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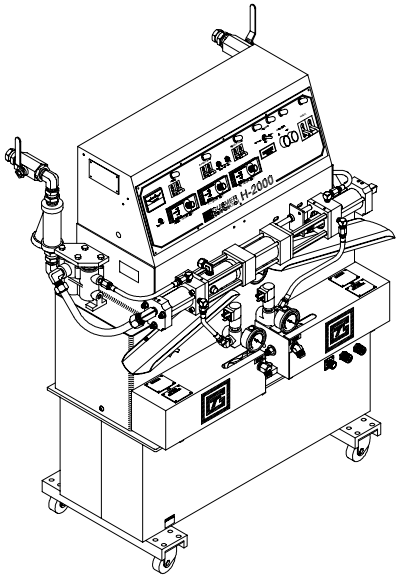
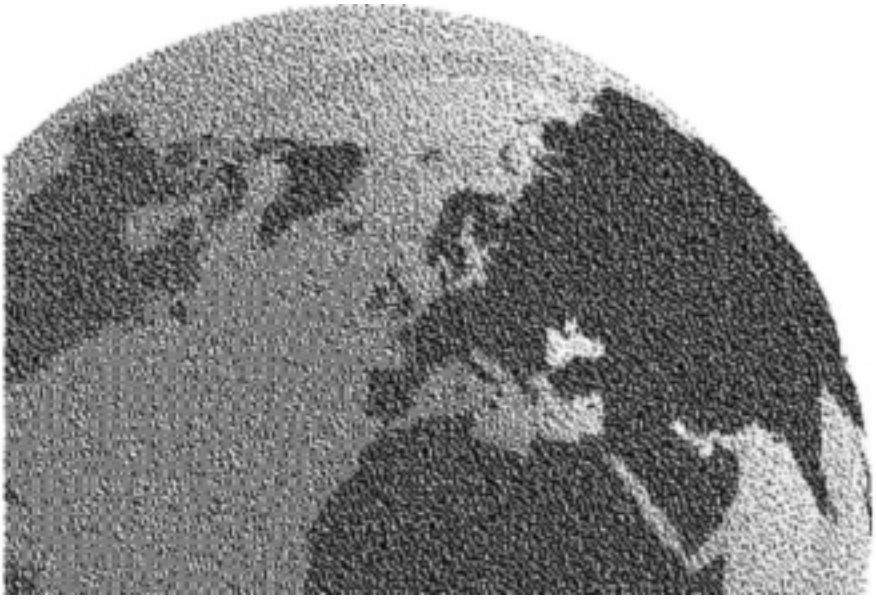
CORPORATION

"Teamwork & Communication"



Model H-2000/H-3500 Proportioning Unit

Operating Manual 15942A-1



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GUSMER CORPORATION ®

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

***NOTICE**: The equipment described in this technical manual must only be operated or serviced by properly trained individuals, thoroughly familiar with the operating instructions and limitations of the equipment. For technical service, call your local distributor. Call: 1-800-FOR-GSMR (1-800-367-4767) for the name and telephone number of your local distributor.*

NOTICE: All statements, information and data given herein are believed to be accurate and reliable but are presented without guarantee, warranty or responsibility of any kind expressed or implied. Statements or suggestions concerning possible use of GUSMER equipment are made without representation or warranty that any such use is free of patent infringement, and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required

CONTENTS

LIST OF FIGURES

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

It is necessary to understand and follow the instructions in this manual to insure 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.

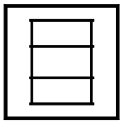
Acceptable Equipment Uses

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.

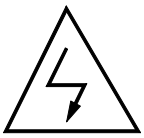
Operational Safety Procedures

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

WARNING: *THE SOVENTS AND CHEMICAL USED WITH THIS EQUIPMENT EXPOSE THE OPERATOR TO CERTAIN HAZARDS. ADEQUATE PERSONAL PROTECTIVE MEASURES MUST BETAKEN 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. INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING FROM THE SUPPLIER OF SUCH CHEMICALS.*

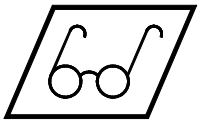


High Voltage

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.*

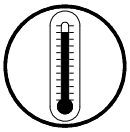
High Pressure

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 INJECTION OF FLUID, NEVER OPEN ANY HYDRAULIC CONNECTIONS OR SERVICE HYDRAULIC COMPONENTS WITHOUT BLEEDING ALL PRESSURES TO ZERO.*



Personal Protective Equipment

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.*



High Temperature

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.*

Warning

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*

DESCRIPTION

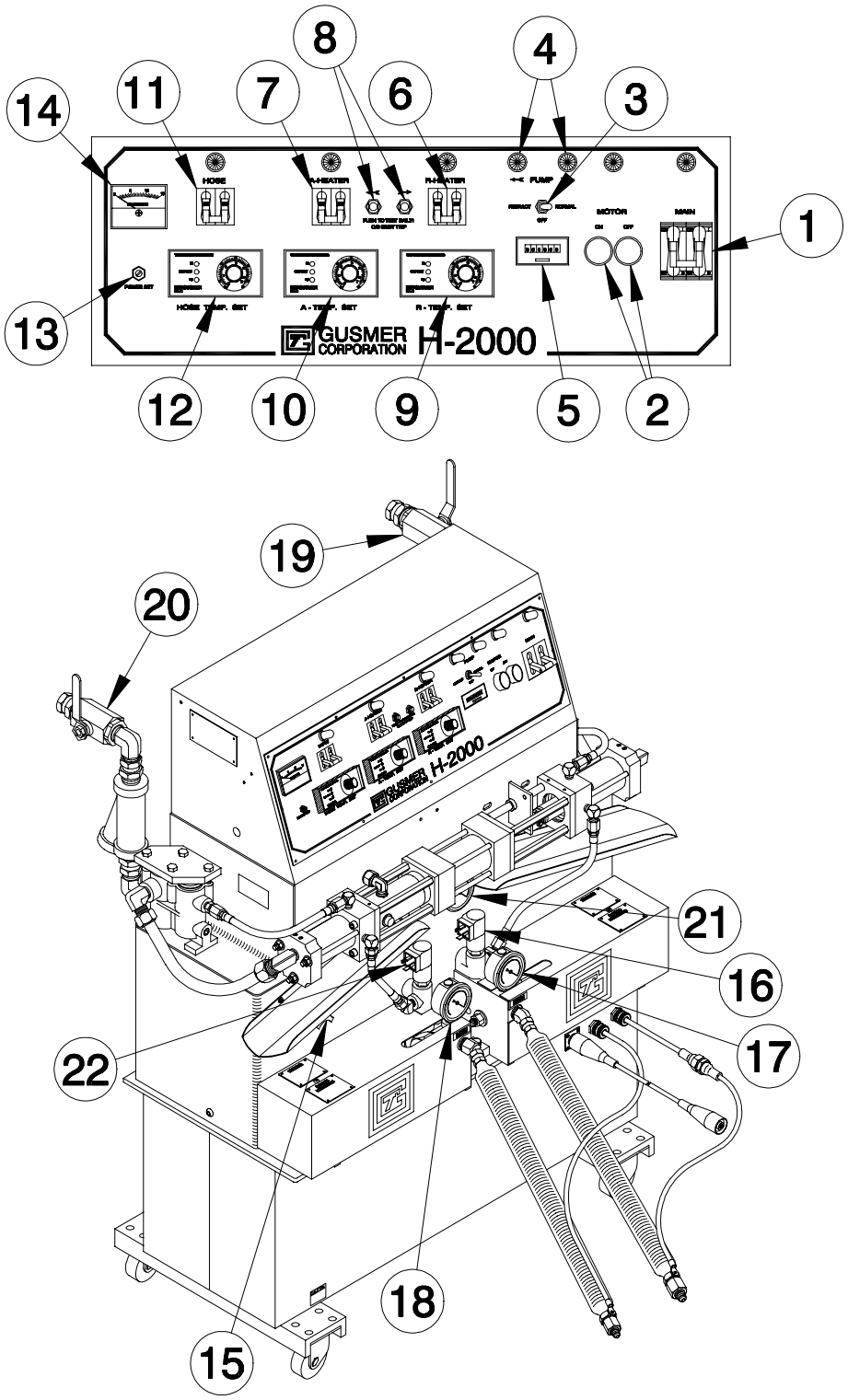


Figure 1. Description Of Controls for both H-2000 and H-3500 Models.

1.	**MAIN CIRCUIT BREAKER**	Controls and protects power to all circuits; must be ON for any function of the proportioning unit to operate.
	Pilot light (White)	Indicates when lighted that the main circuit breaker is on.
2.	**MOTOR CONTROL**	Controls power to the electric motor; must be ON for the hydraulic drive system to operate.
	Pilot light (Amber)	Indicates when lighted that the electric motor is on.
3.	**PUMP SWITCH**	controls operation of the hydraulic drive system;
	OFF	Hydraulic Directional Drive System is off, and cannot generate hydraulic pressure 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 Hydraulic Drive System with the A proportioning pump in the retracted position.
4.	**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.
5.	**COUNTER**	Records the cycle count of the proportioning pumps; one cycle equals two (2) strokes (one in each direction).
6.	**R-PRIMARY HEATER CIRCUIT BREAKER**	Controls and protects power to the R primary heater; must be ON for the primary heater to operate.
	Pilot light (Amber)	Indicates when lighted that the R Primary Heater Circuit Breaker is on.
7.	**A-PRIMARY HEATER CIRCUIT BREAKER**	Controls and protects power to the A Primary Heater; must be ON for the Primary Heater to operate.
	Pilot light (Amber)	Indicates when lighted that the A Primary Heater Circuit Breaker is on.
8.	**PUSH TO TEST BUTTON**	Push button daily to test Primary Heater Circuit Breakers. Circuit Breaker must trip when this button is pushed.
9.	**R-PRIMARY HEATER CONTROLLER**	Controls the temperature of the liquid maintained by the R primary heater; set control selector (dual scale, Fahrenheit or Centigrade) to the desired temperature. From this point, the temperature control is completely automatic.
	Green Controller Light	Indicates when lighted that the temperature of the Resin component in the heater is within +/- 5° F of dial set point.
	Amber Controller Light	Indicates when lighted that the temperature of the Resin component in the heater is more than +/- 5° F cooler than dial set point.
	Red Controller Light	Indicates when lighted that the temperature of the Resin component in the heater is more than +/- 5°F warmer than dial set point.
10.	**A-PRIMARY HEATER CONTROLLER**	Controls the temperature of the liquid maintained by the A Primary Heater. Set Control Selector (dual scale, Fahrenheit or Centigrade) to the desired temperature. From this point, the temperature control is completely automatic.

