MHU Overhead Unit Heaters

Operating Instructions & Owner's Manual

Installer: Leave this manual with the appliance. Consumer: Retain this manual for future reference.

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS.
Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the heater.

MODELS:

MHU100NGPALP	**MHU100NGPSSP**
MHU100NGPAL	**MHU100NGPSS**
MHU125NGPALP	**MHU125NGPSSP**
MHU125NGPAL	**MHU125NGPSS**
MHU150NGPALP	**MHU150NGPSSP**
MHU150NGPAL	**MHU150NGPSS**
MHU200NGPALP	**MHU200NGPSSP**
MHU200NGPAL	**MHU200NGPSS**
MHU250NGPALP	**MHU250NGPSSP**
MHU250NGPAL	**MHU250NGPSS**
MHU300NGPALP	**MHU300NGPSSP**
MHU300NGPAL	**MHU300NGPSS**
MHU400NGPALP	**MHU400NGPSSP**
MHU400NGPAL	**MHU400NGPSS**

This product is approved for sale and installation in the states of California and Massachusetts.

UNIT HEATER
FOR INDUSTRIAL/COMMERCIAL USE

⚠ WARNING:

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury, death or property damage.

Be sure to read and understand the installation, operation and service instructions in this manual.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damages.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
-WHAT TO DO IF YOU SMELL GAS:

- DO NOT try to light any appliance.
- DO NOT touch any electrical switch, do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a phone remote from the building. Follow the gas suppliers instructions.
- If you cannot reach your gas supplier, call the Fire Department.

- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

WARNING: If the information in these instructions are not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

⚠ WARNING:

Heaters must not be installed in locations that have volatile, explosive, or flammable:

- Vapors (including gasoline, paint thinner, oil-based paint)
- Chemicals
- Materials

Do not install near flammable surfaces or materials such as cardboard or paper. Follow all listed distances to combustible walls, ceilings, floors, and materials.

⚠ WARNING:

Failure to follow the clearances to combustible materials and surfaces listed in this manual could result in property damage, fire, or death.

⚠ WARNING:

Do not install the heater in a corrosive atmosphere. Corrosive atmospheres will result in severe damage to the heater and unsafe operation.

⚠ WARNING:

THIS PRODUCT CAN EXPOSE YOU TO CHEMICALS INCLUDING CARBON MONOXIDE, WHICH IS KNOWN TO THE STATE OF CALIFORNIA THAT MAY CAUSE CANCER. FOR MORE INFORMATION VISIT WWW.P65WARNINGS.CA.GOV

⚠ WARNING:

Do not install unit heaters in structures that contain space for family living quarters.

Utility Heaters may be used to heat non-living spaces such as garages, that are attached to, adjacent to or part of a structure that contains space for family living.

Unit heaters are NOT to be installed in structures attached to, adjacent to, or part of family living quarters.

⚠ WARNING:

Sharp metal. This heater is made of sheet metal and may have sharp edges. Use proper personal protective equipment when installing or servicing.

⚠ WARNING:

Failure to provide enough air for combustion could result in death or injury from carbon monoxide.

⚠ WARNING:

Follow these instructions and the latest edition of local codes. In the absence of local codes follow the National Fuel Gas Code NFPA 54/ANSI Z223.1 in the USA or CSA-B149.1 Natural Gas and Propane Installation Code in Canada.

CONTENTS

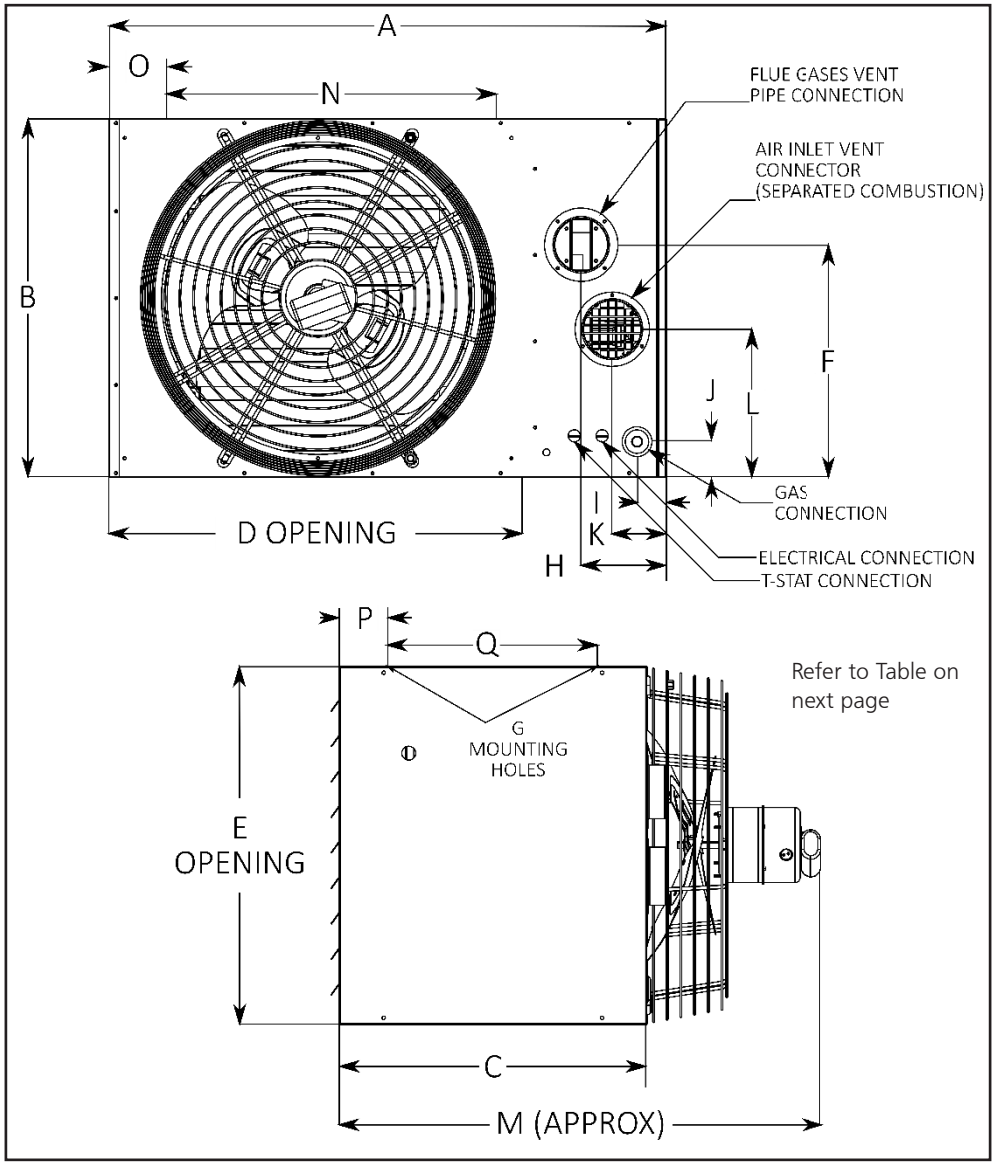
LANGUAGES

SPECIFICATIONS - TABLE 1

Model Size	100	125	150	200	250	300	400
Input*	100,000 BTU/Hr (29.3 kW)	125,000 BTU/Hr (36.6 kW)	150,000 BTU/Hr (44 kW)	200,000 BTU/Hr (58.6 kW)	250,000 BTU/Hr (73.3 kW)	300,000 BTU/Hr (87.9 kW)	400,000 BTU/Hr (117.2 kW)
Output*	82,000 BTU (24kW)	102,500 BTU (30 kW)	123,000 BTU (36 kW)	164,000 BTU (48.1 kW)	205,000 BTU (60.1 kW)	246,000 BTU (72.1 kW)	328,000 BTU (96.1 kW)
Efficiency %	82%	82%	82%	82%	82%	82%	82%
V/A/H/Phase	115 / 5 / 1	115 / 5 / 1	115 / 5 / 1	115 / 7 / 1	115 / 7 / 1	115 / 10 / 1	115 / 12 / 1
Motor HP	1/8	1/8	1/6	1/3	1/3	1/2	3/4
Motor RPM	1,440	1,440	1,050	1,140	1,140	1,130	1,125
Approx. Ship Weight	152 lb. (69 kg)	159 lb. (72 kg)	161 lb. (73 kg)	208 lb. (94 kg)	224 lb. (102 kg)	249 lb. (113 kg)	302 lb. (137 kg)

* Ratings shown are for elevations up to 2,000' (610 m). For elevations about 2,000' (610 m), please refer to "INSTALLATION – HIGH ALTITUDE"

