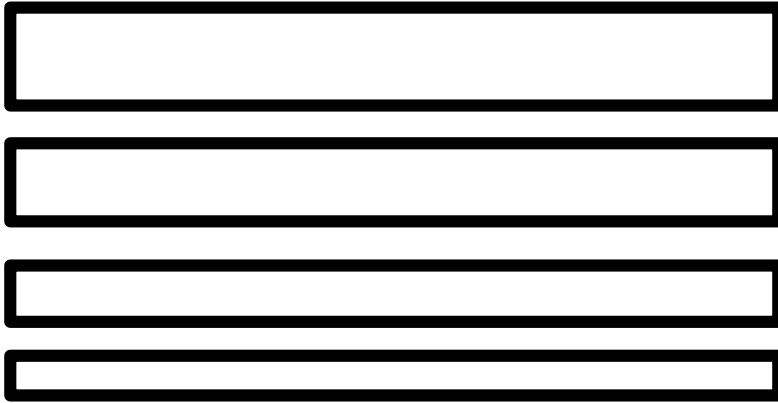


# Synergy<sup>®</sup>



## High Intensity Infrared Heaters

Installation, Service, and Maintenance  
Manual

### ⚠ WARNING ⚠

*Improper installation, adjustment, alteration, service or maintenance can cause death, injury or property damage and could cause exposure to substances which have been determined by various state agencies to cause cancer, birth defects or other reproductive harm. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.*

### FOR YOUR SAFETY

**IF YOU SMELL GAS:**

1. Open Windows.
2. Do not touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.



THIS MANUAL IS THE PROPERTY OF THE OWNER.  
PLEASE BE SURE TO LEAVE IT WITH THE OWNER WHEN YOU LEAVE THE JOB.

Synergy<sup>®</sup>

# IMPORTANT

The use of this manual is specifically intended for a qualified installation and service agency. A qualified installation and service agency must perform all installation and service of these units.

## INSTALLER

Please take time to read and understand these instructions prior to any installation. Contact your representative or the factory if you have any questions.

## OWNER

Retain this manual in a safe place to provide your serviceman with information if the situation arises.

### HAZARD INTENSITY LEVELS

1. **DANGER:** Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
2. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
3. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

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## ⚠ WARNING ⚠

### FIRE OR EXPLOSION HAZARD

Can cause death, severe injury or property damage.

1. Read this manual carefully before installing or servicing this equipment. Improper installation, service, or maintenance can cause death, injury or property damage.
2. Check clearances given on each burner to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. All service must be performed only by a trained service technician or representative
5. After installation is complete, check product operation as provided in these instructions.

**Combustibles:** Failure to maintain the specified minimum clearances to combustibles could result in a serious fire hazard. Do not locate flammable or combustible materials within this distance. Signs should be posted in storage areas to specify maximum stacking height to maintain required clearances to combustibles. Do not locate in hazardous atmospheres containing flammable vapors or combustible dust.

**United States:** Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z83.6 and NFPA-409 and 88 Codes.

**Canada:** Installation in public garages is permitted when in accordance with CAN/CGA 13.149.1 or .2. Installation in airplane hangars is permitted when in accordance with the requirements of the enforcing agency.

**Vehicles:** Minimum clearances must be maintained from vehicles parked, below the heater. Ensure that adequate clearance is maintained where vehicles are in operation or being serviced.

**Gas Connection:** Proper gas connections must be made. Under certain conditions such as aircraft hangers and loading docks, windy conditions may exist. Movement of this appliance with respect to the gas line can occur. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with page 6 of these instructions.

**Ignition:** This appliance may not be equipped with a pilot. This appliance may be equipped with an ignition device, which automatically lights the burner. Do not try to light the burner by hand.

**Mechanical Hazard - Suspension:** Use appropriate suspension hardware, beam clamps (rod or perforated strap) and turnbuckles at predetermined locations. The weight and normal movement of the heating system may cause support failure if the following minimum suspension requirements are not met: Chain size must be 1/0 minimum (200 lb. working load) or equivalent. **DO NOT** suspend heaters from gas piping, electrical conduit, etc. Failure of the suspension system and associated supports can cause death, severe injury or property damage.

## IMPORTANT

Failure to follow these instructions can cause personal injury or property damage:

Caution should be used when running the system near combustible materials such as wood, paper, rubber, etc. Consideration should be given to partitions, storage racks, hoists, building construction, etc. Page 4 outlines required minimum clearances to combustibles.

Some compounds in the air can be drawn into the equipment and can cause an accelerated rate of corrosion of some parts of the heat exchanger. The use of such chemical compounds in or near the enclosure should be avoided where a longer life of the burner and associated components is desirable.

## ⚠ WARNING ⚠

Failure to follow these instructions can cause damage to the system components:

**DO NOT** high-pressure test the gas piping with the burners connected. Failure to follow this procedure will exceed the pressure rating of burner gas controls and this will **require complete replacement of these parts.**

This heater is designed for heating nonresidential indoor spaces. These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc., must be thoroughly understood before proceeding with the installation.

# INTRODUCTION

## CHECKING SHIPMENT

Upon receipt of shipment, check shipment against Bill of Lading for shortages. Also check for external damage to cartons. Shortages and/or external damage to cartons must be noted on the Bill of Lading in the presence of delivery trucker. The delivery trucker should acknowledge any shortages or damage by initialing this "noted" Bill of Lading.

Claims for damaged material, or shortages that were not evident upon receipt of shipment must be reported to carrier and Combustion Research Corporation Sales Representatives within 72 hours.

Before starting to assemble the heater, make sure that all optional and accessory items are accounted for and are available for assembly. It is also important to verify that the correct gas burner is supplied for the gas service, i.e., natural gas burner for natural gas supply.

## IMPORTANT

These instructions, the layout drawing, local codes and ordinances, and applicable standards as apply to gas piping and electrical wiring must be thoroughly understood before proceeding with the installation.

## TESTED UNDER STANDARDS

**AMERICAN STANDARDS** - ANSI Z83.6 (current standard)  
**CANADIAN STANDARDS** - CAN 1-2.16-M81

## BUILDING CODES

## IMPORTANT

Installation must comply with local building codes. In the absence of local codes, installation must comply with the, ANSI Z223.1 (current standard) "National Fuel Gas Code", or in Canada CAN/CGA-B149 codes.

1. Aircraft Hangers - See ANSI/NFPA No. 409 - current standard, or enforcing authority for Canada.
2. Parking Structures - See ANSI/NFPA No. 88A-current standard. For Canada CAN/CGA-B149.1-M91.
3. Repair Garages - See ANSI/NFPA No. 88B-current standard. For Canada CAN/CGA-B149.1-M91.

## AIRCRAFT HANGERS

Heaters for use in aircraft hangers must be installed in accordance with ANSI/NFPA 409 (current standard) for the U.S. and the Enforcing Authority in Canada, with consideration for the following U.S. ANSI/NFPA 409 requirements:

1. Suspended heaters in aircraft storage or service areas shall be installed at least ten feet (10') above the upper surface of wings or engine enclosures of the highest aircraft which may be housed in the hanger. This

should be measured from the bottom of the heater to the wing or engine enclosure; whichever is highest from the floor.

2. In other sections of aircraft hangers, such as shops or offices communicating with airplane storage or servicing area, heaters shall be installed in accordance with their listings and mounted not less than eight feet (8') above the floor.
3. Heaters installed in aircraft hangers shall be located so as not to be subject to damage by aircraft, cranes, and moveable scaffolding or other objects. Heaters shall be placed so they will be readily accessible for maintenance purposes.

## PUBLIC GARAGES

Heaters for use in public garages must be installed in accordance with ANSI/NFPA 88A (current standard) for parking structures and ANSI/NFPA 88B (current standard) for repair garages. In Canada see CAN/CGA B149.1-M91. Special consideration for the following should be given:

1. Heaters shall be installed in accordance with their listings and not be mounted less than eight feet (8') above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
2. When installed over hoists, clearance to combustible material must be maintained from upper most point of the hoist, or provided as insulating or reflective barrier on the hoist (consult representative or factory for guidance).

