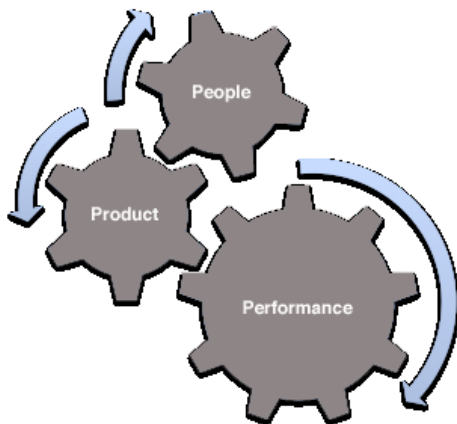




# ***SERVICE MANUAL***

HG-1-1701  
1-Million Btu/Hr  
Gas-Fired Heater  
Service and Operation Guide





**HG-1-1701 GAS-FIRED HEATER**

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*We appreciate your business and hope you enjoy your  
Samuel Jackson Gas-Fired Heater*

This manual contains information on the installation, startup, and operation of your heater. Included is information on:

- Electrical installation.
- Gas piping and supply.
- Heater dimensions.
- Maintenance and troubleshooting.

This manual gives general information on the location of the temperature sensing thermocouple. If the heater is part of a Samuel Jackson Super Grid System or a Samuel Jackson Steamroller System, more detailed information will be shipped to you under separate cover specifically for your system.

***IS STARTUP ASSISTANCE PROVIDED?***

Depending upon your location, a startup and inspection service may be provided with your new heater, free of charge, by Samuel Jackson, Inc. Please contact us to make arrangements or for questions.

In the future when you require service, technical support or parts, contact us by phone, fax or email. Our engineers and service people are available to assist you in obtaining the best performance from your Samuel Jackson, Inc. products.

*Again, thanks for choosing a Samuel Jackson Gas-Fired Heater.*

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**READ THIS CAREFULLY BEFORE OPERATING  
THIS SAMUEL JACKSON PRODUCT!**

The Samuel Jackson product line consists of sophisticated technology capable of greatly enhancing a gin's productivity and efficiency. Improper use of these products could adversely affect those very same factors and potentially cause injury to gin personnel. For this reason, we include an extensive manual with every product. These manuals outline the proper and safe operating procedure for their respective product. **Do not operate any Samuel Jackson product without first reading the entire manual and all accompanying information.**

Sometimes there are updates added at the customer's discretion to products already in the field. We always refer customers to our website, [www.samjackson.com](http://www.samjackson.com) for the latest product information. The latest manual can be downloaded or printed from the website free of charge. In addition to printed literature, the website includes training videos on several popular products. When available, these videos are highly recommended for viewing before operating a respective product. If you do not have internet access, give us a call and we will gladly send you the latest product information.

***DANGER: Please read and understand all the warnings below before operating or maintaining a Samuel Jackson product. If you do not understand, call Samuel Jackson at 806-795-5218 before proceeding. Failure to do so could result in injury or even death. (Si usted no entiende, llamar a Samuel Jackson en 806-795-5218 antes de proceder. La falta de hacer tan podía dar lugar a lesión o aún a muerte.)***

**Electrical.**

Most Samuel Jackson products use supply voltage between 110 and 480 volts AC. These levels are considered high voltage and are extremely dangerous. The ignition transformer voltage output is much higher than this.

**Fire.**

Samuel Jackson Humidair Units and Heaters are combustion-based products. They ignite and burn fuel during operation. These products can reach very high temperatures inside and out. Allow combustion based products 15 minutes to cool before attempting any work.

**Automatic Flame Ignition.**

Some Samuel Jackson Humidair Units and Heaters use technology to ignite automatically. If you do not see a flame, it does not mean that respective product is not in operation.

**Access Doors.**

Samuel Jackson products have access doors for added convenience of product maintenance. Access doors must not be opened while the equipment is in operation. Access doors should also remain closed while any connected equipment such as a fan or conveyor is in operation.

**Moving Parts.**

Many Samuel Jackson products have moving or rotating parts. These parts could form pinch points or grab loose clothing or jewelry. Do not reach across or into any product while in operation.

**Replacement Parts.**

When repairing or maintaining this equipment, use only Samuel Jackson approved parts.

*Do not work on any Samuel Jackson product without first following OSHA Lockout/Tagout procedures. Confirmation by a licensed electrician that there is no electricity present is highly recommended. We recommend using a Samuel Jackson Authorized Technician for all work Samuel Jackson products. Additional safety information is located throughout this manual and should be read carefully before operating this Samuel Jackson product. If you have any questions about how to properly operate a Samuel Jackson product, please call +1-806-795-5218 before proceeding.*

## INTRODUCTION

Cold weather and trashy cotton take a toll on the performance of lint moisture restoration machinery. An independent source of hot dry air to keep condensation and buildup to a minimum is a necessity. The HG-1-1701 1-million BTU/hr. Gas-Fired Heater was developed to meet this need. It comes complete with blower fan & motor to make installation fast and simple. The heater provides up to 3,000 CFM of closely regulated hot air. The heater has PLC combustion and temperature controls with error & alarm logging to make troubleshooting easy. Little external wiring is required for hookup.



HG-1-1701 GAS-FIRED HEATER

## HEATER OPERATION

### *HOW DO I TURN IT ON?*

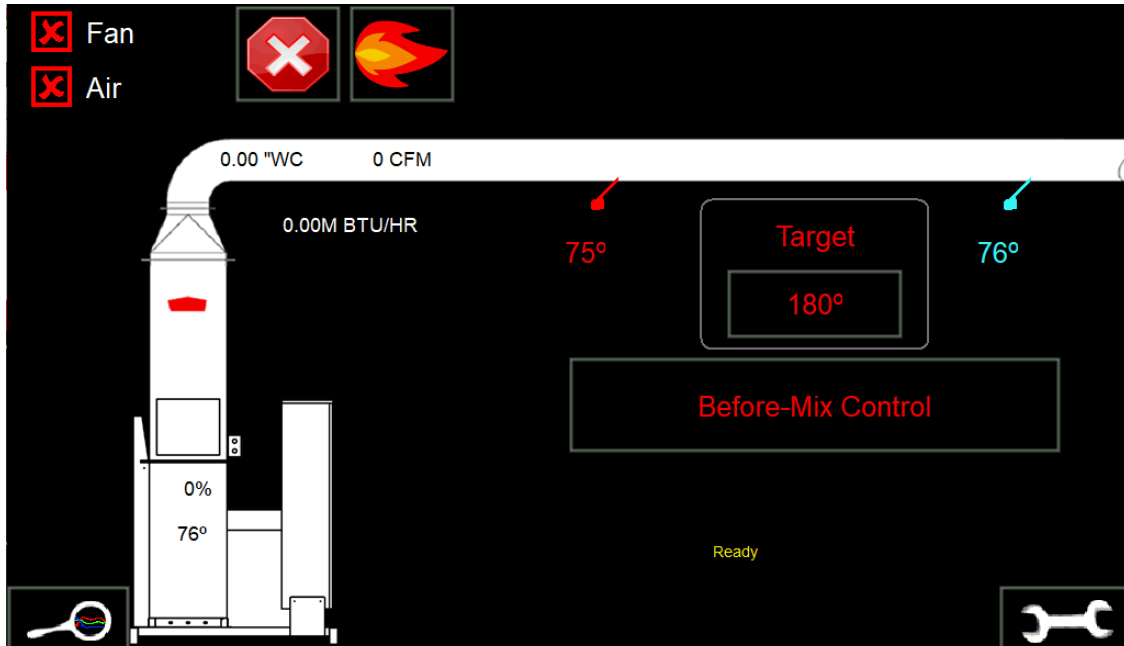
To start the heater locally, look at the touch screen on the front of the cabinet door.



If the screen shows “Ready” near the bottom, the heater is ready to run. Push the flame button to start the heater.

The heater’s blower will start, and various operations will be displayed as the self-checks and ignition sequence are performed. After approximately 20 seconds, the burner will attempt ignition. If ignition fails, the heater controls will automatically make two more attempts following appropriate air purge delays. Any alarms will appear on the screen.

The **Home Screen** is shown below.



The temperature in the box labeled Target is the setpoint and the number near the red thermocouple is the actual Before-Mix air temperature in the pipe. The box below Target changes the control mode between After-Mix Control and Before-Mix Control. The status of the heater is shown by the yellow Ready. Pushing the flame in the box at the top of the page starts the ignition sequence.

### ***WHY IS THERE A DELAY AFTER I TURN IT ON?***

The PLC begins opening and closing valves to test the integrity of various safety switches located in the heater's control cabinet. If it finds a problem with one of these devices, it alerts the operator on the display with a description of the problem.

These diagnostics are performed every time the heater is started and continue during operation until approximately 10 minutes after the heater is turned off. The status of post-burn testing is shown on the display with the time remaining.

The PLC will start the fan when all pre-checks are satisfied and the boxes in the upper left for Fan and Air will turn from red to green and the red X's will turn to green checks.



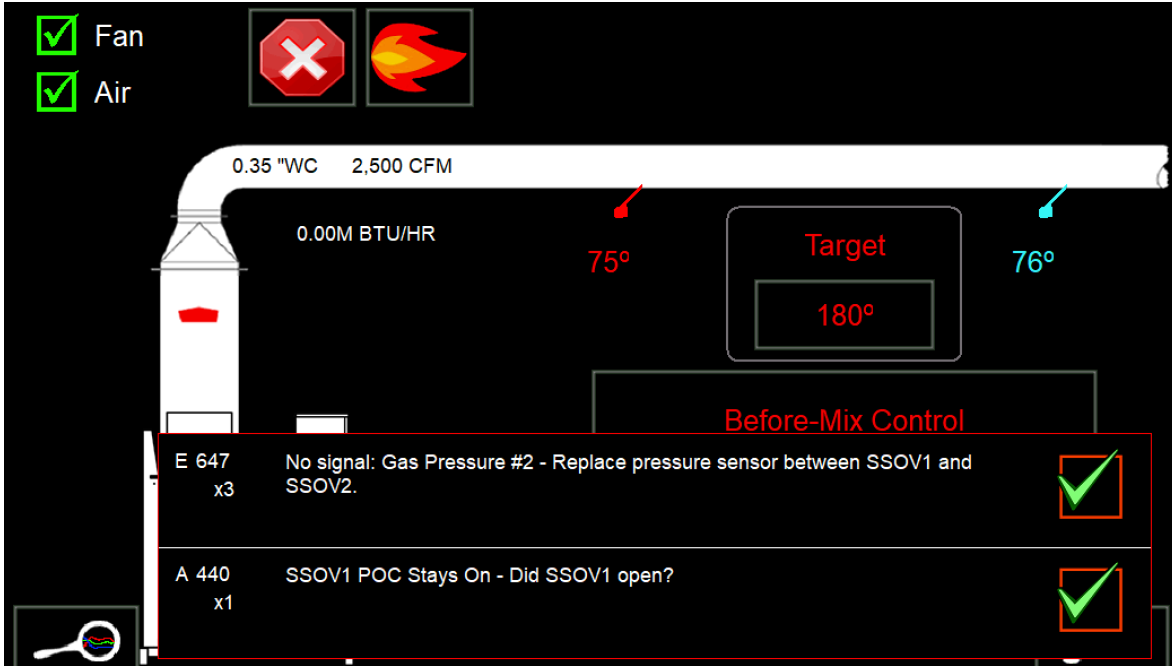
*TIPS*

*Always leave power on the heater during gin season. There is a permanent memory in the PLC that remembers when you turned off the power and did not permit the PLC to check the gas valves. It will result in ERROR 644 after 7 days with no leak check.*

*To prevent lightning damage to the controls in the off season, it is a good idea to turn 3 phase power off to the control cabinet until it is needed again.*

The status line in yellow will switch from Ready to Pre-Check to Warm Up and then to Run during the stages of ignition and operation.

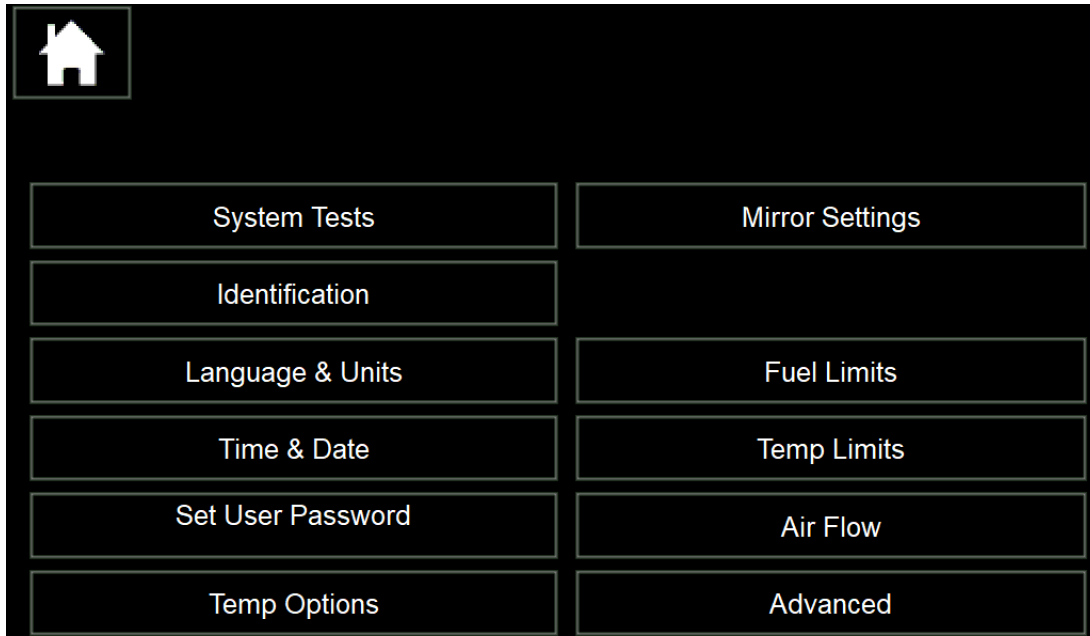
There will be flame appear in the heater body image to indicate that the flame rod is detecting a flame. The thermocouple temperature will increase toward setpoint. Some minor temperature overshoot may occur until the gas valve settles back to the setpoint. This is normal.



**ALARMS and ERRORS** are fully described later in this manual. **ALARMS** will warn the operator of an impending problem and **ERRORS** will cause an immediate shutdown.

## WHAT IS THE SETUP MENU?

Pressing the wrench button in the bottom right corner of the Home screen (see above) will access the Setup Menu. That screen is shown below.



The System Tests button will appear anytime the heater is not running.

Identification is where the heater can be named, and heater number changed.

