

OPERATION, SERVICE AND MAINTENANCE MANUAL



HP SERIES AIR HEATER MODULE



IAS 9-90:1991 Gas-Fired, Desiccant Type Dehumidifiers and Air Conditioners

Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, And Gas-Fired Duct Furnaces [ANSI Z83.8:2016 Ed.6]

Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, And Gas-Fired Duct Furnaces [CSA 2.6:2016 Ed.6]

Gas-Fired Central Furnaces [ANSI Z21.47:2016 Ed.7]

Gas-Fired Central Furnaces [CSA 2.3:2016 Ed.7]

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 serious injury, death or property damage.

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 supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

This manual must be kept with the appliance for future reference.



The Air Heater modules covered by these instructions become a component of a “Listed” product, subject to the guidelines of application provided in these instructions and designated by the Certifying Agency in the Manufacturer’s Listing Procedure

The information provided in this manual applies to the air heater module, installed in the air handling / dehumidification unit and to its operation, maintenance, and service. Refer to the information provided by the equipment manufacturer for all other components.

Table of Contents

Inspection.....3

Unit Location / Clearances.....3

Venting and Combustion Air Supply

Outdoor Installation.....3, 4

Indoor Installation.....4, 5, 6

Separated Combustion7, 8

Gas Supply Piping and Connections.....8, 9

Gas Input.....9

Operation and Safety 9

Start-up..... 10

Failure to Ignite..... 10

Gas Pressures & Adjustment, Gas Valve..... 10, 11

Burner Flames..... 12

Shutdown.....12

Normal Operation.....12

Operating Controls13

Annual Maintenance & Inspection13, 14

Module Component ID14

Inspection on Arrival

1. Inspect equipment upon arrival in accordance with unit manufacturer's instructions, and follow their recommendations if any damage has occurred.
2. Prior to installation locate manufacturer's rating plate and verify that furnace is equipped for the available fuel supply and power supply at the point of installation.

Unit Location / Clearances

1. The heater module is listed for installation on the positive or negative side of the circulating air blower.
2. The furnace module in this unit **MUST BE INSTALLED IN A NON-COMBUSTIBLE** duct or cabinet and is not designed to have any portion of the heat exchanger exposed outside the duct or cabinet in which it is housed.
3. Be sure unit is located with respect to building construction and other equipment to provide ready access and clearance to access panels or doors that must be opened to permit adjustment and servicing.
4. **Do not** install unit in an area where it may be exposed to potentially **explosive or flammable vapors or combustible dust**.
5. **Do not** locate unit in areas where **corrosive vapors** (such as chlorinated, halogenated, or acidic) are present in the atmosphere or can be mixed with combustion air entering heater.

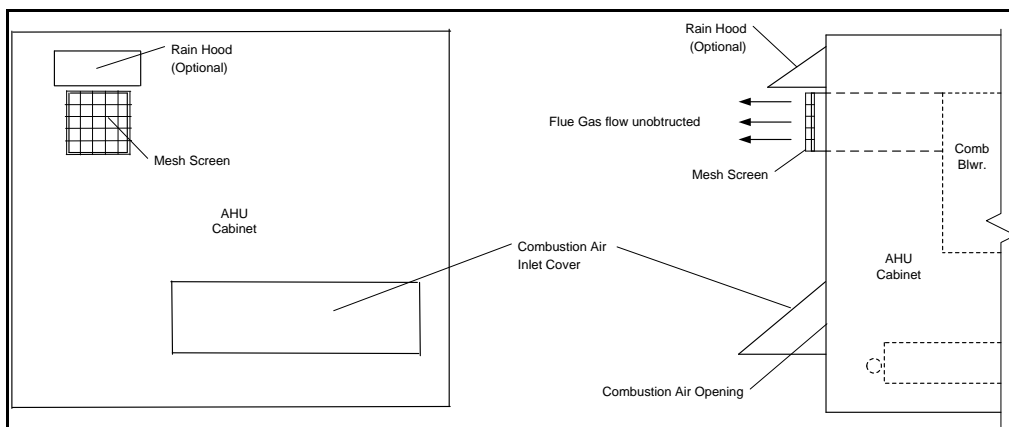
Venting and Combustion Air Supply

Outdoor Installation

The air heater module needs an ample supply of air for proper and safe combustion of the fuel gas. Do not block or obstruct air openings to the area where the heating unit is installed. Combustion air openings in the cabinet should be sized to provide 1 sq. in. of **free area** per 4000 Btuh of input. Combustion air inlet and flue gas outlet **must be located in the same pressure zone**. Provide at least 6 feet clearance to side of the unit, where the combustion air inlet or vent (flue) gas discharge is located, from walls, parapets or adjacent buildings or equipment.

The venting system is designed for direct discharge of flue gases to the outdoors. The vent discharge opening should be located to provide an unobstructed discharge to the outside. Vent duct should **pitch down** toward outlet, to insure that any condensate that occurs in vent duct drains away from combustion blower fan housing. The duct opening should be protected by a ½ in. x ½ in. (12mm x 12mm) mesh screen. An optional rain hood may be used over the discharge opening to prevent wind driven rain from entering the vent duct, but should not intersect the flue gas discharge path. See Figure 1 below.