UNIT DIMENSIONS - FIGURE 1



HEATER DIMENSIONS IN INCHES (mm) - TABLE 2

Model Size	100	125	150	200	250	300	400
A	36.0″ (914 mm)	36.0″ (914 mm)	33.2″ (843 mm)	40.4″ (1026 mm)	40.4″ (1026 mm)	40.4″ (1026 mm)	40.4″ (1026 mm)
B	20.7″ (526 mm)	20.7″ (526 mm)	23.1″ (587 mm)	25.8″ (655 mm)	28.5″ (724 mm)	31.5″ (800 mm)	39.8″ (1012 mm)
C	22.4″ (570 mm)	22.4″ (570 mm)	22.1″ (562 mm)	22.1″ (562 mm)	22.1″ (562 mm)	22.1″ (562 mm)	22.1″ (562 mm)
D	22.6″ (573 mm)	22.6″ (573 mm)	22.6″ (573 mm)	29.4″ (748 mm)	29.4″ (748 mm)	29.4″ (748 mm)	29.4″ (748 mm)
E	18.5″ (469 mm)	18.5″ (469 mm)	21.2″ (538 mm)	23.9″ (607 mm)	26.6″ (677 mm)	29.4″ (747 mm)	37.7″ (960 mm)
F	14.4″ (366 mm)	14.2″ (360 mm)	15.1″ (384 mm)	16.8″ (426 mm)	18.1″ (459 mm)	19.7″ (500 mm)	23.6″ (600 mm)
G (Mounting Hole)*	Refer to Figure 1A and 1B		3/8 - 16	3/8 - 16	3/8 - 16	3/8 - 16	3/8 - 16
H	8.9″ (226 mm)	8.9″ (226 mm)	6.2″ (158 mm)	6.3″ (159 mm)	6.3″ (159 mm)	6.3″ (159 mm)	6.3″ (159 mm)
I	4.8″ (122 mm)	4.8″ (122 mm)	4.8″ (121 mm)	2.2″ (55 mm)	2.2″ (55 mm)	2.1″ (53 mm)	2.3″ (58 mm)
J	7.3″ (187 mm)	6.2″ (158 mm)	2.7″ (69 mm)	2.7″ (69 mm)	2.7″ (69 mm)	2.7″ (69 mm)	2.7″ (69 mm)
K	4.0″ (101 mm)	4.2″ (107 mm)	4.5″ (115 mm)	4.0″ (103 mm)	5.3″ (134 mm)	5.0″ (126 mm)	4.8″ (121 mm)
L	11.3″ (287 mm)	10.6″ (269 mm)	9.4″ (239 mm)	10.8″ (275 mm)	10.2″ (258 mm)	13.0″ (330 mm)	17.2″ (436 mm)
M	32.0″ (813 mm)	32.0″ (813 mm)	32.7″ (830 mm)	34.6″ (879 mm)	34.9″ (885 mm)	33.9″ (882 mm)	36.6″ (929 mm)
N (Mounting Holes)	N/A	N/A	16.6″ (422 mm)	23.5″ (598 mm)	23.5″ (598 mm)	23.5″ (598 mm)	23.5″ (598 mm)
O (Mounting Holes)	N/A	N/A	6.2″ (159 mm)	6.2″ (159 mm)	6.2″ (159 mm)	6.2″ (159 mm)	6.2″ (159 mm)
P	3.7″ (95 mm)	3.7″ (95 mm)	3.7″ (95 mm)	3.5″ (89 mm)	3.5″ (89 mm)	3.5″ (89 mm)	3.5″ (89 mm)
Q	15″ (380 mm)	15″ (380 mm)	14.9″ (380 mm)	14.9″ (380 mm)	14.9″ (380 mm)	14.9″ (380 mm)	14.9″ (380 mm)
Gas Connection	1/2″	1/2″	1/2″	1/2″	3/4″	3/4″	3/4″
Vent Connector Size	4″ (102 mm)	4″ (102 mm)	4″ (102 mm)	4″ (102 mm)	6″ (152 mm)	6″ (152 mm)	6″ (152 mm)
Fan Diameter	18″ (457 mm)	18″ (457 mm)	20″ (508 mm)	22″ (559 mm)	22″ (559 mm)	22″ (559 mm)	24″ (610 mm)

*Listed is the hole diameter and threads per inch to accept threaded rod.

START-UP AND PERFORMANCE CHECK LIST

Customer: _____ Date: _____ Job Name/Number: _____

Unit Model No.: _____ Serial No.: _____ Gas Inlet Pressure: _____

Type of Gas: _____ Name Plate Input: _____ Gas Outlet/Manifold Pressure: _____

- A listed terminal is installed on the vent pipe and air inlet pipe termination?
- The vent system and air inlet system were inspected and determined to function properly?
- The heater, gas and electrical installation was inspected by the local authority have jurisdiction of the installation?
- The structure supporting the heater and means to attach the heater to the structure are appropriate and secure?
- The gas supply piping has been leak checked?
- The voltage has been verified to be in the acceptable range?
- The "Operation Procedure" in the manual was followed to put the heater into operation?
- All fans and motors move freely?
- For propane installations the conversion label was filled out and attached to the heater near the name plate?
- For installations above 2,000' (610m) the high altitude label was filled out and attached to heater near the name plate?

- All wires are tight and all gaskets intact and all plugs/caps in place?
- The air louvers are open and the access panel has been replaced?

RECEIVING INSTRUCTIONS

1. Before signing the bill of lading:
   a. Confirm that the information on the bill of lading matches what was received, including quantity of heaters.
   b. Remove all packing material and inspect the heater for damage.
2. If there is damage or discrepancy on the bill of lading, the consignee should sign the bill of lading listing all damages or discrepancies.
3. Take pictures of damage with the delivery person present.
4. If there is no damage, sign the bill of lading.
5. Confirm that the model number of the heater matches the model number that you ordered.

HEATER INSTALLATION

1. Read the entire installation and service manual before starting the installation.
2. Keep the installation and service manual and other literature for future reference.
3. The installation must comply with the latest edition of:
   a. All local codes, including building, plumbing, electrical and wastewater codes;
   b. In the absence of local building codes refer to:
      - In the USA- The National Fuel Gas Code, NFPA 54/ANSI Z223.1
      - In Canada- The Natural Gas and Propane Installation Code, CSA B149.1
   c. National codes, such as OSHA in the USA.
   d. In this manual the above applicable codes are referred to as "local/national codes"
4. Installation and service must be performed by a qualified installation and service agency as defined in NFPA 54, or in Canada by a licensed gas fitter.
5. Do not attach to duct work or air filters. Do not place downstream from cooling/refrigeration units, air washers or evaporative coolers.
6. This unit is certified with the controls furnished. For replacement parts, please order according to the replacement parts list. The manufacturer reserves the right to substitute other authorized controls as replacements.
7. Do not adjust or alter the fan blade or motor operating speed.
8. The heater must be installed to maintain normal room temperatures. Operating temperatures below 50˚F (10˚C) can cause condensation to form in the heat exchanger system which could result in premature failure of the heater and cause unsafe operation. It is recommended that thermostats with a minimum operating temperature of 50˚F (10˚C) be installed.
9. The burners cannot be operated in temperatures above 90˚F (32˚C). Operating the burners above 90˚F (32˚C) can cause failure of the heater and electrical components and result in unsafe operation. To use the blower for air circulation only, your thermostat must have a "fan only" or fan selection setting. If your thermostat has this option, an additional wire should be run to the "G" terminal on the thermostat connection block. Refer to wiring schematic on page 12.
10. Do not install the heater outdoors. Avoid water spray and dripping of water onto the heater.
11. High humidity and high salt areas can damage the heater and reduce the life of the heater resulting in unsafe operation.
12. Verify that the heater can be safely vented to the outdoors according to these instructions and local/national codes.
13. Do not install units in locations where the flue products can be drawn into adjacent building openings such as windows, fresh air intakes and doors.
14. Maintain the minimum clearances/distance to combustible materials and recommended service clearances shown in Figure 2 and Table 3.
15. All appliances and machines generate noise. This heater generates noise and vibration from the fan, motors and combustion processes. This noise could be considered a nuisance near quiet zones such as offices.
16. Utility heaters must be installed at least 18" (46 cm) above the floor in garages.
17. The heater should be installed so that air can move freely to all air openings on the heater. This includes combustion air and air for the fan.

TABLE 3
Distance to Combustible Surfaces, Materials and Access

Unit Side	100-125	150-400	Service Clearance (Suggested)
Top and Bottom	1 in. 2.54 cm	6 in. 15.24 cm	18 in. 45.72 cm
Access Side	1 in. 2.54 cm	6 in. 15.24 cm	18 in. 45.72 cm
Non-Access Side	1 in. 2.54 cm	1 in. 2.54 cm	18 in. 45.72 cm
Rear	18 in. 45.72 cm	18 in. 45.72 cm	18 in. 45.72 cm

TABLE 4
Maximum Installation Heights (Between bottom of unit and floor)

Model Size	Maximum Install Height
100	12'
125	14'
150	14'
200	16'
250	18'
300	18'
400	20'

IMPORTANT: Environmental conditions and installations vary, so these heights may need to be adjusted based on codes, environmental conditions and installation variations.

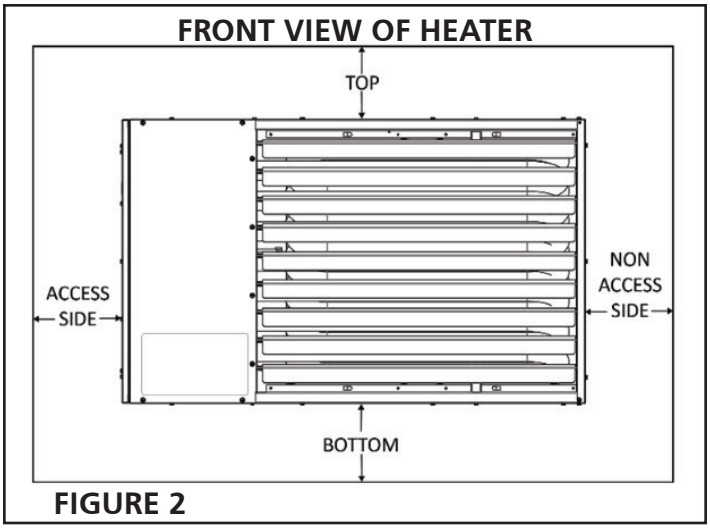


FIGURE 2

18. For installations in aircraft hangers, parking garages and repair garages refer to the following standards:
    - ANSI/NFPA 409 Standard on Aircraft Hangers
    - ANSI/NFPA 88A Standard for Parking Garages
    - ANSI/NFPA 88B Standard for Repair Garages
    - CSA B149.1 Natural Gas and Propane Installation Code
19. To prevent damage to the heater, fully support the bottom of the heater with wood, the shipping pallet or other suitable material when using machines or forklifts to lift the heater into position.
20. The heater is to be suspended from above and is not for installation on a combustible surface (wood, drywall, plastic). On model sizes 100 to 400 there are four mounting holes on top of the heater for 3/8"-16 threaded rod. Locking nuts and washers should be used to lock the threaded rod tightly into the heater mounting holes.
21. The threaded rod should be threaded all the way through the threaded hole on the top of the unit until the rod is visible inside the heater. Usually a minimum of 6 turns.
22. The structure supporting the heater must have adequate strength to hold the weight of the heater without distortion or damage. Refer to Table 1 for unit weights.
23. For proper operation, the unit must be installed in a level horizontal position.
24. If the heater is mounted too high, the hot air may not reach the work area. Mount the heater as low as possible considering local/national codes. Consider clearances for equipment (such as forklifts) and other guidelines from this manual for the minimum distance/clearance to the floor, materials or personnel.