## ELECTRICAL GROUNDING

The burner unit must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA 70 (current standard) and Canadian Electrical Codes CSA C22.2 No. M1988 and CAN/CSA C22.2 No. 0-1991. Also refer to the **ELECTRICAL WIRING SPECIFICATIONS** in the start up section of this manual.

## GAS INPUT LINES

The method of pipe sizing must conform to the U.S. National Standards: ANSI Z223.1 (current standard) "National Fuel Gas Code" or CAN 1-B149.1- M91 Installation Code, and should be installed in accordance with all National and Local Codes and ordinances.

## IMPORTANT

Purging of air from gas lines should be preformed as described in ANSI Z223.1 - latest edition "National Fuel Gas Code", or in Canada CAN/CGA-B149 codes.

## HAZARDOUS LOCATIONS

Where there is the possibility of exposure to combustible airborne materials or vapor, consult the local Fire Marshal, the fire insurance carrier, or other authorities for approval of the proposed installation. **Synergy<sup>®</sup> heating systems DO NOT qualify for use in explosion proof installations.**

## INSTALLER QUALIFICATIONS

Only firms or individuals qualified to perform work in accordance with the applicable specifications should be engaged to install an Synergy<sup>®</sup> system. Consult local Building Inspectors, Fire Marshals, or your local Combustion Research Corporation representative for guidance.

## INSTALLER RESPONSIBILITY

Synergy<sup>®</sup> systems are installed on the basis of information given in a layout drawing. Together with these instructions and the cited codes and regulations comprise the information needed to complete the installation. The installer must furnish all needed material that is not furnished as standard Synergy<sup>®</sup> equipment, and it is his responsibility to see that such materials, as well as the installation methods he uses result in a job that is workman like and in keeping with all applicable codes.

In storage areas where stacking of materials may occur, the installer must provide signs that specify the maximum stacking height so as to maintain the required clearance to combustibles.

## GENERAL CONSIDERATIONS

Combustion Research Corporation Factory Representatives are experienced in the application of this equipment and can be called on for suggestions about installation which can give the owner of the building a more satisfactory and economical installation.

When installing the Synergy<sup>®</sup> system, take maximum advantage of the building upper structure, beams, Joists, purlins etc. from which to suspend the system. Mount units at minimum height for ease of installation and maintenance but of specified height to fully utilize the building.

The general lay out of the Synergy<sup>®</sup> heating system has been established by the engineering drawing. The Synergy<sup>®</sup> heaters are used to heat building structures as well as localized areas that would include doors, loading docks and isolated workstations throughout the building. The location of the Synergy<sup>®</sup> heaters should be such that the area is covered uniformly, in that the heat is positioned on the perimeter or to each side of the area to be heated, rather than directly overhead. This will give a better comfort condition for workers who would be in these areas. Synergy<sup>®</sup> is a suspended system, which requires that consideration be given to the factors that determine its stability, flexibility, safety, and satisfactory operation. Before installation, the contractor should inspect the building along with the owner (or engineer) responsible for the building to

check on the use of the building. Inspection of the building including the use of floor space for storage and height of materials stored in the building must be noted so that there are no problems with clearances to combustibles. Particular care should be taken over doors and high objects such as busses, trucks, cranes, car lifts, etc. Whenever possible use side wall penetrations for combustion air inlets to burners and exhaust outlet penetrations.

### DO -

- ◆ **Maintain specified clearances to combustibles, and to heat sensitive material, equipment, and workstations.**
- ◆ **Provide approved heat radiation shielding or barriers if needed. Refer to the National Fuel Gas Code for guidance.**
- ◆ **Provide access for general servicing; provide easy access for complete removal of burner.**
- ◆ **Familiarize yourself with local and national codes. Develop a planned installation procedure, which will conserve material and labor on the job. Check to see that all material and equipment is on the job before starting installation.**
- ◆ **Use the gas connector ONLY as shown in the instructions.**

### DON'T -

- ◆ **Finish a job without conducting a proper start up.**
- ◆ **Leave an unfinished job without turning off power and closing gas valves.**
- ◆ **Pressure test the gas line under high pressure without replacing the shutoff cocks with plugs. Failure to do so will result in damage to diaphragms and gaskets of regulators and valves.**
- ◆ **Forget to check bird screens on burner inlets and exhaust discharge.**
- ◆ **Forget to leave this manual with customer and explain how this system works.**

**NOTE:** Controls have maximum ½ PSI rating.

# INSTALLATION - Unit Location

## UNIT LOCATION

### ⚠ WARNING ⚠

1. Units must not be installed where they may be exposed to potentially explosive or flammable atmosphere.
2. In storage areas where stacking of materials may occur, the installer must provide signs that specify the maximum stacking height so as to maintain the required clearance to combustibles.

### ⚠ CAUTION ⚠

Units are designed for indoor installation only.  
DO NOT LOCATE UNITS OUTDOORS.

## Location Recommendations

1. When locating the heater, consider the general space and heating requirements and availability of gas and electrical supply.
2. Be sure the structural support and chain at the unit location is adequate to support the weight of the unit.
3. For proper operation, the unit must be mounted on an angle ten to thirty-five degrees (10° to 35°) from the horizontal with the gas manifold located at the low end of the heater. See Figure 4a.
4. Be sure that the minimum clearances to combustible materials and for servicing are maintained. The minimum clearances to combustibles are shown in Table 4a.
5. Mounting height (measured from the bottom of unit) at which heaters are installed is critical. Please refer to mounting height information in Table 5a.
6. Do not locate units in areas where storage of gasoline or other flammable vapors and liquids in open containers are in the vicinity of this appliance.

## Clearance to Combustibles

Table 4a  
Clearance to Combustibles

Model No.	Minimum Clearances to Combustible Materials Inches (mm)			
	TOP	SIDES	REAR	BOTTOM
0SY.028-034	30 (762)	30 (762)	24 (610)	72 (1829)
0SY.055-067	36 (914)	36 (914)	33 (838)	88 (2235)
0SY.083-100	48 (1219)	42 (1067)	39 (991)	104 (2642)
0SY.110-134	54 (1372)	48 (1219)	45 (1143)	120 (3048)
0SY.160	60 (1524)	54 (1272)	51 (1296)	136 (3455)

**NOTE:** In storage areas where stacking of materials may occur, the installer must provide signs that specify the maximum stacking height so as to maintain the required clearance to combustibles. Refer to figure 4b for Stacking Height clearance guidelines.

Figure 4a  
Clearance to Combustibles

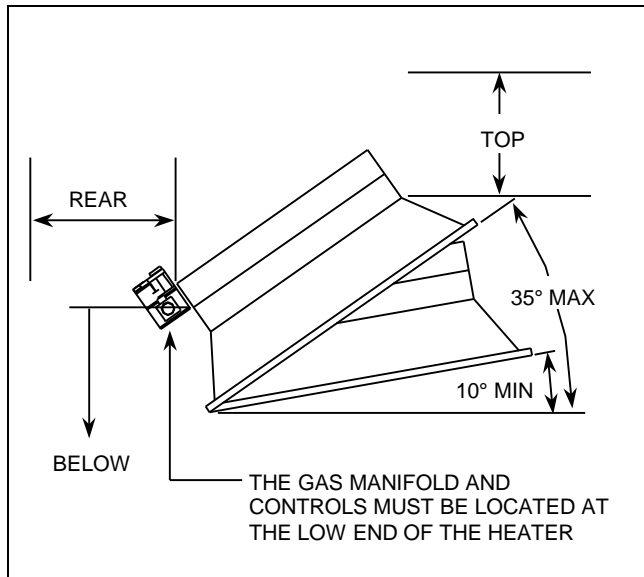
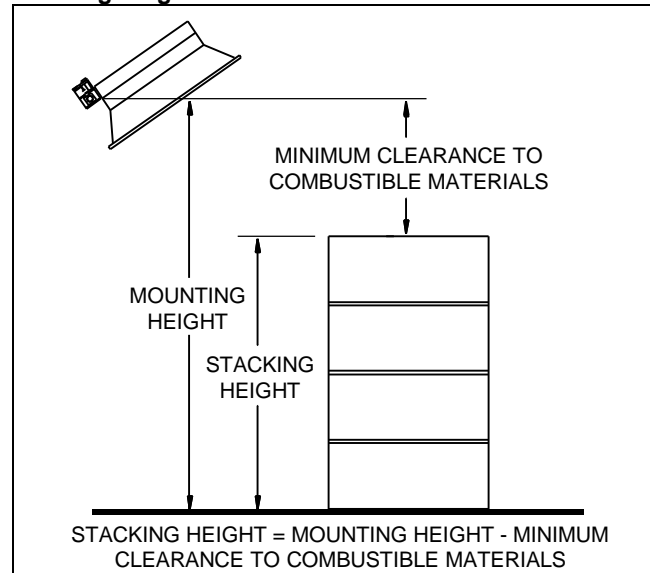


