REZNOR®

Revision: DTHG-IOM (10-26) 2001162-0

Supersedes: — (Original Version)

GAS-FIRED DOCKED TRAILER HEATER INSTALLATION, OPERATION, AND MAINTENANCE

MODEL DTHG



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

- **Failure to follow safety warnings exactly could result in serious injury, death, or property damage.**
- **Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.**
- **Installation and service must be performed by a qualified installer, service agency, or the gas supplier.**
- **Be sure to read and understand the installation, operation, and service instructions in this manual.**
- **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.**

DO NOT DESTROY. PLEASE READ CAREFULLY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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GENERAL INFORMATION

- This unit has been tested for capacity and efficiency so as to provide many years of safe and dependable comfort providing it is properly installed and maintained. With regular maintenance, this unit will operate satisfactorily year after year. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards.
- To achieve optimum performance and minimize equipment failure, it is recommended that periodic maintenance be performed on this unit. The ability to properly perform maintenance on this equipment requires certain tools and mechanical skills.
- The unit is designed to be mounted in the top of a shipping dock doorway to provide comfort for personnel unloading shipping trailers.

Certification

This unit is listed by Intertek for use in industrial and commercial installations in the US and Canada.

Installation Codes

This unit must be installed in accordance with local building codes. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.

Warranty

Refer to the limited warranty form in the literature bag provided with the unit. The warranty is void if:

- Wiring is not in accordance with the diagram furnished with the unit.
- The unit is installed without proper clearance to combustible materials.
- The air delivery system is modified.

Important Safety Information

Please read all information in this manual thoroughly and become familiar with the capabilities and use of your appliance before attempting to operate or maintain this unit. Pay attention to all dangers, warnings, cautions, and notes highlighted in this manual. Safety markings should not be ignored and are used frequently throughout to designate a degree or level of seriousness.

DANGER: A danger statement describes a potentially hazardous situation that if not avoided, will result in severe personal injury or death and/or property damage.

WARNING: A warning statement describes a potentially hazardous situation that if not avoided, can result in severe personal injury and/or property damage.

CAUTION: A caution statement describes a potentially hazardous situation that if not avoided, can result in minor or moderate personal injury and/or property damage.

NOTE: A note provides important information that should not be ignored.

⚠ DANGER ⚠

- **Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances.**
- **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 unit before shutting off the electrical supply.**
- **Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and replace any gas control that has been under water.**
- **Installation should be done by a qualified agency in accordance with these instructions. The qualified service agency installing this heater is responsible for the installation.**

⚠ WARNING ⚠

- **This appliance is not intended for use by persons with reduced physical, sensory, or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.**
- **Children should be supervised to ensure that they do not play with the appliance.**

⚠ CAUTION ⚠

To prevent damage to the unit or to its internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not overtighten!

Weights

⚠ DANGER ⚠

Ensure that any lift or hoist used to lift the unit is adequate to support the weight of the unit with packaging (approximately 429 pounds (195 kg)). Ensure that the support structure for mounting the unit is adequate to support the weight of the unit without packaging (approximately 327 pounds (149 kg)).

Dimensions

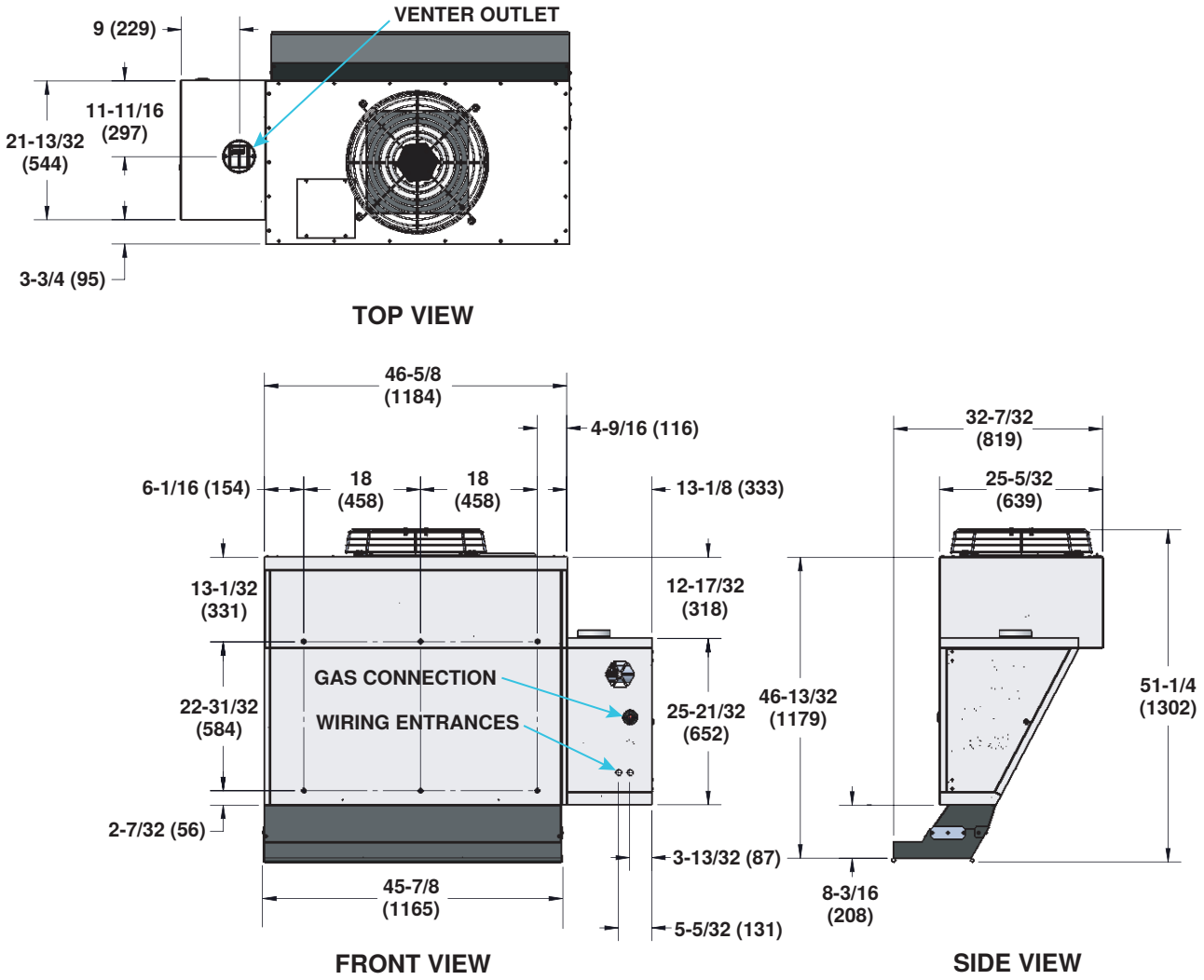


Figure 1. Dimensions

Clearances

The unit must be located so that the clearances listed in **Table 1** are provided for with regards to inspection and service and for proper spacing from combustible construction. Clearance to combustibles is defined as the minimum distance from the unit to a surface or object for which it is necessary to ensure that a surface temperature of 90°F (50°C) above the surrounding ambient temperature is not exceeded. Refer to the dimensions shown in **Figure 1** when determining clearances to combustibles.

Table 1. Clearances to Combustibles

Unit Surface	Minimum Clearance (Inches (mm))
Top (from fan guard)	36 (915)
Control side	21 (534)
Non-control side	1 (26)
Back (non-discharge side)	
Front (discharge side)	2 (51)
Bottom*	1 (25)
*Suspend the heater so that the bottom is a minimum of 5 feet (1 .5 meters) above the floor	

Unit Location

⚠ WARNING ⚠

While in operation, the unit is hot and may cause burns if touched. Suspend the heater a minimum of 5 feet (1.5 meters) above the floor.