Optional Low Clearance Mounting For MHU100 & MHU125

25. The optional low clearance mounting brackets, part number 60470 in Figure 2A can be used to mount the heater directly to the ceiling. ONLY USE THESE BRACKETS ON MODEL SIZES 100 AND 125.
26. Remove the #10 screws as indicated in Figure 3A. KEEP THESE SCREWS. There are 3 on the front and 4 on the back.
27. Place the low clearance mounting brackets on the heater as shown in Figure 2A.
28. Use the screws removed in the steps above to attach the low clearance mounting brackets to the heater. Do not over tighten the screws or you will strip out the holes.
29. This will provide the 1" (2.54 cm) of clearance required to the ceiling for the 100 & 125.
30. Using properly sized fasteners (nuts and bolts for steel or lag bolts for wood) secure the heater to the ceiling. 3/8" diameter fasteners are recommended for most applications.
31. Secure the heater to structural supports capable of holding the weight of the heater (Table 1) and with spacings shown in Figure 2B.

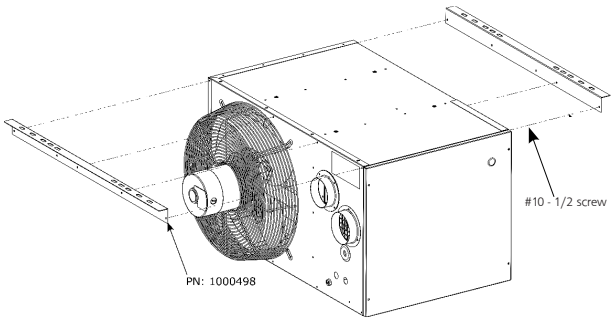


FIGURE 2A

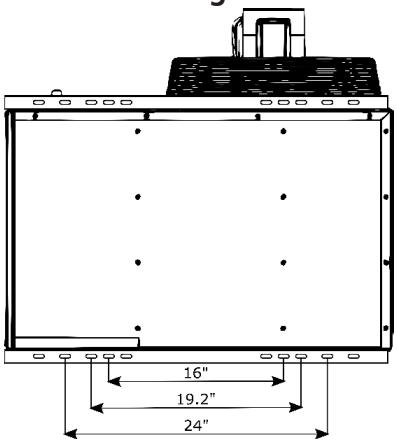


FIGURE 2B

VENTING

⚠WARNING: If an existing heater is being replaced, it may be necessary to resize the venting systems. Improperly sized venting systems can result in death or injury.

⚠WARNING: If the optional inlet air pipe is used, it must be located in the same plane as the vent pipe on the exterior of the building. Failure to have the vent pipe and inlet air pipe located in the same plane (roof or wall) could result in injury or death.

⚠WARNING:

This heater must be vented to the outdoors.
This heater must have proper air for combustion.
Death or injury could result if these instructions are not followed.
Follow these instructions, local codes, or in the absence of local codes the latest edition of The National Fuel Gas Code, NFPA 54/ANSI Z223.1 in the USA or Natural Gas and Propane Installation Code CSA B149.1 in Canada.

1. If the heater being installed is replacing existing equipment and using the existing vent system from that equipment, inspect the venting system for proper size and horizontal pitch by local/national codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion, and other deficiencies, which could cause an unsafe condition.
2. Refer to the "OPERATION" section of this manual to verify existing vent systems are adequate for the new heater. If the vent system is not sized correctly carbon monoxide can leak into the building and condensation can form that will cause damage to the vent system.
3. This heater can be installed with two different vent systems (refer to the model number on the heater).
   a. Power Vent: Exhaust outlet vent pipe (vent pipe) and using room air for combustion.
   b. Separated Combustion: Vent pipe and using the air inlet pipe (inlet pipe) for combustion air from outside which is recommended. Using outside air for combustion may improve the life expectance of the heat exchanger.
4. The heater has a vent adapter for connecting the vent pipe and separated combustion heaters have an inlet air pipe adapter for connecting the inlet air pipe. See Figure 3 and Table 5. Use the same size inlet pipe and vent pipe as the connector unless otherwise specified by local/national codes.
5. Never use vent pipe or inlet pipe that is smaller than the adapters on the heater.
6. Never block the air openings.
7. The heater can be vented vertically as a Category I appliance or horizontally as a Category III appliance. A Category I appliance has a negative pressure in the vent pipe. A Category III appliance has a positive pressure in the vent pipe.

TABLE 5
Vent and Air Connectors and Terminals

Model Size	Vent/Inlet Connector	Vent/Inlet Terminals
100-200	4"	4" Listed Terminal
250-400	6"	6" Listed Terminal

8. Single wall vent pipe must be 6" (15.2 cm) or greater from combustible materials. Increase the distance from materials that can be damaged by increased temperatures.
9. Do not use PVC or plastic for any part of the vent pipe. Refer to NFPA54/ANSI Z223.1 for appropriate material.
10. Attach the vent pipe and inlet pipe to the heater using 3 corrosion resistance #8 sheet metal screws.
11. Single wall vent pipe must not pass through any unoccupied attic, inside wall, concealed space or floor.
12. When installing vent pipe through combustible walls (interior or exterior) and floors, use listed thimbles.
13. Do not use vent dampers or any other restricting devices in any portion of the vent pipe or inlet pipe.
14. All Heaters have a pressure switch. The pressure switch, along with visual inspections, can determine if the vent system and heat exchanger are blocked. Do not alter or remove the pressure switch. If the pressure switch is not operational, contact a qualified service person.
15. Do not vent into masonry chimneys.
16. Do not common vent with other appliances. The vent pipe and inlet pipe system must not be attached to other appliances.
17. The flue products that exit the vent pipe are hot and contain moisture. Protect exterior building surfaces and materials from degradation due to heat and moisture. This includes vinyl siding.
18. See Table 6 on next page for vent pipe termination distances.
19. Do not terminate vent pipe above public walkways.
20. Inlet pipe can be any suitable material that will not sag, bend, or warp and is airtight and smooth interior. The inside diameter of the inlet pipe must be equal to or greater than the outside diameter of the inlet pipe connector on the heater. Galvanized single wall pipe of suitable thickness is recommended.
21. Inlet pipe connections should be airtight. This can be done with any suitable material for the environment of the installation and the pipe used. This includes duct tape, aluminum tape and caulk.
22. If you are installing the Separated Combustion air inlet pipe, it must terminate in the same area and plane (vertical or horizontal) as the vent pipe terminates. If the vent pipe terminates vertically, the inlet pipe must be installed vertically. If the vent pipe terminates horizontally, the inlet pipe must be installed horizontally.
23. The inlet air pipe may need insulation to protect from condensation that may form when cold outside air travels through the pipe to the heater.

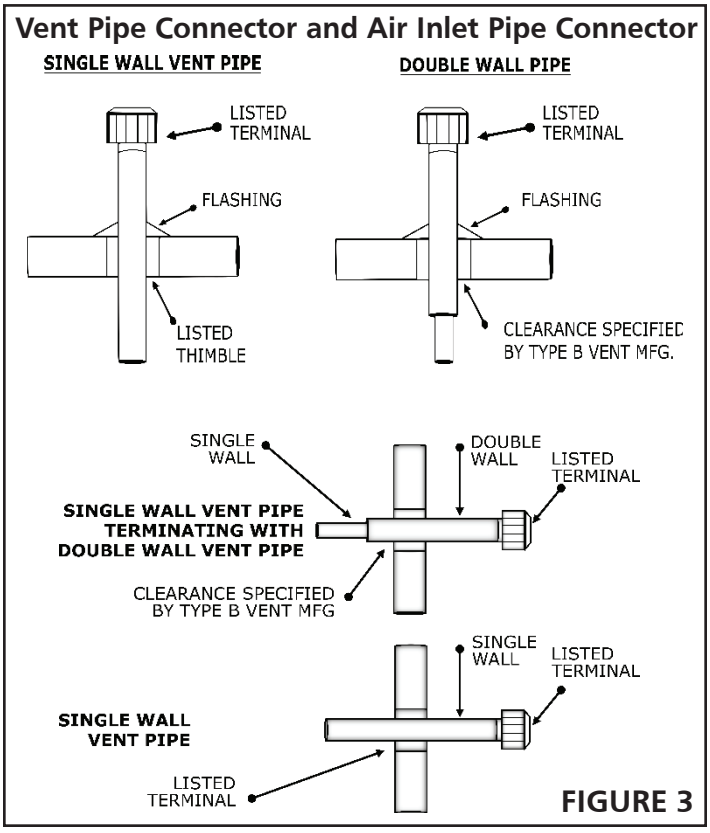


FIGURE 3

TABLE 6
Distance/Clearance for Vent Terminals (For reference only. Refer to the latest edition of local/national codes for up to date distances)

Structure	Minimum Distance/ Clearance for Vent Terminal Location
Air inlet supply	3' (0.91m) above or 10' (3m) horizontally
Door, window, gravity air inlet, or any building opening	4' (1.22m) horizontal and below 1' (0.3m) above
Electric meter, gas meter, gas regulator, and relief equipment	U.S.: 4' (1.22m) horizontal Canada: 6' (1.83m) horizontal
Adjacent public walkways	7' (2.13m) all directions
Grade (ground level)	1' (0.3m) above
Snow line	1' (0.3m) above (consider drifts)

VERTICAL VENTING

⚠WARNING: For Category I venting (vertical), if the horizontal length of the vent pipe exceeds the allowable horizontal length in the latest edition of local codes, or in the absence of local codes the latest edition of The National Fuel Gas Code, NFPA 54/ANSI Z223.1 in the USA or Natural Gas and Propane Installation Code CSA B149.1 in Canada, then the heater is to be installed as a Category III horizontal vented appliance as described in the "Horizontal Venting" section of this manual.