	Green Controller Light	Indicates when lighted that the temperature of the Isocyanate component in the heater is within +/- 5° F of dial set point.
	Amber Controller Light	Indicates when lighted that the temperature of the Isocyanate component in the heater is more than +/- 5° F cooler than dial set point.
	Red Controller Light	Indicates when lighted that the temperature of the Isocyanate component in the heater is more than +/- 5°F warmer than dial set point.
11.	**HOSE HEATER CIRCUIT BREAKER**	Protects hose heater circuit; must be ON for the hose heater to operate.
	Pilot light (Amber)	Indicates when lighted that the Hose Heater Circuit Breaker is on.
12.	**HOSE HEATER CONTROLLER**	Controls the temperature of the liquid maintained by the Hose Heater. Set control selector (dual scale) to the desired temperature. From this point, the temperature control is completely automatic.
	Green Controller Light	Indicates when lighted that the temperature of the hose heater is within +/- 5° F of dial set point.
	Amber Controller Light	Indicates when lighted that the temperature of the hose heater is more than +/- 5° F cooler than dial set point.
	Red Controller Light	Indicates when lighted that the temperature of the hose heater is more than +/- 5°F warmer than dial set point.
13.	**POWER SET**	Controls the amount of power delivered to the hose heater.
14.	**HOSE HEATER AMMETER**	Indicates the amount of heating power delivered to the hose heater.
15.	**HYDRAULIC PRESSURE CONTROL**	Controls the hydraulic pressure available to the hydraulic drive system.
16.	**RESIN OVER-PRESSURE SAFETY SWITCH**	Turns off the hydraulic drive system when the Resin proportioning pump exceeds the safe pressure limitation.
17.	**RESIN PRESSURE GAUGE**	Indicates the pressure in the Resin proportioning system.
18.	**ISOCYANATE PRESSURE GAUGE**	Indicates the pressure in the Isocyanate proportioning system.
19.	**R-INLET SUPPLY BALL VALVE**	
20.	**A-INLET SUPPLY BALL VALVE**	
21.	**HYDRAULIC PRESSURE GAUGE**	Indicates the pressure in the hydraulic drive system.
22.	**ISOCYANATE OVER PRESSURE SAFETY SWITCH**	Turns off the hydraulic drive system when the Isocyanate proportioning pump exceeds the safe pressure limitation.

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 "standard" spray, pour, and froth pour, urethane foams, and approved coating systems. Other use of the equipment, or any part thereof, constitutes misuse without expressed written approval 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 from using abrasive materials **will not be covered** under warranty.

SAFETY EQUIPMENT:

Ware sufficient protective clothing when servicing or operating this equipment to prevent skin and eye contact with the chemicals or solvents used in or with this equipment,

Ware approved safety glasses or goggles when servicing or operating this 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, Gusmer recommends using a fresh air type of respirator system.

APPLICATION:

Due to the potential fire hazard of exposed urethane foam, follow all procedural and safety directives for the storage, handling, and application of the chemicals used with this equipment.

WARNING: *INFORMATION CONCERNING PERSONAL PROTECTION AND PROPER HANDLING AND APPLICATION PROCEDURES OF THE CHEMICALS AND SOLVENTS USED WITH THIS EQUIPMENT MUST BE OBTAINED FROM THE SUPPLIERS OF SUCH CHEMICALS AND SOLVENTS.*

Electric Requirements are as follows:

(5HP) , 220 Volts AC current 60 HZ, Single Phase	103 AMPS at 220 Volts, AC current. 23 KVA (18.4 kw) peak power at 220 Volts.
(5HP), 220 Volts, AC current 50/60 HZ; 3 Phase	45 AMPS at 220 Volts, AC current. 17 KVA (13.6 kw) peak power at 220 Volts.
(5HP), 3 x 380, 50 HZ, AC current.	38 AMPS at 3 x 380, 50 HZ, AC current 25 KVA (20 kw) peak power at 380 Volts.

A terminal block is located in the main electric console for easy connection of the main power cord (not supplied). A certified electrician must perform all electrical servicing to the unit. Electrical service must meet federal and local codes.

WARNING: *DAMAGE TO THE EQUIPMENT COULD RESULT IF THE UNIT IS OPERATED AT OTHER THAN THE NAME PLATE VOLTAGE.*

AIR:

The Model H-2000/H-3500 is hydraulically driven. There are no air requirements for the proportioning unit itself.

MATERIAL SUPPLY:	The temperature of the chemical supply must be as specified by your chemical supplier.
	Protect the chemical supply from moisture in the atmosphere with a blanket of dry nitrogen or desiccated air.
	Resin Inlet-3/4" NPT (FE) swivel
	Isocyanate Inlet-1/2" NPT (FE) swivel
CHEMICAL VISCOSITY:	
	There is no established maximum limitation and, assuming adequate supply, viscosity's of 5,000 cps or more may be possible.
HYDRAULIC SERVICING:	
	16 gallons (62 Liters)
	Recommended operating temperature: 120°F (48°C)
	Maximum operating temperature: 160°F (71°C)
WEIGHT:	Empty: 385 pounds (175 kilograms) Serviced: 482 pounds (219 kilograms)
DIMENSIONS:	Height: 47 inches (119 centimeters)
	Width: 40 inches (102 centimeters)
	Depth: 22 inches (56 centimeters)
OPERATING PRESSURE:	
	H-2000 - 2000 psi maximum (136 Bars)
	H-3500 - 3500 psi maximum (238 Bars)
SUPPLY PRESSURE*:*	400 psi maximum (27 Bars)
OUTPUT:	H-2000 - 30 lb./min. maximum (14 kg/min.) 28 lb./min. at 50 HZ (13 kg/min.)
	H-3500 - 20 lb./min. maximum (9 kg/min.)
INLET FILTER:	80 Mesh Standard (Optional - 60/40 Mesh)
PRIMARY HEATER:	6000 Watts per heater at 220 Volts.*
	H-2000: Δ t=60°F @ 30 lb./min. (14 Kg/min) *
	H-3500: Δ t=60°F @ 20 lb./min. (9 Kg/min) *
HOSE LENGTH:	310 feet (94.5 meters) maximum for heating purposes

* Ideal values obtained in laboratory testing and may not be duplicated under working conditions.

INITIAL MACHINE SET-UP

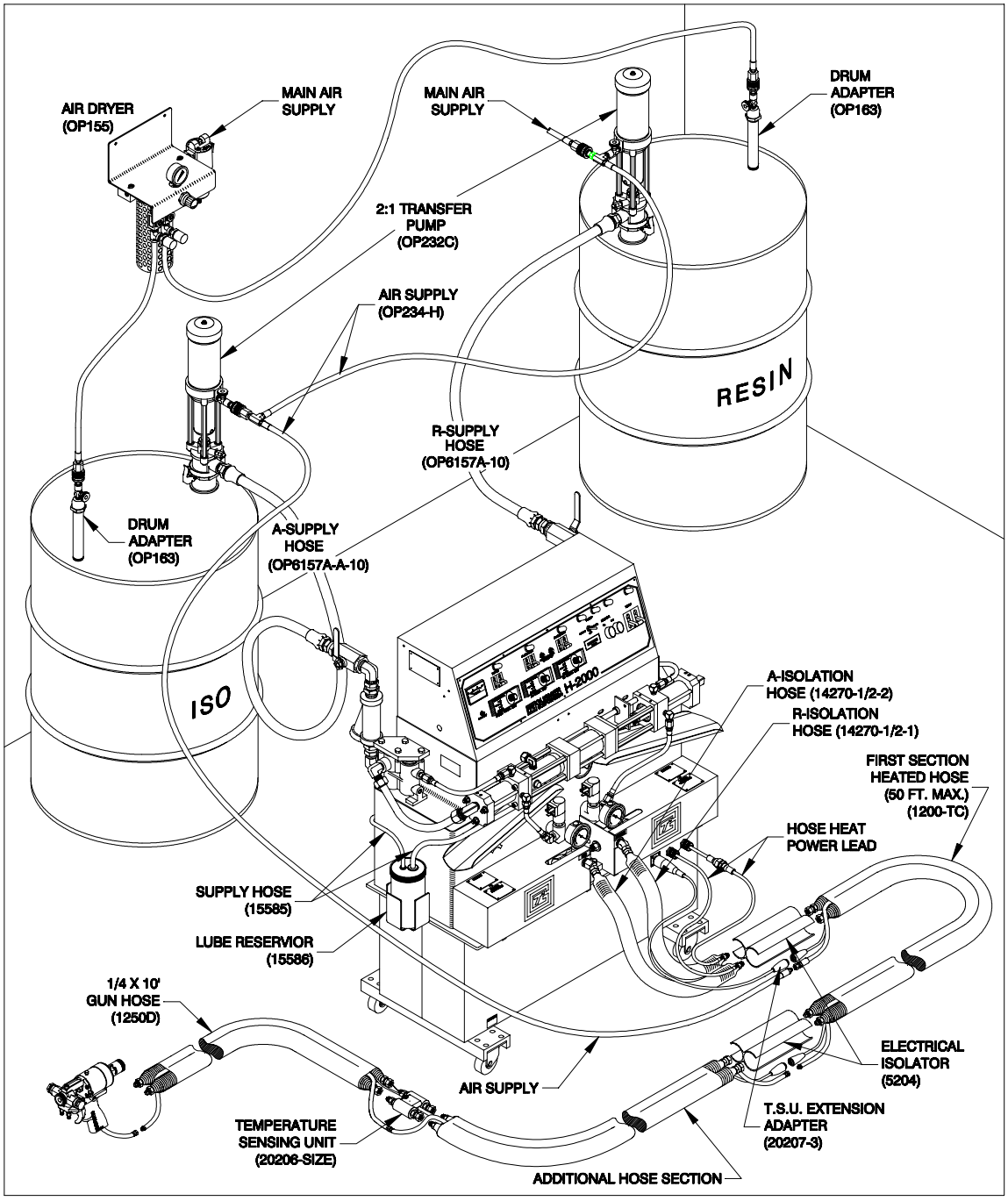


Figure 2. Typical Installation

WARNING: *PROPER PROTECTIVE GEAR MUST BE WORN WHEN SERVICING OR OPERATING THIS EQUIPMENT, WHICH INCLUDES BUT IS NOT LIMITED TO GLOVES, EYE PROTECTION, AND RESPIRATORY PROTECTION AS REQUIRED.*

