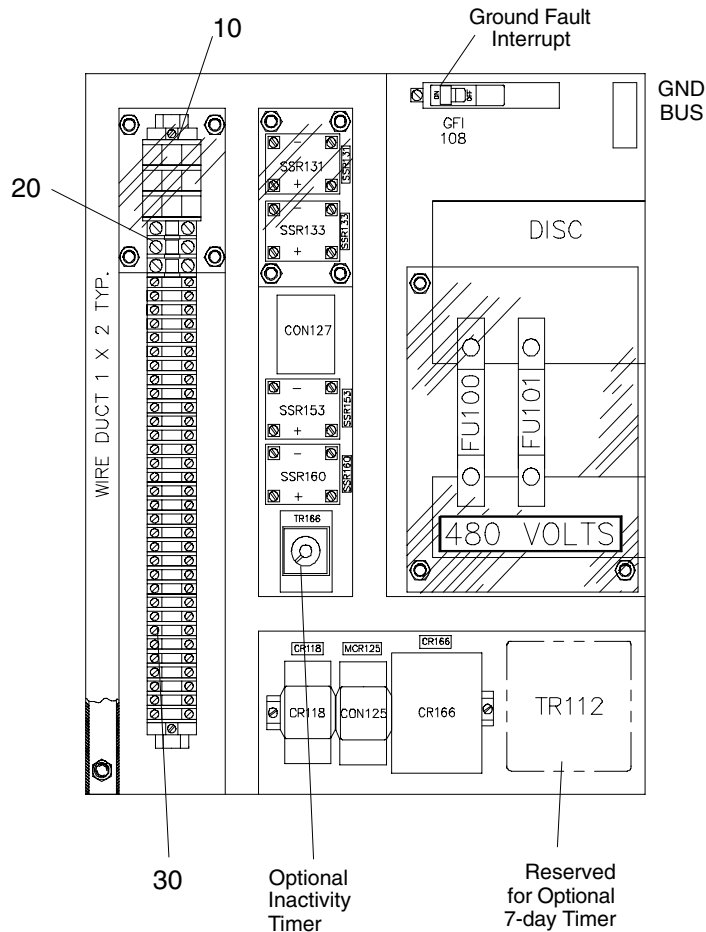
FU109
FU175
FU177
FU179
FU181
TOTAL(5) Type CE6

480 V Terminals

2L1
2L2
GND
(1) SPARE
Total (4) TYPE CD2

120V Terminals

1081
1082
1082
1082
1101
1141
1142
1181
1311
1312
1321
1331
1531
1532
1541
1551
1601
1602
1611
1621
1641
1661
1662
1691
1752
1772
1812
GND
GND
(3) Spares
TOTAL (32) Type CA1



Spare Parts

Temperature Controller
Solid State Relay (for SSRs 153 & 160)
Timer, 7-day
Timer, Inactivity

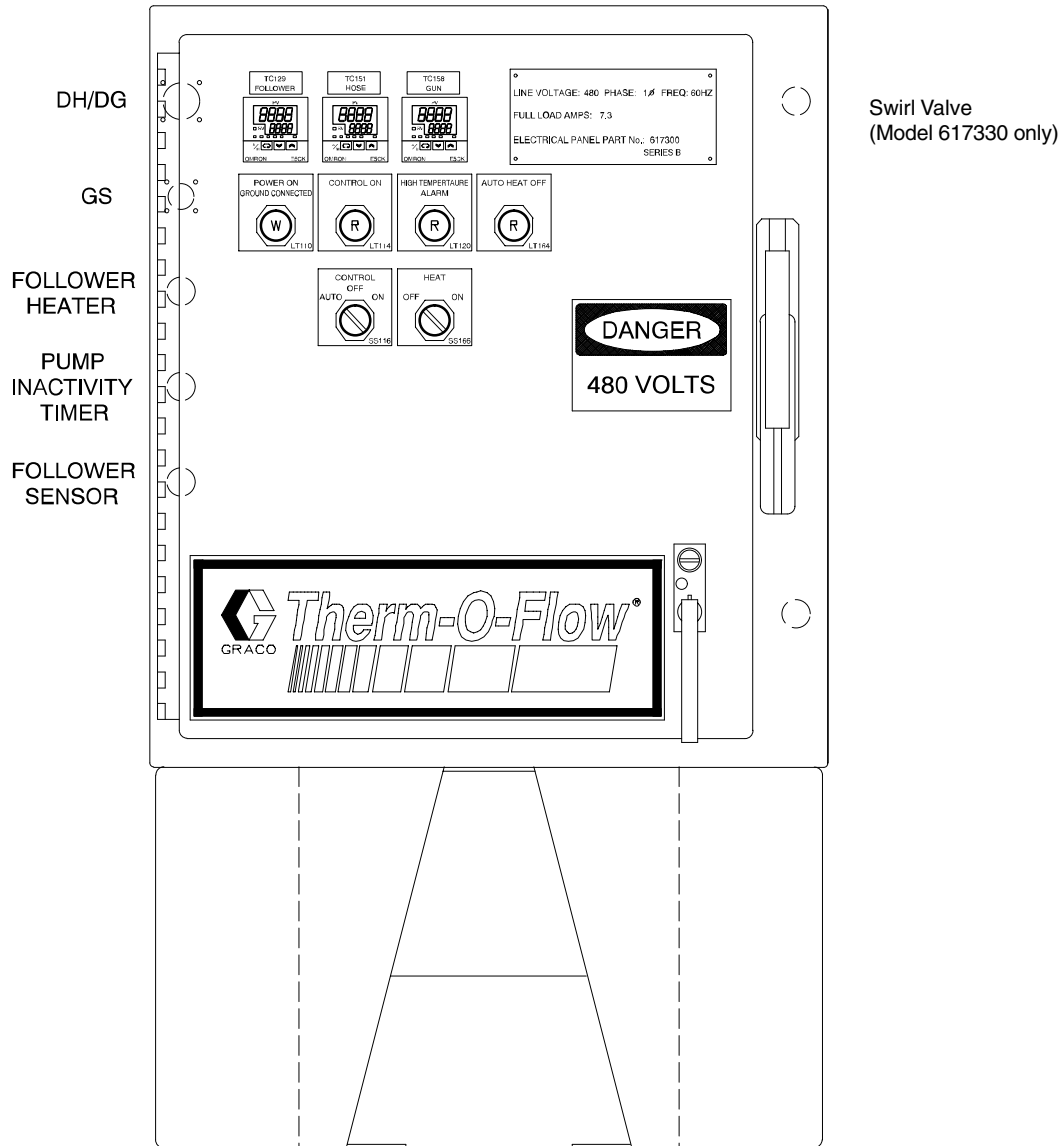
Part Number

195764
C78082
C78167
C78342

For information about other parts, contact your Graco technical support representative.

