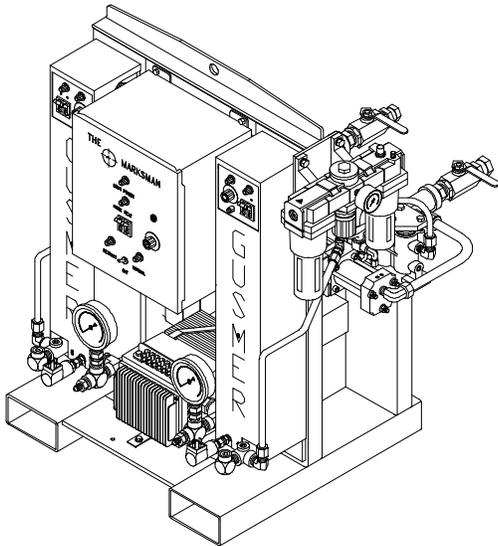


# **GUSMER**<sup>®</sup> CORPORATION

*"Teamwork & Communication"*



## ***Marksman Proportioning Unit***

***Operating Manual  
60942-1***

***September 29, 1997***

***Issue 2***

**GUSMER CORPORATION**<sup>®</sup>

A Subsidiary of Gusmer Machinery Group, Inc.

One Gusmer Drive

Lakewood, New Jersey, USA 08701-8055

Toll Free 1-800-367-4767 (USA & Canada)

Phone: (732) 370-9000

Fax: (732) 905-8968

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**NOTICE:** This manual contains important information for 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, EXPRESSED 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, expressed 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**

The instructions in this manual must be understood and followed to insure proper and safe operation of the Marksman Proportioning Unit.

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

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 Marksman Proportioning Unit

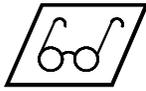
### **ACCEPTABLE EQUIPMENT USES**

The Marksman Proportioning Unit is designed for the proportioning and dispensing of two-component urethane foam, or coating systems and some two-component epoxy systems. 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 system to be used in this equipment.

The electrical circuitry of this equipment is not of explosion-proof design and, therefore, the equipment must not be used in any environment requiring this design.

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

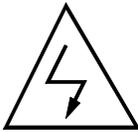
## **PERSONAL PROTECTION**



**PROPER PROTECTIVE  
GEAR**

To prevent prolonged skin contact with the chemicals and solvents to which you will be exposed when operating this equipment, protective gear such as approved safety glasses or goggles, and protective gloves must be worn.

## **HIGH VOLTAGE**



**ELECTRICAL SHOCK**

The electrical system of the Power Pack is rated for 230 volts. Entry into any of the electrical components should be made only by trained and qualified personnel.

## **HIGH PRESSURE**

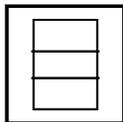


**HYDRAULIC PRESSURE**

The Power Pack system can develop pressures up to 3,000 pounds per square inch. Anyone using the mix head must use extreme caution to insure the head is never pointed at or near any persons, and that the head is never actuated with the outlet tip blocked or restricted by any part of the body.

The electrical system of the Power Pack is rated for 230 volts. Entry into any of the electrical components should be made only by trained and qualified personnel.

## **SOLVENTS AND CHEMICALS**



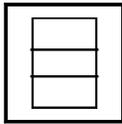
**RAW MATERIALS AND  
SOLVENTS**

The use of solvents and chemicals may be required when operating, servicing or cleaning the Power Pack. In using these solvents and chemicals, it is the users responsibility to insure that adequate personal protective measures are taken so as not to exceed the Threshold Limit Value (TLV) of the products being used, as established by the Occupational Safety and Health Administration or other qualified agency. The user must be aware of the exposure limits specified for the products being used, and must use them in accordance with the recommendations specified by their manufacturer.

## OPERATIONAL SAFETY PROCEDURES-WARNINGS

**NOTE**

These warnings will not be repeated in the text of this manual. The symbols pertaining to these warnings will appear where appropriate to alert the operator to potential hazards.



**RAW MATERIALS AND SOLVENTS**

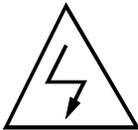
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**WARNING:** THE RAW MATERIALS AND SOLVENTS USED WITH THIS EQUIPMENT EXPOSE THE OPERATOR TO CERTAIN HAZARDS. IN ORDER TO PREVENT BODILY INJURY, INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING OF THESE CHEMICALS MUST BE OBTAINED FROM THE SUPPLIER OF SUCH CHEMICALS.

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**ELECTRICAL SHOCK**

The electrical service must be installed by a qualified electrician.

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**WARNING:** TO PREVENT SERIOUS BODILY INJURY FROM ELECTRICAL SHOCK, NEVER OPEN THE ELECTRIC CONSOLES OR OTHERWISE SERVICE THE EQUIPMENT BEFORE SWITCHING OFF THE MAIN POWER DISCONNECT AND INTERRUPTING SUPPLY VOLTAGE AT THE SOURCE.

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**HYDRAULIC PRESSURE**

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**WARNING:** THE HYDRAULIC COMPONENTS ARE PRESSURIZED UP TO 3500 PSI. TO AVOID SERIOUS BODILY INJURY FROM HYDRAULIC INJECTION OF FLUID, NEVER OPEN ANY HYDRAULIC CONNECTIONS OR SERVICE HYDRAULIC COMPONENTS BEFORE ALL PRESSURES HAVE BEEN BLED TO ZERO.

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**PROPER PROTECTIVE GEAR**

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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 PROTECTION, GLOVES, SAFETY SHOES AND RESPIRATORY EQUIPMENT AS REQUIRED.

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## **KEY FEATURES**

The Marksman establishes Gusmer's position in the market as a leading manufacturer of high performance air operated proportioning units. The Marksman combines the field proven air drive technology from the air driven FF series with the high performance opposed pumping technology from the H series. With the option of the efficient and rugged Gusmer heating systems, hydraulic drive, and a variety of guns and other options, the Marksman is the first metering unit with the capability of meeting all operating environments from contractor to OEM.

The design format of open construction and portability provides easy access for maintenance with the flexibility to adapt to all job sites.

The Marksman has been designed to process a wide range of plural component systems, each with their unique characteristics. It incorporates the proven principles of its predecessors enhanced by many technical innovations specifically developed to provide high pressure for mixing and atomizing, accurate proportioning, precise temperature control, and ease of maintenance.

## **PROPORTIONING PUMP**

The proportioning pumps are positive displacement double acting piston pumps featuring the Gusmer patented opposed design. This unique feature provides equal pressure on each stroke while the direct drive on centerline eliminates the asymmetrical forces, which cause structural failure and packing wear. The proportioning pumps are designed to operate at working pressures up to 3500 psi. Both the pump cylinder and piston shaft are specially treated to resist wear and incorporate field proven Gusmer packing seals.

The pump base is not physically an integral part of the pump. It has been remotely located to facilitate servicing of the pump and allows the design latitude required to properly valve plural component systems with a wide range of specifications. A key feature of the pump base is the externally accessible valve balls and replaceable ball seats.

Protection from the environment on the external side of the pump cylinder packings is very important. The A-proportioning pump contains a continuous flow, liquid lubrication system. In addition, a RETRACT switch provides for shutdown of the proportioning unit with the isocyanate pump shaft completely retracted within the pump cylinder.

## ***PRIMARY HEATER***

The primary heating system consists of two 6000 Watt primary heaters designed to accommodate the unique characteristics of plural component systems. The primary heater is designed to produce efficient, even, and accurate temperature control with an unprecedented simplicity of maintenance. The efficiency is derived from direct contact heating and the advanced circuitry incorporated in the control system to prevent scorching of the liquid. The direct heating principle provides virtually instantaneous warm-up, maximizes heat transfer during flow conditions, and minimizes temperature fluctuation.

Temperature control of the primary heater is completely automatic to within +/-3 degrees F of set point and requires no operator adjustment to compensate for changes in surrounding air temperature. The operator simply dials in the desired temperature at start-up, and the Gusmer heating system takes over from there.

Maintenance of the heater is basic. The heating elements are externally accessible and if necessary, the entire heater can be disassembled, cleaned, and reassembled without the need for replacement parts.

The primary heating system is designed as a stand alone modular unit, complete with control circuitry. It can be factory installed or very easily installed in the field as an option.

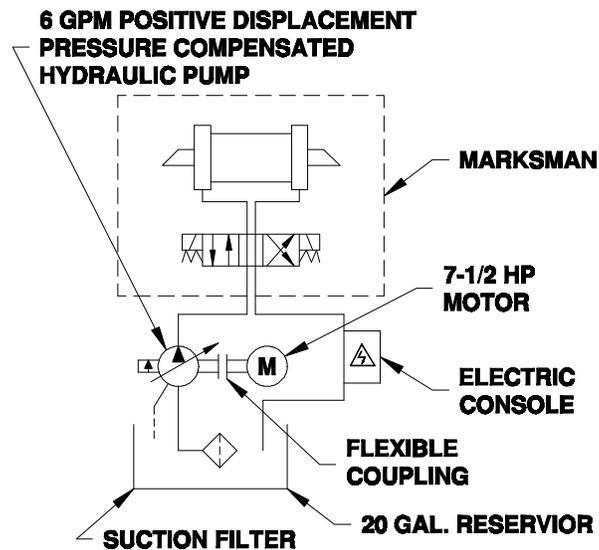
**HOSE HEATER**

The hose heating system is the proven safe and reliable Gusmer LOW VOLTAGE hose heater. The power for the system is supplied by an isolation transformer, which is designed to physically separate high voltage from the operator. The uniquely designed gun hose serves a dual fold purpose of providing heat to the gun end and isolating the gun from the low voltage circuit.

Temperature control of the hose heater is completely automatic and, as in the primary heater, requires no operator adjustment to compensate for changes in surrounding air temperature. The heart of the system is the temperature sensing unit (TSU). The sensor on the TSU is strategically located in the liquid, and provides the most accurate control of chemical temperature available. The Gusmer system provides TEMPERATURE CONTROL where it is the most accurate, IN THE LIQUID.

The hose heating system is also designed as a stand alone modular unit, which can be factory installed or very easily installed in the field as an option.

**DRIVE SYSTEM**



*Figure 1. Hydraulic Schematic*

The Marksman has been designed for use with either air power or hydraulic power. When supplied as a hydraulic drive system, it is necessary to provide a separate Gusmer hydraulic power pack to drive the unit. If the customer supplies an equivalent power pack, it will be their responsibility to assure compatibility with the Marksman. A schematic has been provided below to define the general hydraulic specifications.