Figure 4b  
Stacking Height



## INSTALLATION

### Mounting

Figures 5a and 5b illustrate typical rigid and chain mounting arrangements, respectively, for a Synergy infrared heater. Check local codes for mounting requirements and use of flexible gas connectors. Local codes may require rigid mounting. Heaters must be mounted at angles from 10° to 35° from horizontal. The gas manifold must be located on the low end of the heater, in a horizontal position (parallel to the floor).

Where permissible, Combustion Research Corporation recommends chain mounting. A 5' chain mounting set is available as an accessory, allowing for 10° to 35° mounting angles. In the absence of this chain set, Combustion Research Corporation recommends Number 1/0 Tenso chain (200 lb. working load). "S" hooks should be a minimum 1/4" in diameter and the ends must be closed after installation. Heaters located in aircraft hangers or near overhead doors must be rigidly mounted to prevent swinging. Under no circumstances should the gas supply line or the electrical supply line to the heater be used to provide any assistance in the suspension of the heater. Do not locate any gas or electric service lines directly above or below the heater.

Insure that:

1. Clearances to combustibles (as shown on the rating plate and in Table 5a) are maintained.
2. In locations used for storage of combustible materials, signs shall be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles. See Figure 4b.
3. Either gas piping or suspension mounting is flexible to prevent fatigue failure from vibration or thermal expansion.
4. Adequate clearances to sprinkler heads are maintained, which are dependent upon the setting of each individual sprinkler head. As a guideline, certified minimum distance to combustible material is based on the combustible material surface not exceeding 90°F above ambient room temperature. Using a typical 70°F room temperature, the allowable combustible surface temperature would be 160°F.

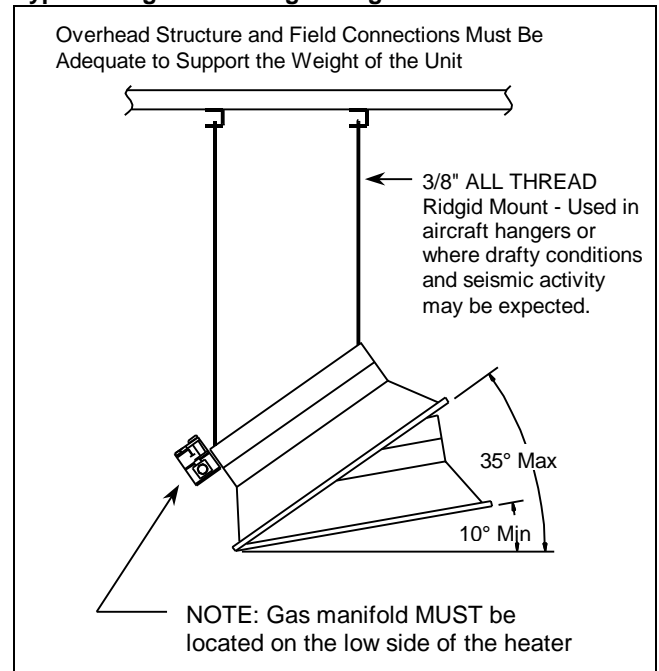
**Table 5a**  
**Typical Mounting Height for Full Building Heating**

Model No.	Typical Mounting Height at Min/Max Mounting Angles (feet)*	
	10°	35°
0SYN.028, 030, 034	8 - 14	7 - 12
0SYN.055, 060, 100	14 - 20	12 - 16
0SYN.084, 090, 132	20 - 26	16 - 24
0SYN.112, 120, 132	26 - 32	20 - 30
0SYN.160	26 - 40	22 - 38

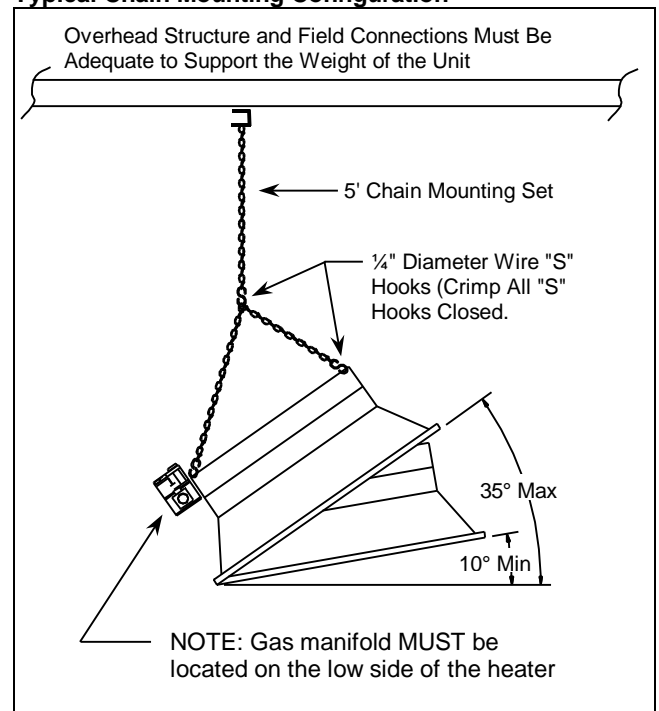
\*Mounting height values are recommendations only and may need to be adjusted to meet requirements of actual installation.

## INSTALLATION - Mounting

**Figure 5a**  
**Typical Ridgid Mounting Configuration**



**Figure 5b**  
**Typical Chain Mounting Configuration**



# INSTALLATION - Gas Connection

## INSTALLATION

### Combustion/Ventilation Air Requirements

High intensity gas-fired infrared heaters require sufficient fresh air to provide adequate combustion air 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/h for natural gas and 5 CFM per 1000 Btu/h for propane gas is required. 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 1000 Btu/h 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.

## Gas Connections

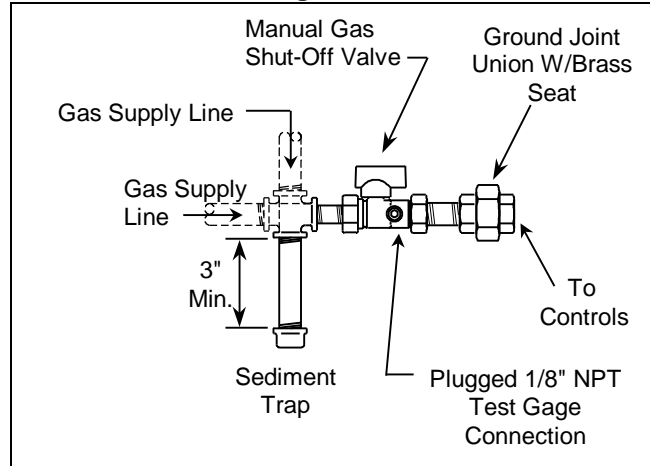
### ⚠ WARNING ⚠

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
2. Gas pressure to unit controls must never exceed 14" W.C. (1/2 PSI).