1. Category I vertical vent pipe, refer to local/national codes for:
   a. Vent pipe size, material, and thickness
      ii. Single wall vent pipe requirements
      iii. Double wall vent pipe requirements
   b. Maximum allowable horizontal length of vent pipe in the system
   c. Distances to roof lines for varying roof pitches.
   d. Distances to other buildings, structures, or walls.
2. Vent connectors serving Category I appliances shall not be connected into any portion of mechanical draft systems operating under positive pressure.
3. Refer to Figures 4, 5, 6 and 7 for vertical venting recommendations.
4. The vent pipe must have a listed vent terminal/cap securely fastened to it. The size of the required terminal is listed in Table 5.
5. The inlet air pipe used on separated combustion models must have a listed vent terminal/cap. The size of the required terminal is listed in Table 5.
6. The vent pipe must be a minimum of 5 vertical feet in height. This means there should be a minimum of a 5' vertical piece of vent pipe between the appliance and the listed vent cap. Refer to local and national codes for the maximum horizontal run of a vertical vent system.
7. The vent cap must be at least 12" above the maximum snow load. Consider snow drifts that may occur.
8. The heat from the flue products in the heater can cause damage to sloped and flat roof materials. Verify the temperature rating of the roof material and confirm that the hot flue products from the vent pipe will not cause damage to the roof material.
9. When installing a two-pipe system vertically (Separated Combustion with vent pipe and inlet pipe), the two pipes must both terminate vertically and both pipes should be within the same general area.
10. Both the vent pipe and inlet pipe should have a tee and drip/ sediment leg with a clean out cap to clean out any debris that may get into the pipes.
11. The separated combustion air inlet pipe seams must be airtight, so all air comes from the outdoors. The inlet pipe can be sealed with a material suitable for the environment where the inlet pipe is installed. Possible materials include duct tape, caulk, or silicone sealant.
12. Condensation may form as cold air moves through the inlet pipe. Protect equipment and materials from dripping condensation. The inlet pipe may need to be wrapped in insulation to avoid condensation.
13. The vent pipe must terminate at least 12" (30.5 cm) above and 12" (30.5 cm) horizontally from the air inlet pipe on Separated Combustion Heaters.
14. Refer to Figures 4 - 7; Table 6 and local/national codes for distances to buildings, walls, sloped roofs, and other objects.

Vertical Category I Vent System - Vent Pipe Only, Sloped Roof

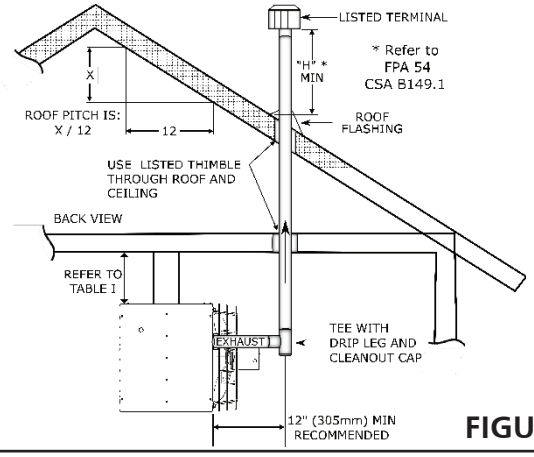


FIGURE 4

Vertical Category I Vent System - Vent Pipe and Air Inlet Pipe, Sloped Roof

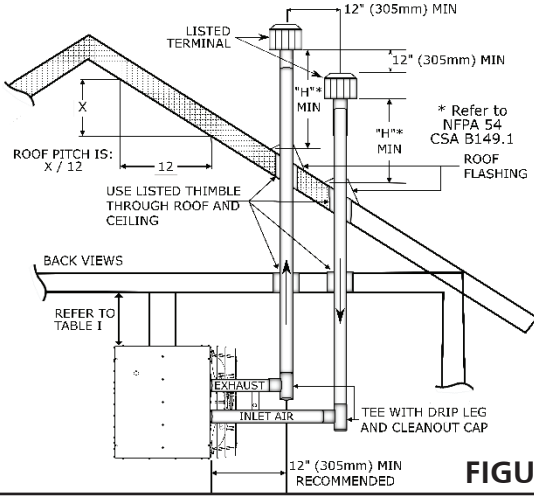


FIGURE 5

Vertical Category I Vent System - Vent Pipe Only

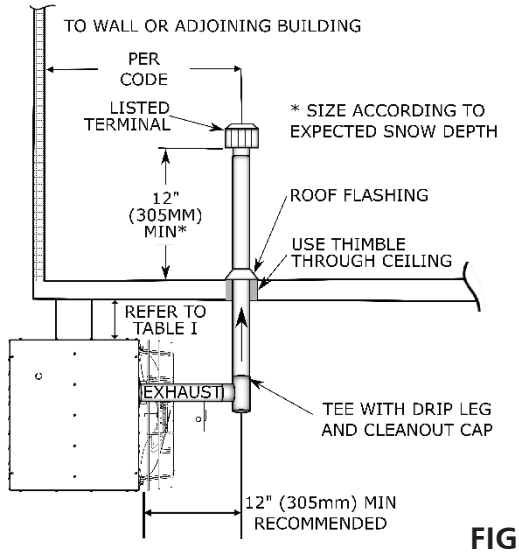


FIGURE 6

Vertical Category I Vent System - Vent Pipe and Air Inlet Pipe, Flat Roof

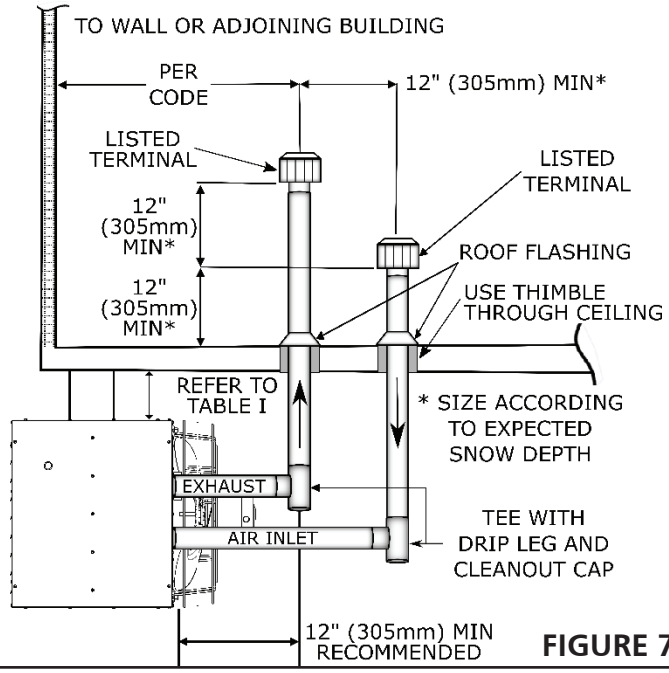


FIGURE 7

HORIZONTAL VENTING

⚠WARNING: Proper Vent Pipe Required!

Failure to follow instructions could result in death, serious injury, and property damage.
Never use a pipe of a diameter other than specified!
Never use PVC, ABS, or any other non-metallic pipe for venting!

⚠WARNING: Hazardous Flue Gas!

Failure to follow instructions could result in flue gas leaks into the space resulting in death, serious injury, or substantial property damage.
Do not use Type B (double wall) vent internally within the building on horizontally vented power vented units.

1. Horizontal venting is Category III. Category III vent pipe has a positive pressure inside the pipe. If Category III vent pipe is not used and installed per the Category III manufacturers instructions, carbon monoxide can leak into the building.
2. Commercial/industrial horizontally vented Category III heaters may be vented with an agency certified (UL 1738) Category III venting system and where allowed by code, appropriately sealed 26 gauge or heavier galvanized steel.
3. Do not attach the vent pipe or inlet pipe to any other appliances or vent systems. This heater must have a dedicated vent pipe and inlet pipe.
4. Do not mix different brands and types of Category III vent pipe.
5. Refer to Table 7 for total minimum and maximum vent lengths.
6. The equivalent length of a 90 elbow is 5' (1.5 m) for 4" (10.2 cm) diameter and 7' (2.1 m) for 6" (15.2 cm) diameter.
7. Refer to Figures 8 and 9 for horizontal venting requirements.
8. Horizontal sections of vent pipe are to be installed with a minimum downward slope from the appliance of 1/4 inch per foot (6.35 mm per 30.5 cm). If local code allows, a 1/4 inch per foot upward slope can be installed.
9. Securely support horizontal vent and inlet air pipe every 3 feet (0.91 m) with steel strapping or other material that can withstand the temperature and rigidity required.
10. Maintain 6" clearances between the vent pipe and combustible surfaces or materials. Greater distances may be necessary if surfaces or materials can be damaged by high heat.
11. A tee with drip leg, cap and condensate drain should be installed at the lowest point of the vent pipe prior to exiting the structure/ building.
12. The vent pipe and inlet pipe (separated combustion models) must terminate with a listed vent terminal/cap with the size listed in Table 5.
13. The vent pipe must extend 20" (50.8 cm) beyond the exterior surface of an exterior wall or further if there is a potential for heat damage on building materials.
14. The air inlet pipe must extend 4" (30.5 cm) beyond the exterior surface of the exterior wall.
15. Do not terminate the vent pipe over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief openings, or other equipment.
16. The vent pipe and inlet pipe (separated combustion models) must be installed 12" (30.5 cm) above the snow line. Consider snow drifts.
17. The inlet air pipe must be a minimum of 12" (30.5 cm) apart from the vent pipe, and 4" (10.2 cm) from the exterior wall.

TABLE 7
Vent Pipe Diameters and Total Equivalent Pipe Lengths for Horizontal Venting

Model Size	Vent Pipe Diameter	Equivalent Vent Length	
		Minimum	Maximum
100-150	4" (10.2 cm)	5' (1.5 m)	30' (9 m)
200	4" (10.2 cm)	5' (1.5 m)	50' (15.25 m)
250-400	6" (15.2 cm)	5' (1.5 m)	50' (15.25 m)

Horizontal Vent System - Vent Pipe Only

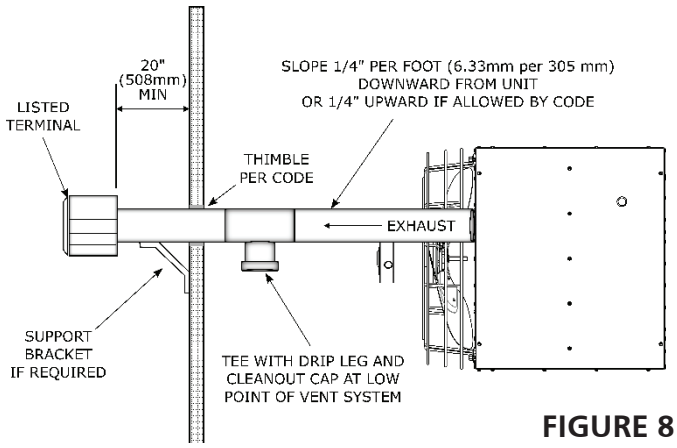


FIGURE 8

Horizontal Vent System - Vent Pipe and Air Inlet Pipe

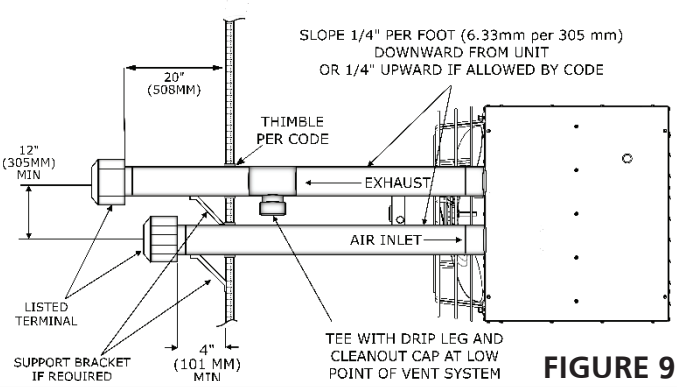


FIGURE 9

GAS INSTALLATION

⚠WARNING: Do not apply more than ½ psi (3.48 kPa) of gas pressure to the heater. Pressures in excess of ½ psi (3.48 kPa) will damage the heater and could result in injury or death. Never use a match or open flame to check for gas leaks. This could result in an explosion or fire, resulting in injury or death.