# DESCRIPTION OF CONTROLS

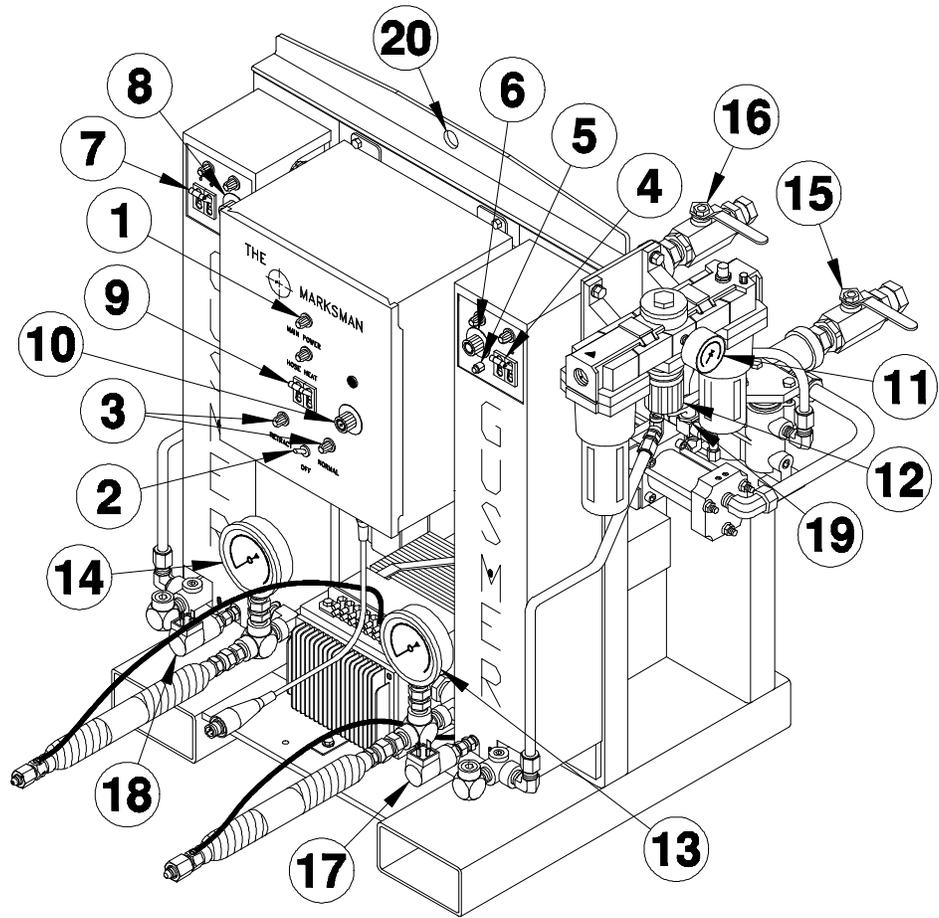


Figure 2. Description of Controls (Air Model Shown)

## ***DESCRIPTION OF CONTROLS***

1. PILOT LIGHT (White) -indicates when lighted the main power fused quick disconnect is ON
2. PUMP SWITCH - controls operation of the drive system; OFF - directional drive system is off, and pressure cannot be generated in this position.

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

RETRACT - this position should be used for shutdown and will stop the drive system with the A-proportioning pump in the retracted position

3. PUMP DIRECTIONAL INDICATOR LIGHTS (Amber) - indicates the direction of proportioning pump travel; both lights will be off when the pump switch is OFF or when either proportioning pump exceeds its safe operating pressure limitation
4. R-PRIMARY HEATER CIRCUIT BREAKER - controls and protects power to the Primary heater; must be ON for the primary heater to operate.  
Pilot light (Blue) - indicates when lighted the R-primary heater circuit breaker is on.  
Pilot light (Amber)- indicates when lighted the heater is ON; Pilot light will blink on and off slowly when heater temperature matches set point temperature.
5. PRESS TO TEST - The primary heater circuit breaker will automatically trip to OFF when the temperature of the primary heater exceeds the safe operating limitations. Press to test the circuit continuity at least once per day.
6. R-PRIMARY HEATER CONTROL - controls the temperature of the liquid maintained by the R-primary heater; set control selector to the desired temperature. The temperature control is completely automatic
7. A-PRIMARY HEATER CIRCUIT BREAKER - See 4 for operation.
8. A-PRIMARY HEATER CONTROL - See 6 for operation.

9. HOSE HEATER CIRCUIT BREAKER - controls and protects power to the hose heater; must be ON for the hose heater to operate.  
Pilot light (Blue) - indicates when lighted the hose heater circuit breaker is ON.  
Pilot light (Green)- indicates when lighted the heater is on; Pilot light will blink on and off slowly when heater temperature matches set point temperature.
10. HOSE HEATER CONTROL - controls the temperature of the liquid maintained by the hose heater; set control selector to the desired temperature. The temperature is completely automatic.
11. AIR PRESSURE GAUGE - (Air Model Only) indicates the pressure in the drive system.
12. PRESS REGULATOR - (Air Model Only) controls the air pressure in the pneumatic drive system.
13. RESIN PRESSURE GAUGE - indicates the pressure in the resin proportioning system.
14. ISOCYANATE PRESSURE GAUGE - indicates the pressure in the isocyanate proportioning system.
15. R-INLET SUPPLY VALVE
16. A-INLET SUPPLY VALVE
17. RESIN OVERPRESSURE SWITCH - factory set to turn off the drive system when the resin proportioning pump exceeds the safe pressure limitation. This is a momentary contact switch.
18. ISOCYANATE OVERPRESSURE SWITCH - factory set to turn off the drive system when the resin proportioning pump exceeds the safe pressure limitation. This is a momentary contact switch.
19. AIR BLEED AND PRESSURE BALANCING VALVE
20. LIFTING EYE

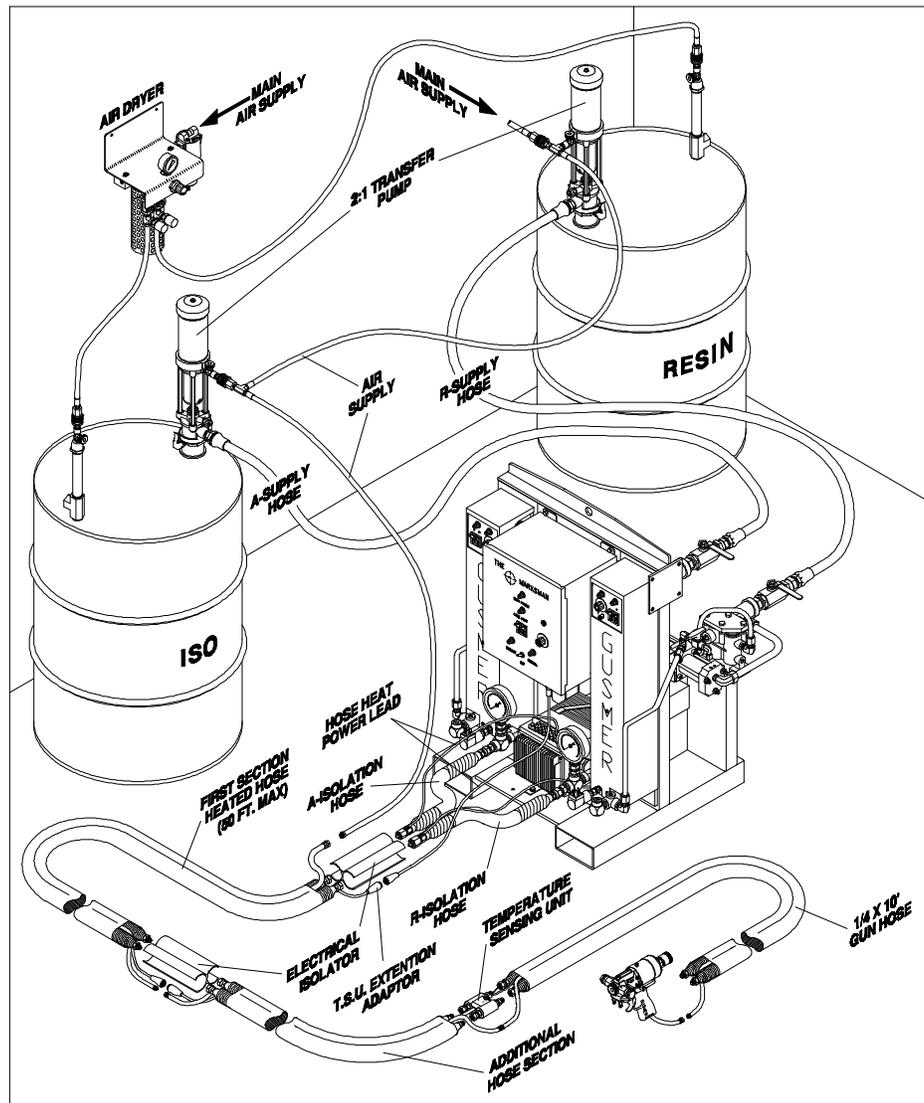


## NORMAL OPERATING PROCEDURE

### SPECIFICATIONS

- ENVIRONMENT:** The equipment is **not** of explosion proof design and should never be used in an atmosphere requiring this design.
- RECOMMENDED USE:** The equipment is designed for use with non-corrosive, low viscosity, two component reactive systems. Other use of the equipment, or any part thereof, constitutes misuse unless expressed written approval is obtained from Gusmer.  
Some plural component systems available for use with this equipment contain abrasives. Although the equipment is abrasion resistant it is not abrasion proof and those parts damaged, as a result of using abrasive materials will not be covered under warranty.
- SAFETY EQUIPMENT:** When servicing or operating the equipment, sufficient protective clothing must be worn to prevent skin and eye contact with the chemicals or solvents used in or with this equipment.  
Approved safety glasses or goggles must always be worn when servicing or operating the equipment.  
Respiratory protection, capable of providing sufficient filtration to prevent inhalation of toxic vapors emitted from the chemical system being used, must be worn by any and all persons in the vicinity of any operation where GUSMER® Equipment is operated. In poorly ventilated areas, it is recommended that a fresh air type respirator system be used.
- APPLICATION:** Due to the potential fire hazard of exposed urethane foam, all procedural and safety directives for the storage, handling, and application of chemicals that are used in this equipment must be followed.
- ELECTRICAL OPTIONS:** A terminal block is located in the main electric console for easy connection of the main power cord (not supplied). It is recommended that UL® approved wire size 3/4 be used. The length should be as short as possible to minimize the voltage drop.
- SUGGESTED COMPRESSOR:** 100 CFM @ 100 PSI (47 liter/sec @ 7 bar): (*Air Only*) Free air - Continuous Duty Rated. Air must be dry and free of particulate matter

<b>MATERIAL SUPPLY:</b>	The temperature of the chemical supply must be maintained at 65°F-75°F (18°-24°C).
	The chemical supply must be protected from moisture in the atmosphere by a blanket of dry nitrogen or desiccated air.
	Resin Inlet 1" NPT (FE) swivel Isocyanate Inlet 3/4" NPT (FE) swivel
<b>CHEMICAL VISCOSITY:</b>	The versatility of the Marksman permits the efficient use of a wide range of systems. No maximum limitation has been established and, assuming adequate supply, viscosity's of 3,000 cps or more may be possible.
<b>WEIGHT:</b>	460 Pounds (1012 kg)
<b>DIMENSIONS:</b>	High x Wide x Deep H=37 inches (94 centimeters) W--42 inches (107 centimeters) D=27 inches (70 centimeters)
<b>OPERATING PRESSURE:</b>	2500 psi maximum @ 40 lbs/min W/ 120 Pumps 3500 psi maximum @ 3 gal/min W/ 80 Pumps
<b>SUPPLY PRESSURE:</b>	400 psi maximum (27 bars)
<b>OUTPUT:</b>	40 lbs/min. maximum (18 kg/min.).
<b>INLET FILTER</b>	80 Mesh
<b>PRIMARY HEATER:</b>	6000 watts per heater at 220 volts. $\Delta t \sim 24^\circ \text{F}$ @ 40 lbs/min.
<b>HOSE LENGTH:</b>	210 feet (64 meters) suggested length for optimum heating.
	<i>NOTE: 310 feet (90 meters) may be used with reduced heating efficiency. In order to minimize pressure drop, we recommend you use fifty percent of a larger diameter hose length, and connected to the proportioning unit.</i>
<b>HYDRAULIC (OPTIONAL)</b>	6 gal/min. @ 2000 psi. See schematic on page 3.