⚠ CAUTION ⚠

- **Gas-fired heaters should not be used in an application where the heated space temperature is below 40°F (4°C). Operating under low ambient conditions may cause condensation to form in the heat exchanger.**
- **Do not locate the heater where it may be exposed to water spray, rain, or dripping water.**

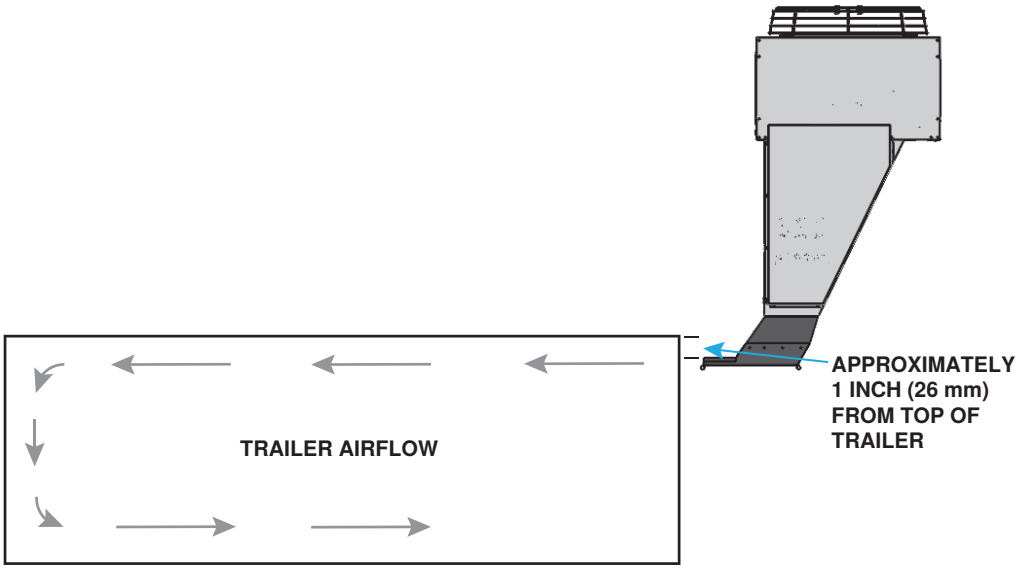


Figure 2. Unit Location

Halogenated Hydrocarbons

Halogenated hydrocarbons are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are used in refrigerants, cleaning agents, and solvents and are heavier than air, a fact that should be kept in mind when determining the installation location of heaters and building exhaust systems.

⚠ CAUTION ⚠

CORROSION HAZARD: Halogenated hydrocarbons, when exposed to flame, precipitate with any condensation present in the heater to form hydrochloric acid, which readily attacks all metals, including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. An outside air supply MUST BE provided to the burner whenever the presence of these compounds is suspected.

Combustion Air Requirements

⚠ WARNING ⚠

Connecting outside air ducts voids the warranty and could cause hazardous operation. Do not install a unit in a confined space without providing wall openings leading to and from the space.

The unit is designed to take combustion air from the space in which the unit is installed and is not designed for connection to outside combustion air intake ducts. The unit must be supplied with the air that enters into the combustion process and is then vented to the outdoors. Sufficient air must enter the equipment location to replace that which is exhausted through the heater vent system. Under all conditions, enough air must be provided to ensure that there will not be a negative pressure condition within the equipment room or space. Requirements for combustion air and ventilation air depend upon whether the unit is located in a confined or unconfined space. A ***confined*** space is defined as a space whose volume is <50 cubic feet per 1,000 BTUh of the installed appliance input rating. An ***unconfined*** space is defined as a space whose volume is ≥50 cubic feet per 1,000 BTUh of the installed appliance input rating. For confined space installation, provide openings (depending on the combustion air source) near the floor and ceiling for ventilation and air for combustion, as shown in **Figure 3** and as listed in **Table 2**.

NOTE: For further details on supplying combustion air to a confined space, refer to the *National Fuel Gas Code* (ANSI Z223.1/NFPA 54, latest edition).

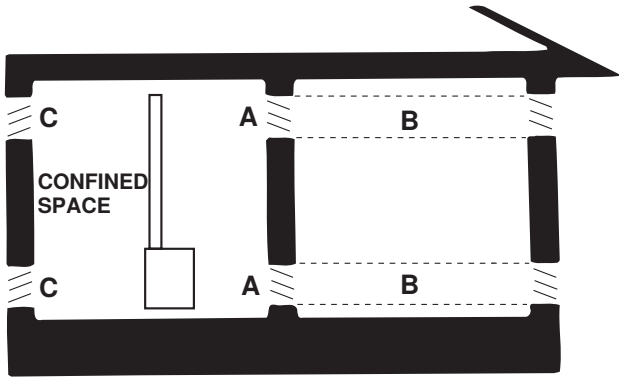


Figure 3. Confined Space Combustion Air Openings (Refer to Table 2)

Table 2. Determining Confined Space Combustion Air Requirements

Letter*	Air Source	Required Opening Size	Calculate Combustion Air Requirements
A	Air inside building	1 square inch free area per 1000 BTUh	Add total BTUh of all appliances in confined space and divide by figures at left for square inch free area size of each (top and bottom) opening
		Never <100 square inches free area for each opening	
B	Outside air through duct	1 square inch free area per 2000 BTUh	
C	Direct outside air	1 square inch free area per 4000 BTUh	

*See **Figure 3**.

INSTALLATION

Unpacking and Inspection

The unit was test-operated and inspected at the factory prior to crating and was in operating condition. If, upon removing it from its crate, the unit has been found to have incurred any damage in shipment, document the damage with the transporting agency and contact an authorized Factory Distributor. If you are an authorized Distributor, follow the FOB freight policy procedures.

Pre-Installation Checklist

- ❑ Check the rating plate for the gas specifications and electrical characteristics of the heater to ensure that they are compatible with the gas and electric supplies at the installation site.
- ❑ Read this manual and become familiar with the installation requirements of your particular heater.
- ❑ If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation.
- ❑ Before beginning, make preparations for necessary supplies, tools, and manpower.
- ❑ Check to see if there are any field-installed options (refer to **Table 3**) that need to be assembled/installed prior to unit installation. Ensure that all options ordered are at the installation site.

Table 3. Field-Installed Options

Option	Description
CC1	Vent cap, alumnized steel
CC21	Vent cap, stainless steel
CE1	Manual shutoff valve
DJ20	High-elevation pressure switch

Unit Mounting

⚠ DANGER ⚠

- **Before suspending the unit, check the supporting structure to be used to verify that it has sufficient load-carrying capacity to support the weight of the unit (refer to Clearances section). DO NOT add additional weight to a suspended unit.**

NOTE: The unit is shipped secured to the shipping pallet. Keep the unit secured to the pallet until it is lifted and secured to its mounting location.

1. Remove screws that secure control compartment (see **Figure 4**) access panel screwlock door and remove door.

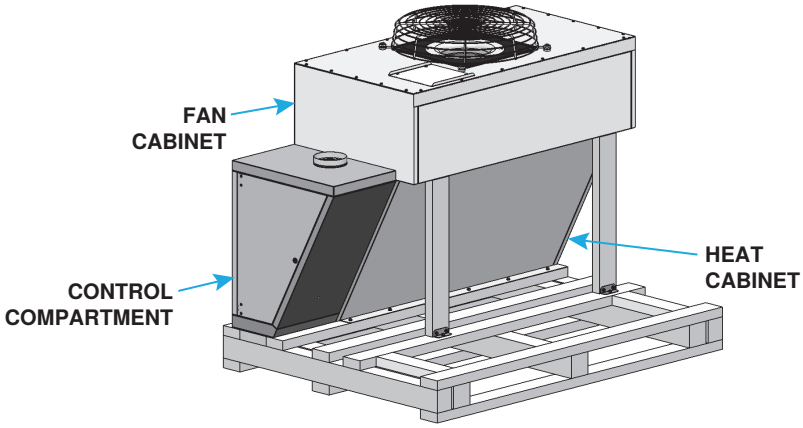


Figure 4. Shipping Pallet with Unit

NOTE: It is recommended that the unit be mounted using the mounting hardware provided, but it can be mounted using field-supplied hardware.

2. Install mounting rails with wall mounts on unit as shown in **Figure 5**. For optimum dispersion of heat in trailer, install rails so that unit is mounted as far left or right in door opening width as is possible. Secure rails to unit using provided hardware—3/8-inch flat washers and 3/8-16 × 3-inch bolts—in nutserts in unit's six rail mount holes as shown.