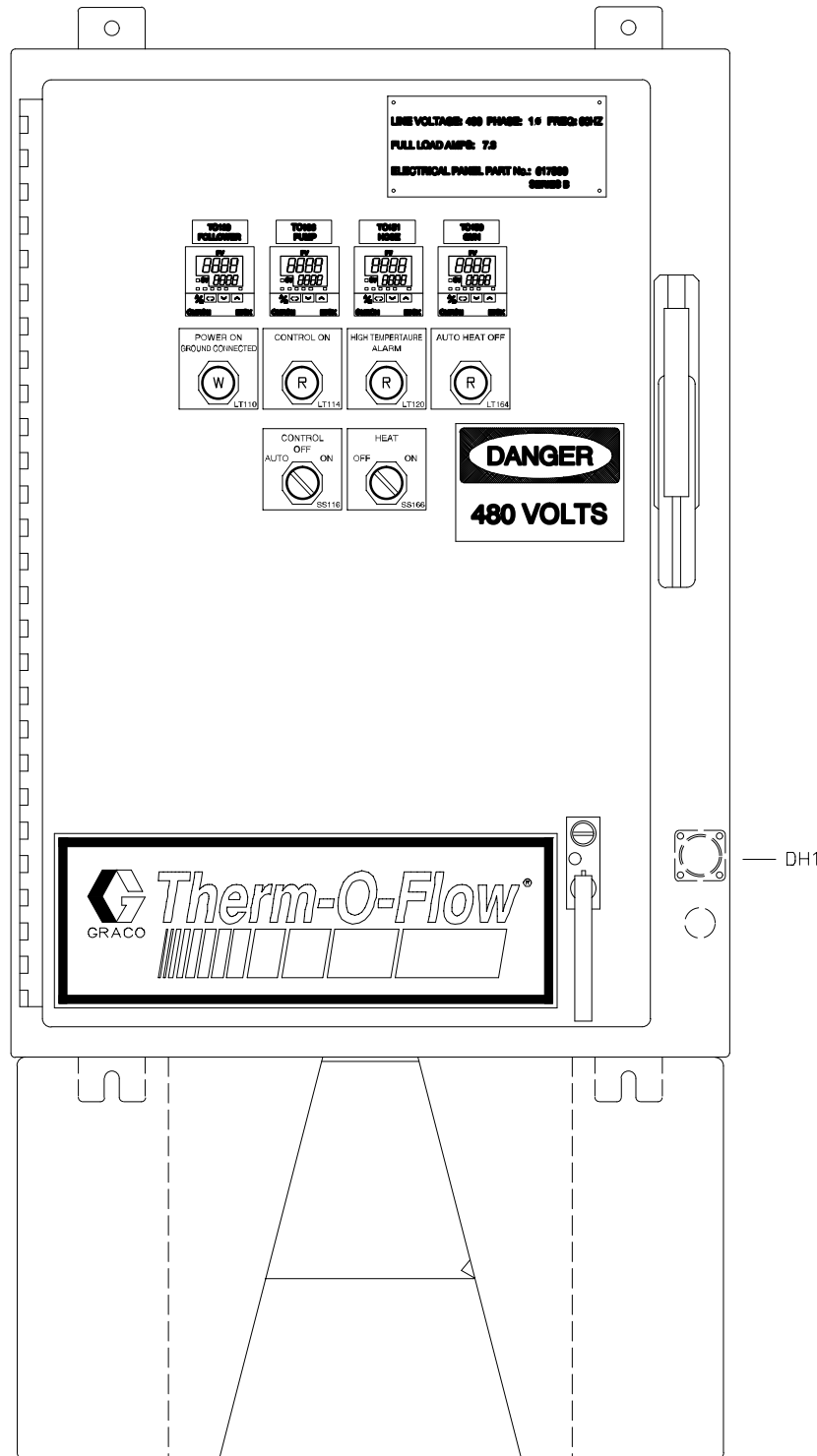
Parts

Models 617300 (standard) and 617330 (Swirl), 480 VAC 3-zone and 617484 240 VAC 3-zone Electrical Control Panel (exterior)



Parts

Models 617349 (480 VAC) and 617485 (240 VAC)
4-zone Electrical Control Panel (exterior)



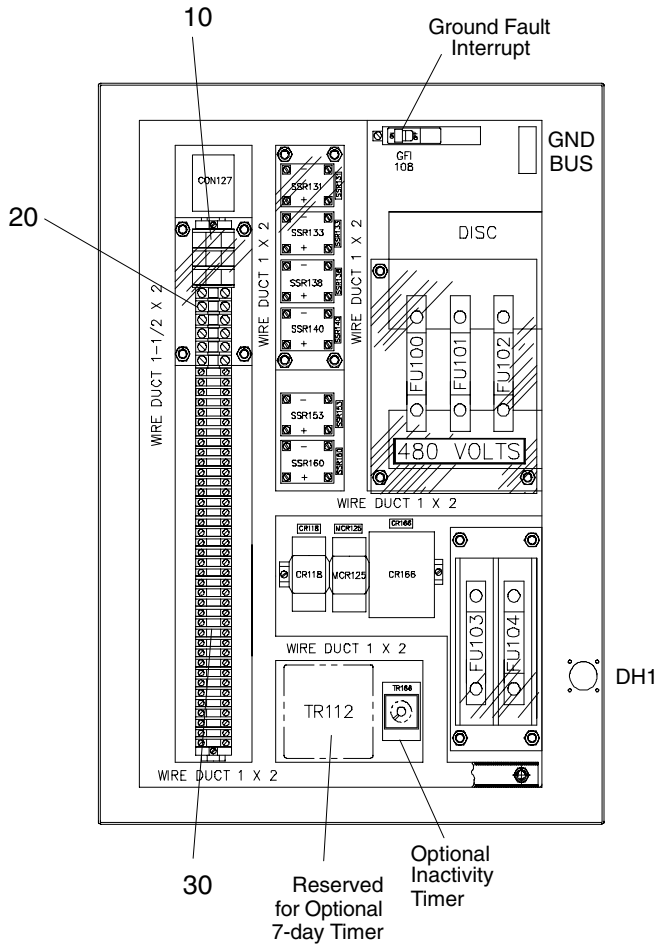
Parts

Models 617349 (480 VAC) and 617485 (240 VAC) 4-zone Electrical Control Panel (interior)

- 10 Fuses
FU109
FU175
FU177
FU179
(4) Total Type CE6

- 20 Terminals
3L1
3L2
5L1
5L2
GND
(5) Total Type CD2

- 30 Terminals
1081
1082
1082
1082
1101
1141
1142
1181
1311
1312
1321
1331
1381
1382
1391
1401
1531
1532
1541
1551
1601
1602
1611
1621
1641
1661
1662
1711
1752
1772
1972
GND
GND
(3) Spares
(36) Total Type CA1



Spare Parts

Part Number

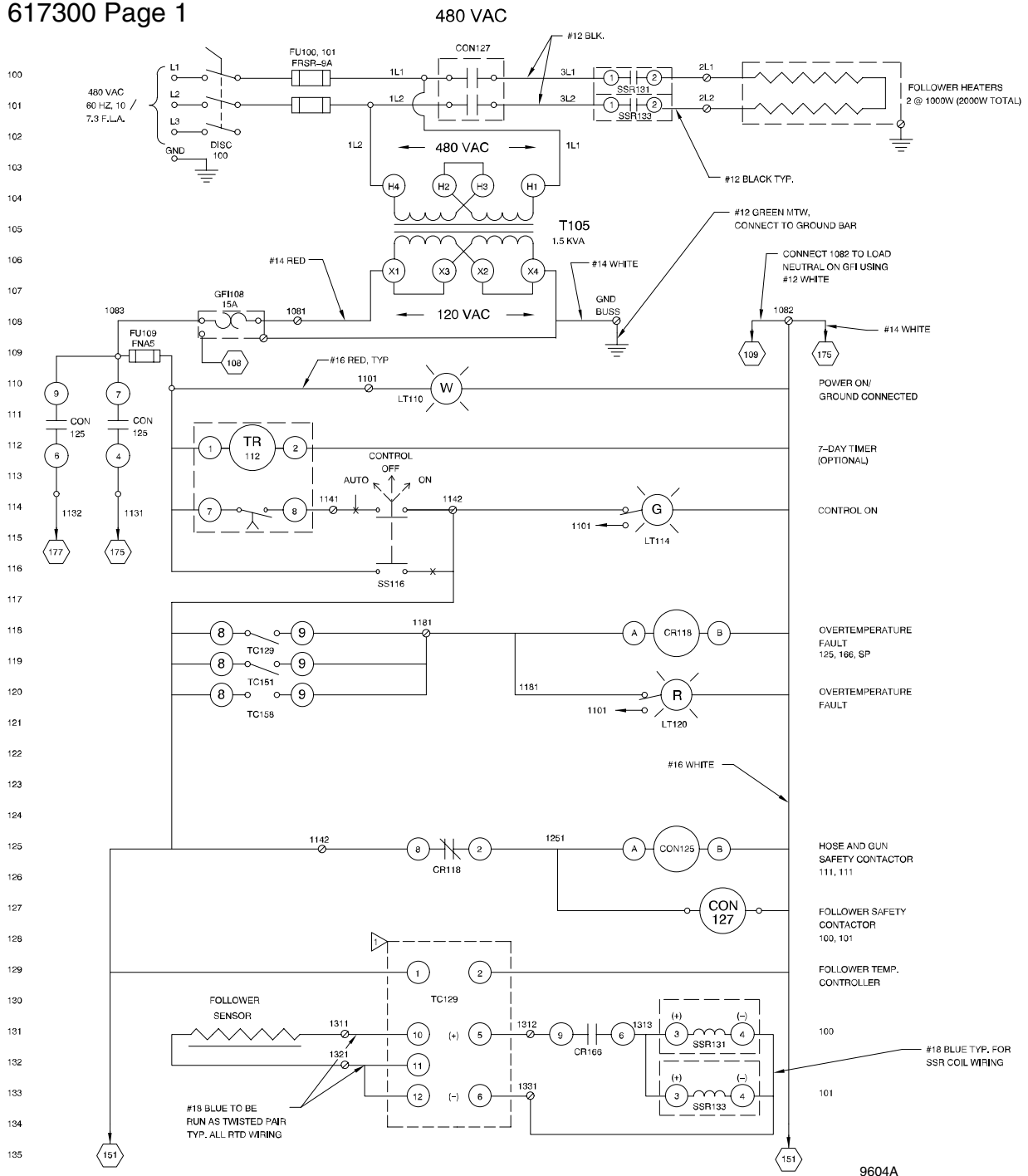
Temperature Controller	195764
Solid State Relay (for SSRs 153 & 160)	C78082
Timer, 7-day	C78167
Timer, Inactivity	C78342