**Figure 3. Typical Installation**

**IMPORTANT:** Gun, Proportioner, and Transfer Pumps must be grounded.

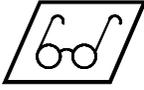


**WARNING:** Fused QUICK DISCONNECT MUST BE INSTALLED BY OTHERS AND MUST BE IN FULL VIEW FROM THE MARKSMAN CONSOLE. FAILURE TO INSTALL ACCORDING TO CODE MAY CAUSE SERIOUS INJURY OR DEATH.

**FUSE RATINGS**

- 220V 10 - 75A Required
- 220V 30 - 75A Required
- 380V 30 - 35-40A Required

## INITIAL MACHINE SET-UP



### PROPER PROTECTIVE GEAR

#### NOTE:

*An accessory package is included with the unit and contains the following parts required for setup:*

#### A and R:

- a) Isolation hoses
- b) TSU extension
- c) 1 set of 1/2 in. to 3/8 in. hose adapters
- d) Electrical isolator
- e) 1 Roll electrical tape

1. Set up the supply and moisture control systems as required. Refer to the individual instruction manuals for the proper procedure.
2. Install the pump lube reservoir and bracket, and service the reservoir with pump lube. No priming of the system is required.
3. Connect the isolation hoses to their respective primary heaters.

**IMPORTANT:** Every precaution has been taken to prevent the inadvertent connection of a hose to the wrong chemical source. The resin hoses are color coded blue and the isocyanate hoses are color coded red for easy identification. In addition, the resin and isocyanate hose fittings thread sizes are different, making it virtually impossible to improperly connect the hoses. Connect the hose heater wire leads to each isolation hose. Take care to make the connection tight. It is recommended that electrical tape be applied to the connection to prevent loosening from vibration

- NOTE:** 4. Connect the heated hose assemblies.

*The hoses are connected end to end during shipment to protect them from moisture intrusion. Do not uncouple the hoses until they are ready to be coupled to the proportioning unit*

The importance of making proper hose connections cannot be overstressed. Connection points are a potential source of fluid and air leaks and are also exposed to damage from the scuffing and snagging on abrasive surfaces. A liberal amount of electrical tape can be used in this area to make the bundle as compact as possible. It is also recommended, the optional scuff jacket be installed to protect the hose insulation and TSU wire from damage.

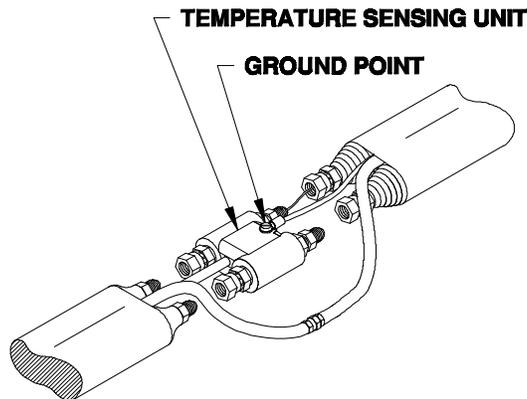
The key areas of extra attention during installation are as follows:

- a) DO NOT interchange the hoses - resin hoses are color coded BLUE. Isocyanate hoses are color coded RED.
- b) Assure a leak proof fluid connection - take care not to cross thread the fitting and DO NOT over-tighten.
- c) Assure a secure electrical connection - slide the protective boot over the TSU plug and tape together.
- d) Tape the electrical insulator securely in place between the fluid fittings - failure to do so will cause a short circuit in the hose heating system.

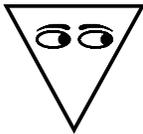
5. Install the temperature sensing unit (TSU). The temperature probe is always placed into the isocyanate hose, between the gun hose and first full section of hose.

**NOTE:**

*Grounding of the gun is required and is the customer's responsibility. This ground point may be used at a convenient location.*



**Figure 4. Temperature Sensing Unit**




---

**CAUTION:** The temperature sensor extends approximately 8 inches into the isocyanate hose and although it is a ruggedly built assembly it will not withstand repeated abuse. Care must be taken not to crush the hose or subject it to severe bending in the area where the sensor is located. Take care not to coil the hose tighter than the recommended 3 ft minimum bend radius.

---

6. Connect the TSU harness to the proportioning unit using the Extension Adapter furnished in the accessory package.

Connect the main air source to the airline in the heated hose assemblies.

7. Connect the main power cord (not supplied) to the electric console using 4/4 wire size or larger. The power cord must be UL approved and must be supplied from a UL approved fused quick disconnect installed by others.

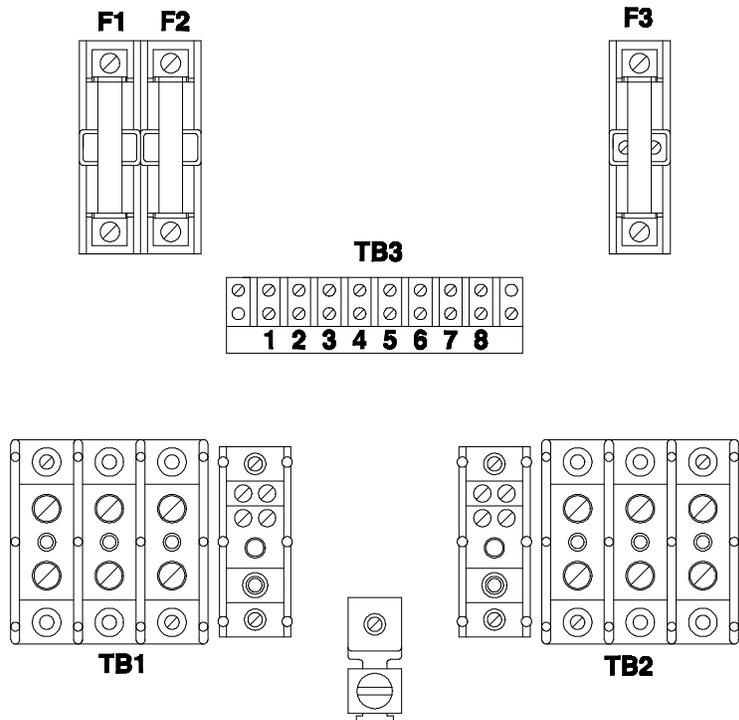


Figure 5. Terminal Blocks & Fuse Blocks



**WARNING:** THE ELECTRIC SERVICE TO THE MARKSMAN MUST BE DONE BY QUALIFIED ELECTRICIAN.

**NOTE:**  
*L3 is not used for single phase installation. Connect the ground wire to ground lug. Close the electric control console.*

8. Open the electric control console. Feed the power cord through the strain relief and connect the power leads.

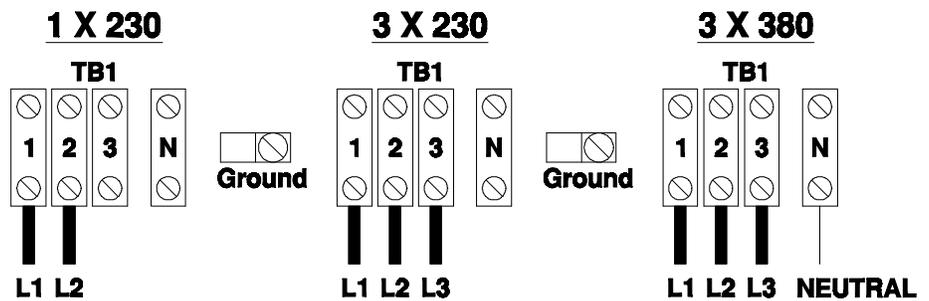
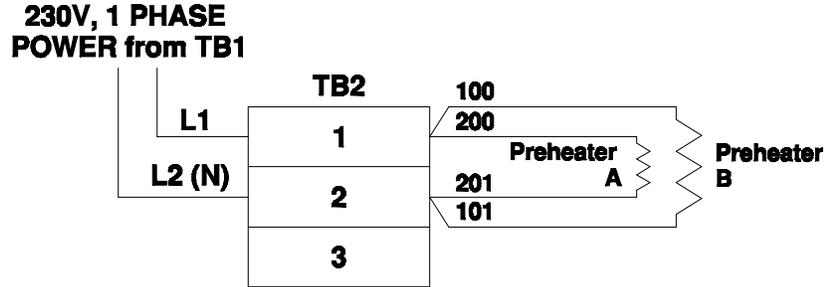


Figure 6. Power Feed Connection

To wire for 230V, single-phase power feed, connect:

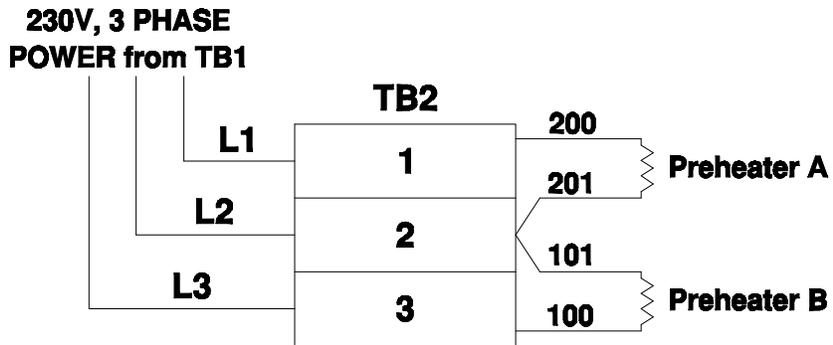
- A-preheater wires 200, 201 to TB2 terminals 1 and 2
- B-preheater wires 100, 101 to TB2 terminals 1 and 2



**Figure 7. 230V Single Phase Heater Feed Connection**

To wire for 230V, three-phase power feed, connect:

- A-preheater wires 200, 201 to TB2 terminals 1 and 2
- B-preheater wires 100, 101 to TB2 terminals 2 and 3



