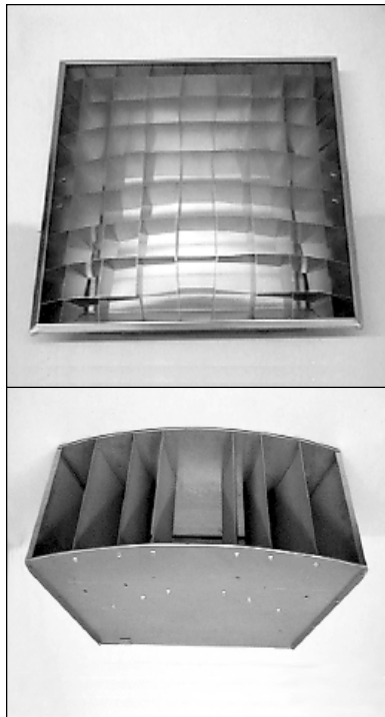


**HotZONE GAS-X3/5 C/L Series**

# **GAS RADIANT HEATERS**

*Installation, Operation  
& Maintenance Manual*



**RADIANT OPTICS, INC.**

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## The Radiant Optics, Inc. Warranty

Radiant Optics, Inc. warrants to the original purchaser new goods or parts to be free from defects in material and workmanship for the following periods of time from the time of delivery: ceramic emitter, ten years; gas control system, one year; electric elements, one year when used with a timer switch or 2000 hours of continual use; all other heater components, three years.

This warranty of material and workmanship specifically excludes ordinary and routine servicing and maintenance associated with the goods sold.

### What is Not Covered by the Warranty

The warranty does not cover: 1) installations not made in accordance with installation instructions; 2) where the operation of the product varies substantially from our operation instructions; 3) malfunctions resulting from misuse, negligence, alteration and accident; 4) loss of time, inconveniences, loss of use of the products, other consequential damages.

The above constitutes our sole warranty. THERE IS NOT WARRANTY OF MERCHANTABILITY AND THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THE FACE HEREOF.



## IMPORTANT INSTRUCTIONS

Improper installation, adjustment, alteration, service or maintenance can cause injury and/or property damage. Read the installation, operation and maintenance instructions thoroughly before installing or servicing this equipment.

**FOR YOUR SAFETY** If you smell gas:

1. Shut off gas to the appliance.
2. Extinguish any open flame.
3. If odor continues, immediately call your gas supplier.

Certain materials or items, when stored under the heater, will be subjected to radiant heat and could be seriously damaged including moveable vehicles and freight.

Installation and repair should be done by a qualified service person. The heater should be inspected before each use and at least annually by a qualified service person. More frequent cleaning may be required as necessary. It is imperative that the control compartment, burners and circulating air passageways of the heater be kept clean.

This manual should be left with the consumer and kept for future reference.

**Prior to installing your Radiant Optics InfraRed Heater, the following should be reviewed and adhered to. Compliance with the following will yield satisfactory heater operation and minimize equipment installation costs.**

1. The installation must conform with ANSI Standard No.Z223.1-1988 entitled "National Fuel Gas Code" and any applicable local codes.
2. Each heater must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No.70-1987. Supply 24VAC of correct amperage with a Class II transformer.
3. The heater requires a minimum inlet gas pressure of 7" W.C.
4. Maximum inlet pressure to heater - one half (1/2) psig. The gas inlet supply and normal operating manifold pressure for each heater are those in the chart. For gas supply line pressures in excess of 1/2 psig, consult with your local representative or the factory.
5. Do not locate either the gas or electrical supply line directly over the flue outlet. Keep fire sprinkler heads away from the flue path.
6. Refer to Mounting Detail for correct installation position of the heater. Installation of the heater in a manner other than that illustrated will void its warranty and may pose life, health and safety issues.
7. The heater must be installed in a location such that it is readily accessible for servicing and adequate clearance around the air openings into the combustion chamber for combustion and ventilation air supply must be given.

**WARNING:** Risk of fire relating to use with or near combustible materials. Not suitable for residential or household use.



## INSTALLATION

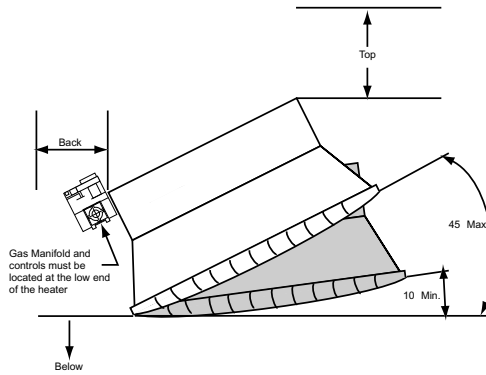
Prior to installing your HotZone™ heater, the following should be reviewed and adhered to. Compliance with the following will yield satisfactory heater operation and minimize equipment costs.

1. Heaters to be installed in aircraft hangars must be installed in accordance with American National Standards for aircraft hangars, ANSI/NFPA No. 409-1979.
2. Heaters to be installed in public garages must be installed in accordance with NFPA No. 88A-1979 Standard for Garage.
3. The installation must conform with ANSI Standard No. Z223.1-1984 entitled "National Fuel Gas Code" and any applicable local codes.
4. Each heater must be grounded in accordance with the National Electrical Code, ANSI NFPA No. 70-1984 when an external electrical source is utilized.
5. Install a ground joint union with brass seat and a manual shut-off valve adjacent to the unit for emergency shut-off and easy servicing of controls, including a 1/8" NPT plugged tapping immediately upstream of the gas supply connection to the heater, accessible for test gauge connection. (Figure 4)
6. Install a sediment trap in the gas supply line before each unit is required to minimize the possibility of loose scale or dirt within the gas supply line entering the heater gas control system. (Figure 4)
7. An approved flexible connector should be used (local codes permitting) as a convenient method of connecting the heaters to the gas supply and to avoid placing stress on the gas supply line or the infrared heater.