An Accessory Package is included with the unit and contains the following parts that are required for setup:

a) Isolation hose (Blue – Resin; Red – Isocyanate)

b) TSU extension adapter

c) Electrical isolator

d) 1 roll electrical tape

e) Fittings/Adapters/Screws

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

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

NOTE:
The power source must be capable of meeting the electrical requirements specified on the nameplate of the proportioning unit and an accessible quick disconnect provided.

1. Connect the main power cord (not supplied) to the electric console. Open the electric control console. Feed the power cord through the strain relief.

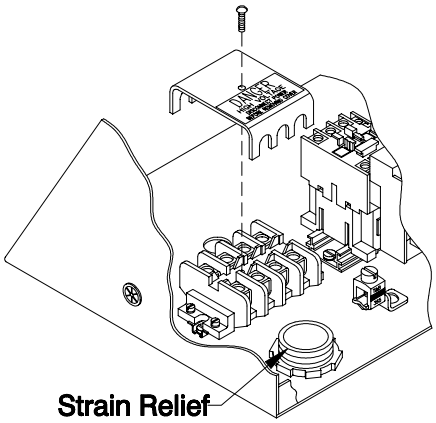


Figure 3. Power Cord Strain Relief

NOTE:
The material supply valves are loosely assembled to the unit so that they may be oriented in the position that best suits the setup.

2. Set up the supply and moisture control systems as required. Refer to the individual instruction manuals for the proper procedures.

3. Fill the hydraulic reservoir through the vented filler neck with approximately 16 gallons of hydraulic fluid. Refer to the listing in Appendix B for the recommended types of fluid.

   Important: *DO NOT overfill. Check that the filler neck is approximately 1/2 filled with liquid.*

4. Check the hydraulic pump to insure that it is full with hydraulic fluid. Remove the 90°-elbow fitting from the top of the pump and determine that the fluid level is to the top of the threaded hole. Add fluid as required and reattach fitting.

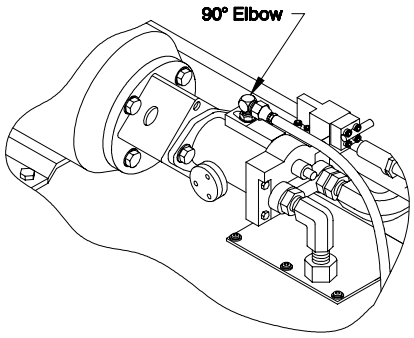


Figure 4. Hydraulic Fluid Level

5. Install the pump lube reservoir and bracket. Thread it onto the reservoir cap assembly and place it into the bracket. No priming of the system is required.

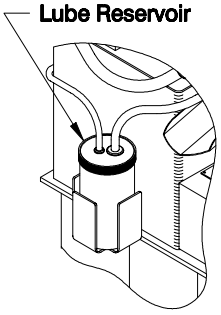


Figure 5. Lube Reservoir

6. 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. The Resin thread is 9/16-18, whereas the Isocyanate thread is ½-20. 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*

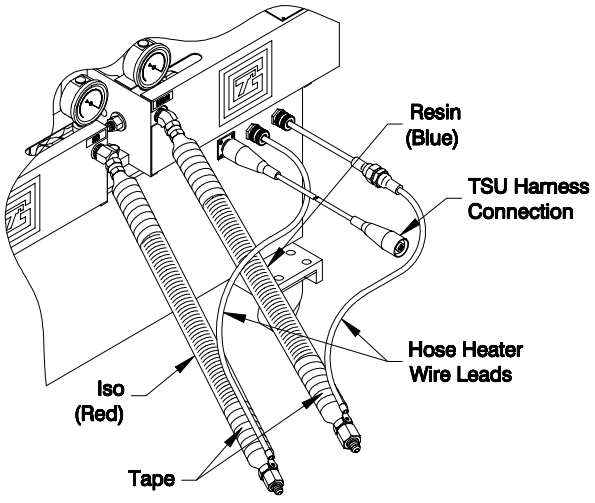


Figure 6. Isolation Hoses

NOTE:
The hoses are Connected end to end during shipment to protect them from moisture intrusion. Do not separate the hoses until they are ready to couple to the proportioning unit.

7. Connect the heated hose assemblies.

Important: *The importance of making proper hose connections cannot be overly emphasized. The connection points are a potential source of chemical and air leaks and are the points, most exposed 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 proper hose connection is shown in sequence on the following page*

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.

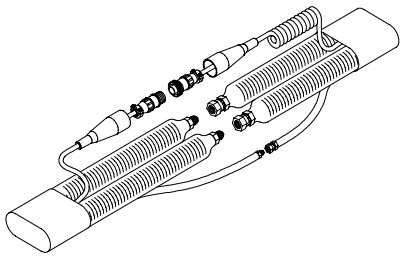


Figure 7. Hose Connection Step (a)

b) To assure a leak proof chemical connections, take care not to cross thread the fitting and DO NOT over-tighten.

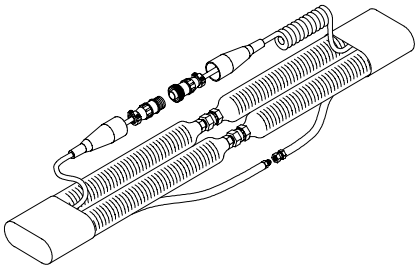


Figure 8. Hose Connection Step (b)

c) Tape the electrical isolator securely in place between the hydraulic fittings: failure to do so will cause a short circuit in the hose heating system.

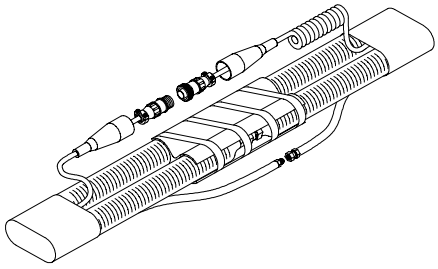


Figure 9. Hose Connection Step (c)

d) To assure a secure electrical connection: place the protective electrical isolator boot over each plug and tape together.

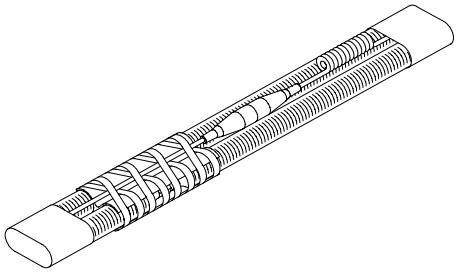


Figure 10. Hose Connection Step (d)

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

8. Install the Temperature Sensing Unit (TSU) onto the gun hose. Pull out and carefully straighten the LOOSE END of the temperature probe from the TSU. Insert the temperature probe into the Isocyanate hose. Connect the ground wire on the gun hose to the ground lug on the TSU.

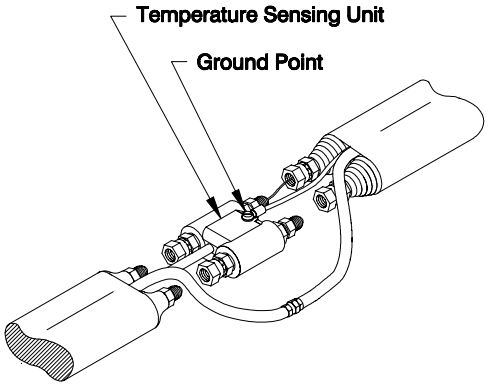


Figure 11. Temperature Sensing Unit

WARNING: *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.*

9. Connect the TSU extension harness to the proportioning unit using the adapter furnished in the provided package. Connect the main air source to the heated hose.

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

Important: *(for 3 phase units only) At this point it is necessary to check the rotation of the electric motor. An arrow located on the Hydraulic Pump and on the Bell Housing indicates a correct direction of rotation. Perform steps 10, 11, 12, 13.*

10. Remove the Bell Housing Safety Plug to allow you to see the shaft coupling. Turn the hydraulic pressure control counter-clockwise to the end. Make sure the pump switch is in the OFF position.

11. Determine that all circuit breakers, on the main console, are OFF. Switch the main circuit breaker to ON.

12. While observing the shaft coupling, cycle the motor ON and OFF. The rotation of the coupling must agree with the directional indicator. If the rotation does not agree, turn off all circuit breakers and disconnect the main power at the source. Open the electric console and switch any two of the three power leads. Recheck the rotation.