1. Installation of gas piping must conform with local/national codes.
2. In The Commonwealth of Massachusetts this heater must be installed by a licensed plumber or gas fitter and must have a "T handle" type gas valve.
3. The gas pipe must have the proper capacity to deliver the correct amount of gas at the proper pressure to the heater. The maximum capacity of gas pipe is defined by local codes or NFPA 54 or CSA B149.1. The capacity is based on:
   a. The diameter of the gas pipe.
   b. The length of the gas pipe.
   c. Type of gas used (natural gas or propane).
   d. The operating pressure of the gas.
   e. The input rate, or gas flow rate of the heater.
4. With the above information and the gas flow for each heater in Table 8, determine the proper size of gas pipe required.
5. The minimum inlet gas pressure is:
   a. Natural gas = 6.0" Water column (1.49 kPa)
   b. Propane = 11.0" W.C. (2.74 kPa)
6. The maximum gas pressure to the appliance is ½ PSI (14" W.C. or 3.48 kPa).
7. Install a union 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 accessible for test gauge connection. See Figure 10.

Sediment Trap/Manual Shut-Off Valve Installation

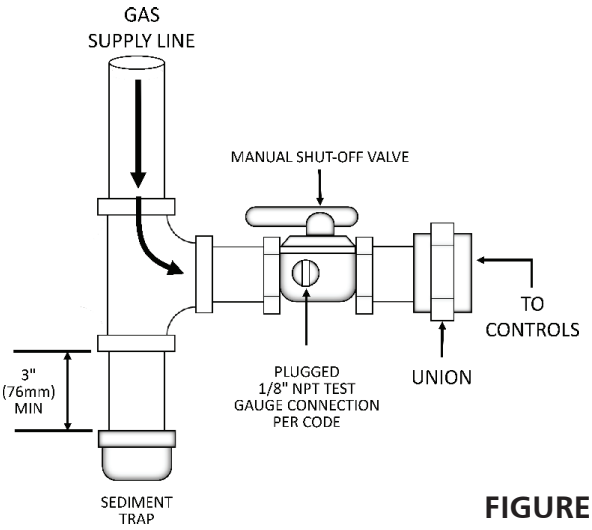


FIGURE 10

TABLE 8
Gas Consumption & Orifice Information*

Model Size	Gas Type	CFH** (m3/Hr)	Gal/Hr (L/Hr)	Orifice Size	# of Orifices
100	NG	95.2 (2.7)	-	#42	4
	LP	40 (1.1)	1.09 (4.1)	#53	
125	NG	119 (3.7)	-	#42	5
	LP	50.0 (1.4)	1.36 (5.1)	#53	
150	NG	142.9 (4.0)	-	#42	6
	LP	60.0 (1.7)	1.6 (6.2)	#53	
200	NG	190.5 (5.4)	-	#38	7
	LP	80.0 (2.2)	2.2 (8.3)	#52	
250	NG	238.1 (6.7)	-	#37	8
	LP	100 (2.8)	2.7 (10.3)	1.65mm	
300	NG	285.7 (8.1)	-	#36	9
	LP	120 (3.4)	3.3 (12.4)	#51	
400	NG	381.0 (10.8)	-	#36	12
	LP	160 (4.5)	4.4 (16.5)	#51	

* Manifold Pressure: NG=3.5" W.C. (0.87 kPA) & LP=10"W.C. (2.49 kPA).

** CFH based upon NG's heating value=1050 Btu/ft3 (39.1 Mj/m3) & LP's heating value=2,500 Btu/ft3 (93.1 MJ/m3).

8. When attaching the gas pipe to the gas valve on the heater, carefully use a 2nd wrench so the gas valve does not rotate and cause damage to the valve or heater.
9. Provide a sediment trap as close to the appliance as possible. See Figure 10.

10. Use thread joint compound that is approved for use with the gas that will be used for the heater.
11. Pressure/leak test the gas supply line prior to installing the heater per local/national code. After the heater is installed, pressure/leak test with test pressures below ½ psi (3.48 kPa) to the appliance. Damage will occur if the test pressure to the appliance is greater than ½ psi (3.48 kPa). The gas valve on the appliance must be off/closed during any pressure testing.

ELECTRICAL INSTALLATION

⚠WARNING: Disconnect all electric power before installing or servicing the heater.
Failure to disconnect all electric power before installing or servicing could cause electric shock, injury, or death.

1. Installation of wiring must conform with local building codes, or in the absence of local codes, with 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. Two copies of the unit wiring diagram are provided with each unit. One is located on the side access control compartment panel and the other is in this manual (see Figure 11). Refer to this diagram for all wiring connections.
3. Refer to Figure 1 on page 3 for the point of entry into the heater for the supply voltage wire and thermostat wire. Standard size knock-out holes are provided.
4. Thermostat wiring is for 24-volt thermostats only.
5. Thermostat connections are made on the circuit board inside the heater.
6. Some thermostats may require the "C" common terminal for added functionality such as WIFI. Refer to the thermostat manufacturer's instructions.
7. The supply voltage and ground connections are made in the heater using the proper sized wire nut connectors to the black, white, and green/yellow wires.
8. The power supply to the heater must be provided by a fused circuit with a disconnected switch located as close to the heater as possible.
9. The power supply must be within 5 percent of the voltage rating of the heater (115V). If not, advise the utility company.

OPERATION PROCEDURE

⚠WARNING: Failure to confirm the proper orifice size and manifold pressure for the installation location, gas and elevation could result in death, injury, or property damage, including fire or premature failure of the heater.
Never adjust the input rate, manifold pressure, or orifice size to give a higher input rate.

⚠WARNING: Failure to confirm the proper orifice size and manifold pressure for the installation location, gas, and elevation, will void the warranty of the electrical components and heat exchanger.

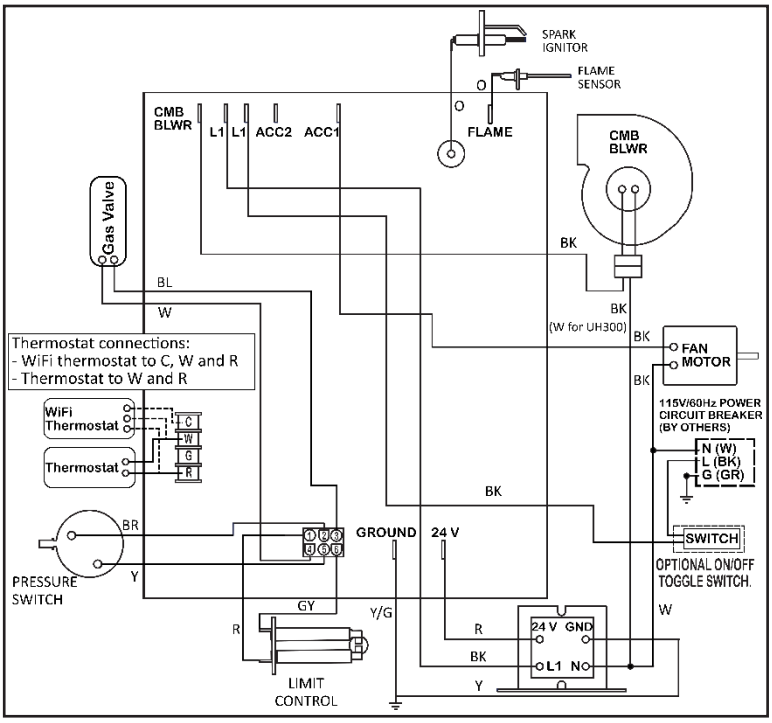
This unit has been fully assembled and has had operational tests performed at the factory. The following pre-operational procedures should be performed to verify proper on-site installation operation.

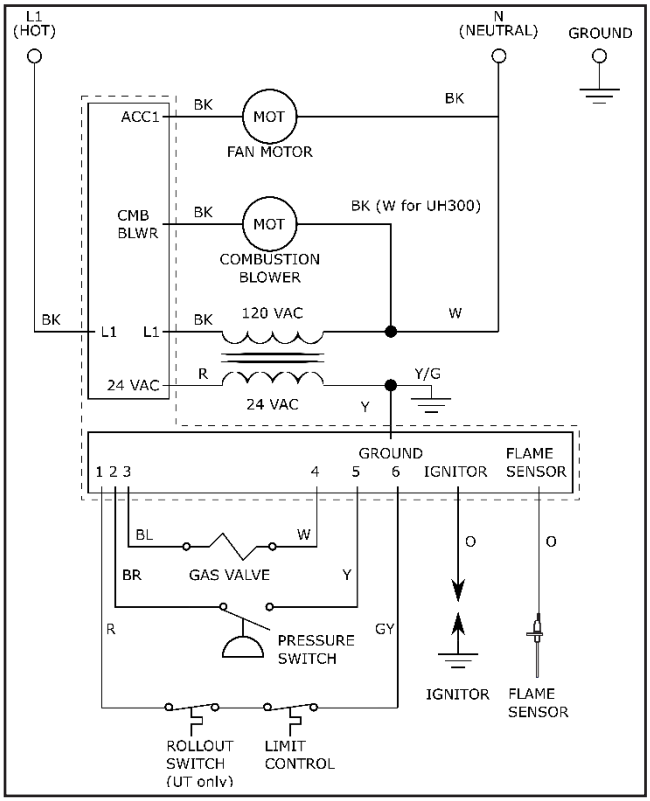
NOTE: Do not bypass or jumper any controls.