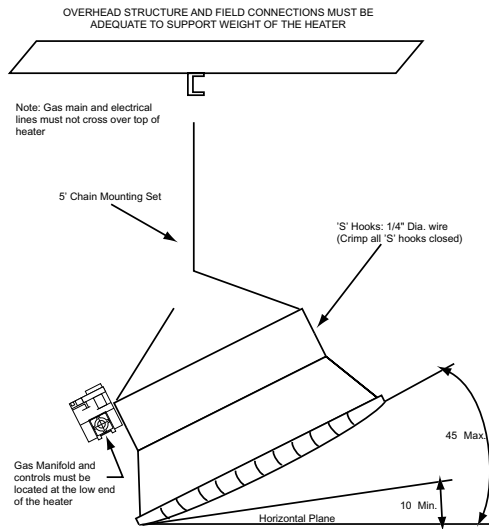
	<b>Natural Gas</b>	<b>Propane Gas</b>
<b>Maximum gas inlet pressure</b>	½ psig (14" W.C.)	½ psig (14" W.C.)
<b>Minimum gas inlet pressure</b>	7" W.C.	11" W.C.
<b>Normal manifold gas pressure</b>	6" W.C.	10" W.C.



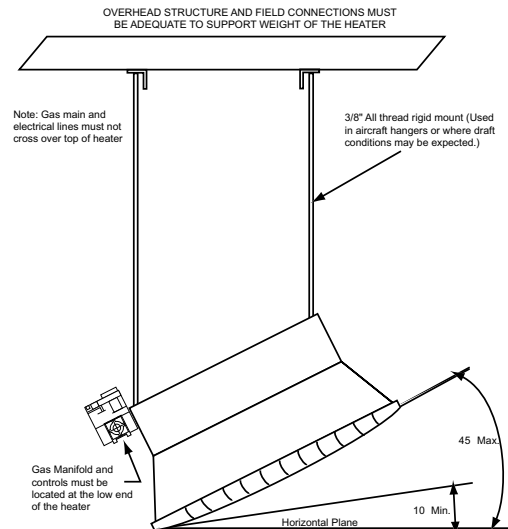
**Figure 1.1 -  
Combustible Material  
Clearances**



**Figure 1.2 -  
Typical Chain Mounting  
Configuration**



**Figure 1.3 -  
Typical Rigid Mounting  
Configuration**



8. When pressure/leak testing pressures above 14" W.C. (1/2 psi), close the field installed shut-off valve, disconnect the appliance, and its combination gas control from the gas supply line, and plug the supply line before testing. When testing pressures 14" W.C. (1/2 psi) or below, close the manual shut-off valve on the appliance before testing.
9. The gas inlet supply and normal operating manifold pressure for each heater listed in the table below. For gas supply line pressures in excess of 1/2 psig, consult with your local representative or the factory.
10. Do not locate either the gas or electrical supply line directly over the flue outlet on the heater. Electrical supply line shorting and/or control overheating may occur.
11. The heater should not be installed at more than a 45° angle from vertical. The valve and manifold must be placed on the bottom of the heater. (Figure 1.1) Installation of the heater in any other manner will void its warranty.
12. The heater must be installed in a location such that it is readily accessible for servicing and no restriction of air flow to the inlet of the heater's venturi tube(s) can occur.

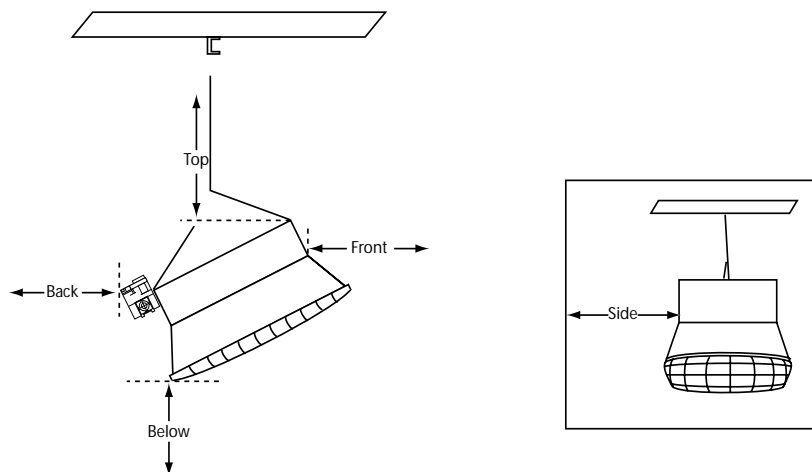
## MOUNTING THE HEATER

1. Mount the heater according to the following installation instructions and assure that the MINIMUM DISTANCE TO COMBUSTIBLES is maintained (see Minimum Clearances to Combustibles chart below).
2. Mount aisle pattern heaters with the heater manifold parallel with the targeted aisle. Installed aisle reflective lenses have reflectors aligned with the aisle.
3. Mount heater according to the installation directives above and assure that the MINIMUM DISTANCE TO COMBUSTIBLES are maintained. Adjust mounting to obtain a 10 to 45 degree mounting angle for the heater with the manifold on the low side.

Heater	Input – MBTU	Minimum Distance to Combustibles				
		Side	Front	Back	Top	Below
<b>GAS</b> X3C	25-35	32"	32"	32"	32"	80"
X3L	25-35	51"	16"	16"	32"	80"
X3C	50-70	39"	39"	39"	38"	106"
X3L	50-70	66"	19"	19"	144"	106"
X3C	75-105	47"	47"	47"	51"	140"
X3L	75-105	81"	21"	21"	51"	140"
X3L	112-140	93"	23"	23"	57"	153"
X5C	25-35	45"	45"	45"	32"	111"
X5C	50-70	55"	55"	55"	38"	106"



**Figure 2 - Distance to Combustibles**



4. Hang the heater from a 100 lb. chain set with S-hooks, or with rigid mounting, from the heaters' four mounting brackets. (See Figures 1.2 & 1.3)
5. Gas heaters are to be installed so as to avoid temperature rises greater than 90 degrees F on surfaces around the heater. (See Minimum Distances to Combustibles, page 6) Surfaces close to the combustibles distances may suffer cosmetic heat damage due to changes in color, texture or shape. The plastic lining of some insulation, for example, often yellows and splits when mounted close to the allowed distance above the heater. As a starting point consider doubling the clearances for such surfaces and testing the distance with a sample, or closely monitoring the first several hours of operation. Alternatively, consider using an auxillary Heat Shield. (See #7 below)
6. When the heater is installed close to the ceiling corner of a room the top, below, side and front/back distances are those that do not overheat the surfaces in those directions. The radiant heat patterns from these heaters have sharp cutoff angles and can be "tucked into a corner" where wall distances next to the heater that are less than the minimum distances allowed. The special rules for constructing the safe three-dimensional space around a heater using the minimum distance to combustibles allows for installation of the unit very close to a wall if the mounting angle is such that the radiant heat "misses" the walls. (Contact factory rep for assistance)
7. Sometimes the desired mounting height places the heater at an unsafe distance to the ceiling. The distance to combustibles can be reduced by 50% with use of a heat shield.