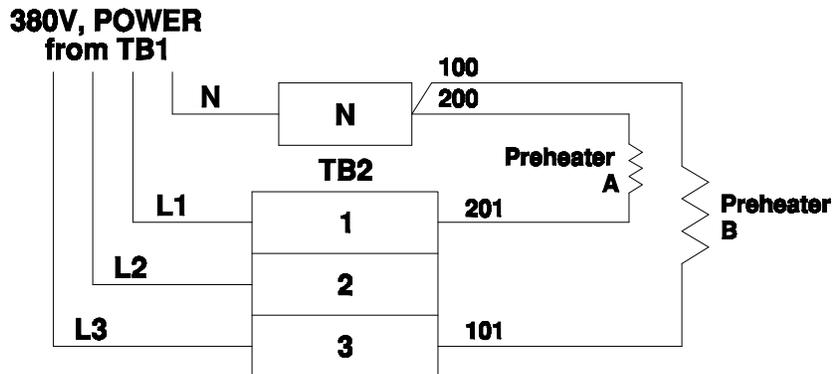
**Figure 8. 230V Three-Phase Heater Feed Connection**

To wire for 380V, three-phase power feed, connect:

- A-preheater wires 200, 201 to TB2 terminals N and 1
- B-preheater wires 100, 101 to TB2 terminals N and 3

**NOTE:**

*The power source must be capable of meeting the electrical requirements specified on the name-plate of the proportioning unit and must be provided with an accessible, fused quick disconnect.*



**Figure 9. 380V Three-Phase Heater Feed Connection**

9. Connect the coupling block to the gun hose and determine that the manual valves are closed.
10. Determine that all equipment is properly grounded. The high velocity flow of fluid can create static sparking which may cause fire or explosion. Certain solvents which may be in use with this equipment are flammable and may present a flash danger to the operator
  - a) The Gusmer 2:1 Transfer Pump has a ground lug. This pump must be grounded in accordance with the instructions provided with the pump.
  - b) The proportioner must be grounded at the main electrical source. A minimum of #3 size wire should be used. In the event that the unit is being powered by a generator, the generator must also be grounded directly to a suitable electrode such as an underground water system, the metal frame of a building, or a pipe driven into the ground. Electrodes of pipe or conduit shall not be smaller than 3/4 inch diameter, galvanized for corrosion protection, and driven below the moisture level. For additional information, consult the National Electric Code.
  - c) Ground the gun by connecting the ground wire on the gun hose to a suitable ground point.
11. The hose heat tap setting is factory set to the minimum setting unless specified otherwise. The tap setting must be set to match the hose length in use. Too low of a setting will cause insufficient heat and too high of a setting will cause the hose heat fuse (50 amps) to blow. Set the tap setting in accordance to the chart affixed to the hose heat transformer as illustrated below.

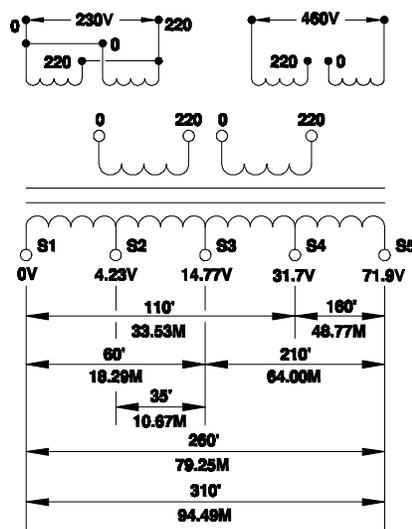


Figure 10. Hose Heat Tap Settings

We now have the proportioner, heated hose, and material supply system hooked up. Before the equipment is ready for use, it is necessary to purge the entire system of air and mineral oil that may be left from the functional testing of the equipment conducted at the factory.

To purge the machine proceed as follows:

- 1) Pressurize the transfer pumps and check for fluid leaks. Slowly open the material supply valves and check for fluid leaks.
- 2) Determine that the pressure control on the Marksman is set at minimum.
- 3) Switch ON the main circuit breaker.
- 4) With the coupling block ports held over separate containers, open both manual valves.
- 5) Switch the pump switch to NORMAL.
- 6) Allow both materials to flow out the coupling block until all spitting of air stops and all traces of residual material have disappeared.
- 7) Switch the pump switch to OFF.
- 8) Close both manual valves and flush any residual material from the coupling block.
- 9) Mount the gun to the coupling block.

Your proportioner is now ready for operation. Refer to the **Daily Start-up** procedures.

***IMPORTANT:** During the initial start-up, slowly increase the pressure and check all fittings for signs of leakage. Tighten as required.*

## DAILY SET-UP PROCEDURES

1. SERVICING- check the condition of the pump lubrication system and service as required.
2. SUPPLY- determine that the supply system is at the proper temperature as recommended by the system supplier, the individual chemicals are properly mixed within their drums and the moisture protection system is properly set for operation.

Check the inlet screens and service as required.

Pressurize the transfer pumps and open both chemicals supply valves.

3. Switch ON the main circuit breaker. The blue pilot light should be on.
4. Switch ON the hose heater circuit breaker and set the temperature selector as required.

The blue pilot light should be on as well as the green pilot light on the control unit.

When the liquid in the hose reaches the temperature selected, the green pilot light will begin to cycle

**NOTE:**  
*To prevent excessive pressure build-up in the dual heated hose, always bring the hose up to temperature before the air or hydraulic drive system is turned on. The flashing green pilot light will indicate that the liquid in the hose is up to temperature. To achieve the best hose temperature control, it is recommended that the TSU be placed in the same environment as the application. DO NOT leave the hose coiled up in a truck when operating on the job site.*

**NOTE:**  
*Primary heating is virtually instantaneous and therefore, the primary heaters should not be turned ON until required for operation. It is also a good practice to turn off the primary heaters during shutdowns exceeding one-half hour.*

**NOTE:**  
*The chemical to air pressure ratio is approximately 50:1 per pump. The chemical to hydraulic pressure is approximately 2:1 per pump.*

5. Switch ON the primary heater circuit breakers and set the temperature selectors as required.

The blue pilot lights should be on as well as the amber pilot lights on the control unit.

6. Set the pump switch to the NORMAL position. The amber directional indicator light should light and the proportioner pumps should move a short distance, pressurize and stall.

7. Pressure check each proportioning pump.

After setting the pump switch to NORMAL, observe both pressure gauges. Resin and isocyanate pressures should be approximately equal and the pressures must remain fixed. Dispense material until the machine reverses.

(Observe the pressures again; they must remain fixed.) If the pressure bleeds off on either stroke, consult the **Trouble Shooting Procedures** before continuing.

The proportioning unit is now ready for operation; connect air to the gun and test spray

### ***DAILY SHUT-DOWN PROCEDURES***

1. Set the pump switch to the RETRACT position.
2. Trigger the gun off target until the proportioner stops in the retracted position and the proportioning pump pressures bleed off to approximately 500 psi. **It is not recommended to bleed the pressure to zero.** Some pressure is required to prevent weepage during shutdown.
3. Switch OFF the hose heater and primary heater circuit breakers.
4. Switch OFF the main circuit breaker.
5. Close both inlet supply valves.
6. SUPPLY - shutdown the supply system as required.
7. GUN - shutdown and service the gun as appropriate



## **TROUBLESHOOTING PROCEDURES**

### **GENERAL INTRODUCTION**

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. This section of the manual provides the operator with an explanation of some of the problems that may arise, how to detect them, and how to resolve them.

As when operating any piece of machinery, it is imperative to know what is normal operation, so that abnormal operation can be detected. Perhaps the best way to acquire knowledge of what is normal performance of Gusmer equipment is through experience in operating it "according to the book." Once this experience is obtained, equipment malfunctions can be readily detected.

After the ability to recognize a malfunction has been acquired, and before one is able to fix the problem, knowledge of how the equipment operates is mandatory. This manual is written to give the operator an 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.

To further develop the necessary knowledge of the proper operation, maintenance and troubleshooting of Gusmer equipment, Training Schools are held on a regular basis throughout the country. These schools give concentrated training on our equipment and help to develop an operator into a competent FOAM MECHANIC®. Information on these schools can be obtained from your Gusmer Distributor or our sales office.

Before continuing, one important point should be noted. Gusmer maintains a competent staff of technical representatives and authorized Distributors who can resolve almost any problems you may encounter with Gusmer equipment. Feel free to call on these people for assistance when you need it.

**HOSE HEATING SYSTEM**




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**WARNING:** THE TROUBLESHOOTING SECTION OF THIS MANUAL IS BASED ON THE ASSUMPTION THAT THE INDIVIDUAL PERFORMING THE WORK ON THE EQUIPMENT IS QUALIFIED TO DO SO. THIS INDIVIDUAL MUST HAVE A WORKING KNOWLEDGE OF BASIC HYDRAULICS; MUST FOLLOW ALL GENERAL ACCEPTED SAFETY PRECAUTIONS USED WHEN WORKING WITH HYDRAULIC 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.

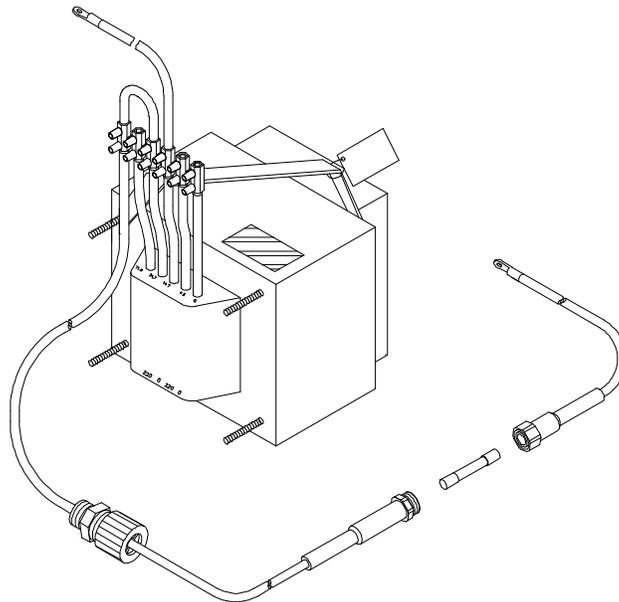
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**WARNING:** ALL ELECTRICAL TROUBLESHOOTING DESCRIBED IN THIS MANUAL MUST BE DONE WITH POWER OFF TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. THIS MEANS, THAT IN ADDITION TO ALL CIRCUIT BREAKERS “OFF”, THE MAIN POWER MUST BE DISCONNECTED AT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

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**Figure 11. Hose Heating Transformer**




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**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 ELECTRIC CONSOLE WITH POWER ON.

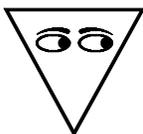
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Try the recommended solutions in the order given for each problem to avoid unnecessary repairs. Also, determine that all circuit breakers, switches, and controls are properly set before assuming there is a problem.