1. With the electric power turned off at the disconnect switch and the manual gas valve turned off, perform a visual inspection to verify the following:
   a. All air openings are not obstructed or blocked.
   b. The fan does not contact the fan guard or cabinet when spun by hand.
   c. All screws are tight.
   d. The size of the orifice matches the data plate, or if applicable the high altitude kit or propane conversion kit size.
   e. The orifices are centered with the burners.
   f. The air deflector louvers are in the desired direction and NOT fully closed.
   g. Confirm all wires and electrical connections are installed per the wiring diagram and are securely fastened. Wires should not be near the burner flame or other hot surfaces.
2. With the manual gas and electric disconnect turned off, install an appropriate means and instruments to measure the inlet gas pressure to the heater gas valve and the gas manifold pressure (outlet pressure). Refer to Figure 12 on page 12 for the location of the pressure taps for measuring the inlet gas pressure and gas manifold pressure (outlet pressure).
3. Turn on the ELECTRICAL POWER ONLY at the disconnect switch.
4. The controls of this heater can determine if a pressure switch and temperature limit switches are operating properly. Do not jumper or bypass safety devices.
5. Make a call for heat on the thermostat and verify that the heater controls function properly without gas. The sequence should be:
   a. Call for heat from the thermostat.
   b. The combustion blower pre-purge is 30 seconds.
   c. The spark ignitor will turn on for 10 seconds after the pre-purge.
   d. Because the gas is turned off, the burners will not light and the combustion blower will continue to operate.
   e. After 30 seconds of inter-purge, the spark ignitor will turn on for 10 seconds. This will repeat 1 more time for a total of 3 trials for ignition.
   f. After the 3rd trial for ignition, the combustion blower will continue to operate for 5 seconds. The LED on the control should flash 2 times as shown in the "LED Diagnostic Code" table located on the heater and in Table 11.
   g. If the above sequence does not happen, refer to "Trouble Shooting".
6. Turn off the electrical disconnect. Turn on the manual gas valve.
7. Use an appropriate gas leak detector to verify there are no gas leaks, including in the gas pressure measuring instruments for the inlet pressure and the manifold pressure.
8. Turn on the electric power. The thermostat should still be calling for heat.
9. Any air in the gas line should have been purged from the system following local/national codes during the gas piping installation.

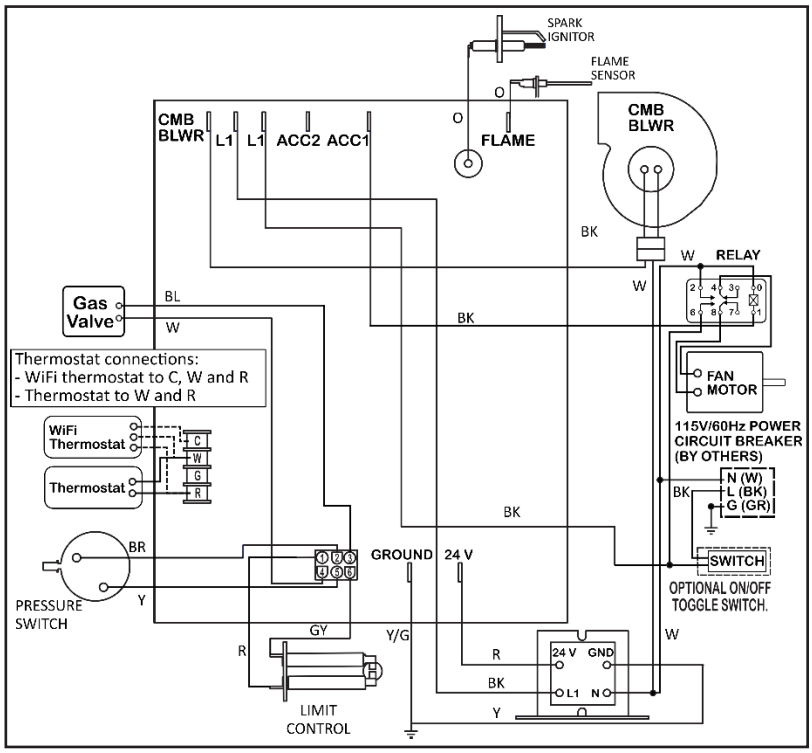
Figure 11 - Electrical Connections and Ladder Diagrams

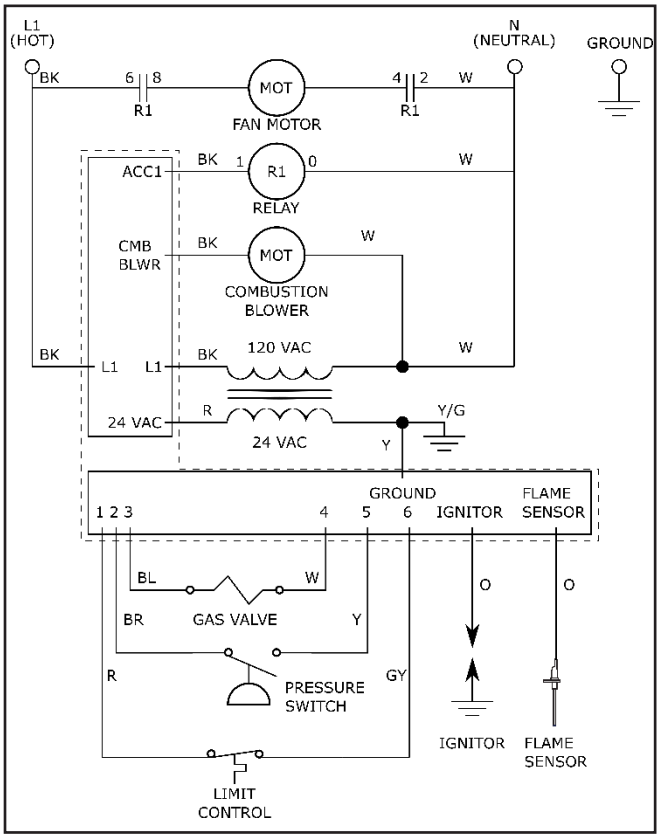
Model Size 100 to 300





Model Size 400 Only

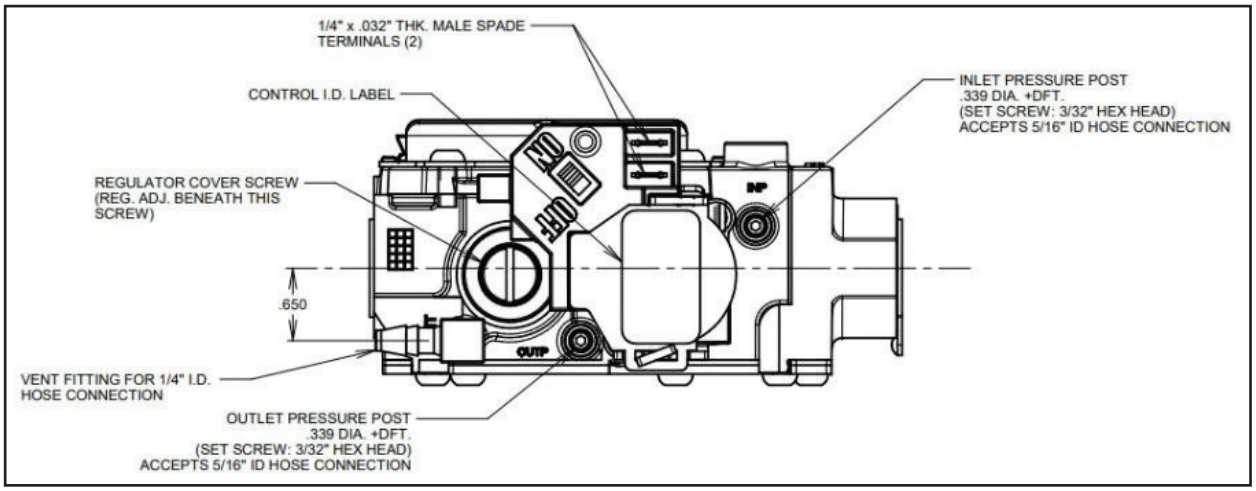


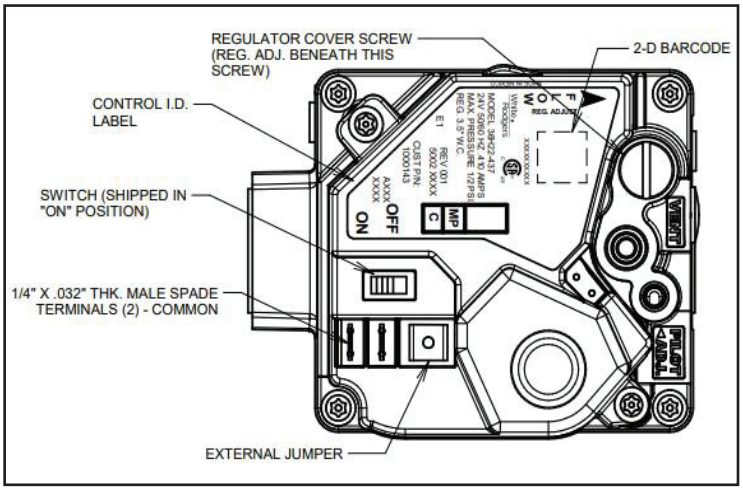


* There is a 3 Amp fuse on the control board of all heaters

10. When the burners light, verify the gas inlet pressure is between 6.0 to 14" W.C. (1.50-3.49 kPa) for natural gas and 11.0 to 14" (2.74-3.49 kPa) for propane. If the gas pressure is not in this range, consult with the gas supply company, installer, or qualified service personnel to determine the cause.
11. Verify that the manifold pressure matches the value on the name plate, or the value for the high-altitude installation or the value for the propane conversion kit. Due to manufacturing tolerances the gas manifold pressure may need to be adjusted to the exact pressure for the installation.
12. To adjust the gas manifold pressure:
    a. Remove the regulator cap. See Figure 12.
    b. To increase the pressure, turn the regulator screw clockwise.
    c. To decrease the pressure, turn the regulator screw counter-clockwise.
    d. Replace the regulator cap.
13. Verify that the circulating air fan turns on approximately 30 seconds after the burner lights.
14. Remove the call for heat from the thermostat.
15. After the burners turn off, the combustion blower should operate for an additional 5 seconds and the circulating air fan should operate for an additional 150 seconds.
16. After the fan stops, turn off the electric power and manual gas valve.
17. Remove the gas pressure measuring instruments and install/tighten any fittings that were removed/used during the gas pressure check.
18. Turn on the electric power and manual gas valve.
19. Check for gas leaks.
20. Make another call for heat on the thermostat.
21. After the burners light, check for gas leaks after the heater gas valve, including any gas fittings used for measuring the gas pressure.
22. Verify that the venting system is installed correctly and free from obstructions. Before you start, use the following steps to verify that the venting system is adequately sized:

