Heat Injector Overview

Understanding the Interlocks

- High Temperature Safety - There is a high temperature limit installed in the Heat Injector Module which will be tripped if the Heat Injector Module is started without airflow. The High Temp Limit has a manual reset. It should be set at about 20°F above the set-point temperature.

- High Temp Limit on the Discharge. The high temperature limit on the discharge will act as a safeguard against over driving the gas modulation to the Burner or operational control malfunctions. It should be set at about 20 degrees F above the set-point temperature. The High Temp Limit has a manual reset.

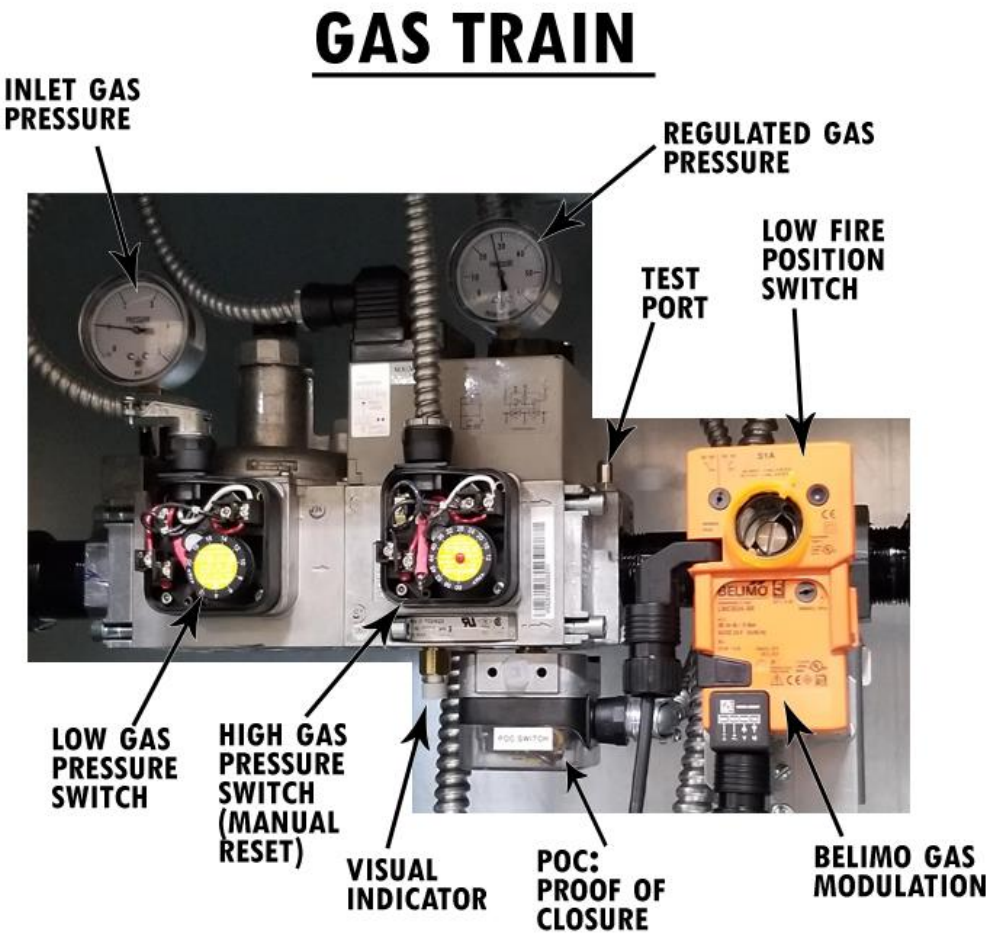
- Call for Heat – The Heat Injector will be started on low fire when the external control system wants heat. This is accomplished with a closed set of contacts on the external system (the control wires have a 24vac signal). With the contacts closed the Heat Injector will start under low fire.

- Proof of Closure (POC) Switch – The proof of closure switch is hanging on the underside of the valve body. There is a button that is pushed down when the switch is closed confirming there is not gas leaking into the injection chamber. When the valve opens the switch opens because it no longer pushes down. The MPA flame management system looks for this change in state. When the POC switch is closed, closed when the power is off and valves are closed, the light is red and when open it is green.

- Flame ON – Once the Heat Injector senses flame, it will produce a closed set of contacts that should be used to start the gas modulation. CAUTION: If the gas modulation is not started/reset when the "Flame ON" signal, a full open signal could be given to the Heat Injector (it won't hurt the Heat Injector Module but it could damage equipment downstream).

- Main Airflow (Run Signal) – The Heat Injector must be interlocked to the main airflow. This is normally sensed by a pressure switch built into the Heat Injector Module but if the upstream static is not significant or it the airflow will be adjusted over a wide range the static pressures will not be significant so a "Run" signal should be provided by the external control system. This confirmation should be built into the "Call for Heat" (external system confirms airflow before giving the "Call for Heat").