Figure 1 – Outdoor Horizontal Venting

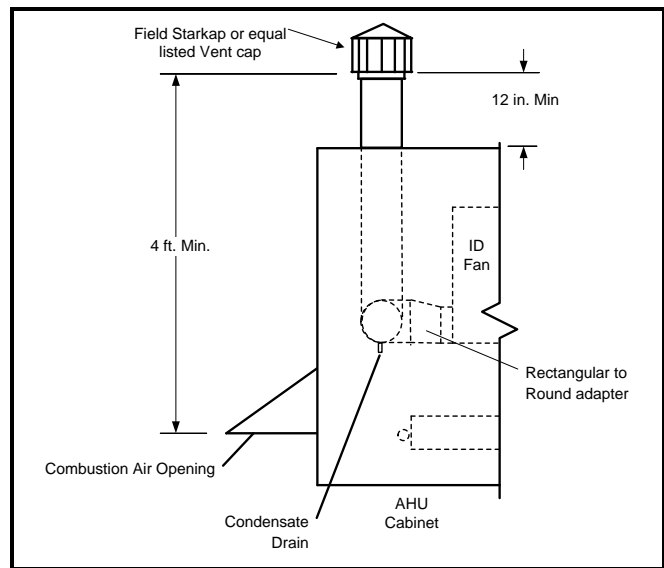
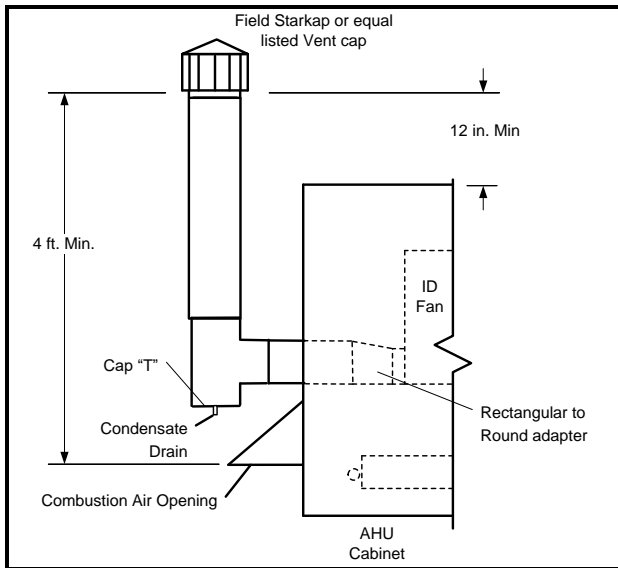


Outdoor units must be individually vented, unless provided with a special vent system by the manufacturer.

Where sufficient clearance for proper horizontal venting cannot be provided, or in jurisdictions requiring a 4 foot (1.23 m) separation between flue gas discharge and combustion air inlet, flue gases need to be vented vertically. Refer to Figure 2 for preferred venting arrangements.

Vent pipe must terminate at least 12 inches (457mm). above the cabinet. The vent must be located on the same side of the appliance as the combustion air inlet opening. Condensation in the vent pipe is likely during heater operation. A capped "T" fitting is used to collect condensate from the vent pipe. Provide a drain fitting at the base of "T" to remove condensate. Disposal of condensate must be in accordance with local codes and ordinances.

Figure 2 – Outdoor Vertical Venting



Do not locate unit near building ventilators or exhausts, or areas where corrosive chemical vapors can be drawn into combustion air supply.

Do not install units in locations where flue products can be drawn in the adjacent building openings such as windows, fresh air intakes, etc.

Indoor Installations

Location & Combustion Air

Locate heating unit to ensure an adequate supply of fresh air to replace air used in the combustion and ventilation process. The heating unit must be installed in a location with adequate clearances to provide for adequate combustion air space, service and inspection, and proper clearances from combustible construction. The heating unit shall be located in such a manner that it does not interfere with the circulation of air in the heated space.

All fuel burning equipment requires an air supply that enters into the combustion process and is then vented outdoors. Air must also enter the appliance location to replace the air exhausted through the vent system. Do not install appliance in a confined space without providing wall openings to the space. If building construction is such that the normal infiltration does not provide sufficient air for combustion and venting, outside air **must** be introduced. Install air openings that provide a total **free area** in accordance with the National Fuel Gas Code Z223.1 (NFPA 54) in the US. In Canada refer to Can/CGA-B149 Installation Code.

Venting Indoor Installations

Furnace modules must be connected to a venting system to convey flue gases outside of the heated space. . Proper venting of the heating units is the responsibility of the installer. Vent piping is supplied by others.

Vertically Vented Duct Furnaces – Category I (See Figure 3)

Non-condensing appliances operating at negative pressure are classified Category I. Vent systems must be sized and installed in accordance with ANSI Z223.1 (NFPA 54), Chapters 12 and 13. When custom designed systems provided by a vent system manufacturer are field installed, proper heating unit operation must be verified, including flue gas analysis of each heater.

1. Use single wall or double wall (Type B) vent pipe of diameters listed in Table 1.
2. Maximize the height of the vertical run of vent pipe. A minimum of **five (5) feet** (1.5m) of vertical pipe is required. The top of the vent pipe must extend at least **two (2) feet** (0.61m) above the highest point on the roof. (Use Listed Type B vent for external runs).
3. An approved weatherproof vent cap must be installed to the vent termination.
4. Horizontal runs should be pitched upward **¼” per foot** (21mm/m) and should be supported at **3 foot** (1m) maximum intervals.
5. Design vent pipe runs to minimize the use of elbows. Each 90o elbow is equivalent to **5 feet** (1.5m) to **7 feet** (2.13m) of straight vent pipe run.
6. Vent pipe should not be run through unheated spaces. If such runs cannot be avoided, insulate vent pipe to prevent condensation inside vent pipe. Insulation should be a minimum of **½”** (12.7mm) thick, foil faced material suitable for temperatures up to 500 oF.
7. Dampers must not be used in vent piping runs. Spillage of flue gases into the occupied space could result.
8. Vent connectors serving Category 1 heaters must not be connected into any portion of a mechanical draft system operating under positive pressure.