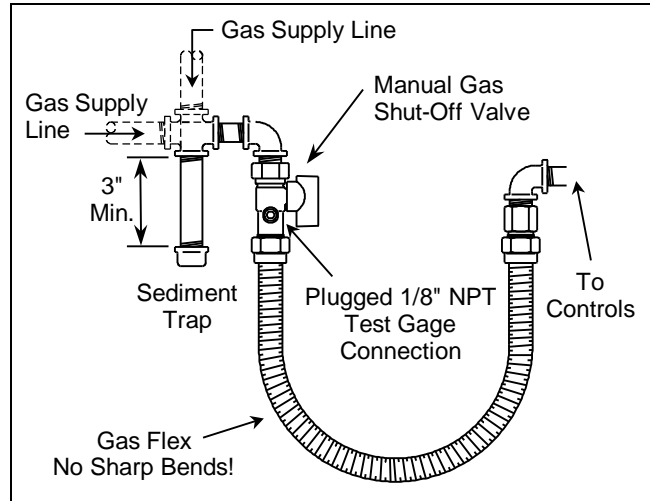
1. Installation of piping must conform with local building codes, or in the absence of local codes, of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - Latest Edition. In Canada, installation must be in accordance with CAN/CGA-B149.1 for natural gas units and CAN/CGA-B149.2 for propane units.
2. Piping to units should conform to local and national requirements for type and volumes of gas handled, and pressure drop allowed in the line. Refer to Table 9a to determine the cubic feet per hour (cfh) for the type of gas and size of unit to be installed. Using this cfh value and the length of pipe necessary, determine the pipe diameter from Table 7a. Where several units are served by the same main, the total capacity, cfh, and length of main must be considered. Avoid pipe sizes smaller than 1/2". Table 7a allows for a 0.3" W.C. pressure drop in the supply main to the unit. The inlet pressure to the unit must be 7-14" W.C. for natural gas and 11-14" W.C. for propane gas. When sizing the inlet gas pipe diameter, make sure that the unit supply pressure can be met after the 0.3" W.C. has been subtracted. If the 0.3" W.C. pressure drop is too high, refer to the Gas Engineer's Handbook for other gas pipe capacities.

3. 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. See Figure 6a.
4. Installation of 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. See Figure 6a.
5. An approved flexible connector may 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. See Figure 6b.
6. 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.

**Figure 6a**  
**Recommended Sediment Trap/Manual Shut-Off Valve Installation - Ridged Connection**



**Figure 6b**  
**Recommended Sediment Trap/Manual Shut-Off Valve Installation - Gas Flex Connection**





**Table 7a  
Gas Pipe Capacities**

Gas Pipe Capacities (Up to 14" W.C. Gas Pressure through Schedule 40 Pipe) Cubic Feet per Hour with Pressure Drop of 0.3" W.C. Natural Gas Specific Gravity - 0.60, Propane Specific Gravity - 1.50												
Length Of Pipe (feet)	Pipe Diameter											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
10	132	83	278	175	520	328	1050	662	1600	1008	3050	1922
20	92	58	190	120	350	221	730	460	1100	693	2100	1323
30	73	46	152	96	285	180	590	372	890	561	1650	1040
40	63	40	130	82	245	154	500	315	760	479	1450	914
50	56	35	115	72	215	135	440	277	670	422	1270	800
60	50	32	105	66	195	123	400	252	610	384	1150	725
40	46	29	96	60	180	113	370	233	560	353	1050	662
80	43	27	90	57	170	107	350	221	530	334	990	624
90	40	25	84	53	160	101	320	202	490	309	930	586
100	38	24	79	50	150	95	305	192	460	290	870	548
125	34	21	72	45	130	82	275	173	410	258	780	491
150	31	20	64	40	120	76	250	158	380	239	710	447

## Electrical Connections

### ⚠ WARNING ⚠

Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage. All units must be wired strictly in accordance with wiring diagram furnished with the unit. Any wiring different from the wiring diagram could result in a hazard to persons and property. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.

1. Installation of wiring must conform with local building codes, or in the absence of local codes, of the National Electric Code ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance to this code. In Canada, wiring must comply with CSA C22.1 Part 1, Electrical Code.
2. Provide only the voltage to the heater as stamped on the heater serial plate. Do not provide external power to a heater equipped with a Millivolt, self-energizing control system (Control Codes N5 or P5).
3. Heaters equipped with 25V controls (Control Codes N2, P2, or N4) require a step-down transformer having a VA rating in excess of the total connected electrical load.
4. The heater is not to be energized until gas is available at the heater. Failure to observe this point may result in failure of control components.
5. Wiring must not be located directly above or below the heater to avoid overheating of the wires. The wires must not touch the sides of the heater.
6. Control wire used to connect the heater to the thermostat must have adequate ampacity and insulation temperature rating for the total connected load.

## START-UP PROCEDURE

### ⚠ CAUTION ⚠

Purging of air from gas lines should be performed as described in ANSI Z223.1 - Latest Edition "National Fuel Gas Code", or in Canada, CAN/CGA-B149 codes.

### IMPORTANT

Start-up and adjustment procedures should be performed by a qualified service agency.

1. Turn off power to the unit at the disconnect switch. Check that fuses or circuit breakers are in place and sized correctly. Turn all hand gas valves to the "OFF" position.
2. Check that the supply voltage matches the unit supply voltage listed on the serial plate. Verify that all wiring is secure and properly protected. Trace circuits to insure the unit has been wired according to the wiring diagram.
3. Verify that there is adequate ventilation for intake of fresh air and exhaust of products of combustion.
4. Perform a visual inspection of the unit to make sure no damage has occurred during installation.
5. Recheck the gas supply pressure. The inlet pressure to the unit must be 7-14" W.C. for natural gas and 11 -14" W.C. for propane gas. The gas supply pressure must never exceed 14" W.C. If the pressure exceeds 14" W.C., a gas pressure regulator must be added upstream of the combination gas valve.
6. Open the field installed manual shut-off valve and turn power on to the unit.
7. Follow the procedure on the heater's Lighting Instruction Label to put the heater into operation. Be certain the gas line is purged of air prior to attempting to operate the unit.
8. For units equipped with a pilot, check the pilot flame length (See Pilot Flame Adjustment section).
9. Check to make sure that the main gas valve opens upon a call for heat from the thermostat.
10. Check to insure that gas controls sequence properly (See Control Operating Sequence, page 8).

# START-UP PROCEDURE

## START-UP PROCEDURE

### Pilot Flame Adjustment (Intermittent Pilot and Millivolt Standing Pilot control systems - Control Codes N3, N4, N5, and P5)

The pilot burner is orificed to burn properly with an inlet pressure of 7-14" W.C. on natural gas and 11-14" W.C. on propane gas, but final adjustment must be made after installation. If the pilot flame is too long or large, it is possible that it may cause soot on the burner assembly. If the pilot flame is shorter than shown, it may cause poor ignition and result in the controls not opening the combination gas control. A dirty pilot orifice may cause a short flame. Pilot flame condition should be observed periodically to assure trouble-free operation.

#### To adjust the pilot flame:

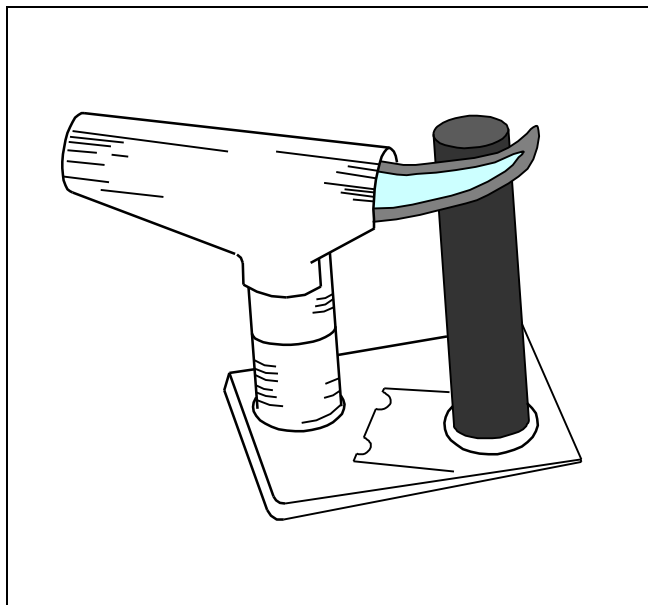
1. Create a call for heat from the thermostat.
2. Remove the cap from the pilot adjustment screw. For location, see the combination gas control literature supplied with unit.
3. Adjust the pilot flame length by turning the screw in or out to achieve a soft steady flame 3/4" to 1" long and encompassing 3/8"-1/2" of the tip of the flame sensing rod or power-pile (See Figure 8a).
4. Replace the cap from the pilot adjustment screw.