## REDUCING COMBUSTIBLE CLEARANCES USING HEAT SHIELDS

Reducing the distance to combustibles is possible by placing a non-combustible surface between the heater and the surface to be protected. This instruction sheet describes how to reduce ceiling clearances by half their original values.

In general, a piece of metal is suspended 6" from the combustible surface and the heater is hung below the sheet. This forces the heat to circle around the shield, thus increasing the actual distance to the ceiling.

The shield is sized differently for each heater so that the combustible distance around the edge of the shield is maintained. The shield consists of two sheets of corrugated metal which are overlapped and attached to two stiffeners. Attachment hardware is included. The sheets are field assembled. See sizes below.

Reducing Combustible Clearances with Heat Shield					
MBTU	Size	Lbs	Original Distance	Distance to Shield	Total Distance
33	4'x4'	13	30"	9"	15"
66	5'x4'	16	36"	12"	18"
99	6'x4'	19	48"	18"	24"
132	8'x4'	25	54"	21"	27"

### SHIELD ASSEMBLY AND INSTALLATION

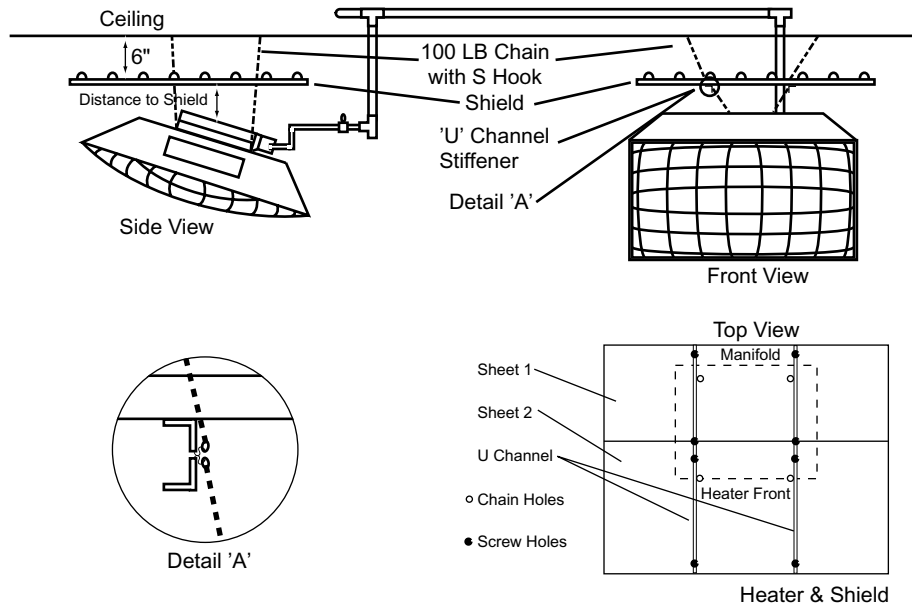
Overlap the two sheets so that the two central screw holes are lined up. Be sure the chain holes are positioned as in figure 3.

Place the U channels under the sheets with the flanges faced outwards and the holes lined up with the sheets (Figure 3). Fasten the sheets to the U channels with the tek screws provided.

Installation consists of hanging the shield horizontally with chain and hook assembly (not supplied) 6" below the ceiling. The chain is routed to the underside of the sheets to a U-channel stiffener. The heater is then attached with an S-hook to this chain. See "top" view for correct placement of heater in relation to shield. The distance below the shield is given in the chart above.



**Figure 3 - Heat Shield Installation**



## ELECTRICAL

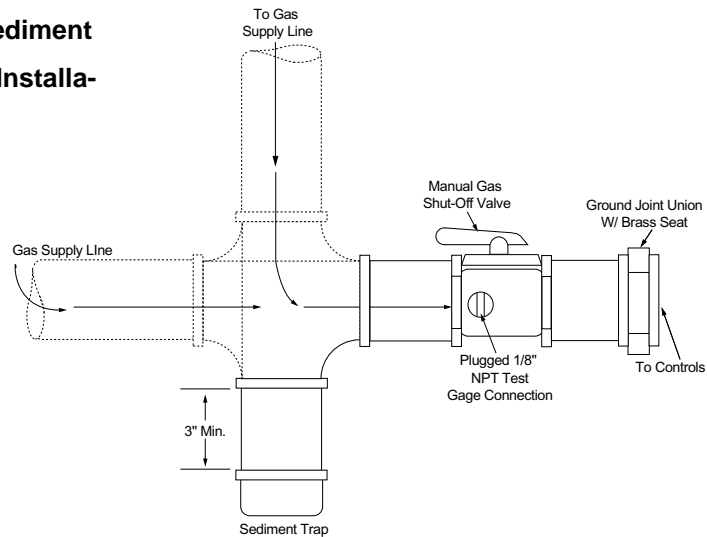
1. Provide only the voltage potential (120V, 24V) to the heater as stamped on the components of the heater's control system.
2. For heaters equipped with a 24V control system, a step-down transformer approved as having a VA rating in excess of the total connected electrical load must be utilized.
3. Control wire used to electrically connect one or more heaters together must have both adequate ampacity and insulation temperature ratings for the connected load. (.75 Amp per 24V Heater, .1 Amp per 120V Heater)

## GAS PIPING

1. All gas pipe connections to the heater(s) must be sealed with a gas pipe compound resistant to liquefied petroleum gases.

2. Installation of a drip leg in the gas supply line going to each heater is required to minimize the possibility of any loose scale or dirt within the gas supply line from entering the heater's control system. (Figure 4)
3. When checking for gas leaks, do not use an open flame. Use a soap and water solution.
4. For gas supply line pressures in excess of 1/2 psig, consult the factory or your local representative for recommendations.
5. Installation of a 1/8" N.P.T. Plugged tap is required upstream of each heater to allow test gauge connection.
6. The appliance and its individual shut off valve must be disconnected from the Gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig.

**Figure 4 - Recommended Sediment Trap/Manual Shut-Off Valve Installation**



## VENTILATION

High intensity gas-fired infrared heaters require sufficient fresh air to provide adequate combustion and removal of products of combustion, as the units are not vented to the outside of the building. Positive air displacement of 4 cfm per 1000 Btu/hr for natural gas and 5 cfm per 1000 Btu/hr for propane gas is required. The fresh air supply must be located in the immediate proximity of the unit(s). Buildings with large open areas and high infiltration rates can often meet these requirements without mechanical ventilation. Tightly constructed, well-insulated buildings require mechanically powered systems. This may be accomplished by the use of exhaust fans and fresh air intake openings. Exhaust fans alone are not sufficient. Inlet air openings are required.