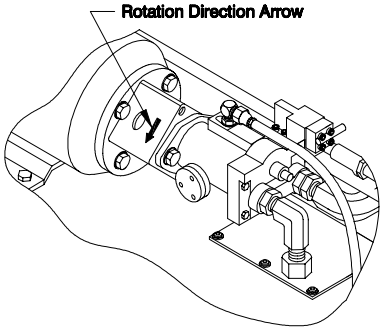


Figure 12. Bell Housing

13. Replace the plug in the motor bell housing.

14. Connect the coupling block to the gun hose and determine that the manual valves are closed.

15. Properly ground all equipment. The high velocity flow of fluid can create static sparking which may cause fire or explosion. Certain solvents, which are commonly 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. Ground this pump in accordance with the instructions provided with the pump.

    b) Ground the proportioning unit at the main electrical source. In the event, that the unit is being powered by a generator, the generator must also be grounded directly to a suitable electrical electrode such as an underground water system, the metal frame of a building, or a driven pipe. Electrodes of pipe or conduit shall not be smaller than ¾ inch diameter, galvanized for corrosion protection, and driven below the moisture level. For additional information, consult the National Electric Code.

    c) Connect the material supply system to the inlet of the proportioning unit. Exercise caution to ensure connecting chemicals to the appropriate proportioning pumps. We now have the proportioning unit, heated hose, and material supply system set up. Before the equipment is ready for use, it is necessary to purge the entire system of air and mineral oil that left over from the functional testing of the equipment conducted at the factory.

16. To purge the machine proceed as follows:

    a) Pressurize the transfer pumps and open the material supply valves. It is a good practice at this point to check for hydraulic leaks.

    b) Determine that the hydraulic pressure control is full decrease (counter-clockwise).

    c) Switch ON the main circuit breaker and motor control.

    d) With the Coupling Block Ports held over separate containers, open both manual valves.

    e) Switch the pump switch to the NORMAL Position.

NOTE:
Disposal of waste chemicals must be in accordance with local, state, and federal codes.

    f) Allow material to flow out of the coupling block until all spitting of air stops and all traces of residual material have disappeared.

    g) Switch the pump switch to OFF.

    h) Close both manual valves and flush any residual material from the outside of the coupling block.

    i) Mount the gun to the coupling block.

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

HOSE HEATER

NOTE:
These procedures are not required on a daily basis but may have to be executed periodically as part of the daily start-up routine

The hose heater transformer tap settings must match the length of hose in use. Therefore, this procedure will have to be executed during the initial installation and when changing the hose length, according to the figure below.

a) Loosen the shaft lock on the hose heater power set control and adjust to zero (full counter-clockwise).

b) Switch ON both the main and hose heater circuit breakers. The white and amber pilot lights respectively should be on. The hose heater ammeter should be zero.

c) Adjust the hose temperature controller for maximum temperature. The amber pilot light, on the hose heater controller, should be on.

NOTE:
As the hose heater warms-up, the amperage will drop slightly and not need readjusting.

d) Adjust the power set control (clockwise) to maximum setting. Tighten the shaft lock nut, as no further adjustments to this control will be required. Reset the temperature controller to the desired temperature setting.

NOTE:
The default tap setting for the transformer is 10V

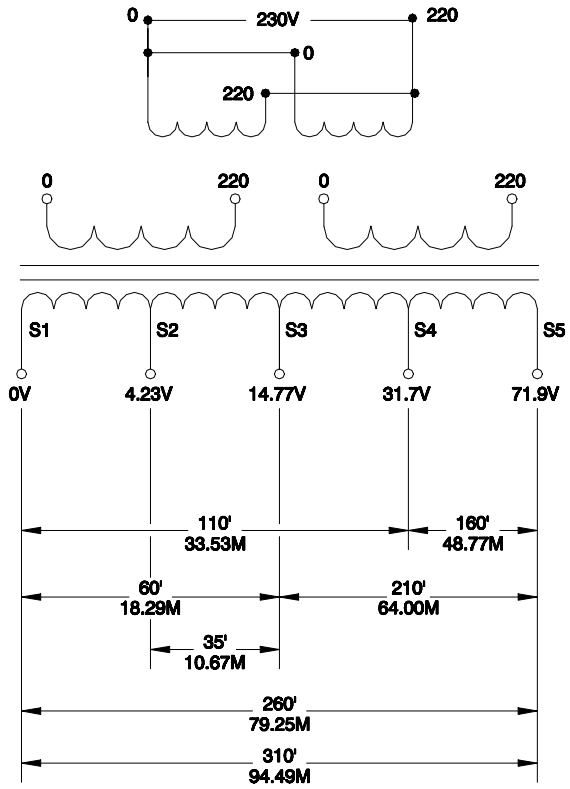


Figure 13. Tap Settings (Single Transformer)

Hose Length (ft)	Setting	Voltage
-	S1-S2	4.23
35	S2-S3	10.54
60	S1-S3	14.77
-	S3-S4	16.93
-	S2-S4	27.47
110	S1-S4	31.7
160	S4-S5	40.2
210	S3-S5	57.13
-	S2-S5	67.67
260 & above	S1-S5	71.9

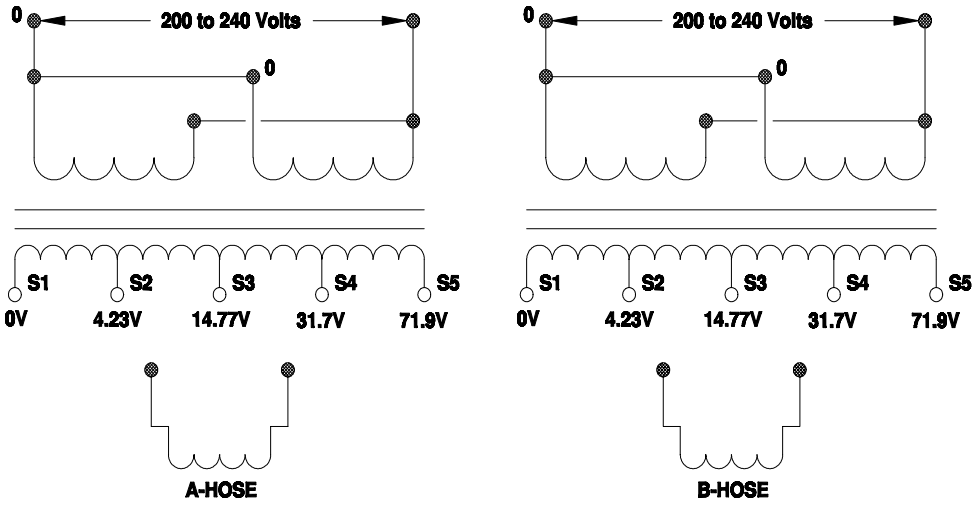


Figure 14. Tap Settings (Dual Transformer)

Hose Length (ft)	Setting	Voltage
35	S1-S2	4.23
60	S2-S3	10.54
110	S1-S3	14.77
-	S3-S4	16.93
160	S2-S4	27.47
210	S1-S4	31.7
260 & above	S4-S5	40.2
-	S3-S5	57.13
-	S2-S5	67.67
-	S1-S5	71.9

OPERATION

Daily Startup Procedures

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

1. SERVICING-check the condition of the hydraulic and pump lubrication systems and service as required. Generally, change the lubricating fluid when it shows signs of color change.

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.

3. Check the inlet screens and service as required.

4. Pressurize the transfer pumps and open both Chemical Supply Valves.

5. Switch ON the main circuit breaker. The white pilot light should be on.

NOTE:
To prevent excessive pressure buildup in the dual heated hose, always bring the hose up to temperature before the Hydraulic system is turned on. The green pilot light, on the hose heater controller, will indicate that the liquid in the hose is up to temperature

6. Switch ON the Hose Heater Circuit Breaker and set the temperature controller as required.

   The amber pilot light should be on as well as the amber controller light.

7. When the liquid in the hose reaches the temperature selected, the green controller light will light and the ammeter will begin to cycle.

NOTE:
Primary heating is virtually instantaneous therefore, do not turn on the primary heaters until required for operation. It is also a good practice to turn off the primary heaters during shutdowns exceeding one half hour

8. Switch on the Primary Heater Circuit Breakers and set the temperature controllers as required.

   The amber pilot light should be on as well as the amber controller lights.

NOTE:
The pump switch must be in the RETRACT or NORMAL position to adjust the hydraulic pressure

9. Switch ON the Motor control and set the hydraulic pressure as required. The amber pilot light should be on.

10. Set the pump switch to the NORMAL position. One of the amber directional Indicator lamps will light and the proportioning pumps should move a short distance and pressurize.

11. Check the pressure of each proportioning pump.

    After setting the pump switch to NORMAL, observe both pressure gauges. The Resin and Isocyanate pressures should be approximately equal and the pressures must remain fixed. Observe the directional indicator lights and manually depress the reversing switch rocker arm, which corresponds to the light, which is off. Observe the pressures again; they must remain fixed. If the pressure bleeds off on either stroke, consult the Trouble Shooting Procedures before continuing.

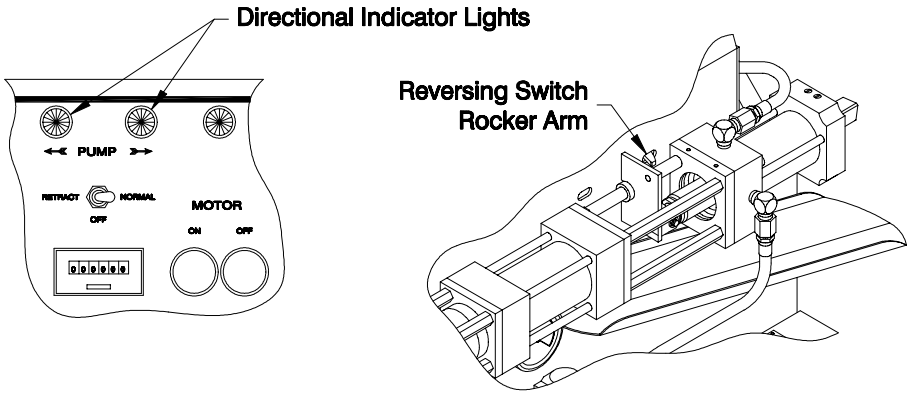


Figure 15. Directional Indicator Lights & Reversing Switch Rocker Arm

12. The proportioning unit is now ready for operation. Connect air to the gun. Following instructions in the gun manual, test spray.

