

## Gusmer<sup>®</sup> GH-2 and GH-4 Hydraulic Proportioner

3A5376L

EN

***Hydraulic, heated, plural-component proportioner for spraying polyurethane foam. Not for outdoor use. For professional use only.***

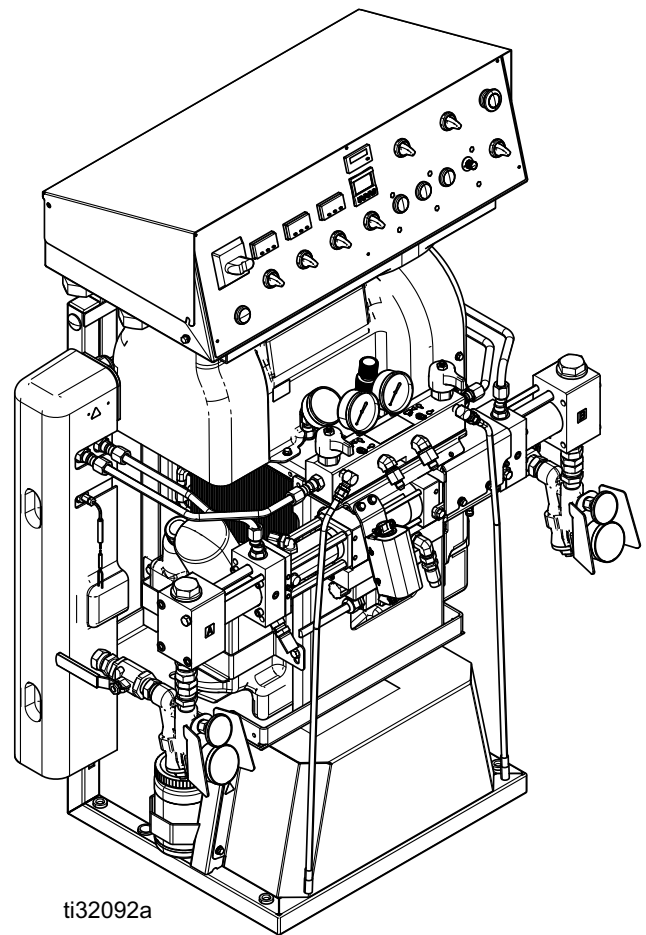
**Not approved for use in explosive atmospheres or hazardous (classified) locations.**

See page 3 for model information, including maximum working pressure and approvals.



### **Important Safety Instructions**

Read all warnings and instructions in this manual and in your component manuals before using this equipment. Save all instructions.



ti32092a

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# Models

**NOTE:** All models require standard 2-component hose with thermocouple cable.

	GH-2 Models (10 kW)			GH-4 Models (15 kW)	
<b>Proportioner</b>	26C200	26C201	26C202	26C699	26C700
<b>Configurable Voltage Phase (VAC, 50/60 Hz)</b>	200-240 VAC 1Ø	200-240 VAC 3ØΔ	350-415 VAC 3ØY	200-240 VAC 3ØΔ	350-415 VAC 3ØY
<b>Full Load Peak Current*</b>	79	46	35	67	41
<b>Maximum Fluid Working Pressure</b>	2000 psi (14 MPa, 140 bar)				
<b>Approximate Output per Cycle (A + B)</b>	0.074 gal. (0.28 L)			0.063 gal. (0.24 L)	
<b>Maximum Flow Rate</b>	28 lb/min 12.7 kg/min			45 lb/min 20 kg/min	
<b>Total System Load†</b>	17,960 W			26,600 W	
<b>Agency Approvals</b>	CE				

\* Full load amps with all devices operating at maximum capabilities. Fuse requirements at various flow rates and mix chamber sizes may be less.

† Total system watts used by system, based on maximum heated hose length for each unit.


- GH-2 series: 310 ft (94.5 m) maximum heated hose length, including whip hose.
- GH-4 series: 410 ft (125.0 m) maximum heated hose length, including whip hose.

## Voltage Configurations Key

Ø	PHASE
Δ	DELTA
Y	WYE

## System Packages

### Standard System Packages

				Standard System Packages			
Proportioner Configuration				Standard Package P/N	Agency Approvals	Hose P/N (Qty.)	Whip Hose (Qty.)
<b>GH-2 (10 kW)</b>	<b>200- 240 V</b>	1-Phase	26C200	ESC200		246778 (1)	25P770 (1)
				EHC200		246778 (5)	
		3-Phase	26C201	ESC201		246778 (1)	25P770 (1)
				EHC201		246778 (5)	
	<b>350- 415 V</b>	3-Phase/ Neutral	26C202	ESC202		246778 (1)	25P770 (1)
				EHC202		246778 (5)	
<b>GH-4 (15 kW)</b>	<b>200- 240 V</b>	3-Phase	26C699	ESC699		246778 (1)	25P770 (1)
				EHC699		246778 (6)	
	<b>350- 415 V</b>	3-Phase/ Neutral	26C700	ESC700		246778 (1)	25P770 (1)
				EHC700		246778 (6)	

\* CE approval applies to packages when used with a recommended gun.

**NOTE:** The standard hose length is 50 ft (15 m) and the standard whip hose is 10 ft (3 m).

### Recommended Guns

Model	Fusion® AP	Fusion CS	Probler P2	Fusion PC
Part	246102	CS02RD	GCP2R2	25P589
	-	-	GCP2R3	25R085



## Accessories

Kit Number	Description
17G340	Caster Kit
24M174	Drum Level Sticks

## Supplied Manuals

The following manuals are shipped with the Gusmer Hydraulic Proportioner. Refer to these manuals for detailed equipment information.

Manuals are also available at [www.graco.com](http://www.graco.com).

Manual	Description
3A5376	Gusmer Hydraulic Proportioner Manual

## Related Manuals






The following manuals are for accessories used with the Gusmer Hydraulic Proportioner.

## Component Manuals in English

Manual in English	Description
<b>Displacement Pump Manual</b>	
3A3085	Pump, Repair-Parts
312071	Seal Kit
<b>Feed System Manuals</b>	
309572	Heated Hose, Instructions-Parts
309852	Circulation and Return Tube Kit, Instructions-Parts
309815	Feed Pump Kits, Instructions-Parts
309827	Feed Pump Air Supply Kit, Instructions-Parts
<b>Spray Gun Manuals</b>	
309550	Fusion® AP Gun
312666	Fusion CS Gun
3A7314	Fusion PC Gun
313213	Probler® P2 Gun
<b>Accessory Manuals</b>	
3A3010	Caster Kit, Instructions-Parts
<b>Component Manuals</b>	
312070	Circulation Valve Kit

# Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

 <b>DANGER</b>	
	<p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnection any cables and before servicing equipment.</li> <li>• This equipment must be grounded. Connect only to grounded power source.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> <li>• Do not expose to rain. Store indoors.</li> </ul>
 <b>WARNING</b>	
	<p><b>TOXIC FLUID OR FUMES HAZARD</b></p> <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled or swallowed.</p> <ul style="list-style-type: none"> <li>• Read Safety Data Sheets (SDSs) for handling instructions and to know the specific hazards of the fluids you are using, including the effects of long-term exposure.</li> <li>• When spraying, servicing equipment, or when in the work area, always keep work area well-ventilated and always wear appropriate personal protective equipment. See <b>Personal Protective Equipment</b> warnings in this manual.</li> <li>• Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.</li> </ul>
	<p><b>PERSONAL PROTECTIVE EQUIPMENT</b></p> <p>Always wear appropriate personal protective equipment and cover all skin when spraying, servicing equipment, or when in the work area. Protective equipment helps prevent serious injury, including long-term exposure; inhalation of toxic fumes, mists or vapors; allergic reaction; burns; eye injury and hearing loss. This protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> <li>• A properly fitting respirator, which may include a supplied-air respirator, chemically impermeable gloves, protective clothing and foot coverings as recommended by the fluid manufacturer and local regulatory authority.</li> <li>• Protective eyewear and hearing protection.</li> </ul>

# **WARNING**



## SKIN INJECTION HAZARD

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



- Engage trigger lock when not dispensing.
- Do not point dispensing device at anyone or at any part of the body.
- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.



## FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:



- Use equipment only in well-ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).
- Ground all equipment in the work area. See **Grounding** instructions.
- Never spray or flush solvent at high pressure.
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Use only grounded hoses.
- Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are anti-static or conductive.
- **Stop operation immediately** if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.



# WARNING

**THERMAL EXPANSION HAZARD**

Fluids subjected to heat in confined spaces, including hoses, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.

- Open a valve to relieve the fluid expansion during heating.
- Replace hoses proactively at regular intervals based on your operating conditions.

**EQUIPMENT MISUSE HAZARD**

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

**BURN HAZARD**

Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

**MOVING PARTS HAZARD**

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.





# WARNING



## PLASTIC PARTS CLEANING SOLVENT HAZARD

Many cleaning solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.

- Use only compatible solvents to clean plastic structural or pressure-containing parts.
- See **Technical Specifications** in all equipment manuals for materials of construction. Consult the solvent manufacturer for information and recommendations about compatibility.



## PRESSURIZED ALUMINUM PARTS HAZARD





Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.

- Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.
- Do not use chlorine bleach.
- Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.

# Important Isocyanate (ISO) Information


Isocyanates (ISO) are catalysts used in two component materials.


## Isocyanate Conditions

									
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Spraying or dispensing fluids that contain isocyanates creates potentially harmful mists, vapors, and atomized particulates.

- Read and understand the fluid manufacturer's warnings and Safety Data Sheets (SDSs) to know specific hazards and precautions related to isocyanates.
- Use of isocyanates involves potentially hazardous procedures. Do not spray with this equipment unless you are trained, qualified, and have read and understood the information in this manual and in the fluid manufacturer's application instructions and SDSs.
- Use of incorrectly maintained or mis-adjusted equipment may result in improperly cured material, which could cause off gassing and offensive odors. Equipment must be carefully maintained and adjusted according to instructions in the manual.
- To prevent inhalation of isocyanate mists, vapors and atomized particulates, everyone in the work area must wear appropriate respiratory protection. Always wear a properly fitting respirator, which may include a supplied-air respirator. Ventilate the work area according to instructions in the fluid manufacturer's SDSs.
- Avoid all skin contact with isocyanates. Everyone in the work area must wear chemically impermeable gloves, protective clothing and foot coverings as recommended by the fluid manufacturer and local regulatory authority. Follow all fluid manufacturer recommendations, including those regarding handling of contaminated clothing. After spraying, wash hands and face before eating or drinking.
- Hazard from exposure to isocyanates continues after spraying. Anyone without appropriate personal protective equipment must stay out of the work area during application and after application for the time period specified by the fluid manufacturer. Generally this time period is at least 24 hours.
- Warn others who may enter work area of hazard from exposure to isocyanates. Follow the recommendations of the fluid manufacturer and local regulatory authority. Posting a placard such as the following outside the work area is recommended:

 **WARNING**




	<b>TOXIC FUMES HAZARD</b>
<b>DO NOT ENTER DURING SPRAY FOAM APPLICATION OR FOR ____ HOURS AFTER APPLICATION IS COMPLETE</b>	
<b>DO NOT ENTER UNTIL:</b>	
<b>DATE:</b> _____ <b>TIME:</b> _____	

## Material Self-ignition

				
Some materials may become self-igniting if applied too thick. Read material manufacturer's warnings and material Safety Data Sheet (SDS).				

## Keep Components A and B Separate

**NOTE:** A-side material is isocyanate (ISO). B-side material is resin (RES).

				
Cross-contamination can result in cured material in fluid lines which could cause serious injury or damage equipment. To prevent cross-contamination:				
<ul style="list-style-type: none"> <li>• Never interchange component A and component B wetted parts.</li> <li>• Never use solvent on one side if it has been contaminated from the other side.</li> </ul>				

## Moisture Sensitivity of Isocyanates

Exposure to moisture (such as humidity) will cause ISO to partially cure, forming small, hard, abrasive crystal that become suspended in the fluid. Eventually a film will form on the surface and the ISO will begin to gel, increasing in viscosity.

### NOTICE

Partially cured ISO will reduce performance and the life of all wetted parts.

- Always use a sealed container with a desiccant dryer in the vent, or a nitrogen atmosphere. **Never** store ISO in an open container.
- Keep the ISO pump wet cup or reservoir (if installed) filled with appropriate lubricant. The lubricant creates a barrier between the ISO and the atmosphere.
- Use only moisture-proof hoses compatible with ISO.
- Never use reclaimed solvents, which may contain moisture. Always keep solvent containers closed when not in use.
- Always lubricate threaded parts with an appropriate lubricant when reassembling.

**NOTE:** The amount of film formation and rate of crystallization varies depending on the blend of ISO, the humidity, and the temperature.

## Foam Resins with 245 fa Blowing Agents

Some foam blowing agents will froth at temperatures above 90°F (33°C) when not under pressure, especially if agitated. To reduce frothing, minimize preheating in a circulation system.

## Changing Materials

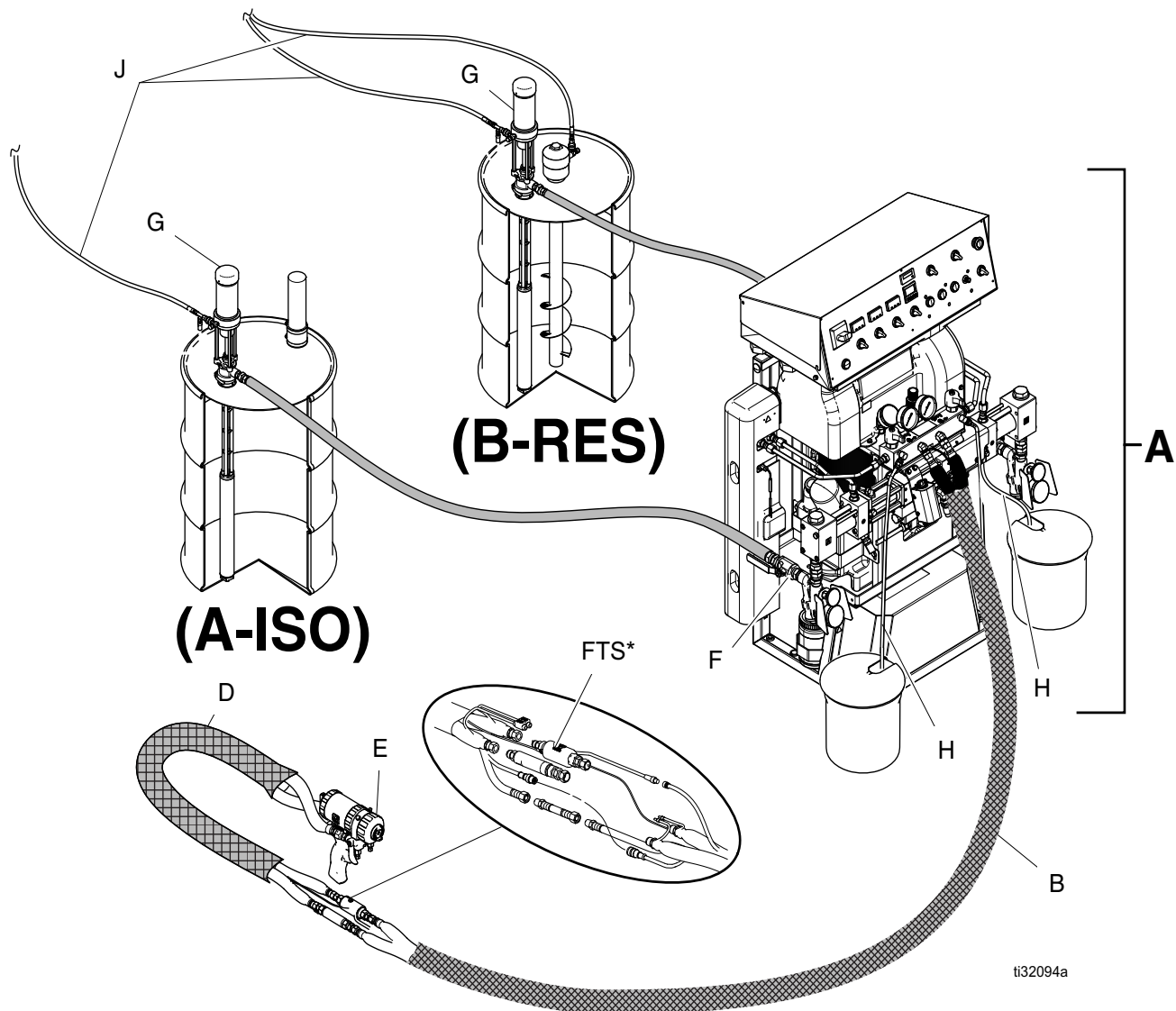
### NOTICE

Changing the material types used in your equipment requires special attention to avoid equipment damage and downtime.

- When changing materials, flush the equipment multiple times to ensure it is thoroughly clean.
- Always clean the fluid inlet strainers after flushing.
- Check with your material manufacturer for chemical compatibility.
- When changing between epoxies and urethanes or polyureas, disassemble and clean all fluid components and change hoses. Epoxies often have amines on the B (hardener) side. Polyureas often have amines on the B (resin) side.

# Typical Installation

## Without circulation



**FIG. 1: Typical Installation**

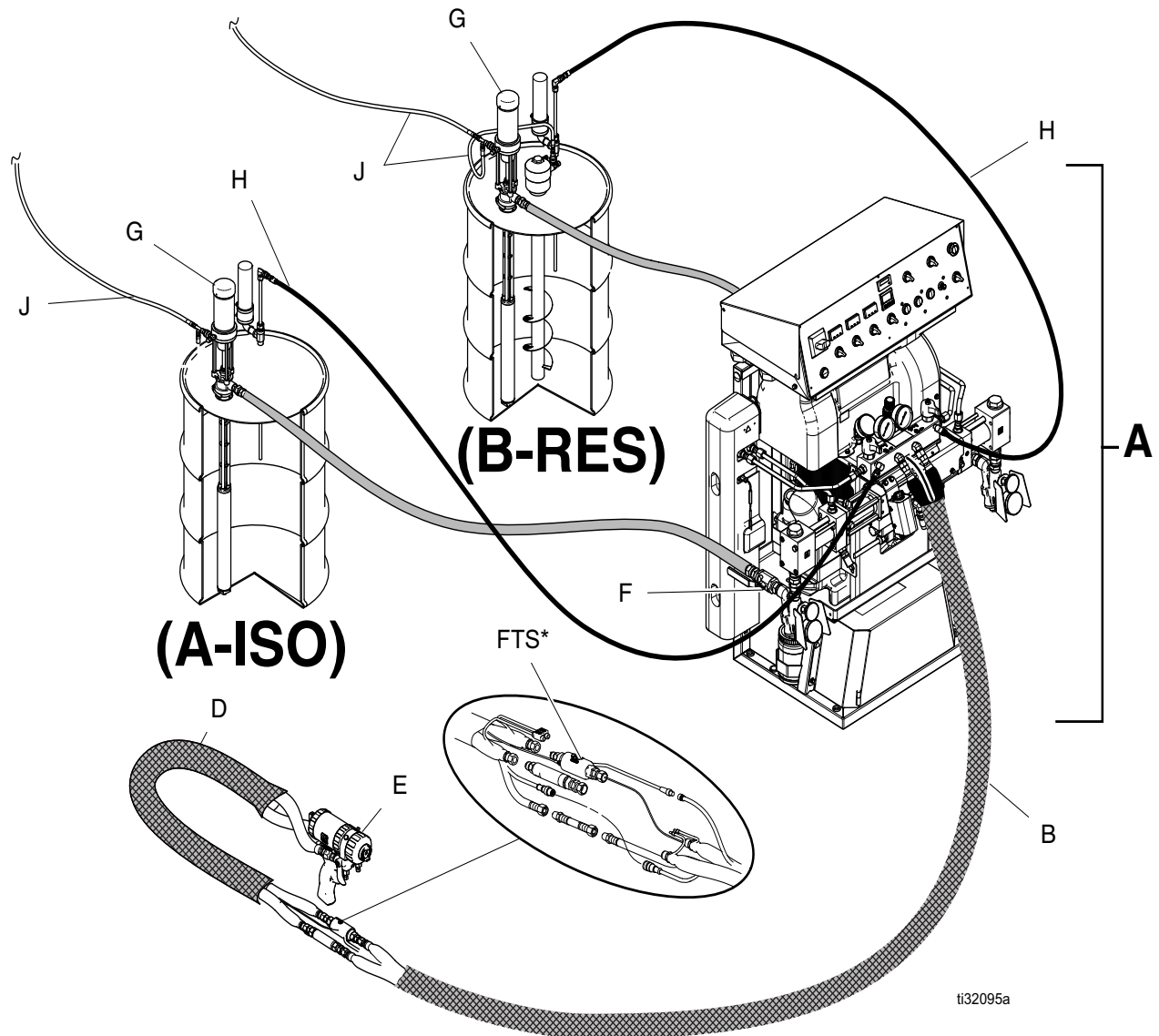
*\*Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
A	Gusmer Hydraulic Proportioner
FTS	Fluid Temperature Sensor (FTS)
B	Heated Hose
D	Heated Whip Hose
E	Spray Gun
F	Fluid Inlets A and B
G†	Feed Pumps A and B

Ref.	Description
H	Pressure Relief Lines
J‡	Air Supply Lines
†	<i>Included in some proportioner packages.</i>
‡	<i>Customer-supplied.</i>



## With proportioner manifold to drum circulation

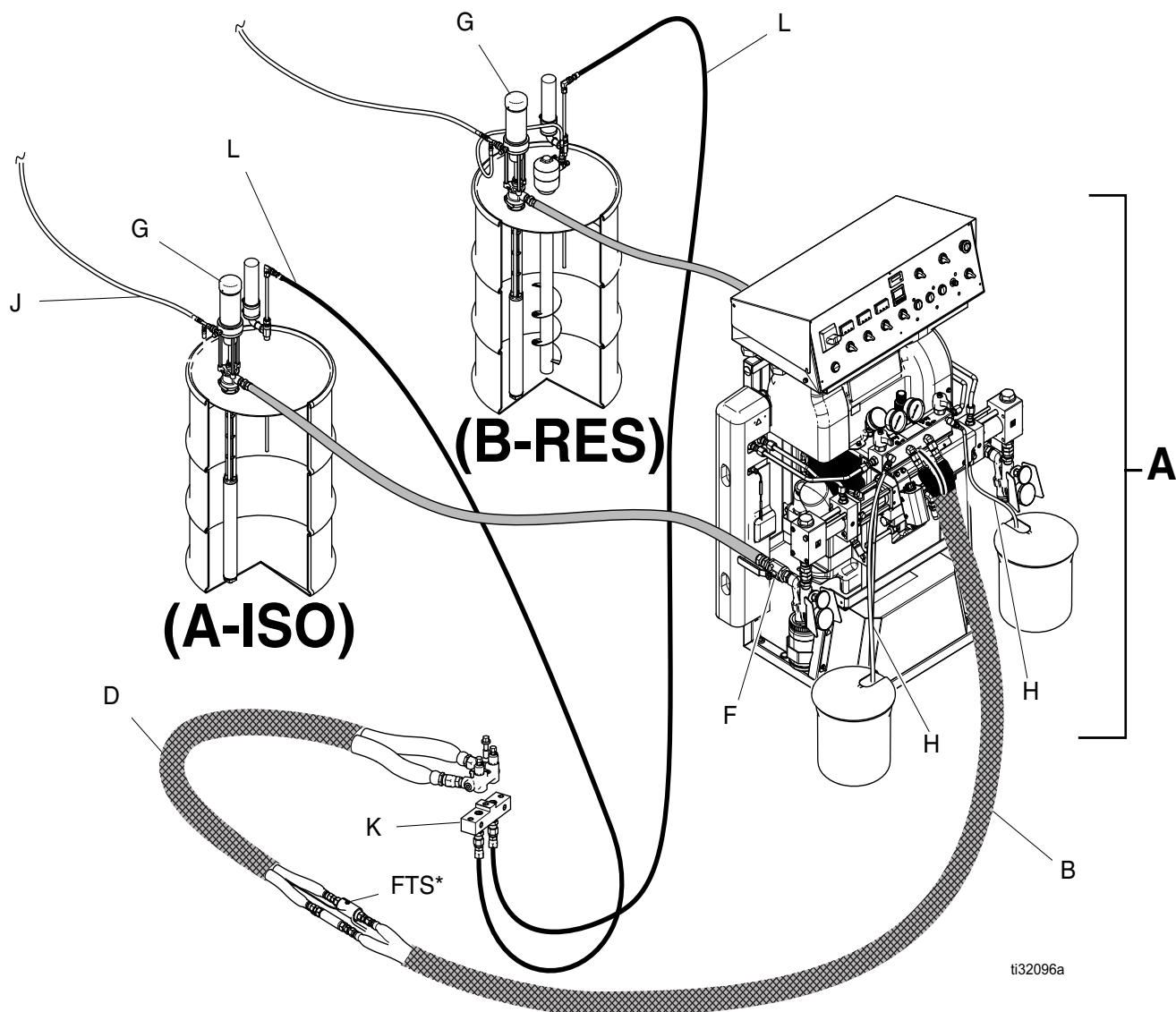


**FIG. 2: Typical Installation**

*\*Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description	Ref.	Description
A	Gusmer Hydraulic Proportioner	G‡	Feed Pumps A and B
FTS	Fluid Temperature Sensor (FTS)	H	Pressure Relief Lines
B†	Heated Hose	J‡	Air Supply Lines
D†	Heated Whip Hose	†	<i>Included in some proportioner packages.</i>
E†	Spray Gun	‡	<i>Customer-supplied.</i>
F	Fluid Inlets A and B		

## With gun manifold to drum circulation



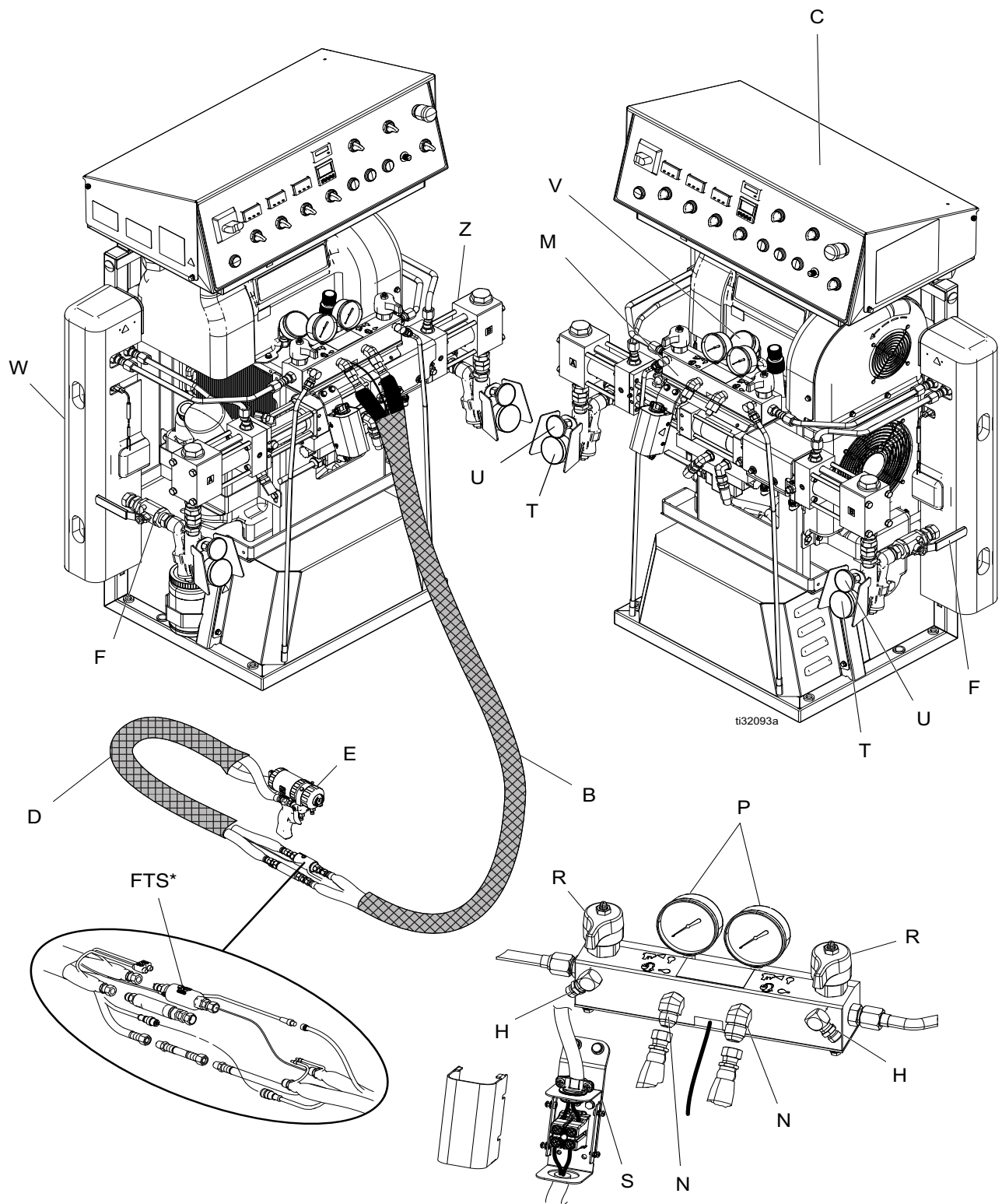
**FIG. 3: Typical Installation**

*\*Shown exposed for clarity. Wrap with tape during operation.*

Ref.	Description
A	Gusmer Hydraulic Proportioner
FTS	Fluid Temperature Sensor (FTS)
B†	Heated Hose
D†	Heated Whip Hose
F	Fluid Inlets A and B
G‡	Feed Pumps A and B
H	Pressure Relief Lines

Ref.	Description
J	Air Supply Lines
K	Gun Recirculation Adapter
L	Gun Recirculation Lines A and B
†	<i>Included in some proportioner packages.</i>
‡	<i>Customer-supplied.</i>

# Component Identification



**FIG. 4: Component Identification**

*\*Shown exposed for clarity. Wrap with tape during operation.*

## Component Identification

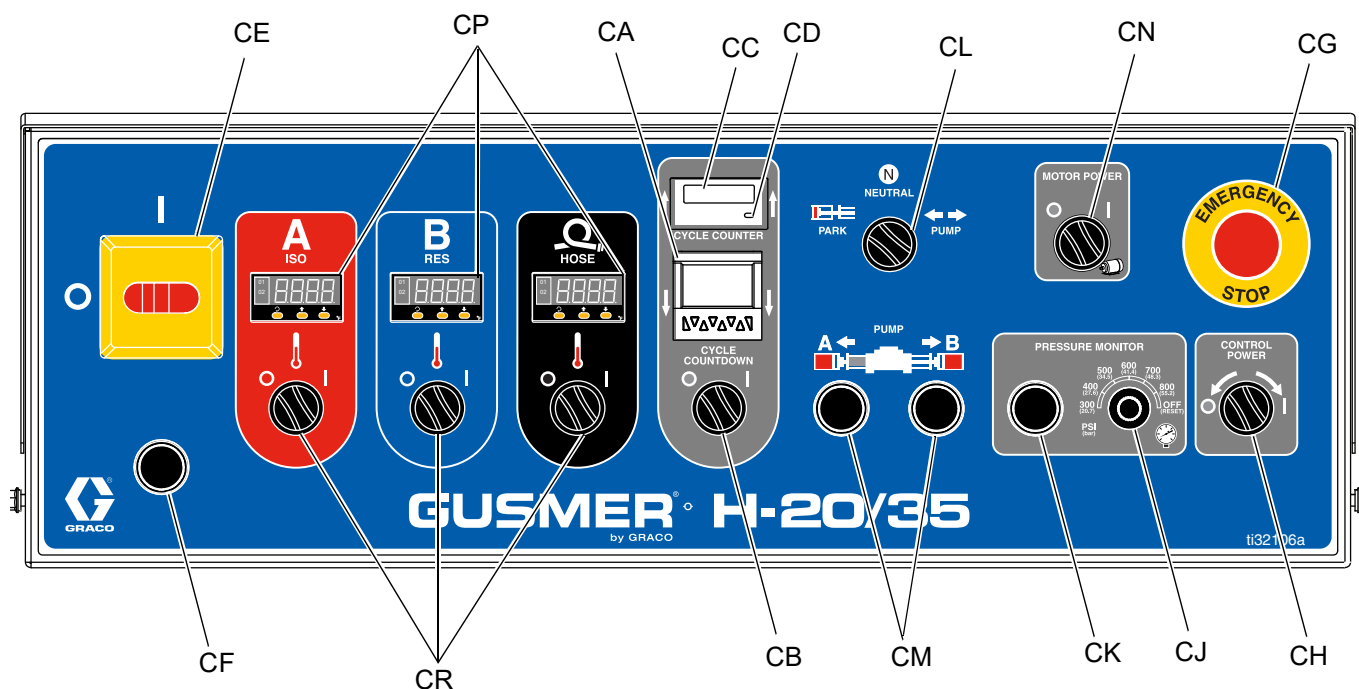
### Ref. Description

B†	Heated Hose
C	Electrical Enclosure
D†	Heated Whip Hose
FTS	Fluid Temperature Sensor (FTS)
E†	Spray Gun
F	Fluid Inlet A and B
H	Pressure Relief Lines A and B
M	Proportioner Manifold
N	Outlet A and B
P	Outlet Pressure Gauge A and B

### Ref. Description

R	Pressure Relief Valve A and B
S	Electrical Junction Box
T	Inlet Pressure Gauge A and B
U	Inlet Temperature Gauge A and B
V	Hydraulic Pressure Gauge
W*	Primary Heater A and B
Z	Fluid Pump A and B
*	<i>Located behind shroud.</i>
†	<i>Included in some proportioner packages.</i>

## Control Panel



**FIG. 5: Control Panel**

### Ref. Description

CA	Cycle Countdown
CB	Cycle Countdown Switch (ENABLE/DISABLE)
CC	Cycle Counter
CD	Cycle Counter Reset Button
CE	Main Power Disconnect (ON/OFF)
CF	Main Power Indicator Light
CG	Emergency Stop Button
CH	Control Power Switch (STOP/RUN/START)
CJ	Pressure Monitor Knob

### Ref. Description

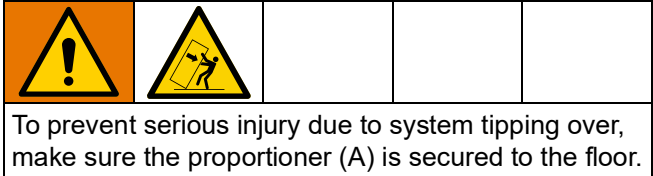
CK*	Pressure Monitor Indicator Light
CL	Pump Control Switch (PARK/NEUTRAL/PUMP)
CM	Pump Direction Indicator Lights
CN	Motor Power Switch (ON/OFF)
CP	Temperature Controllers A, B, and Hose
CR	Heat Zone Switches A, B, and Hose (ON/OFF)

\* Red light indicates fault, white light indicates on.