- Flame Alarm – There are terminal connections for the alarm signal (120 vac) that is produced by the Flame Management System. An alarm signal will be sent if the Burner doesn't start on the 1st attempt or if the flame signal is not detected during normal operation. This alarm illuminates a red light on the control panel. A momentary pushbutton is also supplied to reset this alarm without opening the control panel.



Flame Management System – Error Zones

During the sequence of operations there are 4 zone that would produce an error on the Flame Management System.

Zone 1 – Any errors that can occur after the "call for heat" signal is received. This zone is also known as the safety chain interlocks. (Error Displayed: **A2, F13, D1**)

Zone 2 – The errors that can occur in this zone will be issues with the combustion confirmation interlocks. This primarily will be something with the pressure switches on the combustion blower. (Error Displayed: **A6**)

Zone 3 – After the previous zone are cleared, the flame management system will confirm that the valves are closed by physically monitoring the valve body with a POC (proof of closure) switch. (Error Displayed: **Fb6**)

Zone 4 – If the process make it to this zone, all of the safeties have been confirmed. (Error Displayed: **A7**)

The system will be running in normal operation mode, If the burner loses any of the interlocks or the flame is extinguished an Error or **A8**, or **A9** will appear.

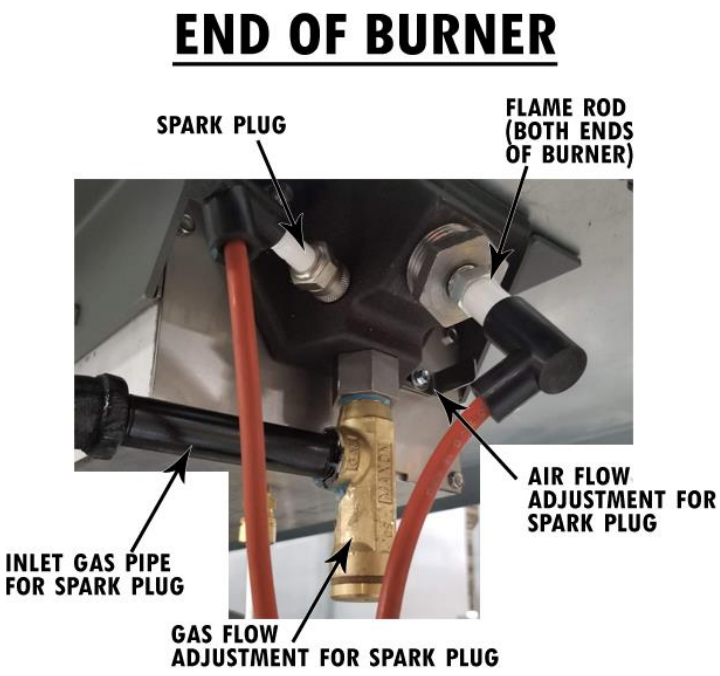
Sequence of Operation

1. The Heat Injector is started with a “call for heat” from the Unit Controller which is fed into the Flame Management System to start the ignition process.

2. The pre-ignition interlocks (safety chain) are checked which includes the following..
   - The High Temp Safety must not be tripped.
   - The High Temp on the Discharge must not be tripped.
   - There must be confirmation of airflow as sensed in the Injection Chamber
   - The Low Gas Pressure Switch confirms that the gas pressure is not too low.
   - The High Gas Pressure Switch confirms the gas pressure in not too high

3. The Flame Management ensures the inputs for combustion are met.
   - The POC on main gas valve is checked to ensure it is closed.
   – The Combustion Blower is started and air pressure is confirmed

4. The Main gas valves open and the ignition applies spark to burner if the gas modulation is set to the low fire position.



5. After the burner lights and a flame is detected by the flame rod, the Flame Management produces the Flame On signal which allows the modulation valve to receive the gas modulation signal.

6. During normal burner operation all pre-ignition interlocks are constantly monitored, if they are not proven, the Flame Management Systems will simply waits until they are made - EXCEPT the high gas pressure switch. If this trips, it must be manually reset.

7. The Flame Management System will go into Alarm mode and shut the Heat Injector down if flame is not detected during the 10 second trial for ignition, if combustion air pressure is not sufficient during operation or if the flame signal is lost during operation. Note: The Flame Management System must be manually reset by pressing a button on the control panel or with a remote signal to serve the same purpose.

8. When the “call for heat” signal (closed set of contacts) is removed, the Heat Injector shuts down by closing the main gas valves, moving the modulation valve back to low fire and removing power from the combustion blower.