For information about other parts, contact your Graco technical support representative.

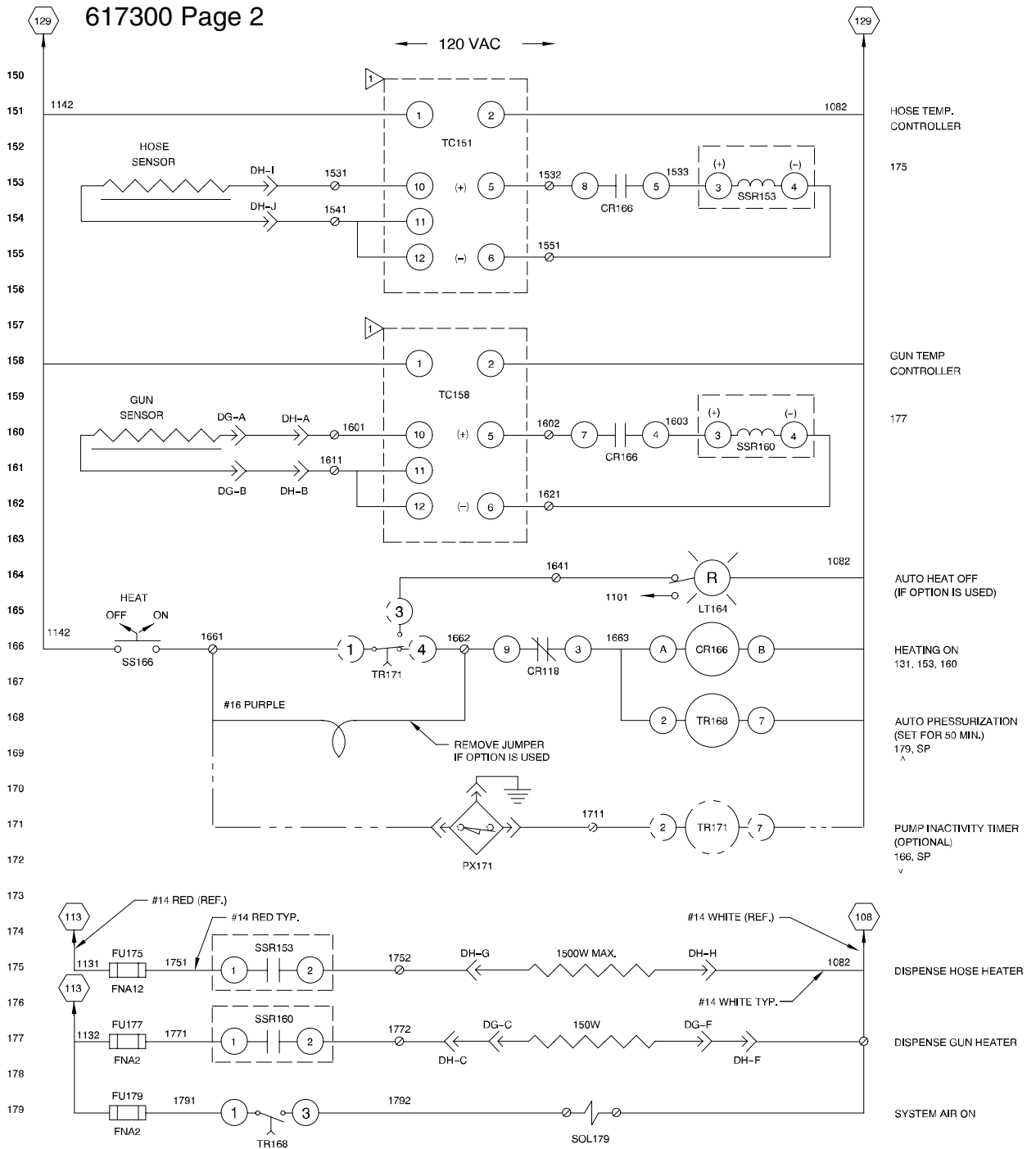
Schematics

Electrical Control Panel and Wiring Parts and Description

617300 Page 1



Schematics

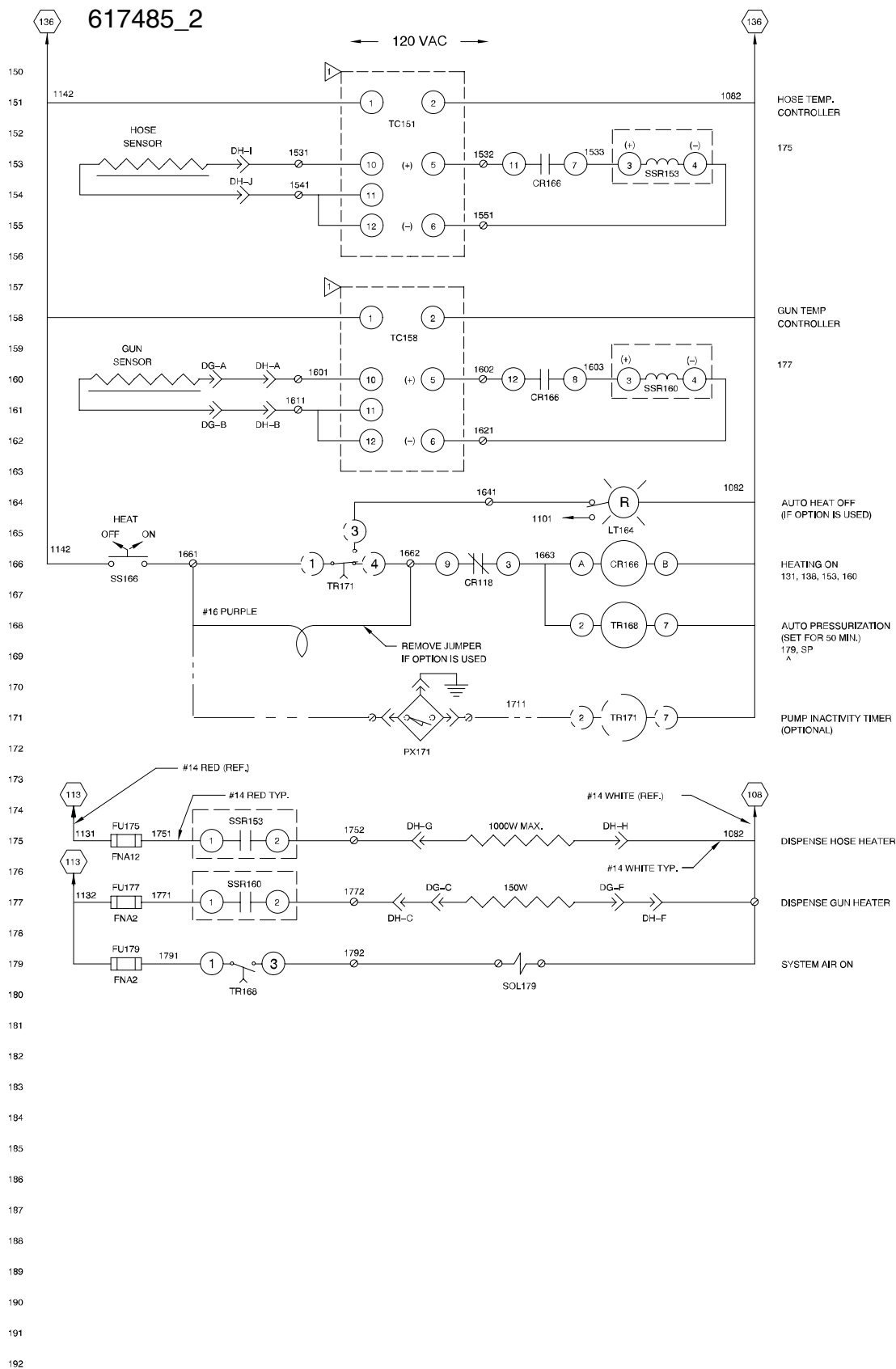


9605A

617485_1



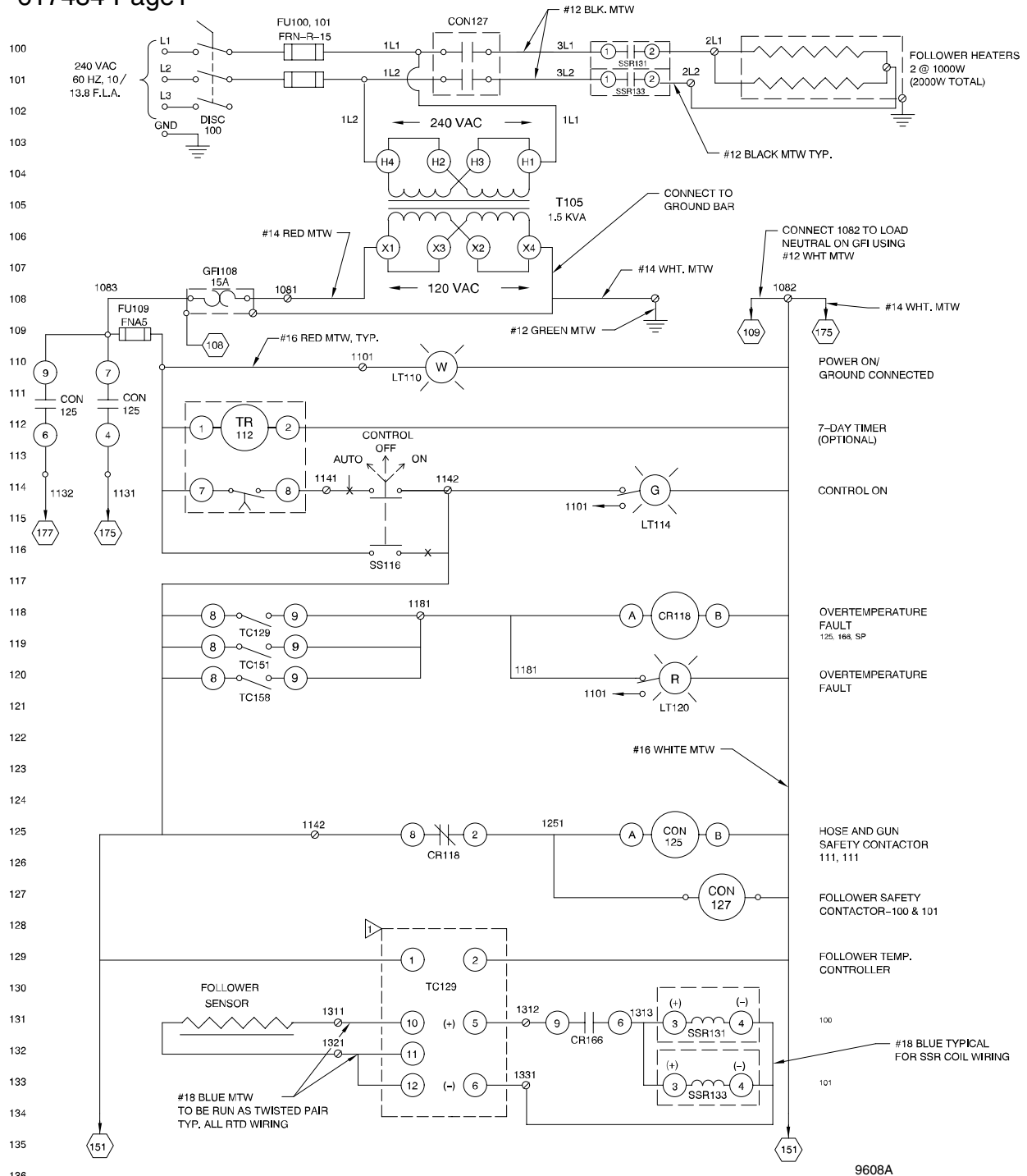
Schematics



Schematics

617484 Page1

240 VAC

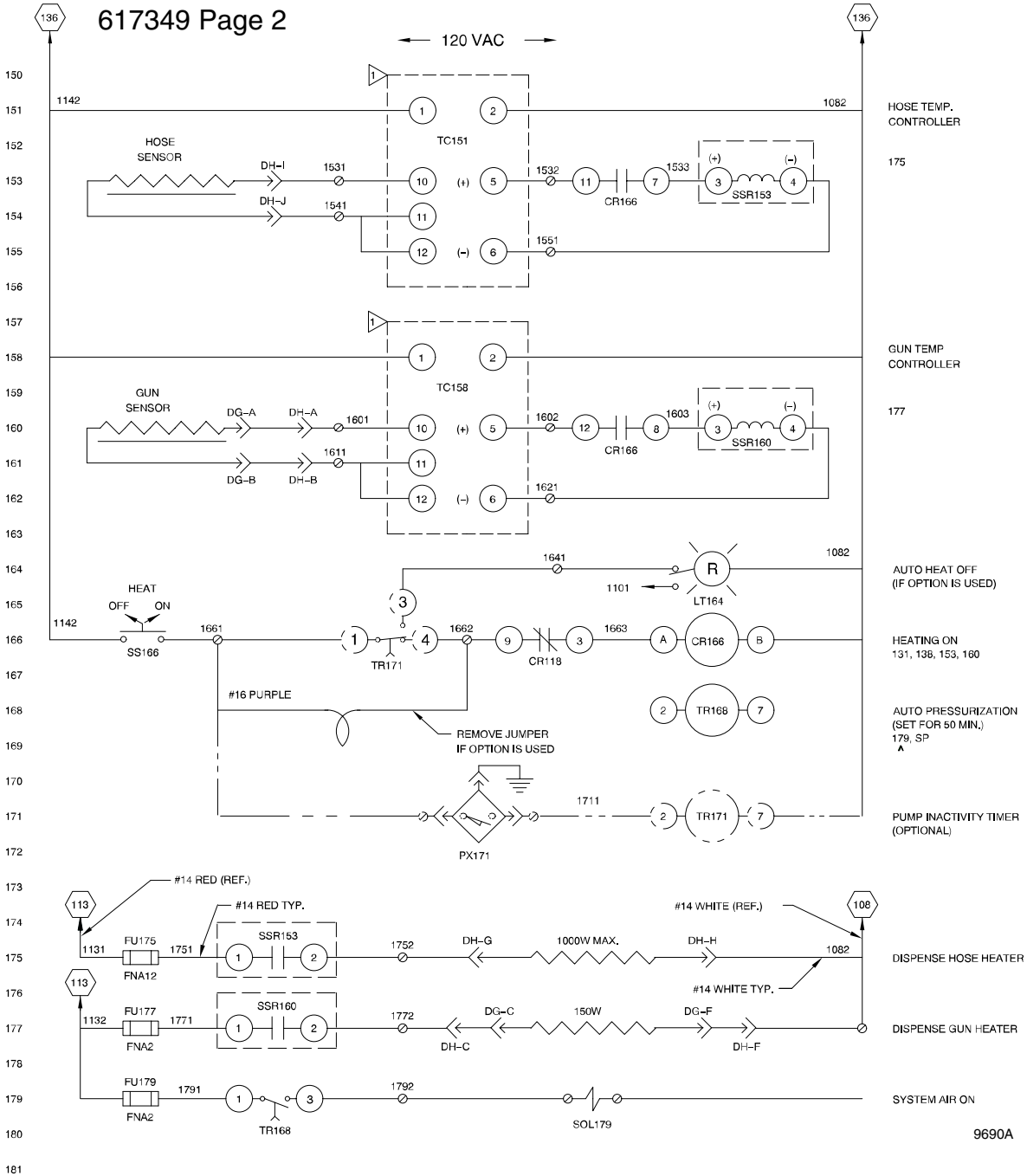


617349 Page1



Schematics

617349 Page 2



Accessories

Use Only Genuine Graco Parts and Accessories

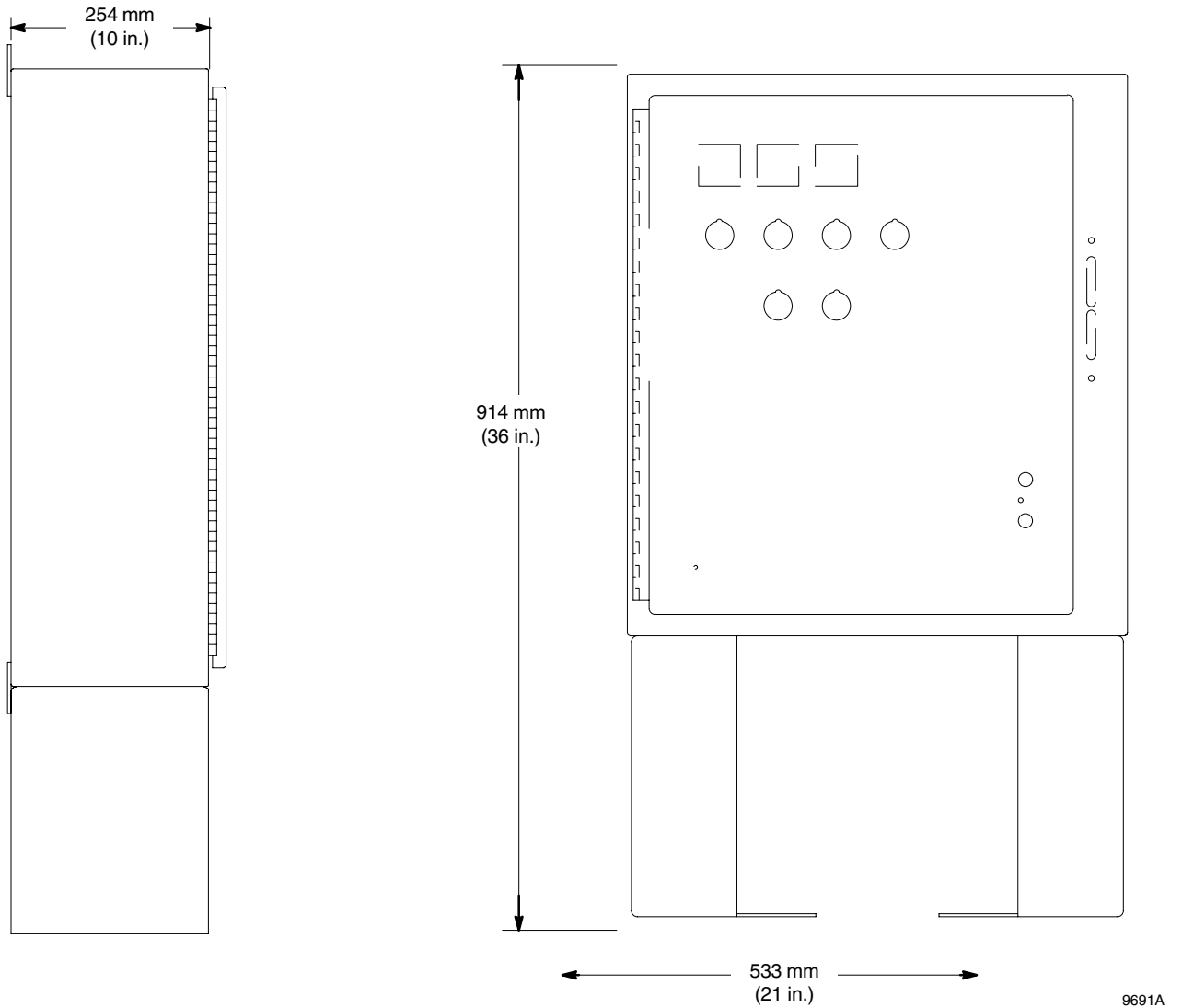
Description	Part No.
HEATED 5-GALLON FOLLOWER PLATE ASSEMBLY Used for 240, 480, 575 VAC. 305 mm (12 in.) O.D. Silicone Wiper hose	
15:1 President finned bottom	918499
CM800 Heated Module smooth bottom	617335
15:1 President smooth bottom	617325
