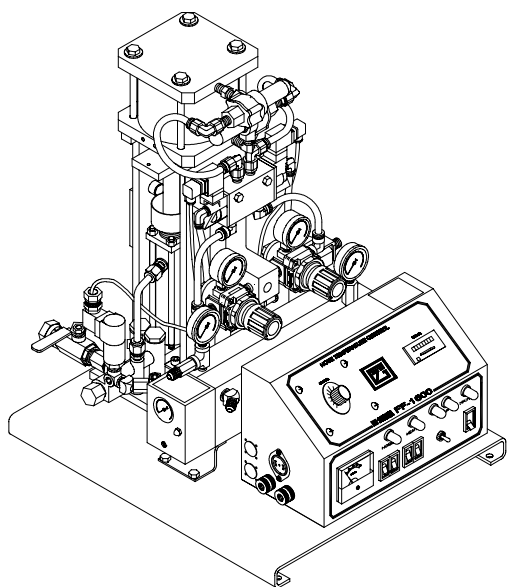


# **GUSMER**<sup>®</sup> CORPORATION

*"Success through Unity"*



## ***Model FF-1600 Proportioning Unit***

### ***Operating Manual 17942-1***

***November 20, 2002***

***Issue 7***

#### **GUSMER CORPORATION<sup>®</sup>**

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**NOTICE:** This manual contains important information about your GUSMER equipment. Read and retain for future reference.

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## **WARRANTY**

Gusmer Corporation (Gusmer) provides a limited warranty to the original purchaser (Customer) of Gusmer manufactured parts and equipment (Product) against any defects in material or workmanship for a period of one year from the date of shipment from Gusmer facilities.

In the event Product is suspected to be defective in material or workmanship, it must be returned to Gusmer, freight prepaid. If Product is found to be defective in material or workmanship, as determined solely by Gusmer, Gusmer will issue full credit to Customer for the freight charges incurred in returning the defective Product, and either credit will be issued for the replacement cost of the Product or a replacement part will be forwarded no-charge, freight prepaid to Customer.

This warranty shall not apply to Product Gusmer finds to be defective resulting from: installation, use, maintenance, or procedures not accomplished in accordance with our instructions; normal wear; accident; negligence; alterations not authorized in writing by Gusmer; use of "look alike" parts not manufactured or supplied by Gusmer; or Product used in conjunction with any other manufacturer's pumping or proportioning equipment. Further, the terms and conditions of this warranty shall not apply to services or repairs made to Product by any third party not authorized in writing by Gusmer. For such Product, a written estimate will be submitted to Customer at a nominal service charge, itemizing the cost for repair. Disposition of Product will be done in accordance with the terms stated on the written estimate.

The warranty provisions applied to product that are not manufactured by Gusmer will be solely in accordance with the warranty provided by the original manufacturer of the product.

GUSMER MAKES NO WARRANTY WHATSOEVER AS TO THE MERCHANTABILITY OF, OR SUITABILITY FOR, ITS PRODUCT TO PERFORM ANY PARTICULAR PURPOSE. CREDIT FOR, OR REPLACEMENT OF, PRODUCT DEFECTIVE IN MATERIAL OR WORKMANSHIP SHALL CONSTITUTE COMPLETE FULFILLMENT OF GUSMER OBLIGATIONS TO CUSTOMER. NO OTHER WARRANTY, EXPRESS OR IMPLIED ON ANY PRODUCT IT MANUFACTURES AND/OR SELLS, WILL BE RECOGNIZED BY GUSMER UNLESS SAID WARRANTY IS IN WRITING AND APPROVED BY AN OFFICER OF GUSMER.

Under no circumstances shall Gusmer be liable for loss of prospective or speculative profits, or special, indirect, incidental or consequential damages. Further, Gusmer shall have no liability for any expenses including, but not limited to personal injury or property damage resulting from failure of performance of the product, use of the product, or application of the material dispensed through the product. Any information provided by Gusmer that is based on data received from a third source, or that pertains to product not manufactured by Gusmer, while believed to be accurate and reliable, is presented without guarantee, warranty, or responsibility of any kind, express or implied.

Gusmer through the sale, lease, or rental of Product in no way expresses or implies a license for the use of, nor encourages the infringement of any patents or licenses.

To insure proper validation of your warranty, please complete the warranty card and return it to Gusmer within two weeks of receipt of equipment.

Revised 11/12/98



## **GENERAL SAFETY INFORMATION**

It is necessary to understand and follow the instructions in this manual to ensure proper and safe operation of the equipment.

As with most mechanical equipment, certain safety precautions must be taken when the equipment discussed in this manual is operated or serviced. Severe bodily injury or damage to equipment and property may result if the instructions and precautions listed throughout this manual are not followed.

Needless to say, sufficient guidelines cannot be developed to eliminate the need for good common sense in the use and servicing of this equipment, and in the use and application of the products, this equipment has been designed to process. Users of this equipment must therefore, make their own determination as to the suitability of the information contained in this manual to their specific operation and requirements. There should be no assumption made that the safety measures and instructions contained herein are all-inclusive, and that other safety measures may not be required for specific use or application.

The following safety guidelines are generally applicable to the safe and efficient use of the equipment.

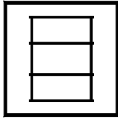
### ***Acceptable Equipment Uses***

The equipment is designed for the dispensing of polyurethane foams, two-component coating systems, and some two-component epoxy systems, specifically polyureas. Under no circumstances should any acid or corrosive chemicals be used in the unit. Consult GUSMER if there is any doubt about the compatibility of the chemical system to be used in this equipment.

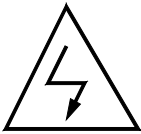
Any use of this equipment other than as indicated above constitutes misuse unless express written approval is obtained from GUSMER.

## Operational Safety Procedures

This safety information will not be repeated in the text of this manual. The symbols pertaining to this information will appear where appropriate to alert the operator to potential hazards.



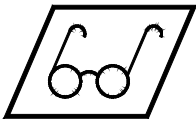
**Solvents and Chemicals**



**High Voltage**



**High Pressure**



**Personal Protective Equipment**



**High Temperature**



**Warning**

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**WARNING:** THE SOLVENTS AND CHEMICALS USED WITH THIS EQUIPMENT EXPOSE THE OPERATOR TO CERTAIN HAZARDS. ADEQUATE PERSONAL PROTECTIVE MEASURES MUST BE TAKEN SO AS TO AVOID EXCEEDING THE THRESHOLD LIMIT VALUE (TLV) OF THE PRODUCTS BEING USED, AS ESTABLISHED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) OR OTHER QUALIFIED AGENCY. OBTAIN INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING FROM THE SUPPLIER OF SUCH CHEMICALS.

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**WARNING:** TO PREVENT SERIOUS BODILY INJURY FROM ELECTRICAL SHOCK, NEVER OPEN THE ELECTRIC CONSOLES OR OTHERWISE SERVICE THIS EQUIPMENT AND/OR EQUIPMENT USED WITH IT BEFORE SWITCHING OFF THE MAIN POWER DISCONNECT AND INTERRUPTING SUPPLY VOLTAGE AT THE SOURCE. THE ELECTRICAL SERVICE MUST BE INSTALLED AND MAINTAINED BY A QUALIFIED ELECTRICIAN.

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**WARNING:** THIS EQUIPMENT HAS OR IS USED WITH EQUIPMENT THAT HAS HYDRAULIC COMPONENTS CAPABLE OF PRODUCING UP TO 3500 PSI. TO AVOID SERIOUS BODILY INJURY FROM HYDRAULIC EJECTION OF FLUID, NEVER OPEN ANY HYDRAULIC CONNECTIONS OR SERVICE HYDRAULIC COMPONENTS WITHOUT BLEEDING ALL PRESSURES TO ZERO.

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**WARNING:** TO AVOID SERIOUS BODILY INJURY, PROPER PROTECTIVE GEAR MUST BE WORN WHEN OPERATING, SERVICING, OR BEING PRESENT IN THE OPERATIONAL ZONE OF THIS EQUIPMENT. THIS INCLUDES, BUT IS NOT LIMITED TO, EYE AND FACE PROTECTION, GLOVES, SAFETY SHOES, AND RESPIRATORY EQUIPMENT AS REQUIRED.

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**WARNING:** THIS EQUIPMENT HAS OR IS USED WITH EQUIPMENT THAT HAS HIGH TEMPERATURE COMPONENTS SUCH AS PRIMARY HEATERS AND HEATED HOSES. TO PREVENT SERIOUS BODILY INJURY FROM HOT FLUID OR HOT METAL, NEVER ATTEMPT TO SERVICE THE EQUIPMENT BEFORE ALLOWING IT TO COOL.

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**WARNING:** FAILURE TO READ AND FOLLOW THIS SAFETY INFORMATION MAY RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT FROM ONE OR MORE OF THE ABOVE LISTED HAZARDS.