[illegible]

# Installation

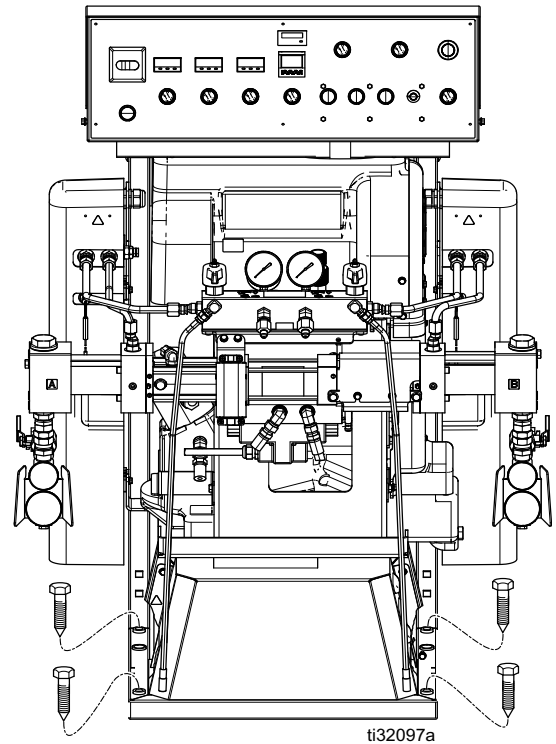
## Mounting the System



**NOTE:** Wall mounting brackets are not included with the system. Evaluate the installation to determine if additional support is required beyond the floor mounting screws.

1. See **Dimensions**, page 104, for mounting hole specifications.
2. Use a minimum of 4 of the 6 mounting holes, evenly spaced in the base of the system frame, to secure base to the floor.

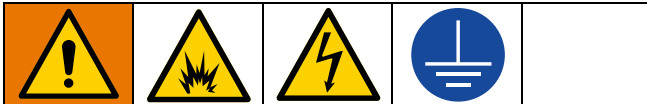
**NOTE:** Bolts are not included.



**FIG. 6: Mount to the Floor**

# Setup

## Grounding



The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

Gusmer Hydraulic Proportioner: grounded through the power cord.

**Spray gun:** connect the grounded wire of the heated whip hose (D) to the fluid temperature sensor (FTS). See **Install Fluid Temperature Sensor**, page 23. Do not disconnect ground wire or spray without whip hose.

**Fluid supply container:** follow local code.

**Object being sprayed:** follow local code.

**Solvent pails used when flushing:** follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts grounding continuity.

**To maintain grounding continuity when flushing or relieving pressure:** hold metal part of the spray gun (E) firmly to the side of a grounded metal pail, then trigger the gun.

## General Equipment Guidelines

### NOTICE

Failure to properly size the electric generator for equipment will cause voltage fluctuations that may result in equipment damage. To avoid damage to equipment, follow the guidelines listed below.

- Determine the correct size generator. Using the correct size generator and proper air compressor will enable the proportioner (A) to run at peak load. See **Models**, page 3. Ensure that the generator matches the voltage and phase of the proportioner.

Use the following procedure to determine the correct size generator.

1. List peak wattage requirements of all system components.

2. Add the wattage required by the system components.

3. Perform the following equation:

$$\text{Total watts} \times 1.25 = \text{kVA (kilovolt-amperes)}$$

4. Select a generator size that is equal to or greater than the determined kVA.



### NOTICE

Voltage fluctuations can damage electrical equipment. To avoid voltage fluctuations, follow the guidelines listed below.

- Use correctly sized power cords for the proportioner. Refer to the amperage listed in **Models** (page 3) to select the correct power cord.
- Use an air compressor with continuous run head unloading devices. Do not use direct online air compressors that start and stop during a job.
- Maintain and inspect the generator, air compressor, and other equipment per the manufacturer recommendations to avoid an unexpected shutdown.



## Connect Power

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>This equipment must be grounded. Connect only to grounded power source.</li> <li>All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

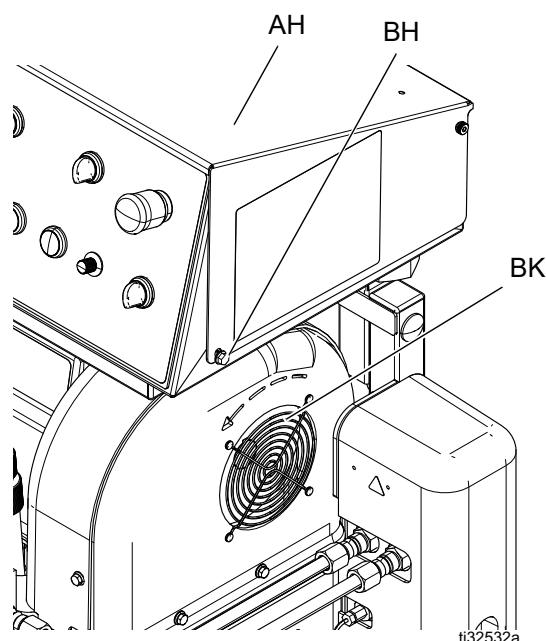
### NOTICE

350-415 VAC Gusmer Hydraulic Proportioners are not designed to operate from a 480 VAC power source. To avoid damage to equipment, follow the guidelines listed below.

- Select correctly sized power cord. Refer to the amperage listed in **Models** (page 3) to select the correct power cord.
- Turn main power disconnect (CE) to OFF.
- Open the electrical enclosure door (AH) by loosening the bolts (BH) and lifting the door upwards. See FIG. 8.
- Route power cable through power inlet cord grip (AL) in electrical enclosure (C). Tighten cord grip (AL). See FIG. 8.
- Connect incoming power wires to main disconnect terminals (AJ) and main ground lug (AK) as shown in FIG. 8. Torque to 55 in-lbs (6.2 N•m). Gently pull on all connections to verify they are properly secured.
  - 230 V, 1 phase:** Using 5/32 or 4 mm hex allen wrench, connect two power leads to L1 and L2. Connect green to ground lug (AK).
  - 230 V, 3 phase:** Using 5/32 or 4 mm hex allen wrench, connect three power leads to L1, L2, and L3. Connect green to ground lug (AK).

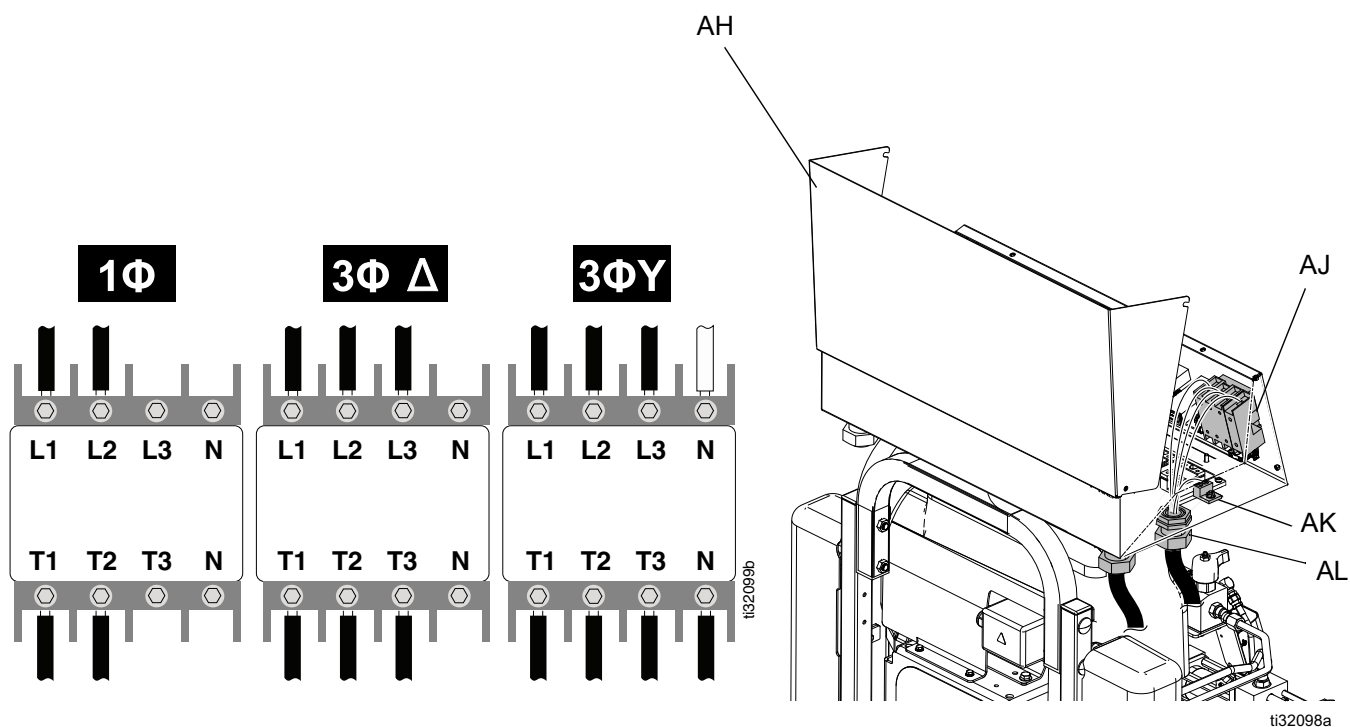
- 400 V, 3 phase:** Using 5/32 or 4 mm hex allen wrench, connect three power leads to L1, L2, and L3. Connect neutral to N. Connect green to ground lug (AK).

- Verify all items are connected properly as shown in FIG. 8. Close the electrical enclosure door (AH) and tighten the bolts (BH).



**FIG. 7: Electric Motor Rotation**

- Verify electric motor fan (BK) rotation is correct.
  - Turn the main power disconnect (CE) to ON.
  - Turn the control power switch (CH) to START. Verify the pump control switch (CL) is in NEUTRAL.
  - Briefly turn the motor power switch (CN) to ON. Observe the direction the electric motor fan (BK) rotates. See FIG. 7.
- If the motor fan rotation is not correct:
  - Immediately turn the motor power switch (CN) to OFF.
  - Turn the control power switch (CH) to STOP.
  - Turn the main power disconnect (CE) to OFF.
  - Repeat **Connect Power**. Swap the incoming power wires between L1 and L2.



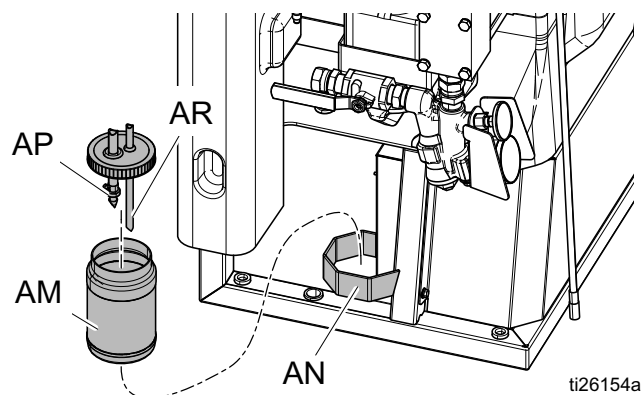
**FIG. 8: Connect Incoming Power Wires**

**NOTE:** See **Models**, page 3, to identify which wiring combination is used with your Gusmer model.

## TSL Pump Lubrication System Setup

**Component A (ISO) Pump:** Fill TSL reservoir (AM) with Graco TSL (Throat Seal Liquid), part 206995 (supplied).

1. Lift the TSL lubricant reservoir (AM) out of the reservoir bracket (AN) and remove the cap.



**FIG. 9**

2. Fill with fresh Graco TSL. Thread the TSL reservoir (AM) onto the cap and place it in the reservoir bracket (AN).
3. Push the TSL inlet filter (AP) approximately 1/3 of the way into the reservoir.
4. Push the TSL outlet tube (AR) into the reservoir until it reaches the bottom.

**NOTE:** The TSL outlet tube (AR) must reach the bottom of the reservoir to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the TSL inlet filter (AP). No priming is required.

## Install Fluid Temperature Sensor

The fluid temperature sensor (FTS) is supplied. Install the FTS between the heated hose (B) and the heated whip hose (D). Refer to your heated hose manual for instructions. Add any additional sections of heated hose if desired. Be sure cables have slack when hose bends. Wrap cable and electrical connections with electrical tape.

## Install Heated Hose to Proportioner

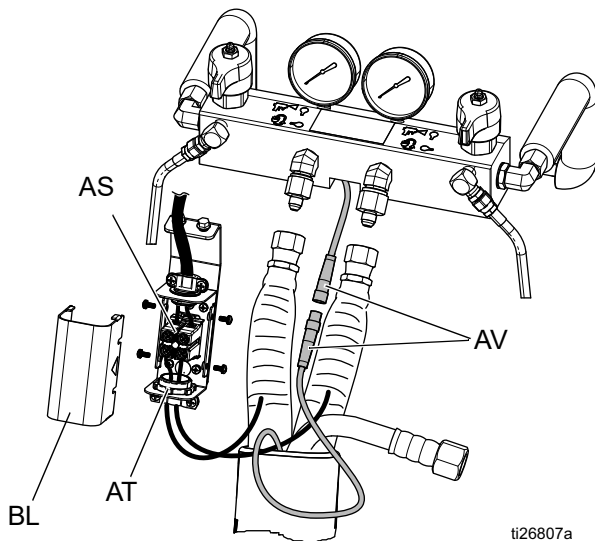


1. Turn main power disconnect (CE) to OFF.

**NOTE:** The Gusmer Hydraulic Proportioner (A) is only compatible with standard, two-component heated hoses using a thermocouple. See heated hose manual for detailed instructions on connecting heated hoses.

**NOTE:** The fluid temperature sensor (FTS) and heated whip hose (D) must be used with the heated hose (B). Hose length, including heated whip hose (D), must be at least 60 ft (18.3 m) minimum.

2. Connect heated hose to proportioner.

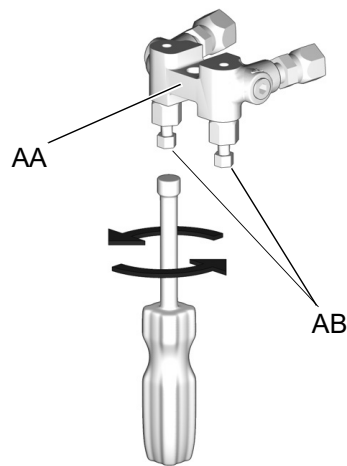


**FIG. 10: Heated Hose Electrical Junction Box**

- a. Connect fluid hoses to proportioner fluid manifold.

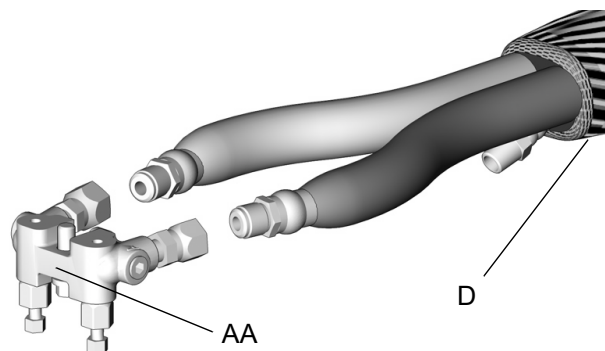
**NOTE:** Fluid outlets (N) come with adapter fittings to allow use of 1/4 in. and 3/8 in. ID fluid hoses. To use 1/2 in. (13 mm) ID fluid hoses, remove adapters.

- b. Remove box cover (BL) and loosen lower strain relief (AT). Connect hose power wires to terminal block (AS). A and B hose wire positions are not important. Torque to 35-50 in-lb (4.0-5.6 N•m).
  - c. Fully tighten lower strain relief (AT) screws and replace cover.
  - d. Connect FTS cable connectors (AV).
3. Close both needle valves (AB) on gun manifold (AA).



**FIG. 11: Gun Manifold**

4. Connect heated whip hose (D) to gun manifold (AA). Do not connect manifold to gun.



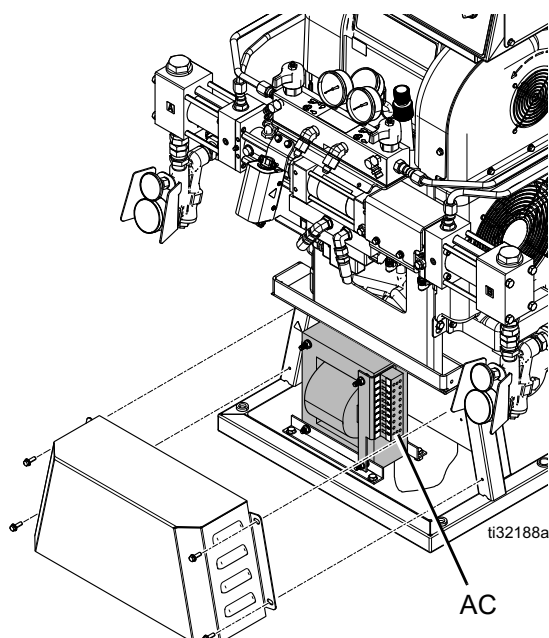
**FIG. 12**

## Adjust Hose Transformer Wiring



**NOTE:** The fluid temperature sensor (FTS) and heated whip hose (D) must be used with the heated hose. Hose length, including whip hose, must be at least 60 ft (18.3 m) minimum. GH-2 proportioners can be used with a maximum of 310 ft (94.5 m) of hose. GH-4 proportioners can be used with a maximum of 410 ft (125.0 m) of hose.

1. Verify that power is disconnected.
2. Remove the transformer cover. See FIG. 13.



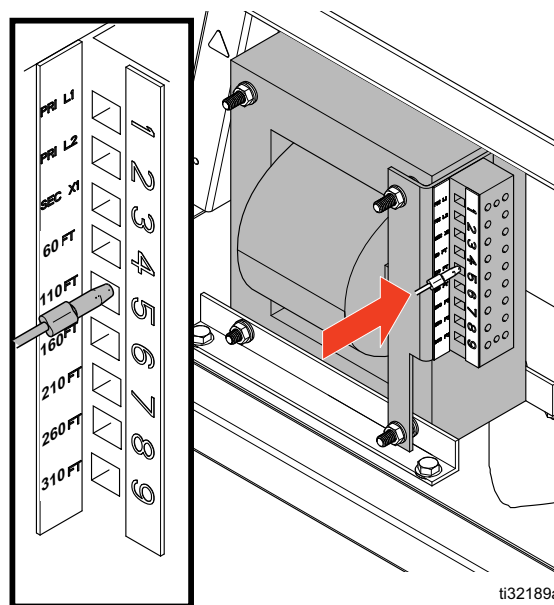
**FIG. 13: Hose Transformer Cover**

3. Move the wire on the hose transformer (AC) to the terminal that matches the length of hose installed. Wire is factory-set to 60 ft. See FIG. 14.

**NOTE:** The transformer terminals are labeled with the corresponding total length of hose, including the whip hose. Always use a whip hose and select the transformer tap that matches the total hose length. If using a whip hose longer than 10 ft (3.0 m), round the total length of hose down to determine the correct terminal setting.

### NOTICE

The maximum amount of heat generated by the heated hose depends on the input voltage to the proportioner. If possible, adjust the generator voltage within the marked voltage range. This will increase or decrease the maximum current (and heat) available to the hose. To avoid damage to the proportioner and hose, do not exceed the maximum voltage rating of the system. Do not exceed a hose current of 50 A.



**FIG. 14: Hose Transformer Wiring**

4. Reinstall the transformer cover. See FIG. 13.

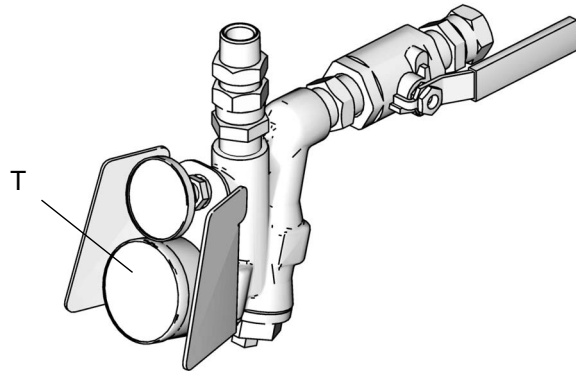
## Flush Before Using Equipment

The equipment was tested with lightweight oil, which is left in the fluid passages to protect parts. To avoid contaminating your fluid with oil, flush the equipment with a compatible solvent before using the equipment. See **Flushing**, page 41.

## Connect Feed Pumps

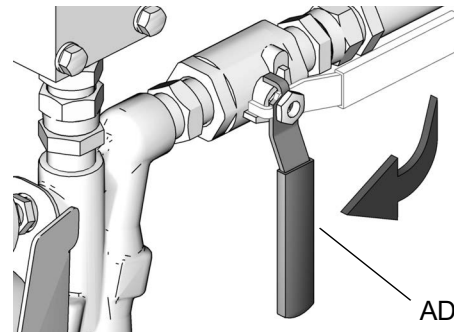
1. Install feed pumps (G) in component A and B supply drums. See **Typical Installation**, page 12.

**NOTE:** A minimum feed pressure of 50 psi (0.35 MPa, 3.5 bar) is required at both inlet pressure gauges (T). Maximum feed pressure is 250 psi (1.75 MPa, 17.5 bar). Maintain A and B feed pressures within 10% of each other.



**FIG. 15: Inlet Pressure Gauge on Inlet Assembly**

2. Seal component A drum. If used, install desiccant dryer in drum vent. Desiccant dryer sold separately.
3. Install agitator in component B drum, if necessary. Agitator sold separately.
4. Ensure A and B inlet valves (AD) are closed.



**FIG. 16: Inlet Valve on Inlet Assembly**

**NOTE:** Fluid inlet (F) hoses from feed pumps (G) should be 3/4 in. (19 mm) ID.

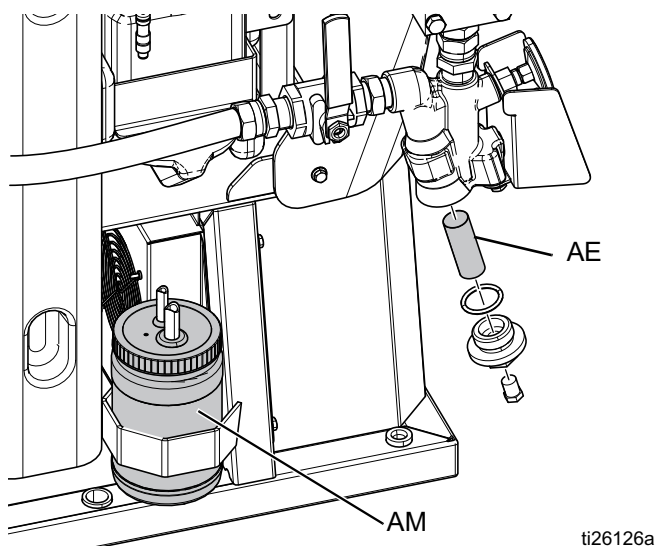
# Startup



## NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

1. Verify that all **Setup** steps are complete. See page 20.
2. Check that the fluid inlet filter (AE) is clean before daily startup.



**FIG. 17: Fluid Inlet Filters**

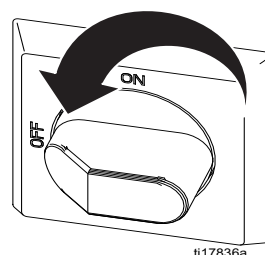
3. Check TSL reservoir (AM). Check level and condition of lubrication daily. See **TSL Pump Lubrication System**, page 44.
4. Measure the material level in each drum. A and B drum level sticks (24M174) sold separately.

5. Check hydraulic fluid level. Hydraulic reservoir is filled at the factory. Check fluid level before operating the first time, and weekly thereafter. See **Maintenance**, page 42.
6. If using a generator:
  - a. Check generator fuel level.

## NOTICE

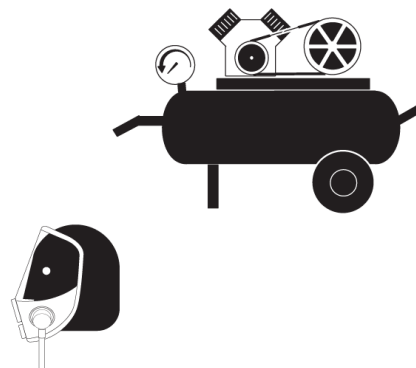
Running out of fuel will cause voltage fluctuations that can damage equipment and void the warranty. Do not run out of fuel.

- b. Confirm main power disconnect (CE) is OFF before starting generator.



**FIG. 18: Main Power Disconnect**

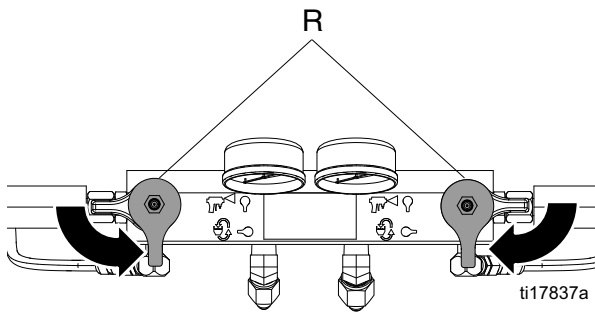
- c. Ensure the main breaker on the generator is in the off position.
  - d. Start the generator. Allow it to reach full operating temperature.
7. Switch on the air compressor, air dryer, and breathing air, if equipped.



**FIG. 19**

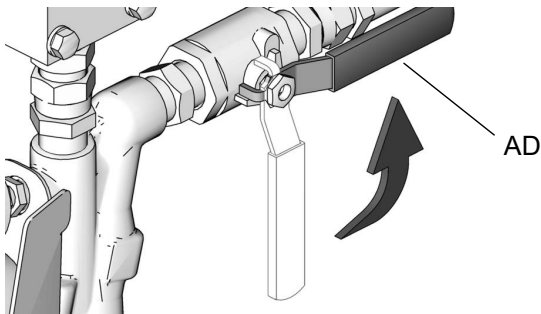
8. For first startup of new system, load fluid with feed pumps (G). See **Component Identification**, page 15.

- a. Turn on agitator, if equipped.
- b. Turn both pressure relief valves (R) to SPRAY



**FIG. 20**

- c. Turn on feed pumps (G).
- d. Open inlet valves (AD). Check for leaks.



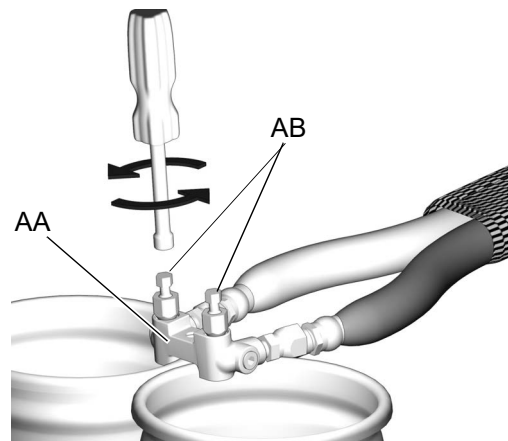
**FIG. 21**



Cross contamination can result in cured material in fluid lines which could cause injury from splashing or damage equipment. To prevent cross-contamination:

- **Never** interchange component A and component B wetted parts.
- Never use solvent on one side if it has been contaminated from the other side.
- Always provide two waste containers to keep component A and component B fluids separate.

- e. Hold gun manifold (AA) over two grounded waste containers. Open needle valves (AB) A and B until clean, air-free fluid comes from valves. Close valves.



**FIG. 22**



9. Turn the motor power switch (CN) OFF and turn the pump control switch (CL) to NEUTRAL.

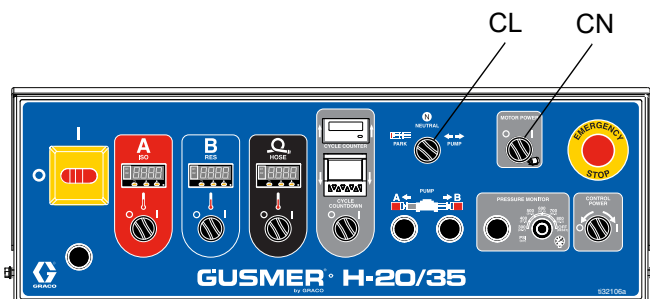


FIG. 23

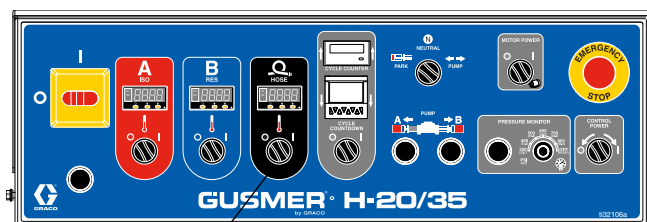
10. Set temperature controllers (CP). See **Digital Temperature Controllers**, page 30.

<p>This equipment is used with heated fluid which can cause equipment surfaces to become very hot. To avoid severe burns:</p> <ul style="list-style-type: none"> <li>Do not touch hot fluid or equipment.</li> <li>Do not turn on hose heat without fluid in hoses.</li> <li>Allow equipment to cool completely before touching it.</li> <li>Wear gloves if fluid temperature exceeds 110° F (43° C).</li> </ul>				

<p>Thermal expansion can cause over-pressurization, resulting in equipment rupture and serious injury, including fluid injection. Do not pressurize system when preheating hose.</p>				

11. Preheat the system:

- If you need to circulate fluid through the system to preheat the drum supply, see **Connect Proportioner Manifold to Drum Circulation**, page 32. If you need to circulate material through the heated hose to the gun manifold, see **Connect Gun Manifold to Drum Circulation**, page 33.
- Turn hose heat zone switch on.



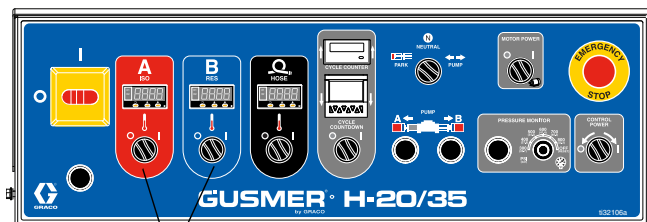
Hose Heat Zone Switch

FIG. 24: Heat Zone Switch for Hose

- Wait for the hose to reach set point temperature.

**NOTE:** Hose heat-up time may increase at voltages less than nominal 230 VAC when maximum hose length is used. Hose transformer wiring must match hose length (see **Adjust Hose Transformer Wiring**, page 25).

- Turn on A and B heat zones by turning on heat zone switches (CR). Wait until the heat zone actual temperatures reach the temperature setpoints.



A and B Heat Zone Switches

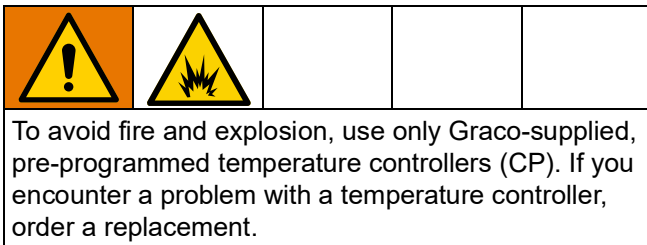
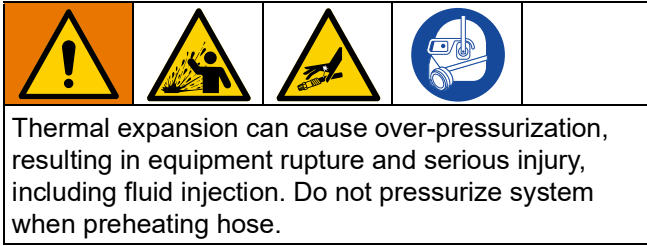
FIG. 25

- If desired, **Set Cycle Countdown**, page 31.
- The proportioner is ready for operation. See **Spraying**, page 35.

## Digital Temperature Controllers

Temperature controls are factory-programmed. The only user-programmable parameters are temperature setpoint “SP1” and temperature units “uniT” (°C or °F).

The proportioner has three temperature controllers (CP) that automatically manage the temperature for the A and B primary heaters (W) and the heated hose (B).



### NOTICE

Heated hoses and primary heaters must always contain fluid when hose power is on. Never turn on heat zone switches while a heated hose or primary heater is empty. Powering empty hoses and heaters may cause equipment damage.

### NOTICE

Always completely unroll and bleed the air from the hose before each use. If the air is not bled from the hose, heat transfer from the heating conductor will not be uniform. In the worst case, the conductor can be damaged. The warranty is void in such cases.

## Adjust Temperature Set Point

1. Turn off all heat zone switches (CR) and motor power switch (CN).
2. Set pump control switch (CL) to neutral.
3. Ensure the main power disconnect (CE) is ON. Main power indicator light (CF) will illuminate.
4. Start machine by turning control power switch (CH) to START. Light in switch and temperature controllers (CP) will illuminate.