WIPER REPAIR KIT	
FOLLOWER REPAIR KIT	
<i>for Therm-O-Flow Mini-5 supply units and Therm-O-Flow 5 units</i>	C31065
AIR CONTROL MODULES FOR RAM AND AIR CONTROL 2 Regulator module contains controls for ram and motor 4 Regulator module contains controls for ram up, ram down, blow-off and motor 8.8 bar (125 psig) <i>MAXIMUM WORKING PRESSURE</i> for Ram	
2-Regulator air control module for 15:1 President air motor	918505
4-Regulator air control module for Bulldog and Senator air motors	918416
LOW LEVEL PAIL KIT Lights a red beacon signal when the pail is empty	918430
CASTER BASEPLATE Used for heated applications.	918414
HOSE SUPPORT KIT Supports hose to ram to prevent hose kinks. Used only in 20 l (5 gal.) applications.	C31197
AUTOMATIC CROSSOVER KIT Switches ram operation to alternate ram, automatically	918393
PUMP AIR MOTOR MOUNTING KIT Used in heated applications to connect the heated CM800 pump to King, Bulldog, and Senator air motors.	C03510
VENT HOOD KIT (5 Gallon) Used for venting toxic fumes. Required for Polyurethane Reactive (PUR) supply units.	617318
PUMP INACTIVITY KIT Used to shut down the heaters if there is no pump activity. Contains proximity switch, electronic timer, and the hardware necessary to install it in the supply unit.	617334
PUMP REBUILD KIT See Form# 308570 for CheckMate 800 See Form# 307431 for Mini-5 Pump	
HEATER/SENSOR REPAIR KIT Contains heaters, sensors and wires for replacing heaters and sensors	C32202
7-DAY TIMER KIT Contains electronic timer and the hardware necessary to install the timer in the electrical control panel	C78167

Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

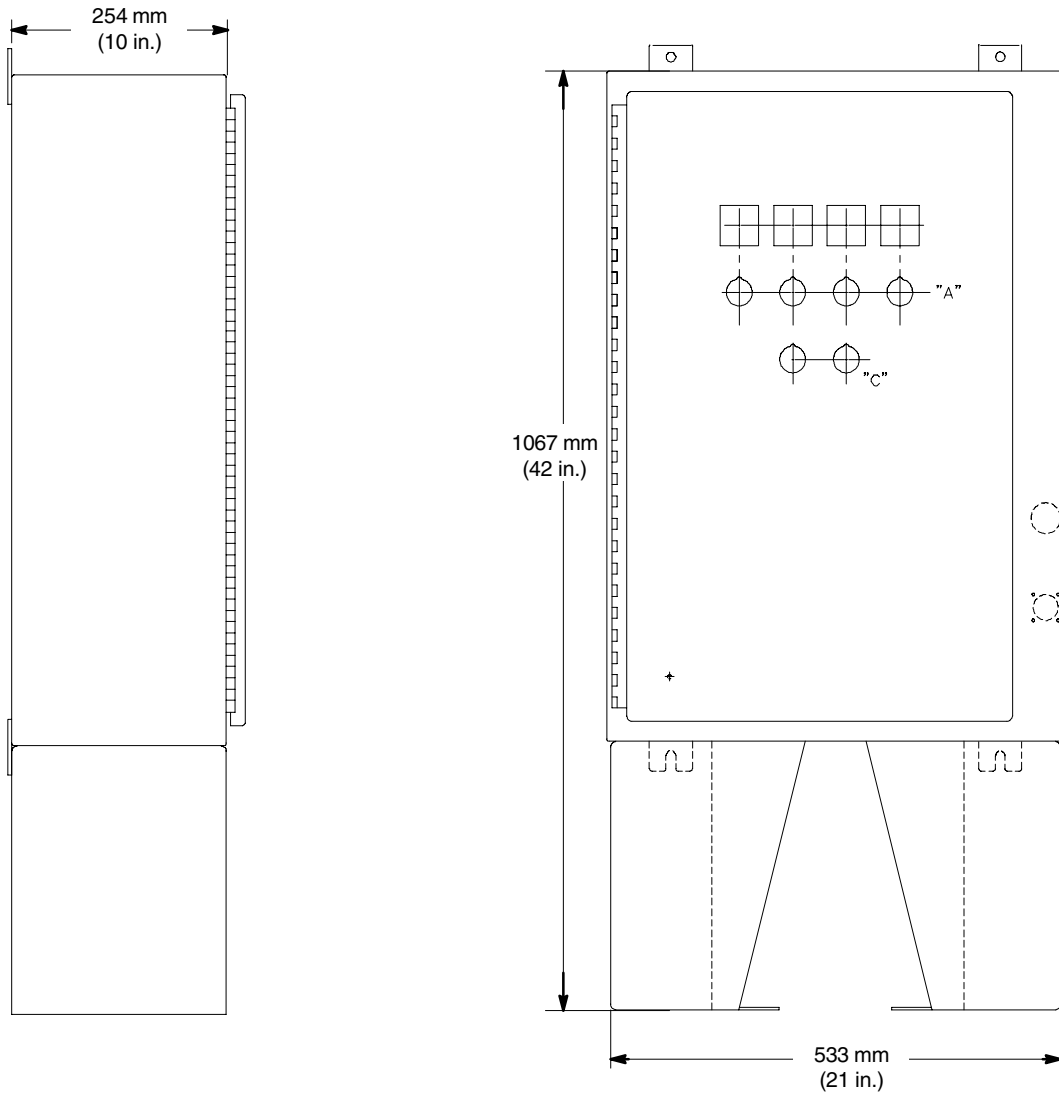
Dimensions

3-Zone Electrical Control Panel Mounting and Clearance Dimensions



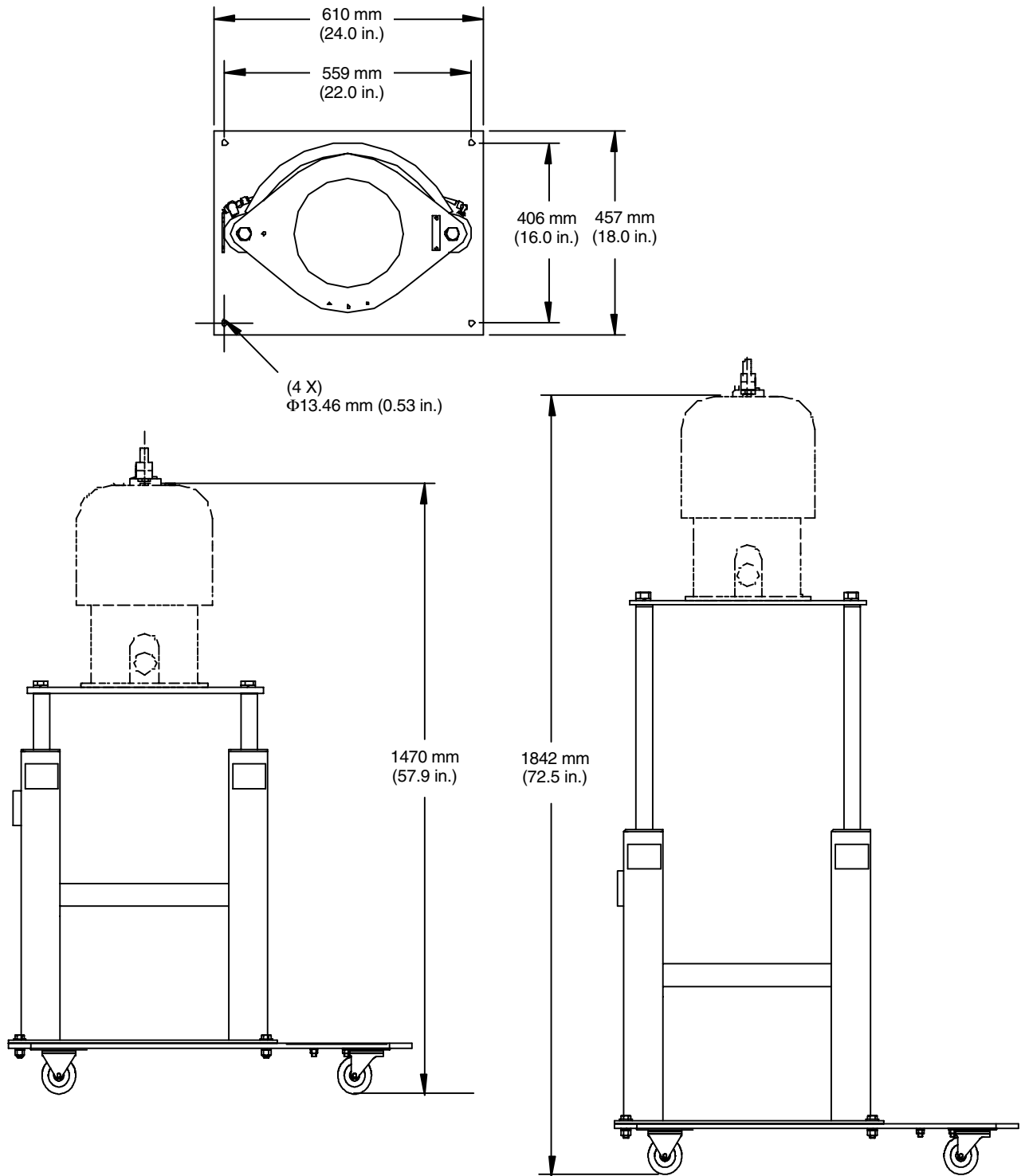
Dimensions

4-Zone Electrical Control Panel Mounting and Clearance Dimensions



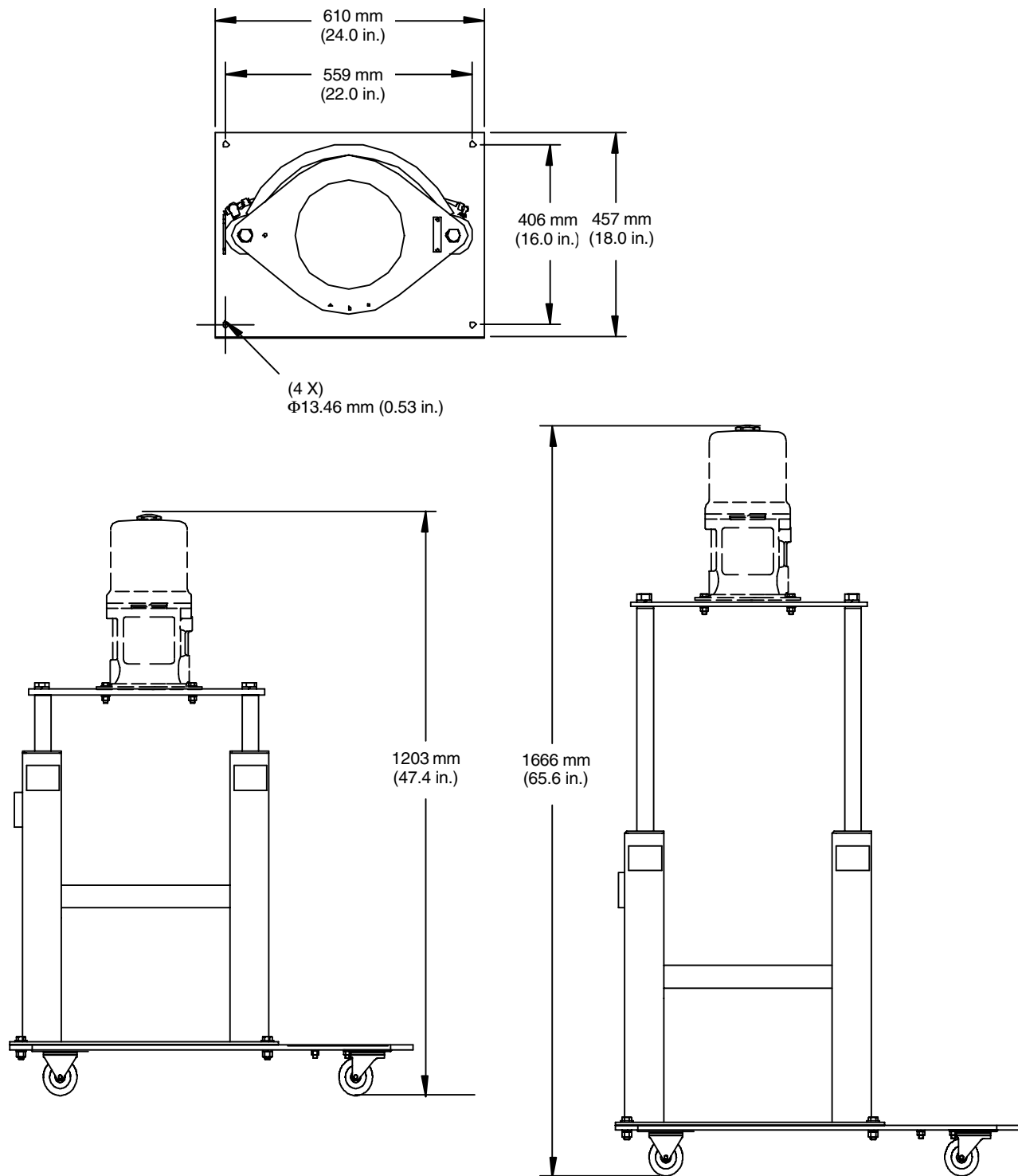
Dimensions

Ram Mounting and Clearance Dimensions for Therm-O-Flow 5



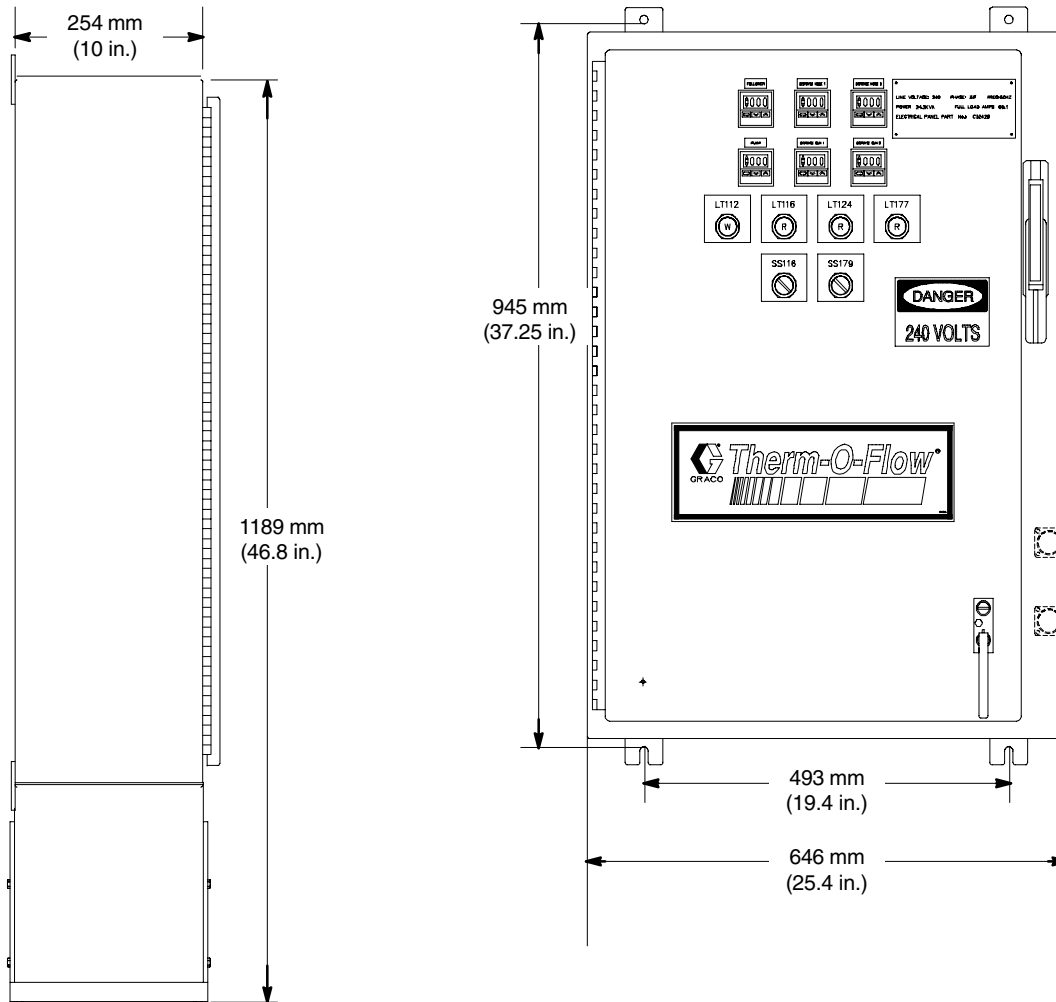
Dimensions

Ram Mounting and Clearance Dimensions w/15:1 President Air Motor



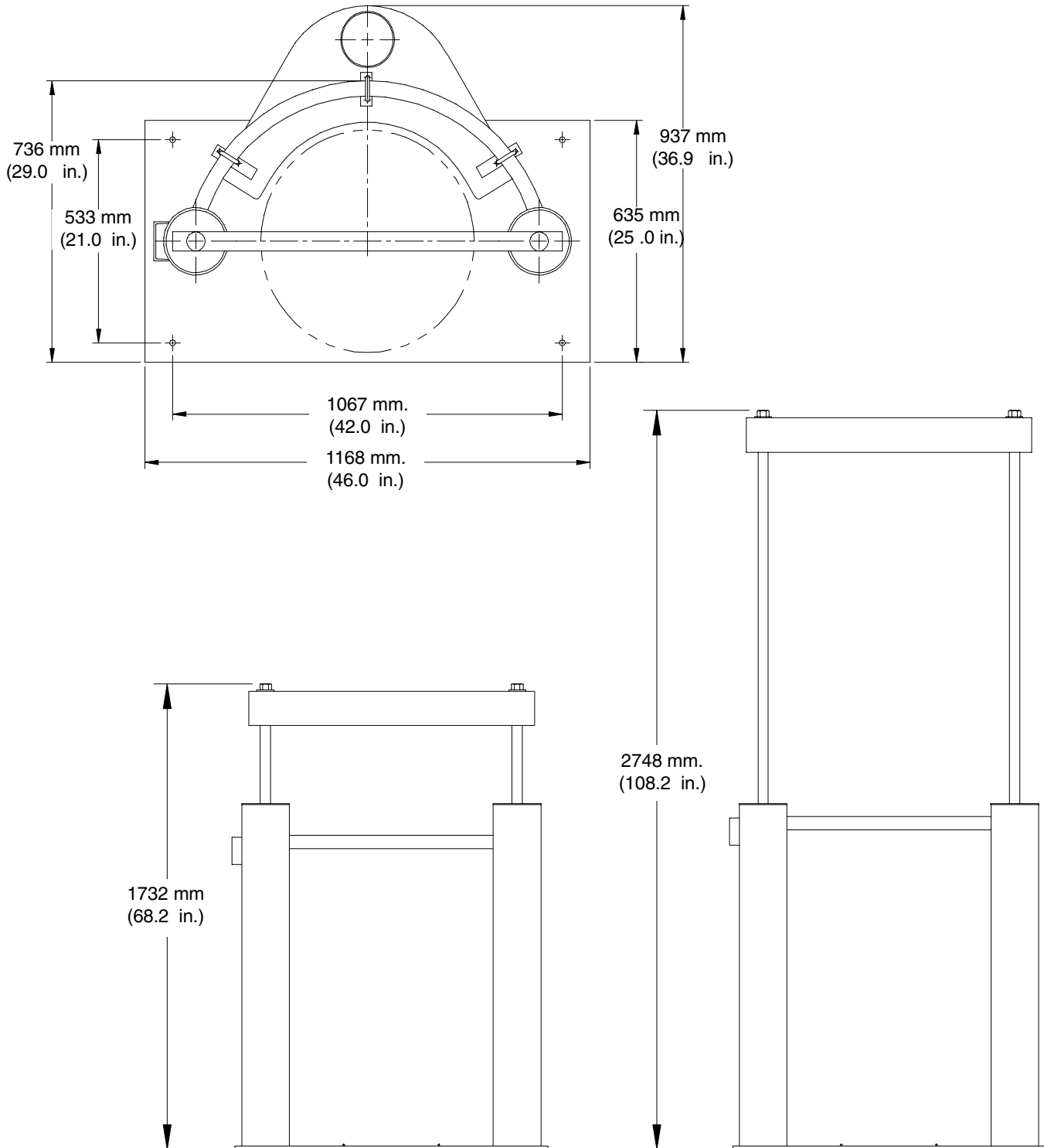
Dimensions

Electrical Control Panel Mounting and Clearance Dimensions



Dimensions

Ram Mounting and Clearance Dimensions



Technical Data

Maximum ram inlet air pressure	8.8 bar (125 psi)
Maximum pump inlet air pressure	
Senator, Bulldog pumps	7 bar (100 psi)
President pumps	8.2 bar (120 psi)
King pumps	6.3 bar (90 psi)
Maximum fluid working pressure (pump only)	403 bar (5850 psi)
Maximum fluid working pressure (pump)	
Senator pumps (19:1)	131 bar (1900 psi)
Bulldog pumps (31:1)	214 bar (3100 psi)
President (15:1) pumps	126 bar (1800 psi)
Weight (ram assembly)	approx. 68 kg (150 lbs)
Weight (typical pump + ram assembly)	
Senator, Bulldog pumps	approx. 318 kg (700 lbs)
President pumps	approx. 295 kg (650 lbs)
Wetted parts (ram)	Carbon steel, aluminum, nitrile, nylon, nickel plating
Wetted parts (pump)	See Form# 308570 for Therm-O-Flow 5 units Call Technical Service for Therm-O-Flow Mini-5 units
Floor space dimensions (w/vent hood)	914 mm wide x 610 mm deep (36 in. x 24 in.)
Overall height (lowered)	
Senator, Bulldog pumps	1.47 m (57.9 in.)