Figure 3 – Indoor Vertical Venting

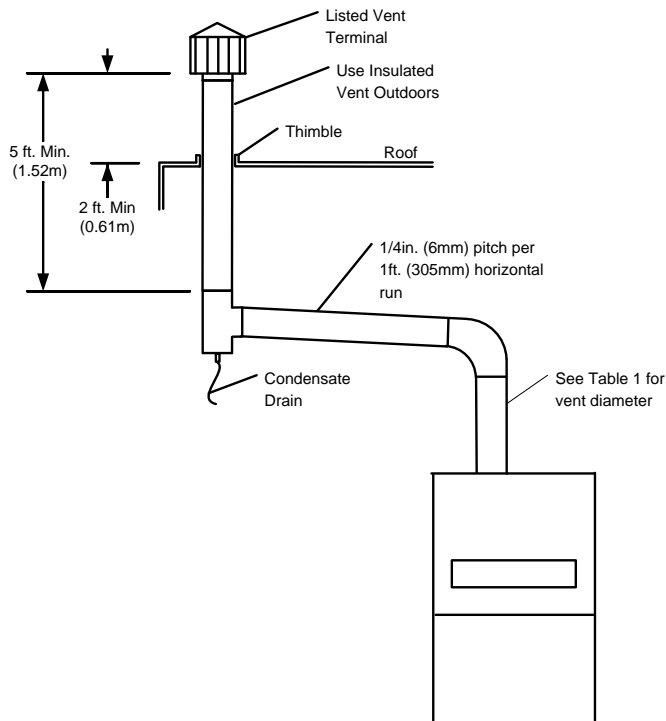


Table 1 – Vent Pipe Diameter

<u>Gas Input (Btuh)</u>	<u>Gas Input (W)</u>	<u>Diameter of Flue Vent</u>
50,000 – 149,999	21,980 – 43,958	5” (126 mm)
150,000 – 400,000	43,960 – 117,228	6” (152 mm)
401,000 – 600,000	117,229 – 175,842	7” (178mm)

Horizontally Vented Duct Furnaces -Category III System (See Figure 4)

Pressures in Category III venting systems are positive and therefore care must be taken to avoid flue products from entering the heated space. **Use only Category III vent materials listed to UL1738 / ULC S636 for vent pipe and fittings.**

All field installed vent pipe and fittings must be from the same manufacturer. DO NOT intermix vent system parts from different vent manufacturers. Follow instruction provided with approved venting materials used.

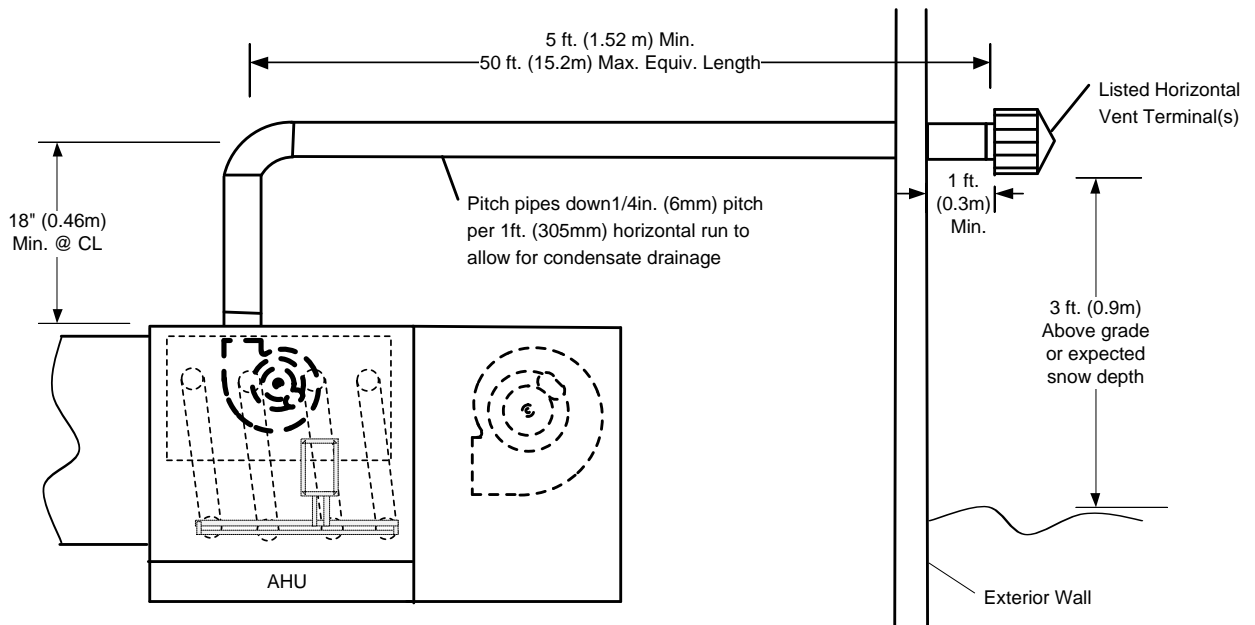
All vent pipe joints must be sealed to prevent leakage into the heated space. Follow instruction provided with approved venting materials used. See Table 1 above for proper sizing of vent pipe diameter.

The **total equivalent length** of vent pipe must not exceed **50 ft. (15.25m)**. Equivalent length of 5 or 6 in. 90o elbows is 5 ft. (1.5 m), and for a 7in. 90o elbow is 7 feet (2.13 m). 45o Elbows are half of the equivalent length of 90o.

The vent system must also be installed to prevent collection of condensate. Pitch horizontal pipe runs downward **¼ in. per foot** (21mm per meter) toward the outlet to permit condensate drainage. Insulate vent pipe exposed to cold air or routed through unheated areas. Insulate vent pipe runs longer than **10 ft. (3m)**. Insulation should be a minimum of **½ in. (12mm)** thick foil faced material suitable for temperatures up to 500 oF. Maintain **6in. (152mm)** clearance between vent pipe and combustible materials.

A Vent Cap listed for horizontal venting or Tee fitting termination must be provided. Vent cap inlet diameter must be same as the required vent pipe diameter. The vent terminal must be at least **12 in. (305mm)** from the exterior wall that it passes through to prevent degradation of building material by flue gases. The vent terminal must be located at least **1 ft. (305mm)** above grade, or in snow areas, at least **3 ft. (1m)** above snow line to prevent blockage. Additionally, the vent terminal must be installed with a minimum horizontal clearance of **4 ft. (1.2m)** from electric meters, gas meters, regulators or relief equipment.

Figure 4 – Indoor Horizontal Venting



EACH APPLIANCE MUST HAVE ITS OWN INDIVIDUAL VENT PIPE AND TERMINAL.

Do not connect vent system from horizontally vented units to other vent systems or a chimney.