**NOTE:** Wait five seconds. Initial information displayed during startup does not affect hose performance.

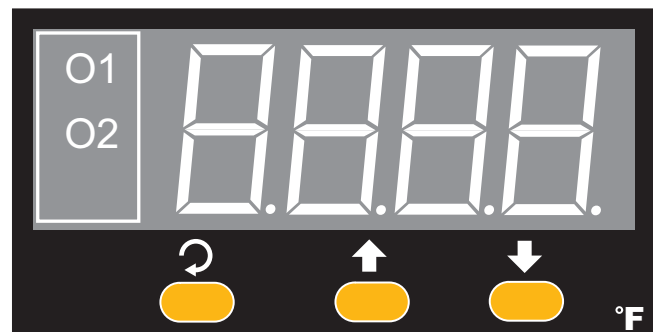





















FIG. 26: Temperature Controller

5. Press  (SCROLL).
6. When module screen displays “SPI,” use  and  (UP, DOWN) to select desired set point.
7. Once desired set point is reached, press both  and  (UP, DOWN) at the same time to return to actual temperature display. Hose is now controlling temperature to desired set point.

**NOTE:** Temperature controllers (CP) normally display actual temperature. When illuminated, the red “O1” on the temperature controller indicates that controller is on and actively trying to heat the heater to match the temperature set point. The heat zone switch must be in the ON position for the heater relay (605) to receive a signal from the controller and cause the temperature to increase. The “O1” disappears when controller is OFF and not actively heating. The “O1” cycles on and off to indicate temperature maintenance.

## Change Between Fahrenheit and Celsius

The temperature controllers (CP) are factory-set to display Fahrenheit units.

1. Enter the setup menu by pressing  (SCROLL). "SP1" is shown on the display.
2. Press  (SCROLL) repeatedly until "LOCK" is shown on the display.
3. Press  (UP) or  (DOWN) arrow until "nonE" is shown on the display.
4. Press  (SCROLL) again until "UNIT" is shown on the display.
5. Press  (UP) or  (DOWN) arrow buttons until the desired unit of °C or °F is shown on the display.
6. Press  (SCROLL) to return to the setup menu. "UNIT" will be shown on the display again.
7. Press  (SCROLL) repeatedly until "LOCK" is shown on the display again.
8. Press  (UP) or  (DOWN) arrow buttons until "uSEr" is shown on the display.
9. Press  (SCROLL) to return to the setup menu. "LOCK" will be shown on the display again.
10. Return to the actual temperature display and normal operation by pressing  (UP) and  (DOWN) buttons at the same time.

## Set Cycle Countdown

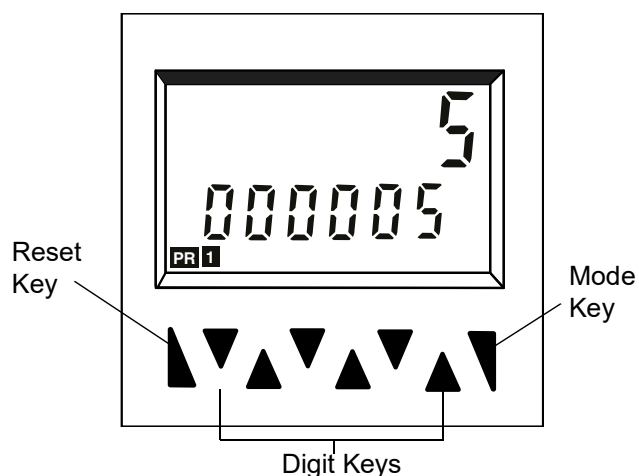
1. Turn the pump control switch (CL) to NEUTRAL.
2. Turn the motor power switch (CN) to OFF.
3. Turn the main power disconnect (CE) to ON. Then turn the control power switch (CH) to ON.
4. Enable cycle countdown by turning the cycle countdown switch (CB) to ON. When cycle countdown is enabled, the pump shuts off automatically after a set number of cycles.
5. Change the preset cycle countdown value to the number of cycles for the pump to complete before automatically shutting off. See table for approximate cycles by volume.

**Table 1: Nominal Volume/Cycle**

Pump Size	Cycles by Volume
140 (GH-2)	13.5 cycles/gal 3.6 cycles/L
120 (GH-4)	15.9 cycles/gal 4.2 cycles/L

- a. Press the digit key associated with the number you would like to change.
- b. Press the reset key or wait 3 seconds to accept the new value. When new value has been accepted, the cycle countdown is set.

**NOTE:** To reset the counter to the preset value, press the reset key again.



**FIG. 27: Cycle Countdown**

# Fluid Circulation



To avoid injection injury and splashing, do not install shutoffs downstream of the pressure relief valves (R). The valves function as overpressure relief valves

when set to SPRAY



Pressure relief lines (H) and gun recirculation lines (L) must be rated for the maximum working pressure of the proportioner. See **Technical Specifications**, page 105. Pressure relief lines must be open so valves can automatically relieve pressure when machine is operating.

## NOTICE

To prevent equipment damage, do not circulate fluid containing a blowing agent without consulting with your material supplier regarding fluid temperature limits.

**NOTE:** Optimum heat transfer is achieved at lower fluid flow rates with temperature set points at desired drum temperature.

## Connect Proportioner Manifold to Drum Circulation

To circulate through gun manifold (AA) and preheat hose, see **Connect Gun Manifold to Drum Circulation**, page 33.

1. Follow **Pressure Relief Procedure**, page 40.
2. Install A-side and B-side pressure relief lines (H) back to component A and B supply drums. See **Typical Installation With proportioner manifold to drum circulation**, page 13.

**NOTE:** Use hoses rated for the maximum working pressure of this equipment. See **Technical Specifications**, page 105.

3. Set pressure relief valves (R) to PRESSURE

RELIEF/CIRCULATION 

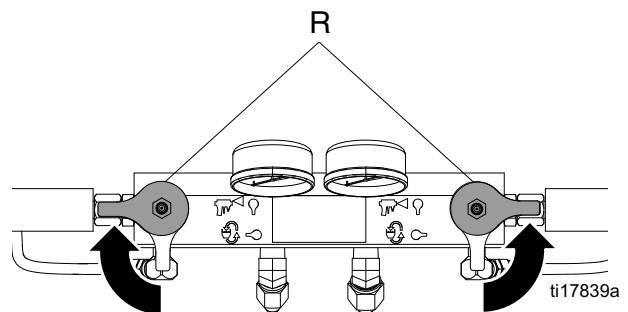


FIG. 28

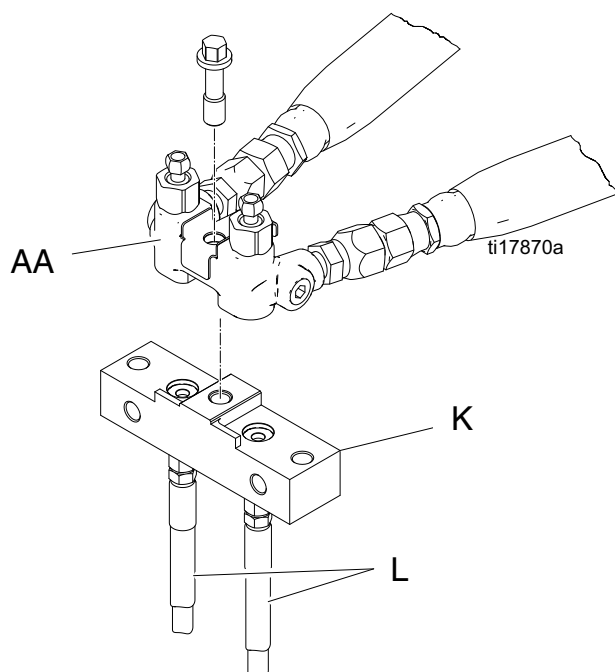
4. Follow **Reduce Hydraulic Pressure**, page 34.

## Connect Gun Manifold to Drum Circulation

**NOTE:** The Fusion gun manifold is shown.

Circulating fluid through the gun manifold (AA) allows rapid preheating of the heated hose (B).

1. Follow **Pressure Relief Procedure**, page 40.
2. Install gun manifold (AA) on gun recirculation adapter (K). Connect gun recirculation lines (L) to gun recirculation adapter (K).

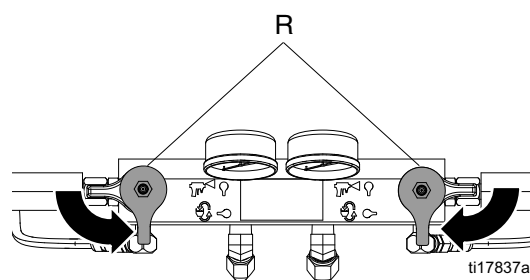


**FIG. 29: Gun Recirculation Adapter Installation**

**NOTE:** Use hoses rated for the maximum working pressure of this equipment. See **Technical Specifications**, page 105.

Gun Recirculation Adapter (K) Kit	Gun	Manual in English
246362	Fusion AP	309818
256566	Fusion CS	313058

3. Route gun recirculation lines (L) back to respective component A or B supply drum.
4. Set pressure relief valves (R) to SPRAY.

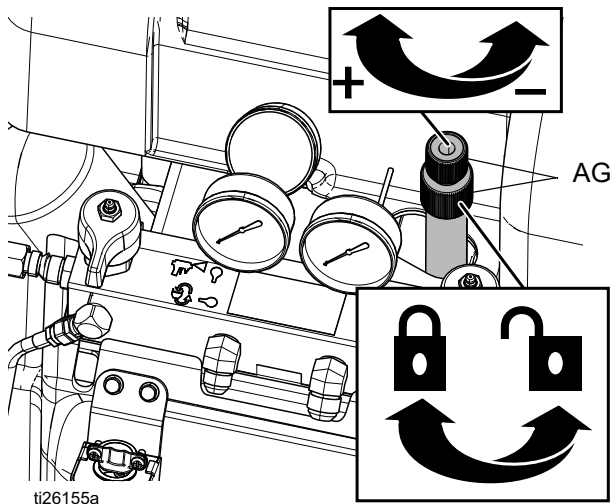


**FIG. 30**

5. Follow **Reduce Hydraulic Pressure**, page 34.

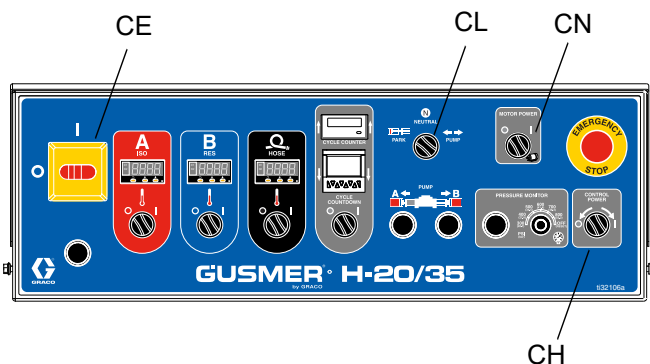
## Reduce Hydraulic Pressure

1. Turn pump control switch (CL) to NEUTRAL position and verify motor power switch (CN) is OFF. Turn main power disconnect (CE) ON. Then start machine by turning control power switch (CH) to START.
2. Before starting the hydraulic motor, unlock the hydraulic pressure adjuster (AG) by rotating the lower adjuster knob counter-clockwise. Then rotate the upper adjuster knob counter-clockwise until it ceases to move to set at lowest possible pressure. The hydraulic pressure adjuster can be relocked by turning the lower adjuster knob clockwise.



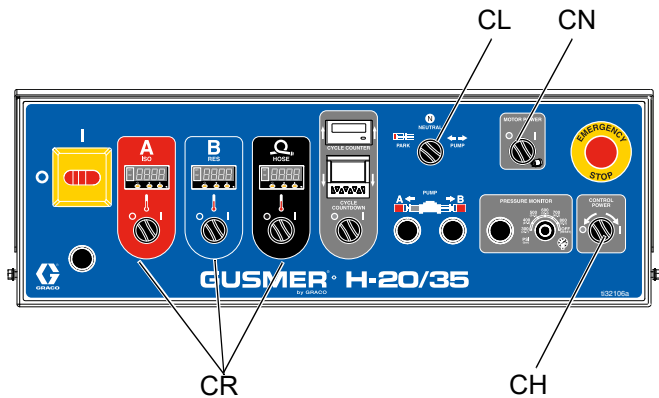
**FIG. 31: Hydraulic Pressure Adjustment**

3. Verify cycle countdown switch (CB) is set to OFF.
4. Turn motor power switch (CN) to ON. Then turn pump control switch (CL) to PUMP. Circulate fluid at lowest possible pressure.



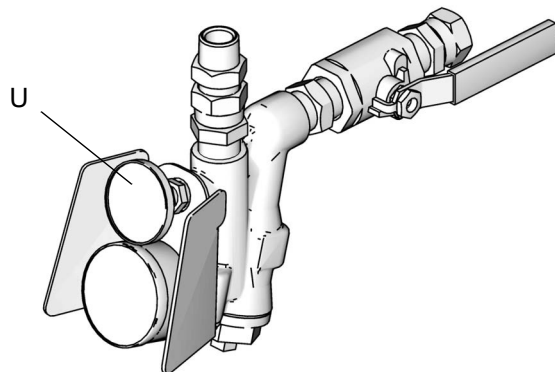
**FIG. 32**

5. If preheating system:
  - a. Verify temperature targets. See **Digital Temperature Controllers**, page 30.
  - b. Turn on all 3 heat zone switches (CR).



**FIG. 33**

- c. Wait until the inlet temperature gauges (U) reach the minimum chemical temperature from the supply drums. Turn pump control switch (CL) to NEUTRAL. Then turn the motor power switch (CN) to OFF.



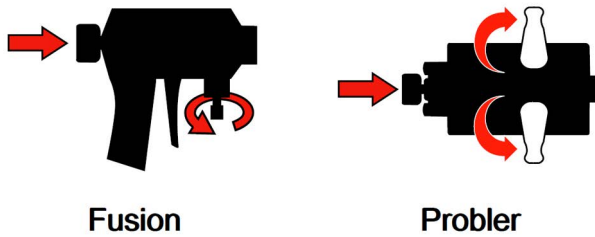
**FIG. 34: Inlet Pressure Gauge on Inlet Assembly**

6. Return to step 12 of **Startup**, page 27.

# Spraying



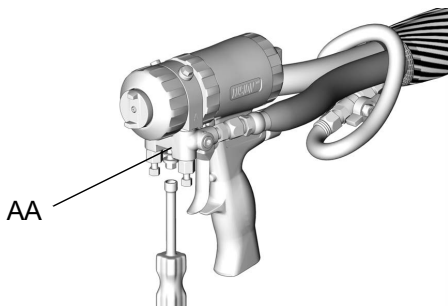
1. Follow **Startup**, page 27.
2. Turn pump control switch (CL) to NEUTRAL. Turn motor power switch (CN) to OFF.
3. Engage gun piston safety lock and close gun fluid inlet valves A and B.



**FIG. 35**

4. Attach gun manifold (AA). Connect gun air line. Open air line valve.

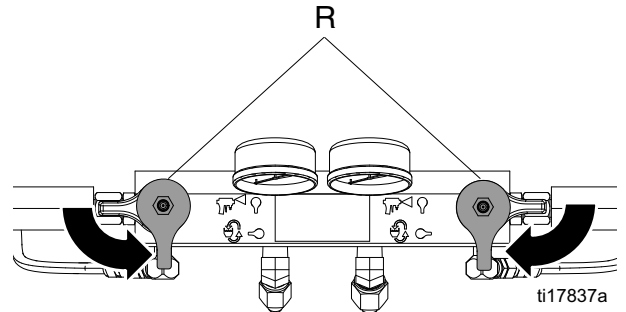
**NOTE:** The Fusion AP gun is shown.



**FIG. 36: Attach Gun Manifold**

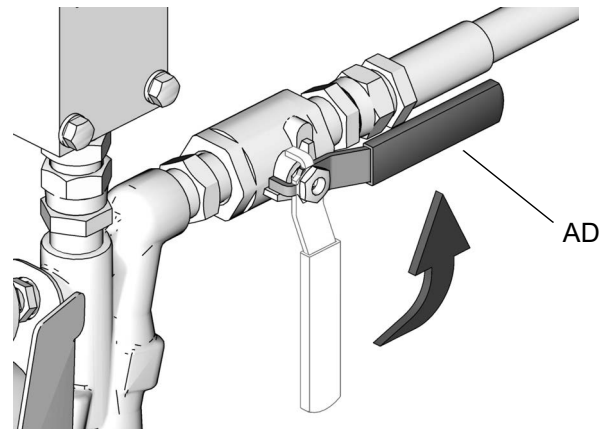
5. Adjust the gun air pressure. Do not exceed 130 psi (0.2 MPa, 2 bar).

6. Set pressure relief valves (R) to SPRAY



**FIG. 37**

7. Verify heat zone switches (CR) are on and temperatures are on target. See **Digital Temperature Controllers**, page 30, to read and operate temperature controllers (CP).
8. Verify inlet valves (AD) on both fluid pumps (Z) are open.



**FIG. 38: Inlet Valve Assembly**

9. Turn pressure monitor knob (CJ) to OFF. See FIG. 39.



10. Start hydraulic motor by turning on motor power switch (CN). Then turn pump control switch (CL) to PUMP.

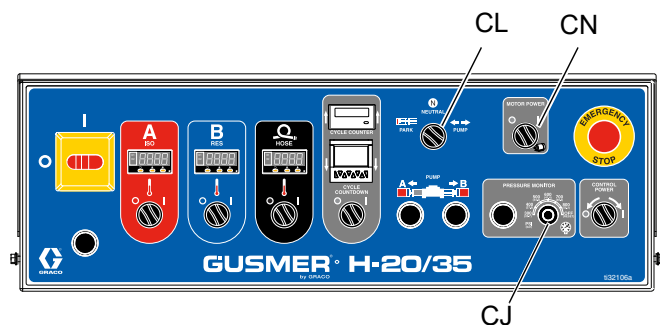


FIG. 39

11. Set hydraulic pressure adjuster (AG) to desired fluid stall pressure. Turn adjuster clockwise to increase pressure and counter-clockwise to decrease pressure. Use hydraulic pressure gauge (V) to view hydraulic pressure.

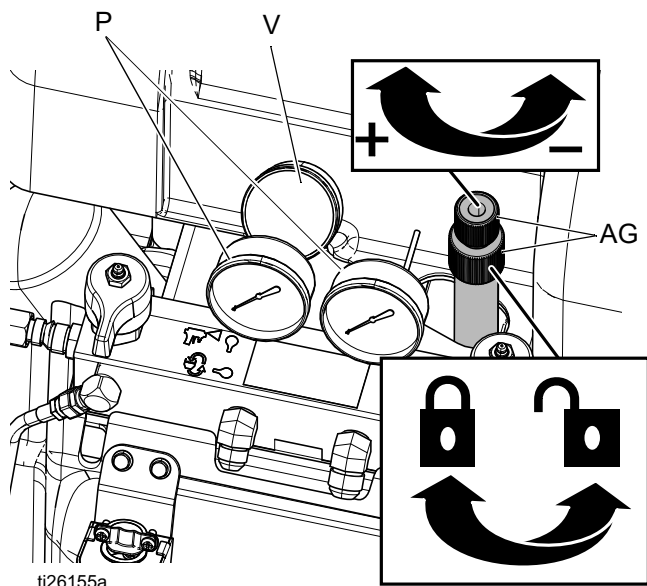



FIG. 40

**NOTE:** Component A and B fluid outlet pressures will be higher than the hydraulic set pressure. See **Technical Specifications**, page 105, for the oil pressure ratio of your model. Component A and B fluid outlet pressures may be viewed on the outlet pressure gauges (P). Once desired fluid stall pressure is set, lock the adjuster (AG) in place by rotating lower portion clockwise until tight.

**NOTE:** If not installed with proportioner manifold recirculation, ensure pressure relief lines (H) have been routed to a suitable waste container to catch excess fluid.

12. Check fluid outlet pressure gauges (P) to ensure proper pressure balance. If imbalanced, reduce pressure of higher component by slightly turning pressure relief valve (R) for that component toward

PRESSURE RELIEF/CIRCULATION  until gauges show balanced pressures.

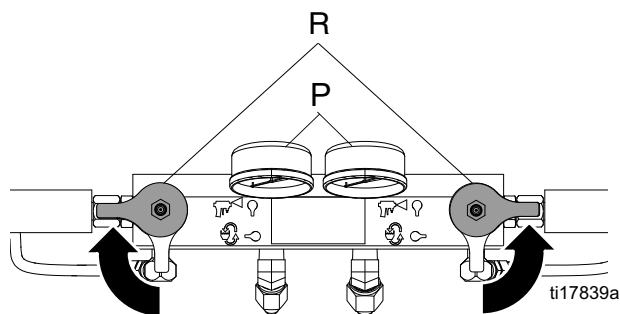


FIG. 41

13. If desired, set pressure monitor. Turn pressure monitor knob (CJ) to desired setting.

**NOTE:** This will automatically shut down the proportioner (A) if the pressure imbalance setting is exceeded.

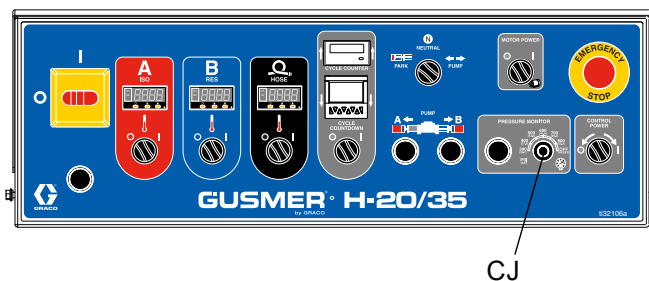


FIG. 42



14. Open gun fluid inlet valves A and B.

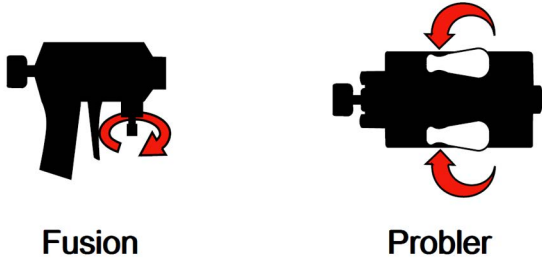


FIG. 43

**NOTICE**

To prevent material crossover in spray gun (E), **never** open gun fluid inlet valves or trigger gun (E) if pressures are imbalanced.

15. Disengage piston safety lock on spray gun (E).

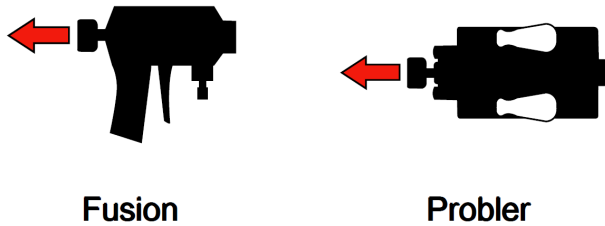


FIG. 44

16. Pull gun trigger to test spray onto cardboard. If necessary, adjust pressure and temperature to get desired results.

## Spray Adjustments

Flow rate, atomization, and amount of overspray are affected by four variables.

- **Fluid pressure setting.** Too little pressure results in an uneven pattern, coarse droplet size, low flow, and poor mixing. Too much pressure results in excessive overspray, high flow rates, difficult control, and excessive wear.
- **Fluid temperature.** Similar effects to fluid pressure setting. The A and B temperatures can be offset to help balance the fluid pressure.
- **Mix chamber size.** Choice of mix chamber is based on desired flow rate and fluid viscosity.
- **Clean-off air adjustment.** Too little clean-off air results in droplets building up on the front of the nozzle, and no pattern containment to control overspray. Too much clean-off air results in air-assisted atomization and excessive overspray.

## Standby



If you stop spraying for a period of time, either:

- **Shutdown** unit (page 38) and follow **Pressure Relief Procedure** (page 40).
- Or recirculate at low pressures. See **Fluid Circulation**, page 32.

## Shutdown



### NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

1. Turn pressure monitor knob (CJ) to OFF.
2. Turn pump control switch (CL) to PARK. Trigger the gun or relieve pressure using the pressure relief valves (R) on the proportioner manifold (M).
3. Turn motor power switch (CN) to OFF when the pump is in the leftmost position.
4. Turn all heat zone switches (CR) to OFF.

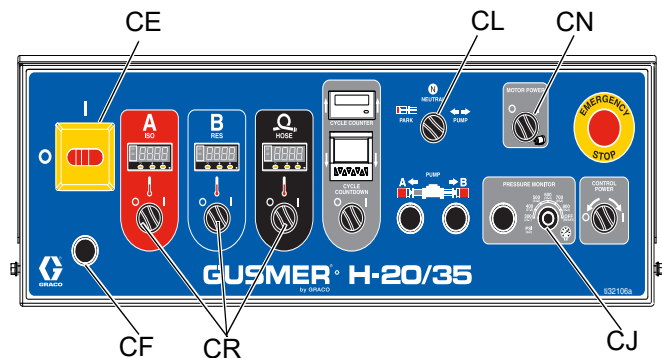
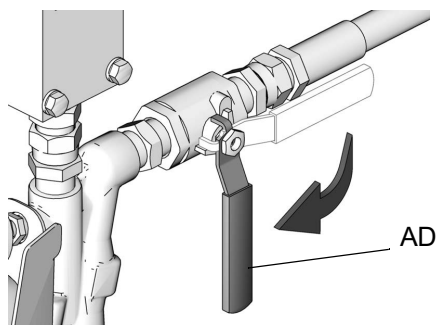


FIG. 45

5. Turn main power disconnect (CE) to OFF. The main power indicator light (CF) will turn off.
6. Turn off the air compressor, air dryer, and breathing air, if equipped.
7. Turn off feed pumps (G).

8. Close both fluid inlet valves (AD).



**FIG. 46: Fluid Inlet Assembly**

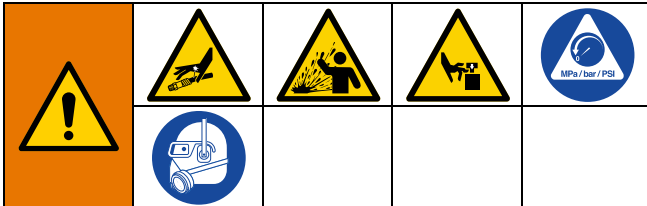
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9. Relieve any remaining pressure. Follow **Pressure Relief Procedure**, starting with step 2, page 40.

# Pressure Relief Procedure



Follow the Pressure Relief Procedure whenever you see this symbol.



This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.

1. Follow **Shutdown**, page 38.
2. Relieve pressure in spray gun (E) and perform gun shutdown procedure. See your gun manual.
3. Verify gun piston safety lock is engaged.

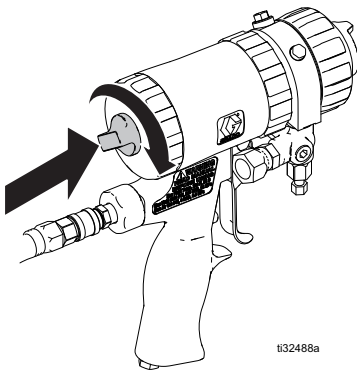


FIG. 47

4. Close gun fluid inlet valves A and B.

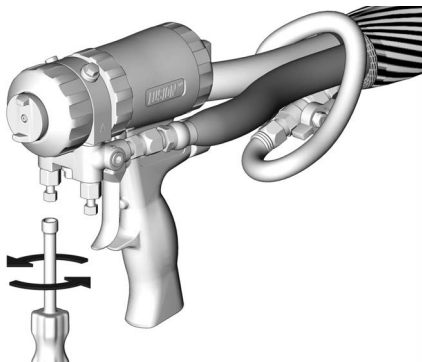


FIG. 48

5. Shut off feed pumps (G) and drum agitator, if used.
6. Route pressure relief lines (H) to waste containers or back to supply drums. Turn pressure relief valves (R) to **PRESSURE RELIEF/CIRCULATION** Ensure both fluid outlet pressure gauges (P) drop to 0.

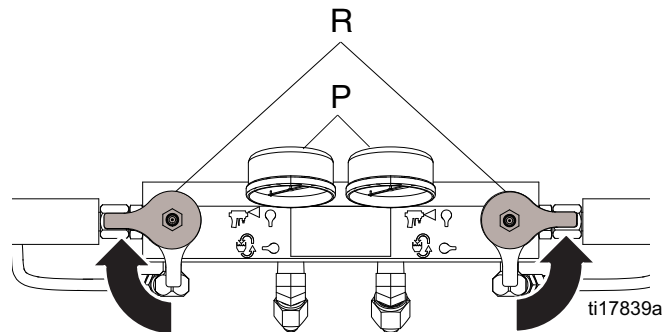


FIG. 49

7. Set pressure relief valves (R) to **SPRAY** on proportioner manifold (M) to seal out moisture.
8. Disconnect gun air hose and remove gun manifold (AA).

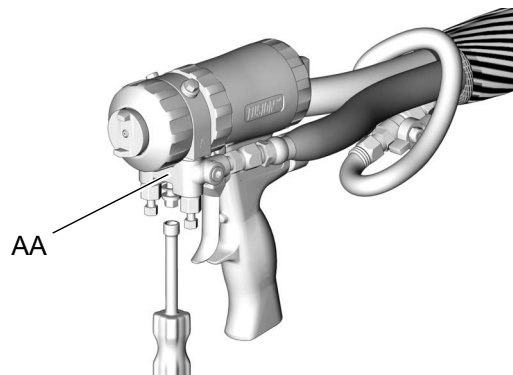


FIG. 50

# Flushing




To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure.

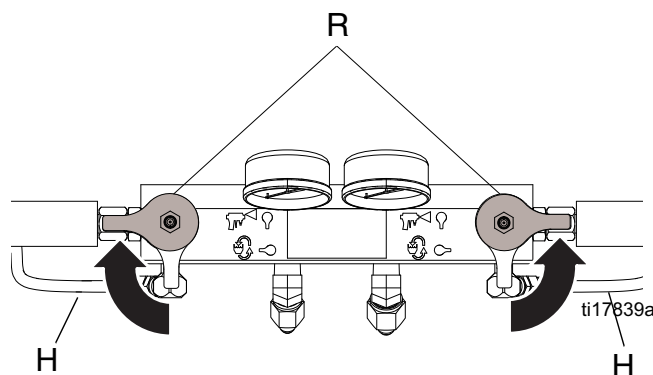
Hot solvent may ignite. To avoid fire and explosion:

- Flush equipment only in a well-ventilated area
- Ensure all heat zone switches (CR) are set to OFF and heaters are cool before flushing.
- Do not turn on heater until fluid lines are clear of solvent

To flush fluid inlet (F) hoses, feed pumps (G), and primary heaters (W) separately from heated hoses:

- Set pressure relief valves (R) to PRESSURE RELIEF/CIRCULATION  Flush through pressure relief lines (H).

**NOTE:** Make sure pressure relief lines (H) are routed to appropriate waste container before flushing.



**FIG. 51**

To flush entire system:

- Circulate at low pressures through gun manifold (AA) with manifold removed from gun.

## NOTICE

To prevent damage to check valves and seals as a result of moisture reacting with isocyanate, always leave the proportioner system filled with a moisture-free plasticizer or oil. Do not use water. Never leave the system dry. See **Important Isocyanate (ISO) Information**, page 10.

# Maintenance



Prior to performing any maintenance procedures, follow **Pressure Relief Procedure**, page 40.

## Preventative Maintenance Schedule

The operating conditions of your particular system determine how often maintenance is required. Establish a preventative maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your system.

- Inspect hydraulic and fluid lines for leaks daily.
- Clean up all hydraulic leaks; identify and repair the cause of the leak.
- Inspect both fluid inlet filters (AE) daily. See **Clean Fluid Inlet Filters**, page 43.
- Keep component A from exposure to moisture to prevent crystallization.
- Check hydraulic fluid level weekly. Check hydraulic fluid level on the dipstick (BN). Fluid level must be between indent marks on dipstick. Refill as required with approved hydraulic fluid, see **Change Hydraulic Fluid and Filter** (page 60) and the **Approved Anti-Wear (AW) Hydraulic Oils Table** (page 61). If hydraulic fluid is dark in color, change fluid and filter.

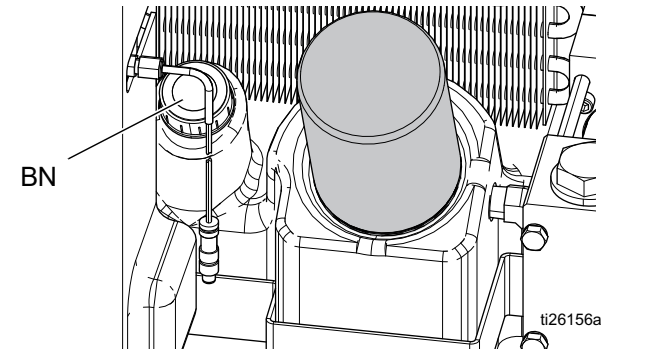


FIG. 52

- Change break-in oil in a new unit until after the first 250 hours of operation or within 3 months, whichever comes first. See Table 2: **Frequency of Oil Changes** for recommended frequency of oil changes.

Table 2: Frequency of Oil Changes

Ambient Temperature	Recommended Frequency
0° to 90° F (-17° to 32° C)	1000 hours or 12 months, whichever comes first
90° F and above (32° C and above)	500 hours or 6 months, whichever comes first

## Proportioner Maintenance

### Fluid Inlet Filters

- Inspect fluid inlet filters daily, see **Clean Fluid Inlet Filters**, page 43.

### Grease Pressure Relief Valves

- Grease pressure relief valves (R) with Graco Fusion grease (117773) weekly. Grease sold separately.

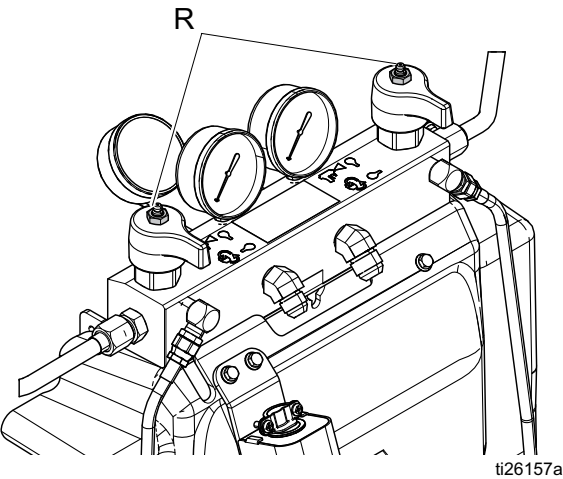


FIG. 53

### TSL Lubrication Level

Inspect TSL lubricant level and condition daily. Refill or replace as needed. See **TSL Pump Lubrication System**, page 44.