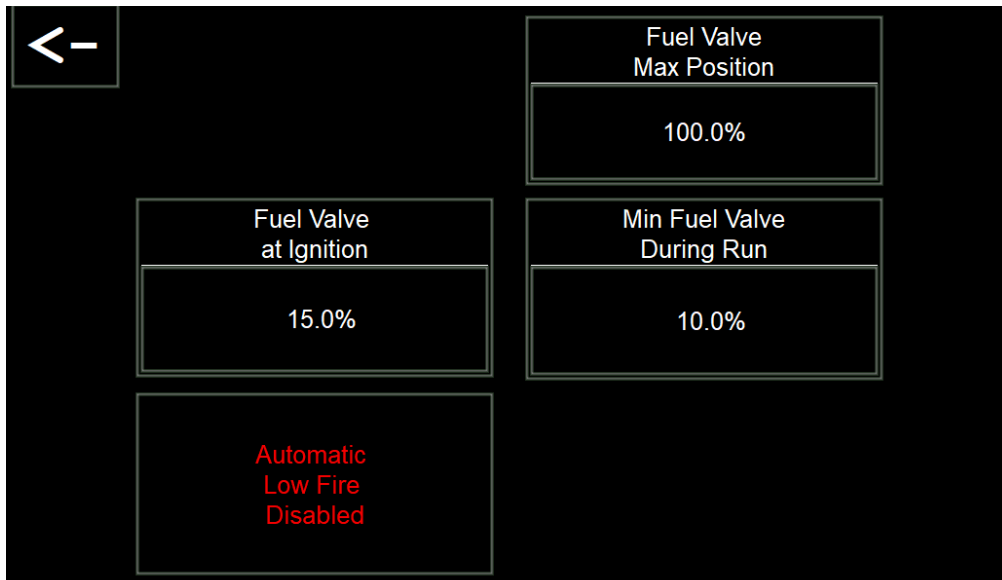
Fuel Limits is where fuel pressure and valve limits can be set.


Temp Limits is where maximum operating temperature along with setpoint ranges can be configured.

Air Flow is where the minimum airflow can be set.

Please note that there is more information later in the manual that discusses how to further setup the heater after installation. This information is critical for installation. Please refer to this section prior to lighting the heater for the first time.

## FUEL LIMIT SETTINGS



	Fuel Valve Max Position
	100.0%
Fuel Valve at Ignition	Min Fuel Valve During Run
15.0%	10.0%
Automatic Low Fire Disabled	

Fuel Valve Max Position – This is the maximum position the fuel valve will ever be allowed to reach.

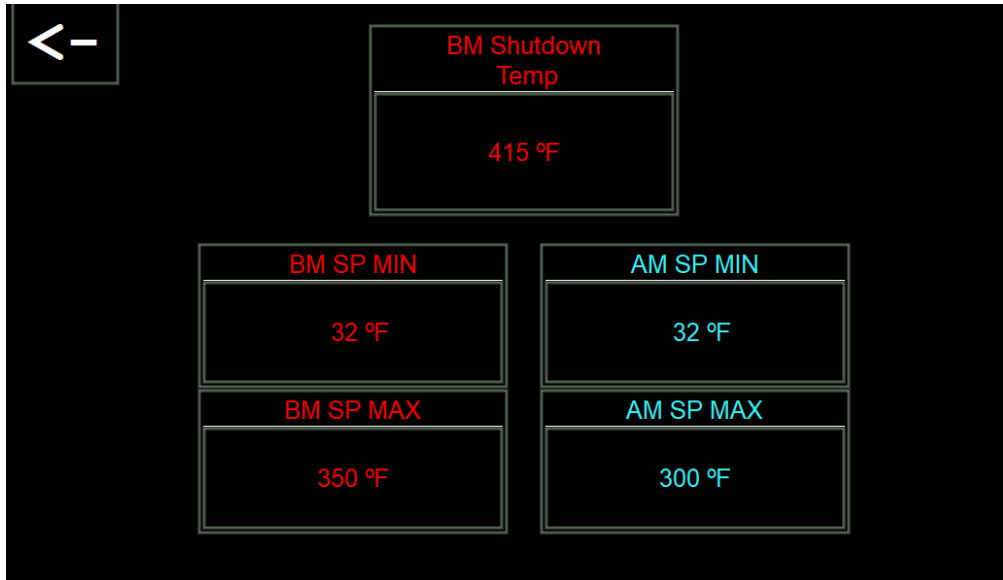
Fuel Valve at Ignition – This is the valve position used when attempting to ignite. Typically, it takes more fuel to establish a flame than to maintain it after ignition. Default setting is 15%.

Min Fuel Valve During Run – Some gas must flow through the main butterfly valve even at low fire to maintain a flame. This minimum gas valve position is set here. A setting of 10% is normal for most applications.

Automatic Low Fire Enable/Disable – Automatic Low Fire adjusts the low fire position based on the airflow through the burner. Higher airflow requires a higher minimum valve position to maintain the flame, while in lower airflow the flame can be maintained with less fuel. Disabled by default.



## TEMPERATURE LIMIT SETTINGS

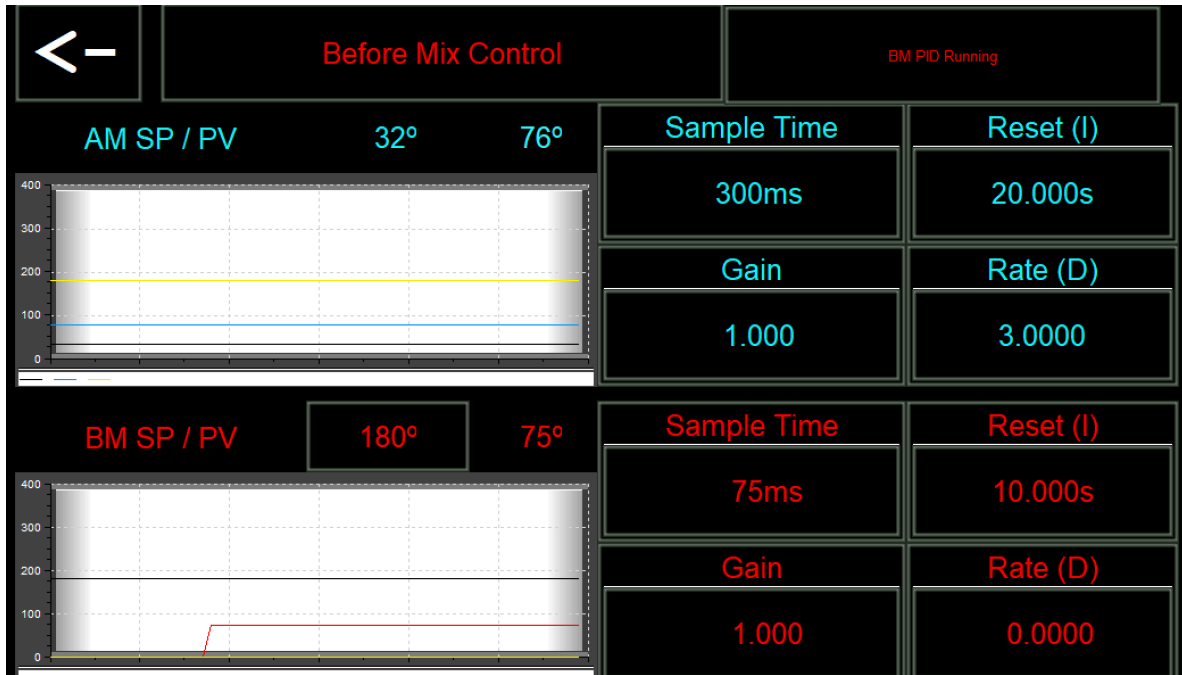


BM Shutdown Temp – High Temperature Limit at which the unit will shut **off**. The factory default is 415 degrees F. The adjustable range is from highest minimum thermocouple temperature to lowest maximum thermocouple temperature, typically 0-777 degrees F.

BM SP MIN/MAX – The minimum/maximum Before-Mix air temperature set point (SP) the user can adjust the control to is set in this step. The factory default is 350 degrees F. The adjustable range is from highest minimum thermocouple temperature to lowest maximum thermocouple temperature, typically 0-777 degrees F.

AM SP MIN/MAX – The minimum/maximum After-Mix air temperature set point (SP) the user can adjust the control to is set in this step. The factory default is 100 degrees F. The adjustable range is from highest minimum thermocouple temperature to lowest maximum thermocouple temperature, typically 0-777 degrees F.

## ADVANCED > PID SETTINGS



**Note** – contact factory before changing setting from default.

**PID SETUP GAIN** -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set AM GAIN to 1.0, set BM GAIN to 1.0.

**PID SETUP RESET** -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set AM RESET to 20.00, set BM RESET to 10.00.

**PID SETUP RATE** -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set AM RATE to 3.0, set BM RATE to 0.0.

**SAMPLE TIME** -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set AM SAMPLE TIME to 300, set BM SAMPLE TIME to 75.

## DATE/TIME SETTINGS

← 13-DEC-21 11:02:34 AM

Daylight Savings Time (Summer Time)  
On

Time Zone  
-6

New Day: 13, New Month: 12, New Year: 2021, New Hour: 11, New Minute: 2, New Second: 0

Set New Date & Time

Before using for the first time the Date/Time, Time Zone, and Daylight Savings Time should be set.

## SET USER PASSWORD

This is used to changed default password. This allows the user to access the Test and Setup screen.

Home icon

Numeric Entry  
Set User Password

Current: 1234  
Minimum: 0  
Maximum: 9999

Temp Options Advanced

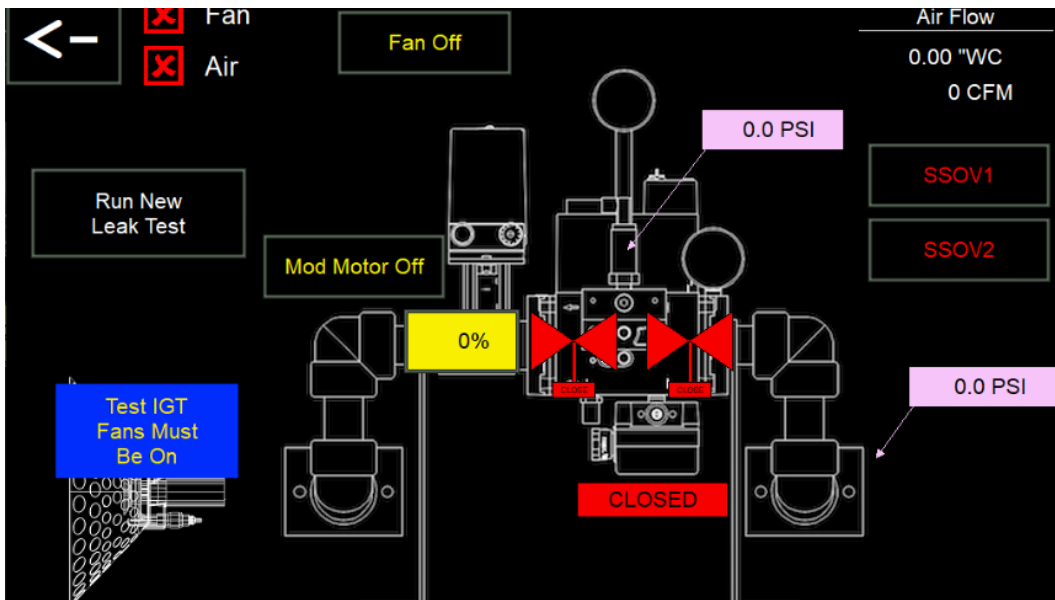
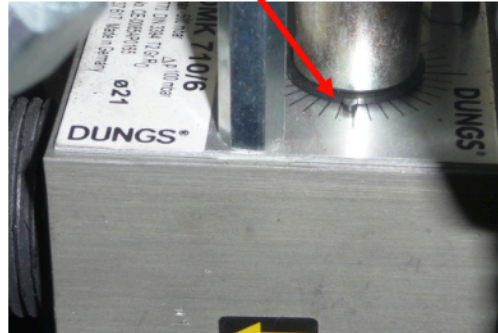
Keypad: 0-9, ESC, BS, CLR, ENT

## SYSTEM TESTS

Modulating Motor Test - Allows the operator to stroke the motor driven valve and observe the pointer on top of the valve body.

Pushing the Mod Motor On/Off pushbutton applies voltage to the motor and the position is set by pressing the % indicator below the actuator. A keypad will appear which allows entry of the exact percentage desired. Stroking from 0-100% shows that the valve is functioning properly.

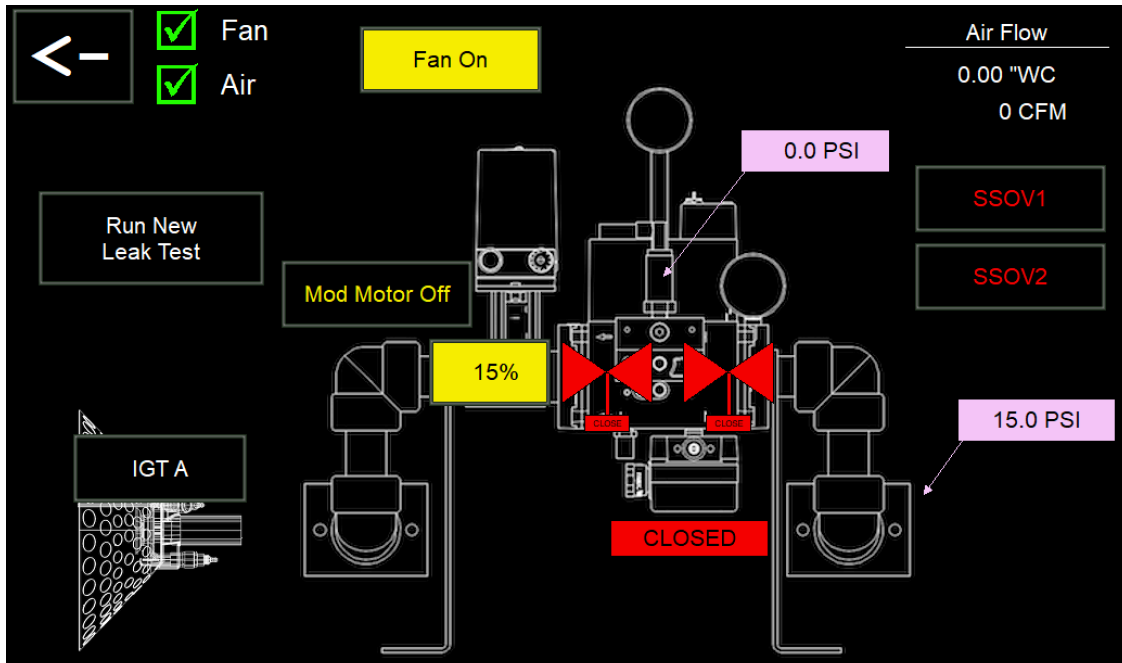
Tip indicates butterfly position in valve. Position shown is closed (0%).



### Explanation of Gas Leak Test -

Every time the heater is turned off, one of two gas leak tests will be performed automatically. The heater will alternate between the two tests after each normal shut down. The test takes about 10 minutes to perform, and the status of the tests is shown on the touch screen. Leak Test 1 checks the integrity of the safety shut off valve SSOV1. With gas evacuated from between the valves in the gas train, if gas builds up pressure, then gas is leaking past the “upstream” SSOV1. For Leak Test 2, the gas train is charged with gas at the start of the test. If gas leaks out of the gas train through “downstream” SSOV2 or fittings, then a downstream leak exists. An ERROR will be displayed if one of these two tests fail. See the *ERROR & ALARM EXPLANATIONS* section for ERROR 435 & 617. Power must be left on to the heater for at least 10 minutes after shutdown for these tests to be performed. The heater can be restarted at any point during the test.