President pumps	1.2 m (47.4 in.)
Overall height (extended)	
Senator, Bulldog pumps	1.84 m (72.5 in.)
President pumps	1.66 m (65.6 in.)
Pump main air inlet	1/24 in. npt (f)
Fluid outlet	
President (15:1) pumps	1/2 in. npt (f)
Senator, Bulldog pumps	1 in. npt (f)
Sound Data	See individual component manuals for their respective sound pressure levels.

Related Publications

Form Name	Form#
President Air Motor	306982
Bulldog Air Motor, 31:1	307049
Senator Air Motor, 19:1 and Quiet Senator Air Motor, 19:1	307592
King Air Motor, 65:1	306968
20 Liter (5 Gallon) 76 mm (3 in.) Air-Powered Ram Module	310525
165 mm (6.5 in.) Global Ram Module	310523
Check-Mate 800 Displacement Pump	308570
Heated Check-Mate 800 Pump Modules	310530
Mini-5 Hot Melt 15:1 Ratio President Pump	307431
Hydraulic Power Supply	307550

Check-Mate, King, Mini-5, and President are trademarks of Graco, Inc.
Bulldog, Senator, and Therm-O-Flow are registered trademarks of Graco, Inc.

Appendix

New Style Temperature Controller Settings List

Symbol	Name
<i>AL 1</i>	First alarm (ALM1)
<i>AL 2</i>	Second alarm (ALM2)
<i>ATU</i>	Autotuning (AT)
<i>STU</i>	Self-tuning (ST)
<i>P</i>	Proportional band (P)
<i>I</i>	Integral time (I)
<i>d</i>	Derivative time (D)
<i>Ar</i>	Anti-reset windup (ARW)
<i>I</i>	Heat-side proportioning cycle (T)
<i>Pc</i>	Cool-side proportioning band (Pc)
<i>db</i>	Deadband (db)
<i>t</i>	Cool-side proportioning cycle (Pc)
<i>Pb</i>	PV bias\P(Pb)
<i>LCK</i>	Set data lock function (LCK)

Appendix

Older Style (E5KC) Temperature Controller Settings List

Level 0, Function Mode Parameter Names

SP	Set point
r-S	Run/Stop