<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; green light is ON.	2, 3, 4b, 5, 6
Hose does not heat; green light is OFF.	9
Heater does not cycle automatically.	4a, 9
Hose heat circuit breaker trips.	2
Hose temperature not maintained during flow.	1, 2, 7, 8
Hose or hoses adjacent to the unit are warm-hoses downstream are cold	5

**Solutions**

1. HOSE LENGTH - *the Marksman* hose heater is designed to operate with up to 210 feet of hose (optional to 310 ft.). At 310 feet the hose temperature should rise approximately 120°F in 40 minutes. Hose lengths in excess of 310 feet will reduce this capability.
2. HOSE HEATER VOLTAGE SET POINT - for hose lengths over 200 feet, the tap setting should be set to maximum voltage. For hose lengths less than 200 feet, the tap setting should be set for approximately 45 amperes secondary current. Amperage over 50 amps will blow the hose fuse. Refer to chart on page 21.
3. HOSE HEAT FUSE - with power OFF, remove the fuse and check it for continuity or simply replace it with one known to be good.




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CAUTION: The fuse must be replaced with one of the same rating. A substitute may damage the equipment and would create a potential source of injury to the operator.

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4. HOSE HEAT POWER CUBE - Important: for the power cube to operate properly the heat generated by the cube must be passed off to the heat sink. DO NOT obstruct the heat sink with rags, polyurethane, or other coverings. Always allow for as much air circulation as possible since the effectiveness of the heat sink is dependent upon unobstructed airflow.
  - a) With power OFF, remove the lead from terminal #1 on the power cube. Check for continuity across terminals #1 and #2. If continuity is present, then the power cube is shorted closed and must be replaced.
  - b) It is not possible to check for normal operation of the power cube without electric power. Therefore, if all other testing fails to determine the source of the problem, assume the power cube is inoperative and replace it.
  
5. HOSE HEATING ELEMENT - To check hose continuity you must unscrew and remove one transformer lead from the Isolation Hose to insure you are not reading the continuity of the Transformer. Then with an Ohm meter or continuity meter place the probes on the Isolation Hose fitting where the transformer screws are located.

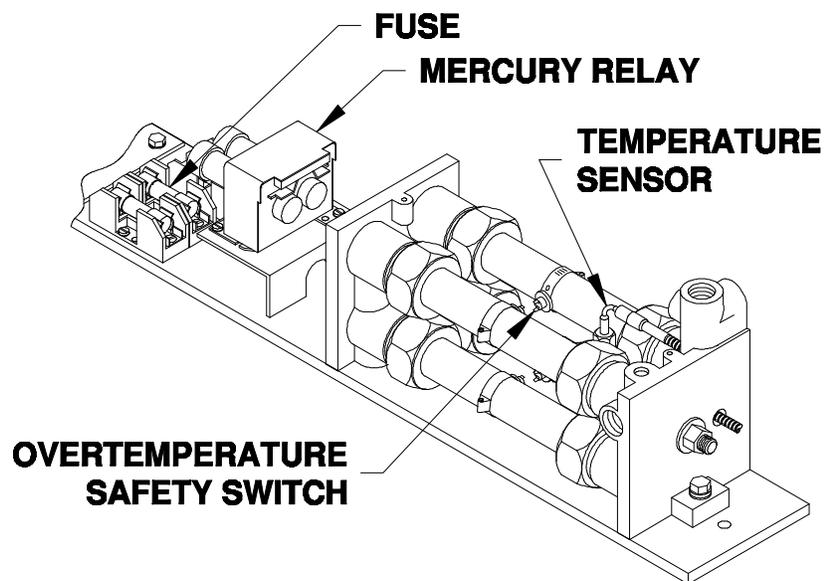
To check for improper electrical isolation, remember the low voltage hoses are electrically connected in series, and the hose fittings make the electrical connection between hoses. Thus, if the resin fittings come into contact with the isocyanate fittings either because the electrical insulator was not installed between them, or because the insulator has slipped out of position, all hoses from the point of contact out to the gun will be "cold" while those hoses back to the proportioner will be heated. If this occurs, it is a matter of finding where the fittings are in contact and isolating them.

6. TEMPERATURE SENSOR - two conditions must be satisfied for proper operation: the sensor must be functional and the signal must travel uninterrupted from the sensor to the control unit. Unplug the TSU. Without undoing any fluid connections, transport the hose to the proportioning unit and plug the TSU directly into the unit. If control is not restored, change the TSU. If control is restored then a systematic check of the TSU extension must be made.

**IMPORTANT:** *The temperature control units are designed with a fail-safe feature to prevent the system from operating in the signal loss from the sensor.*

7. The purpose of the hose heater is not to add heat but rather to maintain the temperature developed by the primary heaters. If indications are that the hose heater is not maintaining temperature flow (amber pilot light on continuously) check that the primary heat and hose heat are set for the same temperature or reduce the output.
8. The hose heater has been designed to operate with a primary voltage 220 volts. Low line voltage will significantly reduce power available and the hose heater will not perform to its full capability. Increase the line voltage up to 240 volts if possible.
9. HOSE HEATER CONTROL UNIT - to determine if a control unit is operating normally, with power OFF, swap it with one known to be good

### **PRIMARY HEATING SYSTEM**



*Figure 12. Primary Heater*

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**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 ELECTRIC 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 PRIMARY HEATER COVER BOX. NEVER OPERATE THE HEATER WITH THE COVER BOX REMOVED. COOL THE FLUID IN THE HEATER BY PUMPING UNHEATED FLUID THROUGH THE HEATER WITH THE HEATER OFF TO AVOID BODILY INJURY FROM HOT FLUID AND HOT METAL.

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

**Problems****Solutions**

Main circuit breaker trips.	1
Heater does not heat - amber pilot light ON.	5 , 2
Heater does not heat - amber pilot light OFF.	4a , 3
Heater overheats with amber pilot light on continuously.	3 , 4b , 2
Partial heat with amber pilot light ON continuously	5 , 6 , 7
When flow starts red pilot light comes on and stays on for 30 seconds or more	4b

**Solutions**

**NOTE:**  
*The bimetallic thermostat will reset automatically once the temperature has cooled to below 300°F. At this point, the main circuit breaker can be manually reset*

1. A completely independent over-temperature safety circuit has been provided and consists of four (4) factory set bimetallic thermostats each bonded to a heating section. When the surface temperature of any section exceeds 300°F the bimetallic thermostat will automatically trip the primary heater circuit breaker to OFF. The circuit breaker cannot be reset until the temperature of the preheater has cooled down to within its limits. **DO NOT** attempt to reset the circuit breaker more than once. You must determine the cause of the problem and correct it.
2. **POWER RELAY** - it is not possible to check for normal operation of the relay without electric power. Therefore, if all other testing fails to determine the source of the problem, assume the relay is inoperative and replace it.
3. **PRIMARY HEATER CONTROL UNIT** - the primary heater controls units on the Marksman are directly interchangeable with one another. To determine if a control unit is operating correctly, with the power OFF, swap the suspected control with one known to be good.
4. **TEMPERATURE SENSOR**
  - a) The temperature control units are designed with a fail-safe feature, which prevents the heating system from operating in the event that the signal from the sensor is lost. In this case the sensor must be replaced. Refer to the maintenance

section of this manual for the proper procedures.

- b) The positioning of the temperature sensor in the outlet heat exchanger is critical
  - (1) The sensor must make positive contact with the heating element, not the spring.
  - (2) The heating element must be functioning properly.

If either of these conditions is not satisfied, it could cause erratic temperature control and possibly overheating. The sensor is properly positioned at the factory and mechanically locked into place. However, during maintenance or changing of the sensor, the positioning may have changed. Refer to the maintenance section of the manual for proper sensing positioning

- 5. HEATING ELEMENTS -The heater contains four 1500 Watt (32 ohm) heating elements wired in parallel. To check that all elements are operational proceed as follows: With main power to the machine off and locked out, turn off the preheater circuit breaker, then read the resistance across the bottom of the mercury relay. The resistance should be 8 ohms. A higher resistance indicates that one or more heating elements is inoperative (see chart below) and a systematic search must be made to determine which one. To do this, disconnect each heating element and check for continuity. If continuity is not present then the heating element is inoperative and must be replaced.

4 Operational	8 ohms
3 Operational	11 ohms
2 Operational	16 ohms
1 Operational	32 ohms

- 6. The primary heater is rated for 6000 watts at a voltage of 220 V. Low line voltage will significantly reduce the power available and the heater will not perform to its full capability, Increase the line voltage up to 240 volts if possible.
- 7. The Marksman primary heater has been designed to be very efficient and maximize the heat transfer from the power available. However, under certain conditions, the heater will not be able to reach the required temperature and the flow must be reduced.

**PROPORTIONING SYSTEM**




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**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 ELECTRIC CONSOLE WITH POWER ON. THE PROPORTIONING UNIT IS GENERALLY OPERATED AT PRESSURES UP TO 3000 PDI. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING THE PUMP OR PUMP BASE, THE OPERATOR MUST USE EXTREME CAUTION TO INSURE THAT THE PRESSURE IN BOTH THE SUPPLY AND DELIVERY SIDES OF THE PUMP HAS BEEN BLED OFF TO ZERO TO AVOID SERIOUS BODILY INJURY FROM FLUID INJECTION. NEVER SERVICE COMPONENTS CONTAINING CHEMICALS WITHOUT WEARING APPROVED SAFETY GLASSES AND PROTECTIVE GLOVES TO PERVENT PROLONGED SKIN CONTACT.

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

<u>Problems</u>	<u>Solution</u>
Proportioning pump does not hold pressure when stalled.	3
Pressure unbalance between pumps.	1,2,4
Cavitation in the proportioning pumps.	1,2,4
Failure of the pump to reverse.	5
Pumps do not move and both of the directional indicator lights are out.	6,7
Pump movement is erratic.	6

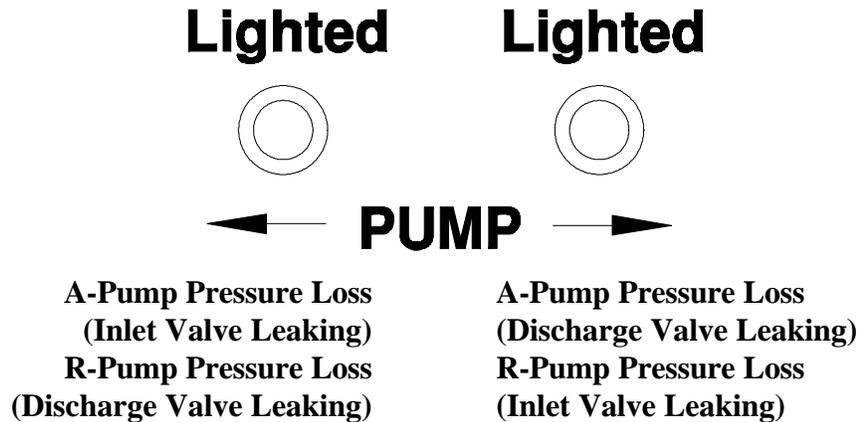
## Solutions

1. The success of all troubleshooting procedures depend on the determination of two points: first, which chemical did not reach the mixing chamber; second, why did that chemical fail to get there. The first determination can usually be made by observing the color of the pattern as it exits the gun. Foam systems are usually a combination of light and dark material. Therefore, by observing the color of the liquid leaving the gun, you can determine which material is not reaching the mixing chamber. The determination as to why the chemical did not reach the mixing chamber may be more difficult to resolve. The reason for the lack of material is either because of an obstruction at the gun or because the proportioning pump did not perform properly to pump it's designed volume. Once you have determined which chemical is missing, the chemical pressure gauges on the proportioner will tell you if the malfunction is due to a restriction at the gun or a lack of material produced by the pump. **To prevent misinterpretation, the focus must be on the pressure gauge corresponding to the missing chemical.**

Assume that it is the R-component, which is not reaching the mixing chamber. Spray off target and note the resin pressure gauge. If the resin gauge is considerably higher than normal, the problem is from the pressure gauge to the gun, probably in the gun and must be resolved by reference to the gun manual. If the resin gauge is considerably lower than normal, the problem is the proportioning pump is not performing properly.