## VALVE AND PRESSURE SENSOR TESTS



Pushing the button labelled SSOV1 turns the button green indicating that the solenoid is energized, admitting gas pressure into the cavity.

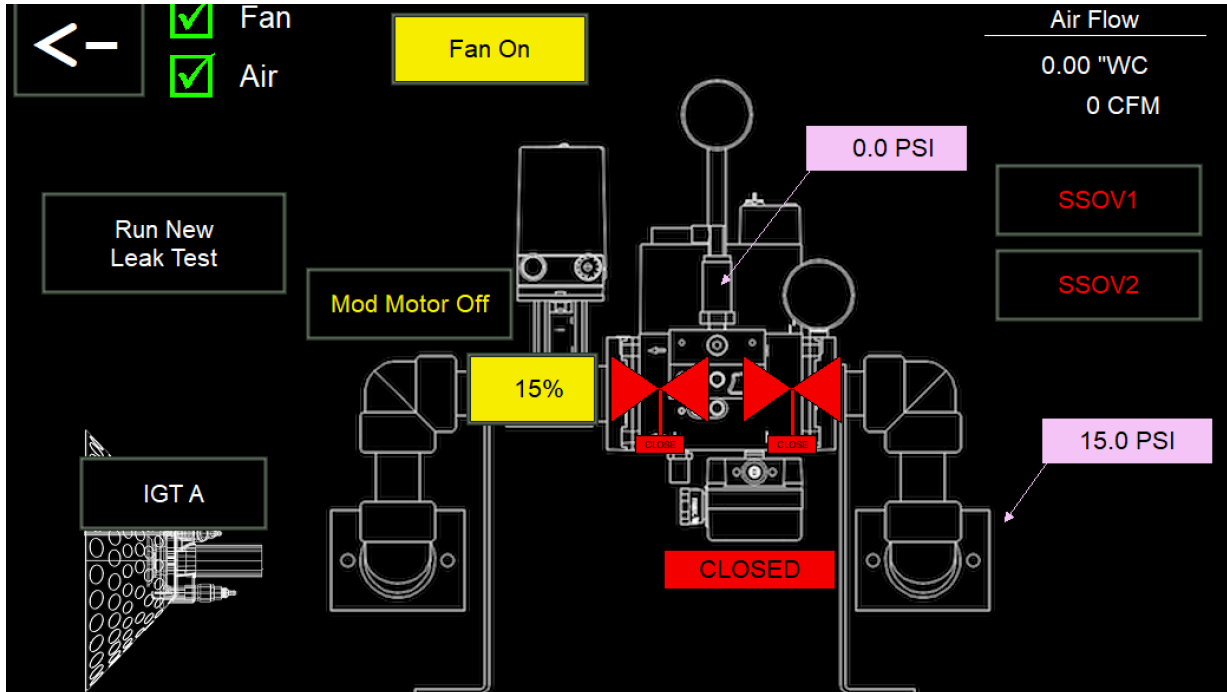
With the gas cavity charged, leave the valves closed several minutes to see that the pressure does not leak off. This tells us that the downstream valve, Safety Shutoff Valve SSOV2, is not leaking. Evacuate the gas cavity. Leave the valves closed several minutes to see that the pressure does not build up. This tells us that the upstream valve, SSOV1, is not leaking.

Pushing the SSOV1 button to charge the cavity again and then energizing SSOV2 will check the operation of this downstream valve.

Note - In rare cases, the screen on the inlet to the SSOV block may become clogged with debris from the gas supply. Evidence of this will be gas low pressure errors and a loss of heat output while the pressure shown on Gas Pressure Gauge 2 (GPG2) is normal of about 3 PSI. The GPG2 pressure tap is upstream of the screen. To clean the screen, it is necessary to remove the valve block from the flanged inlet and outlet pipe fittings. Contact the factory for technical assistance.

## AIRFLOW TRANSDUCER TEST

Push the button labeled Fan. The button will turn green as well as display the word “On” and the fan will start. The two boxes at the top of the screen will show green check marks that prove the Air Flow Transducer is satisfied and that the fan starter indicates the fan is running.

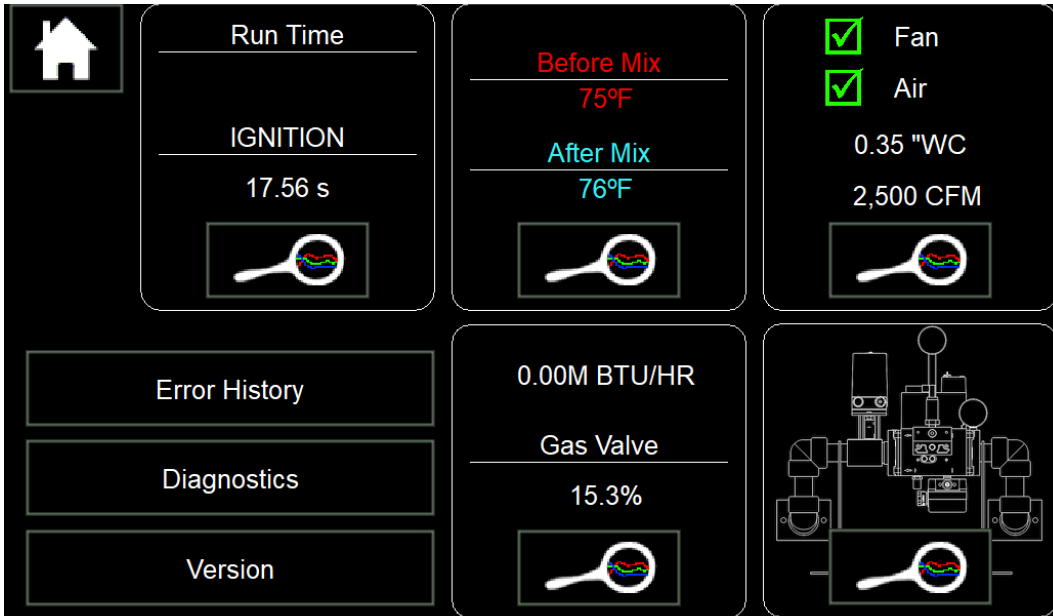


**Interference Test** – Ensures that the ignition wire and the flame relay wire are electrically isolated from each other. Note that the Fan and Air interlocks are indicated at the top of the page. The fan must run to evacuate any gas from the heater prior to initiating a spark.

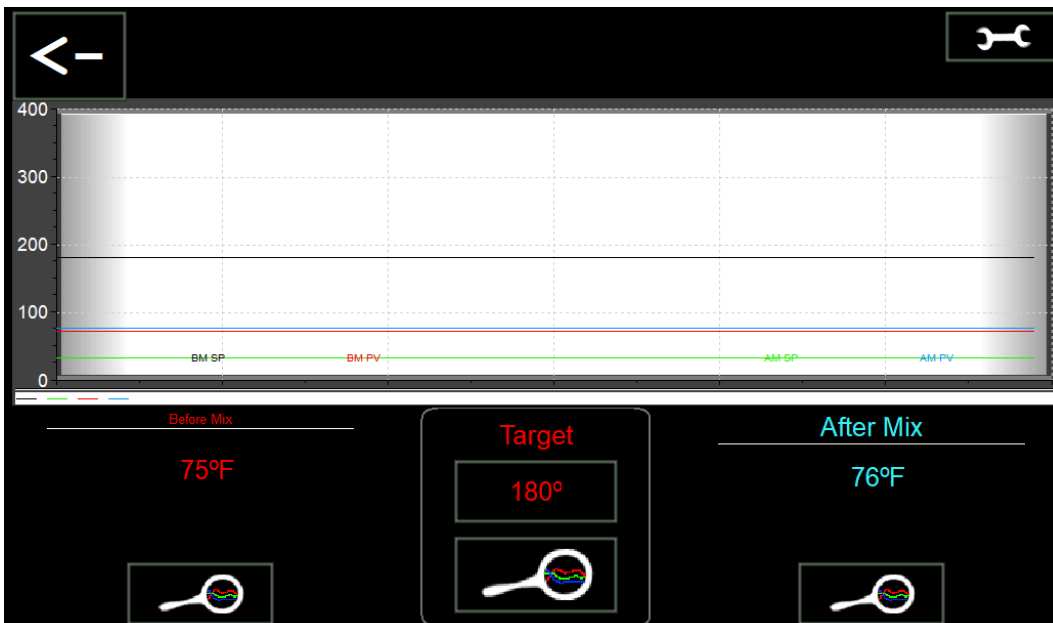
When the Ignition Transformer button is pressed, and the box turns green, the PLC turns on the ignition transformer and causes a spark at the ignitor plug. If the Flame Relay senses a flame at this time it means there is electrical interference between the ignition circuit and the flame detection circuit. The two must be isolated from each other before the heater can run. Refer to Error 155 explanation in the following sections.

## VIEW OPERATION DETAILS AND STATISTICS

On the Home Screen in the lower left corner there is a magnifying glass. Pressing this button will open the Operation Detail screen as seen below.



**Diagnostics** is the same as the Test/Setup screen and will help in troubleshooting. **Error History** shows the Error Log, and **Version** shows information about software version for heater and screen. The box labelled **Temperature** has a magnifying glass in it. Pushing this button turns the screen into a chart recorder for temperature.



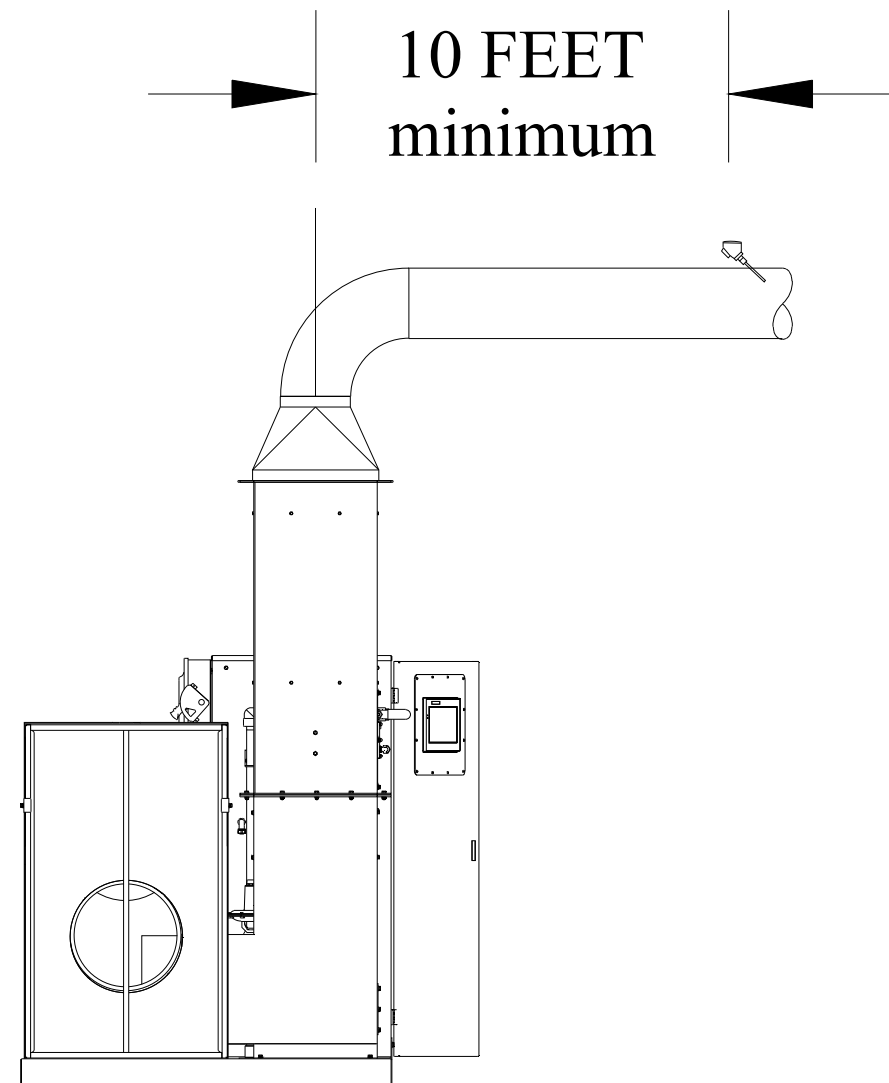
The chart shows setpoint and actual temperature (Target vs. Actual).

## HOW DO I SET THE TEMPERATURE?

The set point (SP) for the air temperature is set by touching the Target box on the Home screen and using the keypad to input the desired temperature. Changing the SP can be done with the heater on or off. The range that the set point can be adjusted, depends upon the minimum and maximum set point settings. These can be changed on the Setup Screen under Temp Limits.

## WHERE DO I INSTALL THE AIR TEMPERATURE THERMOCOUPLE?

A thermocouple with blue paint on the pipe threads (Part No. 21708) is supplied for installation in the hot air duct after the heater. Place it **at least** 10 feet away from the outlet of the heater. If the heater is part of a Samuel Jackson Super Grid System or a Samuel Jackson Steamroller System, more detailed information will be supplied to you specifically for your system. See *THERMOCOUPLE WIRING* section for more details.

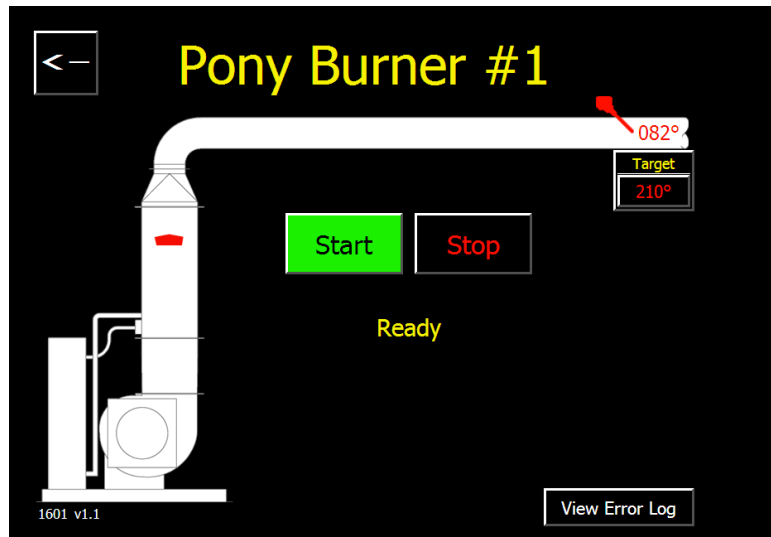




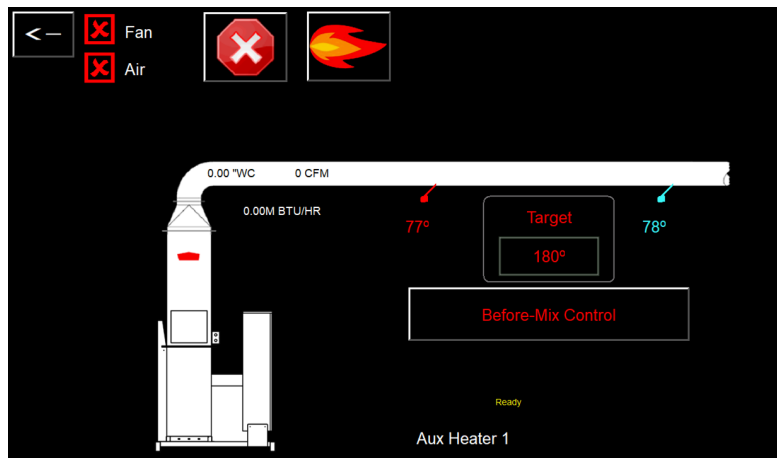
## OPTIONAL MOISTURE MIRROR 3X, 4X, AND SPECTRUM FOR REMOTE CONTROL

The HG-1-1701 Heater is compatible with the optional Moisture Mirror 3X, 4X, and Spectrum offering remote control (normally at the ginner's console) of the heater via a CAT5/6 Ethernet connection. The START/STOP operations, temperature settings and information like run times are displayed on the Mirror's color touch panel. When an ERROR or ALARM occurs, this information is also displayed.