## Moisture

To prevent crystallization, do not expose component A to moisture in air.

## Gun Mix Chamber Ports

Clean mix chamber ports on gun (E) regularly. See gun manual.

## Gun Check Valve Filters

Clean gun check valve filters regularly. See gun manual.

## Dust Protection

Use clean, dry, oil-free compressed air to prevent dust buildup on control modules, fans, and electric motor fan.

## Vent Holes

Keep vent holes on proportioner shrouds, electrical enclosure (C), and hose transformer (128) cover open.

## Clean Fluid Inlet Filters



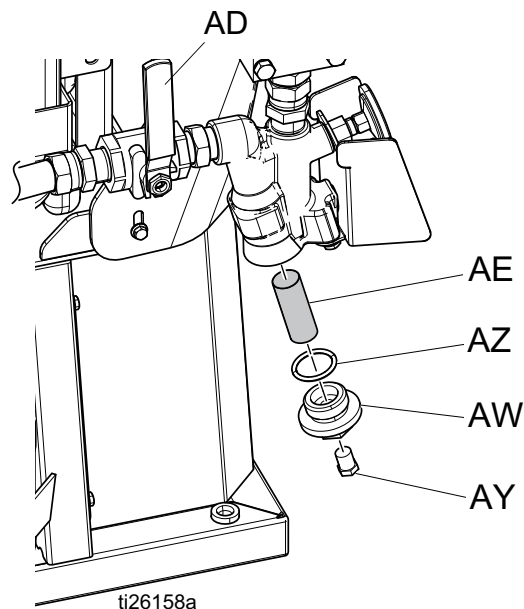
The fluid inlet filters (AE) remove particles that can plug the pump and valves. Inspect the filters daily as part of the startup routine and clean as required.

Isocyanate can crystallize from moisture contamination or from freezing. If the chemicals used are clean and the proper storage, transfer, and operating procedures are followed, there should be minimal contamination of the component A filter.

**NOTE:** Clean the component A filter only during daily startup. This minimizes moisture contamination by immediately flushing out any isocyanate residue at the start of dispensing operations.

1. Close the fluid inlet valve (AD). Then shut off the appropriate feed pump (G). This prevents material from being pumped while cleaning the fluid inlet filter (AE).
  2. Place a container under the filter base (AW) to catch drain-off when removing the filter plug (AY).
  3. Remove the fluid inlet filter (AE) from the housing. Thoroughly flush the filter with compatible solvent and shake it dry. Inspect the filter. No more than 25% of the filter should be restricted. If more than 25% of the filter is blocked, replace the screen. Inspect the filter gasket (AZ) and replace as required.
  4. Ensure the filter plug (AY) is screwed into the filter base (AW).
- NOTICE**

Do not over-tighten the filter plug (AY). Over-tightening can cause damage to filter plug threads. Let the o-ring make the seal.
5. Open the fluid inlet valve (AD), ensure that there are no leaks.



**FIG. 54: Inlet Filter Assembly**

## TSL Pump Lubrication System

Check the condition of the TSL lubricant daily. Change the lubricant if it becomes a gel, its colors darkens, or it becomes diluted with isocyanate.

Gel formation is due to moisture absorption by the TSL lubricant. The interval between changes depends on the environment in which the equipment is operating. The TSL lubrication system minimizes exposure to moisture, but some contamination is still possible.

TSL lubricant discoloration is due to continual seepage of small amounts of isocyanate past the pump seals during operation. If the seals are operating properly, TSL lubricant replacement due to discoloration should not be necessary more often than every 3 or 4 weeks.

To change TSL lubricant:

1. Lift the TSL reservoir (AM) out of the reservoir bracket (AN) and remove the cap. While holding the cap over a suitable waste container, remove the TSL inlet filter (AP) and allow the TSL to drain.

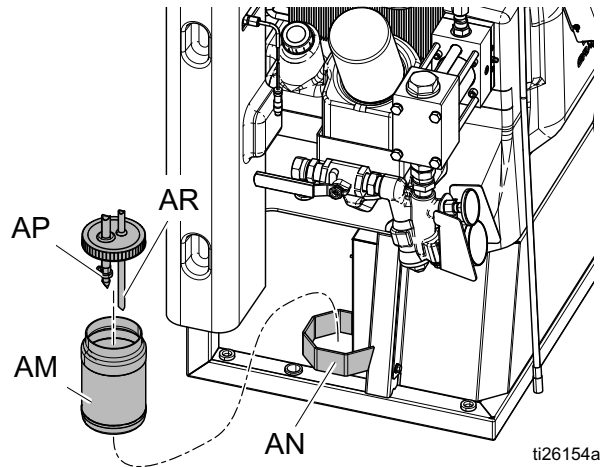
**NOTE:** TSL inlet filter (AP) contains a check valve inside. The check valve also must be flushed clean.

2. Drain the TSL reservoir (AM) and flush it with clean lubricant.
3. When the reservoir is flushed clean, fill with fresh lubricant.

4. Thread the TSL reservoir (AM) onto the cap and place it in the reservoir bracket (AN).
5. Push the TSL inlet filter (AP) tube approximately 1/3 of the way into the TSL reservoir.
6. Push the TSL outlet tube (AR) into the reservoir until it reaches the bottom.

**NOTE:** The TSL outlet tube (AR) must reach the bottom of the TSL reservoir to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the TSL inlet filter (AP).



**NOTE:** No priming is required.



**FIG. 55: Pump Lubrication System**



# Troubleshooting

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				



1. Follow **Pressure Relief Procedure**, page 40, before checking or repairing proportioner.
2. Turn main power OFF.
3. Allow equipment to cool.

**NOTE:** To avoid unnecessary repairs, try the recommended solutions in the order given for each problem. Before assuming there is a problem, determine that wiring is correct and all circuit breakers, switches, and control are properly set.

## Online Troubleshooting

To quickly view online help for troubleshooting, scan the QR code with your smartphone or visit [help.graco.com](http://help.graco.com).



## Hydraulic Drive System

Problem	Cause	Solution
Electric motor will not start or electric motor stops during operation.	Motor or wiring circuit issue	Check the position of the relay (RLY2). If the relay is in the down position, check the motor. If the relay is in the up position, check wiring.
	Loose connections and/or relay (RLY2) is not activating	Check wiring between the following components: <ul style="list-style-type: none"> <li>• motor junction box and RLY2</li> <li>• check fuses F1 and F2</li> <li>• RLY2 and motor switch (SW7)</li> </ul>
	Motor circuit breaker tripped	Confirm wiring is correct and insulation is intact. Reset CB4 within the electrical enclosure.

Problem	Cause	Solution
Hydraulic pump develops low or no pressure. Pump makes screeching noise.	Pump is not primed or lost its prime	Motor (43) must operate counterclockwise from pulley end. Adjust motor wiring according to schematic found inside motor electrical junction box.
		Check dipstick (118) to ensure that hydraulic reservoir is properly filled. See <b>Preventative Maintenance Schedule</b> , page 42.
		Check that inlet fittings (33, 34, 35, 39) are fully tight to ensure no air is leaking into the pump inlet.
		To prime hydraulic pump (27), run unit at lowest pressure setting and slowly increase pressure. In some cases, it may be necessary to remove motor cover (123) and drive belt (51) to allow for manual (counterclockwise) rotation of hydraulic pump. Turn fan pulley (49) by hand. Verify oil flow by removing oil filter (119) to see flow into filter manifold. Reinstall oil filter. Do not operate until without a properly installed oil filter.
	Screeching noise is characteristic of cavitation and is normal during the first 30 seconds of initial startup	If noise continues longer than 30 seconds, shut off motor by turning the motor power switch (CN) to OFF position. Check that the inlet fittings (33, 34, 35, 39) are tight and that the pump has not lost its prime.
	Hydraulic fluid is too hot	Clean ventilation of radiator (25) to allow more efficient heat dissipation.
	Electric motor operating in wrong direction	Motor (43) must operate counterclockwise from pulley end. Adjust motor wiring according to schematic found inside motor electrical junction box.
	Drive belt loose or broken	Check drive belt (51) condition. Replace if broken.
	Inlet filter (16e) in hydraulic reservoir (16) is obstructed	Remove inlet filter (16e) from reservoir (16). Clean or replace filter.

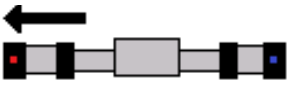
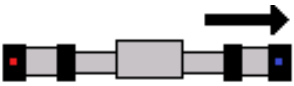
## Proportioning System

Problem	Cause	Solution
Proportioning pump does not hold pressure when stalled	Fluid pump (202) piston or rod seal is leaking	<ol style="list-style-type: none"> <li>1. Observe outlet pressure gauges (P) to determine which pump is losing pressure.</li> <li>2. Determine where the pump has stalled by checking the directional indicator light (CM).</li> <li>3. Repair the worn seal or check valve. See your pump manual.</li> </ol>
	One or both check valves are leaking or stuck open	
Material imbalance. See <b>Pressure/Material Imbalance</b> , page 48.	Restriction at the gun.	Clean the gun. See your gun manual.
	Inadequate flow from feed pump (G); cavitation.	Increase fluid supply to proportioning pump: <ul style="list-style-type: none"> <li>• Use 2:1 or greater supply pump</li> <li>• Use minimum 3/4 in. (19 mm) ID supply hose, as short as practical</li> </ul>
		Fluid is too thick. Consult your material supplier for the recommended fluid temperature to maintain a viscosity of 250-1500 centipoise
		Clean fluid inlet filter (AE). See FIG. 17, page 27.
		Worn pump inlet valve ball/seat or gasket. Replace pump.
Pressure imbalance. See <b>Pressure/Material Imbalance</b> , page 48.	Pressure relief/circulation valve (R) leaking back to supply	Remove pressure relief line (H) and determine if flow is present while in SPRAY mode.
	Pressure monitor knob (CJ) is set too low	Check for leaks in the system. If there are no leaks, set the pressure monitor knob (CJ) higher.
Pump do not reverse direction or pumps do not move	Loose or broken clevis pin (213)	Reinstall or replace clevis pin (213).
	Loose reversing proximity switch	See <b>Pumps Do Not Reverse Direction</b> , page 49.
	Loose piston packing bolt	See <b>Pumps Do Not Reverse Direction</b> , page 49.
	Faulty hydraulic directional valve (207)	See <b>Pumps Do Not Reverse Direction</b> , page 49.

Problem	Cause	Solution
Erratic pump movement	Pump cavitation	Feed pump pressure is too low. Adjust pressure to maintain 100 psi (0.7 MPa, 7 bar) minimum.
		Fluid is too thick. Consult your material supplier for the recommended fluid temperature to maintain a viscosity of 250-1500 centipoise
	Loose reversing proximity switch	See <b>Pumps Do Not Reverse Direction</b> , page 49.
	Faulty directional valve	Replace directional valve (207).
Pump output low	Obstructed fluid hose or gun; fluid inlet (F) hose ID too small	Open fluid hose to clear obstruction or use hose with larger ID.
	Worn piston valve or intake valve in displacement pump	See pump manual.
	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum.
Fluid leak at pump rod seal	Worn throat seals	Replace. See pump manual.
No pressure on one side	Fluid leaking from pump outlet rupture disk	Check if primary heater (W) and pressure relief valves (R) are plugged. Clear. Replace rupture disk (512) with a new one; do not replace with a pipe plug.
	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum.

**NOTE:** The **Determine Valve Leak Location Table** is related to the troubleshooting problem, "Proportioning pump does not hold pressure when stalled."

**Table 3: Determine Valve Leak Location**

	
B-side pump discharge valve is dirty or damaged.	B-side pump inlet valve is dirty or damaged.
A-side pump inlet valve is dirty or damaged.	A-side pump discharge valve is dirty or damaged.

## Pressure/Material Imbalance





To determine which component is out of balance, check the color of some sprayed material. Two-component materials are usually a mix of light and dark fluids, so the under-proportioned component can often be readily determined.

When you have determined which component is under-proportioned, spray off-target, focusing on the pressure gauge for that component.

*For example:* If component B is under-proportioned, focus on the B-side pressure gauge. If the B gauge reads considerably higher than the A gauge, the problem is at the gun. If the B gauge reads considerably lower than the A gauge, the problem is at the pump.

## Pumps Do Not Reverse Direction

For proportioning pumps to reverse direction, the proximity switches (211) must sense the switching plate (319) to reverse the directional valve (207).

			
<p>Voltage is still present inside the directional valve. Improper testing of the proximity switch connections inside the directional valve may cause injury or electric shock. Check the proximity switch connections as instructed. Measure voltage across correct terminals. See <b>Electrical Schematics</b>, page 96.</p> <p>The switching plate moves from side to side during operation. Keep hands away from the switching plate, while checking the functionality of the directional valve, to prevent pinching hands.</p>			

- Check the functionality of each proximity switch (211).
  - Remove the clear front cover (170) by loosening bolts (19) and sliding cover upwards.
  - With the motor powered off, confirm that the indicating lights on the body of each proximity switch (211) turns on when a metallic item, such as the shaft of a screwdriver, is placed on the face of each switch.
  - If the indicating lights on the proximity switches (211) turn on, the proximity switches and switch cables are likely operating correctly; proceed to step 2. If the indicating lights do not turn on, proceed to step 6.
- Confirm the proximity switches (211), switch bracket (209), and switching plate (319) are firmly mounted and not damaged.
- Check distance between the proximity switches (211) and the switching plate (319).
  - Park the pump.
  - Confirm that the proximity switch (211) nearest the A-side of the pump is backed out 0.5 to 1.5 turns from being in contact with the switching plate (319).
  - Disconnect the cable from the proximity switch (211) nearest the B-side of the pump. Operate the pump until the switching plate (319) is located above the B-side proximity switch, then turn off the motor/pump.
  - Confirm that the proximity switch (211) nearest the B-side of the pump is backed out 0.5 to 1.5 turns from being in contact with the switching plate (319).
  - Reconnect the cable to the B-side proximity switch (211).
- Check functionality of the directional valve (207).
  - Inspect wiring inside the cover of the directional valve (207). See **Electrical Schematics**, page 96.
  - During operation, the direction indicator lights on the directional valve body (207) should switch on based on the valve that is open.
  - Turn on the motor and stall the pumps at the lowest pressure setting (compensator knob turned fully counter-clockwise). The pump will travel in either the A or B direction until the pressure setting is reached.
  - Identify the solenoid that is operating by viewing the direction indicator lights on the cover of the directional valve (207). Measure voltage across the associated terminals to determine if proper voltage is reaching the valve (approximately 200 to 240 VAC). See **Electrical Schematics**, page 96, and the **Pump Position Table** to identify the proper terminals to measure across.

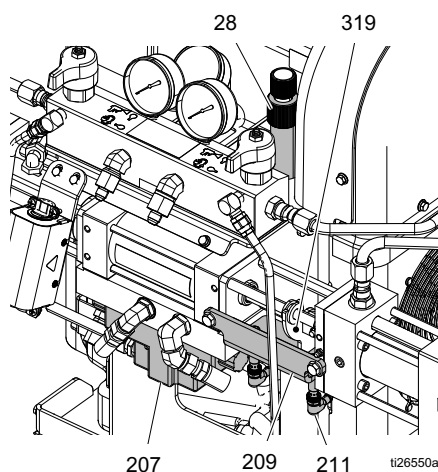
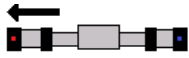
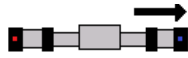


FIG. 56

- e. Trigger each proximity switch (211) with the shaft of a screwdriver, confirming each solenoid within the directional valve (207) operations as described in Table 4: **Pump Position**.
- f. If one or both sides are not operating properly, according to Table 4: **Pump Position**, first reconfirm wiring to directional valve (207) per **Electrical Schematics**, page 96, then replace directional valve.

**Table 4: Pump Position**

For given pump movement direction	Pump driving left (toward park position)	Pump driving right (away from park position)
Pump direction indicator light (CM) indicates direction of pump movement		
Indicator light on directional valve cover	Left arrow, labeled "b"	Right arrow, labeled "a"
Last proximity switch triggered	Right side proximity switch	Left side proximity switch
Terminals in directional valve energized	Terminals associated with red and orange wires	Terminals associated with black and white wires

**NOTE:** For diagnostic purposes, it is possible to manually override the directional valve (207) by using a small screwdriver to depress the button in the center of either directional valve end cap. Depressing the button in the right end cap should cause the pump to travel to the right. Depressing the left button should cause the pump to travel to the left.

5. If you have determined that the cause is none of the above, check for a loose piston packing retaining bolt (825). This causes the piston to contact the inner face of the pump inlet flange before the switching plate (319) activates the proximity switch (211). Shut down the unit and disassemble the appropriate pump (202) for repair.
6. Following step one, if the proximity switch indicating lights do not light:
  - a. Check for loose or faulty proximity switch cable or connections. Confirm the connections to the proximity switches are tight and internally free from oil and other contaminants.
  - b. Swap the cables to the proximity switches to see if the problem follows the switch or is in the cable. Replace either the failed switch or the cable.
7. Replace clear front cover (170) and tighten bolts (19).

## Hose Heat System

Problem	Cause	Solution
No hose heat	The FTS thermocouple is disconnected from the temperature controller (731). The temperature controller displays "SbEr" (Sensor Break Error)	<p>The Gusmer proportioner uses standard, 2-component heated hoses equipped with a thermocouple. GCA hoses equipped with RTDs cannot be used with the Gusmer unit.</p> <p>Verify the type E thermocouple wires are properly connected to the temperature controller. The purple chromel wire (+) should be connected to terminal 9 on the temperature controller. The red constantan wire (-) should be connected to terminal 10 on the temperature controller.</p> <p><b>NOTE:</b> Ensure the wire insulation is not pinched in the terminal. Pinched insulation may prevent good electrical contact.</p>
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See <b>Adjust Hose Transformer Wiring</b> , page 25.
	The temperature controller (731) is not actively trying to heat. The display does not read "O1"	<p>Verify the temperature setpoint is correct. See <b>Digital Temperature Controllers</b>, page 30.</p> <p>If the temperature setpoint is very close to the ambient temperature, increase the setpoint by a few degrees.</p>
	One of the two hose circuit breakers is off or has been tripped	<p>Reset the hose transformer primary circuit breaker (CB3) and reset the hose secondary circuit breaker (CB5).</p> <p><b>NOTE:</b> The hose secondary circuit breaker (CB5) is designed to trip if there is too much current in the hose. This can happen if there is a short in the hose or if the hose tap setting exceeds the actual length of the hose installed. See <b>Adjust Hose Transformer Wiring</b>, page 25.</p>

Problem	Cause	Solution
No hose heat (continued)	The temperature controller (731) output signal is not reaching the hose heat solid state relay. The green light on the hose heat solid state relay (SSR3) is off	Turn the hose heat zone switch ON.  <b>NOTE:</b> Even when the hose heat zone switch is off, the temperature controller will appear as though it is actively trying to heat (and will display "O1").
		Verify the temperature controller output signal wires are connected properly and secured according to the schematic. <ul style="list-style-type: none"><li>• TCM3-6 to SSR3-A2</li><li>• TCM3-5 to SW3-3 / SW3-4 to SSR3-A1</li></ul> Reconnect wires and secure loose connections.
		Verify the temperature controller is displaying "O1" constantly and not blinking. Check the output signal of the temperature controller by measuring the voltage between terminal 5 and 6.  If the output voltage is not between 4-6 V, replace the temperature controller.
	The wrong temperature controller is installed	The hose temperature controller (731) is factory-programmed with different internal settings than the A and B primary temperature controllers (706). See <b>Control Panel Parts</b> , page 93, for the temperature controller part numbers.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See <b>Install Fluid Temperature Sensor</b> , page 23, and your heated hose manual.
	Faulty solid state relay (SSR) failed in the off position  <b>NOTE:</b> If there are not 4-6 V between SSR3-A1 and SSR3-A2, see "The temperature controller output signal is not reaching the..."	Turn circuit breakers CB3 and CB5 off. If there are 4-6 V between SSR3-A1 and SSR3-A2 and the resistance between SSR3-L1 and SSR3-T1 is more than 1 ohm, replace SSR3.



Problem	Cause	Solution
Low hose heat or hose temperature drops when gun is triggered.	Low input voltage to the proportioner	<p>The maximum amount of heat generated by the heated hose depends on the input voltage to the proportioner. The hose transformer lowers the voltage by a fixed percentage. If possible, adjust your generator voltage within the marked voltage range. This will increase or decrease the maximum current (and heat) available to the hose.</p> <p><b>NOTICE:</b> To avoid damage to the proportioner and hose, do not exceed the maximum voltage rating of the system. Do not exceed a hose current of 50 A.</p>
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See <b>Adjust Hose Transformer Wiring</b> , page 25.
	Hose heat is set significantly above one or both primary heater temperature setpoints	The heated hose is not designed to increase the fluid temperature while fluid is flowing. The hose only maintains the temperature of the fluid while it travels through the hose. Adjust the hose heat setpoint so it is at or slightly below the primary heater temperature.
	The wrong temperature controller is installed	The hose temperature controller (731) is factory-programmed with different internal settings than the A and B primary temperature controllers (706). See <b>Control Panel Parts</b> , page 93, for the temperature controller part numbers.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See <b>Install Fluid Temperature Sensor</b> , page 23, and your heated hose manual for more information.

Problem	Cause	Solution
Hose temperature is erratic	The internal programming parameters inside the temperature controller are not correct	The hose temperature controller (731) is factory-programmed with different internal settings than the A and B primary temperature controllers (706). See <b>Control Panel Parts</b> , page 93, for the temperature controller part numbers.  <b>NOTICE:</b> Using temperature controllers that are not programmed with the correct internal settings can damage equipment. Only use genuine Graco parts.
	Wrong hose transformer tap setting	The hose transformer tap setting must match the actual hose length installed. See <b>Adjust Hose Transformer Wiring</b> , page 25.
	Hose heat is set significantly above one or both primary heater temperature setpoints	The heated hose is not designed to increase the fluid temperature while fluid is flowing. The hose only maintains the temperature of the fluid while it travels through the hose. Adjust the hose heat setpoint so it is at or slightly below the primary heater temperature.
	Electrical connections between heated hose sections are loose or damaged or the electrical element in the hose is damaged	Check for continuity between the electrical terminals inside the hose electrical junction box (S). Make sure terminals and heated hose electrical connections at each hose connection are secure. Replace any damaged hose sections.
	FTS is not installed correctly or has failed	The FTS should be installed near the end of the hose and in the same environment as the gun. See <b>Install Fluid Temperature Sensor</b> , page 23, and your heated hose manual for more information.
	Faulty solid state relay (SSR3)	Solid state relays typically fail in the on position. Turn the hose heat zone switch (CR) to OFF. Measure continuity between: <ul style="list-style-type: none"> <li>SSR3-L1 and SSR3-T1</li> </ul> Replace SSR3 if there is continuity.
	Material temperature at the pump inlet is too low	Increase the temperature of the material before use.

## Primary Heater




Problem	Cause	Solution
Primary heater (W) does not heat	Heat zone turned off	Turn heat zone switch (CR) to ON.
	Breaker tripped	Check CB1 for A-side heater and CB2 for B-side heater
	Primary heater temperature controller (706)	The two primary heater controllers (706) are interchangeable. To test for a faulty controller, turn off the main power disconnect and disconnect incoming power. Replace the suspect controller and retest.
	Thermocouple	If there is a signal failure from the thermocouple, the temperature controller will prevent the heaters from operating.  If this occurs, replace the thermocouple. See <b>Replace Thermocouple</b> , page 67.  Check for a resistance of 4-6 ohms between yellow and red wires on the temperature controller. There should be a reading greater than 1 megaohm between the ground wire and the red wire as well as between the ground wire and the yellow wire.
		Thermocouple position is critical to proper operation of the heater. Two conditions must be satisfied: <ul style="list-style-type: none"> <li>• Thermocouple must make contact with the heater cartridge.</li> <li>• Heater cartridge must be functioning properly.</li> </ul> Lack of either of these conditions may cause erratic temperature control and possible overheating. To check thermocouple position, see <b>Replace Thermocouple</b> , page 67.
	Heater cartridge	See <b>Replace Primary Heater</b> , page 65.
	Faulty solid state relay (SSR) failed in the off position.  <b>NOTE:</b> If there are not 4-6 V between SSR3-A1 and SSR3-A2, see "The temperature controller output signal is not reaching the..." in <b>Hose Heat System</b> .	Turn circuit breakers CB1 and CB2 off. If there are 4-6 V between SSR3-A1 and SSR3-A2 and the resistance between SSR3-L1 and SSR3-T1 is more than 1 ohm, replace SSR3.

Problem	Cause	Solution
Primary heat controller has abnormally high temperature overshoots	Damaged thermocouple connections or wire	Check thermocouple connections and wire for damage. Replace if necessary.
	Thermocouple does not touch the heater element	Reinstall the thermocouple. See <b>Replace Thermocouple</b> , page 67.
	Failed heater element	See <b>Replace Heater Element</b> , page 65.
	Failed controller	<p>Verify failed controller by switching A and B temperature controllers (706). If the issue follows the controller, replace the faulty controller.</p> <p><b>NOTE:</b> The A-side and B-side temperature controllers (706) are different than the hose temperature controller (731). Hose temperature and A- and B-side temperature controllers have different internal programming and are not interchangeable.</p> <p><b>NOTICE:</b> Using temperature controllers that are not programmed with the correct internal settings can damage equipment. Only use genuine Graco parts.</p>
	Faulty A-side solid state relay (SSR1) or B-side solid state relay (SSR2)	<p>Solid state relays typically fail in the on position. Turn heat zone switch (R) to OFF. Measure continuity between:</p> <ul style="list-style-type: none"> <li>• SSR1-L1 and SSR1-L2 (A-side)</li> <li>• SSR2-L1 and SSR2-L2 (B-side)</li> </ul> <p>If there is continuity for the A-side or B-side solid state relay, replace that relay.</p>

## Pressure Monitor

Problem	Cause	Solution
Pressure monitor light (CK) is not on	Pressure monitor is turned off or reset	Turn on pressure monitor knob (CJ).
	Control power is turned off	Turn control power switch (CH) to START.
Pressure monitor light (CK) is red and pump direction indicator lights (CM) are off	Pressure imbalance detected	<ol style="list-style-type: none"> <li>1. Determine cause of pressure imbalance. Correct issue. See <b>Pressure/Material Imbalance</b>, page 48.</li> <li>2. Turn the pressure monitor knob (CJ) to the OFF/RESET position.</li> </ol>
Pressure monitor not functioning	Poor wire connection or faulty pressure monitor	See <b>Pressure Monitor Verification</b> , page 57.
	<p>Both A and B pressure transducers (405) are unplugged or damaged and outputting the same incorrect signal.</p> <p><b>NOTICE:</b> The pressure relief valves (R) and burst disks (513) in both primary heaters must be installed and functioning properly to prevent equipment damage in an over-pressure condition. The pressure transducers (405) will not shut down the machine in the event of an over-pressure condition.</p>	<p>The pressure monitor board reads the differential between the A and B pressure transducers (405). If both transducers are unplugged or damaged and outputting the same incorrect signal, the pressure monitor indicator light (CK) will not indicate a fault and the machine will not shut down.</p> <p>See <b>Pressure Monitor Verification</b>, page 57, to verify functional pressure transducers.</p>

### Pressure Monitor Verification

**DANGER**

**SEVERE ELECTRIC SHOCK HAZARD**

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

When accessing the electrical enclosure while power is present:

- Do not make contact with components or wires unless instructed to do so.
- Wear appropriate personal protective equipment.

**NOTE:** If any of the following steps fail, contact Technical Assistance for further assistance.

During this procedure, power is present in the enclosure.

1. Verify the pressure monitor pump control is functioning correctly. Follow **Pumps Do Not Reverse Direction**, page 49.

## 2. Verify functional pressure transducers.

**NOTE:** The pressure measurements displayed by the pressure monitor can be confirmed using a multimeter in the DC voltage measurement mode. In the steps below, the voltage read by the multimeter can be approximately converted to psi using the conversion 1 mV = 1 psi. (A reading of 2.000 V is equal to 2,000 psi.)

**NOTE:** The pressure read using this method may read +/- 200 psi different from the mechanical gauges on the front of the system.

- To measure the A-side pressure, place the positive test lead of the multimeter on the pad marked A and the negative test lead on the common reference pad (marked by a downward pointing arrow).
- To measure the B-side pressure, place the positive test lead of the multimeter on the pad marked A and the negative test lead on the common reference pad (marked by a downward pointing arrow).
- To measure the A to B differential pressure, place the positive test lead of the multimeter on the pad marked A and the negative test lead on the pad marked B.

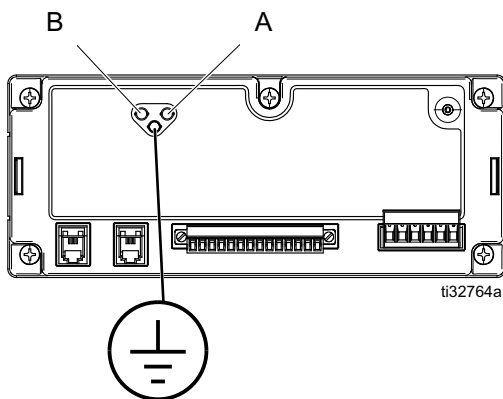


FIG. 57

## 3. Verify functional pressure imbalance fault.

**NOTE:** The pressure monitor board reads the differential between the A and B pressure transducers (405). If both transducers are unplugged or damaged and outputting the same incorrect signal, the pressure monitor indicator light (CK) will not indicate a fault and the machine will not shut down.

- Turn motor power switch (CN) to OFF. Turn pump control switch (CL) to PARK and pressure monitor knob (CJ) to OFF/RESET.
- Turn pressure monitor knob (CJ) to the 800 psi position. The pressure monitor indicator light (CK) should be lit white.
- Wait 5 seconds. Verify that the pressure monitor indicator light is still white.
- Open the electrical enclosure door (173) by loosening the bolts (68) and lifting the door upwards. Unplug the B-side pressure transducer on the pressure monitor. This simulates a pressure imbalance fault.
- Wait 5 seconds. Verify that the pump direction indicator lights (CM) are off and the pressure monitor indicator light (CK) has turned red.
- Plug B-side pressure transducer into the pressure monitor.
- Turn the pressure monitor knob (CJ) to OFF/RESET to clear the pressure imbalance fault. Verify that the pressure monitor indicator light (CK) has turned off.
- Repeat steps b-g while unplugging and plugging the A-side pressure transducer instead of the B-side pressure transducer.

### NOTICE

The pressure relief valves (R) and burst disks (513) in both primary heaters must be installed and functioning properly to prevent equipment damage in an over-pressure condition. The pressure transducers (405) will not shut down the machine in the event of an over-pressure condition.

- Close the electrical enclosure door (173) and tighten the bolts (68).

# Repair

## NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

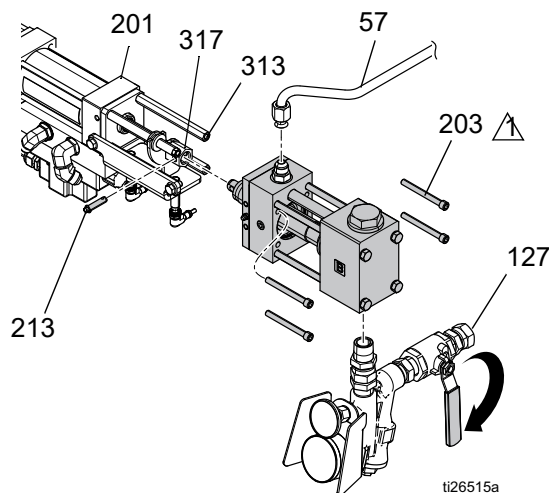
## Repair Proportioning Pumps



1. Perform **Flushing**, page 41.
2. Perform **Shutdown**, page 38.
3. Perform **Pressure Relief Procedure**, page 40.

**NOTE:** Use drop cloth or rags to protect the proportioner and surrounding area from spills.

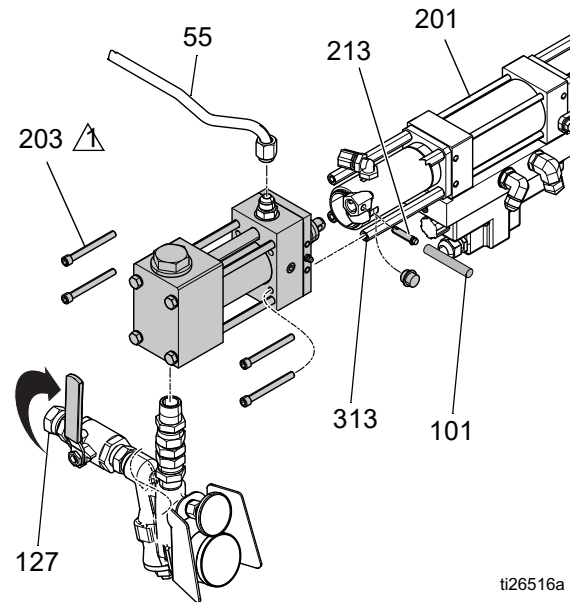
4. Disconnect the B (resin) side fluid inlet (F) line, the inlet y-strainer (127), and hard tube (57). Remove the pin (213) from the clevis (317) to disconnect the pump from the hydraulic cylinder (201). Remove the four screws (203) holding the pump to the spacers (313) of the cylinder. Take the pump assembly to a workbench.



Torque to 200 in.-lb (22.6 N•m)

**FIG. 58**

5. Disconnect the A (ISO) side fluid inlet (F) line, the inlet y-strainer (127), and the hard tube (55). Use the pin extractor tool (101) to remove the pin (213), which disconnects the pump from hydraulic cylinder (201). Remove the four screws (203) holding the pump to the spacers (313) of the cylinder. Take the pump assembly to a workbench.



Torque to 200 in.-lb (22.6 N•m)

**FIG. 59**

6. See fluid pump (Z) manual for repair instructions.
7. Reconnect the fluid pump (Z) in the reverse order. Torque the screws (203) to 200 in.-lb (22.6 N•m).