Daily Shutdown Procedures

1. Set the pump switch to the RETRACT position.

2. Trigger the gun off target until the Isocyanate proportioning pump stops in the retracted position and the proportioning pump pressures bleed off to a point where the spray pattern begins to diminish. It is **NOT** a good practice to bleed the pressure to zero. Some pressure is required to keep the packings operating normally and prevent weepage during shutdown.

3. Switch OFF the motor control.

4. Switch OFF the Hose Heater and Primary Heater Circuit Breakers.

5. Switch OFF the main circuit breaker.

6. Close both Inlet Supply Valves.

7. SUPPLY - shut down the supply system as required.

8. GUN - shut down and service the gun as stated in the gun service manual.

TROUBLESHOOTING

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 is to provide operators 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, before one will be able detect abnormal operation. 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". After obtaining this experience, one can readily detect equipment malfunctions.

After acquiring the ability to recognize a malfunction and before being 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 is available from our sales office.

Important: *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.*

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 GENERALLY 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.*

WARNING: *ALL ELECTRICAL TROUBLESHOOTING DESCRIBED IN THIS MANUAL MUST BE DONE WITH POWER OFF TO AVOID SERIOUS BODILY INJURY FROM ELECTRIC 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 ELECTRICIAN, THOROUGHLY FAMILIAR WITH THE OPERATION OF GUSMER EQUIPMENT.*

Hose Heat

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 ELECTRIC SHOCK. DO NOT ENTER THE ELECTRIC CONSOLE WITH POWER ON.*

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
Hose warms but does not reach temperature or takes too long to reach temperature.	1, 2, 10
Hose does not heat; amber light on the Hose Heater Controller is ON.	2, 3, 4, 6
Hose does not heat; red light on the Hose Heater Controller is ON.	7, 4, 8
Hose does not cycle automatically; red light on the Hose Heater Controller is ON.	5, 4, 7, 8
Hose heat circuit breaker trips.	2
Hose temperature not maintained during flow.	2, 9, 10
Hose or hoses adjacent to the unit are warm-hoses downstream are cold.	11

SOLUTIONS

1. HOSE LENGTH - the H-2000/H-3500 hose heater operates with up to 310 feet of hose. 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 POWER SET - Adjust the power set, clockwise, to achieve maximum amperage.

3. HOSE HEAT FUSE - with power OFF, remove the inline fuse and check it for continuity Replace fuse as needed.

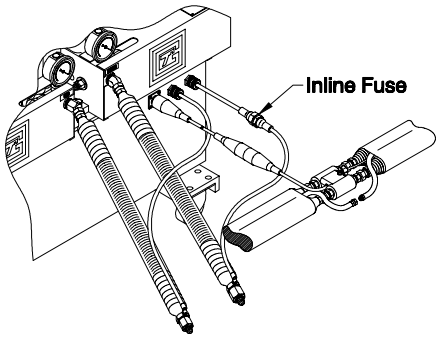


Figure 16. Wire Connection

WARNING: *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.*

4. HOSE HEAT CONTROL UNIT-the three heat control units on the H-2000/H-3500 are directly interchangeable with one another. To determine if the control unit is operating correctly, with power OFF, swap the suspected control with one known to be good.

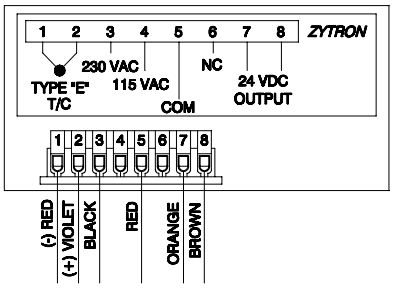


Figure 17. Wire Connection

5. HOSE HEAT SOLID STATE RELAY (SSR)-**Important:** For the SSR to operate properly the heat generated must be passed off to the heat sink. DO NOT obstruct the heat sink with rags, or other coverings, or locate the unit in close proximity to a wall. Always allow for as much air circulation as possible since the effectiveness of the heat sink is dependent upon unobstructed airflow. With power OFF, remove the lead from terminal #1 on the SSR. Check for continuity across terminals #1 and #2. If continuity is present, then the SSR is shorted closed and must be replaced.

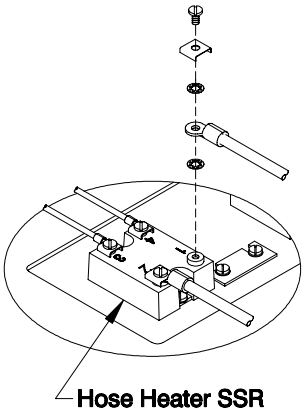


Figure 18. Solid State Relay

6. HOSE HEATING ELEMENT-first check to see that the screw terminals on the isolation hoses are secure. If these connections are secure, then, with the power OFF, check for continuity across terminals #1 and #2 on the hose heater SSR. If continuity is not present, make a systematic search for the failed hose or connection.

7. 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 extension at the gun hose. Without undoing any hydraulic connections, transport the gun hose to the proportioning unit and plug the TSU directly into the 3-foot TSU extension harness at the hose connection. If control is not restored, change the TSU. If control is restored, make a systematic check of the TSU extension harness.

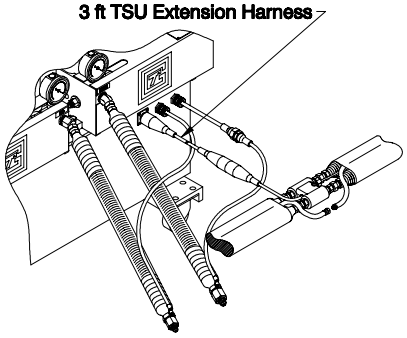


Figure 19. TSU Connection

8. MANUAL HOSE HEAT CONTROL: - The automatic hose heating system can be bypassed to allow manual control of the hose heater. This feature allows for

continued operation of the hose heating system in case of signal or SSR failure. To convert to manual control, proceed as follows:

a) With power OFF, remove the terminal jumper strip conveniently located on the heat sink and install it across terminals #1 and #2 on the hose heat SSR.

b) Maintaining hose temperature now requires manual adjustment of the hose heater power set. Adjust the control to maximum (clockwise) for initial warm up and then adjust as required to maintain the hose temperature.

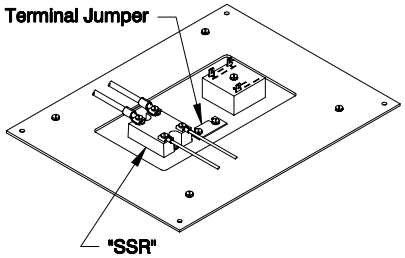


Figure 20. Terminal Jumper Strip

WARNING: *THE TERMINAL JUMPER MUST NEVER BE USED ON EITHER PRIMARY HEATER SSR. THIS WILL RESULT IN COMPLETE LOSS OF CONTROL AND CAUSE DAMAGE TO THE EQUIPMENT OR SERIOUS BODILY INJURY.*

9. The purpose of the hose heater is not to add heat but rather to maintain the temperature developed by the primary heater. If conditions indicate that the hose heater is not maintaining temperature during flow (Amber Hose Heat Controller light on the console stays lit continuously), check that the primary heater and hose heater controllers are set for the same temperature or reduce the output.

10. The hose heater operates at 220 Volts. Low line voltage will significantly reduce power available and the heater will not perform to its full capability

11. When checking for improper electrical isolation, remember that the electrical connection of the low voltage hoses is in series, and that the hose fittings make the electrical connection between hoses. Thus, If the Resin fittings contact the Isocyanate fittings, all hoses from the point of contact out to the gun will be “cold” while those hoses back to the proportioning unit will be heated. This can occur if there was no electrical isolator installed between them, or if the isolator has slipped out of position. If this occurs, it is a matter of finding where the fittings are in contact and isolating them.

Primary Heater

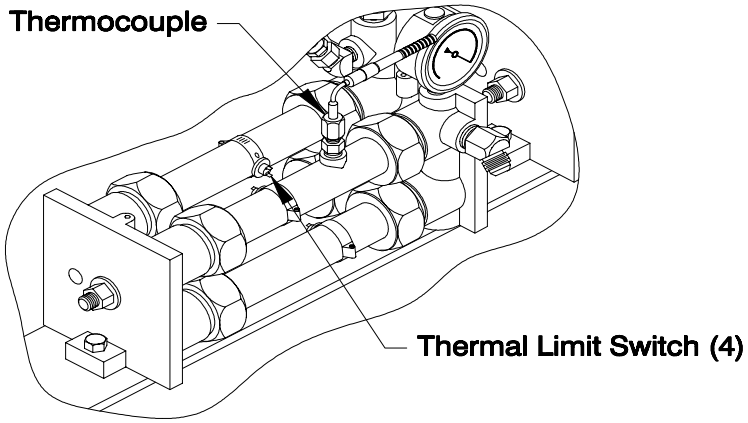
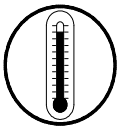


Figure 21. Primary Heater

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 ELECTRIC SHOCK. DO NOT ENTER THE ELECTRIC CONSOLE WITH POWER ON.*

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



WARNING: *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 UNHEATER FLUID THROUGH THE HEATER WITH THE HEATER OFF TO AVOID BODILY INJURY FROM HOT FLUID AND HOT METAL.*

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 and wiring is correct before assuming there is a problem.