Through the wall vents shall not terminate over public walkways, or over an area where condensate or vapor could create a nuisance or hazard. Provide Vent termination clearances to building or structure features as follows:

<u>Structure</u>	<u>Minimum Clearance</u>
Door, Window or gravity inlet	4 ft. (1.2 m) below
	4 ft. (1.2 m) horizontally
	1 ft. (305 mm) above
Forced air inlet within 10 ft. (3m)	3 ft. (.91 m) above
Adjoining building or parapet	6 ft. (1.8 m)
Adjacent public walkways	7 ft. (2.1 m) above grade

Two-Pipe Separated Combustion Systems

The furnace must be mounted with the burner section in a reasonably airtight vestibule compartment, as these systems provide combustion air from outside the heated space and vent the products of combustion outdoors. Additionally the heating unit must include the following:

- 1.) For vent pipe and fittings conveying flue gases, **use only Category III vent materials listed to UL1738 / ULC S636 from same vent manufacturer. DO NOT** intermix vent system parts from different vent manufacturers. Follow instruction provided with approved venting materials used.
- 2.) For combustion air piping, use of 24 gauge galvanized steel single wall pipe is acceptable. Tape joints with aluminum foil tape and secure with corrosion resistant screws.
- 3.) Inlet air pipe must be same size as exhaust vent pipe based on input ratings.
- 4.) Exhaust and vent piping must not exceed a combined **50 equivalent feet** in length.
- 5.) See Figure 5 for recommended vent terminations and air inlet fittings for venting configuration. Proper installation of air inlet and flue gas exhaust piping are essential to proper operation of the heat module.

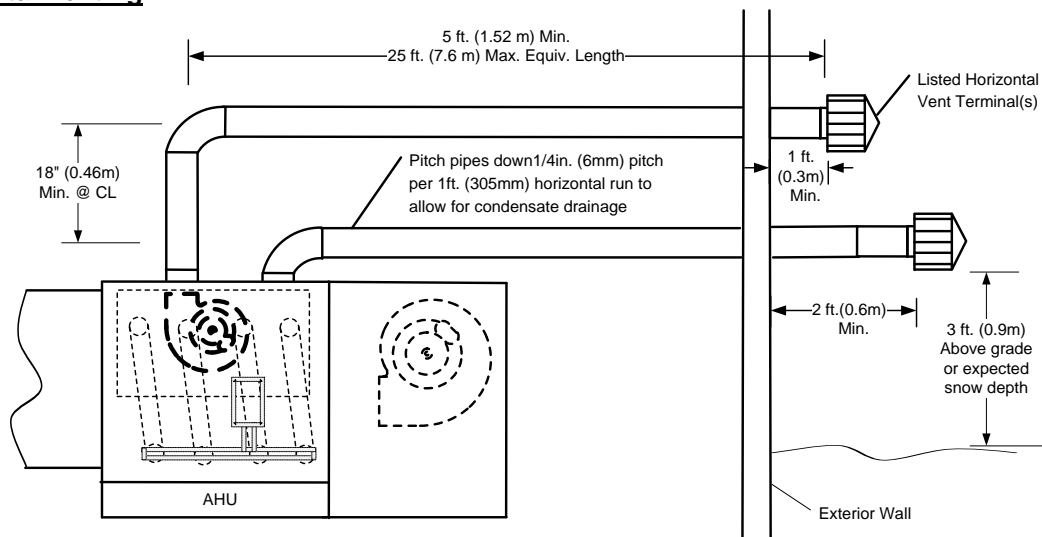
NOTE: The inlet and outlet terminals must be located in the same pressure zone to provide for safe appliance operation.

Separated combustion systems may not be common vented. Each heater must have its own individual air supply and flue gas exhaust vent.

If vent system application does not meet the criteria outlined in the diagrams and information provided, contact a manufacturer of venting systems and materials for assistance with system design.

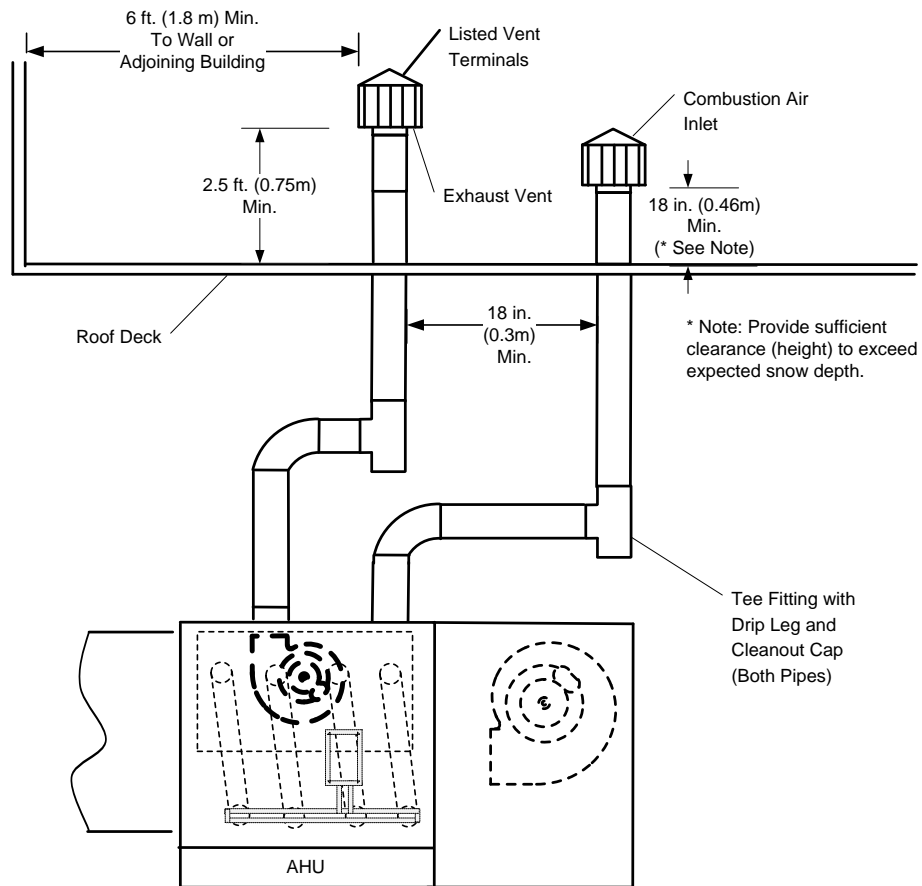
Figure 5 – Separated Combustion Venting

Horizontal Venting



Note: Be sure that the vent cap used for horizontal venting applications is approved for horizontal application. Certain manufacturer's vent terminals are approved for vertical installation only.