# Change Hydraulic Fluid and Filter



**NOTE:** Change break-in oil in a new system after the first 250 hours of operation or within 3 months, whichever comes first.

Ambient Temperature	Recommended Frequency
0 to 90°F (-17 to 32°C)	1000 hours or 12 months, whichever comes first
90°F and above (32°C and above)	500 hours or 6 months, whichever comes first

- 1. Follow **Shutdown**, page 38.
- 2. Follow **Pressure Relief Procedure**, page 40.
- 3. Allow hydraulic fluid to cool.
- 4. Place a pan under the reservoir drain plug (16f) to catch oil.

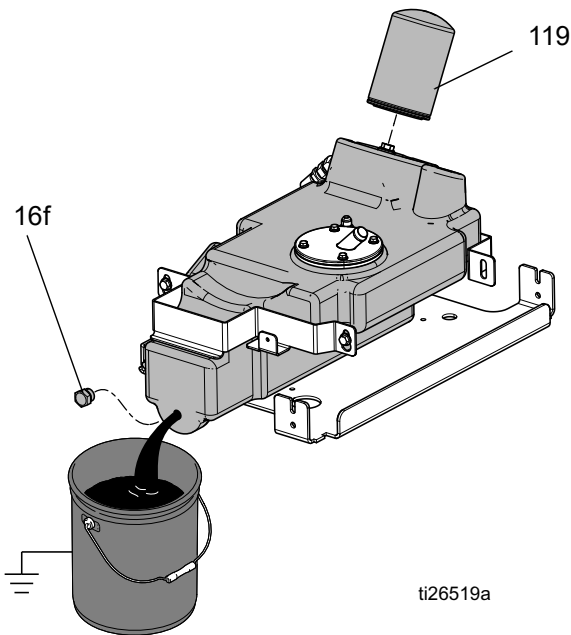


FIG. 60

- 5. Remove the drain plug (16f).
- 6. Place a rag around base of oil filter (119) to prevent oil from spilling. Unscrew filter 1/4-3/4 turn to break air lock in filter. Wait five minutes to allow oil in filter to drain back into reservoir. Unscrew filter and remove.
- 7. Reinstall drain plug (16f).
- 8. Replace filter (119).
  - a. Coat filter seal with fresh oil.

**NOTE:** Make sure old oil filter seal is not stuck to the filter manifold.

- b. Screw filter on snug, then an additional 1/4 turn.

- 9. Refill reservoir with approved hydraulic fluid. See Table 6: **Approved Anti-Wear (AW) Hydraulic Oils** (page 61). Verify oil level on dipstick (BN).

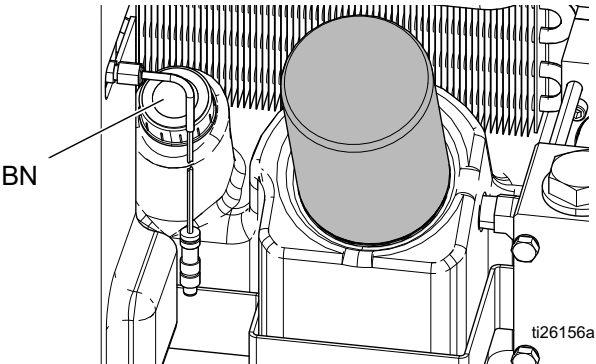


FIG. 61



- 10. Proceed with normal operation.
- NOTE:** Upon starting motor, hydraulic pump may make a screeching noise until primed. If this noise continues for more than 30 seconds, switch off motor control.



**Table 6: Approved Anti-Wear (AW) Hydraulic Oils**

Supplier	Name
Citgo	A/W ISO Grade 46
Amsoil	AWI ISO Grade 46 (synthetic*)
BP Oil International	Energol® HLP-HM, ISO Grade 46
Carl Bechem GmbH	Staroil HVI 46
Castrol	Hyspin AWS 46
Chevron	Rykon® AW, ISO 46
Exxon	Humble Hydraulic H, ISO Grade 46
Mobil	Mobil DTE 25, ISO Grade 46
Shell	Shell Tellus, ISO Grade 46
Texaco	Texaco AW Hydraulic, ISO Grade 46
*Do not mix mineral-based and synthetic hydraulic oils. Completely drain oil from reservoir and pump prior to converting between oils.	
If the approved oils are not available in your area, use an alternative hydraulic oil meeting the following requirements:	
<b>Oil Type</b>	Anti-Wear (AW) Hydraulic
<b>ISO Grade</b>	46
<b>Viscosity, cSt at 40°C</b>	43.0–47.0
<b>Viscosity, cSt at 100°C</b>	6.5–9.0
<b>Viscosity Index</b>	95 or higher
<b>Pour Point, ASTM D 97</b>	-15°F (-26°C) or lower
<b>Other essential properties</b>	Formulated for anti-wear, anti-foaming, oxidation stability, corrosion protection, and water separation.

## Replace Electric Motor or Belt

**DANGER**

**SEVERE ELECTRIC SHOCK HAZARD**

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

- Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.



## Remove Shrouds

**NOTICE**

To prevent dropping the electric motor, two people may be required to remove the motor from the system.

1. Perform **Shutdown**, page 38.
2. Perform **Pressure Relief Procedure**, page 40.
3. Open the electrical enclosure door (173) by loosening the bolts (68) and lifting the door upwards. Disconnect both pressure transducers (405) from the pressure monitor board (720). See FIG. 77, page 75, and **Electrical Schematics**, page 96. Close the electrical enclosure door (173) and tighten the bolts (162).

4. Remove mounting bolts (not provided) from the bottom frame and move the system away from the wall.

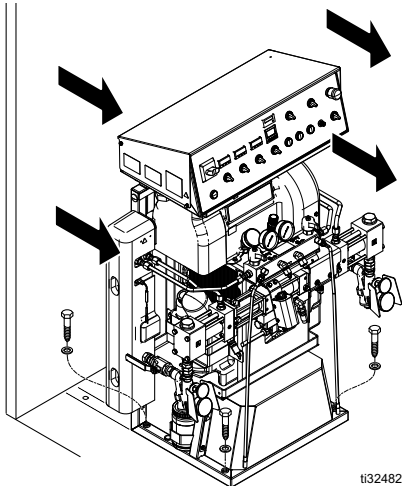


FIG. 62

ti32482a

5. Remove upper bolts (3). Tilt the electrical enclosure (C) down to gain access to the motor cover.

**NOTICE**

To prevent damage to cables, do not crush or strain any cables near the point where the frame halves hinge.

6. Remove motor and belt covers (123, 131). Lift cover (123) and loosen the silver bracket (70) fasteners. Lift the silver bracket (70) off of the fasteners and set aside. Remove the belt covers (131, 132). Remove the heater cover (123). See FIG. 63 and FIG. 64.

**NOTICE**

To prevent damage to the overtemperature switch, carefully remove the covers.

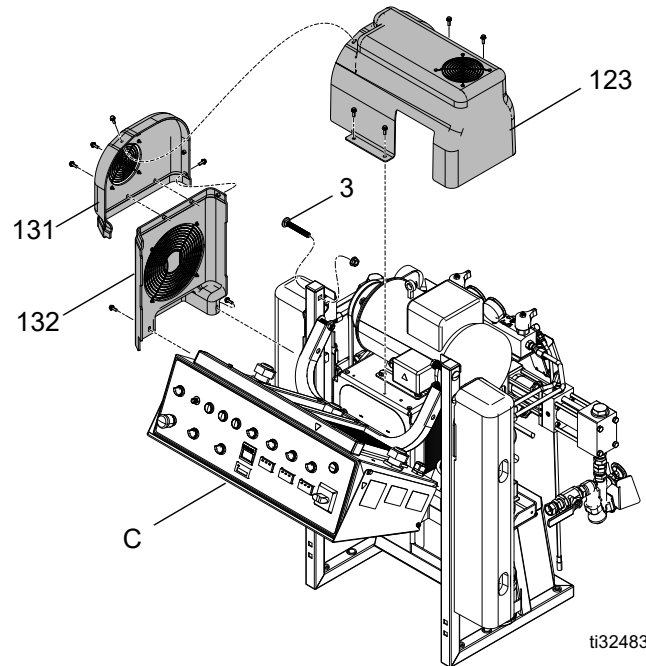


FIG. 63

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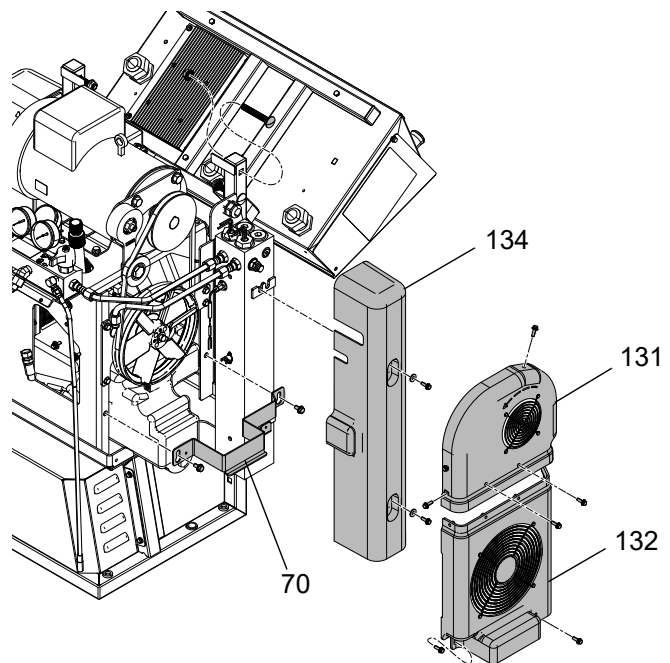


FIG. 64

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7. Replace the motor, if required.

- a. Remove the belt (51). Remove the two pulley screws (48) and the belt tensioning assembly from the motor.

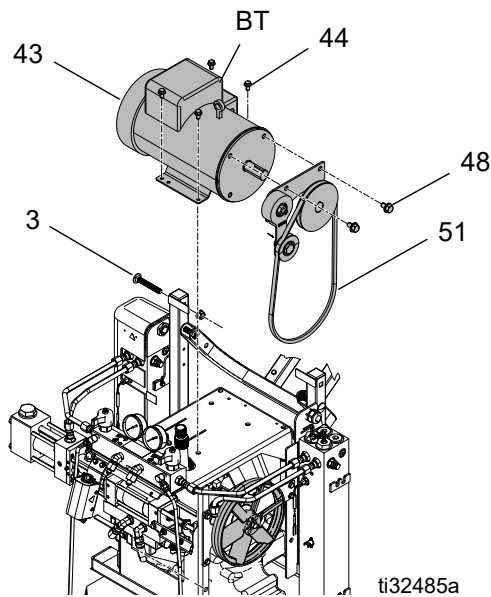


FIG. 65

- b. Remove the electric motor junction box cover (BT).
- c. Disconnect the motor cables. See **Electrical Schematics**, page 96.
- d. Note or label the wire connections. See **Electrical Schematics**, page 96.
- e. Remove the mounting bolts (44) and motor (43).
- f. Place the new motor (43) on the unit.
- g. Fasten the motor with bolts.

- h. Connect the wires, using wire nuts. See **Electrical Schematics**, page 96. The motor must rotate counterclockwise when viewed from the shaft end. The diagram inside the motor junction box shows how to reverse motor direction, if needed.

8. Remove and replace the belt, if necessary.
9. Replace bracket (70) and the belt and heater covers (131, 132, 134).
10. Raise electrical enclosure into the vertical position and ensure wires are not pinched between the frame halves. Replace and tighten bolts (3).
11. Open electrical enclosure (C). Reconnect pressure transducers (405) to pressure monitor board (720). See FIG. 77, page 75.



**NOTICE**

The pressure relief valves (R) and burst disks (513) in both primary heaters must be installed and functioning properly to prevent equipment damage in an over-pressure condition. The pressure transducers (405) will not shut down the machine in the event of an over-pressure condition.

**NOTE:** The pressure monitor board reads the differential between the A and B pressure transducers (405). If both transducers are unplugged or damaged and outputting the same incorrect signal, the pressure monitor indicator light (CK) will not indicate a fault and the machine will not shut down.

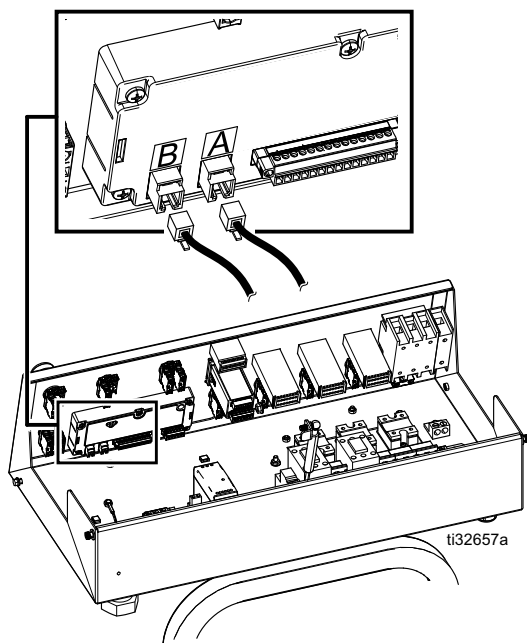
12. Close the electrical enclosure door (173) and tighten the bolts (68). Secure the system to original mounting location.
13. Return to service.

## Replace Pressure Transducers

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

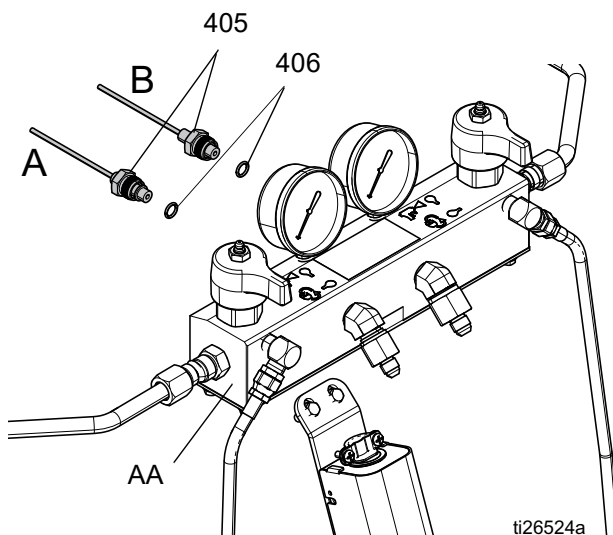


1. Flush. See **Flushing**, page 41.
2. Perform **Shutdown**, page 38, and **Pressure Relief Procedure**, page 40.
3. Disconnect transducer cables from the pressure control board.



**FIG. 66: Transducer Cables**

4. Remove wire ties constraining transducer cable and remove cable from electrical enclosure (C).
5. Remove transducer (405) from manifold (AA).
6. Install o-ring (416) on new transducer (405).
7. Install transducer in manifold. Mark end of cable with tape (red is transducer A, blue is transducer B).
8. Route new cable into electrical enclosure (C) and thread into bundle as before. Attach cable ties to bundle as before.
9. Connect A-side pressure transducer cable to the pressure control board. Connect B-side pressure transducer cable to pressure control board.





**FIG. 67**

### NOTICE

The pressure relief valves (R) and burst disks (513) in both primary heaters must be installed and functioning properly to prevent equipment damage in an over-pressure condition. The pressure transducers (405) will not shut down the machine in the event of an over-pressure condition.

**NOTE:** The pressure monitor board reads the differential between the A and B pressure transducers (405). If both transducers are unplugged or damaged and outputting the same incorrect signal, the pressure monitor indicator light (CK) will not indicate a fault and the machine will not shut down.

## Replace Primary Heater

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				



### Replace Heater Element

1. Flush. See **Flushing**, page 41.
2. Perform **Shutdown**, page 38.
3. Perform **Pressure Relief Procedure**, page 40.
4. Wait for heaters to cool.
5. Remove heater cover (134 or 135).
6. Disconnect heater element wires from heater wire connector inside the electrical enclosure (C). See **Electrical Schematics**, page 96. Test with ohmmeter.

**Table 7: Heater Resistance**

System	Total Heater Wattage	Element	Ohms per Element
GH-2	10 kW	2550	18-21
GH-4	15 kW		

7. If the thermocouple is on the heater element, remove the thermocouple (511 or 512) to avoid damage. See **Replace Thermocouple**, page 67.
8. Use a wrench to remove the heater element (508). Inspect element. It should be relatively smooth and shiny. Replace element if there is a crusted, burnt ash-like material adhered to the element, or if the sheath shows pitting marks.
9. Install the new heater elements (508), holding the mixer (510) so it does not block the thermocouple port. Torque to 120 ft-lbs (163 N•m).
10. Install the thermocouple (511 or 512), if removed earlier. See **Replace Thermocouple**, page 67.
11. Reconnect the wires inside the electrical enclosure. See **Electrical Schematics**, page 96.
12. Replace heater cover (134 or 135).

### Line Voltage

The heater outputs its rated wattage at 230 VAC. Low line voltage will reduce power available and the heater will not perform at full capacity.

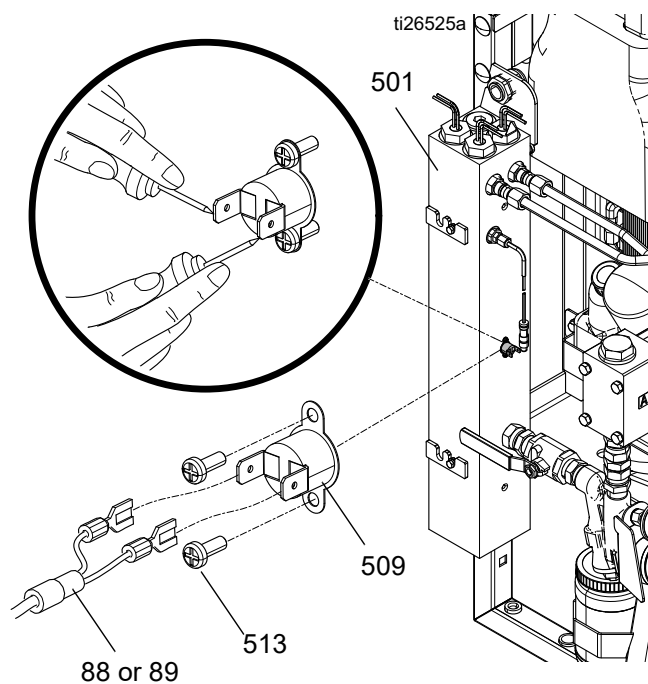
## Repair Heater Overtemperature Switch



1. Perform **Shutdown**, page 38.
2. Wait for heaters to cool.
3. Disconnect overtemperature switches (509) from cable (88 or 89). Test across spade terminals with ohmmeter.



**NOTE:** If the resistance is not approximately 0 ohms, the overtemperature switch (509) needs to be replaced.

4. If the switch fails the test, remove the screws. Discard the failed switch. Apply a thin layer of thermal compound 110009, install a new switch (509) in the same location on housing (501). Secure with screws (513) and reconnect cables (88 or 89).



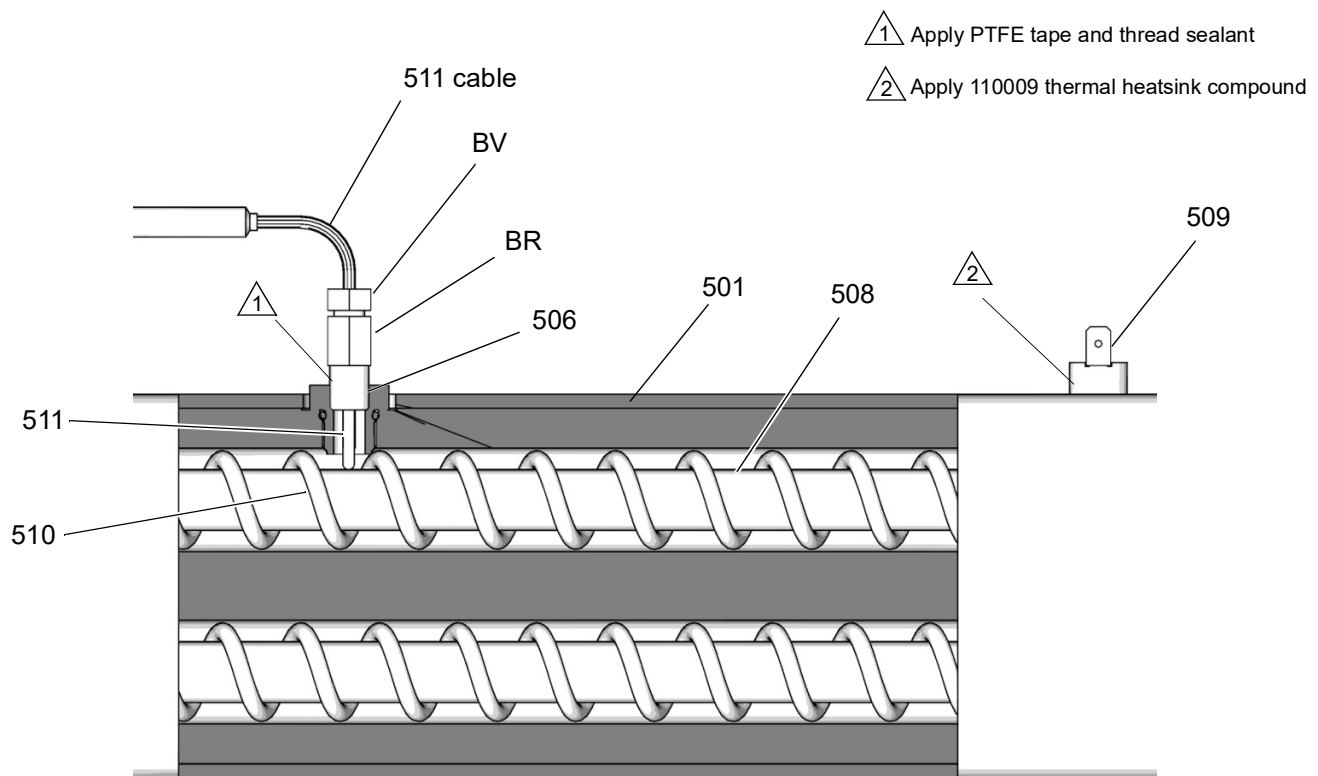
**FIG. 68**

## Replace Thermocouple

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				



1. Perform **Shutdown**, page 38.
2. Follow **Pressure Relief Procedure**, page 40.
3. Wait for heaters to cool.
4. Remove heater shroud (134 or 135).
5. Disconnect thermocouple wires from temperature control module. See **Heater Wiring**, page 98.
6. Feed thermocouple wires out of electrical enclosure (C). Note path as wires must be replaced in the same way.
7. See FIG. 69, page 68. Loosen ferrule nut (BV). Remove thermocouple (511) from heater housing (501), then remove thermocouple housing (BR). Do not remove the thermocouple adapter (506) unless it is also necessary to remove the mixer (510). If adapter must be removed, ensure that mixer (510) is out of the way when replacing the adapter.
8. Replace thermocouple. See FIG. 69.
  - a. Remove protective tape from thermocouple (511) tip.
  - b. Apply PTFE tape and thread sealant to male threads and tighten thermocouple housing (BR) into adapter (506).
  - c. Push in thermocouple (511) so tip contacts heater element (508).
  - d. Holding thermocouple (511) against heater element, tighten ferrule nut (BV) 1/4 turn past finger-tight.
9. Route thermocouple wires into electrical enclosure (C) and thread into bundle as before. Reconnect wires to board.
10. Replace heater shroud.
11. Turn on heaters A and B simultaneously to test. Temperatures should rise at the same rate. If one heater is low, loosen ferrule nut (BV) and tighten thermocouple housing (BR) to ensure the thermocouple (511) tip contacts element (508).



**FIG. 69: Thermocouple**



## Diagnose Heated Hose



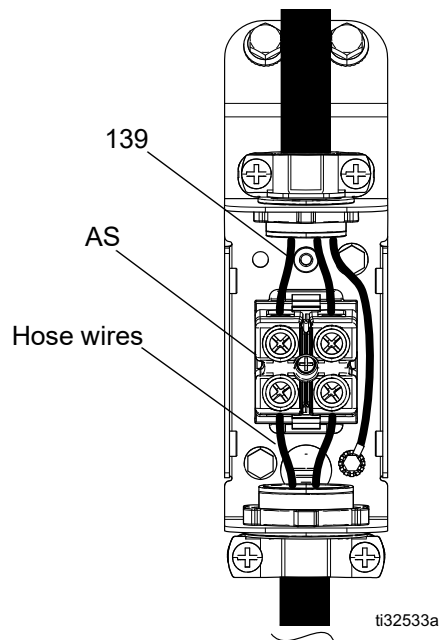
Refer to your heated hose manual for hose replacement parts.

### Check Hose Wires

1. Perform **Shutdown**, page 38.

**NOTE:** Whip hose must be connected.

2. Remove cover (71). See FIG. 71.
3. Disconnect system wires (139) from the proportioner.
4. Disconnect hose wires from terminal block (AS).



**FIG. 70**

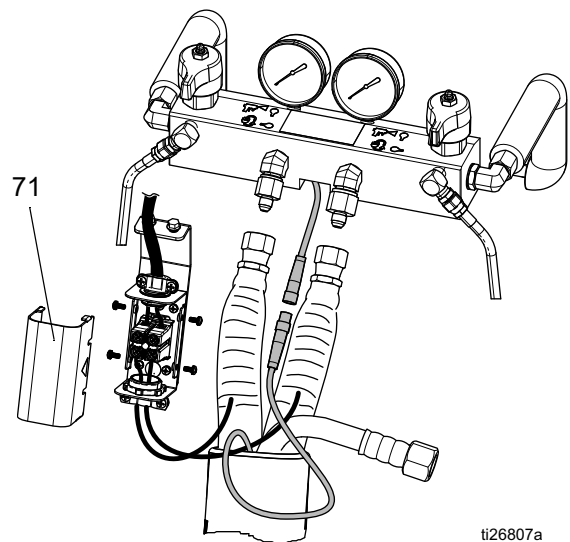
5. Using an ohmmeter, check between the hose wires. There should be continuity.
6. If hose fails test, retest at each length of hose from the system out to the gun, including whip hose, until failure is isolated.
7. Reconnect wires and install cover (71).

### Check Hose Power Connectors

1. Perform **Shutdown**, page 38.

**NOTE:** Whip hose must be connected.

2. Disconnect power wire harness from terminal block (AS).



ti26807a

**FIG. 71: Heated Hose Electrical Junction Box**

3. Use an ohmmeter to check for continuity between the two terminals on the terminal block.
4. If the hose fails the test, re-test at each length of hose, including whip hose, until the failure is identified.

Check FTS Cables

- 1. Perform **Shutdown**, page 38.
- 2. Disconnect FTS cable (163) at proportioner. See FIG. 72.

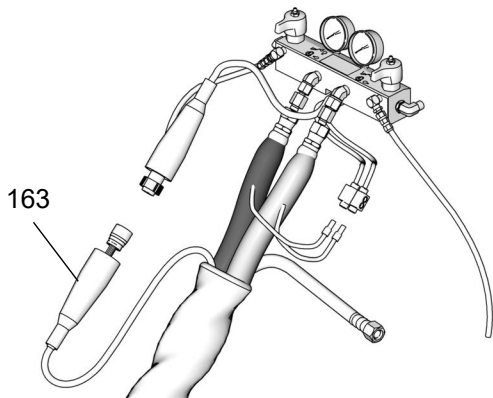


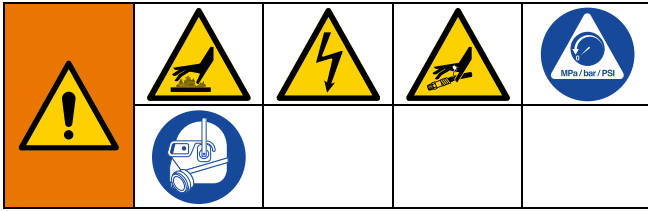
FIG. 72: Disconnect FTS Cable

- 3. Test with ohmmeter between pins of cable connector.

Pins	Result
1 to 2	Approximately 35 ohms per 50 ft (15.2 m) of hose, plus approximately 10 ohms for FTS
1 to 3	Infinity

- 4. If cable fails test, see **Repair Fluid Temperature Sensor (FTS)**, page 71.

# Repair Fluid Temperature Sensor (FTS)



## Installation

The fluid temperature sensor (FTS) is supplied with system. Install FTS between main hose and whip hose. Refer to your heated hose manual for instructions.

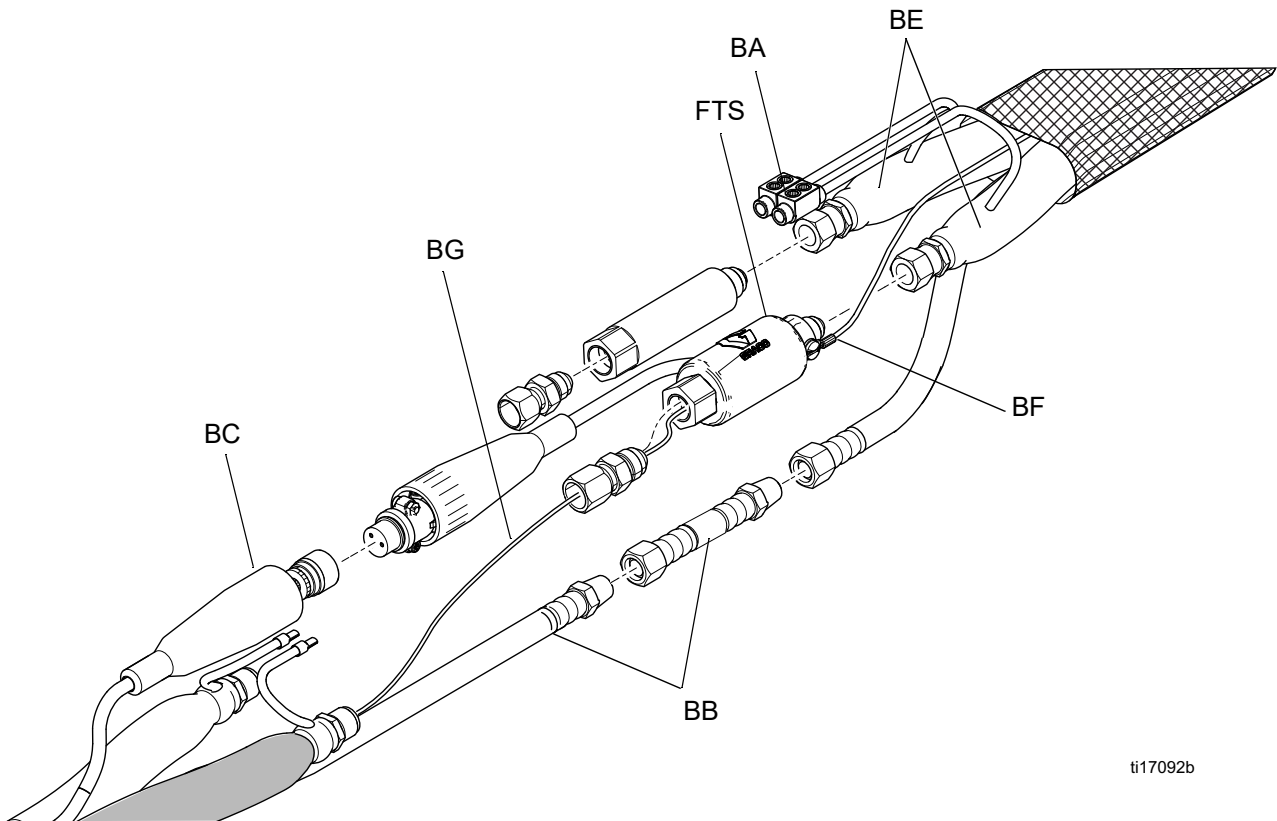
## Test/Removal

1. Perform **Shutdown**, page 38.
2. Follow **Pressure Relief Procedure**, page 40.

3. Remove tape and protective covering from FTS. Disconnect sensor cable (BC). Test with ohmmeter between pins of cable connector.

Pins	Result
1 to 2	Approximately 10 ohms
1 to 3	Infinity
3 to FTS groundscrew	0 ohms
1 to FTS component A fitting (ISO)	Infinity



4. If FTS fails, replace FTS.
  - a. Disconnect air hoses (BB) and electrical connectors (BA).
  - b. Disconnect FTS from fluid hoses (BE).
  - c. Remove ground wire (BF) from ground screw on underside of FTS.
  - d. Remove FTS probe (BG) from component A (ISO) side of hose.



ti17092b

FIG. 73

## Diagnose and Replace Hose Transformer

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

### Transformer Primary Check

**NOTE:** Refer to **Electrical Schematics**, page 96, for circuit breaker and wire identification.

1. Perform **Shutdown**, page 38.
2. Open the electrical enclosure door (173) by loosening the bolts (68) and lifting the door upwards.
3. Turn off circuit breaker CB3.
4. Use an ohmmeter to test for continuity between the CB3-2 and RLY-T1 wires; there should be continuity.
  - a. If there is no continuity, **Replace Transformer**.
  - b. If there is continuity, follow **Transformer Secondary Check**.
5. Turn on circuit breaker CB3.

### Transformer Secondary Check



**NOTE:** Refer to **Electrical Schematics**, page 96, for circuit breaker and wire identification.

1. Perform **Shutdown**, page 38.
2. Open the electrical enclosure door (173) by loosening the bolts (68) and lifting the door upwards.
3. Turn off circuit breaker CB5 and disconnect the hose wires in the hose electrical junction box. See FIG. 70, page 69.
4. Use an ohmmeter to test for continuity between the SEC X1 and the terminal for each hose length; there should be continuity.
  - a. If there is no continuity, **Replace Transformer**.
  - b. If there is continuity, reconnect the hose wires in the electrical junction box. See FIG. 70, page 69. Turn on circuit breaker CB5. Close the electrical enclosure door (173) and tighten the bolts (68).

### Replace Transformer

1. Perform **Shutdown**, page 38.
2. Remove the transformer cover (128). See **Proportioner Parts**, page 76, and FIG. 13, page 25.
3. Remove transformer mounting bolts (15).
4. Disconnect the transformer wires. See **Electrical Schematics**, page 96, and **Adjust Hose Transformer Wiring**, page 25.
5. Replace transformer and reconnect transformer wires. Refer to **Electrical Schematics**, page 96, and **Adjust Hose Transformer Wiring**, page 25.
6. Reinstall transformer mounting bolts (15).
7. Reinstall transformer cover (128).