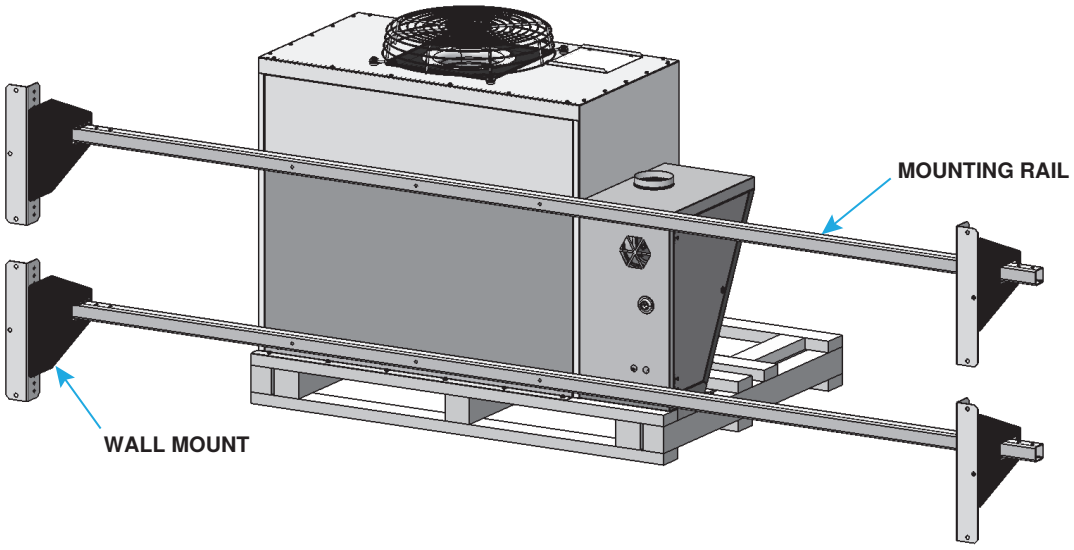


Figure 5. Mounting Rails and Wall Mounts

NOTE: Air dispersion is improved by mounting the unit as far left in the door opening width as is possible. Mounting rails are designed so that adjustment is possible left to right. Wall mounts are designed so that adjustment is possible front to back. The location of the wall mounts must be determined and the unit must be secured to the wall before the canvas discharge nozzle is installed on the unit.

3. Determine unit location so that top of canvas discharge nozzle will be approximately 1 inch (26 mm) below top of docked trailer door opening (see **Figure 2**). Refer to **Figure 6** for mounting hole dimensions.

Unit Mounting—Continued

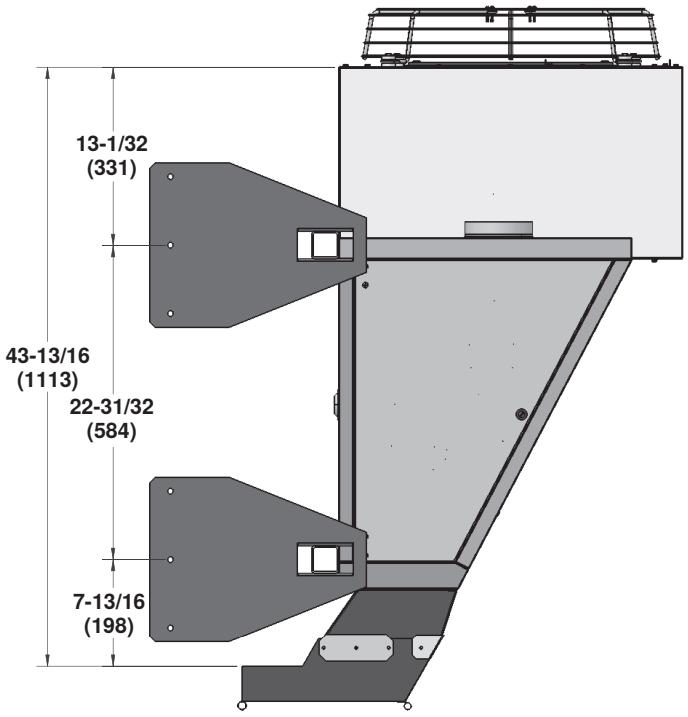


Figure 6. Determining Unit Location

NOTE: The wall mounts are secured to the inside angle brackets.

4. Using suitable lift or hoist, lift unit into position determined in step 3 and mark mounting hole locations for inside angle brackets and outside wall plates (see **Figure 7**). Drill holes through wall as necessary and secure angle brackets and wall plates using field-supplied 1/2-inch nuts, lockwashers, and bolts.

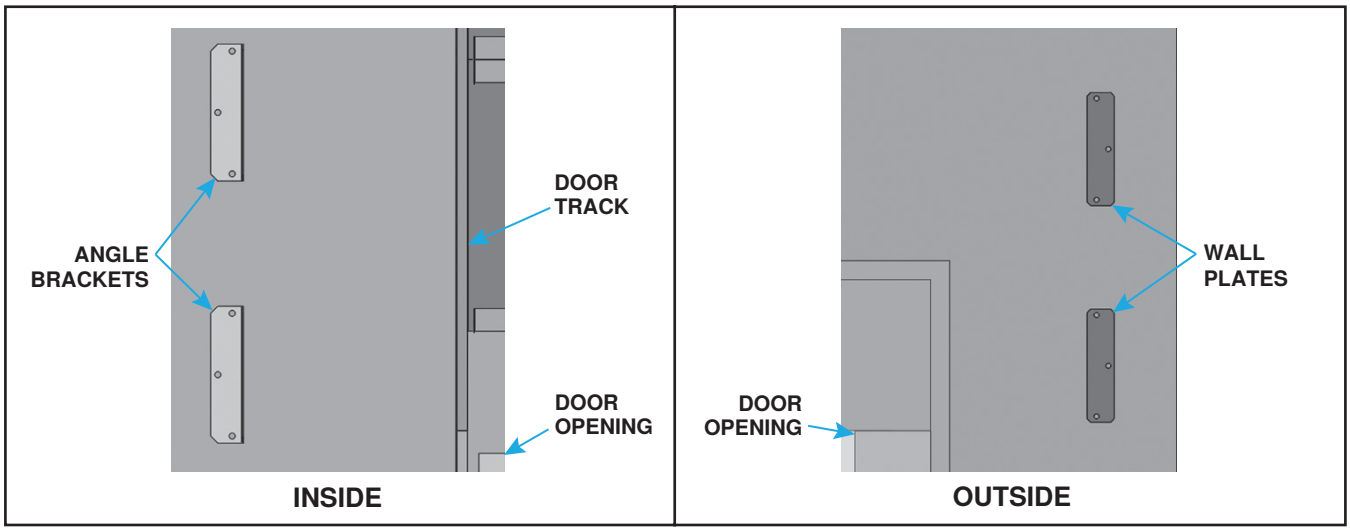


Figure 7. Inside Angle Brackets and Outside Wall Plates

5. Secure wall mounts to inside angle brackets using provided hardware: 3/8-16 × 1-inch bolts and 3/8-inch flat washers, lockwashers, and hex nuts.
6. Secure wall mounts to mounting rails using provided hardware: 3/8-16 × 3-inch bolts and 3/8-inch flat washers, lockwashers, and hex nuts.
7. Remove screws that secure shipping pallet and its vertical support to unit and remove pallet and vertical support. Re-install vertical support screw in unit.
8. Using #10 screws, install discharge duct to bottom of unit as follows (see **Figure 8**).
   a. First, install front duct panel.
   b. Second, install rear duct panel.
   c. Third, install side duct panels.
9. Install and secure canvas discharge nozzle (see **Figure 8**) to duct using backing plates and #10 screws.