2. CAVITATION-cavitation is the formation of a partial vacuum or void that is created within the pump cylinder during the fill stroke. It is actually a "short fill" since the fill chamber is not completely filled with liquid when the pump reverses to start the discharge stroke. This void is created when the proportioning pump demands a greater volume of material during its fill stroke than the supply system can supply. The most common causes of cavitation are as follows
  - a) The transfer pump is not properly sized to handle the supply requirement. Gusmer's 2:1 Transfer Pump is recommended for use with the Marksman.  
  
Also recommended is a minimum of one (1) inch 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. At temperatures below 65°F, the material thickens significantly and becomes increasing difficult to pump.

- c) Inlet filter screen is restricted. Service as described in the maintenance section of this manual.
- 3. LEAKING VALVE BALL-the first determination to be made is which valve; inlet or discharge is leaking. Refer below to determine this and then proceed with step 3a.



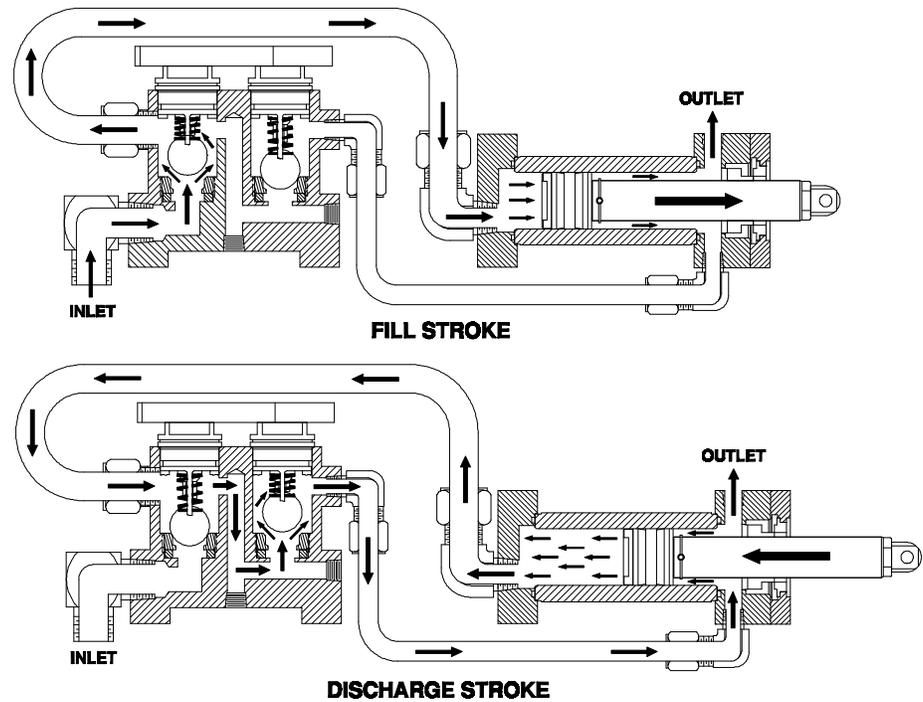
- a) Close the material supply valve and depressurize the transfer pump.
- b) Depressurize the proportioning pump.
- c) Remove the appropriate discharge valve cover, ball and spring. Using the ball seat removal tool, check the seat for proper gasket compression. Snug the seat up to 1/4 turn maximum. If this does not resolve the problem, then the seat must be removed and replaced as required.
- d) Inspect the ball seat gasket and replace as required. Flush and wipe clean the valve ball and ball seat of all residual material.

**NOTE:**

*The gasket should extend beyond the seat by approximately 1/16 of an inch.*

In most cases, the leaking valve will be caused by a particle of foreign material preventing the ball from seating properly. If cleaning the valve ball and seat does not resolve the problem, then these parts along with the gasket should be replaced.

- 4. LEAKING INLET VALVE BALL-an inlet valve ball and/or a leaking seat gasket that does not properly seat will permit some of the proportioned material to flow back towards the supply drum. When this happens the proper volume of material will not be pumped during the discharged stroke and an off-ratio condition will result. This malfunction will evidence itself identically to cavitation, perhaps somewhat less severe however. (For recommended solutions see 3a.)



**Figure 13 Double Acting Proportioning Pumps**

## 5. REVERSING MALFUNCTION-



**WARNING:** THE TROUBLESHOOTING PROCESS FOR THESE MALFUNCTIONS REQUIRES THAT THE GUN (OR COUPLING BLOCK) BE OPEN, AND THAT THE ROCKER ARM OR DIRECTIONAL VALVE BE MANUALLY ACTIVATED. BEFORE CONTINUING, REDUCE THE DRIVE PRESSURE TO ITS MINIMUM, INSURE THAT THE CHEMICALS BEING PUMPED ARE PROPERLY CONTAINED, AND USE A SCREW DRIVER TO MANUALLY SWITCH THE ROCKER ARM SO THAT YOUR FINGERS WILL NOT BE PINCHED.

For the proportioning pumps to switch direction or reverse, the reversing switch activator plate must contact an arm of the rocker arm. Failure of the activator plate to make proper contact is usually caused by something physical such as a bent or loose activator plate.

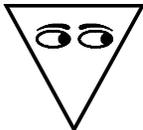
Should the above not be the cause, the problem is likely to be a result of the pump piston packing having loosened and hitting the inner face of the pump inlet flange before the activator plate contact the rocker arm. To resolve this, the unit must be shut down and the appropriate pump disassembled for repair.

Failure of the directional valve to shift is readily seen because the activator plate will have moved past the arm of the rocker and not reverse. When this happens, the first thing to do is to relocate the activator plate so that it is situated between the arms of the rocker arm. Manually activate the spool to reposition the activator plate.

If the spool seems to move freely when it is pushed, the over-run was probably caused by an electrical problem. Using care not to get pinched by the activator plate, push in each arm of the rocker arm, listen for the shifting of the spool (you will probably note a slight movement of the activator plate), and note the direction indicator lights are appropriate. If the spool does not shift, or if the lights do not light there is an electrical problem between the pump switch and the directional valve coil, or the reversing switch may be inoperative.

Should the spool hang up or be hard to push, it is likely there is a mechanical problem within the directional valve, which will necessitate shutting down the unit and disassembling the directional valve for cleaning.

6. **OVERPRESSURE PROTECTION** – Each chemical side of the Marksman is protected with an overpressure safety switch, which is located on the corresponding preheater. These switches are factory set at 2500 psi for the machines with size 120 pumps and at 3500 psi for the machines with size 80 pumps. When this pressure is reached, the switch automatically removes power from the directional valve causing the pumps to stall. When the power is removed both directional indicator lights will go off which is the indication to the operator of overpressure. This is not a lockout design system and when the pressure bleeds off approximately 300 psi below its maximum setting the system will be restored to normal operation; however, the cause of the overpressure should be determined and corrected. The three most likely causes are:
  - a) A restriction in the gun
  - b) Cavitation of the opposite pump
  - c) Air or hydraulic pressure set too high
  
7. **CONTROL TRANSFORMER FUSE** - with power OFF, remove the transformer fuse and check it for continuity or simply replace it with one known to be good.



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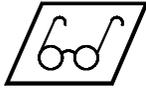
**CAUTION:** The fuse must be replaced with one of the same rating. A substitute may damage the equipment.

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## MAINTENANCE

To realize full productivity from the Marksman, it is necessary that certain maintenance be performed daily or periodically.

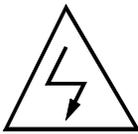


### PROPER PROTECTIVE GEAR

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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 PROTECTION, GLOVES, SAFETY SHOES AND RESPIRATORY EQUIPMENT AS REQUIRED.

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### ELECTRICAL SHOCK

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**WARNING:** TO PREVENT SERIOUS BODILY INJURY FROM ELECTRICAL SHOCK, NEVER OPEN THE ELECTRIC CONSOLES OR OTHERWISE SERVICE THE EQUIPMENT BEFORE SWITCHING OFF THE MAIN POWER DISCONNECT AND INTERRUPTING SUPPLY VOLTAGE AT THE SOURCE.

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### HIGH TEMPERATURE

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**WARNING:** THERE IS HIGH TEMPERATURE INSIDE THE PRIMARY HEATER COVER BOX. BEFORE PERFORMING MAINTENANCE, ALLOW THE HEATER TO COOL TO AVOID BODILY INJURY FROM HOT FLUID OR HOT METAL

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### HYDRAULIC PRESSURE

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**WARNING:** THE FLUID COMPONENTS ARE PRESSURIZED UP TO 3500 PSI. TO AVOID SERIOUS BODILY INJURY FROM HYDRAULIC INJECTION OF FLUID, NEVER OPEN ANY FLUID CONNECTIONS OR SERVICE HYDRAULIC COMPONENTS BEFORE ALL PRESSURES HAVE BEEN BLED TO ZERO.

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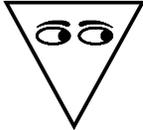
## PUMP LUBE SYSTEM

To insure that the pump lube will do its job, its condition must be checked daily. A change of the pump lube is required when it has become a gel or when its color has become the same as the isocyanate.

The gel formation is due to moisture absorption by the pump lube. The time interval between changes due to gel formation depends entirely upon the environment, which the equipment is operating. Because of the enclosed pump lube system in the Marksman, the exposure to moisture is minimized, but moisture contamination is still a possibility. 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 three or four week intervals.

To change the pump lube- proceed as follows:

- 1) Position the isocyanate proportioning pump to the RETRACT position.
- 2) Drain the lube cylinder.
- 3) Drain the reservoir, flush it with pump lube, and refill it with fresh pump lube.