Problems	**Solutions**
Primary Heater circuit breaker trips.	1
Primary Heater does not heat; amber light on the Primary Heater Controller is ON.	2, 4, 3, 6
Primary Heater does not heat; red light on the Primary Heater Controller is ON.	5, 4
Primary Heater heats but red light on the Primary Heater Controller is ON continuously.	3, 4, 6
Primary Heater partially heats but amber light on the Primary Heater Controller is ON continuously.	6, 7, 8
When flow starts the red light on the Primary Heater Controller comes on and stays ON for 30 seconds or more.	6

SOLUTIONS

1. A completely independent, over-temperature, safety circuit has been provided and consists of four (4) thermal limit safety switches attached to the heating tube(s). When the surface temperature of the tube(s) exceeds 230° F, the thermal limit safety switch will automatically trip the primary heater circuit breaker to OFF. The temperature of the Primary Heater must cool down to within limits before you can reset the circuit breaker. DO NOT attempt to reset the circuit breaker more than once. You must determine the cause of the problem and correct it.

2. PRIMARY HEATER FUSE-the primary heating circuit is protected by two 30 Amp fuses. With power OFF, remove the fuse(s) and check it for continuity or simply replace it with one known to be good.

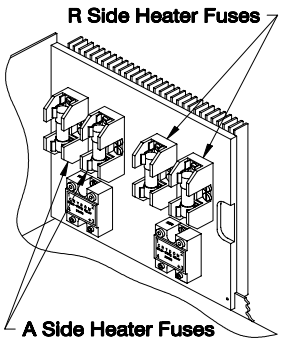


Figure 22. Primary Heater Fuses

WARNING: *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.*

3. PRIMARY HEATER SSR

   With Main Power OFF, remove the lead from terminal #1 on the SSR. Check for continuity across terminals #1 and #2. If continuity is present, the SSR has shorted closed and needs replacing. (Refer to Figure 17).

   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 the problem, assume the SSR is inoperative and replace it.

   Important: *For the SSR to operate properly the heat generated by it must be passed off to the heat sink and dissipated. DO NOT obstruct the heat sink with rags, polyethylene, or other protective covering, or locate the unit in close proximity to a wall. Always allow for as much air circulation as possible, since the effectiveness of the heat sink is dependent upon unobstructed airflow.*

4. PRIMARY HEATER CONTROL UNIT- the three heat controller units on the H-2000/H-3500 are directly interchangeable with one another. To determine if a control unit is operating correctly, with the power OFF, replace the suspected controller with one known to be good.

5. THERMOCOUPLE- the design of the temperature controller units includes a fail-safe feature, which prevents the heating system from operating in the event that there is no signal from the thermocouple. In this case, the thermocouple requires replacing. Refer to the Maintenance section of this manual for the proper procedures.

6. HEATING ELEMENTS- the heater contains four 1500-Watt (32-ohm) heating elements wired in parallel. To check operation of the elements proceed as follows:

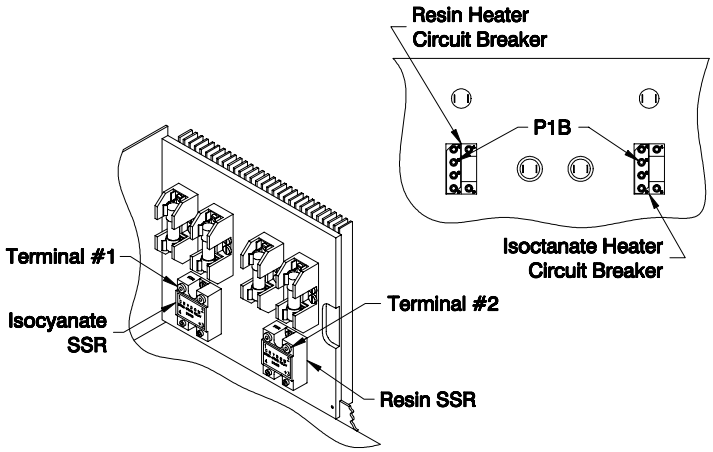


Figure 23. Primary Heater Fuses

a) With Main Power OFF, read the resistance across terminal #1 on the Resin SSR and terminal P1B on the Resin heater circuit breaker

b) Read the resistance across terminal #2 on the Isocyanate SSR and terminal P1B on the Isocyanate heater circuit breaker.

The resistance should be 8 ohms. A higher resistance indicates that one or more heating elements are inoperative. If this is the case, disconnect the heating elements and measure the resistance of each element. Each heating element should measure 32 ohms. If not replace the damaged element or elements.

The positioning of the thermocouple in the outlet heat exchanger is critical to the proper operation of the primary heater. Therefore, two conditions must be satisfied:

a) The thermocouple must make positive contact with the heating element.

b) 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 thermocouple is properly positioned and mechanically locked in place at the factory. However, during maintenance or changing of the thermocouple, the positioning may have changed. Refer to the Maintenance section of the manual for proper thermocouple positioning. Check the resistance of the heating element; it should be 32 ohms.

7. The primary heater rating is 6000 Watts at a voltage of 220 Volts. Low line voltage will significantly reduce the power available and the primary heater will not perform to its full capability.

8. The H-2000/H-3500's very efficient primary heater design maximizes the heat transfer from the power available. However, under certain conditions, the heater will not be able to reach the required temperature and will require a reduction in flow.

Proportioning System

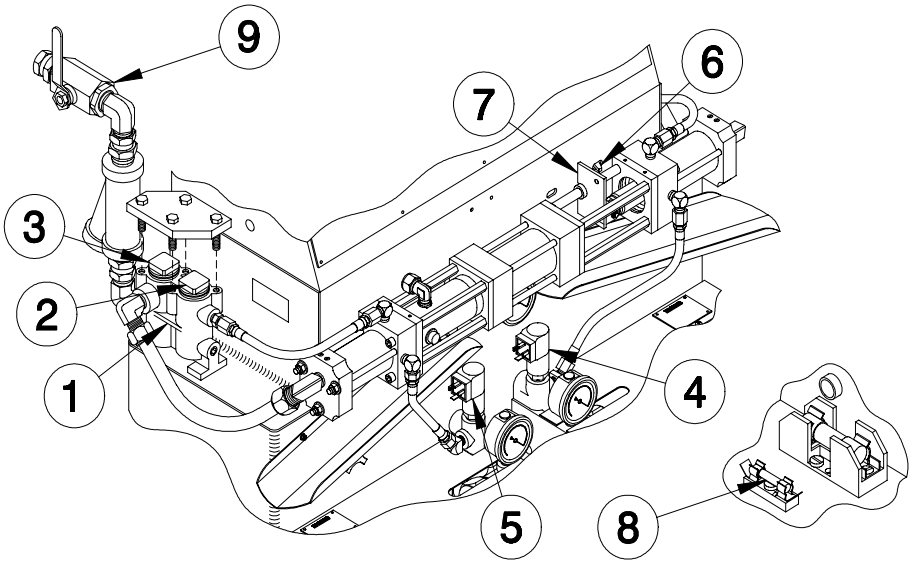


Figure 24. Proportioning System

1. A-Pump Base
   R-Pump Base
   (Not shown, located on far side)
2. A-Discharge Ball Check Valve
   R-Discharge Ball Check Valve (Not shown, located on far side)
3. A-Inlet Ball Check Valve
   R-Inlet Ball Check Valve
   (Not shown, located on far side)
4. R-Over-pressure Safety Switch
5. A-Over-pressure Safety Switch
6. Rocker Arm
7. Reversing Plate
8. 24 Volt Pump Circuit Transformer Fuse
9. A-Material Supply Ball Valve
   R-Material Supply Ball Valve
   (Not shown, located on far side)

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 ELECTRIC SHOCK. DO NOT ENTER THE ELECTRIC CONSOLE WITH THE POWER ON. BEFORE OPENNING 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 PROPER PROTECTIVE EQUIPMENT.*

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.

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

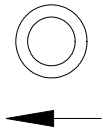
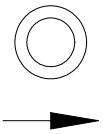
SOLUTIONS

1. LEAKING BALL CHECK VALVE -

   a) Determine which pump is losing pressure by observing the gauges.

   b) Determine in which direction the pump has stalled by observing which directional indicator light is ON.

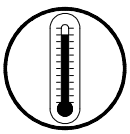
   Refer to the Figure below to isolate the problem

Lighted 	Lighted 
R-Discharge Ball Check Valve or components fouling.	R- Pump Inlet Ball Check Valve or components fouling.
A-Inlet Ball Check Valve or components fouling	A-Pump Discharge Ball Check Valve or components fouling

   To service perform the following procedure:

   a) Shut off all electrical switches, breakers, and the main power supply.

   b) Close the appropriate Inlet Material Supply Valve and disconnect the air supply to the transfer pump.



WARNING: *ALLOW THE HOSE(S) AND PRIMARY HEATER(S) TO COOL PRIOR TO SERVICING THE UNIT.*

   c) Bleed off chemical until the pressure gauge(s) read zero.

d) Remove the appropriate ball guide. Inspect the ball seat gasket and replace as required. Flush and wipe clean the valve ball and ball seat of all residual material.

Using the ball seat removal tool, check the seat for proper seat compression. Snug the seat up to a ¼ turn maximum. The gasket should extend beyond the seat by approximately 1/16 of an inch. If this does not resolve the problem remove the seat inspect the gasket and replace as required.

In most cases, the cause of a leaking valve is a particle of foreign material preventing the ball from seating properly. If cleaning the valve ball and seat does not resolve the problem, replace these parts along with the gasket.

2. PRESSURE UNBALANCE - The success of the troubleshooting procedure for this problem will depend on the determination of two points:

   a) Which chemical did not reach the mixing chamber

   b) Why did the chemical fail to get there?

   Which chemical is missing can usually be determined 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 exiting 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. A restriction at the gun or the proportioning pump not properly pumping its designed volume is the usual cause for a lack of material at the mixing chamber.