More information will be found in the manuals for the Moisture Mirror 3X, 4X, and Spectrum. The Mirror 3X/4X screen for the HG-1-1701 Heater is shown below.



The Spectrum screen for the HG-1-1701 heater is shown below.



## ERROR & ALARM LOGGING SYSTEM

The *ERROR & ALARM LOGGING SYSTEM* is designed to make troubleshooting easier for both the user and Samuel Jackson service personnel. This system remembers the last 500 ERRORS and ALARMS, thus showing a history of past problems.

Log entries are in a first-in first-out stack, therefore Error Log #500 is replaced when another log event occurs.

### HG-1-1701 DIAGNOSTIC CODES (ERRORS SHUT DOWN BURNER, ALARMS WARN UNTIL ACKNOWLEDGED)

<u>CODE</u>	<u>ERR/ALM</u>	<u>BRIEF DESCRIPTION</u>
432	A	MOMENTARY LOW AIR FLOW
433	E	LOW AIR FLOW
435	E	UPSTEAM GAS LEAK DETECTED – CHECK SSOV1 FOR LEAKS
438	A	FAN INTERLOCK BYPASSED
439	A	AIR FLOW SENSOR BYPASEED
440	A	SSOV1 FAILED TO OPEN
441	A	SSOV1 FAILED TO CLOSE
446	E	EXCESSIVE FLAME FAILURES
465	E	EXTERNAL FLAME CONTROL ALARM
601	A	BURNER FAILED TO IGNITE
603	A	BURNER FAILED IN OPERATION\
605	E	FLAME BEFORE FUEL BEFORE SPARK
607	E	FLAME BEFORE FUEL DURING SPARK
609	A	BEFORE-MIX THERMOCOUPLE #1 REVERSED
610	A	AFTER-MIX THERMOCOUPLE #1 REVERSED
611	A	BEFORE-MIX THERMOCOUPLE #2 REVERSED
612	A	AFTER-MIX THERMOCOUPLE #2 REVERSED
613	A	BEFORE-MIX HIGH TEMPERATURE LIMIT
614	E	EXCESSIVE FLAME AFTER SHUTDOWN
617	E	PRESSURE BETWEEN SSOVS FELL MORE THAN 0.5PSI
618	E	NO FAN INTERLOCK

619	E	FUEL PRESSURE LOW AT FUEL INLET
620	E	FUEL PRESSURE TOO HIGH AT FUEL INLET
624	A	NO SIGNAL - GAS PRESSURE #1
631	A	NO SIGNAL - AIR FLOW #1
633	A	NO SIGNAL - AMBIENT TEMP
634	A	NO SIGNAL - BEFORE MIX TEMPERATURE #1
635	A	NO SIGNAL - BEFORE MIX TEMPERATURE #2
636	A	NO SIGNAL – AFTER MIX TEMPERATURE #1
637	A	NO SIGNAL – AFTER MIX TEMPERATURE #2
640	E	HIGH GAS PRESSURE
641	E	LOW GAS PRESSURE
642	E	LOW AIRFLOW
643	E	HIGH GAS PRESSURE PAST THE REGULATOR
644	A	NO LEAK TEST LAST 7 DAYS
645	A	STARTUP TAKING TOO LONG
647	A	NO SIGNAL - GAS PRESSURE #2

## ERROR & ALARM EXPLANATIONS

**PRELIMINARIES** -- As explained in the *Heater Operation* section, ERRORS will cause the burner to automatically shut down. ALARMS will permit the burner to continue operation but warn of conditions which may cause a shutdown if left unattended. In each case, the DIAGNOSTIC CODE with a brief description of the ERROR or ALARM will be shown on the touch screen in the heater cabinet or the Moisture Mirror if it is a 3X, 4X, or Spectrum.

### ERROR & ALARM Condition Display

**EXAMPLE:** The flame electrode is fouled. This prevents the burner from having a flame signal. ALARM code 601 (Burner Failed to Ignite) is displayed. While this is occurring, the burner is automatically restarting itself (three times maximum) attempting to light. The burner shuts itself down on ERROR code 446 (Excessive Flame Failures) after 3 unsuccessful tries. The display continues to show both ALARM and ERROR codes.

#### **ALARM 432**

*MOMENTARY LOW AIR FLOW:* This ERROR is an indication that a choke of the air flow is occurring. It is displayed when the Air Flow Transducer (AFT) detects low air flow for less than 3 seconds. If air flow is ok, the low air flow limit may be set too high. See "AIR Flow" in the "Setup - Home" section of manual for adjustment.

#### **ERROR 433**

*LOW AIR FLOW:* This ERROR occurs when the air flow is interrupted for more than 3 seconds. Verify proper air flow and adjust alarm threshold of Air Flow Transducer (AFT) setting if necessary. See "AIR Flow" in the "Setup Home" section of manual for adjustment of the "alarm" threshold.

#### **ERROR 435**

*UPSTREAM GAS LEAK DETECTED – CHECK SSOV1 FOR LEAKS:* This is a serious ERROR caused by a leak in the SSOV1 (this is the "upstream" gas valve). In the "System Tests" section, select "Run New Leak Test" to access control of the fuel valves to determine the severity of the leak. This ERROR is normally a result of contamination under the valve seat of SSOV1. If severe contact the factory for service.

#### **ALARM 438**

*FAN INTERLOCK BYPASSED:* Samuel Jackson burner controls are provided with a fan interlock relay (FIR) to provide immediate shutdown of the burner when the air fan is turned off. This ERROR indicates that an electrical signal is being received through the fan interlock with no airflow present, effectively bypassing this important safety feature.

#### **ALARM 439**

*AIR FLOW SENSOR BYPASSED:* This ERROR indicates that air flow is being sensed from the Air Flow Transducer (AFT) with no fan interlock (FIR) signal present 10 minutes after turning the Heater off, effectively bypassing this important safety feature. Check the adjustment of the Air Flow Transducer alarm threshold and verify its operation. See "Air Flow" in the "Setup - Home" section of manual for adjustment of the limits.

#### **ALARM 440**

*SSOV1 FAILED TO OPEN:* A Proof of Closure (POC) switch on the bottom of first SSOV1 (“upstream” valve) that tells the PLC when the valve is closed and has failed. Check for loose wires and that SSOV1 valve is actually opening.

#### **ALARM 441**

*SSOV1 FAILED TO CLOSE:* The PLC was not able to verify that Safety Shut-Off Valve 1 (upstream SSOV1 valve) is opening and closing in a timely manner. If this problem persists, try the following: Check that SSOV1 opens and closes. Check operation of SSOV1 proof of closure switch (POC). Replace SSOV1 valve actuator and/or its proof of closure switch. See “FUEL SYSTEM” section of “TESTS” for testing of the valves.

#### **ERROR 446**

*EXCESSIVE FLAME FAILURES:* During ignition and operation, flame failures are counted. When the total comes to 3, the PLC shuts the unit down on ERROR 446. Use the error log to determine which ERRORS were logged before ERROR 446. Knowing which three previous ERRORS caused ERROR 446 may help determine the problem.



*TIPS*

#### ***THE FOLLOWING MAINTENANCE TIPS WILL HELP TO MINIMIZE FLAME FAILURE ALARMS:***

- Check that the burner head is positioned correctly inside burner body. Refer to *TESTS EXPLANATION* in this manual under the *PRELIMINARY* section for details.
- Clean the spark plug if it appears fouled.
- Scrape off the flame electrode and wipe the ceramic insulator with a clean cloth.
- Increase the gas pressure if low fire setting appears to be extinguished from air turbulence.
- Increase the gas low fire valve opening a little.
- Check for a grounded ignition circuit.
- Check burner orifice alignment. See *BURNER ORIFICE ALIGNMENT* page in this manual.

#### **ERROR 465**

*EXTERNAL FLAME CONTROL ALARM:* Check flame control for fault code.

#### **ALARM 601**

*BURNER A FAILED TO IGNITE:* Is fuel present? Is spark present?

**ALARM 603**

*BURNER A FAILED IN OPERATION.* Increase minimum fuel valve during run or reduce air flow target.

**ERROR 605**

*FLAME A BEFORE FUEL BEFORE SPARK:* Check flame rod and flame relay.

**ERROR 607**

*FLAME A BEFORE FUEL DURING SPARK:* Check for leaking fuel valves.

**ALARM 609**

*BEFORE-MIX THERMOCOUPLE #1 REVERSED:* Verify wiring in thermocouple per diagram. This can also be caused by long pipe runs to the thermocouple location and cool ambient temperatures.

**ALARM 610**

*AFTER-MIX THERMOCOUPLE #1 REVERSED:* Verify wiring in thermocouple per diagram. This can also be caused by long pipe runs to the thermocouple location and cool ambient temperatures.

**ALARM 611**

*BEFORE-MIX THERMOCOUPLE #2 REVERSED:* Verify wiring in thermocouple per diagram. This can also be caused by long pipe runs to the thermocouple location and cool ambient temperatures.

**ALARM 612**

*AFTER-MIX THERMOCOUPLE #2 REVERSED:* Verify wiring in thermocouple per diagram. This can also be caused by long pipe runs to the thermocouple location and cool ambient temperatures.

**ALARM 613**

*BEFORE-MIX HIGH TEMPERATURE LIMIT:* Check for low air flow.

**ERROR 614**

*EXCESSIVE FLAME A AFTER SHUTDOWN:* Check for leaking fuel valves.

**ERROR 617**

*PRESSURE BETWEEN SSOVS FELL MORE THAN 0.5PSI:* Check SSOV2 for leaks.

**ERROR 618**

*NO FAN INTERLOCK:* Are all fans running?

**ERROR 619**

*FUEL PRESSURE LOW AT FUEL INLET*

**ERROR 620**

*FUEL PRESSURE TOO HIGH AT FUEL INLET*

**ALARM 624**

*NO SIGNAL - GAS PRESSURE #1:* Check wiring or replace gas inlet pressure sensor.

**ALARM 631**

*NO SIGNAL - AIR FLOW #1*: Check wiring or replace air flow sensor #1.

**ALARM 633**

*NO SIGNAL - AMBIENT TEMP*: Check wiring to burner body. Replace ambient temp sensor.

**ALARM 634**

*NO SIGNAL - BEFORE MIX TEMPERATURE #1*: Check wiring to BM (red) thermocouple #1. Replace BM thermocouple.

**ALARM 635**

*NO SIGNAL - BEFORE MIX TEMPERATURE #2*: Check wiring to BM (red) thermocouple #2. Replace BM thermocouple.

**ALARM 636**

*NO SIGNAL - AFTER MIX TEMPERATURE #1*: Check wiring to AM (blue) thermocouple #1. Replace AM thermocouple.

**ALARM 637**

*NO SIGNAL - AFTER MIX TEMPERATURE #2*: Check wiring to AM (blue) thermocouple #2. Replace AM thermocouple.

**ERROR 640**

*HIGH GAS PRESSURE*: Reset high gas pressure switch on gas train. Check regulator or supply.

**ERROR 641**

*LOW GAS PRESSURE*: Reset low gas pressure switch on gas train. Check supply, filter, or slam-shut.

**ERROR 642**

*LOW AIRFLOW*: Check for airflow problem. Check airflow switch.

**ERROR 643**

*HIGH GAS PRESSURE PAST THE REGULATOR*: Check the correct operation of the regulator.

**ALARM 644**

*NO LEAK TEST LAST 7 DAYS*: Test will automatically be performed at next shutdown.

**ALARM 645**

*STARTUP TAKING TOO LONG*: Reboot PLC or call factory.

**ALARM 647**

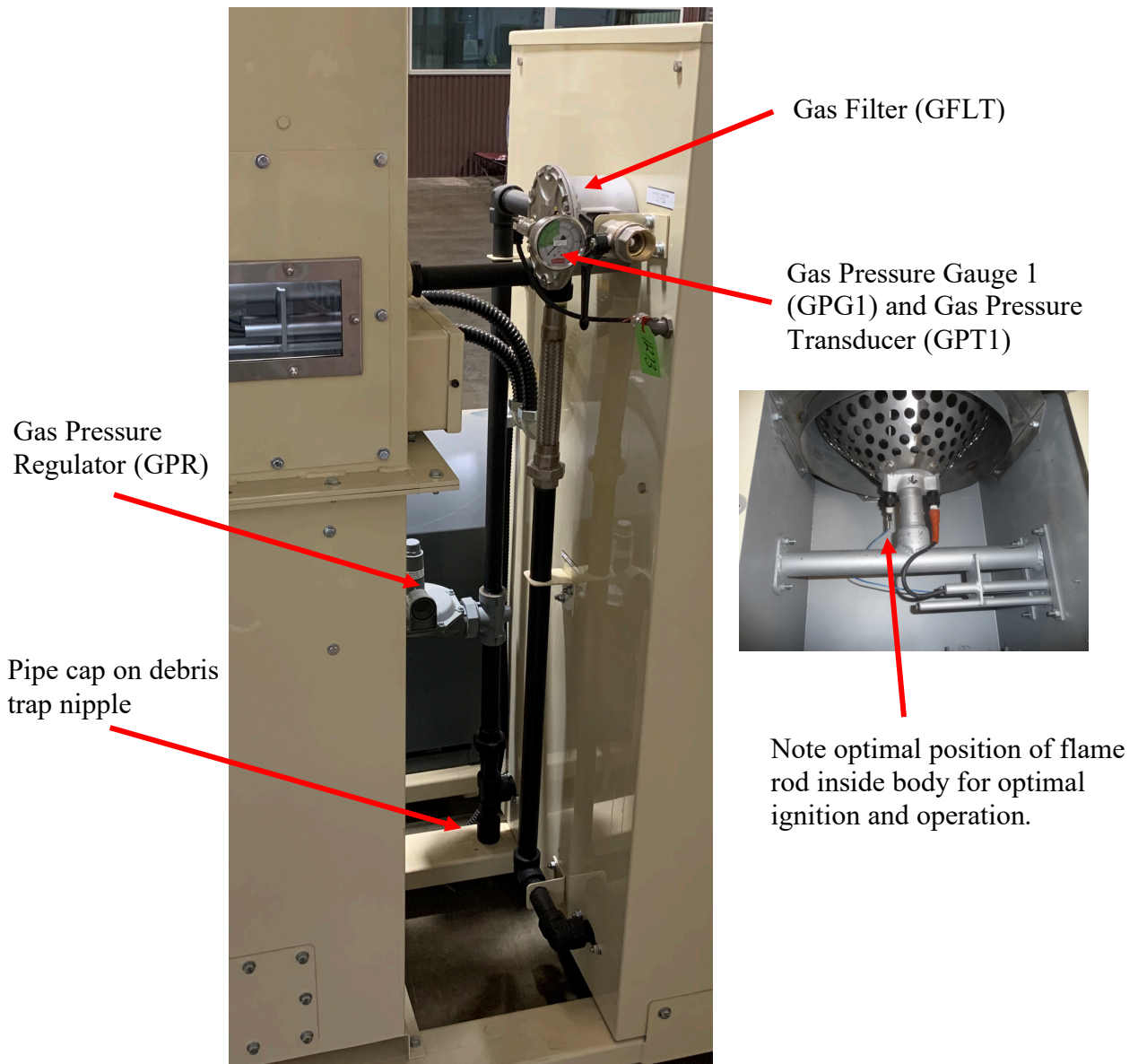
*NO SIGNAL - GAS PRESSURE #2*: Check wiring or replace pressure sensor between SSOV1 and SSOV2.