Figure 12 - Gas Valve Details
Model Size 100 through 200





Model Size 250 to 400
NOTE: The gas pressure taps are located on the side and labeled as "IN P" and "OUT P"

a. Seal any unused openings in the venting system.

b. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, NFPA 54/ ANSI Z223.1 or CSA B149.1 Installation Code – Latest Edition and these instructions. Determine that there is no blockage or restriction, leakage, corrosion, or other deficiencies, which could cause an unsafe condition.

c. As practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system is (are) located and other spaces of the building. Turn on clothes dryers and any exhaust fans such as range hoods and bathroom exhausts, so they shall operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust the thermostat so that the appliance will operate continuously.

e. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.

f. If improper venting is observed during any of the above tests, the venting system must be corrected.

23. After confirming the proper operation of the heater, replace the access panel.

24. Should overheating occur, or the gas supply control system fail to shut off the flow of gas, shut off the manual gas valve to the heater before shutting off the electrical supply.

25. Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and replace any gas control which has been under water.

PROPANE AND HIGH ALTITUDE INSTALLATION

All models are certified by ETL at elevations of 0' – 2000' (0-610m), 2,001' – 5,400' (610.5m-1,645m), 5,401' – 7,800' (1645.5m-2,377m) and 7,801' – 10,100' (2,377.5m-3,078m). The input rating in this manual is for 0' – 2,000' (0-610m). If a unit is to be installed at an elevation above 2,000' (610m), the following instructions must be followed. Included with every heater is a high altitude label that must be filled in with permanent marker and attached to the heater next to the name plate.

Natural Gas High Altitude Adjustments and Conversion Kits

Table 9 lists the required manifold pressure, and pressure switch setting if different than sea level (factory) and orifices for high altitude natural gas installations. Orifices do not need to be changed on any model for high altitude. Pressure switches will need to be purchased from the factory. Part numbers are listed in the "Replacement Parts" section of this manual.

Propane Conversions and Propane High Altitude Information

Table 10 lists the required manifold pressure, pressure switch setting if different than sea level (factory) and orifices for all elevations for propane. Follow the instruction sheet included with the propane conversion kit on how to convert from natural gas to propane.

Refer to the Parts Table for "Conversion Kits" part numbers. Contact your local sales representative or Customer Service for availability.

Refer to the "Operation" section of this manual to properly adjust the heater.

Table 9 – Natural Gas High Altitude Information and Conversion

TABLE 9.1
High Altitude Information NG Units: 2,001' to 5,400' (610m to 1,645m)

Model Size	Btu/Hr Input	NG Manifold Pressure (in. w.c.)/(kPa)	Pressure Switch	Orifice Drill Size (Quantity)
100	100,000	3.5/0.87	-0.80	#42 (4)
125	125,000	3.5/0.87	-0.80	#42 (5)
150	150,000	3.5/0.87	-0.80	#42 (6)
200	200,000	3.5/0.87	N/A	#38 (7)
250	250,000	3.5/0.87	-1.10	#37 (8)
300	300,000	3.5/0.87	-1.20	#36 (9)
400	400,000	3.5/0.87	-1.45	#36 (12)

TABLE 9.2
High Altitude Information NG Units: 5,401' to 7,800' (1,645.5m to 2,377m)

Model Size	Btu/Hr Input	NG Manifold Pressure (in. w.c.)/(kPa)	Pressure Switch	Orifice Drill Size (Quantity)
100	100,000	3.5/0.87	-0.80	#42 (4)
125	125,000	3.5/0.87	-0.80	#42 (5)
150	150,000	3.5/0.87	-0.80	#42 (6)
200	200,000	3.5/0.87	-0.80	#38 (7)
250	250,000	3.5/0.87	-1.10	#37 (8)
300	300,000	3.5/0.87	-1.20	#36 (9)
400	400,000	3.5/0.87	-1.40	#36 (12)

TABLE 9.3
High Altitude Information NG Units: 7,801' to 10,100' (2,377m to 3,078m)

Model Size	Btu/Hr Input	NG Manifold Pressure (in. w.c.)/(kPa)	Pressure Switch	Orifice Drill Size (Quantity)
100	100,000	3.5/0.87	-0.75	#42 (4)
125	125,000	3.5/0.87	-0.75	#42 (5)
150	150,000	3.5 / 0.87	-0.75	#42 (6)
200	200,000	3.5/0.87	-0.75	#38 (7)
250	250,000	3.5 / 0.87	-1.10	#37 (8)
300	300,000	3.5/0.87	-1.20	#36 (9)
400	400,000	3.5/0.87	-1.35	#36 (12)

NOTE: Standard orifices are used for high altitude installations.

Table 10 – Propane (LP) Information and Conversions All Elevations

Table 10.1 Propane Information: 0' to 2,000' (0 to 610m)

Model Size	100	125	150	200	250	300	400
Btu/Hr Input	100,000	125,000	150,000	200,000	250,000	300,000	400,000
Orifice Drill Size	53	53	53	52	1.65mm	51	51
Orifice Qty in Kit*	6	6	6	7	8	12	12
L.P. Manifold Pressure (in. w.c.)/(kPa)	10.0/2.49	10.0/2.49	10.0/2.49	10.0/2.49	10.0/2.49	10.0/2.49	10.0/2.49
Pressure Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A

***Kits may contain more orifices than needed for the specific model being converted. Extra orifices can be discarded.**

Table 10.2 Propane Information: 2,001' to 5,400' (610.5m to 1645 m)

Model Size	100	125	150	200	250	300	400
Btu/Hr Input	100,000	125,000	150,000	200,000	250,000	300,000	400,000
Orifice Drill Size	53	53	53	52	1.65mm	51	51
Orifice Qty in Kit*	6	6	6	7	8	12	12
L.P. Manifold Pressure (in. w.c.)/(kPa)	10.0/2.49	10.0/2.49	9.2/ 2.29	8.6/ 2.14	9.3 / 2.32	9.2 / 2.29	8.2 / 2.04
Pressure Switch	-0.80	-0.80	-0.80	N/A	-1.10	-1.20	-1.45

***Kits may contain more orifices than needed for the specific model being converted. Extra orifices can be discarded.**

Table 10.3 Propane Information: 5,401' to 7,800' (1,646.5 to 2,377m)

Model Size	100	125	150	200	250	300	400
Btu/Hr Input	100,000	125,000	150,000	200,000	250,000	300,000	400,000
Orifice Drill Size	53	53	53	52	1.65mm	51	51
Orifice Qty in Kit*	6	6	6	7	8	12	12
L.P. Manifold Pressure (in. w.c.)/(kPa)	9.2/2.30	9.2/2.30	8.6/2.14	8.0 / 1.99	9.0 / 2.24	8.9 / 2.22	8.1 / 2.02
Pressure Switch	-0.80	-0.80	-0.80	-0.80	-1.10	-1.20	-1.40

***Kits may contain more orifices than needed for the specific model being converted. Extra orifices can be discarded.**

Table 10.4 Propane Information: 7,801' to 10,100' (2,387m to 3,078m)

Model Size	100	125	150	200	250	300	400
Btu/Hr Input	100,000	125,000	150,000	200,000	250,000	300,000	400,000
Orifice Drill Size	53	53	53	52	1.65mm	51	51
Orifice Qty in Kit*	4	5	6	7	8	9	12
L.P. Manifold Pressure (in. w.c.)/(kPa)	8.8/2.20	8.8/2.20	8.1 / 2.02	7.5 / 1.87	8.7 / 2.17	8.7 / 2.17	8.0/1.99
Pressure Switch	-0.75	-0.75	-0.75	-0.75	-1.10	-1.20	-1.35

***Kits may contain more orifices than needed for the specific model being converted. Extra orifices can be discarded.**

MAINTENANCE

Annually have a qualified service agency perform the following maintenance:

⚠WARNING: Service and maintenance must be performed by a qualified service person.
Use only factory authorized replacement parts.

1. Before any service, **TURN OFF THE GAS AT THE MANUAL SHUT-OFF VALVE AND TURN OFF ALL ELECTRIC POWER TO THE HEATER.**
2. Circulating air fan and motor:
   a. Verify the fan blade set screw is tight with a minimum torque of 25 inch pounds and maximum of 100 inch pounds.
   b. Clean the fan blade, fan guard and motor.
   c. Verify the fan blades, motor shaft and motor are not damaged.
3. Burners and orifices:
   a. Remove the burners from the heater and clean them with an appropriate brush or cloth.
   b. Clean the orifices and verify the holes are not blocked.
   c. Check for damage, rust, or deterioration.
   d. Verify the burner carry-over ports are not damaged and that they are touching each other.
4. Spark ignitor and sensor:
   a. Carefully clean the sensor and spark ignitor.
   b. Check for cracks in the ceramic.
   c. Check for damage or deterioration of the metal parts.
5. Wiring:
   a. Check wiring for loose connections.
   b. Check for heat damage to wires.
6. Gas valve and pipe:
   a. Leak check gas fittings with suitable leak detectors. Do not use a match or open flame. Make sure to turn the gas on for this portion of the service.
   b. Verify the manifold gas pressure and inlet gas pressure.
7. Combustion blower:
   a. Clean dust and dirt from the air cooling blades.
   b. Clean dust and dirt off the motor.
   c. Verify the high temperature silicone rubber hose is not cracked or damaged.
8. Heat exchanger and cabinet:
   a. Inspect the heat exchanger for damage and cracks.
   b. Inspect all hardware (screws, nuts, sight glass) on the cabinet, including hardware used for mounting.
9. Vent System:
   a. Inspect the vent system for damage, loose fasteners, loose supports or evidence of damage to surrounding materials.
   b. Clean the vent and air inlet terminations.
   c. Clean the air inlet screen on the heater.
   d. Clean the drip leg.