Mechanical exhaust fans are typically located at high points of the building. For flat roof areas, a series of small exhausters should be distributed over the roof areas and interlocked with various heating zones.



Fresh air intake openings are typically located high on the building sidewalls at a comparable level to the heaters. One square inch of net free inlet area per 2000 Btu/hr is required. Multiple inlets, well distributed, should be used and should direct air upward to prevent drafts at floor level. Inlets are typically limited to 1 to 2 square feet in size.

It is recommended that the local authorities be contacted to assure the ventilating system and heater installation is in compliance with any applicable local and/or state codes.

## LENS ATTACHMENT

There are two different models of heater with the lens attachment. Determine which of the following processes applies to your type of heater.

A: With the heater suspended, mount the reflective lens by following these steps:

1. Match the proper reflective lens to the heater by matching the model number on the heater to the model number on the lens.
2. Hang lens mounting bracket (A) on upper heater flange (A) (Figure 5).
3. Loosen hardware and slide lens mounting bracket (B) back so it will clear the lower heater flange (B).
4. Lift the lens to the heater face and slide lens mounting bracket (B) over heater flange (B).
5. Center the lens in front of the heater then tighten the hardware to the adjustable lens mounting bracket.
6. Ignition module must be mounted on the manifold.

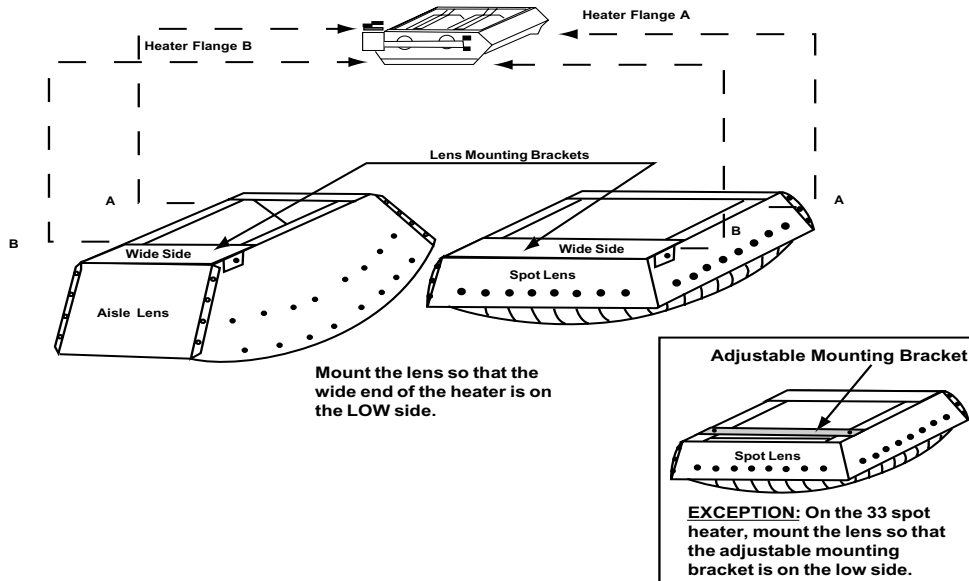
B: With the heater suspended, mount the reflective lens by following these steps:

1. Note the lip on either side of the burner and on either side of the lens.
2. Remove screws on upper side. Lower side screws should stay in.
3. The lens should slide onto the burner until they hit the lower side screws. (if you are installing an aisle heater, you'll need to remove one of the brackets on the long side of the heater in order to slide the lens on. Then re-attach the bracket.)
4. Tighten the screws to secure the lens.

### **WARNING**

The lens will deform if dropped or handled by the interior of the lens

**Figure 5 - Mounting an Aisle Heater or a Spot Heater**



## WIRING INSTRUCTIONS AND CONTROL SEQUENCES

### Direct Spark Ignition Gas Control

This control is an electric ignition system, which directly sparks to ignite the main burner. There is no pilot-light present. It may use either 24-Volt or 120-Volt current. The control is "100% shut-off." If positive ignition does not take within the prescribed time, all gas is shut off (Figure 6).

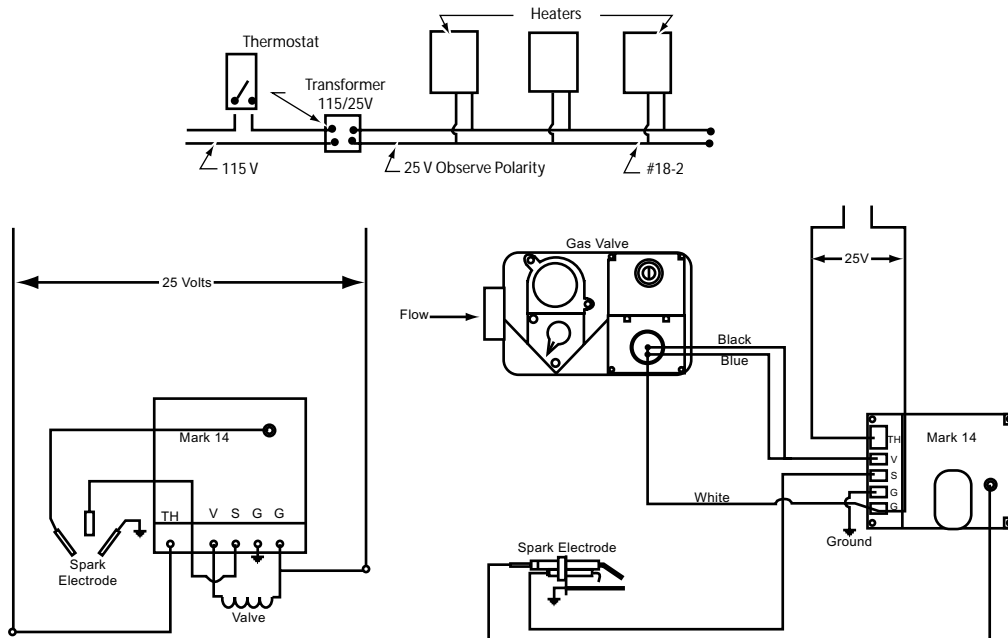
This control utilizes a single-stage combination gas control, an ignition control, and a single-stage thermostat.