## NEW INSTALLATION TESTS EXPLANATION

### PRELIMINARY

To test a new installation, first check that all necessary connections for electrical and gas are made. Standard 3-phase electrical power supplies are 480VAC 60 HZ, 415VAC 50 HZ, or 380VAC 50 HZ.

With electrical power off, prepare to purge the gas line of debris and air by closing off the gas supply valve before the Gas Pressure Regulator (GPR) and having the main gas supply on. Open the pipe cap on the end of the short pipe debris trap nipple under the regulator and quickly open/close the gas supply valve several times. Debris in the pipe will blast out. Keep doing this until gas is noticeable and debris has cleared. Make sure good ventilation is present and no one is smoking.





Check installation of air thermocouple and that burner head is rotated so flame rod is on side of burner body as shown in picture above. Apply power by turning on the disconnect. Check that power on terminals 1 and 3 on the electrical panel is between 110 and 120 VAC. If the single-phase voltage is not within this range, check that the correct secondary tap connections are made on Control Voltage Transformer CT referring to the *ELECTRICAL SCHEMATIC Drawing No. CA17011C* shown in this manual. Call the factory for assistance.

**Gas Train Status** -- Observe the state of the gas train here.



***If the rotation is wrong, disconnect 3 phase power to the Heater following OSHA lockout/tag-out procedures before proceeding.***

Swapping the positions of two of the 3Ø wires at the supply side of the motor contactor (MC) will reverse the blower motor. After checking the wires a final time for tightness, reconnect the power.



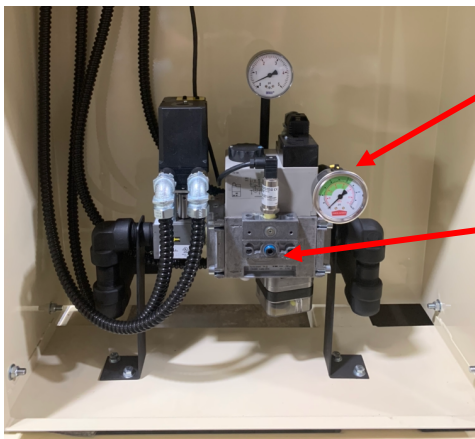
**TIPS**

*It is better to change the speed of the blower to get close to the desired air volume than severely gating down the air flow from an over sped blower.*

**GAS LOW PRESSURE** -- The blower is on for this step. The SSOV1 and SSOV2 are now used to test for presence of gas, adjust its pressure, test for valve leakage. The final pressure should be between 2.5 and 3 PSI when the heater is operating.

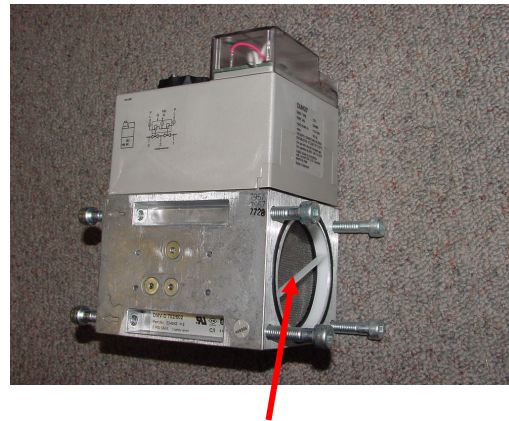
With the gas cavity charged, leave the valves closed several minutes to see that the pressure does not leak off. This tells us that the Safety Shutoff Valve SSOV2, is not leaking. Evacuate the gas cavity. Leave the valves closed several minutes to see that the pressure does not build up. This tells us that the upstream valve, SSOV1, is not leaking. The operating program will perform similar tests every time the heater is shut down. This is one reason electrical power must be supplied to the heater continuously, or at least for 10 minutes after each shutdown.

In rare cases, the screen on the inlet to the SSOV block may become clogged with debris from the gas supply. Evidence of this will be gas low pressure errors and a loss of heat output while the pressure shown on Gas Pressure Gauge 2 (GPG2) is normal of about 3 PSI. The GPG1 pressure tap is upstream of the screen. To clean the screen, it is necessary to remove the valve block from the flanged inlet and outlet pipe fittings.



GPG2

SSOV block



Screen on inlet to SSOV block

**IGT TRANSFORMER** -- The blower will turn on when this test is entered, and it must run 20 seconds to purge the duct system with air before this test can proceed. Turn on the Ignition Transformer IGT. If the gin is quiet, you can hear the spark. If there is difficulty, check the spark plug electrode gap at 1/16 to 1/8" (1.5 to 3 mm). Hold the IGT on for two seconds while observing the flame light on the local panel LP. If the Flame Signal turns on, it means that there is electrical interference between the spark plug wire and the flame electrode wire. They should be run to the burner in separate conduits to avoid such interference. Since the operating program makes a similar test before each ignition, the burner will not operate until this problem is corrected. INTERFERENCE will flash on the display if electrical interference occurs.

**Try the Burner to see if it lights** – Try to start from the Home screen.

If flame fails during startup, Fuel Valve at Ignition position can be increased and try to light again.

## BURNER ORIFICE ALIGNMENT

If you are experiencing excessive flame failures or difficulty establishing flame, check to make sure the orifice in your burner head is aligned correctly to the flame rod. Proper orifice alignment will also reduce the formation of soot and carbon on the flame rod especially when using propane or butane fuels.

The picture below shows the correct alignment of the orifice disk. The contoured stainless steel disk has been removed for illustration. Note that one of the orifice slots is pointed directly toward the spark plug.

Point one slot directly  
to spark plug



To adjust the orifice alignment, remove the contoured disk from the burner body by removing the 3/8-inch stainless steel cap screw. Rotate the orifice disk so that one of the slots is pointed directly at the spark plug. Insert a small screwdriver through the hole in the burner shell and into a slot in the orifice. Reinstall the contoured disk while using the screwdriver to keep the orifice from rotating. Newer burner heads and shims will have a locating tail that keeps the proper alignment during tightening.

After reinstalling the burner assembly, the flame rod should glow red hot while the flame is on improving ignition, reducing flame failures, and reducing formation of soot and carbon on the flame rod.

Note: Application of an anti-seize compound on any threads around the burner will make it much easier to disassemble next time.

## STUB-UP'S

<u>NO.</u>	<u>DESCRIPTION</u>	<u>ROUTING AND NOTES</u>
1	BURNER POWER	<p>FROM ELECTRICAL SERVICE TO HEATER. 380VAC-480VAC, 50/60 HZ, 3 HP, ¾ CONDUIT, 3-12 GA WIRES AND GROUND</p> <p>FAN MOTOR STARTER AND 120V CONTROL TRANSFORMER ARE IN HEATER CABINET.</p>
2	DUCT THERMOCOUPLE (MARKED BLUE)	<p>FROM BURNER CABINET TO: LOCATE IN HOT AIR DUCT AT LEAST 10 FEET FROM BURNER OUTLET.</p> <p>1/2" CONDUIT WITH 1 PAIR SHIELDED CABLE. * DO NOT RUN WITH AC VOLTAGE WIRES. OKAY TO RUN WITH OTHER THERMOCOUPLE OR DC VOLTAGE WIRES. SEE <i>THERMOCOUPLE WIRING</i> SECTION FOR MORE DETAILS.</p>
3	<p>OPTIONAL HEATER CONTROL AC WIRES TO REMOTE LOCATION. FOR REMOTE START/STOP AND FLAME INDICATION.</p> <p>ELECTRICIAN TO SUPPLY OPTIONAL SWITCHES AND LIGHT FOR 120VAC</p>	<p>HEATER CABINET TO CONSOLE ½" CONDUIT, 5-16 GA WIRES.</p> <p>HEATER CABINET TO NETWORK SWITCH, CAT-5E OR BETTER.</p>
4	GAS SUPPLY FOR BURNER	<p>1" GAS SUPPLY LINE. NATURAL GAS OR PROPANE. 6 TO 20 PSI, 0.4 TO 1.7 BARS. SEE <i>DRAWING 14-1899</i> IN MANUAL FOR NOMINAL RECOMMENDED PIPE SIZES.</p>

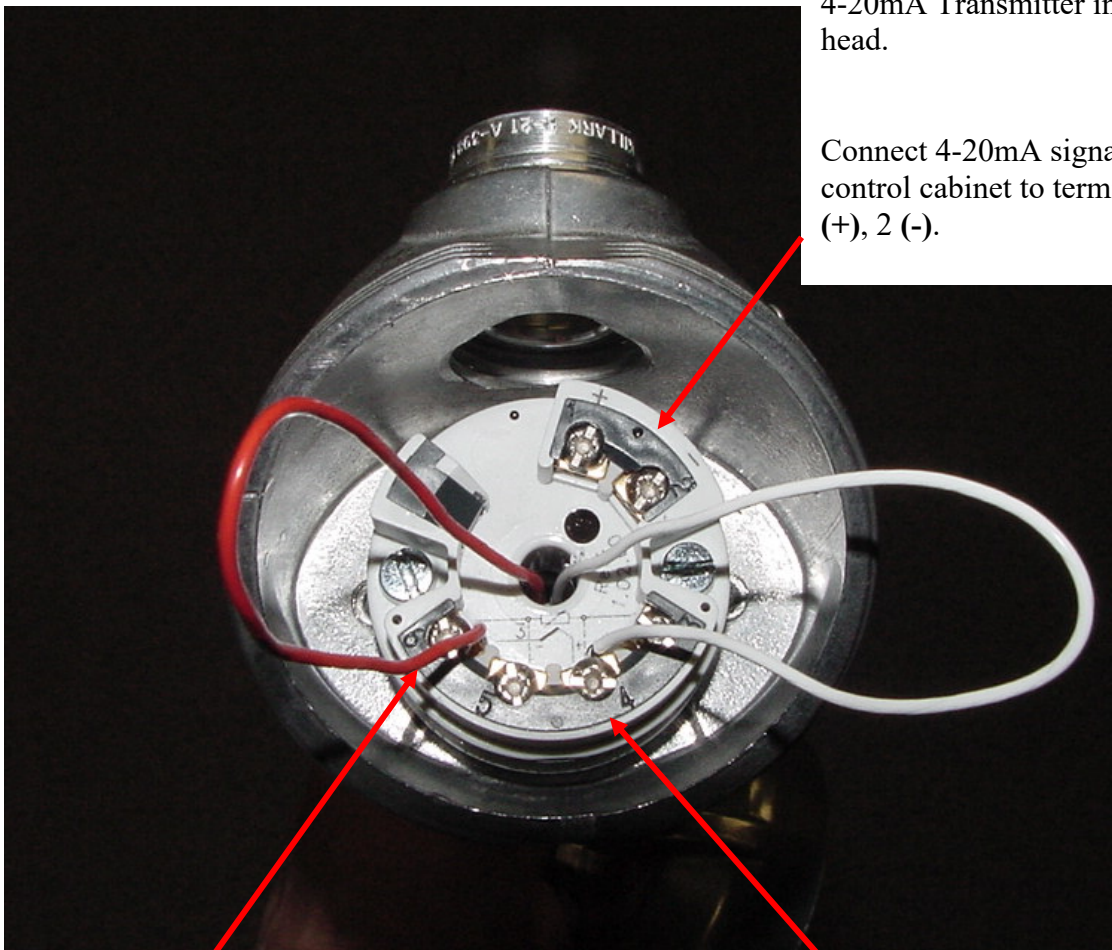
## THERMOCOUPLE WIRING

The following rules need to be followed when wiring the thermocouple temperature sensors from the Thermocouple to the Heater electrical panel. The signal from the temperature sensor is 4-20mA DC.

- **Always** use shielded, 2 conductor cable from the thermocouple to the control panel terminal blocks. Terminate the shield only on the electrical panel end. Do not use Type J thermocouple wire for hookup.
- **Never** run the shielded sensor wires with the power wiring (including 120 VAC control wires). You can run several shielded 4-20mA shielded wires together in the same conduit with other wires marked sensitive on the external connection diagram.

Part No. 21708 Type 'J'  
Thermocouple shown with  
4-20mA Transmitter in junction  
head.

Connect 4-20mA signal wires to  
control cabinet to terminals 1  
(+), 2 (-).



Red (-) wire from Thermocouple  
junction goes to terminal 6.

White (+) goes from Thermocouple  
junction goes to terminal 4.