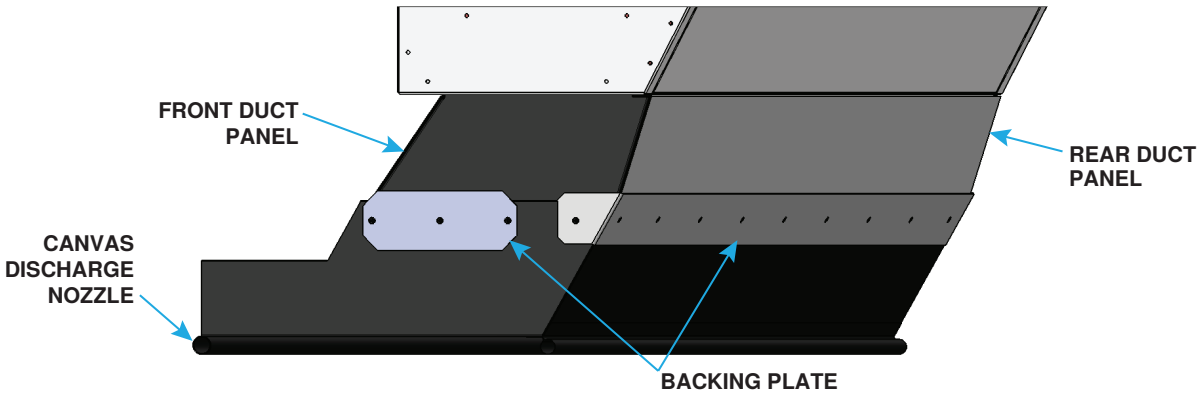


Figure 8. Discharge Duct and Canvas Discharge Nozzle

Piping Connections

Gas Supply Pressure

- The unit is equipped for a maximum gas supply pressure of 1/2 psi, 3.5 kPa, or 14 IN WC for natural gas or propane. The minimum supply pressure, as measured while the unit is operating at full fire, is 5 IN WC for natural gas or 11 IN WC for propane.
- Supply pressure higher than 1/2 psi requires the installation of an additional service regulator external to the unit.
- **Pressure testing supply piping:** For test pressures ***above*** 1/2 psi, disconnect the heater and manual valve from the gas supply line to be tested and cap or plug the supply line. For test pressures ***below*** 1/2 psi, before testing, close the manual valve on the heater.

Gas Supply Piping

⚠ DANGER ⚠

- **All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage, or death.**
- **Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.**

Piping Connections—Continued

Gas Supply Piping—Continued

⚠ CAUTION ⚠

- **All piping must be in accordance with requirements outlined in the *National Fuel Gas Code* (ANSI Z223.1, latest edition) or the *Natural Gas and Propane Installation Code* (CSA B149.1, latest edition).**
- **Gas supply piping installation shall conform with good practice and with local codes.**
- **Support gas piping with pipe hangers, metal strapping, or other suitable material. Do not rely on the heater to support the gas pipe.**

- The heater is orificed for operation with natural gas having a heating value of 1,050 (±50) BTU per cubic foot or with propane gas having a heating value of 2,550 (±100) BTU per cubic foot. Sizing of gas supply lines depends on piping capacity and is based on cubic feet per hour based on a 0.3 IN WC pressure drop, a 0.6 specific gravity for natural gas at 1,050 BTU per cubic feet, and a 1.6 specific gravity for propane at 2,550 BTU per cubic feet. If the gas at the installation does not meet this specification, consult the factory for proper orificing.
- Variables for sizing gas supply lines are listed in **Table 4**. When sizing supply lines, consider the possibility of future expansion and increased requirements (refer to the *National Fuel Gas Code* for additional information).

Table 4. Gas Supply Line Sizes

Pipe Length (Feet)	Natural Gas						Propane					
	Pipe Diameter (Inches)											
	1/2	3/4	1	1-1/4	1-1/2	2	1/2	3/4	1	1-1/4	1-1/2	2
	Cubic Feet per Hour											
20	92	190	350	730	1100	2100	56	116	214	445	671	1281
30	73	152	285	590	890	1650	45	93	174	360	543	1007
40	63	130	245	500	760	1450	38	79	149	305	464	885
50	56	115	215	440	670	1270	34	70	131	268	409	775
60	50	105	195	400	610	1105	31	64	119	244	372	674
70	46	96	180	370	560	1050	28	59	110	226	342	641
80	43	90	170	350	530	990	26	55	104	214	323	604
90	40	84	160	320	490	930	24	51	98	195	299	567
100	38	79	150	305	460	870	23	48	92	186	281	531
125	34	72	130	275	410	780	21	44	79	168	250	476
150	31	64	120	250	380	710	19	39	73	153	232	433
175	28	59	110	225	350	650	17	36	67	137	214	397
200	26	55	100	210	320	610	16	34	61	128	195	372

Supply Piping Connections

NOTE: The *National Fuel Gas Code* requires the installation of a minimum 3-inch sediment trap with a drip leg. Local codes may require a sediment trap longer than 3 inches (typically 6 inches). To permit burner removal, this sediment trap must extend beyond the edge of the heater.

1. Make 1/2-inch gas connection at pipe nipple that extends outside cabinet (see) using ground joint union.
2. Install manual shutoff valve (see) upstream of unit control system. Manual shutoff valve's 1/8-inch plugged tapping provides connection for supply line pressure test gauge.
3. Install minimum 3-inch (typically 6 inches) sediment trap (see).

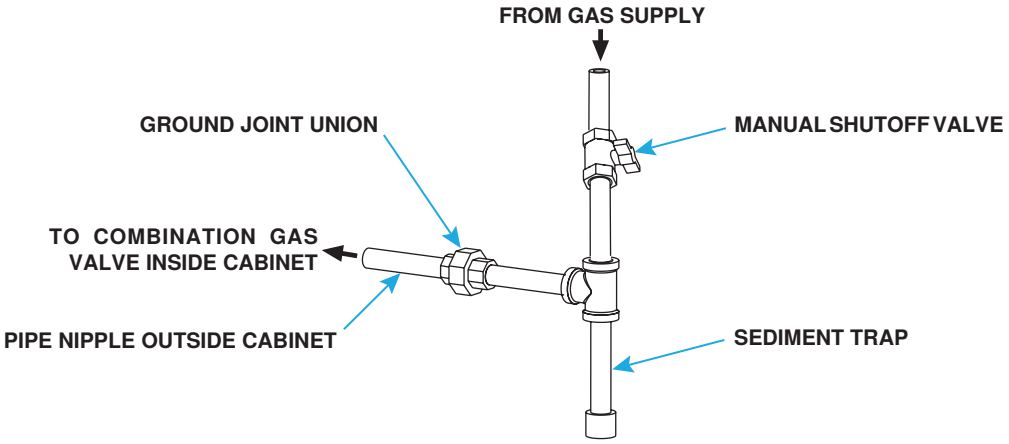


Figure 9. Gas Connections

4. Bleed trapped air from gas lines as needed.
5. Leak test all connections using leak detecting solution.

Electrical Connections

⚠ CAUTION ⚠

- **Ensure that all wiring is in accordance with the wiring diagram provided with the unit.**
- **All electrical wiring and connections, including electrical grounding MUST BE made in accordance with the *National Electric Code* (ANSI/NFPA No. 70, latest edition) or, in Canada, the *Canadian Electric Code* (Part 1, CSA C.22.1, latest edition). In addition, the installer should be aware of any local ordinances that might apply.**
- **All external wiring MUST BE within approved conduit and have a minimum temperature rise rating of 140°F (60°C). Conduit must be run so as not to interfere with the access panel.**

NOTES:

- **Check the rating plate for supply voltage and current requirements. A dedicated line voltage supply with a disconnect switch (option CP1 or CP2 or field-supplied) should be run directly from the main electrical panel to the unit.**
- **The circuit board is located inside on the bottom of the control compartment. The circuit board is polarity sensitive. The circuit board is factory-wired, but it is advisable to check to ensure that the black wire is the hot wire connected to terminal L1 and that the white wire is the neutral wire.**

1. Open control compartment (see **Figure 4**) access panel screwlock door.
2. Connect control and supply wiring in accordance with wiring diagram provided with unit:
   a. Route wiring for HEAT ON/FAN ONLY control through wiring entrance (see **Figure 1**) and connect to RCGW terminals on circuit board (see **Figure 10**).
   b. Route supply wiring through wiring entrance (see **Figure 1**) and connect to supply leads from circuit board.
3. Close control compartment access panel screwlock door.

Electrical Connections—Continued

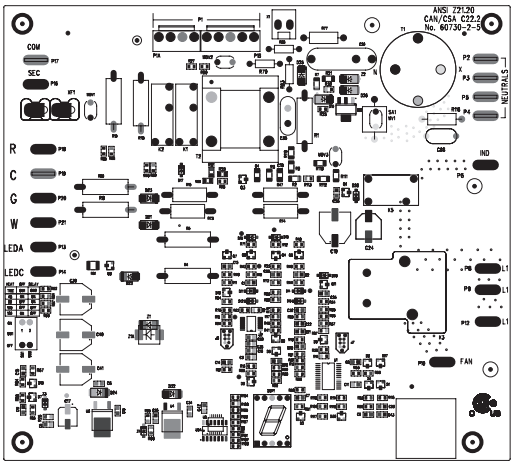


Figure 10. Circuit Board (DSI Control Module)

Transformer Installation (Units with Option AK9 or AK10)

NOTE: The transformer is screwed to the pallet for shipping and is factory-wired with conduit running into the electrical compartment. Remove transformer cover for mounting.