1. The thermostat calls for heat.
2. The main gas valve opens and the spark igniter sparks in an attempt to light the gas at the ceramic burner.
3. Once the burner is lit, the flame sensor proves ignition and stops the spark igniter from sparking. If ignition is not proven (the burner does not light) within 15 seconds, the system will lockout, de-energizing the gas valve and ignition control system. If the system locks out, it may be reset by an interruption of the power source. The system will then attempt to light the burner, if a call for heat from the thermostat remains.
4. The unit continues to operate until the thermostat is satisfied, at which time the main gas valve closes 100% and the unit shuts off.



## Standing Pilot Control System

**Figure 6 - Control Description - Direct Spark Ignition Gas**



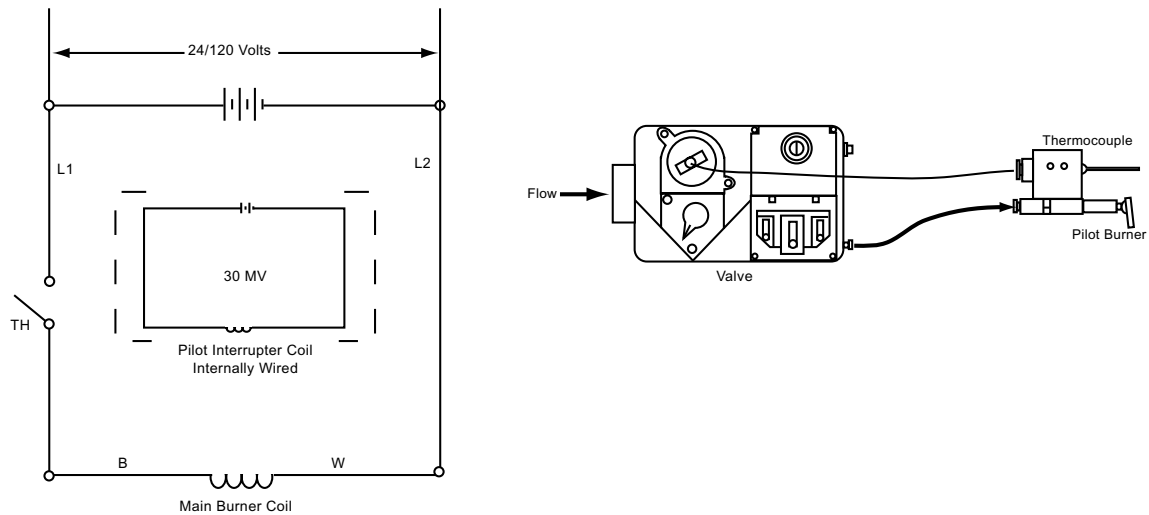
### Sequence of Operation

1. When energized, both gas and spark will be present for ignition.
2. This try will last for 15 seconds.
3. If ignition is not proved through the flame sensor within the 15 second trial, the system will shut down thereby de-energizing the main gas valve and spark ignition transformer.
4. The heater may be reset by an interruption of the power source.

**NCH or PCH** - This control system is manually lighted with standing pilot and 100% shut-off. With the pilot light lit and the black "A" cock on the valve body turned to "on," the main burners are ignited by the pilot light as the normally closed solenoid valve is energized.

In the event of pilot outage, the thermocouple cools and pilot and main burner gas is shut off. To continue normal operation, the pilot light must be manually lighted. Follow lighting instructions on heater to manually light the pilot (Figure 7).

**Figure 7 - Control Description - Standing Ignition**



**Millivolt, Self-Energizing with Standing Pilot and 100% Safety Shut-Off Gas Controls**

This control utilizes a single-stage combination gas control and a single-stage millivolt thermostat.

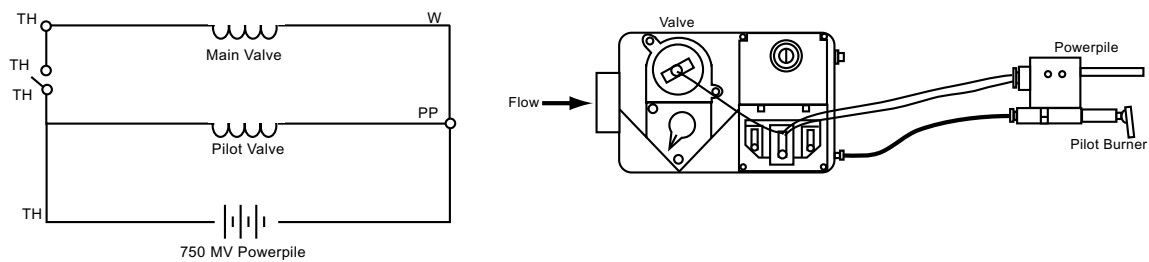
This system is a manually lighted standing pilot, 100% shut-off, millivolt operated requiring no external power source. It operates with its own millivolt thermostat which should not exceed a 35' remote location from the valve. Locations further than 35' will require a change in wire size. See thermostat instruction sheet.

As the pilot light strikes the 750 millivolt powerpile, the system provides enough voltage to open or close the main burner gas solenoid valve as called for by the thermostat. In the event of pilot light outage, the pilot must be manually lighted before operation will resume. With the loss of pilot, the powerpile will cool eliminating the positive signal to the valve and thus shut off pilot and main burner gas for 100% shut-off. Follow lighting instructions on heater to manually light the pilot (Figure 8).

1. The pilot is manually lighted with the gas valve control knob depressed in the PILOT position and held (approximately 1 minute) until the millivolt generator is heated sufficiently to keep the pilot valve open. The control knob is then turned to the ON position.
2. Upon a call for heat, the millivolt thermostat contacts close, completing the circuit to the gas valve. The gas valve will open and the ceramic burner is lit from the standing pilot.

3. Once the millivolt thermostat is satisfied, the main gas valve closes 100% and the unit shuts off, with the pilot valve remaining open with a standing pilot.
4. If the pilot goes out, the millivolt generator will cool and interrupt the circuit to the pilot valve. Both the pilot and main gas valves are closed 100%. The unit remains inactive until step 1 is repeated.

**Figure 8 - Control Description - Millivolt Self Energizing**



## CONVERTING THE HEATER FROM NATURAL TO L.P. GAS

This regulated Natural Gas to regulated L.P. Gas conversion kit allows the 36C and 36E Series gas valves to be used on L.P. gas applications. This conversion kit is for use on all single stage, fast and slow open models only.