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**CAUTION:** Do not fill the lube cylinder with pump lube. This would over pressure the system and may cause the lube reservoir to burst. The system is self-priming and the will fill during normal operation of the machine.

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### **INLET FILTER SCREEN**

A filter screen has been provided before each proportioning pump, to filter 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 the screen will be sufficient.

**NOTE:**  
*This will not be the case when spraying many plural component-coatings, particularly if the resin was not thoroughly mixed in the supply drum. A clogged resin inlet filter will be one of the most common causes of problems.*

The isocyanate pump screen presents another matter. The isocyanate component can crystallize from either moisture contamination or freezing. If proper storage, transfer, and operating procedures are followed and the chemicals you receive are clean, you should have little problem with the isocyanate screen. In practice though, it has been found that daily cleaning of the isocyanate screen is good preventative maintenance. It is important to note that the isocyanate pump screen should NEVER be cleaned 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. By accomplishing the cleaning operation during the START-UP procedure, contamination problems will be minimized because the isocyanate residue that any be contaminated will be flushed out immediately when dispensing commences.

## **PROPORTIONING PUMPS**

Both proportioning pumps should be disassembled and cleaned annually. The pistons and cylinder should be inspected for marks or scratches, which may cause leakage or damage to packings, and replaced as necessary. It is also recommended that the piston and cylinder packings, expanders, and packing springs be replaced at this time basis as a preventative maintenance precaution.

## **PUMP BASES ASSEMBLY**

1. Depressurize the system.
2. Remove the valve cover bracket. A groove has been provided in the valve cover to facilitate the removal by use of a screwdriver. If the valve cover is particularly difficult to remove, use the 3 inch monkey wrench to turn the cover back and forth while applying upward leverage with a screwdriver.

Inspect the valve cover o-ring and replace as required. It is a good practice to liberally coat the o-ring with grease prior to inserting the valve cover back into the pump base assembly. Also check the chamfer around the cavity to insure that there are no sharp edges which could damage the o-ring and prevent proper seal.

3. Remove the spring. Remove the valve ball. Do not use a screwdriver or knife as the ball surface may be damaged. Since the ball is stainless steel it cannot be removed by the use of a pocket magnet.
4. Using the ball seat removal tool, (5/8 hex stock) to unthread and remove the ball seat

Inspect the seat gasket and replace as required. Note the gasket should extend beyond the seat by approximately 1/16 inches when new. Any extension less than 1/32 inches will require a new seat be installed.

Clean the gasket seating surfaces on the underside of the seat and inside the pump base cavity.

Reinstall spring and valve cover.

Thoroughly clean the thread on the seat before replacement. It is also a good practice to coat the threads with a liberal amount of grease. Reinstall the seat with gasket by threading the seat into the base by hand until the gasket bottoms inside the pump base. Use a 6"

adjustable wrench to snug the seat approximately 1/4 turns DO NOT OVERTIGHTEN. It may be necessary to periodically retighten the seat throughout the life of the gasket.

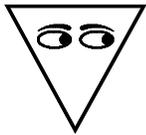
5. Wipe the valve ball clean and inspect for nicks. Replace as required.

Inspect the seat area for nicks or scratches. Replace as required.

## **PRIMARY HEATERS**

HEATING ELEMENTS - the heating element can be conveniently replaced without disassembly of the heater. With the power OFF, disconnect the lead wires, and using an open end wrench, loosen the heating element and remove it. Since each element is surrounded by fluid, be prepared to catch the residual fluid as the element is withdrawn. Inspect the removed element, it should be relatively smooth and shiny. If there is crusted or burnt ash like material adhered to the rod, it may indicate that the primary heater is developing excessive temperature.

Reinstall the heating element using a thread sealant.



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**CAUTION:** If removing the heating element from the tube with the temperature sensor, the sensor must be removed first.

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***IMPORTANT-** An electrical schematic, which shows the proper element hook-up is fastened to the inside of the heater cover, and must be followed. Each of the heat exchangers is protected from overheating by a bimetallic-thermostat and to afford the maximum safety protection the corresponding heating elements must not be wired to the same fuse.*

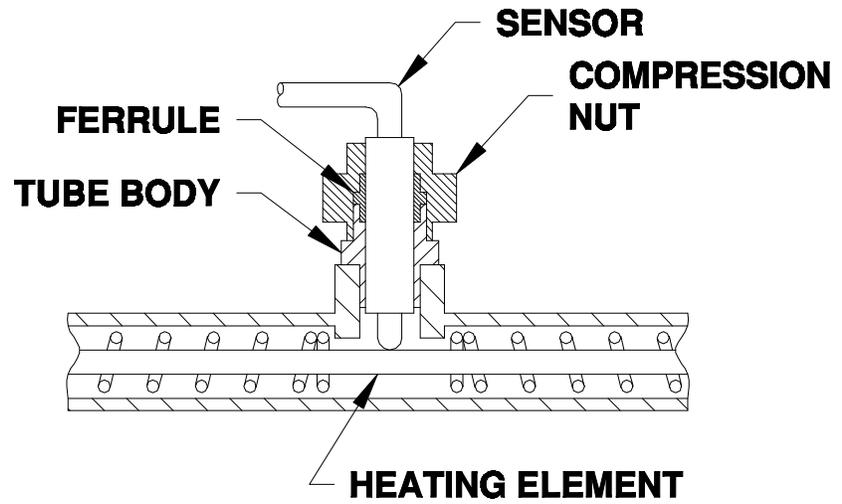
TEMPERATURE SENSOR - the temperature sensor includes the compression nut and ferrule, and once the ferrule has been locked in place, it becomes a permanent part of the sensor and cannot be relocated or removed. The location of the temperature sensor is critical to the operation of the heater and it must be properly positioned before the compression nut is tightened.

Proper installation procedures are as follows:

1. Determine that the body of the compression fitting is securely tightened into the heat exchanger tube to prevent any leakage. Remember, once the ferrule has been set, the position of the body cannot be changed!
2. Determine that the heat exchanger spring is not obstructing placement of the sensor. The spring can be moved out of the way with a small screwdriver if required. Place the sensor into the body and continue to insert until positive contact is made with the heating element

3. Firmly hold the sensor in place against the element while tightening the locknut.

Note the correct ferrule positioning.



*Figure 14. temperature sensor*



**APPENDIX**

**TABLE 1. MAXIMUM FLOW CHART**

**NOTE:**  
*Charts based upon specific gravity of 1.20.*

<b>OUTPUT (LBS/MIN)</b>	<b>OUTPUT (GPM)</b>	<b>PUMP SIZE</b>	<b>S (STROKES/MIN)</b>	<b>MAX. PRES. OPERATING</b>
20	2.0	80	85	3500
25	2.5	80	110	3500
30	3.0	80	130	3500
40	4.0	120	130	2500

**Formula:** This formula is useful for calculating the output of the proportioning unit:

$$Q(\text{gpm}) = S(\text{strokes/min}) \times \text{pump size} \times .00026$$

$$Q(\text{lbs/min}) = S(\text{strokes/min}) \times \text{pump size} \times \text{sp. gr.} \times .0022$$

\*Recommended Hydraulic Fluid or the Equivalent:

- 1) Mobil DTE 24
- 2) Exxon-Nuto H-32(44)
- 3) Cooks Albavis 8
- 4) Chevron ISO32

\*Hydraulic Tank Capacity: 20 Gal (76 liter)