   Once you have determined which chemical is missing, the chemical pressure gauges on the problem side of the proportioning unit 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 the R-component is not reaching the mixing chamber. Spray off target and note the Resin pressure gauge. If the Resin gauge is considerably higher than the Isocyanate gauge, the problem is within the gun. Refer to the gun manual to resolve the problem.

3. CAVITATION- Cavitation is the formation of a partial vacuum or void created within the pump cylinder during the fill stroke. It is actually a “short fill” since the fill chamber is not completely full when the pump reverses to start the discharge stroke. This void occurs 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 cannot handle the supply requirement or is malfunctioning. The Gusmer 2:1 Transfer Pump is recommended for use with the H-2000/H-3500.
   Also recommended is a minimum of three-quarter inch diameter supply hose as short as practical.

   b) The chemical is too viscous (thick) to pump properly. Consult your Chemical Supplier for the recommended supply temperature.

   c) Inlet strainer screen is restricted. Service as described in the Maintenance section of this manual.

d) 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 proportioning pump will not pump the proper volume of material during the discharged stroke and an off-ratio condition will result. This malfunction will evidence itself identically to Cavitation, perhaps somewhat less severe however.

4. REVERSING MALFUNCTION- For the proportioning pumps to change direction or reverse, the Activator plate must contact the rocker arm to activate the reversing switch. 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 retaining bolt having loosened. This would cause the piston to contact the inner face of the pump inlet flange before the activator plate contacts the rocker arm. To resolve this, shut down the unit and disassemble the appropriate pump for repair.

   When the directional valve fails to shift the activator plate will have passed the rocker arm and not reversed. 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 as follows:

   a) Determine in which direction the plate must move: this is predicated upon which stroke is overrun.

   b) Go to the hydraulic manifold and locate the manual operator centered in the end of the housing of the coil on the same side of the machine toward which the activator plate must go. For example: If the plate over ran to the left and requires moving to the right toward the Resin pump go to coil on the Resin side.

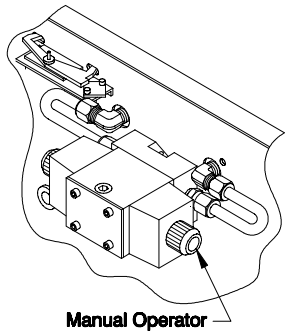


Figure 25. Hydraulic Manifold

   With the gun (or coupling block) open, the main circuit breaker and motor control ON, and the pump switch OFF, push in the manual operator (a 3/16 Allen wrench is ideal for this) and hold it in until the activator plate is approximately centered. Release it and close the gun or coupling block.

   If the spool seemed to move freely when pushed the cause of the overrun was probably an electrical problem. Turn off the motor and place the pump switch in the NORMAL position. Push in each end of the rocker arm, listen for the shifting of the spool, and note the direction indicators light as appropriate. If the spool does not shift, or if the lights do not light, there is an electrical problem with the reversing switch, directional valve coil, or pump switch.

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

5. OVER-PRESSURE PROTECTION- Each proportioning pump contains a pressure switch set to 2200 psi / 3700 psi. On reaching this pressure, the switch will automatically remove 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 over-pressure. This is not a lockout type of system and when the pressure bleeds off below approximately 2200 psi / 3700 psi the system will be restored to normal operation; however, the cause of the over pressure should be determined and corrected. The three most likely causes are:

a) A restriction in the gun

b) Cavitation of the opposite pump

c) Hydraulic pressure set too high

6. 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.

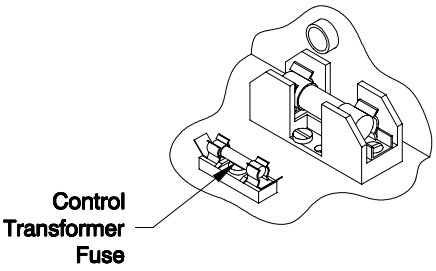


Figure 26. Control Transformer Fuse

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

Hydraulic Drive System

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 ELECTRIC SHOCK. DO NOT ENTER ELECTRIC CONSOLE WITH POWER ON.*

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	Solution
Electric motor will not start or stops during operation.	1
Hydraulic pump does not develop pressure.	2
Low or zero pressure with screeching noises.	2, 3

SOLUTIONS

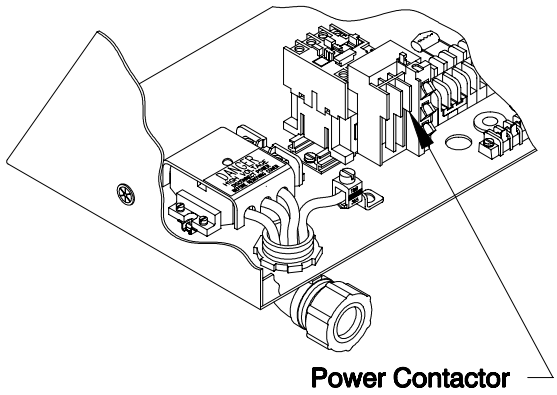


Figure 27. Power Contactor

1. POWER CONTACTOR- A power contactor set to trip when the motor draws too much current protects the electric motor. To restore the motor to operation, allow it to cool and with power OFF, depress the reset button. It is also important to determine the cause of the trip. Improper low line voltage can also cause harm to the motor due to overheating which will cause the power contactor to trip

2. ZERO OR LOW PRESSURE- Remember when the motor or pump switch in the off position hydraulic pressure cannot be generated.

   Assuming the pump is in proper working order, and the pump switch is set to NORMAL, the major factors, which can cause it not to produce pressure, are that the pump is either not primed or loses its prime. To assure a positive prime, check the following:

   a) Hydraulic reservoir serviced to the proper level including a check that the cartridge strainer and hydraulic fluid are clean.

   b) Pump case is full with Hydraulic fluid.

   c) Inlet fitting is fully tight to insure no air is leaking into the pump case.

3. SCREECHING-the screeching noise is a characteristic of Cavitation and is normal at initial start-up for a maximum of 30 seconds. If the screeching continues for more than 30 seconds, check that the inlet fittings are tight and that the pump has not lost its prime.

A second cause of screeching can be excessive hydraulic oil temperature. Determine that the reservoir is properly serviced and if necessary provide better ventilation to permit the reservoir to dissipate heat more efficiently.

MAINTENANCE

To realize full productivity from the Model H-2000/H-3500, it is necessary to perform certain maintenance procedures daily or periodically.

WARNING: *WHENEVER WORKING WITH THE EQUIPMENT, INSURE THAT EYE PROTECTION IS WORN AND THAT SKIN IS PROTECTED AGAINST EXPOSURE TO CHEMICALS AND SOLVENTS BEING USED. WORK SHOULD ALWAYS BE DONE IN A WELL VENTILATED AREA TO PREVENT HARMFUL FUMES AND VAPORS. INFORMATION CONCERNING THE TOXICITY AND PROPER HANDLING PROCEDURES OF YOUR CHEMICALS IS AVAILABLE FROM YOUR SUPPLIER.*

WARNING: *UNLESS SPECIFIED OTHERWISE, ALL CIRCUIT BREAKERS SHOULD BE OFF AND THE MAIN POWER DISCONNECTED AT THE SOURCE TO AVOID SEVERE BODILY INJURY FROM ELECTRICAL SHOCK. DO NOT ENTER ELECTRICAL CONSOLE WITH POWER ON.*

Pump Lube System

To insure that the pump lube will do its job, check its condition on a daily basis. Change the pump lube before it becomes a gel, or when its color becomes 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 in which the equipment is operating. The enclosed pump lube system in the H-2000/H-3500 minimizes exposure to moisture, but moisture contamination is still possible.

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 or 4-week intervals.

To change the pump lube proceed as follows:

1. Position the Isocyanate proportioning pump to the extreme right by jogging the pump switch with the gun or coupling block.

2. Lift the lube reservoir out of the bracket and remove the cap from the container. Holding the Cap over a suitable container, remove the Check Valve and allow pump lube to drain. Reattach the Check Valve to the inlet hose.

3. Now drain the reservoir, flush it with pump lube and refill it with fresh pump lube.

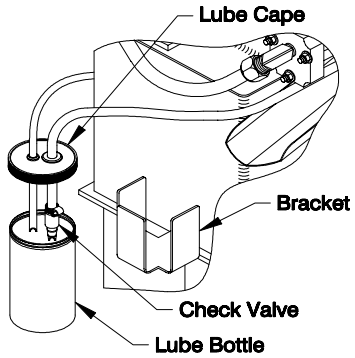


Figure 28. Pump Lube System

4. Screw the Lube Bottle back onto the Lube Cap and place in the Bracket.

WARNING: *DO NOT FILL THE LUBE CYLINDER WITH PUMP LUBE. THIS WOULD OVER SERVICE THE SYSTEM AND MAY CAUSE THE LUBE RESERVOIR TO BURST. THE SYSTEM IS SELF-PRIMING AND THE LUBE CYLINDER WILL FILL DURING NORMAL OPERATION OF THE MACHINE.*

Inlet Strainer Screen

A strainer screen in each proportioning pump filters out solid matter that could adversely effect the operation of the ball check valves 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.

The Isocyanate component can crystallize from either moisture contamination or from freezing. Following proper storage, transfer, and operating procedures, and if the chemicals you receive are clean, you should have little problem with the Isocyanate screen. In practice though, it is good preventative maintenance to daily clean the Isocyanate screen. 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 will immediately flush out any Isocyanate residue.

Removal and cleaning of the strainer screen is accomplished as follows:

1. Close the material supply valve at the inlet of the appropriate proportioning pump. This prevents material being pumped when the strainer screw is removed.