Level 1, Function Mode Parameter Names

At	Auto-tuning Execute/Cancel
AL-1	Alarm value 1
AL-2	Alarm value 2
P	Proportional band
I	Integral time
d	Derivative time
CP	Control period (heat)

Level 2, Function Mode Parameter Names

SP-rU	SP ramp time unit
SP-rt	SP ramp set value
nU-S	MV at stop
nU-E	MV at PV error
oL-H	MV upper limit
oL-L	MV lower limit
o r L	MV change rate limit
cnF	Input digital filter
ALH1	Alarm 1 hysteresis
ALH2	Alarm 2 hysteresis
cnSH	Input shift upper limit
cnSL	Input shift lower limit

Setup, Function Mode Parameter Names

cn-t	Input type
d-U	°C/°F selection
cnLt	Parameter initialize
oUt1	Control output 1 assignment
oUt2	Control output 2 assignment
SUB1	Auxiliary control 1 assignment
ALt1	Alarm 1 type
ALIn	Alarm 1 open in alarm
ALt2	Alarm 2 type
AL2n	Alarm 2 open in alarm
orEu	Direct/Reverse operation

Expansion, Function Mode Parameter Names

SL-H	Set point upper limit
SL-L	Set point lower limit
cnTL	PID/ON/OFF
St	ST
ALFA	alpha range: 0.01 to 1.00
At-G	AT calculated gain
rEst	Standby sequence reset setting method
rEt	Automatic return of display mode
At-H	AT hysteresis

[illegible]

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 procédures concernées.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call one of the following numbers to identify the distributor closest to you:

1-800-328-0211 Toll Free

612-623-6921

612-378-3505 Fax

*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.*

MM 310528

Sales Office: Minneapolis

International Offices: Belgium, China, Japan, Korea

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

www.graco.com

PRINTED IN USA 03/1996, Revised 02/2006