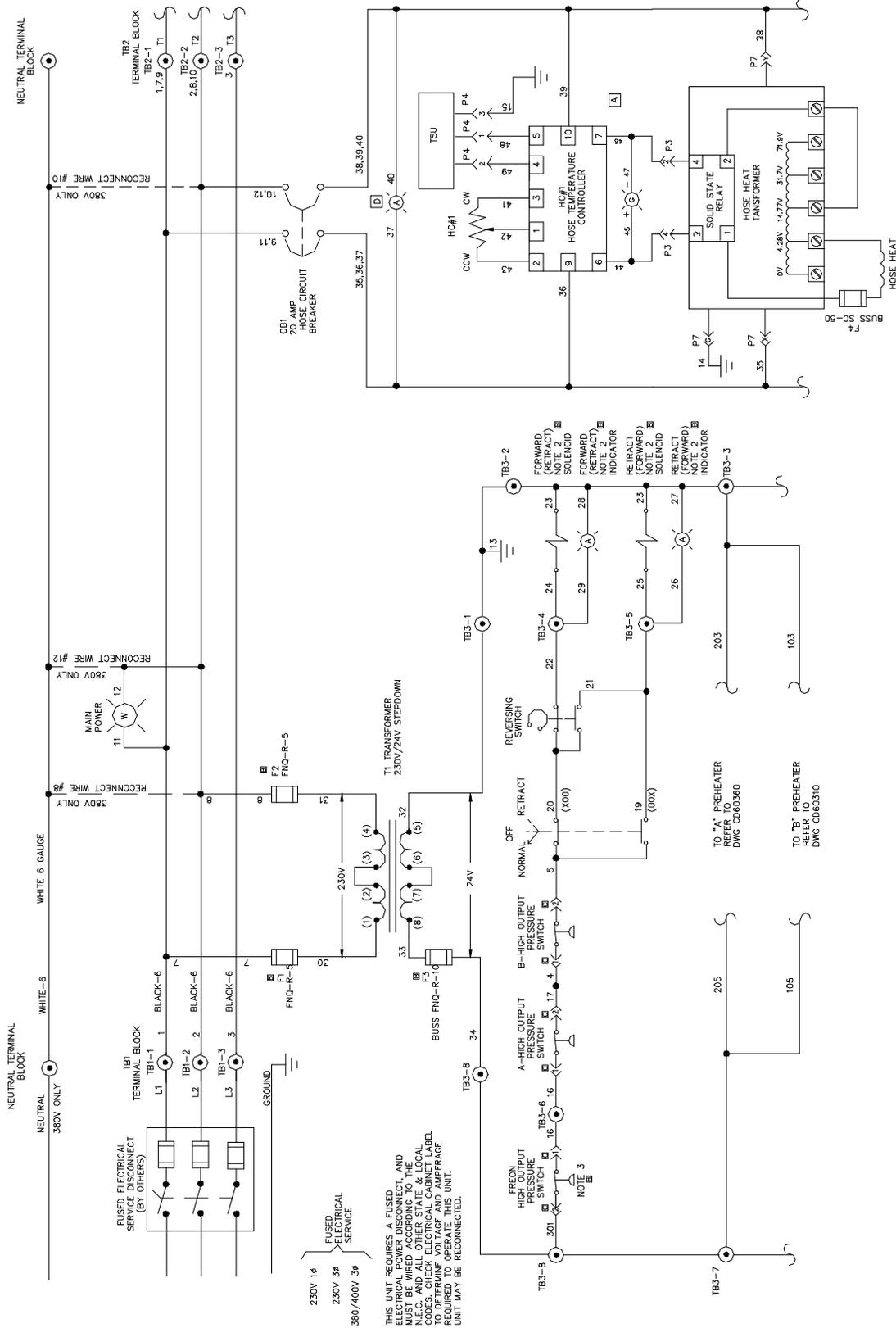
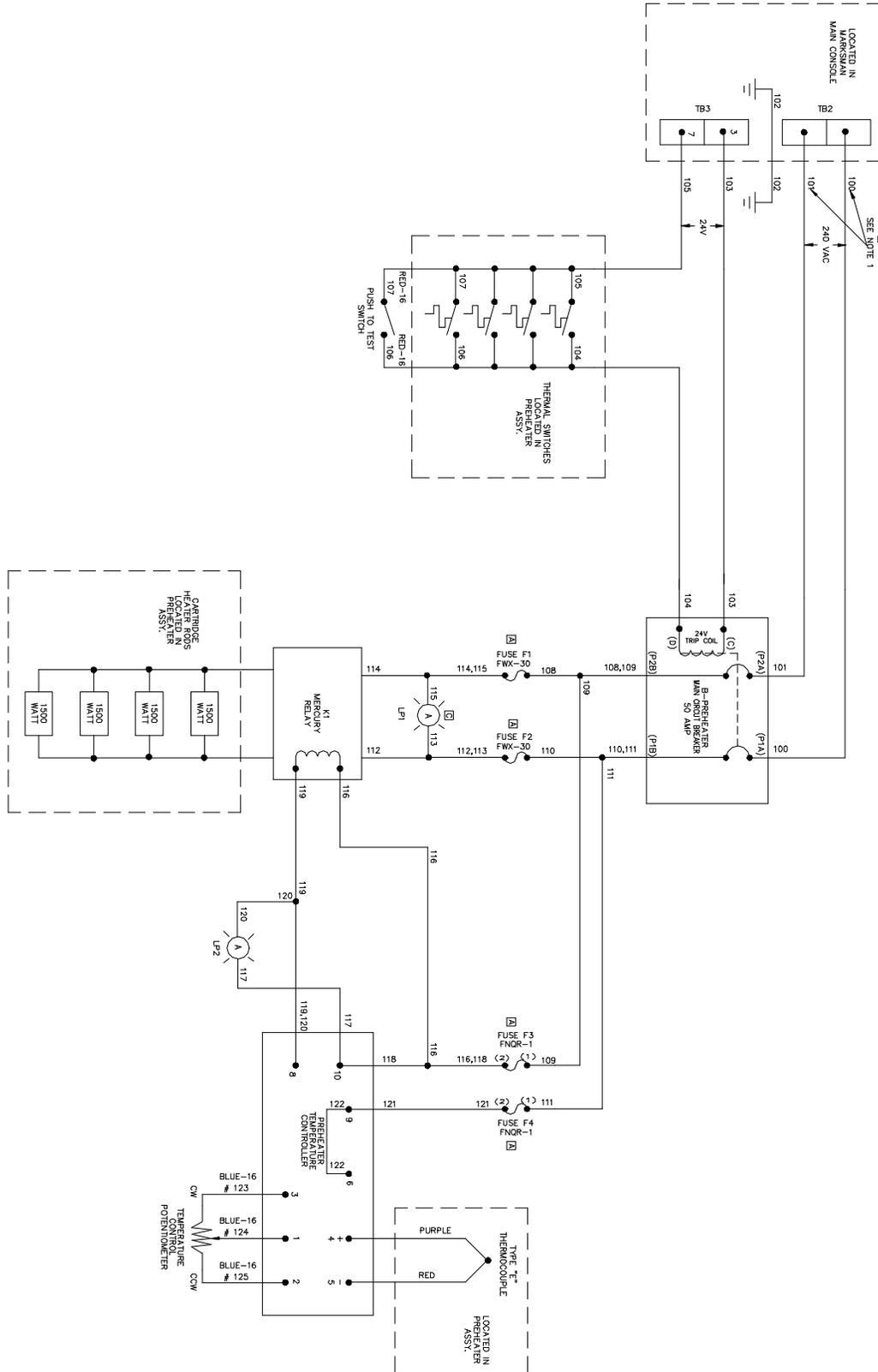


Figure 15. Basic Marksman Connection diagram



**Figure 16. Polyol Preheater Wiring Diagram**

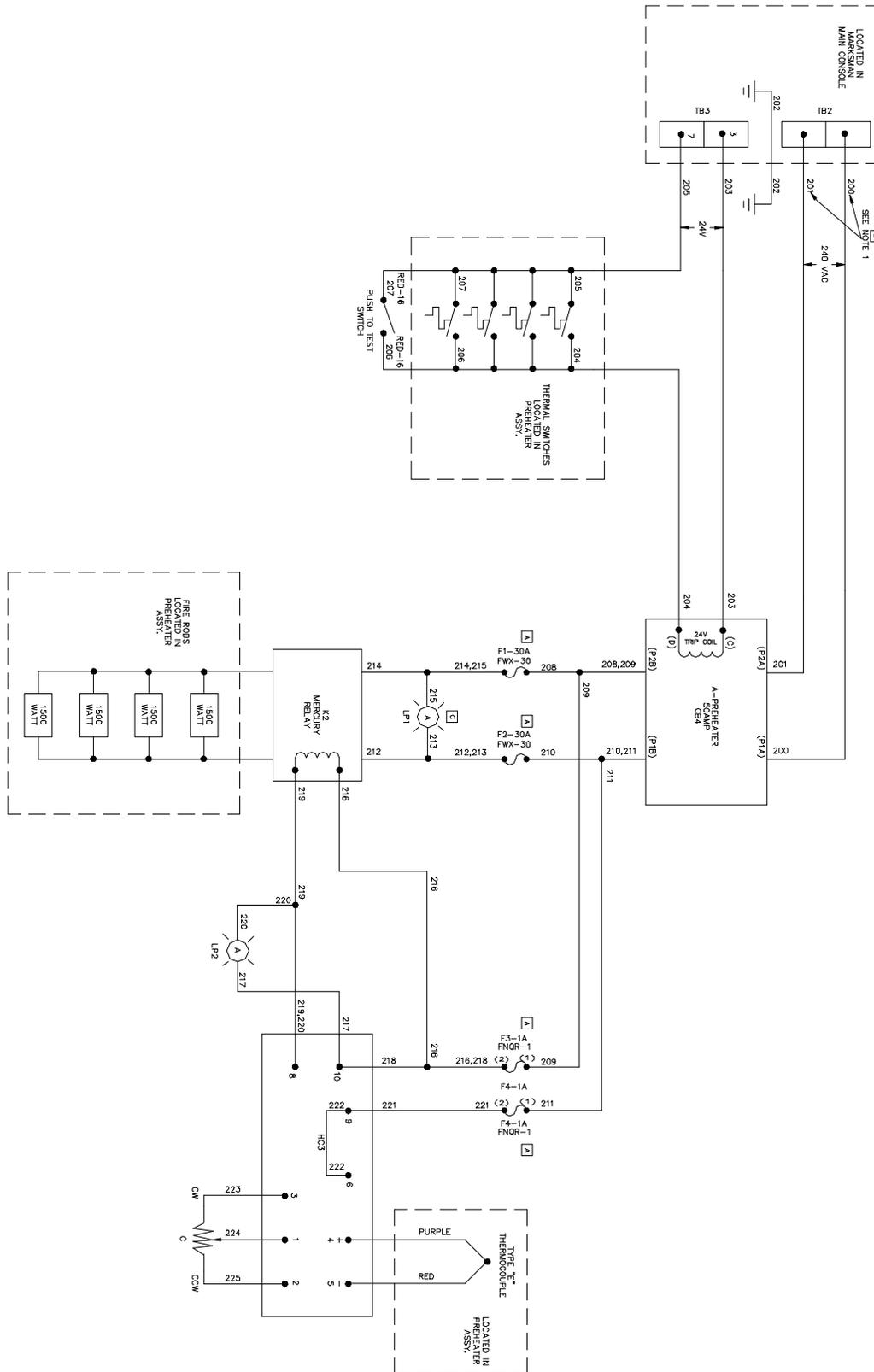
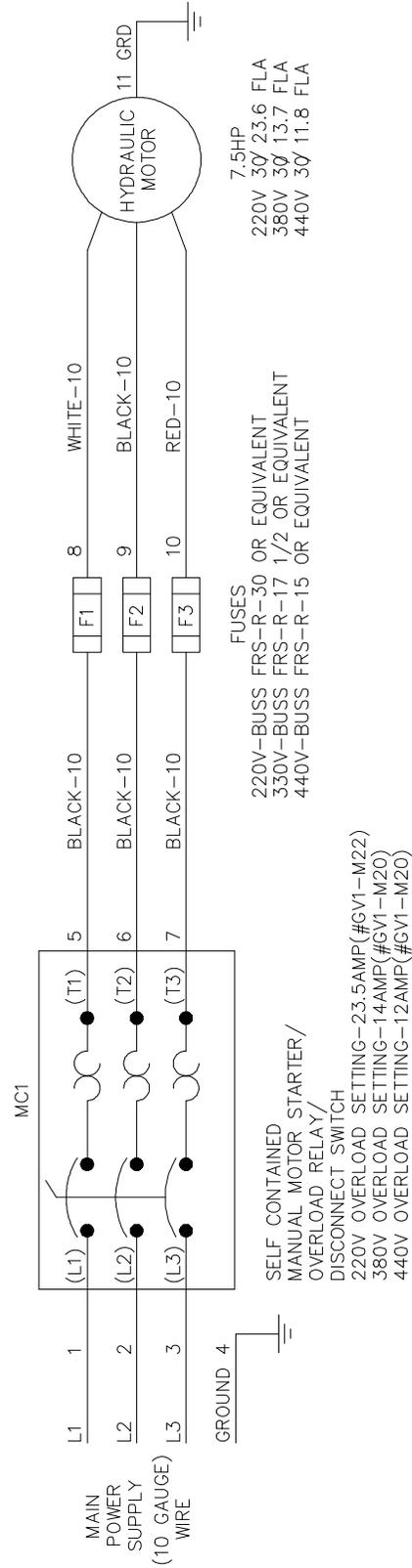


Figure 17. Isocyanate Wiring Diagram



**Figure 18. Hydraulic Power Pack Schematic**



<b>Field Number</b>	<b>Field Title</b>	<b>Description</b>
1	<b>Date</b>	Enter date report is submitted.
2	<b>Name</b>	Enter name of person making report.
3	<b>IM Number</b>	Enter the Part Number of the Instruction Manual from the title page.
4	<b>Issue Number</b>	Enter the Issue number of the Instruction Manual from the title page. If there is no issue number enter <b>NONE</b> .
5	<b>Date of Issue</b>	Enter the date of Issue of the Instruction Manual from the title page. If there is no issue date enter <b>NONE</b> .
6	<b>Page Number</b>	Enter the page number containing the discrepancy
7	<b>Discrepancy</b>	Provide a brief description of discrepancy

**NOTE:** You may send a marked copy of the page as an attachment to your submittal.