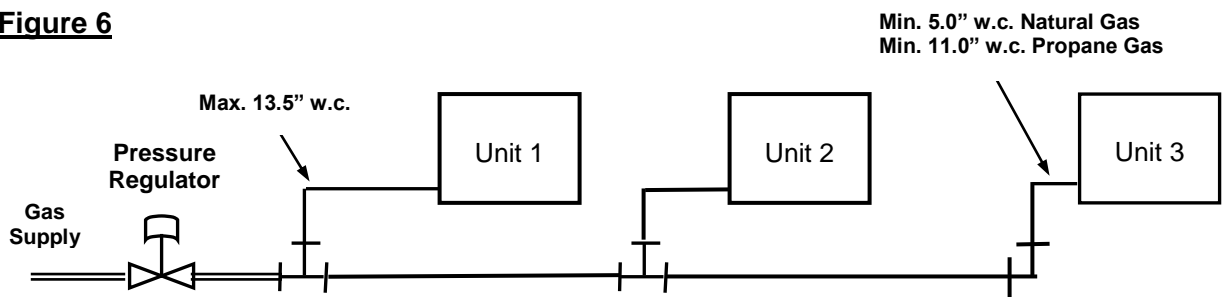
Vertical Venting



Gas Supply, Piping and Connections

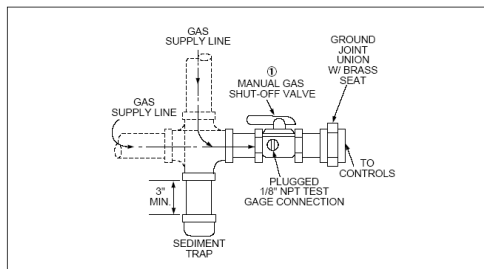
1. Installation of piping must conform with local building codes and ordinances, or in the absence of local codes with ANSI Z223.1 the National Fuel Gas Code. In Canada, installation must be in accordance with CAN/CGA –B149.1 for Natural gas and B149.2 for propane units.
2. **Properly support gas valve with back-up wrench**, during supply pipe installation.
3. Gas piping must be sized for the total Btu input of all units (heaters) serviced by a single supply.
4. Be sure that gas regulators servicing more than one heater have the proper pipe and internal orifice size for the total input of all heaters serviced by the regulator.
5. **Minimum** inlet gas pressure required for **Natural gas** operation is **5.0 "w.c.** and for **Propane (LP) gas** is **11.0" w.c.** Maximum inlet pressure for either gas is **13.5" w.c.**, with the furnace operating.
6. A 1/8" NPT tap is provided on the inlet side of the gas valve to the heater (See Pg. 11). A fitting suitable for connection to a pressure gauge capable of measuring gas pressure should be connected to each heater serviced by a single regulator so that gas pressure at each heater can be measured with all heaters in operation. (See Figure 6)

Figure 6



7. A drip leg (sediment trap) and a manual shut off valve must be provided immediately upstream of the gas control on the heating unit. To facilitate servicing of unit, installation of a union is recommended. (See Figure 7)

Figure 7



The individual duct furnace inlet gas supply pipe connection size is 3/4" NPT for gas inputs up to 400,000 Btuh and 1" NPT for gas inputs between 401,000 and 600,000 Btuh for all control systems.

WARNING !

1. All field gas piping must be pressure / leak tested prior to operation. NEVER use and open flame to check for leaks. Use a soap solution or other leak detecting solution for testing.
2. Gas pressure to appliance controls must never exceed 13.5" w.c. (1/2 PSI)

WARNING !

1. When pressure testing at 1/2 PSI or less, close the manual shut-off valve on the appliance before testing.
2. When pressure testing gas supply line at 1/2 PSI or higher, close manual gas valve and disconnect heater from supply line to be tested. Cap or plug the supply line.

Gas Input Rate

The correct heat capacity of the heater module is controlled by the burner orifices and the gas manifold pressure. The manifold pressure is factory set, but should be checked at the time of start-up as described below.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

Operating & Safety Instructions

1. This heater module does not have a pilot. It is equipped with a direct spark ignition device that automatically lights the gas burner. DO NOT try to light burners by hand.
2. **BEFORE OPERATING**, leak test all gas piping up to heater gas valve. Smell around the unit area for gas. **DO NOT** attempt to place heater in operation until source of gas leak is identified and corrected.
3. Use only hand force to push and turn the gas control knob to the "ON" position. **NEVER** use tools. If knob does not operate by hand, replace gas valve prior to starting the unit. Forcing or attempting to repair the gas valve may result in fire or explosion.
4. Do not attempt to operate unit, if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to trying to start the unit.

Start-up

1. Turn thermostat or temperature controller to its lowest setting
2. Turn off gas supply at the manual shut-off valve
3. Turn off power to the unit at the disconnect switch.
4. Remove access panel or open door to unit vestibule housing the gas heater.
5. Move gas control knob to "Off" position.
6. Install a tapped fitting for attachment to a manometer, or other gauge suitable for 14.0" w.c., in the inlet pressure tap, and for 10.0" w.c., in the manifold pressure tap.
7. Wait 5 minutes for any gas to clear out. If you smell gas, see Step 2 above and correct leak. If you don't smell gas or have corrected any leaks, go to the next step.
8. Turn gas control knob to "On" position
9. Open all manual gas valves
10. Turn power on at disconnect switch
11. Set thermostat or controller to its highest position to initiate call for heat and maintain operation of unit.*
12. Draft Inducer will run for a 15 to 30 second pre-purge period (See Sequence of Operation provided)
13. At the end of the pre-purge the direct spark will be energized and gas valve will open
14. Burners ignite.