1. Remove regulator cover screw.
2. Remove regulator adjustment screw (beneath the cover screw).
3. Remove Natural Gas regulator spring from regulator sleeve.
4. Insert the L.P. regulator spring (provided in the conversion kit) into the regulator sleeve.
5. Replace the regulator adjustment screw. Then adjust the outlet pressure to the appliance manufacturer's specified outlet pressure. (6" W.C. Natural Gas, 10" W.C. LP Gas)
6. Replace the regulator cover screw.
7. Attach the WARNING label (provided in the kit) to the gas valve where it can be readily seen. Also attach the small round L.P. label to the top of the regulator cover screw.
8. If present pilot burner is to be used, the pilot orifice must be replaced.

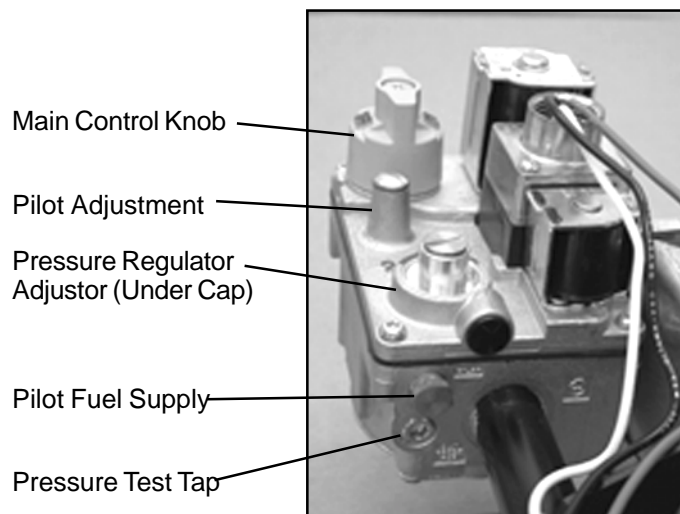
Conversion back to Natural Gas use may be made at a later date by retaining the Natural Gas spring (removed in step 3, above) and following the same procedures (except for burner pressure given in step 5).

## SETUP & ADJUSTMENT

### Adjusting the manifold pressure:

1. The correct manifold pressure is 6.0" W.C. for natural gas (10.0" W.C. LP Gas). Adjust the main gas pressure regulator spring to achieve the proper manifold pressure (Figure 9).
2. Move the field installed manual shut-off valve to the "OFF" position.
3. Remove the 1/8" pipe plug in the gas valve adjacent to the manifold and attach a water manometer of "U" tube type that is capable of 12" W.C.
4. Move the field installed manual shut-off valve to the "ON" position.
5. Create a call for heat from the thermostat.
6. After adjustment, move the field installed manual shut-off valve to the "OFF" position and replace the 1/8" pipe plug.
7. After the plug is in place, move the field installed manual shut-off valve to the "ON" position and recheck pipe plugs for gas leaks with a soap solution.

**Figure 9 - Adjusting the Manifold Pressure**



## HEATER OPERATION

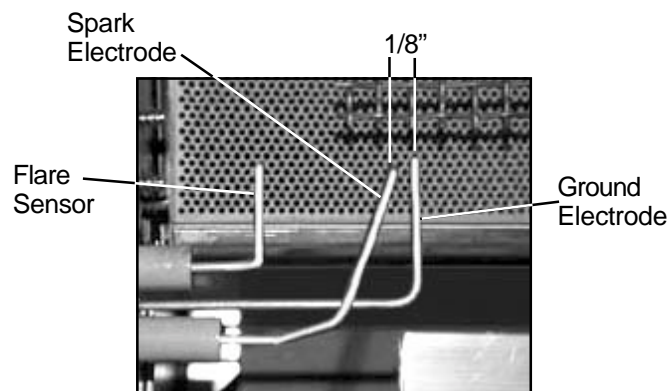
Upon installation of the heater and completion of the gas and electrical supply line to each heater, follow the steps outlined on the "Lighting Instruction" plate located on the heater's reflector near its control system to put the heater in operation.

## MAINTENANCE

To obtain the maximum performance from your heater each year, we recommend the following be performed.

1. With an air hose regulated to 30 psi, blow off any dust and dirt that has accumulated on the heater and lens.
2. From the front of the heater, direct the air hose from a distance of approximately twenty (20) inches over the entire exposed area of each burner's ceramic.
3. Do NOT insert the air hose into the inlet of each venturi tube.
4. Remove each main burner orifice, clean and reinstall each orifice back into the heater's manifold.
5. Remove the heater's pilot burner assembly. With an air hose, blow the assembly clean and replace it in the same position as it was originally located when the heater was received from the factory.
6. If additional service to the heater is required, contact the factory or your local representative.

**Figure 10 - Ground Electrode and Spark Electrode Gap**



**NOTE:**

Protective eyeglasses must be worn when any service or maintenance work is done to the heater.

## TROUBLESHOOTING

### *Direct Spark Control System*

#### **System is energized but sparks is not present**

1. Be sure to check the operating characteristics for the proper electronics system on your unit. Make sure unit is getting power. (12VA required per unit at 24 Volt).
2. Check for adequate power to the ignition control and that all wires are connected securely. Make sure that the electrode is not grounded against the screen or grounding out against another metal object.
3. Check gap between ground electrode and spark electrode. Regap by spreading the ground electrode only. Holding it firmly with one set of pliers while slightly spreading the gap with the other. (Figure 10)
4. Replace electronics box.

#### **Electrode sparks but burner doesn't ignite**

1. At the moment when the electronics control allows the main burner gas to flow, there should be a single click sound which is the main burner gas solenoid opening. If such a click is heard, there should be a gas smell at the burner before it closes on 100% shut-off. If gas valve doesn't open, jumper 24V source to black/blue wires. If it opens, replace electronics box; if not replace valve.
2. Check gas pressure to the valve. It should be 7" W.C. inlet or 1/4 PSI Minimum for Natural gas, 11" inlet for L.P. gas while the heater is operating. Small gas piping can reduce volume which affects operating pressure. Check manifold pressure tap on the valve or at an orifice on multi-burner units. Operating pressure at the manifold pressure tap should be 6.0" W.C. on Natural gas and 10.0" W.C. on LP Gas. If manifold pressure is below the proper settings and inlet pressure is correct, then gas pipe is undersized. Check with installer.
3. Regap electrode or replace.