1. Remove transformer from shipping pallet and position on top fan cabinet panel as shown in **Figure 11**.
2. Secure transformer to top fan cabinet panel using provided bracket and hardware as shown in **Figure 11**.

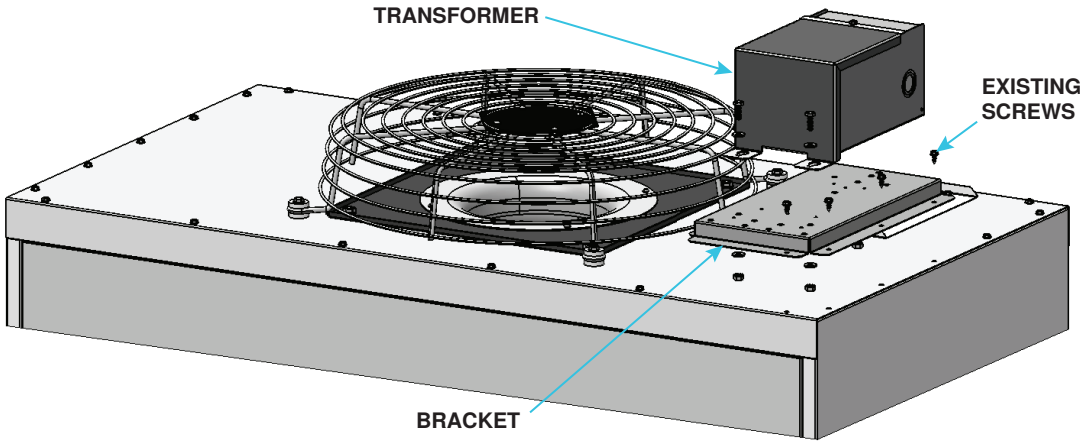


Figure 11. Transformer Installation

Vent Connections

⚠ CAUTION ⚠

When an existing appliance is removed or replaced in a venting system, verify that the venting system is properly sized to vent the new appliance. An improperly sized venting system may result in the formation of condensate, leakage, and/or spillage. DO NOT vent into an existing gravity vent or chimney or intermix different vent system parts from different manufacturers in the same venting system.

NOTE: Venting must be in accordance with local codes and with the *National Fuel Gas Code* (ANSI Z223.1) or the *Installation Code for Gas Burning Appliances and Equipment* (CSA B149.1). Local requirements supersede national requirements.

Vent Pipe Size Requirements

Install 5-inch (127-mm) vent pipe with a maximum vent length of no more than 50 feet (15.2 meters).

NOTE: The equivalent vent length for a 90-degree elbow is 2.5 feet (0.76 meters). Add all straight sections and equivalent lengths for elbows—the total combined length must not exceed the maximum vent length.

Condensation Mitigation Requirements

⚠ CAUTION ⚠

- **Failure to pitch the vent run properly may damage the heater due to condensate running back into the unit.**
- **Exceeding vent pipe diameter and length requirements may result in condensate forming in the vent pipe.**

- For units with long vent runs—over 50% of maximum vent length allowed—or installed in low ambient conditions (below 50°F (10°C), it is recommended that vent pipes be fitted at the low point of the vent system with a tee, a drip leg, and a cleanout cap to prevent any moisture in the vent pipe from entering the unit. The drip leg should be inspected and cleaned out periodically during the heating season.
- Any length of single-wall vent pipe exposed to cold air or run through an unheated area or an area with an ambient temperature of 50°F (10°C) or less, must be insulated along its entire length with a minimum of 1/2-inch foil-faced fiberglass, 1-1/2# density insulation.
- For horizontal vent runs, the flue pipe must be pitched down toward the terminal end—1/4-inch per foot for condensate drainage—for the entire length of the horizontal vent run.

Vent System Support Requirements

⚠ CAUTION ⚠

- **Do not rely on the heater to support either horizontal or vertical vent pipe.**
- **Use non-combustible supports on vent pipe.**

- Support horizontal runs every 6 feet (1.8 meters).
- Support vertical runs in accordance with the pipe manufacturer's requirements.
- Support single-wall pipe in accordance with accepted industry practice.

Vent System Sealing Requirements

Vent system joints depend on the type of pipe being used:

- **Category III pipe:** follow manufacturer's (refer to **Table 5**) instructions for joining pipe sections—connect venter outlet or the vent cap using secure, sealed joints that follow a procedure best suited to the style of Category III pipe being used.
- **Single-wall galvanized pipe (26-gauge or heavier):** secure slip-fit connections using sheet metal screws or rivets—seal all joints and seams in accordance with local codes.
- **Double-wall Type B vent pipe:** join pipe sections in accordance with the pipe manufacturer's requirement—refer to the illustrated instructions in **Figure 12** to connect double-wall pipe to the heater collar, single-wall pipe, and vent cap. Work quickly to assemble components before sealant dries.

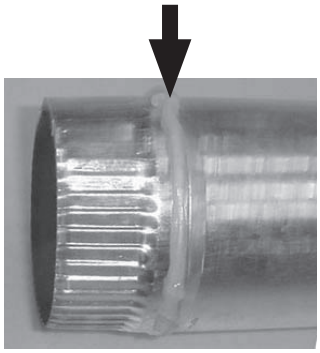
Vent Connections—Continued

Vent System Sealing Requirements—Continued

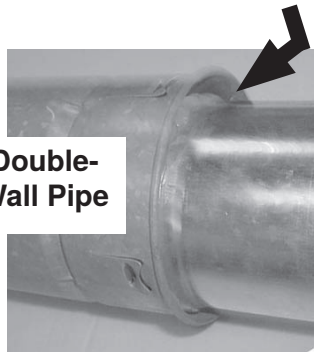
Table 5. Category III Vent Manufacturers

Manufacturer	Model(s)	Diameter (Inches)
CaptiveAire Systems	2V-Type BH	—
Cheminee Lining E Inc.	IPP, HEP, HEPL, HEPLA, HEPL1, and HEPL2	6–48
Cleaver-Brooks Inc.	CBH, CBHL, CBHL2, CBHLA, and CBHL1	
DuraVent Inc.	FasNSeal fixed blade damper assembly	4–18 (ID)
	FasNseal special gas vent assembly	—
	FasNSeal W2 special gas vent system	
	FasNSmooth chimney liner system for use in masonry chimneys only	
	FasNSeal CVS special gas vent system and direct vented pellet system	
	S-Vent and PVP	4 and 5
ENERVEX Inc.	EPS and EPS-1	4–48
ECCO Manufacturing Division of ECCO Heating Products Ltd.	SGDW series	3–6
ICC Industrial Chimney Co.	VIC	4–24
Industrial Combustion LLC	ICH, ICHL, ICHLA, ICHL1, and ICHL2	4–48
Jeremias Inc.	DWKL, SWKL, DWFL, and SWFL	4–36
	DWGV double-wall, air-insulated, 1 inch between inner and outer pipe diameter	—
	DWGV1 double-wall, fiber-insulated, 1 inch between inner and outer pipe diameter	
	DWGV2 double-wall, fiber-insulated, 2 inches between inner and outer pipe diameter	
	SWGV single-wall	4–12
Lifetime Chimney Supply LLC	Xi1, Xi2, and Xi4	5
METAL-FAB Inc.	CGSW, FCSSW, CG, FCS, FCG-1, and FCS-1	6–24 (ID)
	FCGSW, FCG, FCG-1, FCS-3 CORR/GUARD, and FCS-2 CORR/GUARD	6–36 (ID)
	CGSW, CG, FCG, 3CGSWHVK, and 4CGSWHVK	4 and 5
Noritz America Corporation	N-Vent	4 and 5
Rheem Sales Co. Inc.	RTG	3
Security Chimneys International Ltd.	Secure Seal Flex chimney lining system	3–12
Selkirk Corporation	Saf-T-CI and Saf-T C1	4, 5, and 6
	Saf-T-Vent	3–6 and 8
	EZ Seal	3–6
	SGV	3, 4, and 5
	CI Plus	6 and 8
	SC, DGV, EZ Seal Quick Kit, Sel-Vent, and Sel-Vent II	4
	IPS316, PS316, and G316	5 and 6
SFL Flue & Chimney	DEVON EPS and EPS-1	4–6
The Schebler Co.	SSD, ESW, eVent, and eVent PLUS	2 and 4–6
	eVent SD	4–6
Sunair Products	SADW-2V and SADW-V	4
Tokyo Gas Renovation Co. Ltd.	KP and KC	4 and 5
	N-Vent	3, 4, and 5
Van-Packer Co. Inc.	MW, CS, and CSplus	4–6 (ID)
Z-FLEX US Inc.	SVE and SVEII	3 and 4
	SVEIII	2, 3, and 4
	SVEIV single-wall and SVEIV double-wall	4, 5, and 6
	NovaVent single-wall and NovaVent double-wall	
	Z-VentBlu single-wall and Z-VentBlu double-wall	3, 4, and 5