#### Main Burner Adjustment

The gas pressure regulator (integral to the combination gas control) is adjusted at the factory for average gas conditions. It is important that gas be supplied to the heater in accordance with the input rating on the serial plate. Actual input should be checked and necessary adjustments made after the heater is installed. Over-firing, a result of too high an input, reduces the life of the appliance and increases maintenance. Under no circumstances should the input exceed that shown on the serial plate.

Measuring the manifold pressure is done at the test port on the main gas valve on the heater (See Figure 8b).

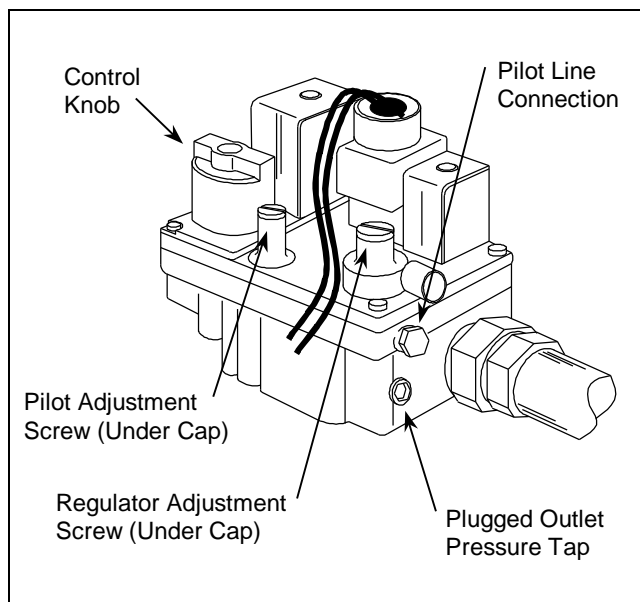
**Figure 8a**  
Correct Pilot Flame (Millivolt powerpile shown)



#### To adjust the manifold pressure:

1. The correct manifold pressure is 6" W.C. for natural gas and 10" W.C. for propane gas. Adjust the main gas pressure regulator spring to achieve the proper manifold pressure (See Figure 8b).
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 at least 12" high.
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 8b**  
Gas Valve



**Table 9a  
Manifold Pressure and Gas Consumption**

	Type of Gas	Natural	Propane	Number of Orifices
	Btu/ft <sup>3</sup>	1040	2500	
	Specific Gravity	0.50	1.53	
<b>Manifold Pressure - In. W.C.</b>		6.0	10.0	
0SY.028	cfh	26.4	-	1
	Orifice Drill Size	#43	-	
0SY.030	cfh	28.8	12.0	1
	Orifice Drill Size	#42	#52	
0SY.034	cfh	32.2	-	1
	Orifice Drill Size	#41	-	
0SY.055	cfh	52.9	-	2
	Orifice Drill Size	#43	-	
0SY.060	cfh	57.7	24.0	2
	Orifice Drill Size	#42	#52	
0SY.067	cfh	64.4	-	2
	Orifice Drill Size	#41	-	
0SY.083	cfh	79.3	-	3
	Orifice Drill Size	#43	-	
0SY.090	cfh	86.5	36.0	3
	Orifice Drill Size	#42	#52	
0SY.100	cfh	96.6	-	3
	Orifice Drill Size	#41	-	
0SY.110	cfh	105.8	-	4
	Orifice Drill Size	#43	-	
0SY.120	cfh	115.4	48.0	4
	Orifice Drill Size	#42	#52	
0SY.134	cfh	128.8	-	4
	Orifice Drill Size	#41	-	
0SY.160	cfh	153.8	64.0	4
	Orifice Drill Size	#38	#49	

## CONTROL SYSTEM OPTIONS

Synergy series infrared heaters are available with a choice of three different gas control options. The available controls and associated control codes is (see Table 10b for description of Control Codes):

- ◆ Direct spark ignition with 100% safety lockout with manual reset:  
Natural Gas - Control Code N1 or N2  
Propane Gas - Control Code P1 or P2
- ◆ Intermittent pilot ignition with non-100% shut-off:  
Natural Gas only - Control Code N3 or N4
- ◆ Millivolt, self-energizing with standing pilot and 100% safety shutoff:  
Natural Gas - Control Code N5  
Propane Gas - Control Code P5

## CONTROL OPERATING SEQUENCE

### Direct Spark Ignition Gas Controls - Control Codes N1, N2, P1, and P2

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.

### Intermittent Pilot Ignition with non-100% shut-off Gas Controls - Control Codes N3 and N4

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

1. The thermostat calls for heat.
2. The pilot gas valve opens and the pilot spark igniter sparks in an attempt to light the pilot.
3. The pilot flame sensor attempts to prove pilot ignition. If the pilot does not light, ignition sparking and pilot gas flow will continue until the pilot flame is established.
4. Once the pilot is lit, the pilot flame sensor proves ignition and stops the spark igniter from sparking. At the same time the main gas valve is opened and the ceramic burner is lit. The unit continues to operate until the thermostat is satisfied at which time the main gas and pilot gas valves are closed 100% and the unit shuts off.

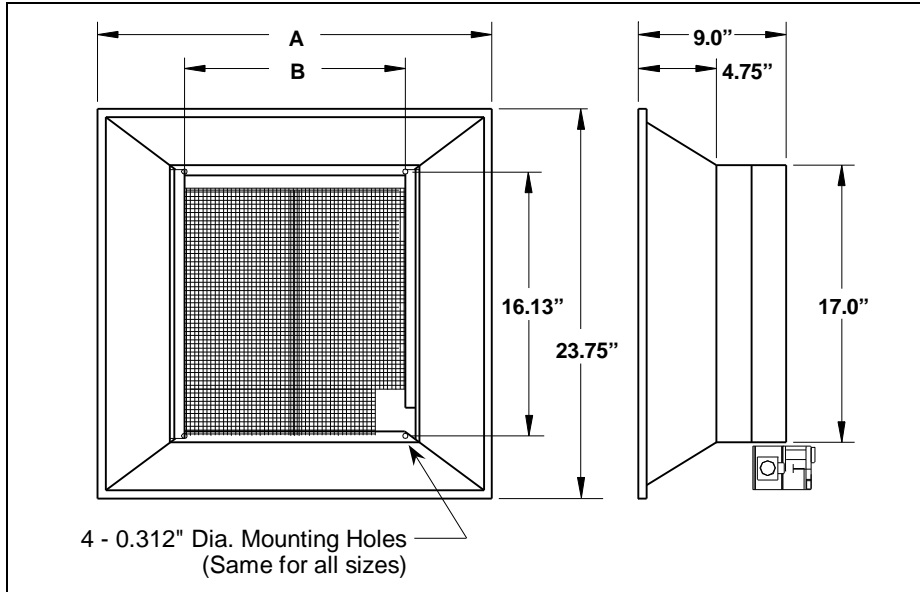
### Millivolt, Self-Energizing with Standing Pilot and 100% Safety Shutoff Gas Controls - Control Codes N5 and P5

Utilizes a single-stage combination gas control and a single stage Millivolt thermostat.

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.