### **Millivolt Control System**

#### **Pilot will not light:**

1. Be sure gas valve on the piping ahead of the heater in "on," also that "A" cock on gas valve is in pilot position and is depressed allowing gas to flow to the pilot.
2. Bleed air out of gas line to heater.
3. Be sure unit is for correct gas - L.P. or Natural.

#### **Pilot is on but goes off when "A" cock is turned to on:**

1. Too much air in gas line. Bleed line to heater.
2. Thermostat wires on valve are not correct or powerpile wires are not correct.
3. Gas line is too small to support volume required by heater.
4. Re-align powerpile so that the pilot flame is striking it in the center and being split in half by the powerpile.
5. Is the unit rated for the proper gas being used - L.P. or Natural?
6. Adjust pilot flame at pilot light screw.
7. Replace powerpile; replace valve.

#### **Main Burners will not come on:**

1. Air wash the pilot light area only, to remove any dust or lint build-up.
2. Place a jumper wire across the two thermostat (TH and TH-PG) terminals on the valve; if the unit functions, the thermostat could need to be replaced. Re-align the pilot flame for better impingement against powerpile.

#### **Main burners open then close - open/close "motorboating":**

1. Mounting angle should be 10° to 35°. Horizontal mounting or past 35° will cause pilot flame to draw away from proper impingement against powerpile. Adjust heater angle.



2. Check gas pressure to the valve. It should be 7" W.C. minimum for Natural gas, 11" W.C. inlet for L.P. gas while the heater is operating. Small gas piping can reduce volume which affects operating pressure. Check manifold pressure at the pressure tap on the valve or at an orifice on multi-burner units. Operating pressure should be 6.0" W.C. on Natural gas and 10.0" W.C. on propane. If manifold pressure is below the proper settings and inlet pressure is correct than gas pipe is undersized. Check with installer.
3. Air wash pilot cartridge area and adjust powerpile so that flame is split in two as it strikes the powerpile.
4. Replace pilot burner and orifice and/or powerpile.

**Burner(s) farthest from pilot do not ignite:**

1. Check for adequate pressure and adequate gas pipe sizing to unit.
2. Mounting angle past 35° should be lowered more toward 10° from floor. Manifold should be parallel to the floor.
3. Check brass orifices for obstruction. Check venturi on burner housing for obstruction.
4. If flame is burning at orifice into venturi, replace burner immediately.

**Standing Control System**

**Pilot Will Not Light:**

1. Be sure gas valve on the piping ahead of the heater is "on," also that "A" cock on gas valve is in pilot position and is depressed allowing gas to flow to the pilot.
2. Bleed air out of gas line to heater.
3. Be sure unit is for correct gas - L.P. or Natural.

**Pilot in ON; "A" Cock on Valve is "On" But Main Burners Will Not Ignite:**

1. Thermostat wires on valve are not correct. Make sure valve has proper voltage and amperage.
2. Air wash the pilot light area (only) to remove any dust or lint build-up.
3. Gas line is too small to support volume required by heater.
4. Re-align thermocouple so that the pilot flame is striking it in the center and being split in half by the thermocouple.
5. Is the unit rated for the proper gas being used - L.P. Natural?
6. Adjust pilot flame at pilot light screw.
7. Replace thermocouple, replace valve.



### **Main Burners Open Then Close - Open/Close “Motorboating”:**

1. Mounting angle should be 10° to 35°. Horizontal mounting or past 35° will cause pilot flame to draw away from proper impingement against thermocouple. Adjust heater angle.
2. Check gas pressure to the valve. It should be 7” W.C. or minimum for Natural gas, 11” W.C. inlet for L.P. gas. Small gas piping can reduce volume which affects operating pressure. check manifold pressure at the pressure tap on the valve or at an orifice on multi-burner units. Operating pressure should be 6.0” W.C. on Natural Gas and 10.0” W.C. on propane. If manifold pressure is below the proper settings and inlet pressure is correct, then gas pipe is undersized. Check with installer.
3. Air wash pilot cartridge area and adjust thermocouple so that flame is split in two as it strikes the thermocouple.
4. Replace pilot burner and orifice and/or the thermocouple.

### **Burner(s) Farthest From Pilot Do Not Ignite:**

1. Check for adequate pressure and adequate gas pipe sizing to unit.
2. Mounting angle past 35° should be lowered more toward 10° from floor. Manifold should be parallel to the floor.
3. Check brass orifices for obstruction. Check venturi on burner housing for obstruction.
4. If flame is burning at orifice into venturi, replace burner immediately.

### **System ignites but then goes off**

1. Flame sense rod is not detecting flame. Check connections.
2. Gas pressure may be inadequate. Check pressure and gas line size.
3. Replace ignition detection control.
4. If the unit is burning back at the orifice and inside the burner rather than on the tile surface, replace the burner at once. A back flash is generally caused by over or under-pressurizing or a broken tile surface. Check for the proper condition. The electrode and ignition detection control box may vary. Identify the specific parts and sequence of operation before troubleshooting.

### **Main burners open then close**

1. Mounting angle should be 10° to 45°. Adjust heater angle.
2. Check gas pressure to the valve. It should be 7” W.C. or 1/4 PSI Minimum (as measured upstream of gas valve). Small gas piping can reduce volume which affects operating pressure. Check manifold pressure at the pressure tap on the valve or at an orifice on multi-burner unit. Manifold operating pressure should be 6.0” W.C. on natural gas (10.0” W.C. LP

Gas). If manifold pressure is below the proper settings and inlet pressure is correct, then gas pipe is undersized. Check with installer.