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## DESCRIPTION

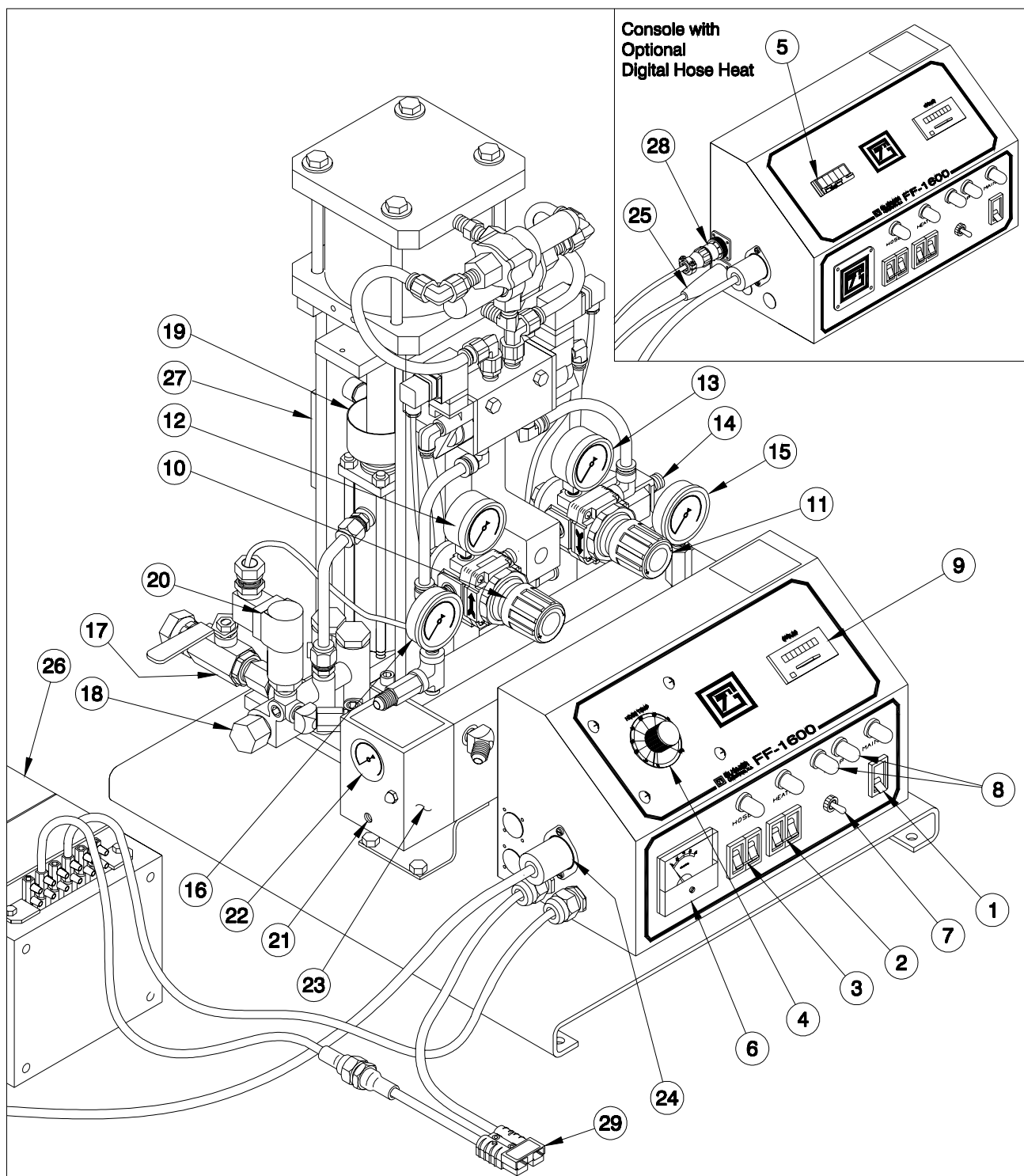


Figure 1. Model FF-1600 Proportioning Unit

1. **MAIN SWITCH** - Controls power to all circuits and must be ON for any function of the proportioning unit to operate.

Pilot light (White) - Indicates the Main Switch is ON.

2. **PRIMARY HEATER CIRCUIT BREAKER** - Controls and protects power to the primary heater; must be ON for the primary heater to operate.

Pilot light (Amber) - Controlled by the thermostat and indicates when lighted that the primary heater is in a heating cycle.

3. **HOSE HEATER CIRCUIT BREAKER** - Controls and protects the Low Voltage Power Pack; must be ON for the hose heater to operate.

Pilot light (Amber) - Indicates the Hose Heater Circuit Breaker is ON.

4. **HOSE HEAT POWER SET** - Controls the amount of power delivered to the hose heater. Adjust the power as required to maintain the desired hose temperature as shown on a hose thermometer.

5. **DIGITAL HOSE TEMPERATURE SELECTOR (See Inset Figure 1)** - Controls the temperature maintained by the hose heater. Set the selector to the desired temperature; from this point, the temperature control is completely automatic.

6. **HOSE HEATER AMMETER (*Manual Hose Heat Only*)** - Indicates the amount of heating power delivered to the hose heater.

7. **PUMP SWITCH** - Controls operation of the air drive system.

**OFF** - Air drive system is off.

**NORMAL** - Must be in this position for the proportioning pumps to operate.

**RETRACT** - Use this position for shutdown to stop the air motor at the bottom of the stroke with the Proportioning Pumps in the retracted position.

8. **PUMP DIRECTIONAL INDICATOR LIGHTS (Amber)** - Indicates the direction of the proportioning pump travel; both lights will be off when the Pump Switch is OFF or when either proportioning pump exceeds the designed operating pressure limit.

9. **COUNTER** - Records the cycle counts of the proportioning pumps; one cycle count equals two (2) strokes (one in each direction).

10. **DOWNSTROKE AIR PRESSURE REGULATOR** - Controls the air pressure available to the air motor on the downstroke.

11. **UPSTROKE AIR PRESSURE REGULATOR** - Controls the air pressure available to the air motor on the upstroke.

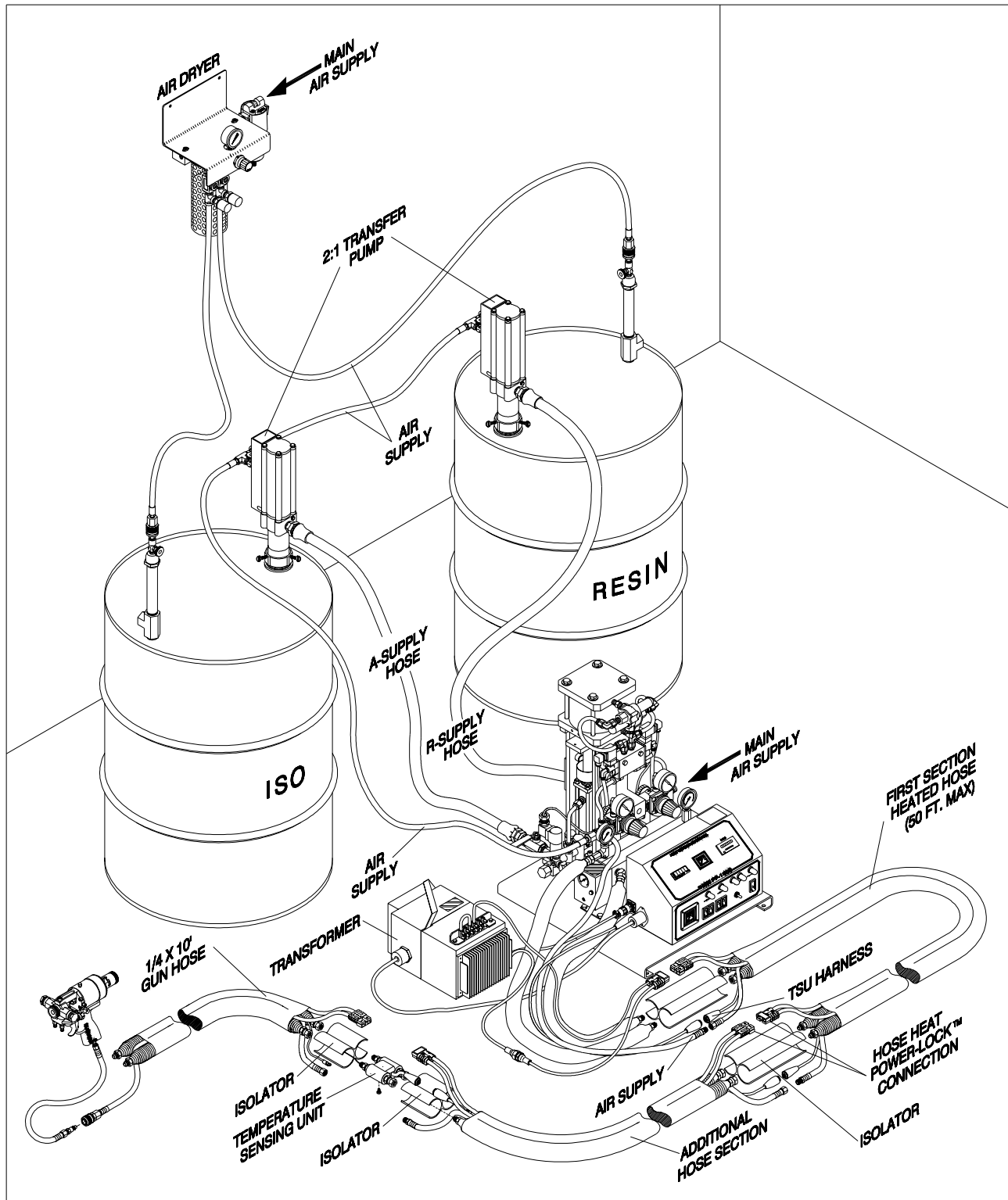
12. **DOWNSTROKE AIR PRESSURE GAUGE** - Indicates the air pressure in the air drive system during the downstroke.

13. **UPSTROKE AIR PRESSURE GAUGE** - Indicates the air pressure in the air drive system during the upstroke.



14. **MAIN AIR FILTER** - Filters the system air supply.
15. **RESIN PRESSURE GAUGE** - Indicates the pressure in the Resin proportioning system.
16. **ISOCYANATE PRESSURE GAUGE** - Indicates the pressure in the Isocyanate proportioning system.
17. **A-INLET BALL VALVE** (*R-Inlet Ball Valve on other side*)
18. **A-INLET FILTER SCREEN** (*R-Inlet Filter Screen on other side*)
19. **A-PACKING NUT, LUBE CUP** (*R-Packing Nut on other side*)
20. **PRESSURE LIMIT SWITCH** - Factory set to turn off the air drive system when the proportioning pump exceeds the designed operating pressure limit.
21. **PRIMARY HEATER TEMPERATURE CONTROL** - Controls the temperature of the primary heater. Turn clockwise to increase temperature; turn Counter clockwise to decrease temperature.  
  