***Note:** If modulating controls are provided on heater module, a separate set-up sheet is included with this manual. Refer to that set-up sheet for complete start-up instructions

Failure to Ignite

1. On the initial start-up, or after heating unit has been off long periods of time, the first ignition trial may be unsuccessful due to need to purge air from manifold at start-up.
2. If ignition does not occur on the first trial, the gas and spark are shut-off by the ignition control and the control enters an inter-purge period of 15 seconds, during which the draft inducer continues to run.
3. At the end of the inter-purge period, another trial for ignition will be initiated.
4. Control will initiate up to three ignition trials on a call for heat before lockout of control occurs.
5. Control can be brought out of lockout by turning thermostat or controller to its lowest position and waiting 5 seconds and then turning back up to call for heat. Controls provided will automatically reset after one hour and initiate a call for heat.

Manifold Pressure Adjustment

A pressure tap is provided in each furnace module manifold for measuring the gas manifold pressure. Manifold pressure must be checked at start-up and during any service or maintenance.

All control systems require a **manifold pressure of 3.40 to 3.50 in. w.c. at maximum input on Natural Gas**, and 10.0 in. w.c. on Propane Gas at rated input. See **Fig. 7** for Gas Valve adjustment locations.

For two stage and modulating control applications, verify proper low fire adjustments as outlined in the "Sequence of Operation" sheet provided in the instruction package.

Figure 8A – Honeywell VR8305Q Gas Valve

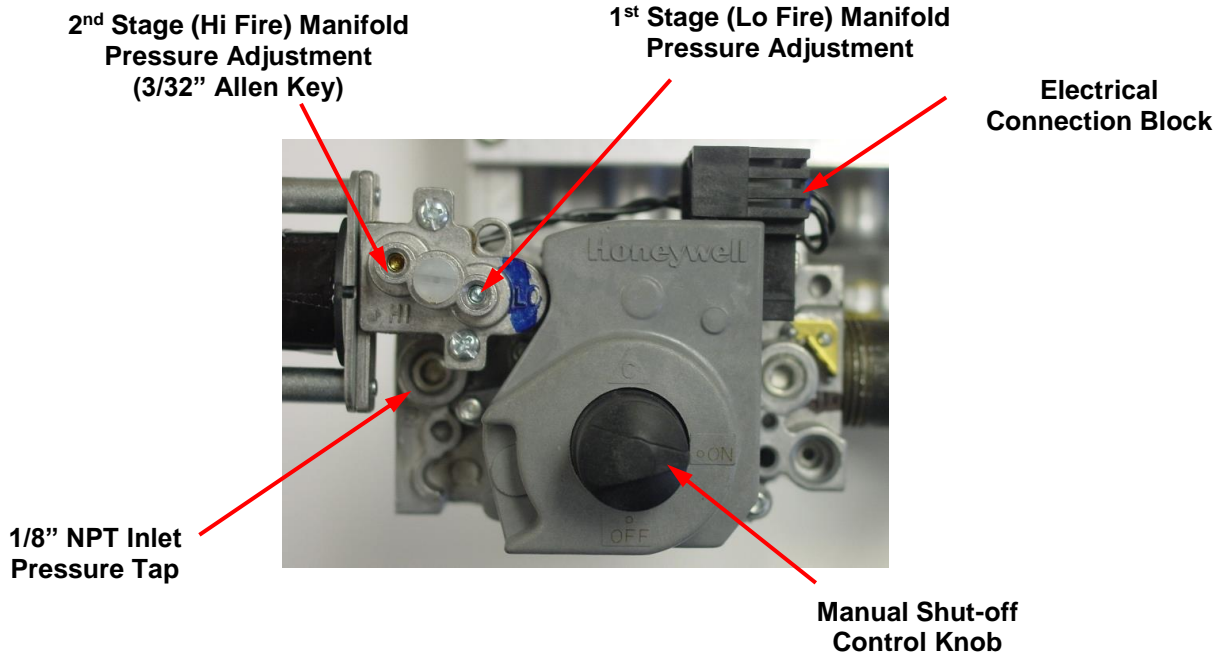


Figure 8B – White Rodgers 36H Gas Valve

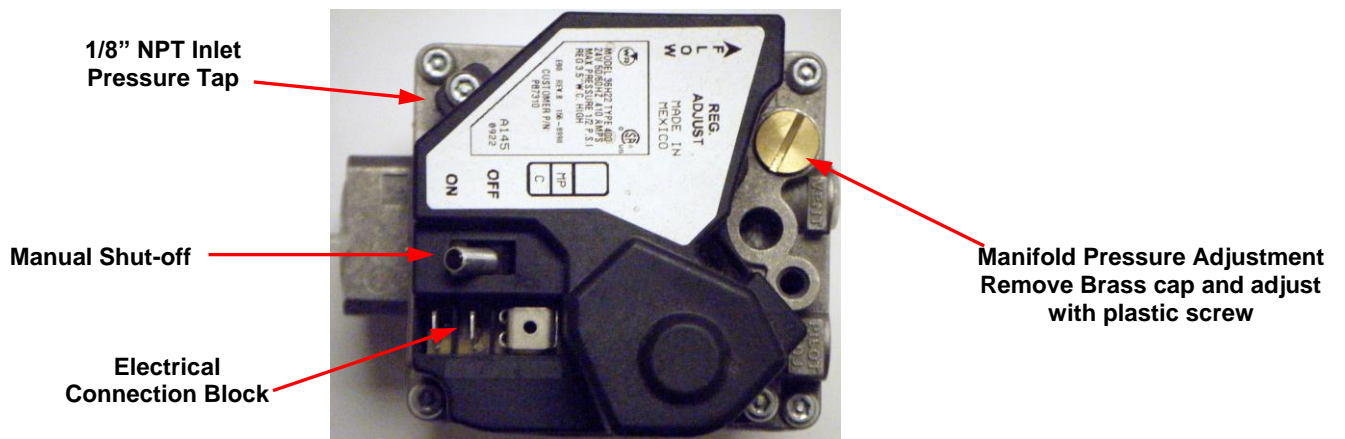
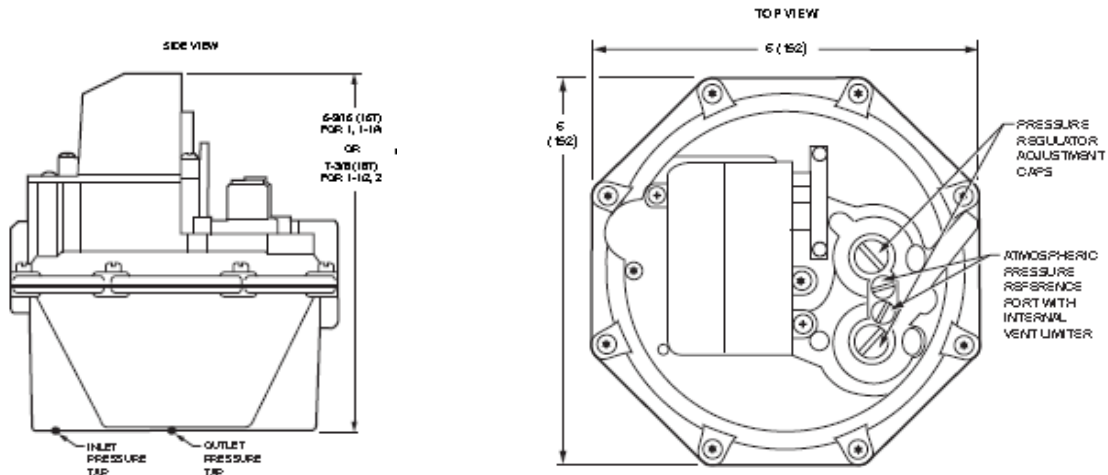