# DIMENSIONS / PERFORMANCE & AVAILABLE CONTROL SYSTEMS

**Figure 10a**  
**Burner Unit Dimensional Data**



**Table 10a**  
**Dimensions**

Model Numbers	Dimensions Inches (mm)		Radiant Area Sq. Inches (cm <sup>2</sup> )	Shipping Weight Lbs. (kg)
	A	B		
OSY.028, 030, 034	17.12 (434.8)	7.63 (193.8)	93 (600)	30 (13.6)
OSY.055, 060, 067	24.00 (609.6)	14.44 (366.8)	186 (1200)	40 (18.2)
OSY.083, 090, 100	30.75 (781)	21.25 (539.7)	279 (1800)	48 (21.8)
OSY.110, 120, 134, 160	37.58 (954.5)	28.08 (713.2)	372 (2400)	59 (26.8)

**Table 10b**  
**Systems and Available Controls <sup>1&2</sup>**

Model Number	Gas Input (Btu/hr)	Direct Spark Ignition 100% Safety Lockout with Manual Reset				Intermittent Pilot Non 100% Lockout		Millivolt, Self Energizing Standing Pilot, 100% Safety Lockout	
		Natural Gas		Propane Gas		Natural Gas		Natural Gas	Propane Gas
		N1-115V <sup>3</sup>	N2-25V	P1-115V <sup>3</sup>	P2- 25V	N3-115V <sup>3</sup>	N4-25V	N5-Millivolt	P5 -Millivolt
OSY.028	27,500	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.030	30,000	♦	♦	♦	♦	♦	♦	♦	♦
OSY.034	33,500	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.055	55,000	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.060	60,000	♦	♦	♦	♦	♦	♦	♦	♦
OSY.067	67,000	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.083	82,500	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.090	90,000	♦	♦	♦	♦	♦	♦	♦	♦
OSY.100	100,500	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.110	110,000	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.120	120,000	♦	♦	♦	♦	♦	♦	♦	♦
OSY.134	134,000	♦	♦	N/A	N/A	♦	♦	♦	N/A
OSY.160	160,000	♦	♦	♦	♦	N/A	N/A	N/A	N/A

Notes: <sup>1</sup> ♦ Indicates the control system is available at the specified rating, N/A indicates the rating does not exist with the indicated control system.  
<sup>2</sup> Voltages shown are control voltages. Please refer to the heater Rating Plate for supply voltage.  
<sup>3</sup> Control codes N1, P1, and P3 are equipped with 25-volt control components and are fitted with a 115V/25V step down transformer.

## GENERAL MAINTENANCE

All heating equipment should be serviced before each heating season to assure proper operation. The following items may require more frequent service based on the environment in which the unit is installed, and how long the unit is operated.

## BURNER ASSEMBLY

Disconnect all electrical power to the heater and close the gas supply valve installed adjacent to the heater. With an air hose regulated to 15 PSIG maximum, blow off any dust and dirt that has accumulated on the heater, by blowing across the ceramic burner (not directly at the ceramic burner). Do not insert the air hose into the inlet of each venturi tube.

## IMPORTANT

To check most of the Possible Remedies listed in Table 11a, refer to the applicable sections of this manual.

## BURNER ORIFICE

Remove each burner orifice, clean, and reinstall on the heater manifold. Drill sizes can be found in Table 9A. Pilot Assembly (not applicable for Direct Spark Ignition) Remove the pilot burner assembly. With an air hose regulated to 15 psig maximum, blow the assembly clean and replace in the original position.

## ELECTRICAL WIRING

The electrical wiring should be checked annually for loose connections or deteriorated insulation.

## GAS PIPING & CONTROLS

The gas valves and piping should be checked annually for general cleanliness and tightness. The gas controls should be checked to insure that the unit is operating properly.

**Table 11a  
Trouble Shooting**

Trouble	Possible Cause	Possible Remedy
No Gas	<ol style="list-style-type: none"> <li>1. Main gas is off.</li> <li>2. Power supply is off.</li> <li>3. Air in gas line.</li> <li>4. External regulator malfunctioning.</li> <li>5. External regulator reversed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Open manual gas valve.</li> <li>2. Turn on main power.</li> <li>3. Purge gas line.</li> <li>4. Replace external regulator.</li> <li>5. Remove and install regulator properly.</li> </ol>
Pilot does not light	<ol style="list-style-type: none"> <li>1. Main gas is off.</li> <li>2. Power supply is off.</li> <li>3. Air in gas line.</li> <li>4. Dirt in pilot orifice.</li> <li>5. Gas pressure out of proper range.</li> <li>6. Pilot valve does not open.</li> <li>7. No spark at igniter.               <ol style="list-style-type: none"> <li>a. Loose wire connections.</li> <li>b. Pilot sensor is grounded</li> <li>c. Defective ignition controller.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Open gas shut-off valve.</li> <li>2. Turn on main power.</li> <li>3. Purge gas line.</li> <li>4. Check for plugged pilot orifice and clean with compressed air if necessary.</li> <li>5. Adjust to a maximum of 14" W.C. Minimum for Natural Gas - 7" W.C. Minimum for Propane Gas - 11" W.C.</li> <li>6. Check wiring for 24 volts to valve. Defective ignition controller or gas valve.</li> <li>7.               <ol style="list-style-type: none"> <li>a. Check all ignition controller wiring.</li> <li>b. Replace sensor if cracked or worn.</li> <li>c. Replace ignition controller.</li> </ol> </li> </ol>
Pilot goes out on 100% shut-off when hold down button is released	<ol style="list-style-type: none"> <li>1. Defective pilot interrupter in combination gas valve.</li> <li>2. Defective pilot flame sensor.</li> <li>3. Insufficient heat on pilot flame sensor.</li> <li>4. Improper pilot flame sensor location.</li> <li>5. Connection is poor contact at valve end of the sensing element.</li> <li>6. Low gas pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Defective valve.</li> <li>2. No electrical power to gas valve.</li> <li>3. Defective pilot sensor.</li> <li>4. Defective ignition controller.</li> <li>5. Improper thermostat wiring.</li> <li>6. Manual valve closed on combination gas valve.</li> </ol>
Main burners do not light (Pilot is lit)	<ol style="list-style-type: none"> <li>1. Replace combination gas valve.</li> <li>2. Replace pilot flame sensor.</li> <li>3. Check pilot orifice for size. Clean pilot burner.</li> <li>4. Check position with respect to pilot.</li> <li>5. Insure clean and tight contact.</li> <li>6. Provide proper gas pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace valve.</li> <li>2. Check wiring to gas valve.</li> <li>3. Replace pilot sensor.</li> <li>4. Replace ignition controller.</li> <li>5. Verify wiring compared to diagram.</li> <li>6. Turn knob to ON position on combination gas valve.</li> </ol>