Pilot light (amber) - will be ON when the control is calling for heat and OFF when it is not.
22. **PRIMARY HEATER DIAL THERMOMETER** - Indicates the temperature of the primary heater.
23. **THERMAL LIMIT SWITCH** (Located under cover not shown)- Interrupts power to the primary heater when the surface temperature approaches the designed operating temperature limit.
24. **LOW VOLTAGE POWER PACK RECEPTACLE**
25. **TSU EXTENSION ADAPTER RECEPTACLE** (*Digital Hose Heat Only*)  
(See Inset of Figure 1)
26. **LOW VOLTAGE POWER PACK** - Step down isolation transformer provides low voltage to the hose heater.
27. **AIR MOTOR REVERSING SWITCH** - energize and de-energize the air valve coils to reverse direction.
28. **TRANSFORMER HARNESS RECEPTACLE** (*Digital Hose Heat Only*)  
(See Inset of Figure 1)
29. **POWER-LOCK™ HOSE HEAT CONNECTION**- Connects power from the Transformer to the Heated Hoses.

## INITIAL MACHINE SETUP



**Figure 2. Typical FF-1600 Installation**  
(Digital Hose Heat Version Shown)



**WARNING:** PROPER PROTECTIVE GEAR AS SPECIFIED BY THE CHEMICAL AND SOLVENT SUPPLIER MUST BE WORN WHEN SERVICING OR OPERATING THIS EQUIPMENT. THIS INCLUDES BUT IS NOT LIMITED TO GLOVES, EYE PROTECTION, AND RESPIRATORY PROTECTION. REFER TO THE GENERAL SAFETY INFORMATION SECTION OF THIS MANUAL.

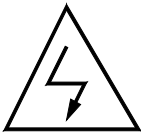
An Accessory Package is included with the unit and contains the following parts required for set-up:

- Tape Roll
- Isolator
- (2) Swivel Unions
- Isolation Hoses  
Blue – Resin  
Red – Isocyanate
- Temperature Sensing Unit (TSU) \*
- Parts Identification Manual
- Binder
- Warranty Card
- Hose Jumper Plug
- TSU Extension Adapter \*

\* Supplied with units equipped with Digital Hose Heat only.

Refer to Figure 2 for additional parts required for set-up.

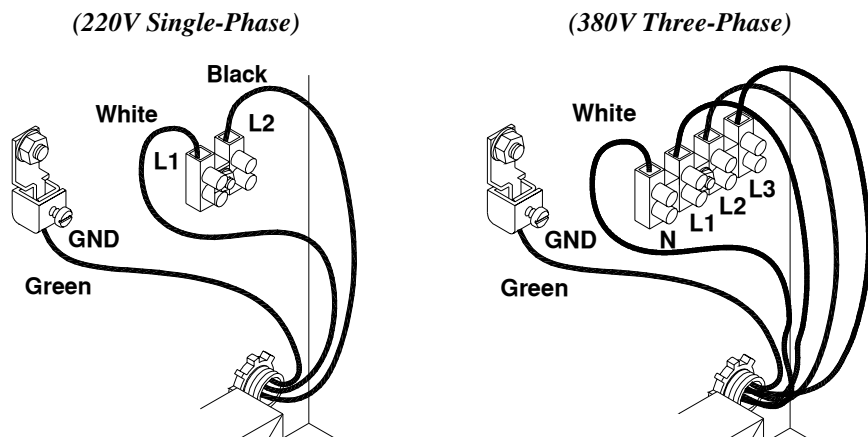
**IMPORTANT:** Complete and return the Warranty Validation Card within 2 weeks of receipt of equipment.



**WARNING:** THE PROPORTIONING UNIT ELECTRIC SERVICE MUST BE INSTALLED BY A QUALIFIED ELECTRICIAN ACCORDING TO NATIONAL ELECTRIC CODE AND ALL APPLICABLE LOCAL CODES.

**NOTE:**  
To obtain the best possible results, the power source must be capable of meeting the electrical requirements specified on the nameplate and must be provided with a dedicated fuse disconnect.

1. Remove and retain four (4) screws from the Console Cover. Open the cover.
2. Connect the Main Power Cord to the electrical console using wire size #10 or larger. (Not supplied) (See Figure 3)
  - a) Feed the power cord through the strain relief in the back of the console and connect the power leads to L1 and L2 (220V) –or– L1, L2, L3, and N (380V).
  - b) Connect the ground wire to the ground lug.



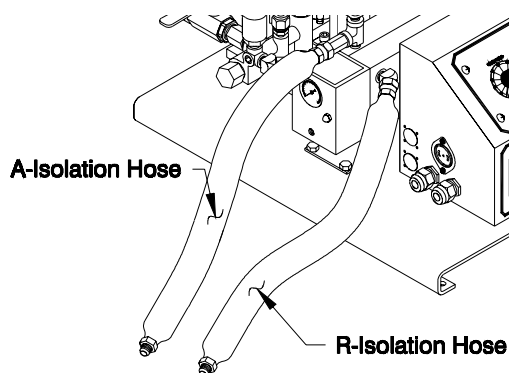
**Figure 3 Main Power Connections**

3. Set up the supply as follows:
  - a) Connect the R- (Resin) supply to the R-Inlet 3/4 FPT (Swivel) Fitting.
  - b) Connect the A- (Isocyanate) supply to the A-Inlet 1/2 FPT (Swivel) Fitting.
  - c) Connect the air supply to the 1/4 MPT nipple on the 2:1 Transfer Pump. Remove the cap to access it.
4. Connect the Main Air Supply to the Proportioning Unit. The Main Air Inlet at the Air Filter requires a 3/8 NPT fitting. (See Item 14 on page 9)

**IMPORTANT:** The Main Air Supply must be clean and free of contaminants. A minimum of 3/8-inch inside diameter air line (not supplied) should be used to deliver the air supply to the Proportioning Unit. A Main Air Shutoff Valve to the Proportioning Unit is recommended.

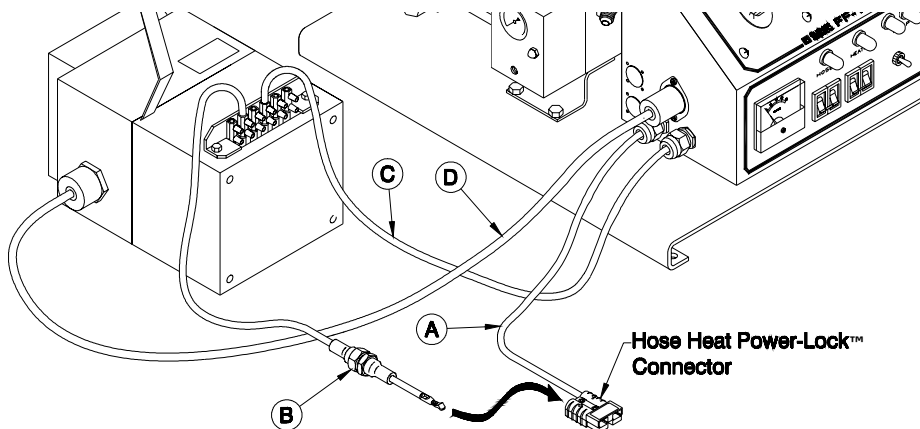
5. Connect the Isolation Hoses to the Primary Heater (see Figure 4).

**IMPORTANT:** The Resin hoses are color-coded blue and Isocyanate hoses are color-coded red for easy identification. In addition, the Resin and Isocyanate hose fittings are different sizes, making it virtually impossible to improperly connect the hoses.



**Figure 4. Isolation Hoses**

6. Connect the Transformer to the FF-1600 as follows:
  - a) Manual Hose Heat Machines Only:
    - 1) Plug the Transformer Wire with inline fuse (B) into the Hose Heat Power-Lock™ Connector on the end of the Console Wire (A).



**Figure 5. Transformer Connections**

- 2) Connect the second Console Wire (C) to the Transformer terminal block (see Figure 13 on page 18 to set correct hose heat voltage).
- 3) Connect the Power Cord (D) from the Power Pack to the Electric Console. Twist the plug to lock it into the receptacle.

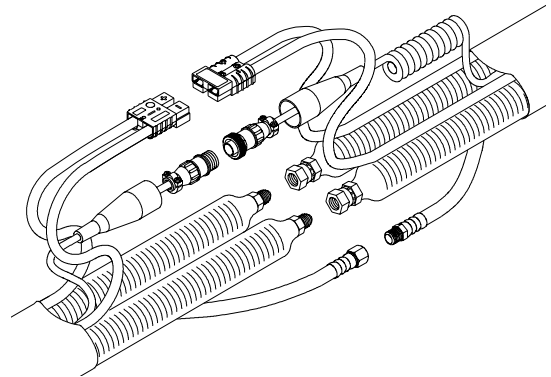
## b) Digital Hose Heat Machines Only (see Figure 2):

- 1) Connect the Harness from the Power Pack to the receptacle on the Electric Console.
- 2) Connect the Power Cord from the Power Pack to the Electric Console. Twist the plug to lock it into the receptacle.