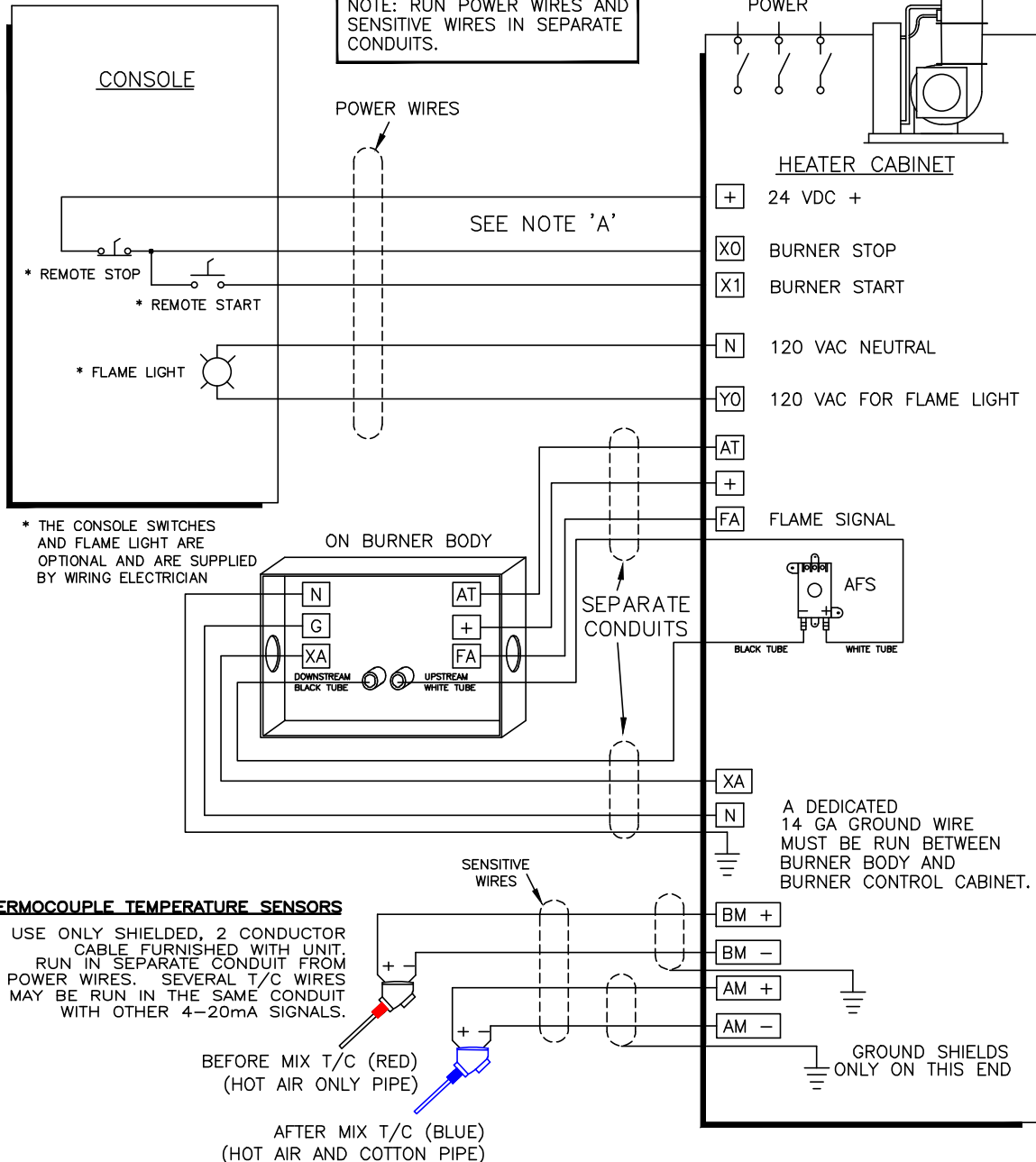
# WIRING DIAGRAMS

## EXTERNAL ELECTRICAL CONNECTIONS HG-1-1701 GAS FIRED HEATER

CA17012  
12-21

\* A REMOTE START/STOP CONTROL MAY BE PURCHASED FROM SAMUEL JACKSON, INC. OR SUPPLIED BY WIRING ELECTRICIAN

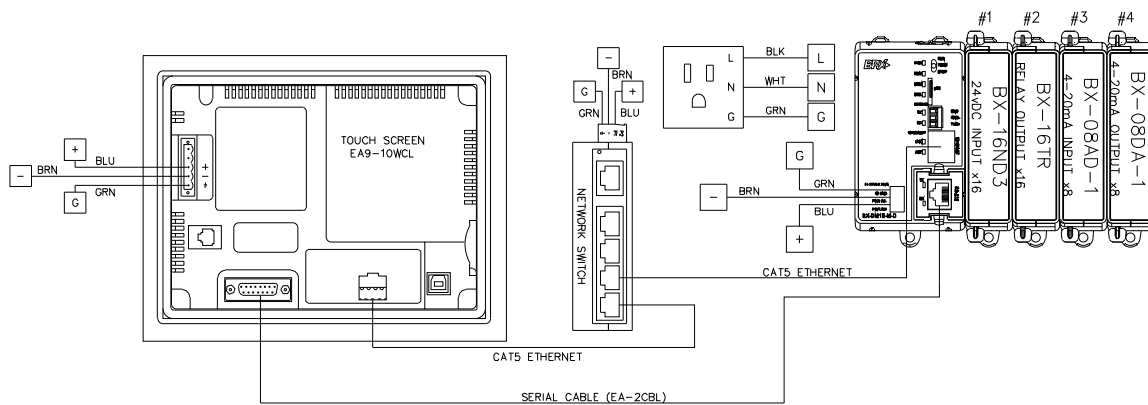
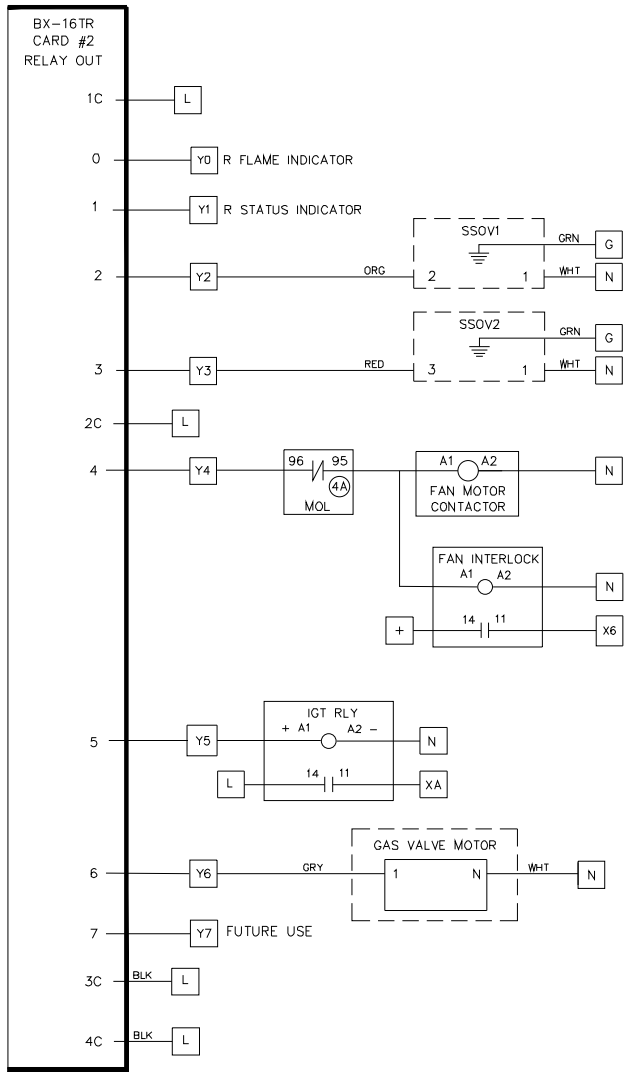
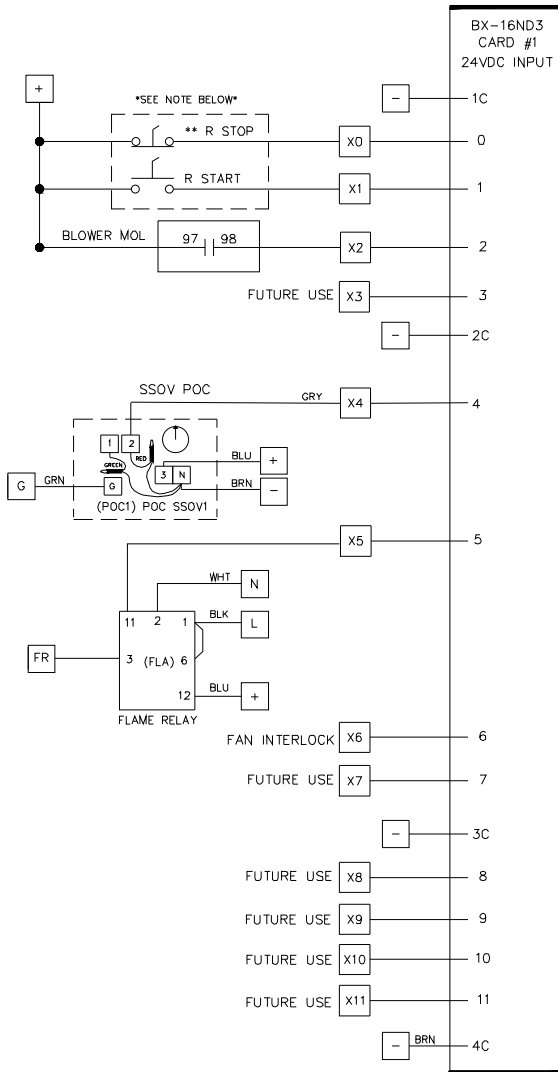
NOTE: RUN POWER WIRES AND SENSITIVE WIRES IN SEPARATE CONDUITS.



\* THE CONSOLE SWITCHES AND FLAME LIGHT ARE OPTIONAL AND ARE SUPPLIED BY WIRING ELECTRICIAN

A DEDICATED 14 GA GROUND WIRE MUST BE RUN BETWEEN BURNER BODY AND BURNER CONTROL CABINET.

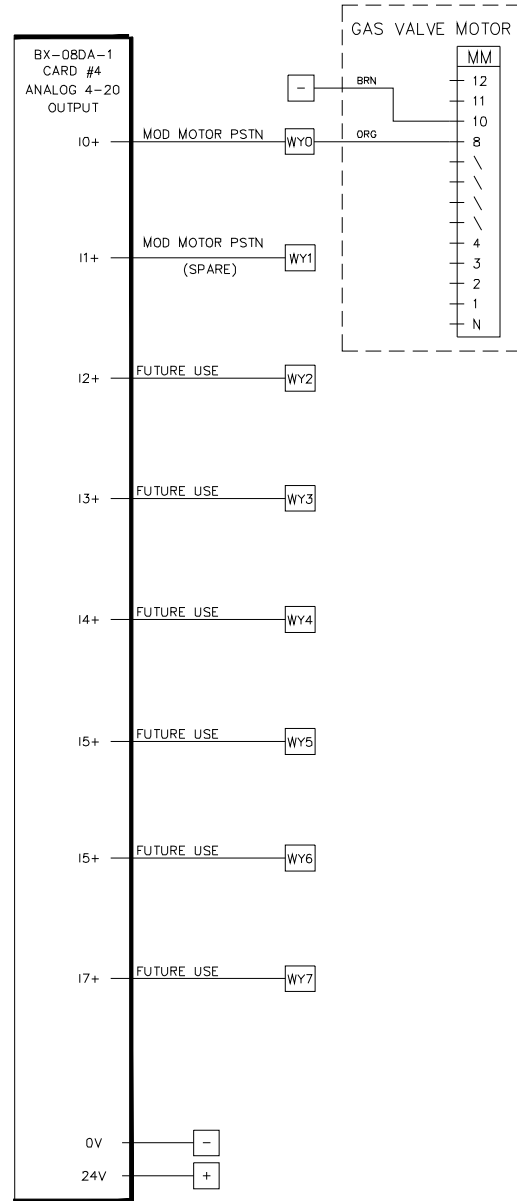
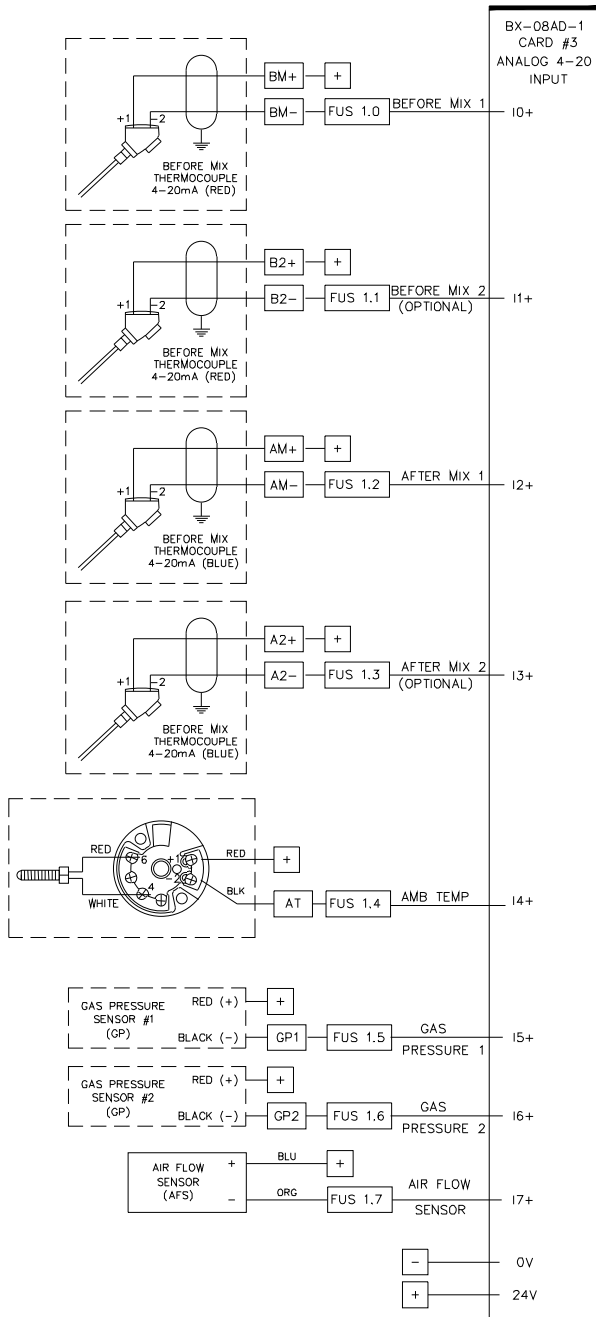
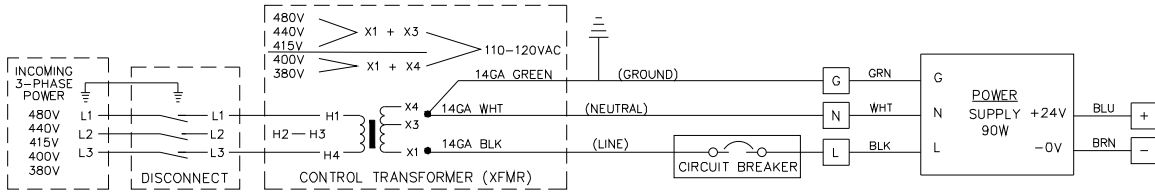
NOTE 'A': IF A REMOTE START-STOP SWITCH IS INSTALLED, THE JUMPER BETWEEN TERMINALS + & X0 MUST BE REMOVED



\*\* REMOVE JUMPER BETWEEN + & X0 WHEN INSTALLING OPTIONAL STOP SWITCH

**SAMUEL JACKSON, INC.**  
ELECTRICAL SCHEMATIC  
WITH DISCRETE PLC I/O  
FOR HG-1-1701  
1-MILLION BTU HEATER

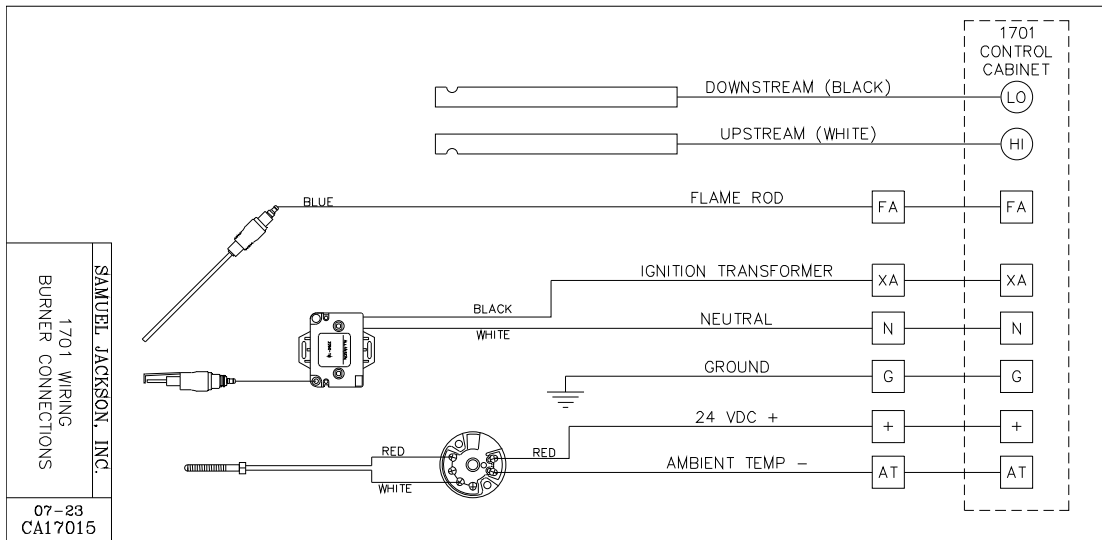
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07-23



**SAMUEL JACKSON, INC.**  
 ELECTRICAL SCHEMATIC  
 WITH ANALOG PLC I/O  
 FOR HG-1-1701  
 1-MILLION BTU HEATER

CA17011D  
 07-23





## GAS PIPING

The size of the pipe supplying gas to heaters and other appliances should be large enough to prevent excessive pressure losses when all of them are in use. See following Table of RECOMMENDED *MINIMUM PIPE SIZES* (Drawing 14-1899) for heater capacities, pipe lengths, and pressures.