# TROUBLE SHOOTING

**Table 10a (Continued)**  
**Trouble Shooting**

<b>Trouble</b>	<b>Possible Cause</b>	<b>Possible Remedy</b>
Direct spark fails to ignite main burner(s)	<ol style="list-style-type: none"> <li>1. Electrode improperly located</li> <li>2. Electrode ceramic cracked</li> <li>3. Electrode wire is loose, broken, or frayed.</li> <li>4. Low manifold gas pressure.</li> <li>5. Gas valve fails to open.</li> <li>6. Ignition detection control defective</li> </ol>	<ol style="list-style-type: none"> <li>1. Relocate to correct position.</li> <li>2. Replace electrode</li> <li>3. Reconnect loose wire or replace broken or frayed wire and/or electrode.</li> <li>4. Provide proper gas pressure.</li> <li>5. Replace gas valve.</li> <li>6. Replace ignition control module.</li> </ol>
Flashback (burning of gas/air mixture inside plenum)	<ol style="list-style-type: none"> <li>1. Heater mounted at incorrect angle.</li> <li>2. Excessive drafts.</li> <li>3. Gas leak at manifold, gas valve, and/or pilot tube connections.</li> <li>4. Separation of ceramic tiles.</li> <li>5. Ceramic grid(s) cracked.</li> </ol>	<ol style="list-style-type: none"> <li>1. Angle to be 10° to 35° from horizontal.</li> <li>2. Shield or relocate heater from drafts.</li> <li>3. Check all connections with soap solution and tighten as necessary.</li> <li>4. Replace burner assembly.</li> <li>5. Replace burner assembly.</li> </ol>
Unit cycles off and on	<ol style="list-style-type: none"> <li>1. Insufficient heat on pilot element.</li> <li>2. Excessive drafts.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check pilot orifice, clean pilot burner.</li> <li>2. Shield or relocate unit from drafts.</li> </ol>
Heater will not turn off	<ol style="list-style-type: none"> <li>1. Defective thermostat.</li> <li>2. Gas valve stuck open.</li> <li>3. Unit undersized.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or replace thermostat.</li> <li>2. Replace gas valve.</li> <li>3. Check design conditions. If the unit is undersized, additional heater(s) may be required</li> </ol>
Dark spots on ceramic	<ol style="list-style-type: none"> <li>1. Foreign matter behind the ceramic tile(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean ceramic tiles or replace.</li> </ol>
Carbon formation on ceramic surface of burner	<ol style="list-style-type: none"> <li>1. Mis-aligned orifice.</li> <li>2. Pilot depositing carbon.</li> <li>3. Obstruction in venturi tube.</li> <li>4. Low gas pressure</li> <li>5. Wrong gas supplied to the heater.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace orifice.</li> <li>2. Clean pilot burner, check pilot orifice.</li> <li>3. Clean with a soft brush.</li> <li>4. Provide proper gas pressure.</li> <li>5. Check label for gas required.</li> </ol>
Low heater output	<ol style="list-style-type: none"> <li>1. Low inlet or manifold gas pressure</li> <li>2. Orifice partially blocked with foreign matter.</li> <li>3. Products of combustion not adequately vented.</li> <li>4. Manifold misaligned from excessive torque applied at time of gas pipe installation.</li> <li>5. Foreign matter in venturi tube.</li> <li>6. Gas supply piping too small.</li> <li>7. Unit undersized.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust for proper gas pressure.</li> <li>2. Remove orifice, clean, and reinstall.</li> <li>3. Provide adequate ventilation for products of combustion.</li> <li>4. Replace the manifold.</li> <li>5. Clean with a soft brush.</li> <li>6. Replace piping or increase gas supply pressure.</li> <li>7. Check design conditions. If unit is undersized, an additional unit(s) or other heat source must be added</li> </ol>
Gas odor	<ol style="list-style-type: none"> <li>1. Loose pipe connection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check all connections with a soap solution and tighten as necessary.</li> </ol>
Control assembly overheating	<ol style="list-style-type: none"> <li>1. Heater not mounted correctly.</li> <li>2. Heater mounted too close to ceiling</li> </ol>	<ol style="list-style-type: none"> <li>1. Angle to be 10° to 35° from horizontal.</li> <li>2. Check to maintain proper top clearance.</li> </ol>

## SERVICING

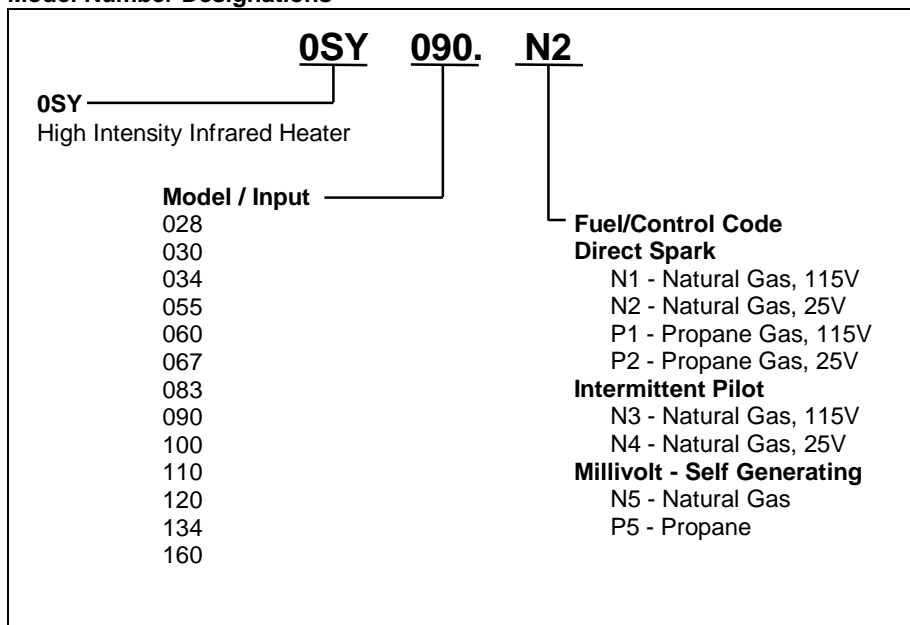
If a qualified service person cannot solve a problem with the installation, please consult with your local Gas Company or Combustion Research Corp. representative.

## REPLACEMENT PARTS ORDERING

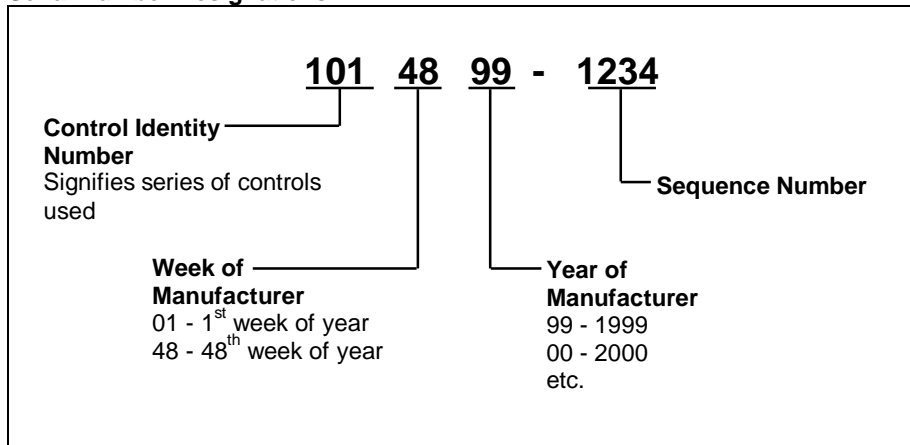
When servicing or repairing this equipment, use only Combustion Research Corp. approved service replacement parts. A complete replacement parts list may be obtained by contacting Combustion Research Corp. Refer to the rating plate on the unit for complete unit model number, serial number, and company address. Any substitution of parts or controls not approved by Combustion Research Corp. will be at the owner's risk.

The serial plate is located on the side of the reflector. For a complete description of the Model Number or Serial Number, see Figures 13a and 13b.

**Figure 13a**  
**Model Number Designations**



**Figure 13b**  
**Serial Number Designations**



## **WARRANTY STATEMENT**

Combustion Research Corporation ("CRC") offers the end-use buyers of its products a specific and limited one-year standard Warranty covering the Synergy<sup>®</sup> product systems or components, the details of which are given below. This Warranty is offered only to the Buyer-For-End-Use ("Buyer") and is effective when the product is properly installed and maintained. Proper installation shall be assumed (for purposes of this warranty only) if installation is performed by a qualified installer in accordance with the owner's manual as well as local, state and federal standards.

In addition, to the one-year warranty on all product components, Combustion Research Corporation also offers the Buyer an Extended Warranty on the ceramic burner assembly (exclusive of controls), which has been installed as original equipment. This Extended Warranty becomes effective (1) on the invoice date of the original equipment from CRC, and (2) the product is properly installed and maintained in accordance with the owners manual.

This Warranty is subject to limitations and conditions which effect the Buyer's rights and which can lead to voidance of the warranty. The Buyer should read and understand these limitations.