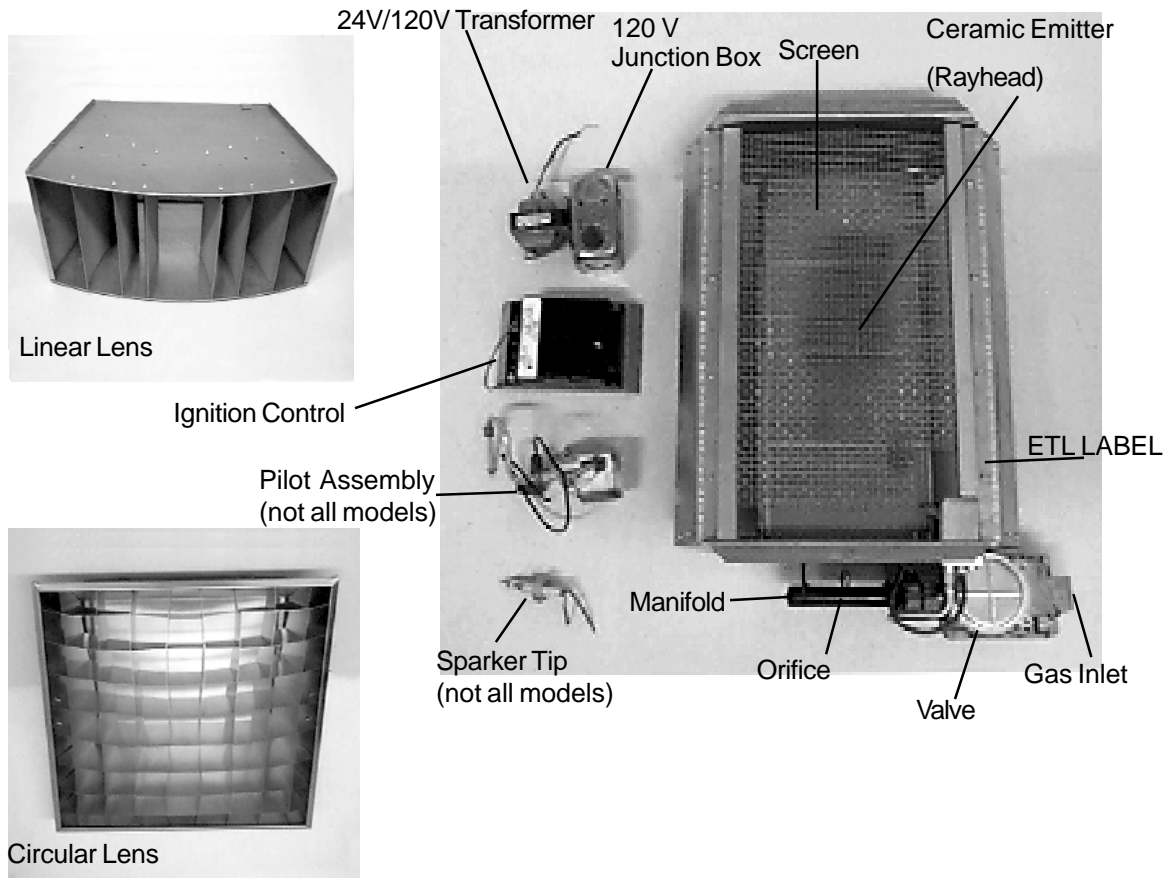
**Some burners do not ignite**

1. Check for adequate pressure and adequate gas piping sizing to unit.
2. Check for proper mounting angle and orientation. Manifold should be parallel to the floor on end of heater closest to the floor. Brass orifices for main burner are directed upwards toward the roof in a proper installation.
3. Check brass orifices for obstruction. Check venturi on burner housing for obstruction.



## PARTS DETAIL

All replacement parts must be obtained from the manufacturer at RADIANT OPTICS, INC. 14522 NE N Woodinville Way #107 Woodinville, WA 98072 Phone (425) 806-3990 Fax (425) 806-3991. No parts other than those specified below should be used on this heater. Please specify heater model and serial number when ordering.



# GAS HEATER MODEL & CONTROLS

## Heater with 3X Lenses

GAS-X3C-Pxx-025 GAS-X3L-Pxx-025 GAS-X3L-Pxx-025-S
GAS-X3C-[P,N]xx-028 GAS-X3L-[P,N]xx-028 GAS-X3L-[P,N]xx-028-S
GAS-X3C-[P,N]xx-030 GAS-X3L-[P,N]xx-030 GAS-X3L-[P,N]xx-030-S
GAS-X3C-Pxx-033 GAS-X3L-Pxx-033 GAS-X3L-Pxx-033-S

GAS-X3C-Pxx-050 GAS-X3L-Pxx-050 GAS-X3C-[P,N]xx-056 GAS-X3L-[P,N]xx-056
GAS-X3C-[P,N]xx-060 GAS-X3L-[P,N]xx-060 GAS-X3C-Nxx-066 GAS-X3L-Nxx-066

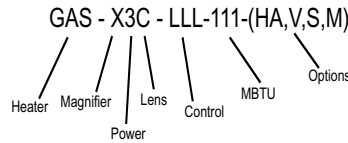
GAS-X3C-Pxx-075 GAS-X3L-Pxx-075 GAS-X3C-[P,N]xx-084 GAS-X3L-[P,N]xx-084
GAS-X3C-[P,N]xx-090 GAS-X3L-[P,N]xx-090 GAS-X3C-Nxx-099 GAS-X3L-Nxx-099

GAS-X3L-Pxx-112 GAS-X3L-[P,N]xx-120 GAS-X3L-Nxx-132
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## Heater with 5X Lenses

GAS-X5C-Pxx-025 GAS-X5L-Pxx-025
GAS-X5C-[P,N]xx-028 GAS-X5L-[P,N]xx-028
GAS-X5C-[P,N]xx-030 GAS-X5L-[P,N]xx-030
GAS-X5C-Nxx-033 GAS-X5L-Nxx-033

GAS-X5C-Pxx-050  GAS-X5C-[P,N]xx-056  GAS-X5C-[P,N]xx-060  GAS-X5C-Nxx-066
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### Gas Controls

P= Propane/LP Gas @ 10" Manifold, 15" Max, 11" Min Pressure.

PCH Manual Ignition, Constant Pilot, 100% Shut Off	24vac, 9Watts
PMH Man Ignition, Constant Pilot, Energizing, 100% Shut Off	MV, Tstat+35' #18-2
PSP Cycling Spark Reignited Pilot, 100% Shut Off	24v, 18.7Watts
PDS Direct Spark Ignition, 100% Shut Off	24v, 18.7Watts

N= Natural Gas @ 6" Manifold, 15" Max, 7" Min Pressure.

NCH Manual Ignition, Constant Pilot, 100% Shut Off	24vac, 9Watts
NMH Man Ignition, Constant Pilot, Self Energizing, 100% Shut Off	MV, Tstat+35' #18-2
NSC Cycling Spark Reignited Pilot, 100% Off without Power	24v, 18.7Watts
NSP Cycling Spark Reignited Pilot, 100% Shut Off	24v, 18.7Watts
NDS Direct Spark Ignition, 100% Shut Off	24v, 18.7Watts

### Gas Options

- A HighAltitude for installations over 2000' (all sizes w/purchase).
- V Volts 120 stepdown transformer w/Mounting Plate.

### Electrical