Where LPG (Liquefied Petroleum Gas, Propane, Butane) is used as fuel, see the following Drawing 14-3566 *LIQUEFIED PETROLEUM GAS TANK INSTALLATION FOR HUMIDAIRE UNITS AND DRYING HEATERS* for recommended practices.

Emergency shut-off valves should be provided to permit turning off the fuel in an emergency. They should be located so that they are accessible in an emergency situation.

IRI (Industrial Risk Insurers) and some state and local authorities require venting the gas regulator and normally open vent valve.

NFPA (National Fire Protection Association) 86\* states:

3-3.4.3.2 Regulators shall be vented to a safe location, where vented gas cannot re-enter the building without extreme dilution. The terminating end shall be protected against water entry and bug-screened. Vent pipe shall be of adequate size so as to not lengthen response time.

3-3.4.3.3 Vent lines from multiple regulators, where manifolded together, shall be piped in such a manner that diaphragm rupture of one will not backload the others.

3-3.4.3.4 Vents from gas pressure switches, but from no other devices, may be vented into the regulator lines provided that switch or regulator diaphragm failure will not backload the regulator.

\* Reprinted with permission from NFPA 86-1985, Standard for Ovens and Furnaces, copyright © 1985, National Fire Protection Association, Quincy, Mass. 02269. This reprint of material is not the complete and official position of the NFPA on the referenced subject which is represented only by the standard in its entirety.

Note: The HG-1-1701 is usually at the end of the gas line and therefore will be the first device to have gas pressure issues in cold weather when all gas burners are running at maximum. We recommend that a gas gauge be installed on the high-pressure side (before the regulator) where it can be easily seen. If the burner is installed adjacent to a Humidaire, the gauge can be used as an indicator for both.

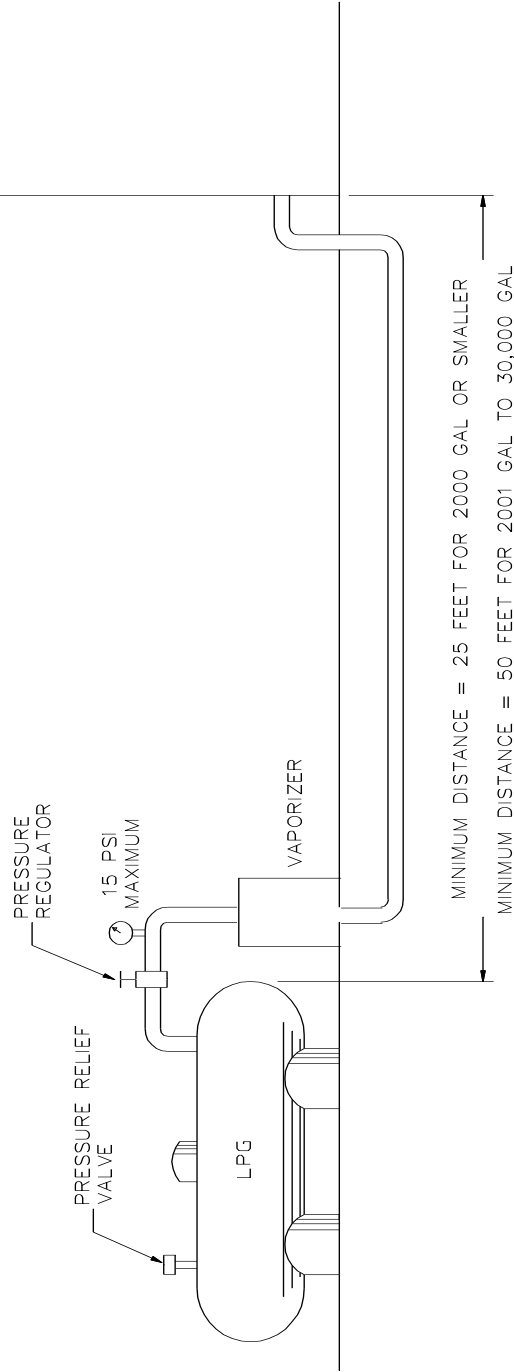
TOTAL HEATER CAPACITY MILLION BTU/HR	PIPE LENGTH FEET	RECOMMENDED MINIMUM PIPE SIZES				
		PRESSURE AT SERVICE REGULATOR OR VAPORIZER OUTLET, PSIG				
		NATURAL GAS			PROPANE *	
		6	10	15	10	15
2	100	1-1/4	1	3/4	3/4	3/4
	200	1-1/4	1	1	3/4	3/4
	500	1-1/2	1-1/4	1	1	3/4
4	100	1-1/2	1-1/4	1	3/4	3/4
	200	2	1-1/2	1-1/4	1	1
	500	2	1-1/2	1-1/4	1-1/4	1-1/4
8	100	2	1-1/2	1-1/4	1-1/4	1
	200	2-1/2	2	1-1/2	1-1/4	1-1/4
	500	3	2	2	1-1/2	1-1/2
16	100	3	2	1-1/2	1-1/2	1-1/4
	200	3	2-1/2	2	2	1-1/2
	500	4	2-1/2	2-1/2	2-1/2	2
24	100	3	2-1/2	2	2	1-1/2
	200	4	3	2-1/2	2-1/2	2
	500	5	3	2-1/2	2-1/2	2-1/2

\* OR BUTANE

FILE: 14-1899

PIPE SIZES ARE NOMINAL DIAMETERS, SCHEDULE 40, AND ARE BASED ON 5 PSIG BEING REQUIRED AT INLETS OF COMBUSTION REGULATORS.

# Liquefied Petroleum Gas Tank Installation for Humidaira Units and Drying Heaters

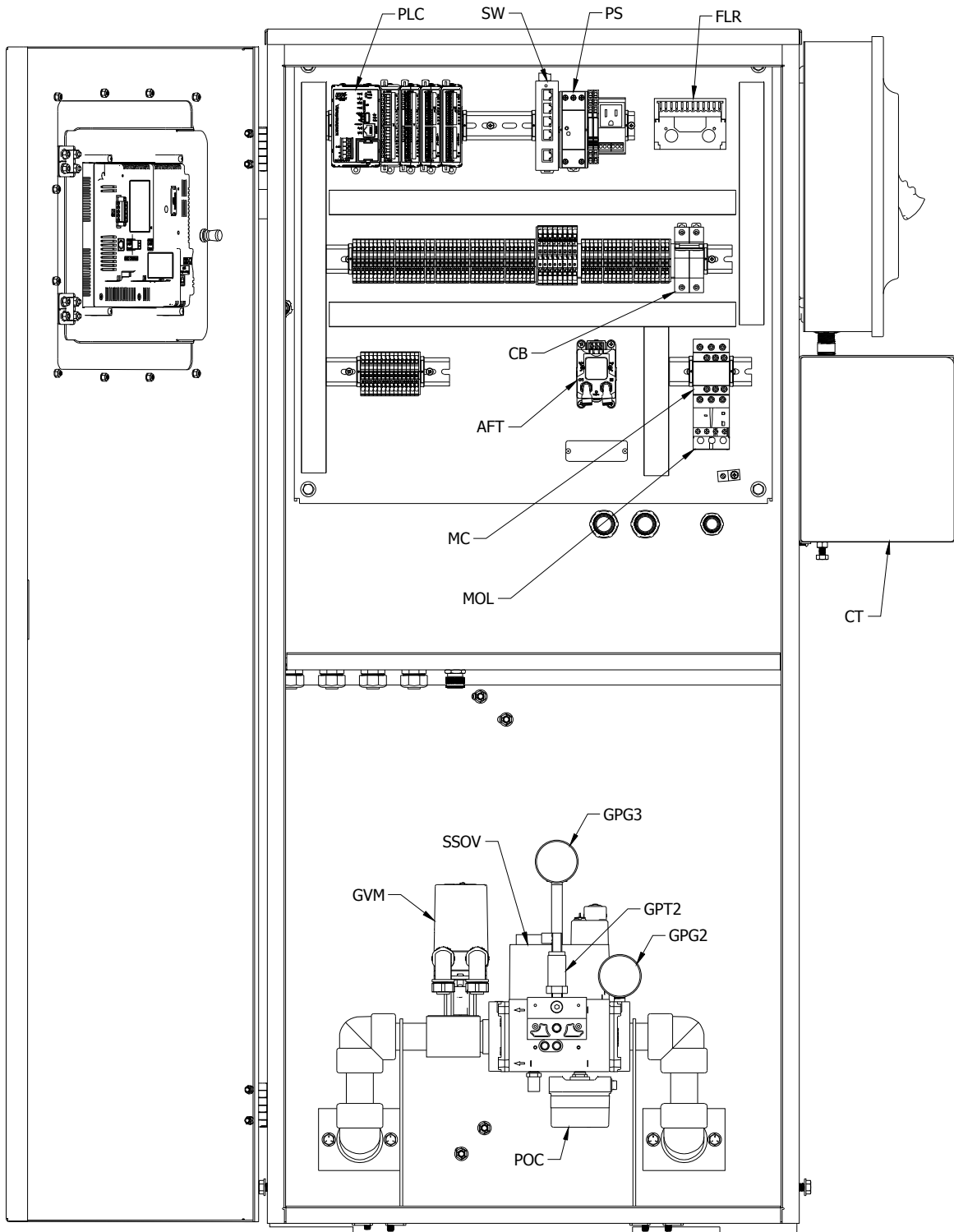


For LPG installations, the tank should be at least 1200 US gallons to provide adequate surface area to absorb heat of vaporization from the atmosphere. To be compatible with the quantity of LPG received in each delivery, a larger tank may be necessary. A battery of small tanks of the desired total capacity has more heat-absorbing area than one large tank.

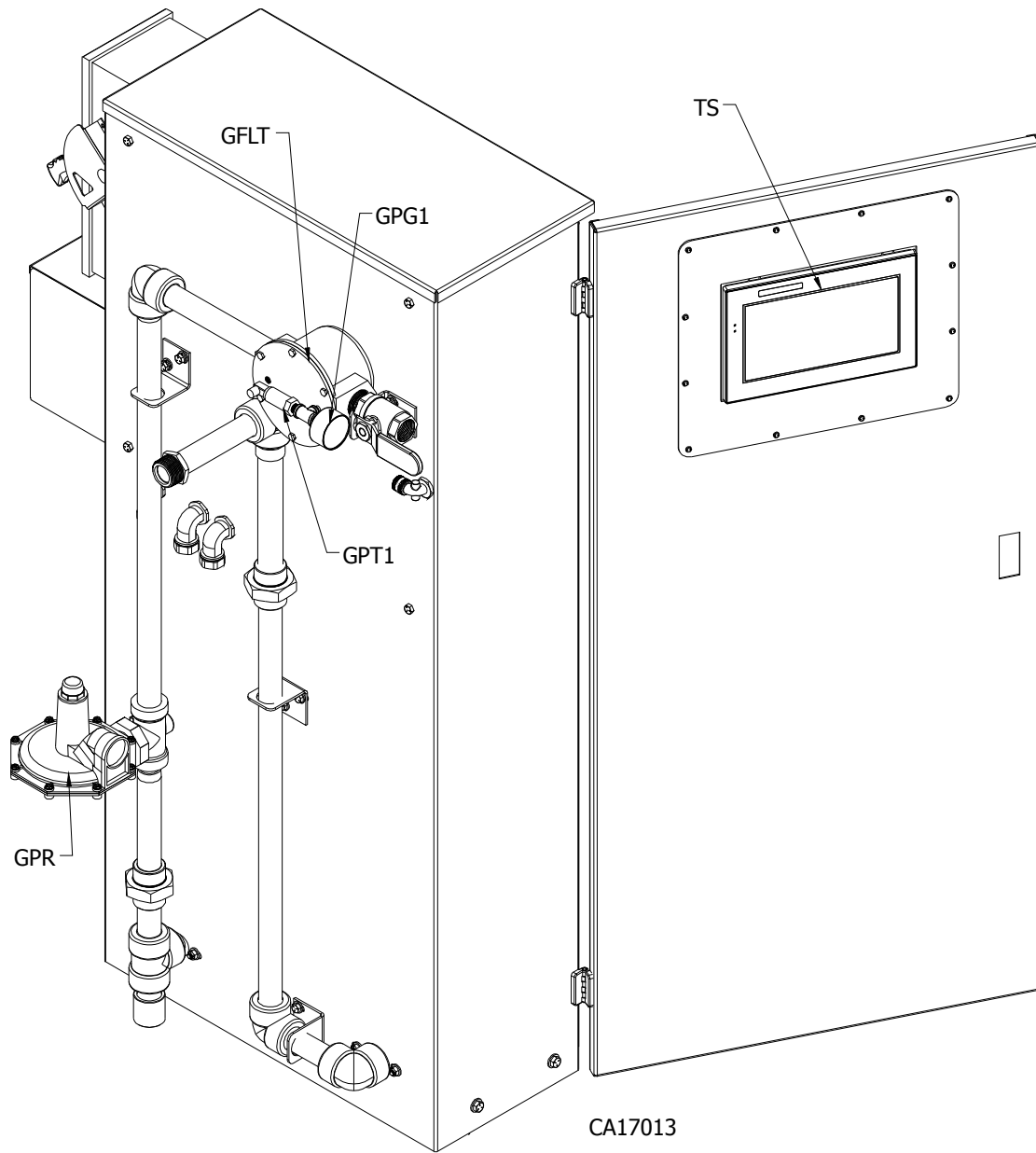
Whether or not a vaporizer is used, make sure that a regulator reduces the pressure to 15 psi (1 bar) BEFORE the pipe goes underground. Otherwise, reliquefaction will take place in the cool earth and cause MUCH trouble. If the gas line in the building feels extremely cold during operation, liquid is in the line and the situation should be corrected immediately.