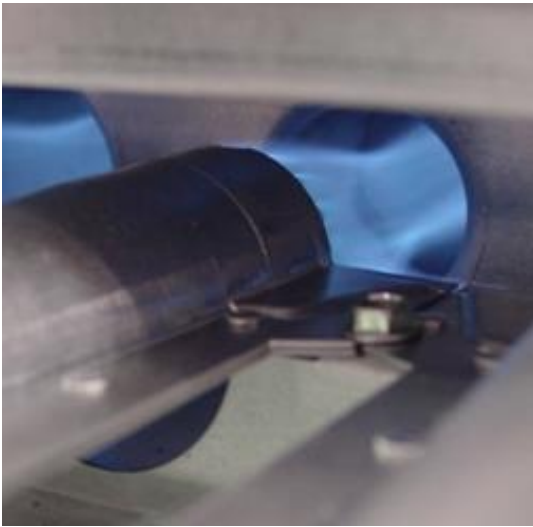
Figure 8C – Honeywell V8944 Gas Valve



Burner Flames

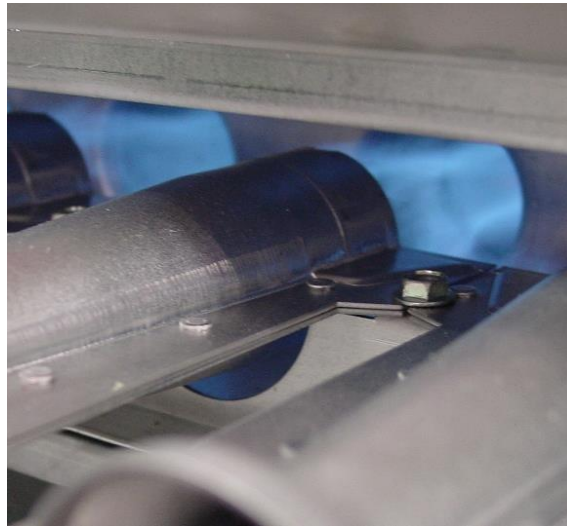
Prior to completing the start-up, check the appearance of the main burner flame. See Figures below for flame characteristics of properly adjusted Natural gas systems.

Figure 9A



Burner Flame @ Start-up 1.2" w.c. Manifold
Pressure Draft Inducer – High Speed

Figure 9B



Burner Flame @ High Fire 3.5" w.c. Manifold
Pressure Draft Inducer – High Speed

1. The burner flame should be predominately blue in color and well defined and centered at the tube entry as shown in Figures above. Distorted flame or yellow tipping of natural gas flame, or a long yellow flame on propane, may be caused by lint and dirt accumulation inside burner or at burner ports, at air inlet between burner and manifold pipe, or debris in the main burner orifice. Soft brush or vacuum clean affected areas.
2. Poorly defined, substantially yellow flames, or flames that appear lazy, indicate poor air supply to burners or excessive burner input. Verify gas supply type and manifold pressure with rating plate.
3. Poor air supply can be caused by obstructions or blockage in heat exchanger tubes or vent discharge pipe. Inspect and clean as necessary to eliminate blockage. Vacuum any dirt or loose debris. Clean heat exchanger tubes with stiff brush. Poor flame characteristics can also be caused by undersized combustion air openings or flue gas recirculation into combustion air supply. Increase air opening size or re-direct flue products to prevent recirculation.
4. Reduced air delivery can also be the result of fan blade slippage, dirt accumulation in the fan blade or low voltage to draft inducer motor. Inspect draft fan assembly and be sure fan blade is secure to motor shaft. Check line voltage to heater.

Shutdown

1. Set thermostat or controller to lowest setting.
2. Turn off electrical supply to unit at disconnect switch.
3. Turn off manual gas supply.
4. Disconnect manifold and inlet pressure taps and re-install pipe plugs
5. Replace vestibule access panel or close door.

Normal Operation

1. Turn on electrical supply to unit at disconnect switch
2. Turn on manual gas supply
3. Set Thermostat or Temperature controller to desired temperature.
4. Information outlining the normal Sequence of Operation and Wiring Diagram for the control system supplied with the furnace model is enclosed with this instruction.

Operating Controls

Ignition control

Direct spark ignition with flame supervision and 100% safety shut-off, multiple ignition trials on call for heat, pre-purge and post-purge and auto reset on lockout after one (1) hour. Control incorporates a diagnostic LED.