## **DISCLAIMER OF IMPLIED WARRANTIES**

**(Please Read Carefully)**

COMBUSTION RESEARCH CORPORATION ("CRC") DISCLAIMS ANY AND ALL IMPLIED WARRANTIES OF ANY KIND OR DESCRIPTION, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, CONDITION, QUALITY OR DURABILITY, WHICH MAY BE PROVIDED BY LAW AS RELATES TO ALL PRODUCTS MANUFACTURED, SOLD, ASSEMBLED AND/OR PROVIDED TO THE ULTIMATE USER, TRANSFEREE, CONTRACTOR, CONSUMER, BUYER AND/OR PERSON UNDER THE LAWS OF THE STATE OF MICHIGAN AND/OR THE UNIFORM COMMERCIAL CODE. THIS DISCLAIMER MEANS NO IMPLIED WARRANTY OF ANY NATURE WHATSOEVER DEALING WITH THE ULTIMATE USE OF THE PRODUCT ASSEMBLED, MANUFACTURED AND/OR SOLD BY CRC SHALL BE GRANTED TO ANY PARTY WHO WITHOUT SAID DISCLAIMER WOULD BE ENTITLED TO BRING AN APPROPRIATE ACTION IN THE COURTS OF THE STATE OF MICHIGAN AS THE LAW SO PROVIDES. THE EXPRESS WRITTEN WARRANTY OF CRC FOR EACH PARTICULAR TRANSACTION SHALL BE THE ONLY EXPRESS WARRANTIES SO PROVIDED AND SHALL BE THE ONLY WARRANTY PROVIDED BY CRC FOR ITS PRODUCTS. THERE ARE NO WARRANTIES WHATSOEVER BEYOND THE DESCRIPTION ON THE FACE HEREOF.

## **DISCLAIMER OF DAMAGES**

**(Please Read Carefully)**

IN NO EVENT SHALL CRC BE LIABLE FOR SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY TYPE OR DESCRIPTION WHETHER ARISING UNDER CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY. SUCH DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF PROFITS, LOSS OF USE OF THE PRODUCTS, DAMAGE TO PROPERTY, INCONVENIENCE AND CLAIMS OF THIRD PARTIES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR ANY LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES OR ANY LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH VARY, FROM STATE TO STATE. HOWEVER, TO THE EXTENT PROVIDED BY LAW, MICHIGAN LAW CONTROLS ALL RIGHTS AND OBLIGATIONS HEREUNDER.

## **LIMITATIONS AND CONDITIONS FOR STANDARD WARRANTY**

The express written Warranty is a representation by CRC that the products, including all components, purchased by the Buyer from CRC or an authorized CRC representative are free from defects in material and workmanship. This Warranty applies to defects which are discovered either upon receipt of the product, or up to one (1) year after receipt of the product or CRC's invoice date, whichever event last occurs. If any such defect is found and the Buyer has satisfied the warranty requirement, and the warranty is not voided under any of the following conditions, CRC will replace free-of-charge, the defective part or parts. However it is not CRC's obligation to find, remove, or transport the defective part or parts. Further, it is not CRC's obligation to install or to pay for installation of any replacement part or parts. Repair or replacement of defective part or parts will only be done after CRC has determined in its sole judgment that the warranty applies.

## **LIMITATIONS AND CONDITIONS FOR EXTENDED 10 YEAR WARRANTY**

The Extended Warranty is a special offer made by Combustion Research Corporation (CRC) to Buyers-For-End-use of CRC products to give them an extra term of replacement part protection. The Extended Warranty covers the ceramic burner assembly (exclusive of controls). The ceramic burner assembly by CRC to be free from defects in material and workmanship for 10 years from CRC's invoice date. If any defect is found during this period, and if the Buyer-For-End-Use has satisfied the Warranty and Extended Warranty requirements, and if the warranty is not voided under any of the following conditions, CRC's obligation is either repair the defective part or to furnish the Buyer-For-End-Use with a replacement part or

- CONTINUED-



parts. As with the Standard Warranty, it is not CRC's obligation to find, remove, or transport the defective part or parts, or to pay for finding, removing, or transporting such part or parts, and it is not CRC's obligation to install or pay for installation of the replacement part or parts. Again, it is the Buyer's obligation to send the part or parts freight pre-paid to CRC.

### **LIMITATIONS ON STANDARD AND EXTENDED 10 YEAR WARRANTY**

These Warranties are the only warranties offered by Combustion Research Corporation (CRC) and are in lieu of all other warranties either express or implied. CRC shall not be liable for any special, incidental or consequential damage, such as damage to a building or persons or things within a building due to any kind of radiant energy heating system failure. In addition, the Standard and Extended Warranties apply only to those products, which are shipped to and installed in the United States and Canada.

### **ARBITRATION**

In the event any Buyer, user, subsequent owner, transferee, installer, purchaser and/or ultimate customer experiences any problem, difficulty and/or has a complaint dealing with the use, installation and/or operation of the products sold, delivered and/or manufactured by CRC under the terms and provisions of any purchase order, contract, invoice or other document, then the differences between that person or entity and CRC shall be amicably resolved. In the event a resolution of the differences between the parties is unable to be accomplished, said matter shall be resolved through final and binding arbitration under the laws of the State of Michigan. The party complaining shall select, appoint, and pay for an arbitrator. CRC shall select, appoint, and pay for an arbitrator, and the two (2) arbitrators so selected shall agree upon and appoint a third impartial arbitrator. The dispute and/or matter of controversy shall be submitted to the arbitrators who by majority vote shall render a final and binding decision dealing with the controversy in existence between the parties. Said decision shall be enforceable in a Michigan Court maintaining jurisdiction over said matter under the requisite provisions of Michigan law. The costs of the impartial arbitrator shall be paid one-half (1/2) by the complaining party and one-half (1/2) by CRC.

### **MICHIGAN LAW TO GOVERN**

This contract and/or document dealing with the purchase sale and/or installation of products sold and/or manufactured by CRC shall be governed by the laws of the State of Michigan, both as to its interpretation and performance. The place of this contract, its situs and forum shall at all times be the State of Michigan. All matters relating to the validity, construction and enforcement of this contract shall be determined in the appropriate courts maintaining jurisdiction over all controversies in the State of Michigan.

### **VOIDING OF WARRANTIES**

Each of the following listed events, conditions, acts or omissions by any person or entity may void the Warranty:

1. Improper installation; i.e., installation which is not in accordance with the instructions in the service and installation manual.
2. Running the burner(s) with combustion air drawn from an atmosphere, which is contaminated with halogenated hydrocarbons, fluorocarbons, or other corrosive substances.
3. The input of the heater exceeds the rated input, as indicated on the nameplate, by more than 2%.
4. Relocation or reinstallation of the product or system.
5. Use of electrical power having voltages, frequencies, or transients, which exceed product or system ratings.
6. Physical abuse or neglect to the product system or components of the system; i.e., allowing the product system to operate with broken or damaged system components.
7. Damage to the product system or components of the product system by fire, flood, earthquake, or act of God.
8. Removal of the serial number or nameplate.
9. Refusal to permit inspection and/or service of the product system or parts by an authorized CRC representative.
10. Repair or replacement of any product components or other heating components that have been repaired or replaced with other than factory parts.

The determination and evaluation of any or all of the above conditions shall be according to the sole and exclusive discretion of CRC, and/or its authorized representative. If, upon examination, either CRC or its authorized representative determines that the defect or defects are caused by any of the above, the warranty obligation of CRC shall not be honored. No representative of CRC, other than an officer, has authority to change or extend these provisions or warranties. Changes or extensions shall be binding only if confirmed in writing by CRC's duly authorized executive officers. Product systems installed by CRC or its authorized representatives shall be or presumed to be properly installed and to be free of any and all conditions which might void the warranty at the time of installation. All product components or systems repaired or replaced are warranted under the same terms and conditions as the original Warranty, but only for the remaining time under the original warranty. No action shall be brought for any breach of this warranty more than one (1) year after the cause of action for such breach arises. Nothing herein shall be construed to extend any warranty beyond the stated periods. CRC shall not be liable for any default or delay in performance by it in accordance with these warranties which delay or performance is caused by contingency beyond its control including but not limited to war, government restriction or restraint, strikes, fire, floods, unavailability of raw material, and acts of God.