2. Place a container beneath the strainer base to catch the drain-off of chemical when removing the strainer screw.

NOTE:
More than 25% restriction of the screen can prevent proper filling of the pump during operation. If more than 25% is blocked, the screen should be replaced

3. Remove the screen from the strainer base.
   Thoroughly flush the screen with gun cleaner and shake it dry. Inspect the screen to insure that no more than 25% of the mesh is restricted.
   Inspect the strainer screw gasket and replace as required.

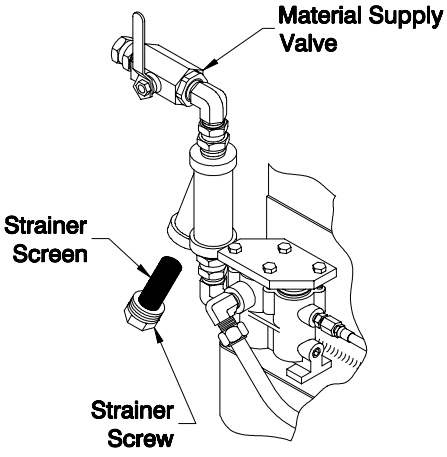


Figure 29. Strainer

4. Install the strainer screw with the strainer in place and tighten. Important: Take care not to over-tighten, let the gasket make the seal.

5. Open the material supply valve; insure there are no leaks and wipe the equipment

clean.

6. Proceed with operation.

Hydraulic System

WARNING: *THE HYDRAULIC COMPONENTS ARE PRESSURIZED UP TO 3500PSI. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY.*

The hydraulic system should be checked annually for cleanliness as follows:

1. Thoroughly clean the tank top, the access cover plate, and the components in the area of the cover plate. This will insure that no foreign matter will enter the hydraulic reservoir when removing the cover plate.

2. Remove the six (6) cover plate mounting screws. Separate the hydraulic suction pipe from the fitting connecting the pipe to the hydraulic pump.

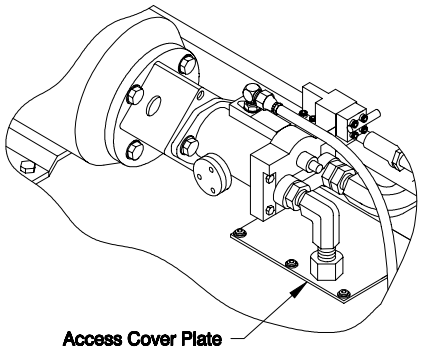


Figure 30. Hydraulic System

3. Remove the cover and pipe from the hydraulic reservoir.

4. Inspect the bottom of the reservoir for sediment. If sediment is present, drain the hydraulic fluid, thoroughly clean the tank, and refill with new fluid. The strainer on the suction pipe should be replaced (with 200 mesh screening) to insure free flow of hydraulic fluid to the pump.

5. Replace the cover and the suction pipe; connect and tighten the suction pipe to the fitting on the hydraulic pump; and secure the cover in place with the mounting screws.

6. Check to insure the hydraulic pump is full with hydraulic fluid.

7. Proceed with normal operation.

NOTE:
Upon starting the motor, the hydraulic pump may make a screeching noise for a short time upon initial start-up. Should this noise continue for more than 30 seconds, switch off the motor control and refer to the troubleshooting section of this manual

Proportioning Pumps

WARNING: *THE HYDRAULIC COMPONENTS ARE PRESSURIZED UP TO 3500PSI. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTUION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY.*

Disassemble and clean both proportioning pumps annually. Inspect the pistons and cylinder for mars or scratches, which may cause leakage or damage to packings. Gusmer also recommends replacing the piston and cylinder packings, expanders, and packing springs on an annual basis as a preventative maintenance precaution. *(Refer to the Proportioning Pump Assembly section of the Parts I.D. for reference.)*

WARNING: *TO AVOID SERIOUS BODILY INJURY. BOTH PROPORTIONING PUMPS OPERATE UNDER HIGH PRESSURE. IT IS IMPERATIVE THAT THE PUMP TIE RODS BE PRECISELY TORQUED AFTER SERVICING: H-2000 TORQUE TO 17 FT. LBS. H-3500 TORQUE TO 30 FT. LBS.*

Pump Bases

WARNING: *BOTH PUMP BASES OPERATE UNDER HIGH PRESSURE. TO AVOID SERIOUS BODILY INJURY, BEFORE SERVICING THE PUMP BASE ASSEMBLY, USE EXTREME CAUTION TO INSURE ALL PRESSURE FROM BOTH THE SUPPLY AND DELIVERY SIDE OF THE PUMP BASE HAVE BEEN BLED TO ZERO.*

Disassembled and clean both Pump Bases annually. To do so follow these steps:
(Refer to the Pump Base Assembly section of the Parts I.D. for reference.)

1. De-pressurize the system.

2. Remove the valve cover bracket and the ball guides. A groove in the ball guide will facilitate removal by use of a screwdriver. If the ball guide is particularly difficult to remove, use a wrench to turn the guide back and forth while applying upward leverage with a screwdriver.

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

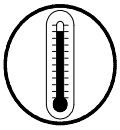
4. Using the ball seat removal tool, (5/8 hex stock) unthread and remove the ball seat.

    - Clean the gasket seating surfaces on the underside of the seat and inside the pump base cavity.
    - Inspect the seat gasket and replace as required.
    - Inspect the ball seat for nicks or scratches. Replace as required.
    - Thoroughly clean the thread on the seat before replacement. It is also a good practice to coat the threads with a liberal amount of lubricant.
    - Install 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 ¼ turn,
    - 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 and complete the Pump Base Assembly.

Primary Heaters

WARNING: *THE HYDRAULIC COMPONENTS ARE PRESSURIZED UP TO 2000/3500PSI. BEFORE OPENING ANY HYDRAULIC CONNECTIONS OR SERVICING HYDRAULIC COMPONENTS, USE EXTREME CAUTUION TO INSURE THAT ALL PRESSURES HAVE BEEN BLED TO ZERO TO AVOID SERIOUS BODILY INJURY.*



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

The sheath on the H-2000 and H-3500 heating rods are made from a special alloy designed to be resistant to corrosion and erosion. However, eventually the service life of the rod will be reached and if the sheath should fail, fluid under pressure will leak into the heating element. This may result in leakage through the potting at the junction end of the rod. Therefore, it is imperative that the unit **NEVER** be operated with the guard removed and furthermore, you must never remove the guard for servicing without bleeding the material pressure in the heater to zero and disconnecting all electrical power.

Replacing the heating element does not require 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 fluid surrounds each element, 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 burnt ash like material adhered to the rod or the sheath shows pitting marks; replace the heating elements.

Reinstall the heating element using a thread sealant.

THERMOCOUPLE- The thermocouple includes the compression nut and ferrule, and once locked in place the ferrule becomes a permanent part of the thermocouple and cannot be relocated or removed. The location of the thermocouple is critical to the operation of the heater and requires proper positioning before tightening the compression nut.

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 thermocouple. Place the thermocouple into the body and continue to insert until it makes positive contact with the heating element.

3. Firmly hold the thermocouple in place against the element while tightening the locknut. Note the correct ferrule positioning.

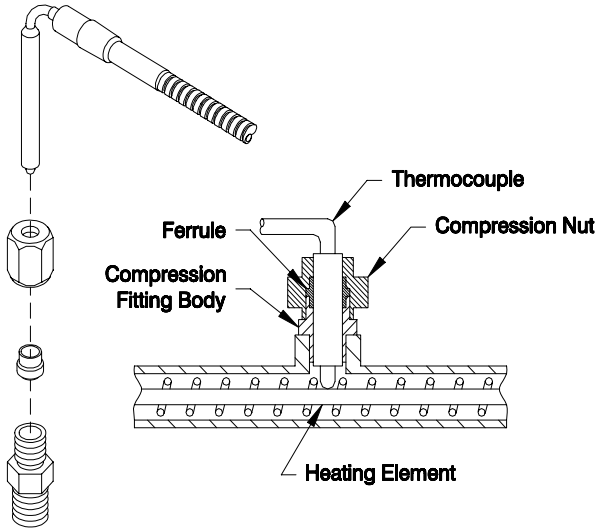


Figure 31. Thermocouple

APPENDIX

OUTPUT (lbs./min.)	OUTPUT (gpm)	S (strokes/min)	MAXIMUM PRESSURE OPERATING
20	2.0	65	1800
25	2.5	80	1350
30	3.0	97	1150

Chart based upon 208 Volts

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

Q (lbs/min) = **S** (strokes/min x .31)

Q (lbs) = **S** (strokes) **x .31**

Recommended Hydraulic fluid or equivalent

1. Mobil DTE 24
2. Mobil DTE 25
3. Cooks Albavis 10

The H-2000 and H-3500 interfaces with all the following Equipment.

- GX-7 High Pressure Spray Guns
- GX-7 Auto High Pressure Spray Gun
- TX-50 Automatic Shot Timer/Counter
- GX-8 Spray Gun
- GX10 Pour Head
- AR-C/D High Pressure Pour Gun
- Model D High Pressure Spray Gun

INSTRUCTION MANUAL DISCREPANCY REPORT

Field Number	Field Title	Description
1	Date	
2	Name	
3	IM Number	
4	Issue Number	
5	Date of Issue	
6	Page Number	
7	Discrepancy	

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Field Number	Field Title	Description
1	**Date**	Enter date report is submitted.
2	**Name**	Enter name of person making report.
3	**IM Number**	Enter the Part Number of the Instruction Manual from the title page.
4	**Issue Number**	Enter the Issue number of the Instruction Manual from the title page. If there is no issue number, enter **NONE.**
5	**Date of Issue**	Enter the date of Issue of the Instruction Manual from the title page. If there is no issue date, enter **NONE.**
6	**Page Number**	Enter the page number containing the discrepancy
7	**Discrepancy**	Provide a brief description of discrepancy **NOTE:** You may send a marked copy of the page as an attachment to your submittal.