## 7. Connect the heated hose assemblies as follows:

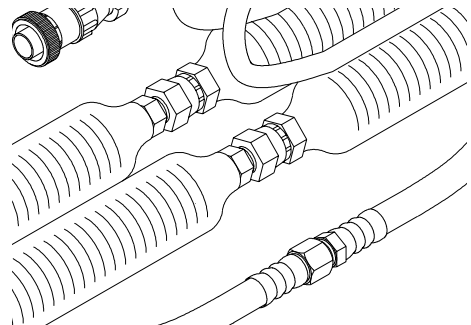
**IMPORTANT:** Be sure to make proper hose connections. The connection points are a potential source of chemical and air leaks and are susceptible to damage from scuffing and snagging on abrasive surfaces. A liberal amount of duct tape can be used in this area to make the bundle as compact as possible. Gusmer strongly recommends installing the optional scuff jacket to protect the hose insulation and TSU extension from damage.

- a) Lay out the heated hose assemblies as shown (see Figure 6).
- A- (Isocyanate) hoses are color-coded RED.
- R- (Resin) hoses are color-coded BLUE.



**Figure 6. Hose Connection Step (a)**

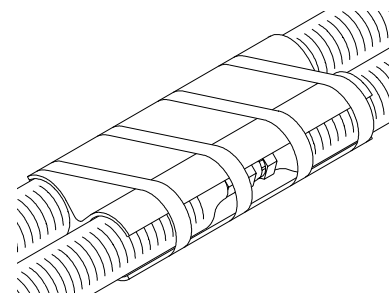
- b) Connect the Heated Hoses to the Isolation Hoses. Take care not to cross-thread or over-tighten the fittings, ensuring a leak-proof chemical connection.
- c) Connect the Air Hoses and tighten the fittings with open-end wrenches.



**Figure 7. Hose Connection Step (b & c)**

- d) Tape the Isolator securely in place between the hydraulic fittings (see Figure 8).

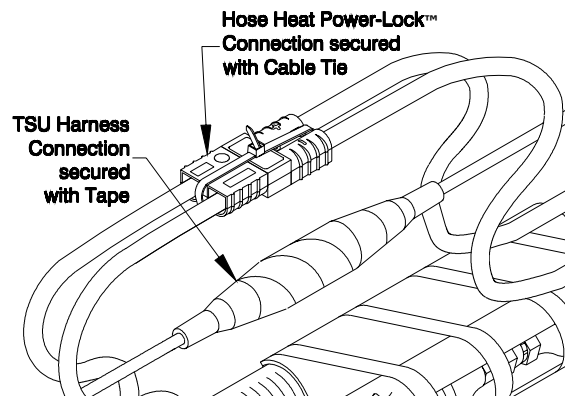
**IMPORTANT:** Always install the Isolator to prevent damage to the fittings.



**Figure 8. Hose Connection Step (d)**

See Figure 9 for Steps e) and f).

- e) Digital Hose Heat Machines Only: Connect the TSU Harness Plugs together. To ensure a secure electrical connection, place the protective electrical isolator boot over each plug and tape together.

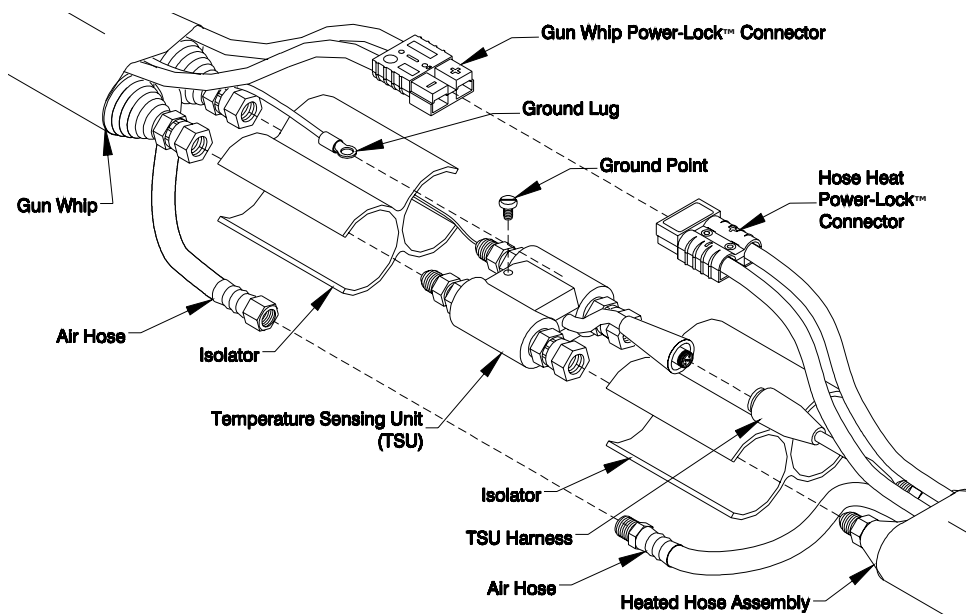


**Figure 9. Hose Connection Step (e & f)**

- f) Plug the Hose Heat Power-Lock™ Connectors together. Secure the connection in place with the Cable Tie provided; failure to do so could cause a disruption in the Hose Heat System.

**\*\*\* Repeat Step 7 for adding additional hoses. \*\*\***

8. On Manual Hose Heat units, install the Gun Whip in the same way additional hoses are added and then proceed to step 10.
9. On Digital Hose Heat units, install the Temperature Sensing Unit (TSU) on the Gun Whip as follows:
  - a) Pull out and carefully straighten the loose end of the temperature probe from the TSU. (See Figure 10)
  - b) Insert the Temperature Probe into the Isocyanate Hose and connect the TSU to the Gun Whip, taking care not to cross-thread or over-tighten the fittings, thereby ensuring a leak-proof chemical connection. (See Figure 10)



**Figure 10. Temperature Sensing Unit (TSU)**



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**WARNING:** *The Temperature Probe extends approximately 8 inches into the Isocyanate hose and although it is a ruggedly built assembly, it will not withstand repeated abuse. Do not to crush the hose or subject it to severe bending in the area where the Thermocouple is located. Do not to coil smaller than the recommended 3-ft. bend radius.*

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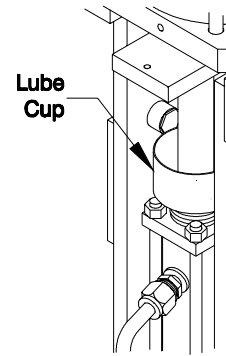
- c) Connect the ground wire on the gun hose to the Ground Point on the TSU.
  - d) Connect the Heated Hose Assemblies to the TSU taking care not to cross-thread or over-tighten the fittings, thereby assuring a leak-proof chemical connection.
  - e) Connect the TSU Harness to the TSU.
  - f) Cut the Isolator in two and secure the two pieces in place between the hydraulic fittings.
  - g) Plug the Hose Heat Power-Lock™ Connectors together. Secure the connection in place with the Cable Tie provided; failure to do so could cause a disruption in the Hose Heat System.
  - h) Plug the TSU Extension Adapter into the left side of the Electric Console.  
(See Inset of Figure 1 on page 7.)
  - i) Connect the TSU Harness to the TSU Extension Adapter.
10. Install the optional Scuff Jacket, if provided.
11. Connect the Air Hose Adapter between the Proportioning Unit and Heated Hoses.
12. Connect the Coupling Block to the gun hose and see that the Manual Valves are closed. (See the *Spray Gun Operating Manual*.)
13. Manual Hose Heat Machines Only: Insert the Hose Thermometer through the sponge in the 10-ft gun hose, so that the stem follows the twist of the hoses and lies between the butyl inner hose and the outer insulation. This gives the most accurate temperature indication. Choose a location where it is inserted easily through the sponge without excessive force and close to the gun so that the operator can read it while spraying.
14. Properly ground all auxiliary equipment. The high velocity flow of fluid can create static sparking, which may cause fire or explosion. Certain solvents that are commonly in use with this equipment are flammable and may present a flash danger to the operator.
- a) Ground the material supply. (Transfer Pumps/Day Tanks)
  - b) The 2:1 Transfer Pump has a ground lug. Ground the pump in accordance with the instructions provided with the pump.
  - c) Check that the Proportioning Unit ground at the main electrical source is installed in accordance with the National Electrical Code. If a generator will be powering the unit, consult with your electrician about additional grounding measures that may be required.
15. Close the Console Cover. Reinstall the four (4) screws retained from Step 1.

## ***Air Purge***

Before the equipment is ready for use, it is necessary to purge the entire system of air and mineral oil left over from the functional testing of the equipment at the factory.

To purge the machine proceed as follows:

1. Close the Manual Valves on the Coupling Block.
2. Turn on the Main Air Supply.
3. With the A and R-Inlet Supply Valves closed, pressurize the Transfer Pumps. (It is a good practice at this point to check for material leaks.)
4. Open the A and R-Inlet Supply Valves.
5. Switch ON the Main Switch. (The White pilot light should be ON.)
6. Adjust both Air Pressure Regulators to zero. (Fully counterclockwise).
7. Switch the Pump Switch to NORMAL.
8. Adjust both the Air Pressure Regulators clockwise until the pumps begin to move (approximately 15-psi air pressure). When the pumps reach the top of their stroke, turn the Pump Switch to OFF. This will allow access to the Pump Lube cup on the Isocyanate pump. Fill the lube cup to about 1/4-inch from the top with Gusmer Pump Lube (P/N 0960-1-GAL). (See Figure 11)
9. Open both Manual Valves while holding the Coupling Block over separate containers. Allow both materials to flow out of the Coupling Block simultaneously until all spitting of air stops and all traces of residual material have disappeared and a solid flow of each material is seen.



**Figure 11. Pump Lube Cup**

**IMPORTANT:** Properly discard both materials in accordance with applicable environmental regulations.

10. Switch the Pump Switch to OFF.
11. Close both Manual Valves and wipe clean any residual material from the Coupling Block.
12. Mount the gun to the Coupling Block. (See the Spray Gun Operating Manual.)