TABLE 11
Green LED Diagnostic Codes

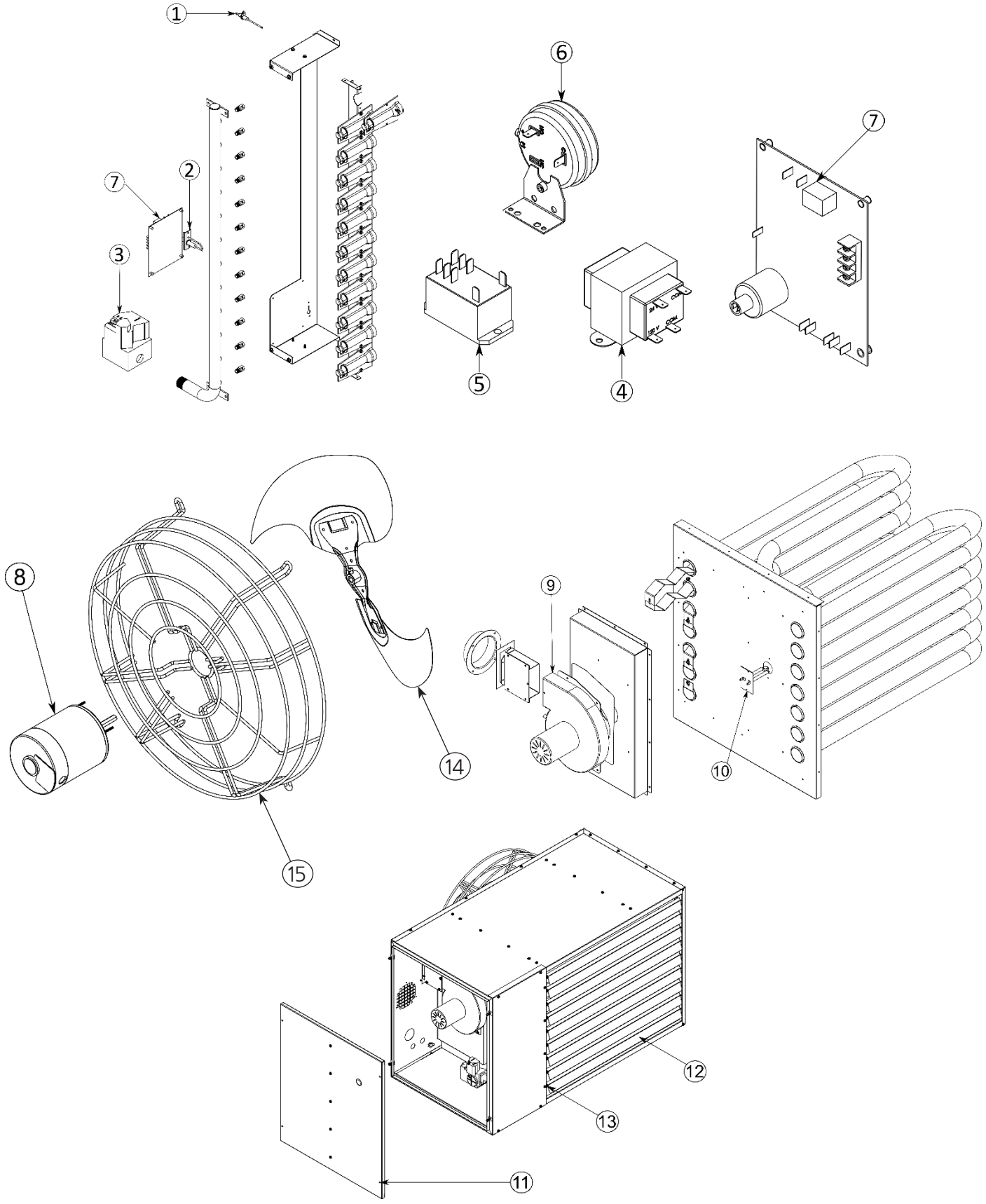
Steady ON	Control Internal Failure
Steady OFF	Internal Control Fault or No Power
Slow Flash	Control OK, No Call For Heat
Fast Flash	Control OK, Call For Heat Present
2 Flashes	In Lockout From Failed Ignitions or Flame Losses
3 Flashes	Pressure Switch Open with Inducer On or Closed with Inducer Off
4 Flashes	Limit or Rollout Switch is Open
5 Flashes	Flame Sensed While Gas Valve Off
6 Flashes	On-Board Microprocessors Disagree

TROUBLESHOOTING

Symptom	Possible Cause	Possible Remedy
Unit does not Start	1. Power supply is off. 2. No 24V power to thermostat. 3. Thermostat malfunction. 4. LED flashes. 5. Blown fuse on control board. 6. Defective control.	1. Turn on main power. 2. Check control transformer. a. If failed transformer – check thermostat wire gage, length, and defects. 3. Verify wire connections to R&W terminals only. a. Check/replace thermostat. 4. Check LED flash codes located on decal in the unit or Table 11. 5. Replace fuse. 6. Replace control.
LED Light Off or Flashing	1. Blown fuse on control board. 2. Multiple causes.	1. Replace fuse. 2. Control board LED flash codes vary with control type. A decal is installed in the unit and Table 11 gives a brief description of the applicable codes for your heater.
Unit Starts but Does Not Ignite	1. Main gas is off. 2. Air in gas line. 3. Main or manifold gas pressure. 4. Check gas valve switch.	1. 1. Open manual gas valve. 2. Purge gas line following the necessary precautions. 3. Set gas pressures per manual instructions. 4. Set gas valve switch to “ON” position.
Unit Goes Through Cycle but the Burners Go Out in Less than 10 Seconds	1. Reversed main power polarity. 2. Unit not grounded. 3. Flame not sensed.	1. Black wire – HOT, White Wire – NEUTRAL, Green Wire – GROUND. 2. Ground unit and verify quality of ground connection. 3. Check flame sensor probe and connection.
Air Circulating Fan Inoperable	1. Loose Connections. 2. Defective control board. 3. Defective fan motor.	1. Check all connections. 2. Check control board data sheet and function. 3. Check fan motor.

REPAIR PARTS

When ordering parts include the complete unit model number listed on the unit rating plate.



PARTS LIST (SEE BACK PAGE FOR PARTS ORDERING INFORMATION)

UNIT CAPACITY (MBH)			100	125	150	200	250	300	400
NO. OF TUBES PER MODEL			4	5	6	7	8	9	12
ITEM	DESCRIPTION	PN	PART NO. (QTY*)						
1	Flame Sensor	60366	✓	✓	✓	✓	✓	✓	✓
2	Spark Igniter	60375	✓	✓	✓	✓	✓	✓	✓
3	Gas Valve	60376	✓	✓	✓	✓			
	Gas Valve	60377					✓	✓	✓
4	Transformer	60387	✓	✓	✓	✓	✓	✓	✓
5	Relay	60388							✓
6	Pressure Switch	60473	✓	✓					
	Pressure Switch	60389			✓	✓			
	Pressure Switch	60390					✓		
	Pressure Switch	60472						✓	
	Pressure Switch	60391							✓
7	Ignition Module	60392	✓	✓	✓	✓	✓	✓	✓
8	Fan Motor	60394	✓	✓					
	Fan Motor	60395			✓				
	Fan Motor	60396				✓	✓		
	Fan Motor	60397						✓	
	Fan Motor	60398							✓
9	Combustion Blower	60421	✓	✓	✓	✓	✓		
	Combustion Blower	60422						✓	✓
10	Limit Switch	60427	✓	✓	✓	✓	✓	✓	✓
11	Removable Panel	60435	✓	✓					✓
	Removable Panel	60436			✓				
	Removable Panel	60437				✓			
	Removable Panel	60438					✓		
	Removable Panel	60474						✓	
	Removable Panel	60475							✓
	Upper Removable Panel	60439							✓
12	Air Deflectors	60453	(-7)	(-7)	(-8)				
	Air Deflectors	60454				(-9)	(-10)	(-11)	(-14)
13	Deflector Spring	60455	(-7)	(-7)	(-8)	(-9)	(-10)	(-11)	(-14)
14	Fan Blade	60410			✓				
	Fan Blade	60411				✓			
	Fan Blade	60412					✓		
	Fan Blade	60413						✓	
	Fan Blade	60414							✓
15	Fan Guard	60406			✓				
	Fan Guard	60407				✓	✓	✓	
	Fan Guard	60408							✓

UNIT CAPACITY (MBH)			100	125	150	200	250	300	400
NO. OF TUBES PER MODEL			4	5	6	7	8	9	12
ITEM	DESCRIPTION	PN	PART NO. (QTY*)						
NS	Rollout Limit Switch	60463	✓	✓					
NS	6 Pin Harness	60464	✓	✓	✓	✓			
	6 Pin Harness	60465					✓	✓	✓
NS	Pressure Switch (HA), -0.75	60466	✓	✓	✓	✓			
	Pressure Switch (HA), -0.80	60482	✓	✓	✓	✓			
	Pressure Switch (HA), -1.10	60467					✓		
	Pressure Switch (HA), -1.20	60390						✓	
	Pressure Switch (HA), -1.35	60472							✓
	Pressure Switch (HA), -1.40	60469							✓
	Pressure Switch (HA), -1.45	60468							✓
NS	Low Clearance Mounting Bracket	60470	(-2)	(-2)					
NS	Fuse, 3A - Ignition Module	60478	✓	✓	✓	✓	✓	✓	✓

Natural Gas to Liquid Propane Conversion Kit

Model Size 100/125/150.....F163070
Model Size 200.....F163071
Model Size 250NG.....F163072
Model Size 300/400.....F163073

Liquid Propane to Natural Gas Conversion Kit

Model Size 100/125/150.....F163074
Model Size 200.....F163075
Model Size 250NG.....F163076
Model Size 300/400.....F163077