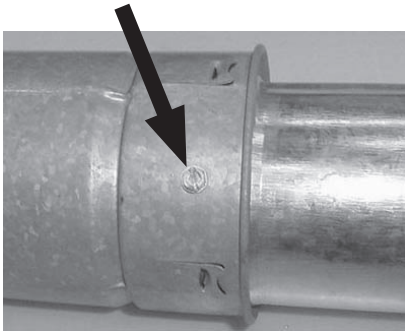
STEP 1: Place continual 1/4-inch bead of silicone sealant around circumference of single-wall pipe.



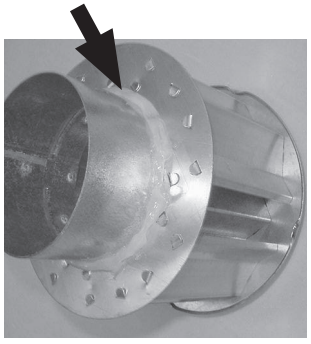
STEP 2: Before sealant can dry, insert single-wall pipe into inner pipe of double-wall pipe until bead of sealant contacts inner pipe to create sealed joint.



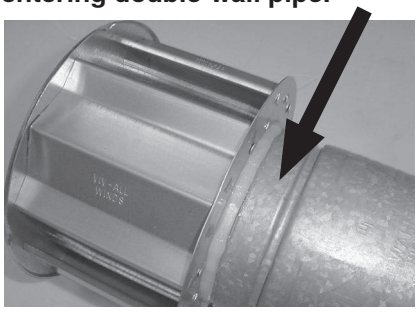
STEP 3: Drill three small holes spaced equally around double-wall pipe below sealant ring. Secure joint using 3/4-inch-long sheet metal screws. Do not overtighten screws.



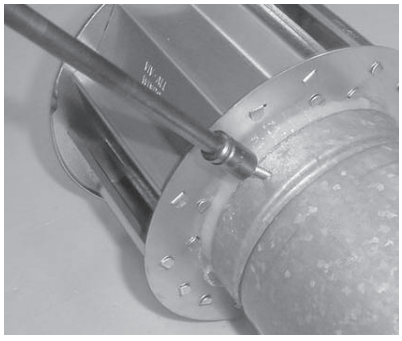
STEP 4: Place continual 3/8-inch bead of silicone sealant around he circumference of vent cap collar to prevent any water inside vent cap from running down double-wall pipe.



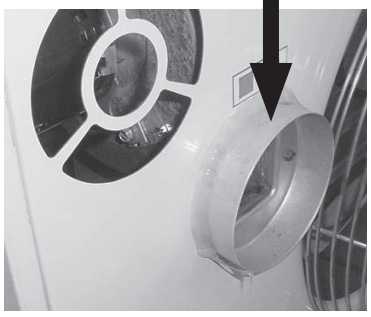
STEP 5: Before sealant can dry, insert collar on vent cap as far as possible inside inner wall of double-wall pipe. Apply silicone sealant to fully close any gaps between vent cap and double-wall pipe to prevent water from entering double-wall pipe.



STEP 6: Drill small hole through vent cap and double-wall pipe. Secure joint using 3/4-inch-long sheet metal screw. Do not overtighten screw.



STEP 7: Place continual 1/4-inch bead of silicone sealant around circumference of venter outlet collar.



STEP 8: Before sealant can dry, slide double-wall pipe over collar so that collar is inside inner pipe. Push double-wall pipe tight to heater cabinet. Drill three small holes through the pipe and into collar spaced equally around pipe below sealant ring. Secure joint using 3/4-inch-long sheet metal screws. Do not overtighten screws.

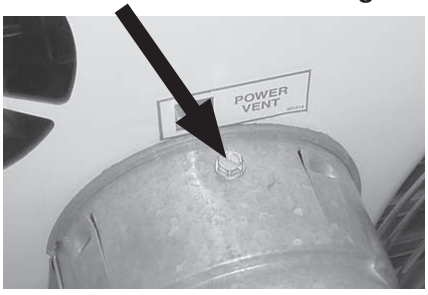


Figure 12. Instructions for Connecting Double-Wall Type B Vent Pipe to Single-Wall Pipe

Vent Connections—Continued

Venter (Flue) Outlet Diameter

Connect a 5-inch appliance adapter (available from the Category III pipe manufacturer) directly to the collar and then use a taper-type connector as necessary.

Vent Terminal Requirements

⚠ DANGER ⚠

- **Do not enclose the vent pipe or place it closer than 6 inches (152 mm) to combustible material.**
- **To prevent combustion products from entering the occupied space, all vent terminations must be positioned or located away from fresh air intakes, doors, and windows. Failure to comply could result in severe personal injury or death and/or property damage.**
- **Consider local snow depth conditions. The vent must be at least 6 inches (152 mm) above the anticipated snow depth.**

⚠ WARNING ⚠

- **A different style vent cap could cause nuisance problems or unsafe conditions. The vent cap must be the same size as the vent pipe.**
- **Do not locate a vent termination where it may cause hazardous frost or ice accumulations on adjacent property surfaces.**
- **Maintain the required clearance from the wall to the vent terminal cap for stability under wind conditions and to protect the building.**

⚠ CAUTION ⚠

Products of combustion can cause discoloration of some building finishes and deterioration of masonry materials. Applying a clear silicone sealant that is normally used to protect concrete driveways can protect masonry materials. If discoloration is an esthetic problem, relocate the vent or install a vertical vent.

- Vertical vents must terminate a minimum horizontal and vertical distance from roof lines and adjacent walls or obstructions. For vertical vents with double wall vent pipe and a vent cap size of ≤12 inches (≤305 mm):
  a. **Vent is >8 feet (>2.44 meters) horizontally from any vertical wall or obstruction:** terminate the vent at least 2 feet (0.61 meters) above the highest point where it passes through a roof or any part of a building.
  b. **Vent is <8 feet (<2.44 meters) horizontally from any vertical wall or obstruction:** terminate the vent in accordance with **Figure 13** and **Table 6**.
- Refer to **Table 7** for horizontal vent terminal clearances.

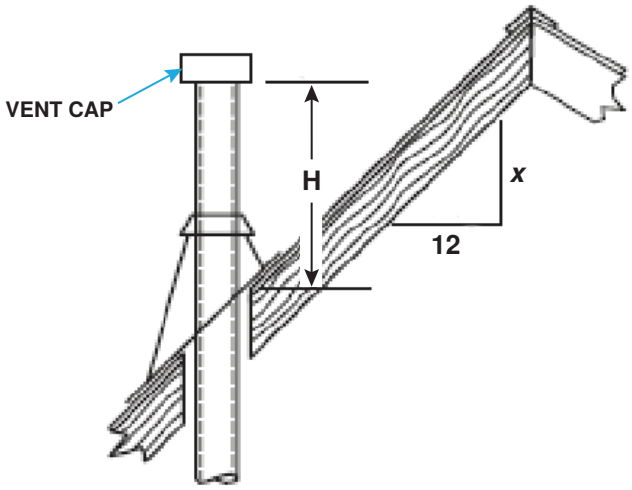


Figure 13. Double-Wall Vertical Vent Height Based on Roof Pitch

Table 6. Double-Wall Vertical Vent Height											
Variable *x* (See Figure 13) = Roof Pitch Numerator (Inches)*											
≤6	**>6–7**	**>7–8**	**>8–9**	**>9–10**	**>10–11**	**>11–12**	**>12–14**	**>14–16**	**>16–18**	**>18–20**	**>20–21**
Dimension H (See Figure 13) = Minimum Height to Lowest Discharge Opening (Feet (Meters))											
1.0 (0.30)	1.25 (0.38)	1.5 (0.46)	2.0 (0.61)	2.5 (0.76)	3.25 (0.99)	4.0 (1.22)	5.0 (1.52)	6.0 (1.83)	7.0 (2.13)	7.5 (2.27)	8.0 (2.44)
*Roof pitch = *x*/12 inches.											
NOTE: The values above apply to vents <8 feet (<2.44 meters) horizontally from any vertical wall or obstruction.											