## Digital Hose Heater Temperature Controller (Optional)



**NOTE:**  
*Digits normally show  
process temperature.*

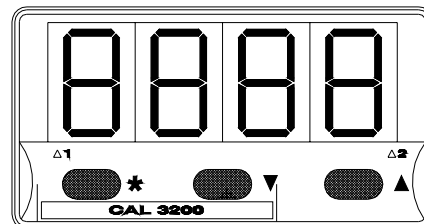
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**WARNING:** DO NOT TURN THE TEMPERATURE CONTROLLER ON UNTIL ALL PURGING PROCEDURES ARE COMPLETED AND THE HOSE(S) COMPLETELY FILLED WITH CHEMICAL. ADDITIONALLY DO NOT CHANGE ANY OF THE PREPROGRAMMED PARAMETERS.

---

The Digital variant of the FF-1600 has a Temperature Controller that automatically controls the temperature for the Hose Heater. (See Figure 12.) To enter or change the set point proceed as follows:

- \* Press to view set point
- \* ▼ Press together to decrease set point
- \* ▲ Press together to increase set point



**Figure 12. Hose Heat Temperature Controller**



---

**WARNING:** THE TEMPERATURE CONTROLLERS ARE FACTORY PROGRAMMED AND ARE NOT FIELD PROGRAMMABLE. IF YOU ENCOUNTER ANY PROBLEMS WITH THE CONTROLLER CONTACT GUSMER FOR A REPLACEMENT. DO NOT SUBSTITUTE A CONTROLLER FROM AN ALTERNATE SUPPLIER AS ITS USE MAY RESULT IN DAMAGE TO THE EQUIPMENT AND/OR BODILY INJURY.

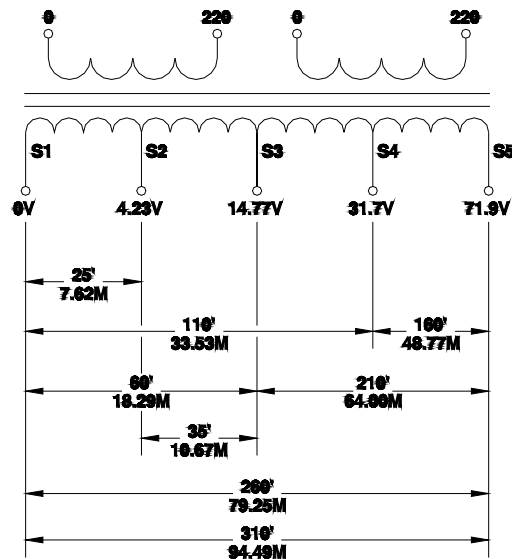
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## Hose Heat Power Pack (Transformer)

The Hose Heat Transformer tap settings must match the length of hose in use. To set up the transformer proceed as follows:

1. Turn OFF the Main Power Switch.
2. Using Figure 13, determine the voltage required for the length of hose to be used.

**IMPORTANT:** The power pack must be set to match the hose length used. Too much power will cause the hose heat circuit fuse to open; too little power will result in insufficient hose heating.



MINIMUM HOSE LENGTH IN FEET AND METERS

Figure 13. Tap Settings

3. Locate the Terminal Block Assembly on the Hose Heat Power Pack. Move the Tap Wire to a position matching the voltage required as shown in Figure 13.
4. On Manual Hose Heat Units, turn the Hose Heat Power Set counterclockwise to zero.
5. Turn ON the Main Switch. The white pilot light should be on.
6. Turn ON the Hose Heater circuit breaker.
7. Adjust the Hose Heat Power Settings.
  - a) On Manual Hose Heat Units adjust the Hose Heat Power Set (clockwise) to increase the temperature as desired (**Do Not exceed 50 Amps**).
  - b) On Digital Hose Heat Units adjust the Digital Hose Heater Temperature Controller for the required temperature. (See page 17.)

**NOTE:**  
As the hoses warm up, the  
amperage will drop slightly and  
will not need readjusting.

If all steps have been followed and no problems have been encountered the FF-1600 should now be ready for operation.



## NORMAL OPERATING PROCEDURES

### Daily Start-up Procedure



**NOTE:**

*The daily start-up procedures will describe normal operation and will assume that all calibrations have been properly executed and that the heating system is NOT up to required temperatures.*

---

**WARNING:** DURING THE INITIAL START-UP, SLOWLY INCREASE THE AIR PRESSURE AND CHECK ALL FITTINGS FOR SIGNS OF LEAKAGE. TIGHTEN AS REQUIRED.

---

1. Check the condition of the air system and Isocyanate Lube Cup. Service as required.
2. Determine that the supply system is at the proper temperature as recommended by the system supplier, that the individual chemicals are properly mixed within their drums, and that the moisture protection system is properly set for operation.
3. Adjust the Packing. The packing nuts on the Iso and Resin Pumps are adjustable and will require periodic tightening. The Iso Packing will require tightening when the pump lube requires frequent changing.
4. Check the inlet screens and service as required.
5. Turn on the Main Air Supply to the Transfer Pump.
6. Pressurize the Transfer Pumps and open both A- and R-inlet supply valves.
7. Switch ON the Main Switch. The pilot light should be on.
8. Uncoil the Heated Hose Assemblies.

**IMPORTANT:** Always uncoil the hoses before switching on the Hose Heat Circuit Breaker to prevent overheating the Heated Hose Assemblies and creating hot spots within them.

9. Switch ON the Hose Heat Circuit Breaker. The amber pilot light should be on.
10. On Digital Hose Heat Units, adjust the Digital Temperature Controller to the desired temperature.
11. On Manual Hose Heat Units, adjust the Hose Heat Power Set clockwise to 45-50 Amps for quick warm-up. (**Do Not exceed 50 Amps.**) Check the hose thermometer for proper spray temperature and readjust the power control as necessary to maintain temperature.
12. Switch ON the Primary Heater Circuit Breaker. The amber pilot light should be on and then cycle to off as the heater comes up to temperature.

Set the desired temperature (clockwise to increase, counter clockwise to decrease) by making small adjustments and allowing the heater to stabilize in between.

**IMPORTANT:** Always bring the Hose and Primary Heater up to operating temperature before turning on the Pump Switch to prevent excessive pressure build-up in the heated hoses.

13. Set the Pump Switch to NORMAL. One of the amber Directional Indicator Lights should be ON and the Proportioning Pumps should move a short distance and pressurize.

**NOTE:**

*The standard size 60 pumps have a material pressure to air pressure ratio of approximately 16 to 1.*

14. Set both pressure regulators as required.

Always set the Down stroke Pressure Regulator first to the desired air pressure; then set the Upstroke Pressure Regulator approximately 10 psi lower to compensate for the pressure boost generated by pressure feeding material into the pumps.

15. Connect air to the gun.

16. Open the Manual Valves and test spray while observing the Iso and Resin Pressure Gauges on both the up and down strokes.

**NOTE:**

*The Downstroke regulator is always adjusted to the desired operating pressure while the upstroke regulator is slaved to match the desired operating pressure.*

17. Readjust the Upstroke Pressure Regulator as required so that the pressure is equal on both the up and down strokes.

*The FF-1600 Proportioning Unit is now ready for operation.*

## **Daily Shut-Down Procedure**

1. Set the Pump Switch to the RETRACT position.
2. Trigger the gun off target until the Proportioning Pumps stop in the retracted position.

**IMPORTANT:** DO NOT bleed the pressure to zero, as some pressure is required to keep the packings operating normally and prevent weepage during shutdown.

3. Switch OFF the Pump Switch.
4. On Manual Hose Heat Units, turn the Hose Heat Power Set counterclockwise to zero.
5. Switch OFF the Hose Heater and Primary Heater Circuit Breakers.
6. Switch OFF the Main Switch.
7. Close both Inlet Supply Valves.
8. Coil or secure the Heated Hose carefully to prevent damage to it. (On Manual Hose Heat Units, remove the Hose Thermometer.)
9. Shutdown the Chemical Supply System as required.
10. Close both Manual Valves on the gun. Shutdown and service the gun as needed.
11. Turn OFF air to the gun and Transfer Pumps.



## TROUBLESHOOTING PROCEDURES

### General Information

When properly maintained and operated, GUSMER equipment will provide long and faithful service. However, occasional problems will arise which must be resolved before operation can continue. The purpose of this section is to give an explanation of what problems may arise, how to detect them, and how to resolve them.

This manual is written to give the operator a general overview of the operation of the equipment. Therefore, it is imperative that before any troubleshooting process begins, the operators have read and understood the applicable portions of this manual.

Training schools held on a regular basis further develop the necessary knowledge for proper operation, maintenance and troubleshooting of GUSMER equipment. These schools give concentrated training on the equipment and help to develop an operator into a competent Certified Gusmer Technician. Obtain information on these schools from our sales office.

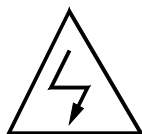
GUSMER maintains a competent staff of Technical Representatives and authorized Distributors who can resolve almost any problem you may encounter with GUSMER equipment. Feel free to call on these people for assistance when you need it.



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**WARNING:** THE TROUBLESHOOTING SECTION OF THIS MANUAL ASSUMES THAT THE INDIVIDUAL PERFORMING THE WORK ON THE EQUIPMENT IS QUALIFIED TO DO SO. THIS INDIVIDUAL MUST HAVE A WORKING KNOWLEDGE OF BASIC HYDRAULICS AND PNEUMATICS; MUST FOLLOW ALL GENERALLY ACCEPTED SAFETY PRECAUTIONS USED WHEN WORKING WITH HYDRAULICS, PNEUMATIC AND ELECTRICAL EQUIPMENT; MUST HAVE READ AND UNDERSTOOD THE APPLICABLE SECTIONS OF THIS MANUAL; AND MUST WEAR PERSONAL PROTECTION APPROPRIATE TO THE TASK BEING UNDERTAKEN.