## Replace Power Supply

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

1. Perform **Shutdown**, page 38.
2. Open electrical enclosure (C).
3. Disconnect input and output cables from both sides of the power supply. See **Electrical Schematics**, page 96.
4. Insert a flat head screw driver in the mounting tab on the bottom of the power supply to remove from the din rail.
5. Install new power supply in reverse order.
6. Close electrical enclosure (C).

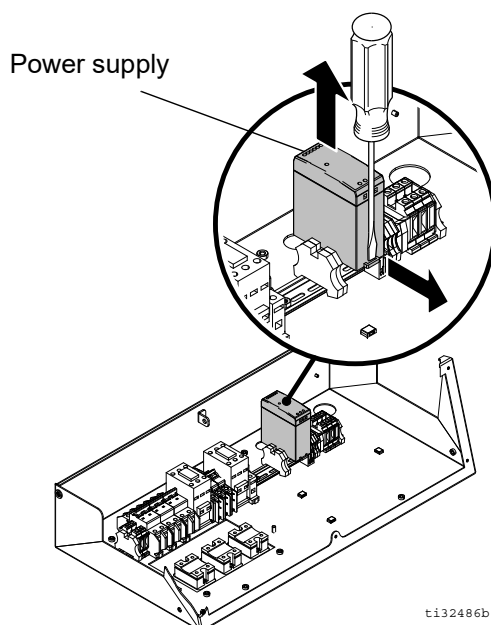




FIG. 74

## Replace Power Supply Fuse

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

1. Perform **Shutdown**, page 38.
2. Open electrical enclosure (C).
3. Open fuse enclosure F1 or F2. See **Electrical Enclosure**, page 91.
4. Remove blown or faulty fuse (659). Replace with new fuse.
5. Shut fuse enclosures firmly. Close electrical enclosure (C).

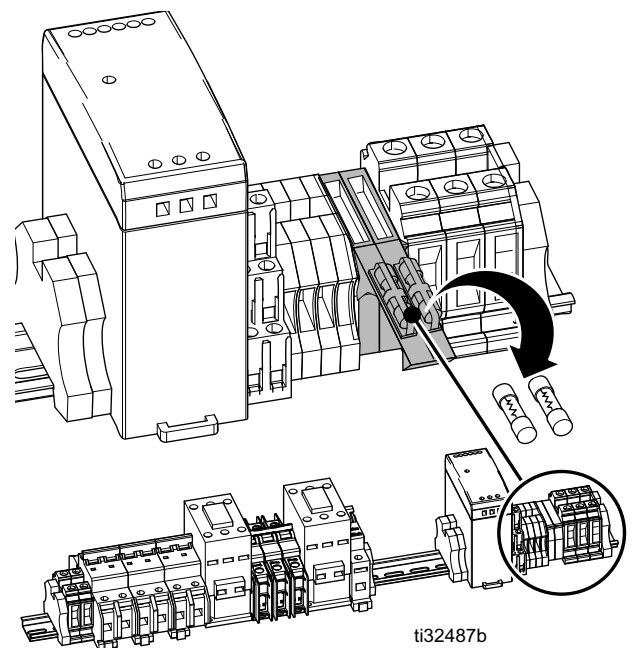


FIG. 75

## Replace Surge Protector

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**DANGER**  
**SEVERE ELECTRIC SHOCK HAZARD**  
 This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

- Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

1. Perform **Shutdown**, page 38.

2. Open the electrical enclosure door (173) by loosening the bolts (68) and lifting the door upwards.
3. Loosen connections on terminals F1-1 and F1-2 on din rail. See **Electrical Schematics**, page 96.
4. Follow the two remaining wires (BU) from the surge protector (621) to the zip-tied wire loom (BW). Cut off one end of the zip tie and peel back the loom on each wire. Unplug both wires.
5. Loosen nuts (623) and remove the faulty surge protector (621).
6. Install the new surge protector in reverse order. Reinstall looms (BW) with new zip ties. Be sure to connect the wires according to their labels.
7. Close the electrical enclosure door (173) and tighten the bolts (68).

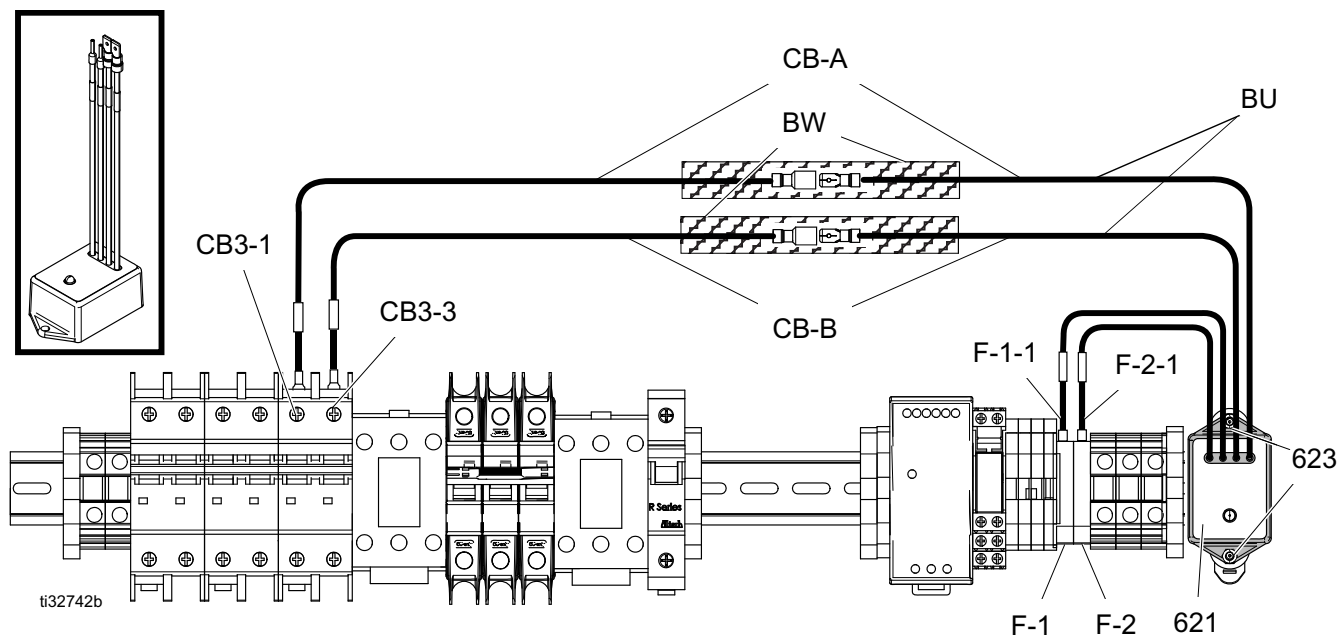


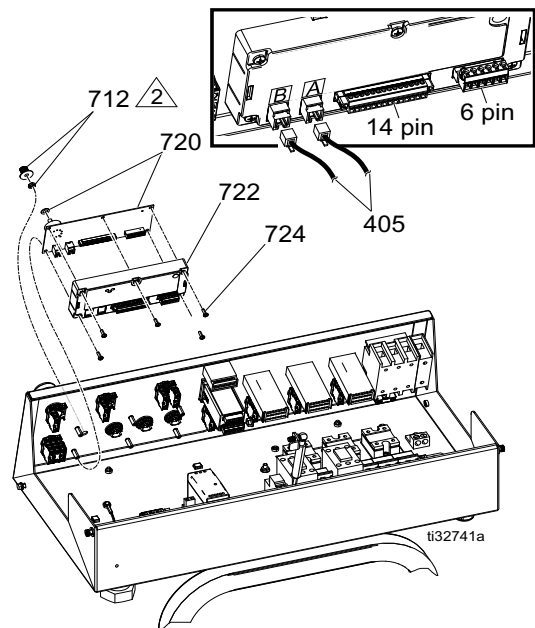


FIG. 76

## Replace Pressure Monitor Board

				
<p><b>DANGER</b></p> <p><b>SEVERE ELECTRIC SHOCK HAZARD</b></p> <p>This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.</p> <ul style="list-style-type: none"> <li>Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>				

1. Perform **Shutdown**, page 38.
2. Open electrical enclosure (C).
3. Disconnect pressure transducer cables (405).
4. Disconnect 14-pin and 6-pin connectors.
5. Use a hex key to remove the pressure monitor knob (712). Unscrew the nut underneath the knob.
6. Loosen and remove screws (724) and pressure board cover (722).
7. Remove faulty pressure monitor board (720) and replace with new board.
8. Reinstall parts in reverse order.



**FIG. 77**

### NOTICE

The pressure relief valves (R) and burst disks (513) in both primary heaters must be installed and functioning properly to prevent equipment damage in an over-pressure condition. The pressure transducers (405) will not shut down the machine in the event of an over-pressure condition.

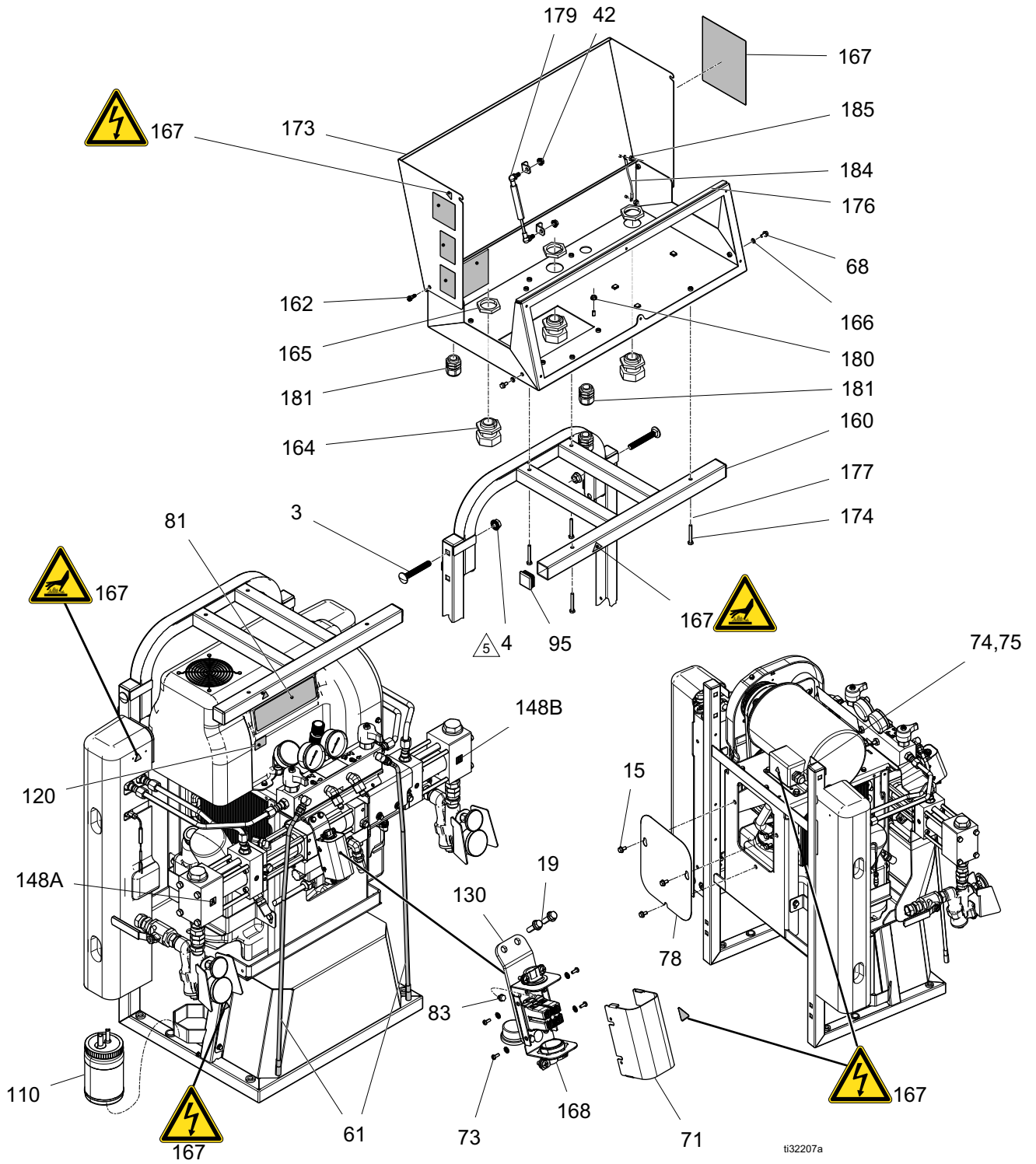
**NOTE:** The pressure monitor board reads the differential between the A and B pressure transducers (405). If both transducers are unplugged or damaged and outputting the same incorrect signal, the pressure monitor indicator light (CK) will not indicate a fault and the machine will not shut down.



- 3** Ensure that the fan (109) direction arrow points away from the mounting panel.

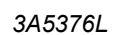


# Proportioner

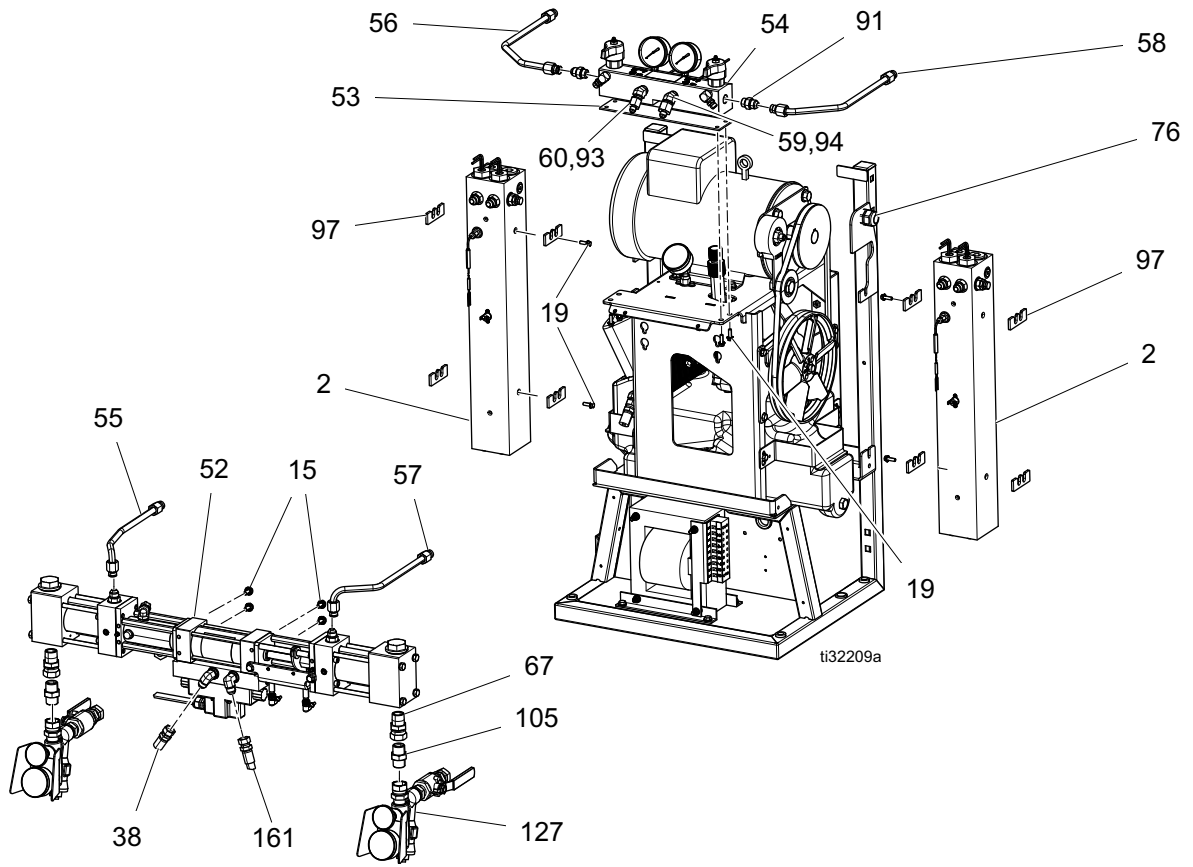


1. Apply anaerobic pipe sealant to all non-swiveling pipe threads.

5. Apply single component thixotropic anaerobic sealant to threads.



# Proportioner



**GH-2 and GH-4**

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
				36	15G784	HOSE, coupled	2
1	-----	CART, weldment, hr2, paint	1	37	121321	FITTING, elbow, SAE x JIC (GH-2 only)	1
2	17V435	HEATER, 5 kw, 1 zone, thermocouple (GH-2 10 kW only)	2		121320	FITTING, elbow, SAE x JIC (GH-4 only)	1
	17V436	HEATER, 7.5 kw, 1 zone, thermocouple (GH-4 only)	2	38	15T895	HOSE, hydraulic supply	1
3	127277	BOLT, carriage, 1/2-13 X 3.5 L	4	39	117464	CLAMP, hose, micro 1.75 max dia.	1
4	112731	NUT, hex, flanged	4	40	112161	SCREW, mach, hex, wshr hd	2
8*	115836	GUARD, finger	3	41	112586	SCREW, cap, hex hd	1
9	17V437	FAN, cooling, 120 mm, 24 VDC	1	42	110996	NUT, hex, flange head	3
10	103181	WASHER, lock ext	4	43	247816	MOTOR, 230 VAC, 4.0 hp (GH-2 only)	1
11	117683	SCREW, mach, phil pan hd	4		247785	MOTOR, 230 VAC, 7.5 hp (GH-4 only)	1
15	111800	SCREW, cap, hex hd	20	44	113802	SCREW, hex hd, flanged	4
16	247826	RESERVOIR, assembly, hydraulic	1	45	247845	PULLEY, drive, vee	1
16a	247778	HOUSING, inlet	1	46	15H207	BRACKET, tensioner	1
16b	247771	GASKET, inlet	1	47	247853	ADJUSTER, belt, tensioner	1
16c	247777	TUBE, inlet	1	48	111802	SCREW, cap, hex hd	2
16d	247770	TUBE, return	1	49	15E410	PULLEY, fan (GH-2 only)	1
16e	116919	FILTER, inlet	1		247856	PULLEY, fan (GH-4 only)	1
16f	255032	FITTING, plug, SAE	1	50	120087	SCREW, set, 1/4 x 1/2	2
16g	255021	FITTING, straight	1	51	803889	BELT, AX46	1
17	117556	FITTING, nipple, #8 JIC x 1/2 npt	1	52	25D460	PUMP, hydraulic, iso and resin (GH-2 only)	1
18	17V438	BRACKET, retaining, tank, paint	1		25D459	PUMP, hydraulic, iso and resin (GH-4 only)	1
19*	113796	SCREW, flanged, hex hd	36	53	15B456	GASKET, manifold	1
20	17V497	ADAPTER, hydraulic gage	1	54	17V439	MANIFOLD, fluid	1
21	17G624	TUBE, gauge, pressure	1	55	17G600	TUBE, fluid, iso, heater, inlet	1
22	15H524	ACCUMULATOR, pressure, 1/4 npt	1	56	17G601	TUBE, fluid, iso, heater, outlet	1
23	119789	FITTING, elbow, street, 45 deg,	1	57	17G603	TUBE, fluid, res, heater, inlet	1
24	112567	GAUGE, pressure, fluid	1	58	17G604	TUBE, fluid, res, heater, outlet	1
25	247829	COOLER, hydraulic, complete	1	59	117677	FITTING, reducer #6 x #10 (jic)	1
26	17G611	BRACKET, mntg, pump, hyd, lf, paint (GH-2 only)	1	60	117502	FITTING, reducer #5 x #8 (JIC)	1
	17G612	BRACKET, mntg, pump, hyd, hf (GH-4)	1	61	16W043	TUBE, pressure relief	2
27	247855	PUMP, hydraulic (GH-2 only)	1	64	-----	SLEEVE, wire, .50 id	3
	255019	PUMP, hydraulic (GH-4 only)	1	65	17G668	NUT, wire, gray	2
28†	-----	KNOB, compensator	1	66	295731	NUT, wire	2
29†	-----	KNOB, lock, compensator	1	67	118459	FITTING, union, swivel, 3/4"	2
30	15H512	LABEL, control	1	68	113161	SCREW, flange, hex hd	4
31†	-----	SCREW, set, 1/4-20 sst, 1.25 lg	1	69	-----	GROMMET	1
32	110792	FITTING, elbow, male, 90 deg	1	70	17V440	BRACKET, retaining, tank, shroud, pnt	1
33	115764	FITTING, elbow, 90	1	71	25A234	ENCLOSURE, cover, painted	1
34	120804	FITTING, elbow, 1/2npt x 1 JIC (GH-2 only)	1	73	16X129	SCREW, mach, Phillips, tooth wash	4
	255020	FITTING, elbow, 1 1/16 SAE x 1/2 tube (GH-4 only)	1	74	-----	BUSHING, strain relief, 1/2 npt	1
35	247793	HOSE, inlet, coupled	1				

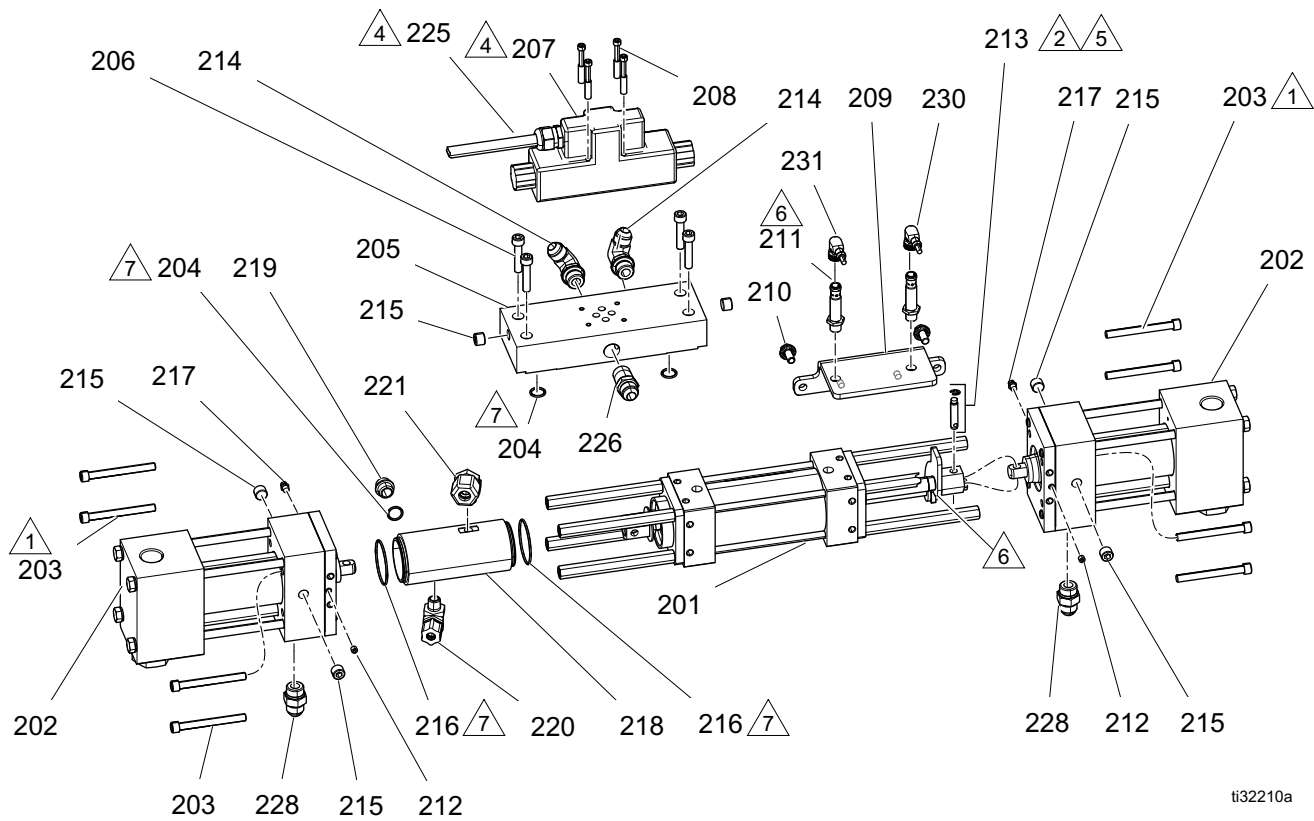
Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
75	-----	NUT, strain relief, 1/2 npt	1	138	17V454	HARNESS, motor (GH-2 only)	1
76	127816	BUSHING, strain relief	2		17H959	HARNESS, motor (GH-4 only)	1
77	17F532	TIE, cable, fir tree	17	139	17V455	HARNESS, hose	1
78	17G599	COVER, access, hr2, paint	1	144	15G782	HOSE, coupled	1
81	17V442	LABEL, Gusmer branding, GH-2	1	145	116793	FITTING	1
82	114269	GROMMET, rubber	1	148	128417	LABEL, A/B	1
83	16P338	SCREW, MACH, serrated hex head	2	157	127368	SLEEVE, split, wire, 1.50 id	2
				160	17V456	BRACKET, electrical box, painted	1
84	125943	NUT, serrated flange	2	161	17B524	HOSE, hydraulic supply	1
85	101032	BOLT, machine	2	162	17V457	BOLT, shoulder, 1/4-20	2
88	17V444	HARNESS, OT A	1	163	17V458	CABLE, hose control, 72"	1
89	17V445	HARNESS, OT B	1	164	120858	BUSHING, strain relief, m40 thread	4
91	121309	FITTING, adapter, SAE-ORB X JIC	2				
				165	120859	NUT, strain relief, m40 thread	4
93	299520	CAP, 9/16-18 JIC cap, aluminum	1	166	16V153	WASHER, retaining	2
94	299521	CAP, 1/2-20 JIC cap, aluminum	1	167▲	25D512	LABEL, safety	1
95	111218	CAP, tube, square	4	168	24W204	ENCLOSURE, terminal block	1
97	16W654	INSULATOR, foam, heater	8	170	17V459	COVER, hydraulic pump, clear	1
101	296607	TOOL, clevis pin extractor	1	171	17V460	WASHER, epdm, 1/4"	2
103	C19843	SCREW, cap, sockethead	1	173	17V462	COVER, electrical, paint	1
105	C20487	FITTING, nipple, hex	2	174	105170	SCREW, cap hex hd	4
106*	114027	WASHER, flat	12	175	261669	KIT, fluid temp sensor, coupler	1
107*	-----	RIVET, pop, 5/32 dia.	12	176	17V463	GASKET, foam	1
109	117284	GRILL, fan guard	1	177	100016	WASHER, plain	4
110	296731	RESERVOIR, lube hose assembly	1	179	17V464	SPRING, gas	1
				180	115942	NUT, hex, flange head	1
113	206995	FLUID, TSL, 1 qt.	2	181	121171	GRIP, cord, 35-.63, 3/4	2
116	17H155	WASHER, flat, nylon	4	182	-----	LABEL, identification	1
118	116915	CAP, breather filler	1	183	17V465	HARNESS, 230 V/1-phase	1
119	247792	FILTER, oil, 18-23 psi bypass	1		17V491	HARNESS, 230 V/3-phase (GH-2, Series A only)	1
120	15Y118	LABEL, made in the USA	1				
121	106569	TAPE, electrical	1		17H961	HARNESS, 230 V/3-phase, (GH-2 Series B and later, GH-4)	1
122	125871	TIE, cable, 7.50 inch	22		17V736	HARNESS, 400 V/3-phase, neutral (GH-2 only)	1
123*	17V446	COVER, motor, painted	1		17H960	HARNESS, 400 V/3-phase, neutral (GH-4 only)	
127	17G644	KIT, assembly, pair, inlet	1				
128	17G623	COVER, transformer, paint	1	184	194337	WIRE, grounding, door	1
130	17G620	BRACKET, connector, hose, paint	1	185	113504	NUT, keps, hex hd	2
131	17V447	COVER, belt, upper, hr2, paint	1	186	128053	TOOL, screwdriver	1
132	17V448	COVER, belt, lower, hr2, paint	1	187	17G667	FUSE, 2.5 amp, 250 V, time-lag	4
133	17V449	TRANSFORMER, 4090 VA (GH-2 only)	1				
	25P661	TRANSFORMER, 5310 VA (GH-4 only)	1				
134	17V450	COVER, heater, right, paint	1				
135	17V451	COVER, heater, left, paint	1				
136	17V452	CABLE, M12, A prox	1				
137	17V453	CABLE, M12, B prox	1				

▲ Replacement safety labels, tags, and cards are available at no cost.

\* Parts included in Kit 17V446 (purchase separately).

† Parts included in Kit 17G606 (purchase separately).

## Proportioner Assembly

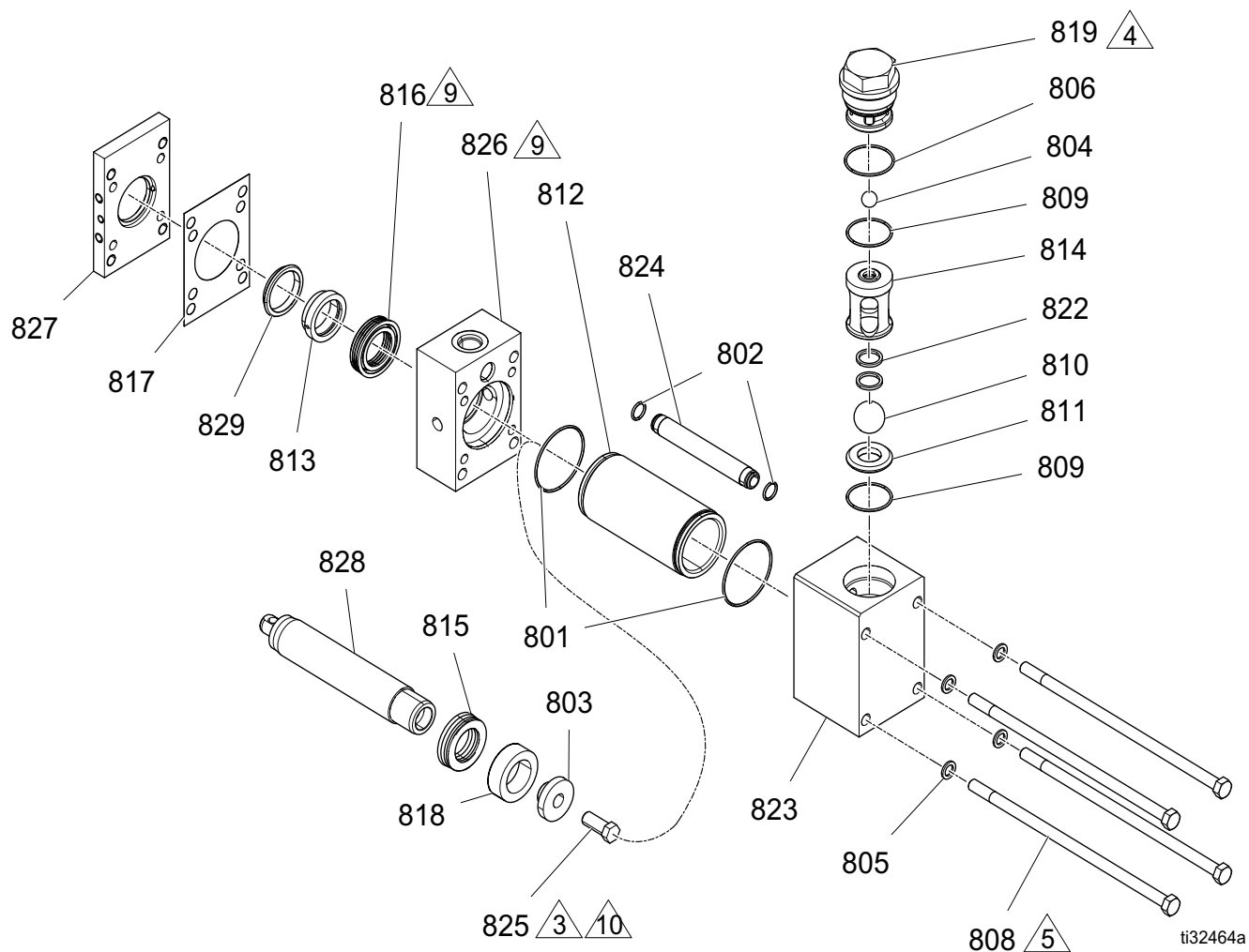


**Proportioner Assembly**

<b>Ref.</b>	<b>Part</b>	<b>Description</b>	<b>Qty.</b>	<b>Ref.</b>	<b>Part</b>	<b>Description</b>	<b>Qty.</b>
				213	296653	KIT, clevis pin	2
201	17G499	CYLINDER, hydraulic, w/ spacers	1	214	121312	FITTING, elbow, SAE X JIC	2
202	247576	PUMP, proportioner, 140 (GH-2 only)	2	215	295225	PLUG, pipe, flush	6
	247377	PUMP, proportioner, 120 (GH-4 only)	2	216	106258	PACKING, o-ring	2
203	295824	SCREW, cap, sh, 5/16 x 3	8	217	295229	FITTING, grease, 1/4-28	2
204	112793	PACKING, o-ring	3	218*	- - - -	CYLINDER, lube	1
205	17G531	MANIFOLD, hyd, hr2	1	219	295829	FITTING, plug, 3/8mpt x .343 lg	1
206	113467	SCREW, cap, socket hd	4	220	295826	FITTING, elbow, 90, 1/4 mpt x 3/8"	1
207	120299	VALVE, directional, hydraulic	1	221	295397	FITTING, elbow, 3/8 mpt x 1/2"	1
208	C19986	SCREW, cap, socket, hd	4	225	17G690	HARNESS, valve, solenoid, hr2	1
209	17V466	BRACKET, prox switch	1	226	121319	FITTING, adapter, npt x jic	1
210	111800	SCREW, cap, hex hd	2	228	121309	FITTING, adapter, sae-orb x jic	2
211	17G605	SENSOR, prox, switch, hr2	2	230	17V453	CABLE, m12, B prox	1
212	M70430	SCREW, set, socket (1/4 28 x .19)	4	231	17V452	CABLE, m12, A prox	1

\* Parts included in Kit 261863 (purchase separately).