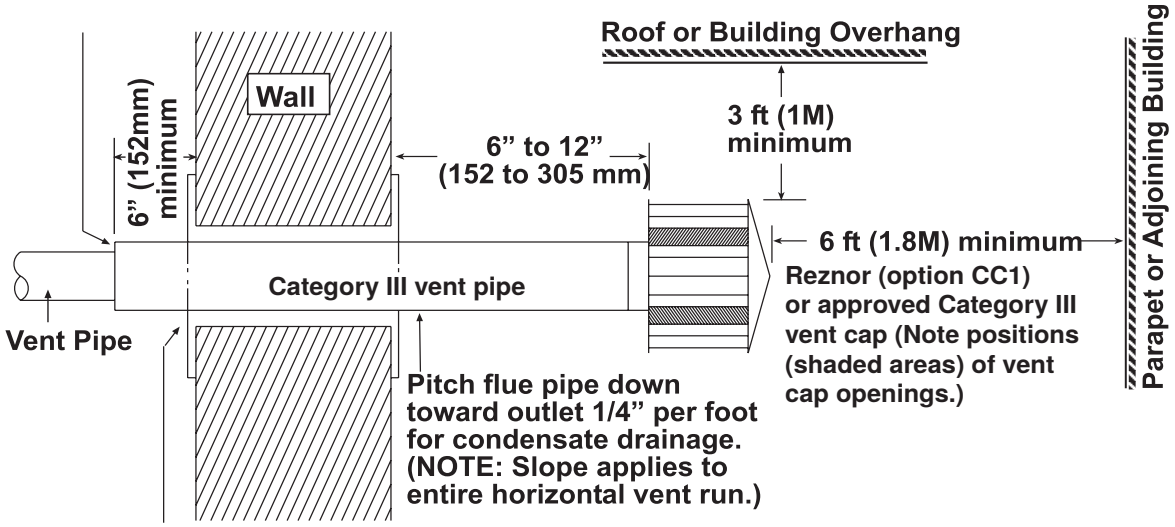
Table 7. Minimum Clearance Requirements for Category III Horizontal Vent Terminal	
Component/Structure	**Minimum Clearance, All Directions Unless Specified (Feet (Meters))**
Forced air inlet within 10 feet (3.1 meters)*	3 (0.9) above
Combustion air inlet of another appliance	6 (1.8)
Mechanical air supply inlet to any building	Canada: 6 (1.8)
Any building opening (door, window, or gravity air inlet)	4 (1.2) horizontal and below
	1 (0.3) above
Gas meter,** electric meter, and relief equipment	US: 4 (1.2) horizontal
	Canada: 6 (1.8) horizontal
Gas regulator**	US: 3 (0.9) horizontal
	Canada: 6 (1.8) horizontal
Adjoining building or parapet	6 (1.8)
Adjacent public walkway	7 (2.1) above
Grade (ground level)	3 (0.9) above
*Does not apply to the inlet of a direct vent appliance.	
**Do not terminate the vent directly above a gas meter or service regulator.	

Vent Connections—Continued

Category III Vent Installation

A Category III installation may have either a horizontal or a vertical vent run. Install the vent as follows:

1. Select vent pipe (refer to **Table 5**)—following types are acceptable:
   a. If at least 75% of equivalent length of vent run **IS** vertical:
      (1) Double-wall Type B vent pipe.
      (2) Vent pipe approved to UL standard 1738 for Category III appliances.
      (3) Appropriately-sealed 26-gauge (minimum) galvanized or equivalent steel single-wall pipe.
   b. If at least 75% of equivalent length of vent run **IS NOT** vertical:
      (1) Vent pipe approved to UL standard 1738 for Category III appliances.
      (2) Appropriately-sealed 26-gauge (minimum) galvanized or equivalent steel single-wall pipe.
2. If connecting double-wall pipe to heater, follow instructions in **Figure 12**.
3. Determine vent pipe diameter and length. Minimum vent length is 3 feet (1 meter). Use only one diameter of vent pipe for installation.
4. Determine venter (flue) outlet diameter (refer to **Venter (Flue) Outlet Diameter** section).
5. Make all vent pipe joint connections in accordance with **Vent System Sealing Requirements** section.
6. Properly support all vent pipe runs in accordance with **Vent System Support Requirements** section.
7. Take appropriate steps to mitigate condensation in accordance with **Condensation Mitigation Requirements** section.
8. Terminate vent as follows:
   a. If using single wall metal pipe or double-wall Type B vent pipe:
      (1) Install double-wall Type B terminal vent pipe (connect in accordance with **Figure 12**) and terminate vent with option CC1 or CC21 vent cap or approved Category III vent cap.
      (2) Refer to instructions shown in **Figure 14** to install horizontal vent terminal.
      (3) Refer to instructions shown in **Figure 15** to install vertical vent terminal.
      (4) Ensure that vent terminal is installed in accordance with **Vent Terminal Requirements** section.
   b. If using vent pipe approved to UL standard 1738 for Category III appliances, install the Category III vent system in accordance with manufacturer's instructions. Ensure that required distances shown in **Figure 14**, **Figure 15**, and **Vent Terminal Requirements** section are implemented.



Approved clearance thimble is required when flue pipe extends through combustible materials. Follow the requirements of the thimble and/or the vent pipe manufacturer.

Figure 14. Horizontal Vent Terminal (Commercial/Industrial Installations)

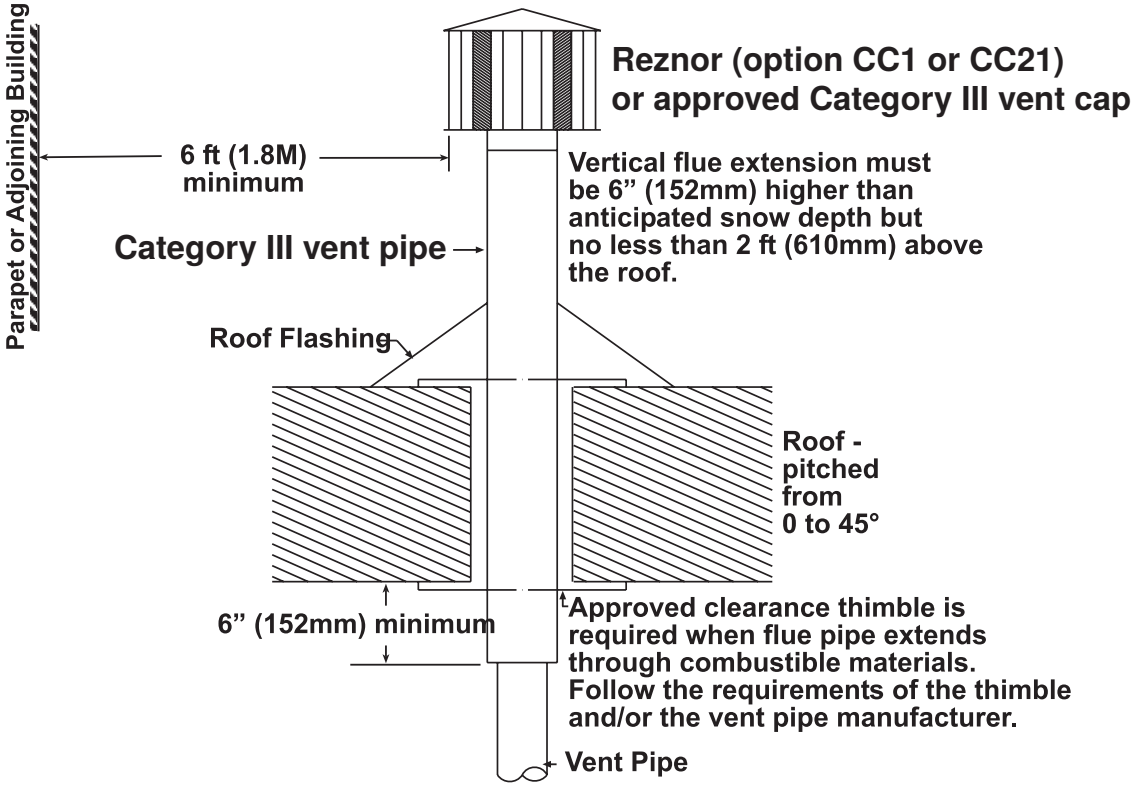


Figure 15. Vertical Vent Terminal (Commercial/Industrial Installations)