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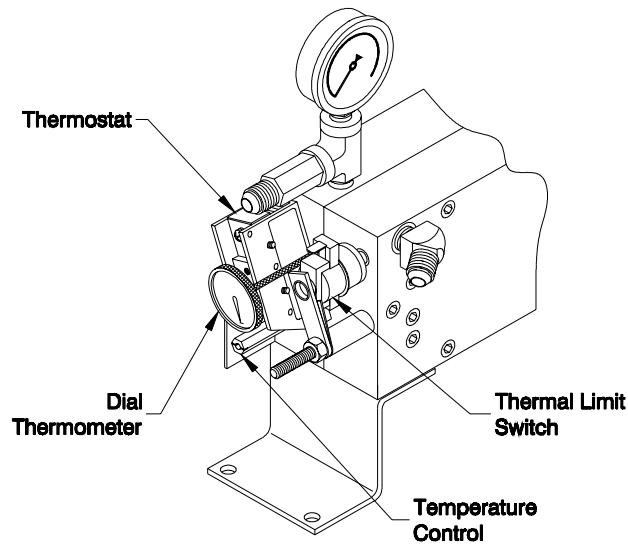
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**WARNING:** ALL ELECTRICAL TROUBLESHOOTING DESCRIBED IN THIS MANUAL MUST BE DONE WITH POWER OFF TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. THIS MEANS, THAT IN ADDITION TO ALL CIRCUIT BREAKERS "OFF," DISCONNECT THE MAIN POWER AT THE SOURCE. ANY ELECTRICAL TROUBLESHOOTING REQUIRED BEYOND THE SCOPE OF THIS MANUAL MUST BE DONE BY A QUALIFIED ELECTRICIAN, THOROUGHLY FAMILIAR WITH THE OPERATION OF GUSMER EQUIPMENT.

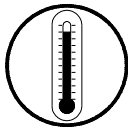
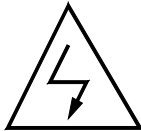
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## Primary Heating System

**NOTE:**  
Shown with cover removed for  
clarity to troubleshoot **ONLY**.



**Figure 14. Primary Heater Features**



**WARNING:** BEFORE PERFORMING THESE TROUBLESHOOTING PROCEDURES, DETERMINE THAT ALL CIRCUIT BREAKERS ARE OFF AND MAIN POWER IS DISCONNECTED AT THE SOURCE TO AVOID BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.

THERE IS HIGH VOLTAGE INSIDE THE PRIMARY HEATER COVER BOX. DO NOT REMOVE THE COVER BOX WITH POWER ON.

THERE IS HIGH TEMPERATURE INSIDE THE COVER BOX. DO NOT OPERATE THE HEATER WITH COVER BOX REMOVED.

COOL THE FLUID IN THE HEATER BY PUMPING UNHEATED FLUID THROUGH THE HEATER TO AVOID BODILY INJURY FROM HOT FLUID AND HOT METAL.

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

### Problems

### Solutions

No heat, amber pilot light does not cycle on	1
Partial heat, amber pilot light on continuously	2

### **SOLUTIONS**

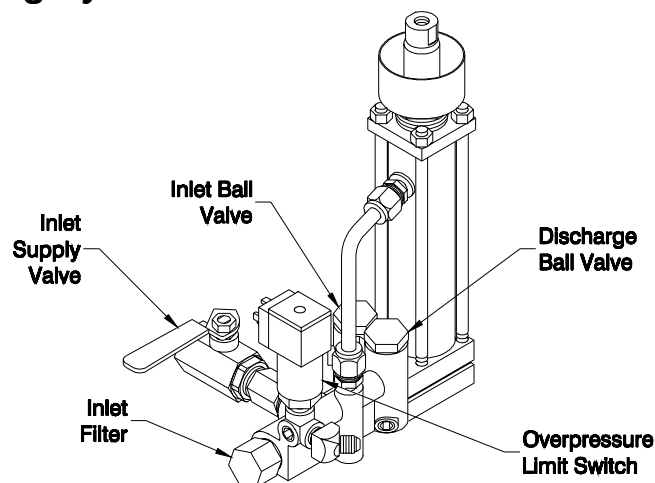
1. The Thermostat or Thermal Limit Switch is not functioning properly.
  - a) THERMOSTAT CHECK- the amber pilot light will only be on when the temperature of the Primary Heater is below the temperature setting of the thermostat. Turn the thermostat up (clockwise) to check the operation of the heater and then reset to the desired setting.  
If this does not solve the problem continue to step (b)

- b) **THERMAL LIMIT SWITCH** - When moving the Proportioning Unit, it is probable that the Thermal Limit Switch will trip in transit. Nevertheless, if the heater functions properly after the limit switch has been reset, it is imperative that the operation of the heater is closely monitored to ensure the switch has not tripped as a result of a heater malfunction.

To reset the Limit Switch, proceed as follows:

- 1) Switch off the Main Switch and Primary Heater Circuit Breaker.
  - 2) Remove the cover box by removing the acorn nut and sliding the cover box away from the heater.
  - 3) Recheck to ensure all electrical power is OFF.
  - 4) Reset the Thermal Limit Switch by pushing in the red button on the switch.
  - 5) If the Thermal Limit Switch does not feel as though it reset, then disconnect one lead from the Thermal Limit Switch and read continuity across the switch. If no continuity, the switch is defective and must be replaced.
  - 6) If this does not solve the problem, replace the thermostat.
  - 7) Slide the cover box back into place and tighten the acorn nut.
  - 8) Switch on the electrical power and monitor the operation of the primary heater to ensure it is functioning properly.
2. **HEATING RODS** - The Primary Heater contains four 1250-watt (38.7 ohms each) Heating Rods wired in parallel. To check that all elements are operational, proceed as follows:
- a) With power OFF and the Primary Heater Circuit Breaker OFF, read the resistance across the four Heating Rods. The resistance should be 9.6 ohms. A higher resistance indicates that one or more rods are not working. If this is the case, proceed to step (b).
  - b) Disconnect the Heating Rods and measure the resistance of each rod. Each rod should measure 38.7 ohms. If not replace the damaged rod or rods.

## ***Proportioning System***



**Figure 15. Proportioning Pump Features**

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

**Problems****Solutions**

Proportioning Pump does not hold pressure when stalled.	1
Pressure imbalance between pumps.	2,3,4
Cavitation in the Proportioning Pump.	2,3,4
Failure of the pump to reverse.	7,8
Pumps do not move and the Directional Indicator Lights are out.	5,6,7
Pump movement is erratic.	8
Unequal pressure or speed on the upstroke verses the down stroke	9

**SOLUTIONS**

1. Determine which inlet and discharge Ball Valve is leaking. If the pump (A or R) is losing pressure on the upstroke then check the discharge valve of the respective pump. If the pump is losing pressure on the down stroke then check the inlet valve of the respective pump.
  - a) Close the Inlet Supply Valve and de-pressurize the Transfer Pump.
  - b) De-pressurize the Proportioning Pump.
  - c) Remove the appropriate Valve Cover and, using a magnet remove the Valve Ball.
  - d) Flush and wipe clean the Valve Ball and Ball Seat of all residual material. Inspect these parts for damage.
  - e) In most cases, the cause of the leaking valve is a particle of foreign material preventing the ball from seating properly. If cleaning the ball and seat does not resolve the problem, replace the Valve Ball and or Pump Base.

**NOTE:**

*Higher supply temperatures will be necessary with systems containing substitute-blowing agents such as CFC-141b. Contact the system supplier for specifications.*

2. Troubleshooting this problem requires that two points be determined:

**First-** Which chemical is not mixing at the proper proportion?

**Second-** Why is that chemical failing to mix at the proper proportion?

Determine the first point by checking the color of the material exiting the gun. Since foam systems are usually a combination of light and dark material, the missing or under-proportioned material can be readily determined in most cases.

The second point either is due to a restriction in the gun or because the Proportioning Pump did not perform properly in pumping its designed volume.

This is determined by checking the Iso and Resin Pressure Gauges on the Proportioning Unit. Focus on the Pressure Gauge corresponding to the missing chemical.

Assume that the R-component is reaching the gun at a lower proportion than normal. If the Resin Pressure Gauge is considerably lower than normal, the problem is with the pump. If the Resin Pressure Gauge is considerably higher than normal the problem is usually in the gun and must be resolved by referring to the gun manual.

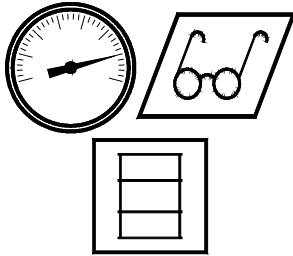
3. CAVITATION is the formation of a partial vacuum or void within the pump cylinder during the fill/upstroke stroke.  
It is actually a "short fill" since the fill chamber does not fill completely with liquid when the pump reverses to start the discharge/down stroke. This "short fill" occurs



when the Proportioning Pump demands a greater volume of material during its fill stroke than can be supplied.

The most common causes of cavitation are as follows:

- a) The Transfer Pump cannot handle the supply requirement. A 2:1 Transfer Pump is recommended for use with the FF-1600. Also recommended is a minimum of 3/4" diameter supply hose, as short as practical.
- b) The chemical is too viscous (thick) to pump properly. The recommended supply temperature is 65° F, to 75° F. Temperatures below 65° F, cause the material to thicken and become increasingly harder to pump.
- c) The Inlet Filter Screen is restricted. Service as required.




---

**WARNING:** THIS PROPORTIONING UNIT OPERATES AT PRESSURES UP TO 1600 PSI. USE EXTREME CAUTION BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING THE PUMP OR PUMP BASE. BLEED OFF THE PRESSURE IN BOTH THE SUPPLY AND DELIVERY SIDES OF THE PUMP TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID EJECTION. DO NOT SERVICE COMPONENTS CONTAINING CHEMICALS WITHOUT WEARING APPROVED SAFETY GLASSES AND PROTECTIVE GLOVES TO PREVENT PROLONGED SKIN CONTACT.