## Proportioner Assembly (continued)



△3 Apply (113500) to threads.

△4 Torque (819) to 75 ft-lbs (102 N•m).

△5 Apply thread lube and torque (808) to 38 ft-lbs (52 N•m). If threads are dry, torque to 45 ft-lbs (61 N•m).

△9 Seal (816) must be pressed straight into housing (826).

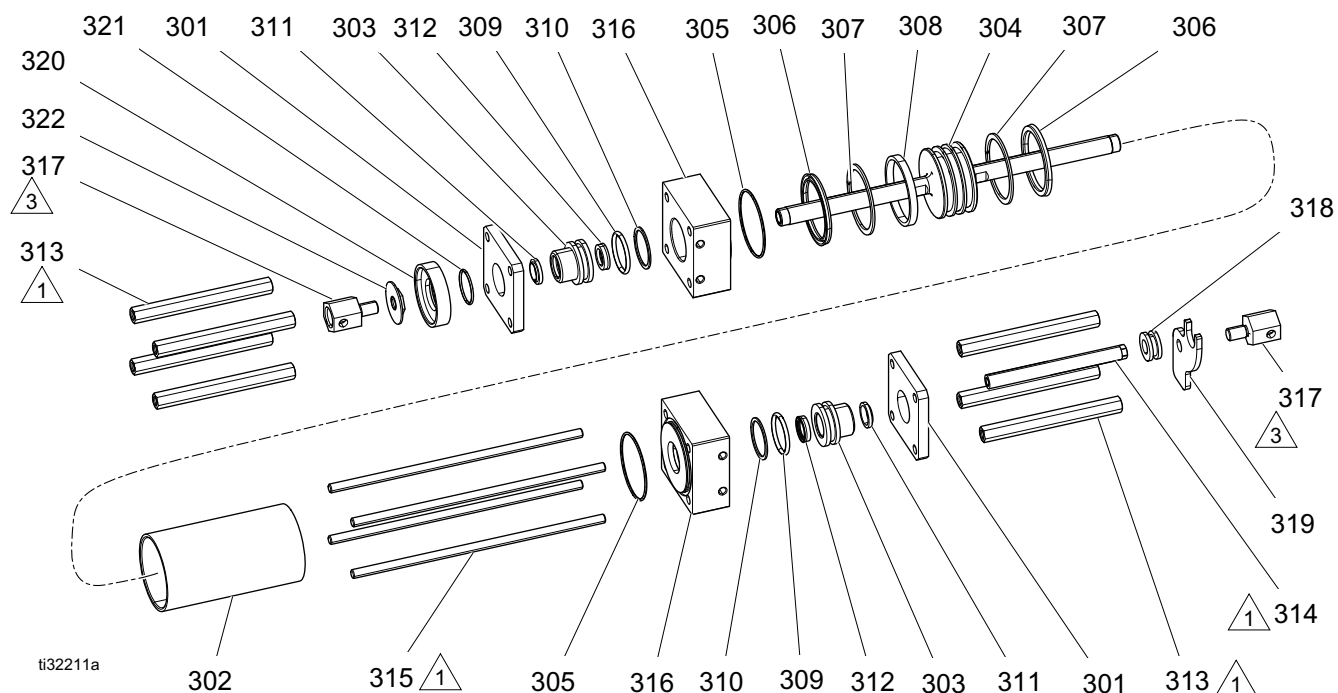
△10 Torque to 45 ft-lbs (61 N•m).



**Proportioner Assembly (continued)**

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
					‡ - - - -	SEAL, throat, 120 proportioner (GH-4 only)	1
801	110492	PACKING, o-ring	2	817‡◆	295145	GASKET	1
802	104319	PACKING, o-ring	2	818★	- - - -	BUSHING, piston, 140 (GH-2 only)	1
803*‡	261885	CAP, piston	1		◆ - - - -	BUSHING, piston, 120 GH-4 only)	1
804	105445	BALL, (0.5 in.)	1				
805	261866	WASHER, flat	4	819	261867	GUIDE, 0.5 in. ball, cap	1
806	107078	PACKING, o-ring	1	822	261897	SPRING, valve	1
808	261865	SCREW, 9 x 0.38 in., hex hd cap	4	823	261903	PUMP, base, proportioner	1
809	107098	PACKING, o-ring	2	824	261898	TUBE, crossover	1
810	107167	BALL, sst	1	825◆★	- - - -	SCREW	1
811	193395	SEAT, carbide	1	826	261901	FLANGE, outlet	1
812	247583	CYLINDER, 140 proportioner (GH-2 only)	1	827	261875	RETAINER, flange	1
	261890	CYLINDER, 120 proportioner (GH-4 only)	1	828‡	- - - -	ROD, piston, 140 (GH-2 only)	1
813◆	- - - -	BEARING, throat, 140 proportioner (GH-2 only)	1		* - - - -	ROD, piston, 120 GH-4 only)	1
	‡ - - - -	BEARING, throat, 120 proportioner (GH-4 only)	1	829	247587	ADAPTER, throat, 140 (GH-2 only)	1
814	261899	GUIDE, 1 in. ball, seat assembly	1		261868	ADAPTER, throat, 120 (GH-4 only)	1
815★	- - - -	SEAL, piston, 140 proportioner (GH-2 only)	1	* <i>Parts included in Kit 261876 (purchase separately).</i>			
	◆ - - - -	SEAL, piston, 120 proportioner (GH-4 only)	1	‡ <i>Parts included in Kit 247585 (purchase separately).</i>			
816◆	- - - -	SEAL, throat, 140 proportioner (GH-2 only)	1	‡ <i>Parts included in Kit 261747 (purchase separately).</i>			
				◆ <i>Parts included in Kit 247581 (purchase separately).</i>			
				◆ <i>Parts included in Kit 261845 (purchase separately).</i>			
				★ <i>Parts included in Kit 247579 (purchase separately).</i>			

## Hydraulic Cylinder



△ Torque spacers (313, 314) and rod (315) to 200 in-lbs (22.5 N•m).

△ Torque to 40 +/- 5 ft-lbs (345 +/- 54 N•m).

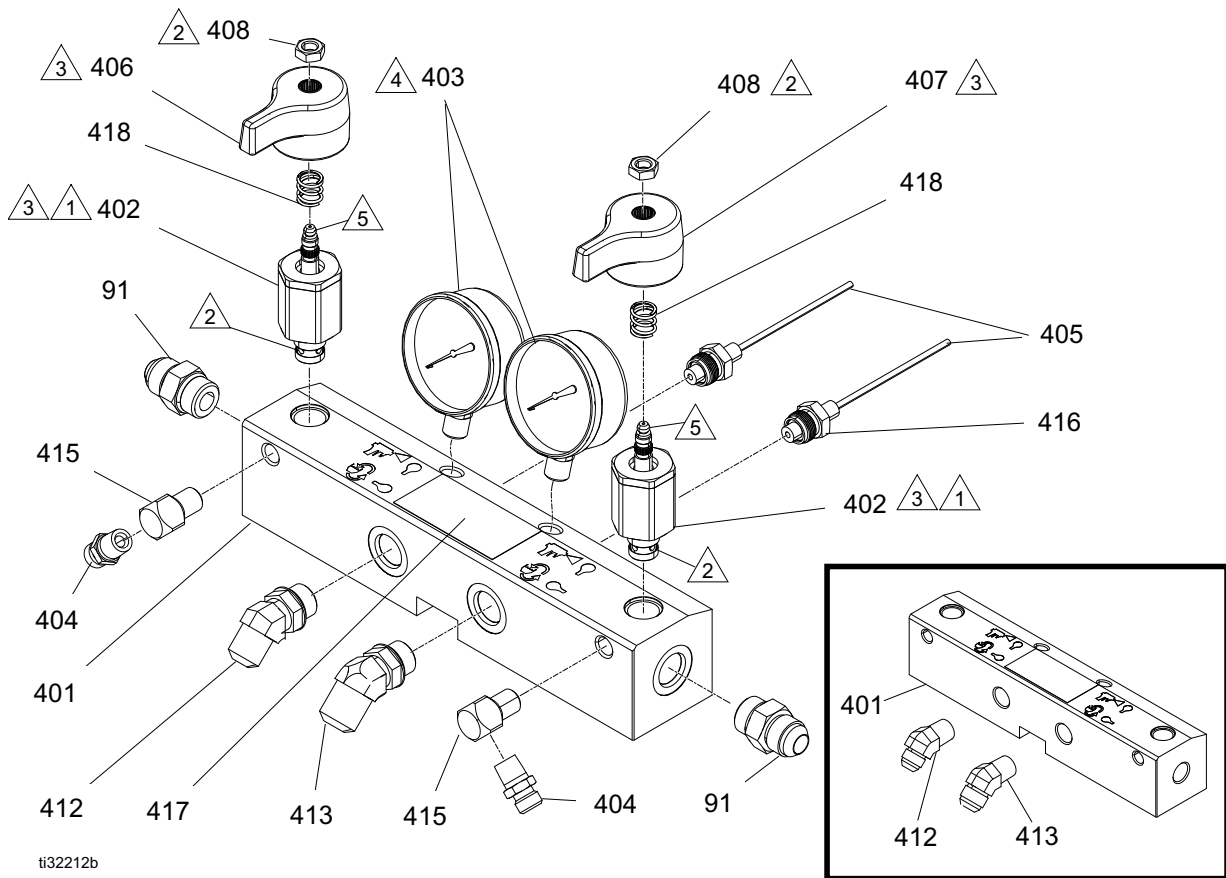
4. Apply grease to all soft parts before assembly.

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
301	295029	PLATE, retainer	2	314	261502	SPACER, reversing switch	1
302	295030	CYLINDER	1	315	295034	ROD, TIE, hydraulic cylinder	4
303*	295031	BUSHING, rod	2	316	295035	BLOCK, port	2
304	296642	PISTON, cylinder, hydraulic	1	317	261864	CLEVIS, hex, proportioner	2
305*	295640	O-RING	2	318	17G527	BUSHING, clocking, hr2	1
306*	295641	SEAL, u-cup	2	319	17G529	PLATE, clocking, driver, hr2	1
307*	295642	RING, back up	2	320†	-----	ADAPTER, lube, cylinder	1
308*	296643	RING, wear	1	321	177156	PACKING, o-ring	1
309*	158776	PACKING, o-ring	2	322	295852	NUT, jam, baffle	1
310*	295644	RING, back up	2				
311*	295645	WIPER, rod	2				
312*	296644	SEAL, shaft	2				
313	295032	SPACER, proportioner pump	7				

\* Parts included in Kit 296785 (purchase separately).

† Parts included in Kit 261863 (purchase separately).

## Fluid Manifold



ti32212b

① Torque to 355-395 in-lbs (40-44.6 N•m).

② Apply sealant (113500) to threads.

③ Valve must be closed with handle position as shown on drawing.

④ Apply PTFE tape and thread sealant to gauge threads.

⑤ Apply grease on valve.

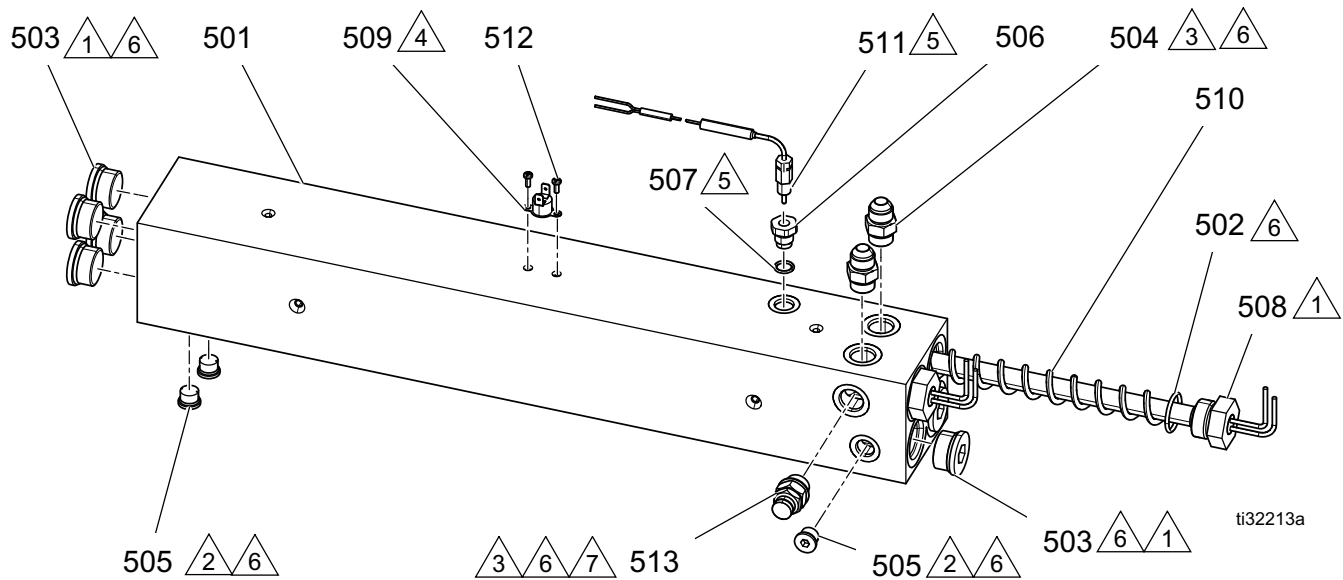
6. Apply PTFE tape or thread sealant to all tapered threads.

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
401◆	255228	MANIFOLD, fluid, inlet, etched	1	416	111457	PACKING, o-ring	2
402*†‡	247824	VALVE, drain valve	2	417▲	189285	LABEL, safety, burn	1
403	102814	GAUGE, press, fluid	2	418*†‡	150829	SPRING, compression	2
404	162453	FITTING, (1/4 npsm x 1/4 npt)	2	▲ Replacement safety labels, tags, and cards are available at no cost.			
405	24K999	TRANSDUCER, pressure control	2	* Parts included in Kit 255150 (purchase separately).			
406†‡	247788	HANDLE, red	1	† Parts included in Kit 255149 (purchase separately).			
407*†‡	247789	HANDLE, blue	1	‡ Parts included in Kit 255148 (purchase separately).			
408*†‡	112309	NUT, hex, jam	2	◆ Part includes replacement ORB fittings (part 412 and 413).			
412❖	17Y236	FITTING, 3/4 ORB x #8 JIC	1	❖ To order a replacement part, verify the type of fitting used with your fluid manifold (1/2 npt or 3/4 ORB fitting).			
	117556	FITTING, nipple, #8 JIC x 1/2 npt	1				
413❖	17Y235	FITTING, 3/4 ORB x #10 JIC	1				
	117557	FITTING, nipple, #10 JIC x 1/2 npt	1				
415	100840	FITTING, elbow, street	2				

# Heater

**17V435: 5 kW Single Zone Heater, GH-2 10 kW (Shown)**

**17V436: 7.5 kW Single Zone Heater, GH-4 15 kW**



△1 Torque to 120 ft-lbs (163 N•m).

△2 Torque to 23 ft-lbs (31 N•m).

△3 Torque to 40 ft-lbs (54 N•m).

△4 Apply thermal paste.

△5 Apply pipe sealant and PTFE tape to all non-swiveling threads and threads without o-rings.

△6 Apply lithium grease lubricant to o-rings before assembling in block (510).

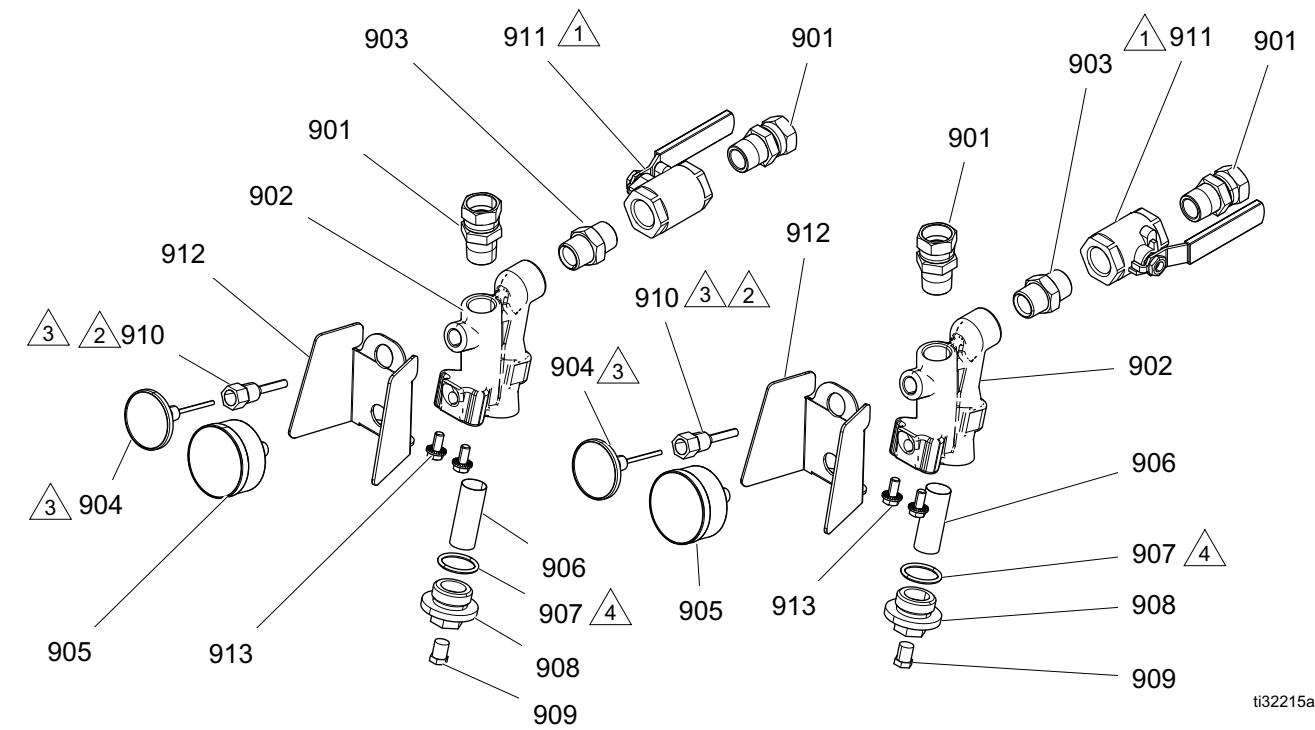
△7 Position rupture disc housing (513) so that the exhaust hole points away from fitting (508).

**Heater**

Ref.	Part	Description	Qty.	
			17V435	17V436
501	-----	HEATER, machined, 1 zone, 3500 psi	1	1
502	124132	O-RING	2	3
503	15H305	FITTING, plug hollow hex 1-3/16 sae	6	5
504	121309	FITTING, adapter, sae-orb x jic	2	2
505	15H304	FITTING, plug 9/16 sae	3	3
506	15H306	ADAPTER, thermocouple, 9/16 x 1/8	1	1
507	120336	O-RING, packing	1	1
508	16A110	HEATER, immersion, (2550 W, 230 V)	2	3
509	15B137	SWITCH, over temperature	1	1
510	15B135	MIXER, immersion heater	2	3
511	117484	SENSOR	1	1
512	124131	SCREW, mach, pnh	2	2
513	24U856	HOUSING, rupture disc	1	1

Fluid Inlet Kits

17G644



ti32215a

- △ 1 Position ball valves as shown.

△ 2 Apply tape to threads of housing.

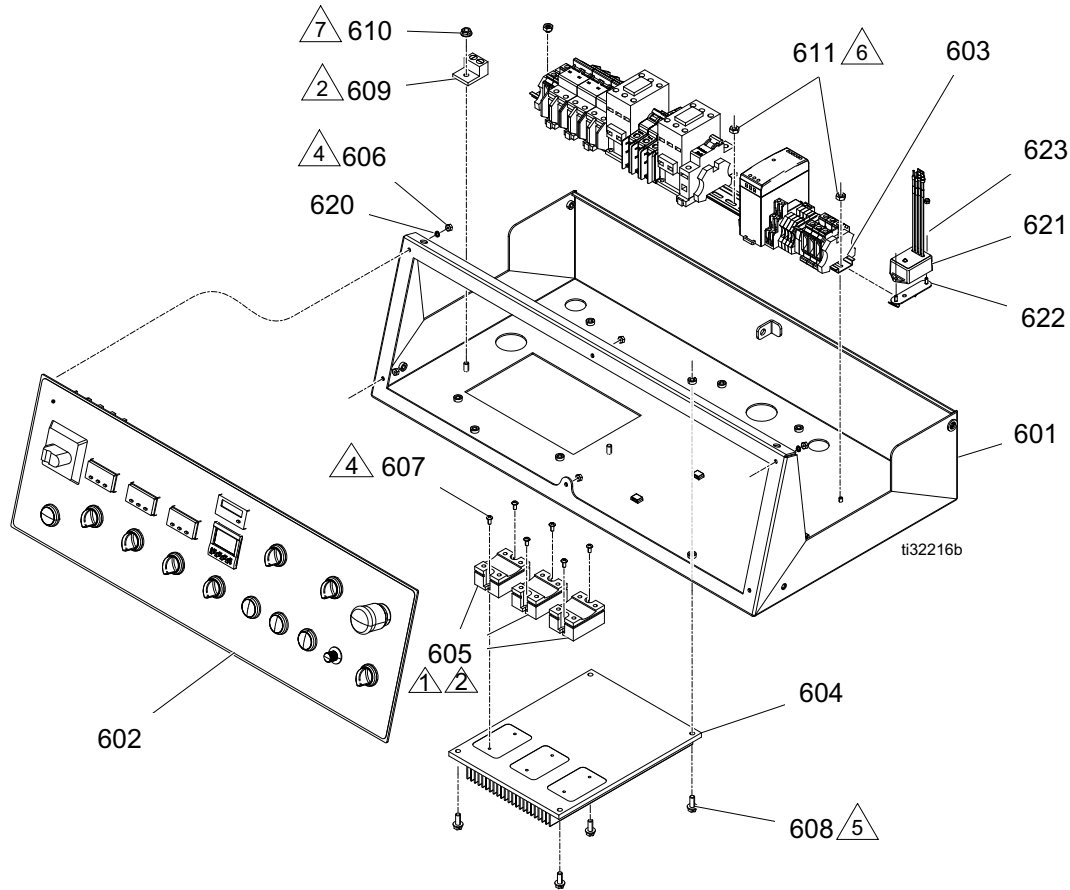
△ 3 Apply thermal lubricant completely covering thermometer probe (904) before inserting into housing (910).

△ 4 Apply grease to o-ring (907).
5. Apply sealant to all tapered pipe threads. Apply sealant to female threads. Brush into at least the first four threads and approximately 1/4 turn wide.

6. Position gauges vertically within assembly.

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
901	118459	FITTING, union, swivel, 3/4"	4	908	16V879	CAP, filter	2
902	16W714	MANIFOLD, strainer, inlet	2	909	555808	PLUG, 1/4mp w/ hex hd	2
903	C20487	FITTING, nipple, hex	2	910	15D757	HOUSING, thermometer	2
904	16W117	THERMOMETER, dial	2	911	109077	VALVE, ball 3/4 npt	2
905	16T872	GAUGE, press, fluid	2	912	253481	GUARD, gauge, wye strainer, painted	2
906	180199	FILTER, replacement	2	913	111800	SCREW, cap, hex hd	4
907	128061	PACKING, o-ring, fx75	2				

# Electrical Enclosure



△ Apply even distribution of thermal lubricant on the bottom machined surface of (604) to a thickness of 0.003 min..

△ Position as shown.

△ Torque to 18 in-lbs (24 N•m).

△ Torque to 50-55 in-lbs (68-75 N•m).

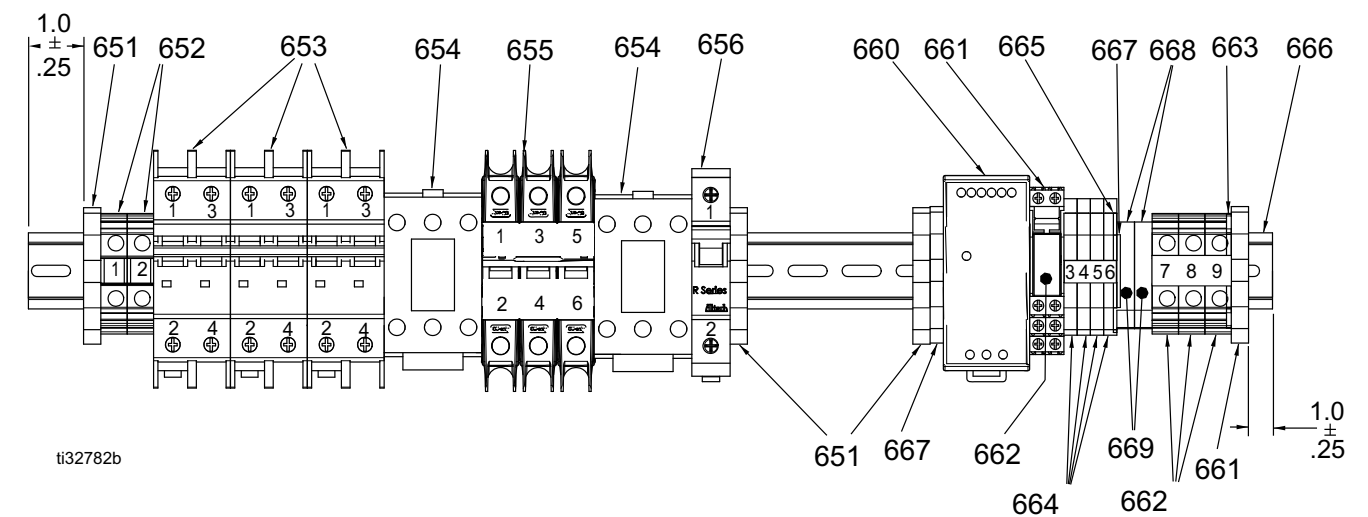
△ Torque to 45 in-lbs (61 N•m).

△ Torque to 110 in-lbs (149 N•m).

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
601	17V486	BASE, enclosure, elec, paint	1	614	17V493	HARNESS, wire, low voltage	1
602	17V487	PANEL, front, assembly	1	615	17V494	HARNESS, power (GH-2 Series A only)	1
603	17V488	MODULE, breaker (GH-2 Series A only)	1		17H962	HARNESS, power (GH-2 Series B and later, GH-4)	
	26A847	MODULE, breaker (GH-2 Series B and later, GH-4)	1	616	17V495	HARNESS, ssr	1
604	17V489	HEAT SINK, ssr	1	619	17V496	WIRE, jumper, counter lock	1
605	17V490	RELAY, 480/75 amp, ssr	3	620	103181	WASHER, lock ext	6
606	C19862	NUT, lock, hex	6	621*	16U530	MODULE, system, surge protector	1
607	-----	SCREW, machine, ph, 8 x 3/8	6	622*	17V505	ADAPTOR, din, MOV block	1
608	108296	SCREW, mach, hex wash hd	4	623*	105334	NUT, lock, hex	1
609	117666	TERMINAL, ground	1				
610	115942	NUT, hex, flange head	1				
611	113504	NUT, keps, hex hd	3				
613	17V492	HARNESS, wire, low current, ac	1				

\* Only included with 350-415 V, 3-Phase/Neutral models. See **Models**, page 3.

Breaker Module



Ref.	Part	Description	Qty.
651	255045	BLOCK, clamp end	4
652	126382	BLOCK, terminal	5
653	17V521	CIRCUIT, breaker, 2 P, 40 A, UL489	3
654	262654	RELAY, contactor, 65 A, 3 P	2
655	17V522	CIRCUIT, breaker, 2 P, 20 A, UL489 (GH-2 Series A only)	1
	17G724	CIRCUIT, breaker, 3 P, 20 A, UL489 (GH-2 Series B and later, GH-4)	1
656	17V540	CIRCUIT, breaker, single, 50 A	1
657	-----	COVER, end, fuse block	1
658	255043	HOLDER, fuse terminal block, 5 x 20 mm	2
659	17G667	FUSE, 2.5 amp, 250 V, time-lag	2
660	126453	POWER SUPPLY, 24 V	1
661	17V523	RELAY, cradle	1

Ref.	Part	Description	Qty.
662*	17V524	RELAY, 24 V	1
663	126383	COVER, end	1
664	255042	BLOCK, terminal	4
665	-----	COVER, end, terminal block	1
666	-----	RAIL, mounting, din	1
667	255046	BLOCK, terminal ground	1
668	17V525	CLIP, relay, retaining	1
669	-----	TERMINAL, block markers	1

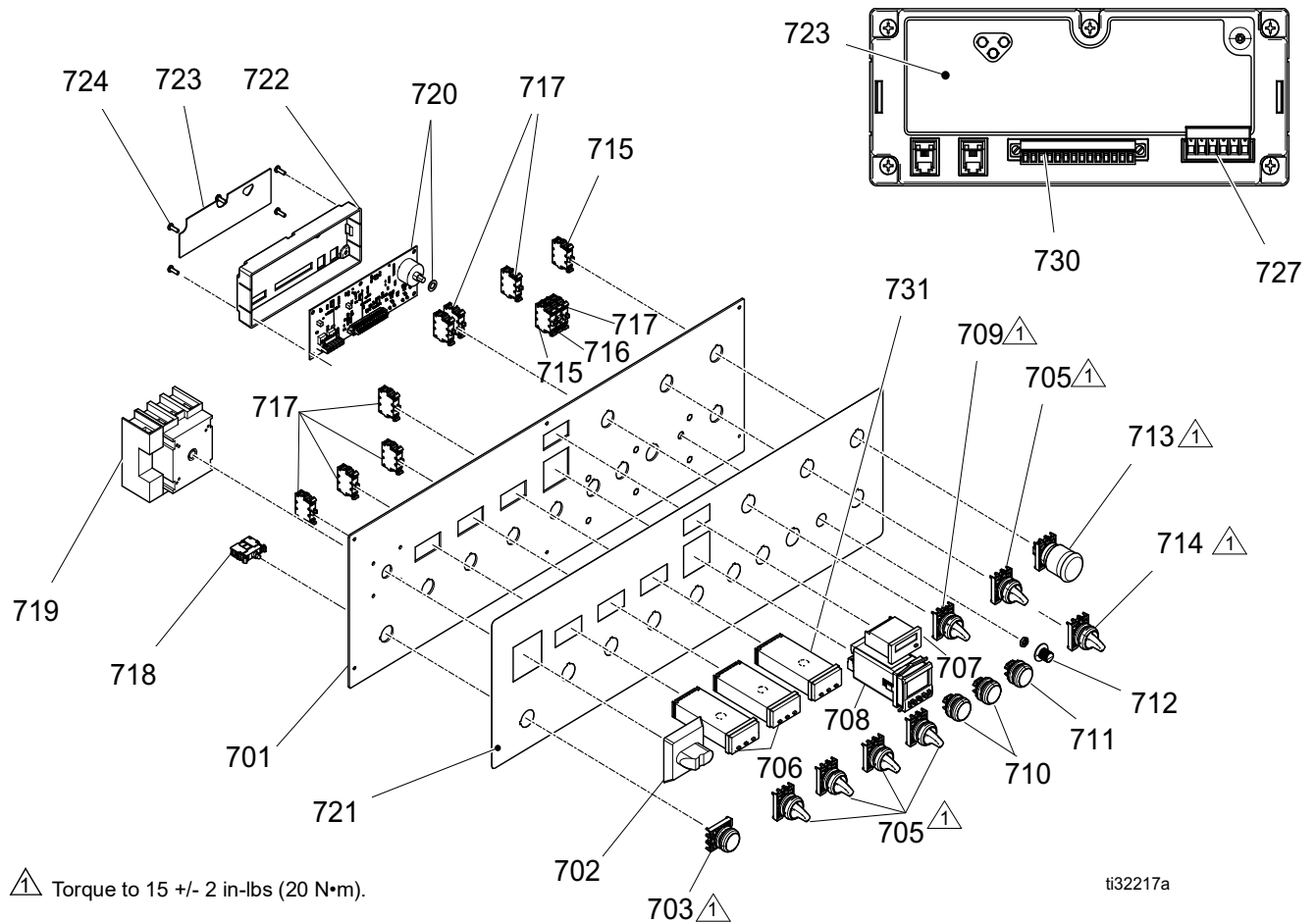
\* See Notice.

NOTICE

Do not use tools to insert, remove, or inspect the relay. Tool use may cause damage to the relay (662). Instead, remove the relay using the included plastic ejector.



# Control Panel



Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
701	17V467	PANEL, front, Gusmer, painted	1	717	17V479	CONTACT, block, 1n0	8
702	123967	KNOB, operator disconnect	1	718	17V480	MODULE, LED, 240 V, green	1
703	17V468	LIGHT, indicating, green lens	1	719	24R736	SWITCH, disconnect, door mounted	1
705	17V469	SWITCH, 2 position	5	720*	-----	BOARD, assembly, pressure monitor	1
706	130287	CONTROL, temperature, a-b	2	721	17V481	LABEL, operations	1
707	17V470	COUNTER, LED display	1	722*	-----	COVER, pressure board	1
708	17V485	COUNTER, count down	1	723*	-----	LABEL, pressure board	1
709	17V471	SWITCH, 3 position	1	724*	-----	SCREW, mach, pan head	5
710	17V472	LIGHT, indicating, blue lens	2	727	17V482	CONNECTOR, plug, 5.08 mm, 6 position	1
711	17V474	LIGHT, indicating, white lens	1	730	17V483	CONNECTOR, plug, 3.81 mm, 14 position	1
712*	-----	KNOB, switch, pressure monitor	1	731	17V484	CONTROL, temperature, hose	1
713	17V475	SWITCH, emergency stop	1				
714	17V476	SWITCH, momentary, 3 position, red	1				
715	17V477	CONTACT, block, 1nc	2				
716	17V478	INDICATOR, front mount, red, 12-30 V	1				

\* Parts included in Kit 17U244 (purchase separately).