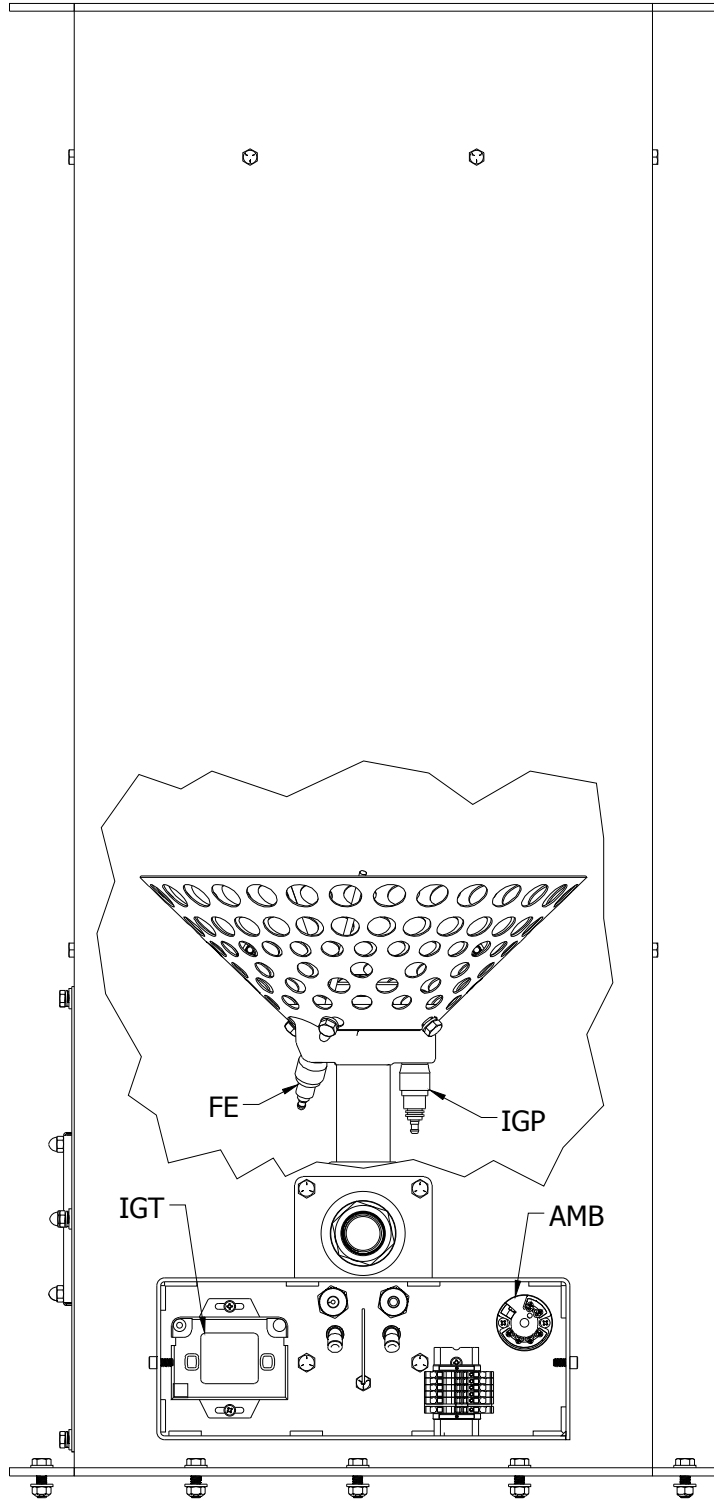
14--3566

# HEATER COMPONENTS



CA17013





CA17013

## HEATER COMPONENT LIST

<u>SYMBOL</u>	<u>PART NAME, NUMBER, MFR'S TYPE</u>	<u>LOCATION</u>
AFT	AIR FLOW TRANSDUCER 24595, 0-2"	UPPER CABINET
CB	CIRCUIT BREAKER 22175, DOUBLE POLE 5A	UPPER CABINET
CT	CONTROL VOLTAGE TRANSFORMER 16480A, 500 VA, E500TF	BOX BELOW DISCONNECT
FAN	BLOWER AND MOTOR 20897A, 7H166, 3 HP MOTOR	BLOWER
FE	FLAME ELECTRODE 12399A, CA390	BURNER
FLR	FLAME RELAY 26540, LFS1	UPPER CABINET
GFLT	GAS FILTER 24679, 6 BAR 1"	OUTSIDE CABINET
GPG1	GAS PRESSURE GAUGE, (0-60 PSI) 25666, BCM DIAPHRAGM	OUTSIDE CABINET
GPG2	GAS PRESSURE GAUGE, (0-10 PSI) 25665, BCM DIAPHRAGM	LOWER CABINET
GPG3	GAS PRESSURE GAUGE, (0-5 PSI) 19188, BCM DIAPHRAGM	LOWER CABINET
GPR	GAS PRESSURE REGULATOR 21347, 143-80-2HP	OUTSIDE CABINET
GPT1	GAS PRESSURE TRANSDUCER 25176, 0-50 PSI	OUTSIDE CABINET
GPT2	GAS PRESSURE TRANSDUCER 25177, 0-10 PSI	LOWER CABINET
GVM	GAS VALVE MOTOR WITH VALVE 21330A, 46050-3 DMA30B120 (MOTOR) 21608, D237614 DMK710/6 (VALVE)	LOWER CABINET
IGP	IGNITER PLUG 12398A, CA475	BURNER



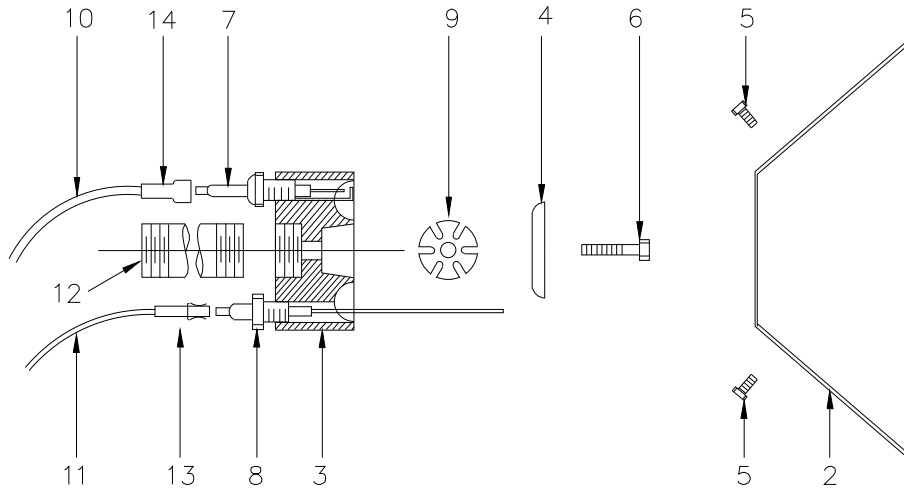
<u>SYMBOL</u>	<u>PART NAME, NUMBER, MFR'S TYPE</u>	<u>LOCATION</u>
IGT	IGNITION TRANSFORMER 21706, 2260-TW	UPPER CABINET OR BURNER
MC	BLOWER MOTOR CONTACTOR 22072, LC1D25 110/120	UPPER CABINET
MOL	BLOWER MOTOR OVERLOAD 22616, LRD10	UPPER CABINET
PLC	PROGRAMMABLE LOGIC CONTROLLER 25678 COMPRISED OF 25686, 25679, 25680, 25681, 25682	UPPER CABINET
POC	PROOF OF CLOSURE SWITCH 21328, D224253 CPI-400	LOWER CABINET
PS	POWER SUPPLY, 120VAC TO 24VDC 21553A, IDEC PS5R-VD24	UPPER CABINET
SSOV	DOUBLE SAFETY SHUT-OFF GAS VALVES 21326, D224843 DMV-D702/602	LOWER CABINET
SW	NETWORK SWITCH 23702F, SE2-SW5U	UPPER CABINET
TCA	THERMOCOUPLE (AIR) 21708, EXPOSED TIP, 4-20mA TRANSMITTER TYPE (BLUE)	DISCHARGE AIR
TS	COLOR TOUCHSCREEN 26288, EA9-T10WCL	UPPER CABINET

# BURNER HEAD ASSEMBLY

## 13480A BURNER HEAD ASSEMBLY

CAT3131C

2-22



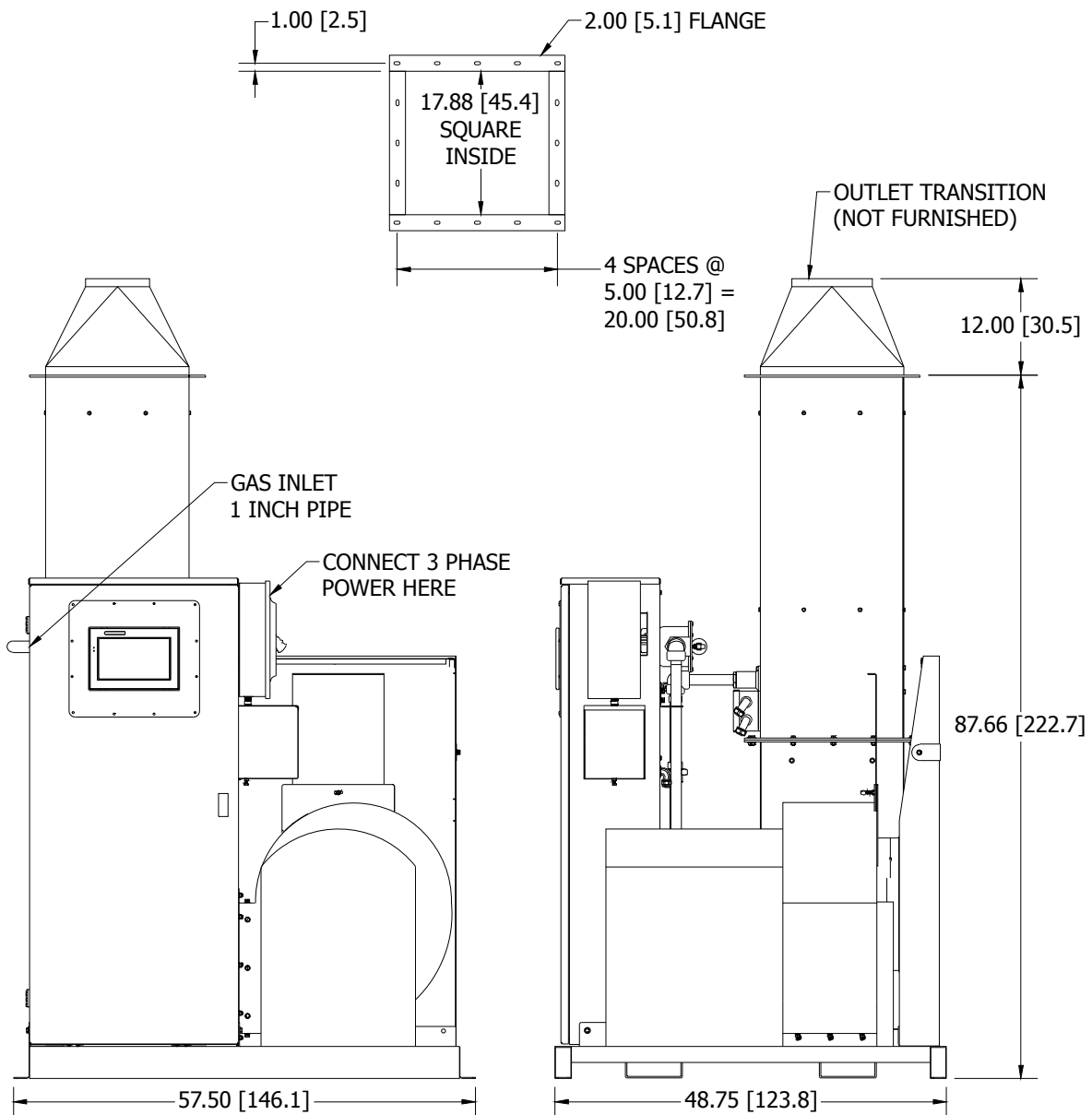
TOP VIEW

REF	QUANTITY	PART NO.	DESCRIPTION
2	1	12975B	GAS BURNER SHELL
3	1	18000	BURNER HEAD BODY
4	1	12985B	CONTOURED DISC
5	4	15724	5/16 X 1/2 HX HD SS CAP SCREW
6	1	15767	3/8 X 1 3/4 HX HD SS CAP SCREW
7	1	12398A	SPARK PLUG, CA475
8	1	12399A	FLAME ELECTRODE, CA390
9	1	18031A, 18032A, 18033A, 18034A, 18035A, 18036A, 18037A, 18038A	BURNER ORIFICE DISC
			PARTS NOT INCLUDED IN 13480A BURNER HEAD:
10	1	13201	SPARK PLUG WIRE, PER FT
11	1	16465	FLAME ELECTRODE WIRE, PER FT
12	1	15189	1 1/4 X 4 BLACK PIPE NIPPLE
13	1	13923	RAJAH TERMINAL
14	1	13925, 14989	SPARK PLUG TERMINAL & BOOT

# DIMENSIONS SHEET

## DIMENSION SHEET FOR HG-1-1701 1 MILLION BTU/HR GAS-FIRED HEATER PUSH THROUGH

CA13504B  
2-22



DIMENSIONS IN INCHES [CENTIMETERS]

# WARRANTY

## LIMITED WARRANTY

### SAMUEL JACKSON, INCORPORATED

For Commercial and Industrial Customers of Samuel Jackson Moisture Control Products

**SAMUEL JACKSON, INCORPORATED** ("Sam Jackson") warrants to its customers who purchase Sam Jackson products that its equipment is free from defects in material and workmanship under normal use and service for 12 months from the date of shipment from its Lubbock, Texas factory.

THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT SUBJECTED TO MISUSE, NEGLIGENCE, OR ACCIDENT. NOR DOES THIS WARRANTY APPLY UNLESS THE PRODUCT COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND LOCAL CODES REQUIRE, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS.

Equipment, which is defective in material or workmanship and within the warranty period, will be repaired or replaced, at Sam Jackson's option, in order to facilitate proper operation.

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL SAM JACKSON BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE.

Sam Jackson neither assumes nor authorizes any person to assume for Sam Jackson any other liability or obligation in connection with the sale of this equipment. Sam Jackson's liability and Customer's exclusive remedy being limited to repair or replacement as set forth above.

**SAMUEL JACKSON, INCORPORATED**  
3900 Upland Avenue Lubbock, Texas 79407

## **IMPORTANT!**

**The following notice affects your warranty.**

### **Electrical Controls and Your Safety**

Your new Sam Jackson product may be equipped with electrical controls or designed to interact with controls on a related Sam Jackson product.

In the event that local, state, federal or other specified safety compliance is required, we will consider modifications to meet the particular requirements. Implementation of alternative safety devices may incur additional charges. No warranty of compliance with a particular standard is made in the absence of specific reference to it in our quotation.

If you modify, or permit others to modify, these controls without specific written permission from Sam Jackson, Inc. the warranty on your product will be void and there is a possibility of serious damage to machinery, damage to product, serious injury to personnel, or death. The modifier of the controls assumes all liability for these consequences.

Samuel Jackson, Incorporated  
3900 Upland Avenue  
Lubbock, Texas 79407  
806-795-5218