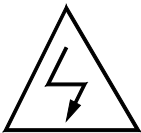
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4. **LEAKING INLET CHECK VALVE** - An Inlet Check Valve and/or leaking seat that does not properly seal will permit some of the proportioned material to flow back towards the supply drum. When this happens the proper volume of material will not pump during the discharge stroke and an off-ratio condition will result.
5. A 2000 psi Pressure Limit Switch protects each Proportioning Pump. Upon reaching this pressure, the switch automatically removes power from both directional coils causing the pump to stall. When the power is removed, both Directional Indicator Lights will go out; this indicates an overpressure shutdown.

This is not a lockout type of system and when the pressure bleeds off to approximately 200 psi, the Proportioning Pumps will be restored to normal operation; however, the cause of the overpressure should be determined first and then corrected.

The most likely causes of over-pressure are:

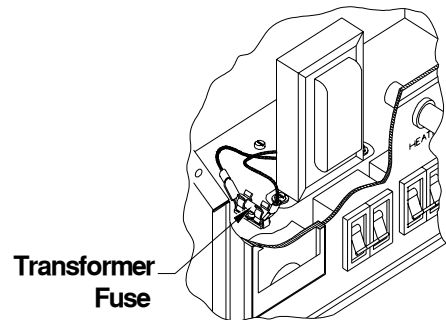
- a) Restriction in the gun
  - b) Pump cavitation
  - c) Air pressure set too high
6. **CONTROL TRANSFORMER FUSE**- With the power OFF, open the Electric Console and remove the Control Transformer Fuse and check it for continuity or simply replace it.



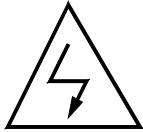

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**WARNING:** REPLACE THE FUSE WITH ONE OF THE SAME RATING. A SUBSTITUTE MAY DAMAGE THE EQUIPMENT.

---



**Figure 16. Transformer Fuse Location**



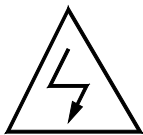
**WARNING:** BEFORE PERFORMING THESE TROUBLESHOOTING PROCEDURES, DETERMINE THAT ALL CIRCUIT BREAKERS ARE OFF AND MAIN POWER IS DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH THE POWER ON.

7. **REVERSING SWITCH** - In order for the Proportioning Unit to switch direction or reverse, the ends of a slot machined in the rear leg of the pump yoke must contact the arm of the switch lever. This contact causes the switch lever to move an arm on the reversing switch, which energizes one air valve coil and de-energizes the other. A problem arises when the yoke fails to contact the switch lever or when the spool in the air valve fails to shift after its coil is activated.

Failure of the pump yoke to contact the switch lever is usually caused by something physically preventing the yoke from traveling its full stroke. It may also be the result of the air pressure set to a point where the total resistance downstream of the air motor is such that the air motor cannot pump against it. The first problem may be physically checked and corrected, and the second may be resolved by increasing the air pressure.

8. **ROLLER BEARINGS** - Occasionally the roller bearings will become clogged with dirt or isocyanate and seize up. In this case, they must be replaced.
9. **UPSTROKE REGULATOR** - The proportioning pump pressure is higher during the upstroke for both Proportioning Pumps due to the supply pump pressure. Adjust the upstroke regulator so that the proportioning pump pressures are equal on both strokes.

## Hose Heat System



**WARNING:** BEFORE PERFORMING THESE TROUBLESHOOTING PROCEDURES, DETERMINE THAT ALL CIRCUIT BREAKERS ARE OFF AND THE MAIN POWER IS DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.

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

<u>Problems</u>	<u>Solutions</u>
Hose warm but does not reach temperature or takes too long to reach temperature	1, 2, 8
Hose does not heat; Light on	2, 3, 4, 5*
Hose Heat Circuit Breaker trips or fuse blows	2
Hose temperature not maintained during flow	1, 2, 7, 8
Hose or hoses adjacent to the unit are warm - hoses downstream are cold	4
Controller displays the code EE1	6*

\* **Digital Hose Heat Control Only**

## SOLUTIONS

1. **HOSE LENGTH-** The design of the Hose Heater allows it to operate with up to 310 feet of hose. Hose lengths greater than that reduce the ability of the hose heat to reach temperature. (See Initial Machine Set up) In addition, if chemical or ambient temperature is too cold, the hose circuit may not have enough power to bring the chemical up to temperature.
2. **HOSE HEAT POWER SET** - Adjust the Hose Heat Power Set (clockwise) to achieve maximum amperage. **(Do Not exceed 50 Amps.)**
3. **HOSE HEAT FUSE-** With the power OFF, remove the fuse and check it for continuity or simply replace it with one known to be good.




---

**WARNING:** REPLACE THE FUSE WITH ONE OF THE SAME RATING. A SUBSTITUTE MAY DAMAGE THE EQUIPMENT AND CREATE A POTENTIAL SOURCE OF INJURY TO THE OPERATOR.

---

4. **HOSE HEATING ELEMENT-** With power OFF, check to see that the Power-Lock™ Connectors on the hoses and all electrical connections between the hoses and Proportioning Unit are tight. If these connections are secure and hose heat is not present, then make a systematic search for the electrical fault as follows:
  - a) Starting at the Gun Whip, unplug the Power-Lock™ Connectors and plug the Hose Jumper Plug (P/N 0684-3) into the last “upstream” segment of hose.
  - b) Turn ON power to the Hose Heat System and adjust the Hose Heat Power Set (clockwise) to between 45 and 50 Amps (Do not exceed 50 Amps).

If hose heat is restored, then the fault is within the Gun Whip.

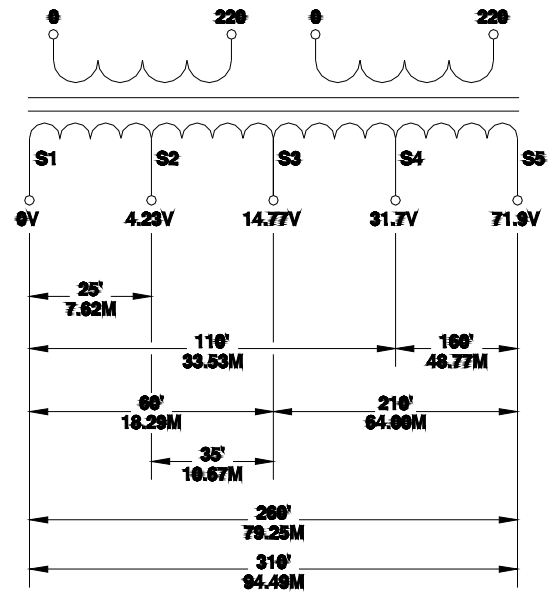
If hose heat is not restored, adjust the Hose Heat Power Set counterclockwise until the Ammeter reads zero, then turn OFF power to the Hose Heat System and proceed with the Steps below.

**IMPORTANT: READ FIRST BEFORE PROCEEDING**

*ALWAYS reduce the Hose Heat Transformer voltage by adjusting the tap setting LOWER to match the shorter hose length each time an additional hose segment is unplugged. Too much power will cause the hose heat fuse to fail. (See Figure 17)*

- c) Adjust the tap settings of the Hose Heat Transformer to match the next shortest length of heated hose (see Figure 17).
- d) Unplug the next set of Power-Lock™ Connectors and plug the Hose Jumper Plug into the last “upstream” segment of hose.
- e) Turn ON power to the Hose Heat System and adjust the Hose Heat Power Set to between 45 and 50 Amps (Do not exceed 50 Amps).  
If hose heat is restored, then the fault is within the last unplugged segment of hose.

If hose heat is not restored, adjust the Hose Heat Power Set counterclockwise until the Ammeter reads zero, then turn OFF power to the Hose Heat System and repeat Steps c) through e) until the fault is located.



MINIMUM HOSE LENGTH IN FEET AND METERS

Figure 17. Transformer Tap Settings

5. DIGITAL HOSE HEAT SOLID STATE RELAY (SSR)- It is not possible to check for normal operation of the SSR without electric power. Therefore, if all other testing fails to determine the source of problem, assume the SSR is inoperative and replace it.

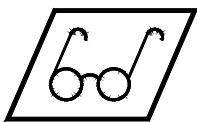
**IMPORTANT:** ALWAYS maintain maximum air circulation around the transformer heat sink or damage to the internal Solid State Relay (SSR) will result. Keep all foreign objects (rags, polyurethane, coverings, etc.) away from the heat sink. DO NOT locate the unit against a wall.

6. TEMPERATURE SENSING UNIT (TSU)- Two conditions must be satisfied for proper operation:
  - The sensor must be functional.
  - The signal must travel uninterrupted from the sensor to the control unit.
- a) Unplug the TSU from its extension. Without undoing any chemical connections, move the hose section with the TSU to the Proportioning Unit.
- b) Plug the TSU directly into the console. Change the TSU, if control is not restored. Then systematically check the TSU wire harness.
7. The purpose of the hose heater is not to add heat but rather to maintain the temperature developed by the Primary Heater. If indications are that the hose heater is not maintaining temperature during flow, check that the primary heat and hose heat are set for the same temperature or reduce the output.
8. Low voltage may significantly reduce power available and the heater will not perform to its full capability at maximum hose length.



## MAINTENANCE

To realize full productivity from the FF-1600 it is necessary that certain maintenance be performed daily or periodically.