# Performance Charts

Use this chart to help identify the proportioner that will work most efficiently with each mix chamber. Flow rates are based on a material viscosity of 60 cps.

**NOTICE**

To prevent system damage, do not pressurize the system above the line for the gun tip size being used.

## Foam Performance Chart

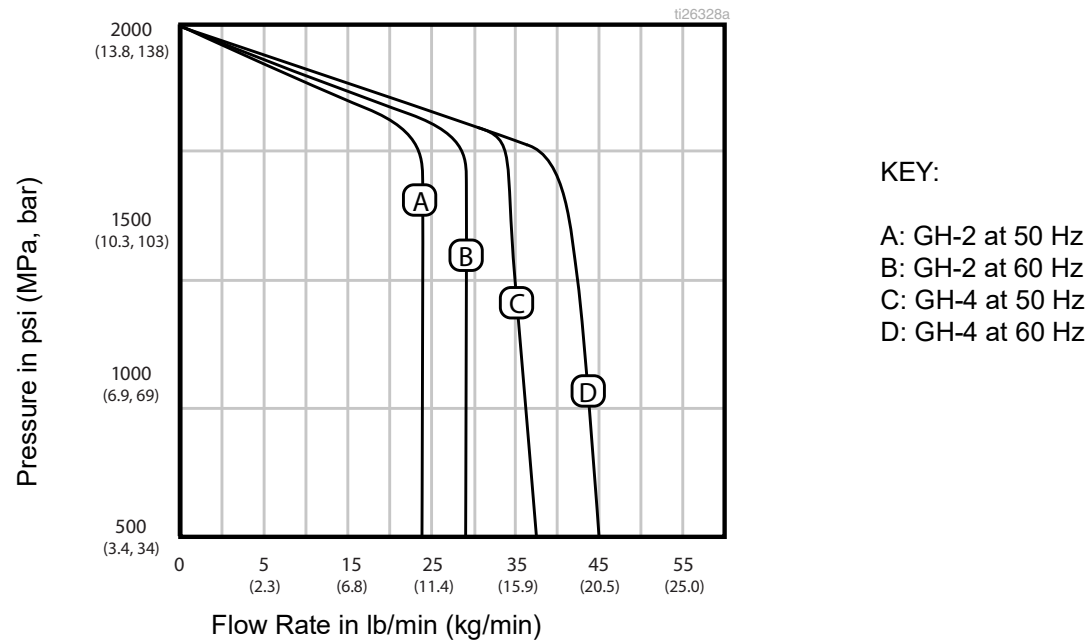
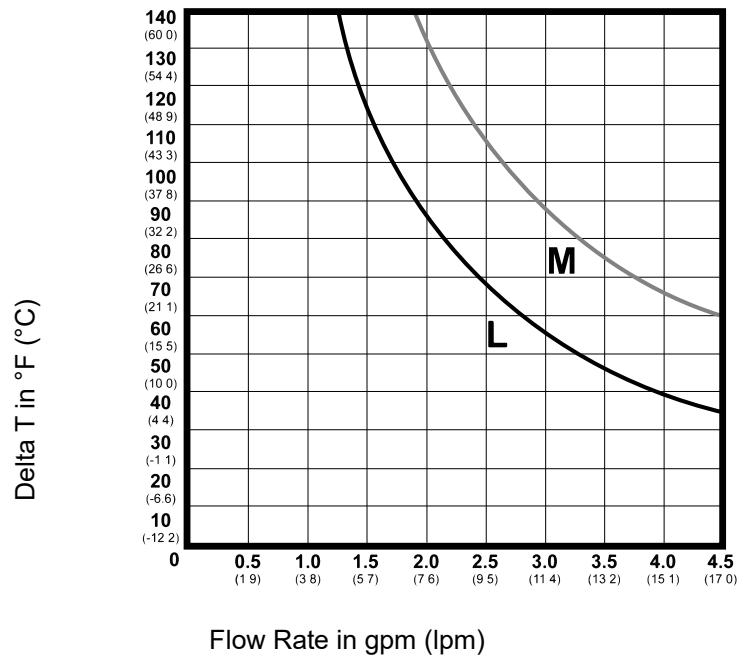


FIG. 78: GH-2 and GH-4 Foam Performance

# Heater Performance Chart



KEY:

L: 10.2 kW (GH-2 models only)

M: 15.3 kW (GH-4 models only)

FIG. 79: Heater Performance

# Electrical Schematics

## Wire Connection

Power Wiring		
Description	Terminal 1	Terminal 2
A Heater	TB1-2	RLY1-T3
A Heater	TB2-2	SSR1-T1
A Heater	CB1-2	SSR1-L1
A Heater	CB1-4	RLY1-L3
B Heater	CB2-2	SSR2-L1
B Heater	CB2-4	RLY1-L2
XFRMR	CB3-4	RLY1-L1
Motor	CB4-2	RLY2-L2
Motor	CB4-4	RLY2-L1
Motor	CB4-6	RLY2-L3
Hose	CB5-2	SSR3-L1
B Heater	TB7-2	RLY1-T2
B Heater	TB8-2	SSR2-T1
A Heat On/Off	SW1-4	SSR1-A1
A SSR+	TCM1-5	SW1-3
A SSR-	TCM1-6	SSR1-A2
B Heat On/Off	SW2-4	SSR2-A1
B SSR+	TCM2-5	SW2-3
B SSR-	TCM2-6	SSR2-A2
Hose On/Off	SW3-4	SSR3-A1
Hose SSR+	TCM3-5	SW3-3
Hose SSR-	TCM3-6	SSR3-A2

Low Voltage Wiring				
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4
GND	PM-7	PS1-(V-)	RLY3-A1	
24V	PM-8	SW4-3	SW8-1	RLY3-A2
Park	PM-9	SW6-B4		
Pump	PM-10	CTR1-11		
GND	PM-11	SW6-B3	SW6-A3	SW5-X1
GND	PM-12	CTR2-4	CTR2-6	CTR1-15
COUNT1	PM-13	CTR1-4		
COUNT2	PM-14	CTR2-1		
E-STOP	SW8-2	SW5-1		
24V	RLY3-24	TB6-2	SW5-X2	SW5-4
OVERTEMP	TB3-2	SW5-2		
24V	PS1-(V+)	SW5-3	RLY3-21	
COUNTDOWN	SW6-A4	CTR1-13		
COUNTDOWN	SW4-4	CTR1-14		
COUNTDOWN	CTR1-1	CTR1-6		

Line Voltage, Low Current Wiring								
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5	Terminal 6	Terminal 7	Terminal 8
L1-FUSED	TCM1-2	TCM2-2	TCM3-2	PM-17	PS1-N	F1-2	RLY1-A2	RLY2-A2
CONTROL POWER	TCM1-1	TCM2-1	TCM3-1	PM-16	SW7-3	RLY3-14	RLY1-A1	
MOTOR ON/OFF	SW7-4	RLY2-A1						
L2-FUSED	PS1-L	F2-2	RLY3-11					

Single Phase, 230 V							
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5	Terminal 6	Terminal 7
L1	CB1-1	DIS1-T1	CB2-1	CB3-1	CB4-1	F1-1	LED1-X1
L2	CB1-3	DIS1-T2	CB2-3	CB3-3	CB4-3	F2-1	LED1-X2

Three Phase, 230 V						
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5	Terminal 6
L1	CB1-1	DIS1-T1	CB2-1	CB4-5		
L2	CB1-3	DIS1-T2	CB3-1	CB4-1	F1-1	LED1-X2
L3	CB2-3	DIS1-T3	CB3-3	CB4-3	F2-1	LED1-X1

Three Phase with Neutral, 400 V, GH-2							
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5	Terminal 6	Terminal 7
L1	CB1-1	DIS1-T1					
L2	CB2-1	DIS1-T2					
L3	CB3-1	DIS1-T3	CB4-1	F1-1	LED1-X2		
N	CB1-3	DIS1-N	CB2-3	CB3-3	CB4-3	F2-1	LED1-X1

Three Phase with Neutral, 400 V, GH-4					
Description	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5
L1	CB1-1	DIS1-T1	CB4-5		
L2	CB2-1	DIS1-T2	CB4-3		
L3	CB3-1	DIS1-T3	CB4-1	LED1-X2	
N	CB1-3	DIS1-N	CB2-3	CB3-3	LED1-X1

Heater Wiring

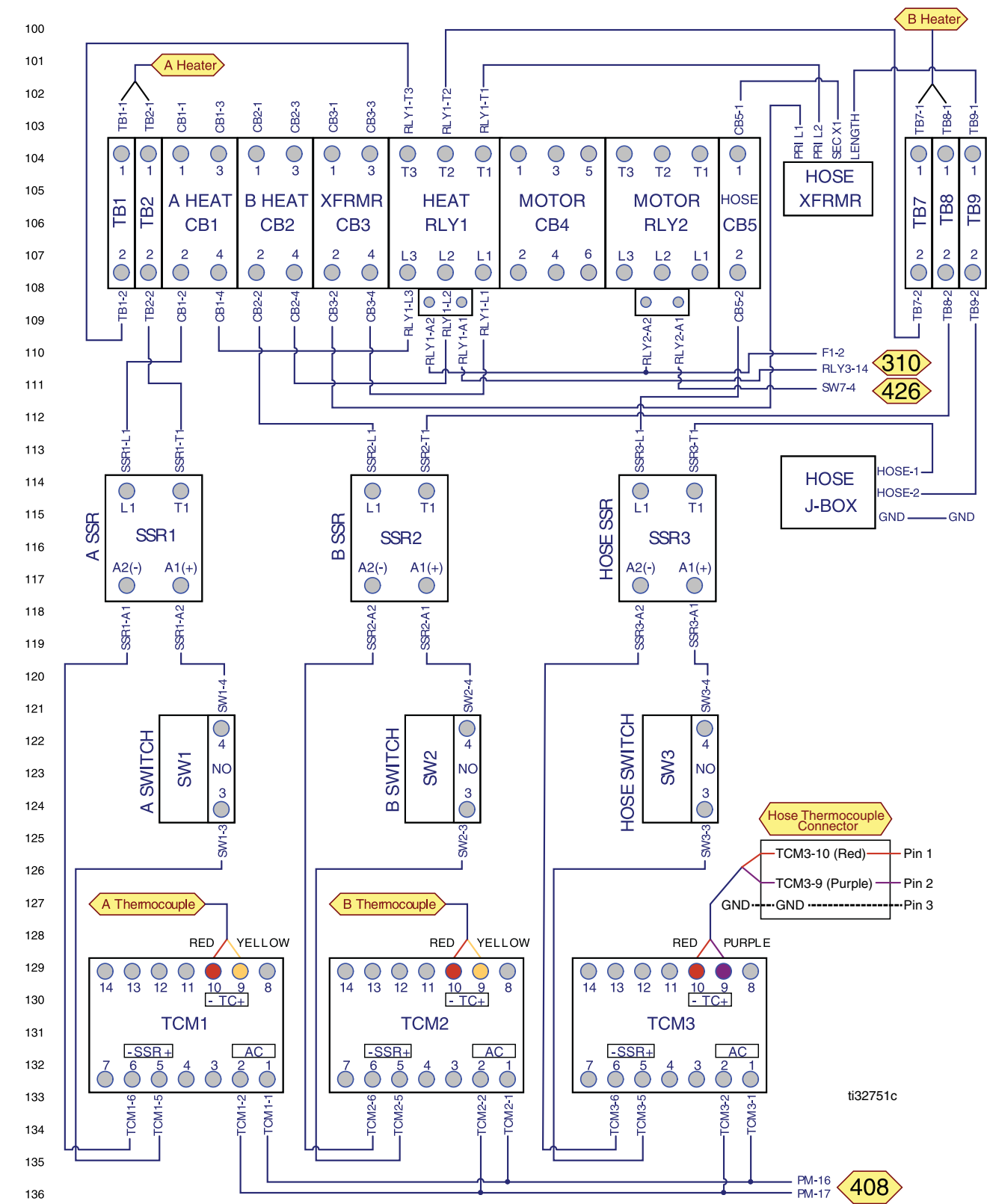
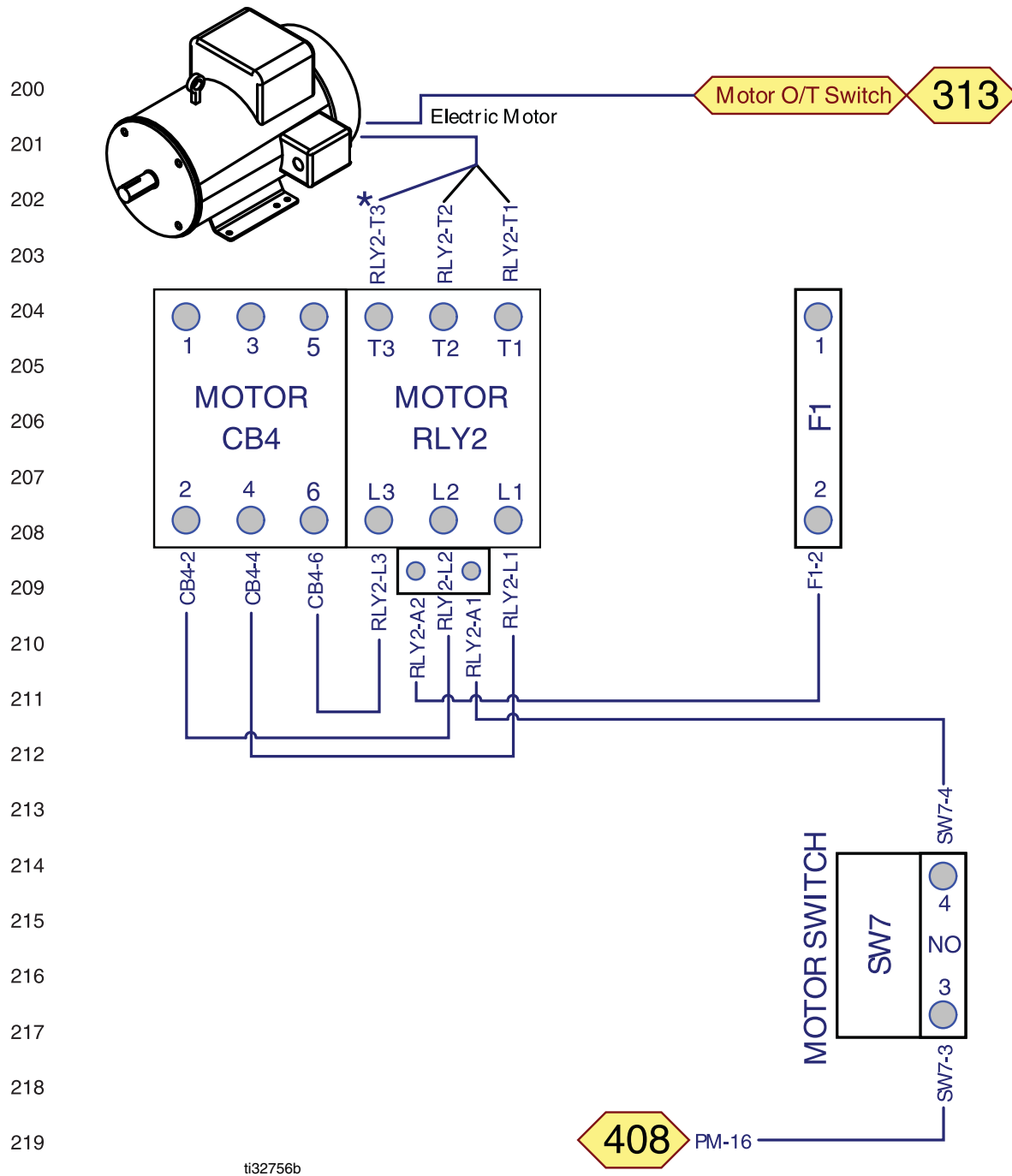


Fig. 80

# Motor Relay Wiring



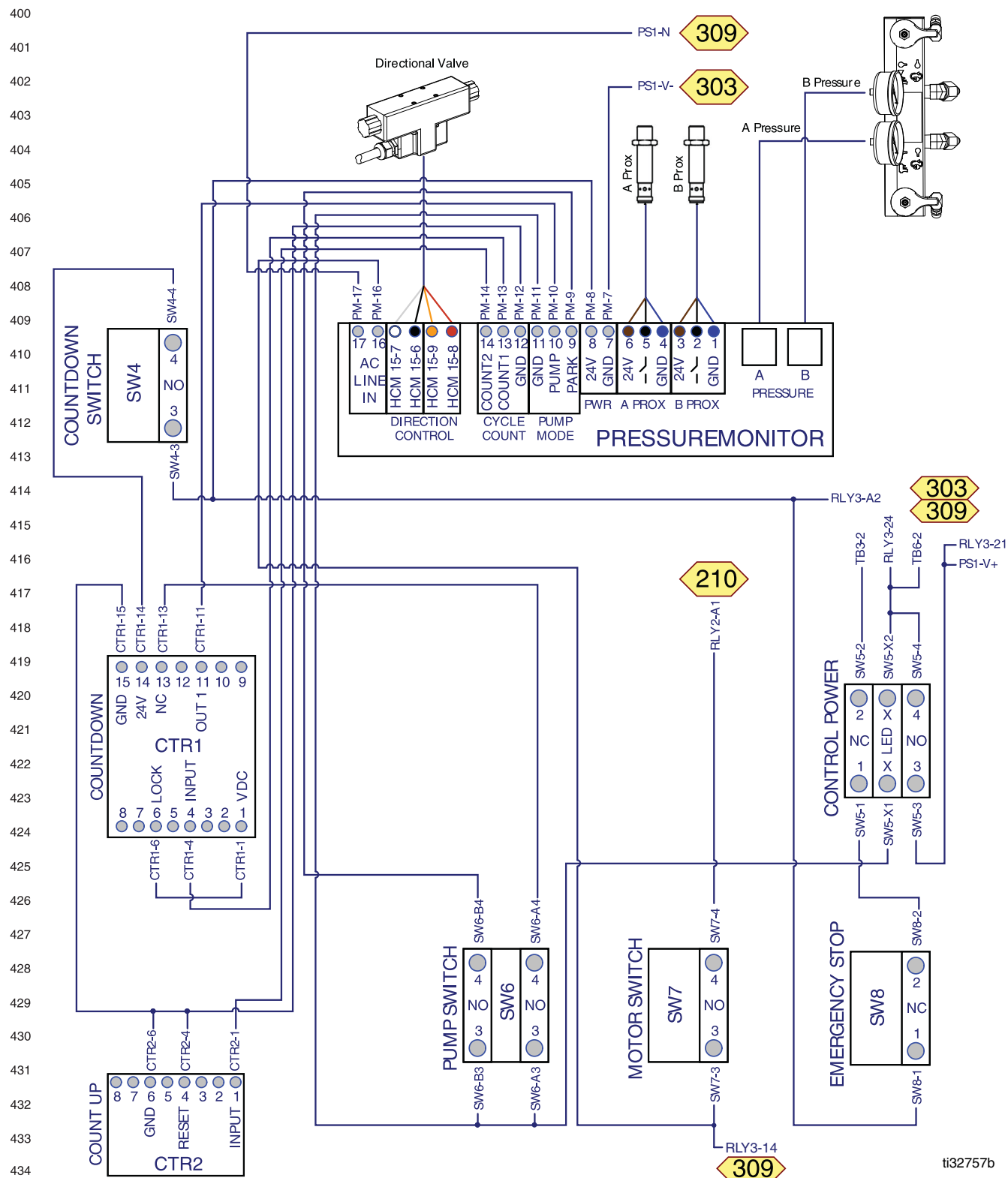
**FIG. 81**

\* RLY2-T3 is only present on GH-4 models.





# Pump Control Wiring



ti32757b

FIG. 83

Single Phase Power Wiring

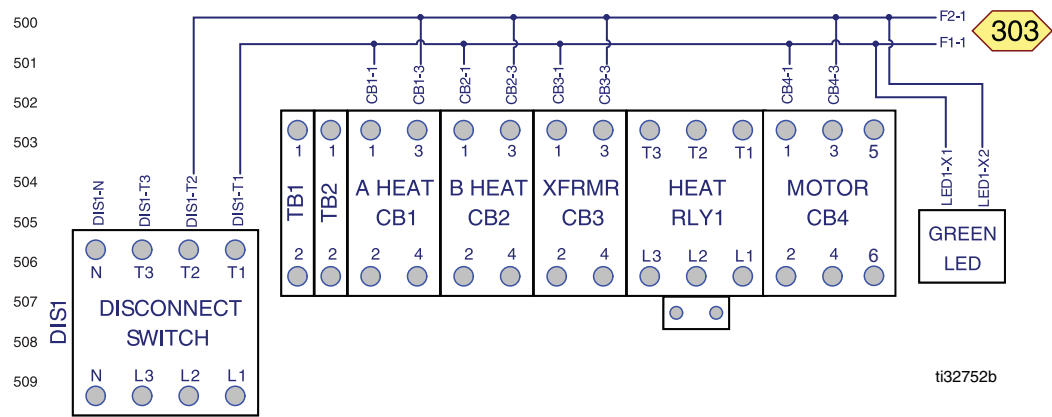


FIG. 84

NOTE: Used with harness 17V465.

Three Phase (230 V) Power Wiring

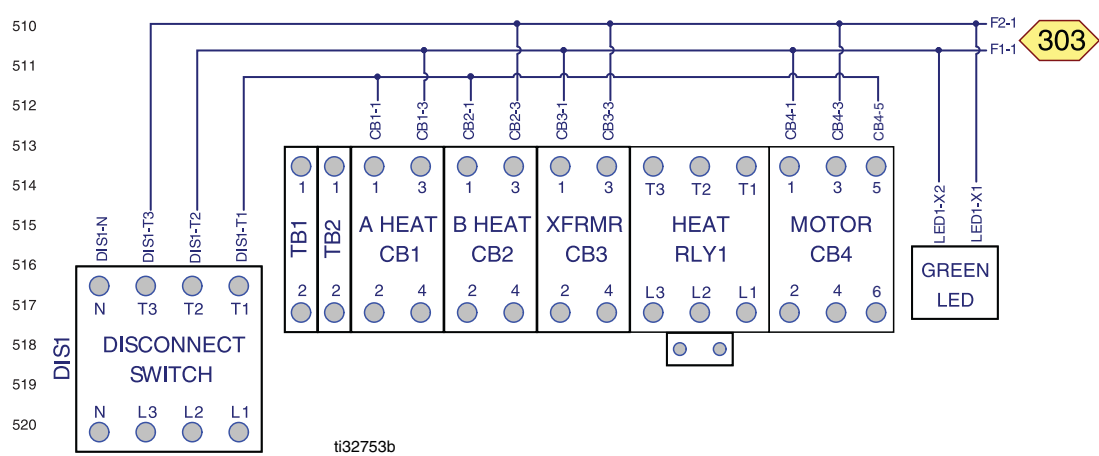
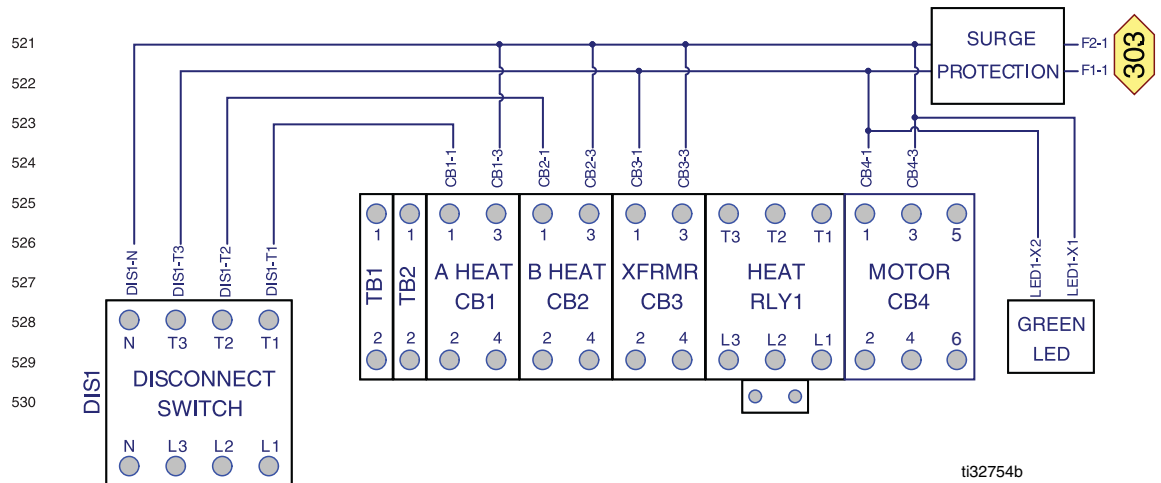


FIG. 85

NOTE: Used with harness 17H961 (GH-4 and GH-2 Series B and later).

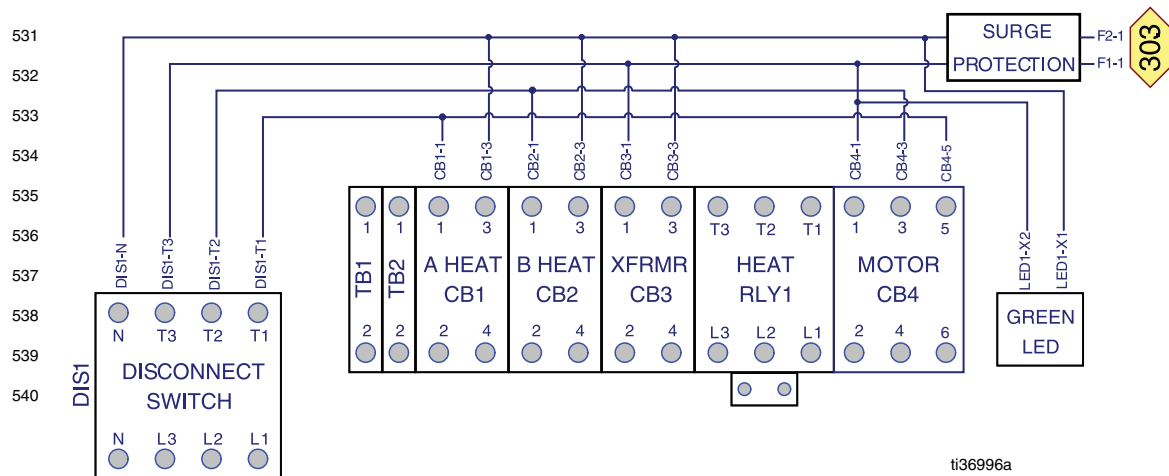
## GH-2 Three Phase (400 V) Power Wiring



**FIG. 86**

**NOTE:** Used with harness 17V736.

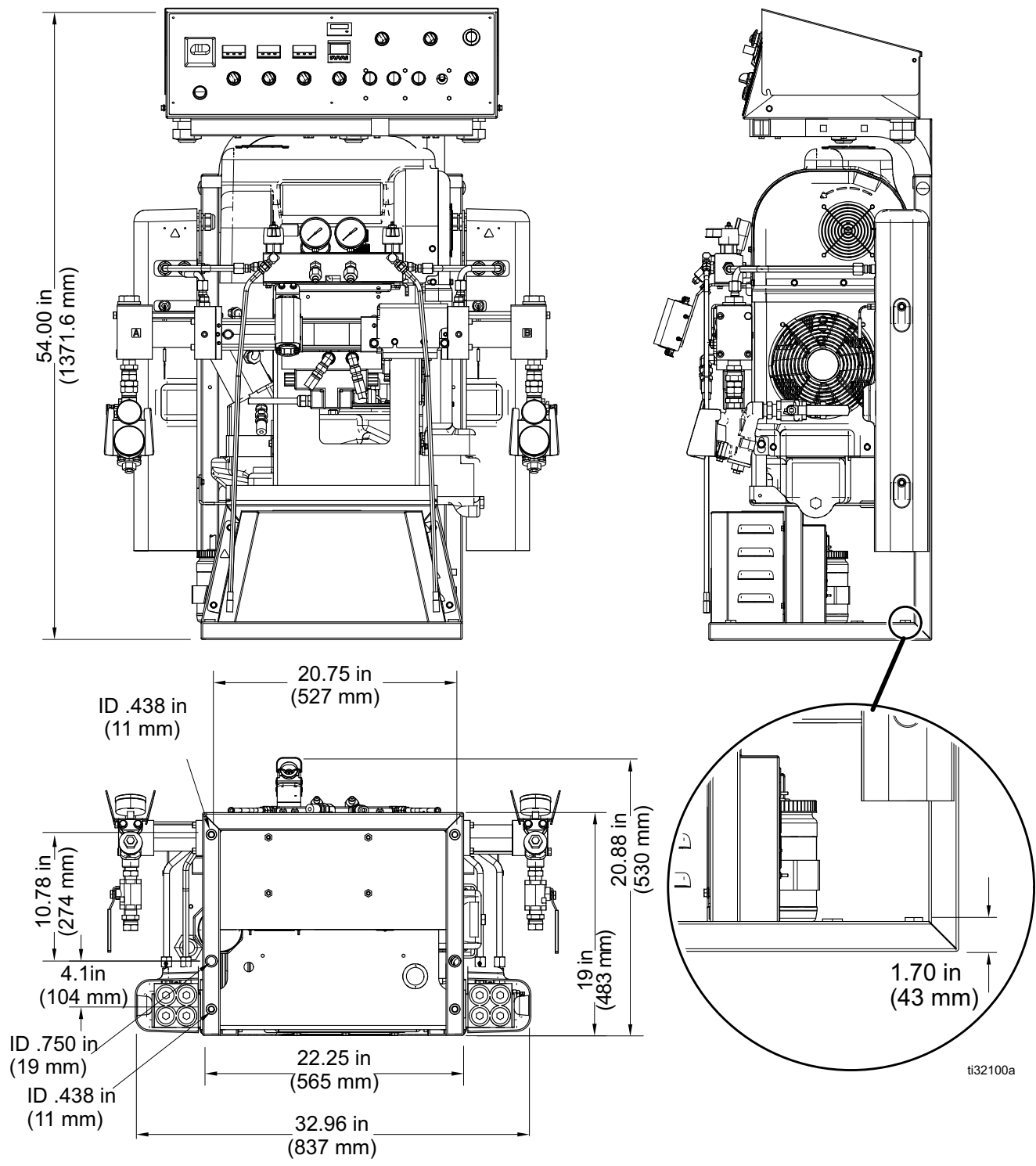
## GH-4 Three Phase (400 V) Power Wiring



**FIG. 87**

**NOTE:** Used with harness 17H960.

# Dimensions



# Technical Specifications

Gusmer Hydraulic Proportioner		
	US	Metric
Maximum Fluid Working Pressure for Bare Proportioners		
GH-2	2000 psi	13.8 MPa, 138 bar
GH-4		
Minimum Fluid Working Pressure for Bare Proportioners		
GH-2	700 psi	4.8 MPa, 48 bar
GH-4		
Fluid : Oil Pressure Ratio		
GH-2	1.64 : 1	
GH-4	1.91 : 1	
Fluid Inlets		
Component A (ISO)	3/4 npt(f), 300 psi maximum	3/4 npt(f), 2.07 MPa, 20.7 bar maximum
Component B (RES)	3/4 npt(f), 300 psi maximum	3/4 npt(f), 2.07 MPa, 20.7 bar maximum
Fluid Outlets		
Component A (ISO)	#8 1/2 in. JIC, with #5 5/16 JIC adapter	
Component B (RES)	#10 5/8 in. JIC, with #6 3/8 in. JIC adapter	
Fluid Circulation Ports		
1/4 npsm(m)	250 psi	1.75 MPa, 17.5 bar
Maximum Fluid Temperature		
	190°F	88°C
Maximum Output (10 weight oil at ambient temperature)		
GH-2	28 lb/min (60 Hz)	13 kg/min (60 Hz)
GH-4	45 lb/min (60 Hz)	20 kg/min (60 Hz)
Output per Cycle (A and B)		
GH-2	0.074 gal.	0.28 liter
GH-4	0.063 gal.	0.24 liter
Supply Voltage Tolerance		
230 V nominal, 1 phase	200-240 V, 50/60 Hz	
230 V nominal, 3 phase	200-240 V, 50/60 Hz	
400 V nominal, 3 phase	350-415 V, 50/60 Hz	

Gusmer Hydraulic Proportioner		
	US	Metric
Amperage Requirement (Phase)		
See the models listing in the manual.		
Heater Power (A and B heaters total)		
See the models listing in the manual.		
Hydraulic Reservoir Capacity		
	3.5 gal.	13.6 liters
Recommended Hydraulic Fluid		
	Citgo, A/W Hydraulic Oil, ISO Grade 46	
Weight		
GH-2 (10 kW)	585 lb	265 kg
GH-4 (15 kW)	625 lb	283 kg
Wetted Parts		
	Aluminum, stainless steel, zinc-plated carbon steel, brass, carbide, chrome, fluoroelastomer, PTFE, ultra-high molecular weight polyethylene, chemically resistant o-rings	
Noise (dBa)		
Sound power	90.2 dB(A)	
Sound pressure	82.6 dB(A) @ 70 psi (0.48 MPa, 4.8 bar)	
Sound pressure measured 3.28 feet (1 meter) from equipment.		
Sound power measured per ISO-9614-2.		
Notes		
All trademarks or registered trademarks are the property of their respective owners.		

## California Proposition 65

### CALIFORNIA RESIDENTS

 **WARNING:** Cancer and reproductive harm – [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov).

# Graco Extended Warranty

Graco warrants all equipment referenced in this document which is 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. Graco will, for a period as defined in the table below 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.

Part	Description	Warranty Period
17U244	Pressure Monitor Kit	120 Months (10 Years)
	All Other Parts	12 Months

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

For the latest information about Graco products, visit [www.graco.com](http://www.graco.com).

For patent information, see [www.graco.com/patents](http://www.graco.com/patents).

TO PLACE AN ORDER, contact your Graco distributor or call to identify the nearest distributor.

Phone: 612-623-6921 or Toll Free: 1-800-328-0211, Fax: 612-378-3505

*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.*

Original instructions. This manual contains English. MM 3A5376

**Graco Headquarters:** Minneapolis

**International Offices:** Belgium, China, Japan, Korea

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[www.graco.com](http://www.graco.com)  
Revision L, November 2024