Refer to Sequence of Operation and Control Diagnostic data sheets provided in the instruction package for a detailed description of the control features, operation and troubleshooting for the model control installed.

Air Pressure Switch

A combustion air pressure switch is provided as part of the control system to verify airflow through draft inducer by monitoring the difference in pressure between the draft inducer and the atmosphere. If sufficient negative pressure is not present, indicating lack of proper air movement through heat exchanger, the switch opens shutting off gas supply through the ignition control module. On units with two speed draft inducer operation, a dual air pressure switch is used, monitoring high and low speed pressures. The air pressure switches have fixed settings and are not adjustable.

Rollout Switch (Manual Reset)

The heater module is equipped with manual reset rollout switch(es) in the event of burner flame rollout. The switch will open on temperature rise and shut-off gas supply through the ignition control module. Flame rollout can be caused by insufficient airflow for the burner firing rate (high gas pressure), blockage of the vent system or in the heat exchanger. The furnace module should not be placed back in operation until the cause of rollout condition is identified. The rollout switch can be reset by pressing the button on top of the switch.

High Limit Switch

The heater module is equipped with a fixed temperature high limit switch mounted on the vestibule panel that shuts off gas to the heater through the ignition control module in the event of high temperatures in the air tunnel due to low circulating airflow over the heat exchanger. Determine the cause of the reduced air flow and correct.

Note: The limit is an automatic recycle type and on circulating air fan failure, heater will cycle on limit resulting in possible heat build-up. Prolonged operation under this condition can cause heat damage to components and cabinet structure.

Circulating Airflow Proving Switch

The installation of an airflow proving switch in the cabinet or duct is recommended, to prevent operation of the gas heater in the event of failure of the circulating air fan or low airflow caused by dirty or blocked filters or restriction of the air inlet or outlet to the unit. The air switch should be located upstream of the heating section in the duct or cabinet.

Maintenance

Air Heater Module Inspection

Turn off all electrical power to the unit before inspection and servicing.

The heater module should be inspected annually by a qualified service agency. The condition of the burners, heat exchanger, draft inducer, vent system, operating controls and wiring should be determined. Check for obvious signs of deterioration, accumulation of dirt and debris and any heat or water related damage. Any damaged or deteriorated parts should be replaced before the unit is put back into service.

1. Clean burners, heat exchanger, draft inducer and vent ducts as outlined on Page12.
2. Check Heat Exchanger for cracks. If any are present, replace heat exchanger before putting unit back into service.
3. Check the attachment point of the furnace module to the cabinet or ducts to verify that they are air tight.
4. Check the automatic gas valve to insure that the gas valve seat is not leaking.
5. Check connection terminals to make sure they are safe and inspect the wiring for any deterioration.
6. Label all wires prior to disconnection when servicing unit. Wiring errors can cause improper or dangerous operation. Verify proper operation after servicing.

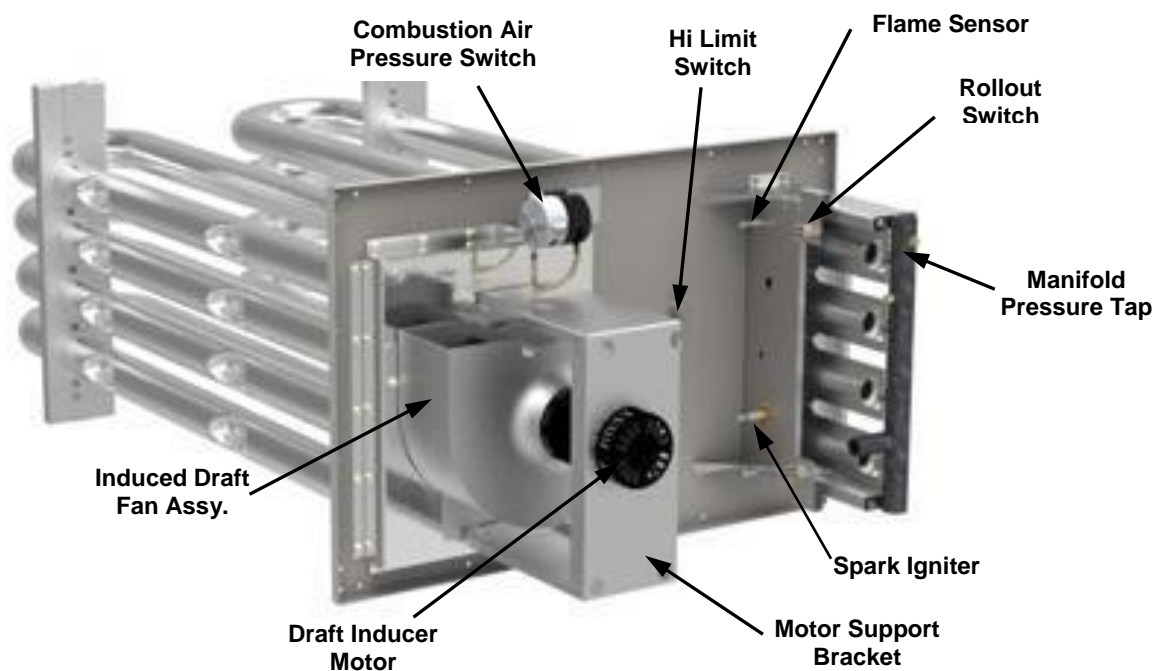
CAUTION !

If any of the original wiring needs to be replaced it must be replaced with wiring materials suitable for 105°C.

Air Heater Module Operation Check

1. Turn on power to the unit and set thermostat or heat controller to call for heat, allowing furnace module to operate.
2. Check for proper start-up and ignition as outlined in "Start-Up" on Page 10.
3. Check the appearance of the burner flame (See Figure 9A and 9B on Page 12).
4. Return thermostat or heat controller to normal setting.
5. Refer to the appliance manufacturer's instructions for annual maintenance procedures on the complete unit.

Module Component ID



Heatco Inc.
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Cartersville, Ga. 30120