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**WARNING:** WHENEVER WORKING ON THE EQUIPMENT, WEAR EYE AND SKIN PROTECTION TO PREVENT EXPOSURE TO THE CHEMICALS AND SOLVENTS BEING USED. ALWAYS WORK IN A WELL VENTILATED AREA TO PREVENT EXPOSURE TO HARMFUL FUMES AND VAPORS. OBTAIN INFORMATION CONCERNING THE TOXICITY AND PROPER HANDLING PROCEDURES OF YOUR CHEMICALS AND SOLVENTS FROM YOUR SUPPLIER.



UNLESS OTHERWISE SPECIFIED, SWITCH OFF ALL CIRCUIT BREAKERS AND DISCONNECT THE MAIN POWER AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER THE ELECTRICAL CONSOLE WITH POWER ON.



THERE IS HIGH TEMPERATURE ON THE PRIMARY HEATER. BEFORE PERFORMING MAINTENANCE, ALLOW THE HEATER TO COOL TO AVOID BODILY INJURY FROM HOT FLUID OR HOT METAL.



THE HYDRAULIC COMPONENTS ARE PRESSURIZED UP TO 1600 PSI. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO ENSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID EJECTION.

---

### Isocyanate Pump Lube

To ensure that the Isocyanate pump lube will do its job, check its condition DAILY. Change the pump lube before it has become a gel, when its color turns cloudy, or when it has become the same color as the isocyanate. The gel formation is due to moisture absorption by the pump lube, the rate of which will vary depending on environmental conditions in which the equipment is operating.

Discoloration of the pump lube is inevitable due to the continual weepage of Isocyanate during pump operation. However, if the packing within the Isocyanate Pump is functioning properly, pump lube replacement due to discoloration should not be more frequent than 3 to 4 week intervals.

To change the pump lube proceed as follows:

1. Stop the Proportioning Unit with the pump yoke at the top reverse. Switch OFF the Pump Switch and disconnect the air from the Proportioning Unit.
2. Remove the pump lube from the Lube Cup by dipping a dry rag into the cup to absorb the contaminated liquid. Wipe the cup and pump shaft clean. Remove any hardened material from the shaft taking care not to scratch the shaft.
3. Fill the Lube Cup with pump lube to about 3/4 inch below the top.

## ***Inlet Filter Screen***

A filter screen in each Proportioning Pump filters out solid matter that could adversely effect the operation of the valve balls in the pump base. You will note that the Daily Start-up Procedure indicates these screens should be inspected daily.

For the first week or so of operation, you should clean both pump screens on a daily basis. However, you will probably find that the Resin pump screen remains clean and that weekly checking of this part will be sufficient.

The Isocyanate Pump Screen presents another matter. The isocyanate component can crystallize from either moisture contamination or from freezing. If you follow proper storage, transfer and operating procedures and the chemicals you receive are clean, you should have little problem with the Isocyanate Screen. In practice though, it is good preventative maintenance to clean the Isocyanate Screen daily. It is important to NEVER clean the Isocyanate pump screen during the shutdown operation. This is because the cleaning of the screen exposes it and its related parts to moisture and solvent, which can cause the Isocyanate to crystallize. Performing the cleaning operation during the start-up procedure will minimize contamination problems because dispensing immediately flushes out the Isocyanate residue.

Removal and cleaning of the Filter Screen is accomplished as follows:

1. Switch OFF the Pump Switch and disconnect air from the Proportioning Unit. Bleed chemical pressure from the side you are working on by opening the corresponding Manual Valve on the Coupling Block while pointing it into an appropriate container.
2. Close the Material Supply Valve at the inlet of the appropriate Proportioning Pump. This prevents pumping of material with the Screen Screw removed.
3. Place a rag beneath the filter base to catch the drain-off of chemical when removing the screen screw.
4. Loosen the screen screw sufficiently to allow the material in the screen screw cavity to drain out onto the rag.  
  
Remove the Screen Screw from the pump base by continuing to unthread it until it comes loose.
5. Remove the retainer ring at the end of the Screen Screw and slide the screen from the Screen Screw. Thoroughly flush the Screen Screw, the retainer ring, and the screen with gun cleaner, and shake them dry. Inspect the screen to ensure the mesh is not restricted. Replace as required.
6. Slide the screen on the Screen Screw and replace the retainer ring.
7. Flush the cavity in the pump base with gun cleaner and wipe the cavity clean using caution not to push foreign matter into the ball seat.
8. Install the Screen Screw assembly into the pump base by inserting the Screen Screw with the threaded portion sliding along the top cavity. This prevents the pushing of foreign matter into the ball seats.
9. Open the Material Supply Valve; ensure there are no leaks and wipe the equipment clean.

## ***Proportioning Pumps***

Disassemble and clean both Proportioning Pumps annually. Inspect the pistons and cylinders for marks or scratches, which may cause leakage or damage to packings. As a preventive maintenance precaution, Gusmer also recommends replacing the piston and cylinder packings on an annual basis. *(Refer to the Proportioning Pump Assembly section of the Parts I.D. for reference.)*

## ***Pump Bases***

1. Completely depressurize the system.
2. Remove the valve cover using an adjustable wrench.  
  
Inspect the valve cover o-ring and replace as required. It is good practice to liberally coat the o-ring with grease prior to inserting the valve cover back into the pump base. Also, check the chamfer around the cavity to ensure that there are no sharp edges, which could damage the o-ring and prevent proper seal.
3. Remove the Valve Ball and inspect it for nicks and scratches. Replace as required.  
  
Remove the ball seat with the special tool provided and inspect it for nicks and scratches. Replace as required.
4. Inspect the face of the gasket for damage and replace as required. Reassemble pump base.



## APPENDIX

### ***Specifications: 16:1 Air Motor***

<b>Air</b>	26 scfm @100 psi (12 liters/sec @7 bars)
<b>Electric</b>	40 amps @ 220 volts, 50/60 Hertz single phase, AC. 25 amps @ 3x380/220, 50 Hertz
<b>Output</b>	16 lbs/min. (7.25 kg/min)
<b>Operating Pressure</b>	1600 psi (108 bars)
<b>Viscosity</b>	25-3000 cps (25-3000 cps)
<b>Maximum Hose Length</b>	310 feet (95 meters)
<b>Weight</b>	130 pounds (60 kg)
<b>Dimensions</b>	24 inches high (61 cm high) 18 inches wide (46 cm wide) 24 inches long (61 cm long)

### ***Specifications: 10:1 Air Motor (Optional)***

<b>Air</b>	12 scfm @100 psi (5.6 liters/sec @7 bars)
<b>Electric</b>	40 amps @ 220 volts, 50/60 Hertz single phase, AC 25 amps @ 3x380/220, 50 Hertz
<b>Output</b>	12 lbs/min (5.4 kg/min)
<b>Operating Pressure</b>	1000 psi (67.5 bars)
<b>Viscosity</b>	25-3000 cps (25-3000 cps)
<b>Maximum Hose Length</b>	310 feet (95 meters)
<b>Weight</b>	130 pounds (60 kg)
<b>Dimensions</b>	24 inches high (61 cm high) 18 inches wide (46 cm wide) 24 inches long (61 cm long)



**TABLE 1. MODEL FF-1600 PROPORTIONING UNIT PUMP SPECIFICATIONS**

Pump Size	Cross-Sectional Area		Displacement per Stroke Cubic Inches
	Square Inches	Square Millimeters	
#60	.60	387.1	1.80
#56	.56	361.3	1.68
#52	.52	335.5	1.56
#48	.48	309.7	1.44
#44	.44	283.9	1.32
#40	.40	258.1	1.20
#30	.30	193.6	.90
#24	.24	154.8	.72
#22	.22	141.9	.66
#19	.19	122.6	.57
#15	.15	96.8	.45

**TABLE 2. APPROXIMATE NUMBER OF CYCLES FOR DISPENSE**

Pump Ratio	Approximately 1 lb. (.5 kg.) of Mixed Materials (Cycles)	1 Gal (3.8 l) of Mixed Materials (Cycles)
50-50	3.2	32
52-48	3.3	33
53.5-46.5	3.4	34
55.5-44.5	3.6	36
57.5-42.5	3.7	37
60-40	3.8	38
66.7-33.3	4.3	43
71-29	4.6	46
73.2-26.8	4.7	47
75.4-24.6	4.9	49
80-20	5.1	51

## Proportioning Ratios

**PROPORTIONING RATIOS:** Established by volume in accordance with pump sizes. Pump size designation is determined by the piston rod's cross-section area. For instance, the designation #60 would indicate a pump having a piston rod with a cross-section of .6 square inches ( $387.1\text{mm}^2$ ) with a displacement of 0.6 cubic inches per inch (25.4mm) of stroke. The #60 pump is considered to be the basic pump, and will be matched with another #60 when supplying 1:1 ratio proportions. Pump sizing has been achieved by varying piston and cylinder bore. Pump base and base parts are universal.

**TABLE 3. PROPORTIONING RATIOS**

Pump Size	Cross-Sectional Area		Ratio per #60 Pump
	Square Inches	Square Millimeters	
#60	.60	387.1	50-50
#56	.56	361.3	52-48
#52	.52	335.5	53.5-46.5
#48	.48	309.7	55.5-44.5
#44	.44	283.9	57.5-42.5
#40	.40	258.1	60-40
#30	.30	193.6	66.7-33.3
#24	.24	154.8	71-29
#22	.22	141.9	73.2-26.8
#19	.19	122.6	75.4-24.6
#15	.15	96.8	80-20

## INSTRUCTION MANUAL DISCREPANCY REPORT

[illegible]

### Instructions:

Complete the above fields of the form by following the instructions listed on the reverse side of this sheet and mail to:

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Field Number	Field Title	Description
1	Date	Enter date report is submitted.
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3	IM Number	Enter the Part Number of the Instruction Manual from the title page.
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5	Date of Issue	Enter the date of Issue of the Instruction Manual from the title page. If there is no issue date, enter <b>NONE</b> .
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