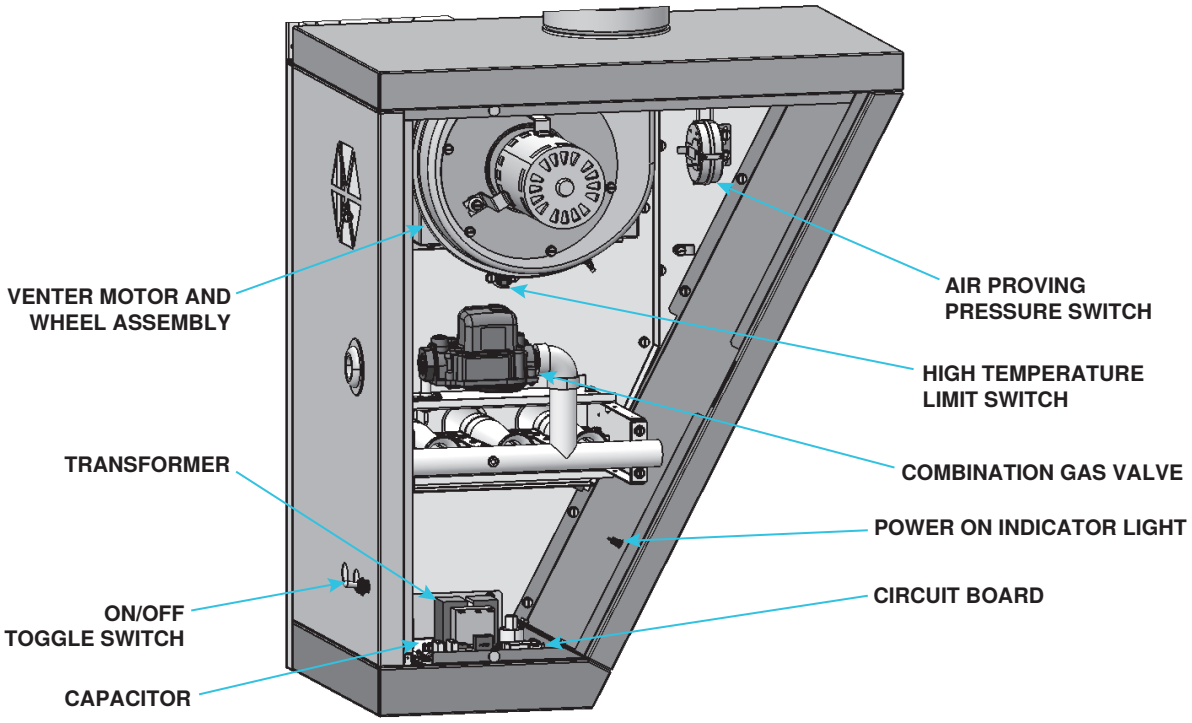


Figure 16. Control Locations

Circuit Board (DSI Control Module)

The heater's ignition system is controlled by a circuit board (see **Figure 16**), a Direct-Spark Integrated (DSI) control module (see **Figure 10**), that monitors the safety devices and controls the operation of the fan and venter motors and the combination gas valve between heat cycles. The module's Seven-Segment Display (SSD) is visible through a viewport on the access door panel. In addition, there is a status LED on the bottom of the heater. Its status indications are **off** (heater is not powered or control board fault), **steady on** (heater is on with no faults), or **flashing** (heater is on with fault(s)). Additional status indications appear on the display at the bottom of the control module (labeled as DSP1, see **Figure 10**). The display's codes are listed and described in the **Unit Troubleshooting Using DSI Control Module** section.

Air Proving Pressure Switch

⚠ WARNING ⚠

The automatic-reset air proving pressure switch will continue to shut down the unit until the cause is corrected. Never bypass this switch as hazardous conditions could result.

All units are equipped with a normally-open automatic-reset air proving pressure switch (see **Figure 16**) that senses air pressure provided by fan operation. The switch is factory-set and is non-adjustable. When the setpoint is satisfied, the switch allows electric supply to the heating elements. This safety device provides protection in the case of fan motor failure or lack of airflow due to a restriction at the inlet or outlet.

Venter Wheel and Motor Assembly

The venter motor is assembled to the venter wheel (see **Figure 16**) and operates to provide combustion airflow. Operation is controlled by the circuit board (refer to **Circuit Board (DSI Control Module)** section).

High Temperature Limit Switch

⚠ WARNING ⚠

The automatic-reset high temperature limit switch will continue to shut down the unit until the cause is corrected. Never bypass this switch as hazardous conditions could result.

All units are equipped with a normally-closed temperature-activated, automatic-reset high temperature limit switch (see **Figure 16**). The switch is factory-set and is non-adjustable. If the setpoint is reached, the switch interrupts the electric supply to the heating elements. This safety device provides protection in the case of fan motor failure or lack of airflow due to a restriction at the inlet or outlet.

Manual HEAT ON/FAN ONLY Control

A field-installed wall-mounted HEAT ON/FAN ONLY control assembly (see **Figure 17**) is provided with each unit. The control assembly has two green pushbuttons—HEAT ON and FAN ONLY.

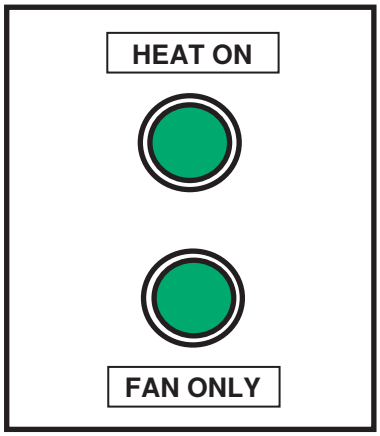


Figure 17. Manual HEAT ON/FAN ONLY Control

Combination Gas Valve

⚠ WARNING ⚠

The combination gas valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting them to the unit to ensure positive closure.

The combination gas valve (see **Figure 16**) is powered by the 24V control circuit through the manual control (see **Figure 17**) and safety controls. The diaphragm-type valve is pre-set at the factory and provides regulated gas flow.

Fan Motor

The fan motor is equipped with automatic-reset thermal overload protection. If the motor does not run, the cause may be due to improper voltage. Ensure that the correct voltage is available at the motor.

OPERATION

⚠ DANGER ⚠

- **For your safety, read before operating. If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury, or loss of life.**
- **This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.**
- **Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.**
- **WHAT TO DO IF YOU SMELL GAS:**
  - **a. Do not try to light any appliance.**
  - **b. Do not touch any electrical switch; do not use any phone in your building.**
  - **c. Leave the building immediately.**
  - **d. Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.**
  - **e. If you cannot reach your gas supplier, call your fire department.**
- **Use only your hand to turn the gas control ON/OFF knob on the gas valve. Never use tools. If the valve ON/OFF knob will not turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.**
- **Should overheating occur, or the gas supply control system fail to shut off the flow of gas, turn off the manual gas valve to the appliance before shutting off the electrical supply.**
- **Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.**
- **All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage, or death.**

Pre-Startup Checklist

Check the following ***before*** startup:

- ❑ Check to ensure that all screws used to secure shipping brackets have been re-installed in heater cabinet.
- ❑ Check suspension—unit must be secure and level.
- ❑ Check to ensure that clearances from combustibles are in accordance with **Table 1**.
- ❑ Check vent system to ensure that it is installed in accordance with venting instructions.
- ❑ Check piping for leaks and proper gas line pressure and bleed trapped air from gas lines (refer to **Supply Piping Connections** section).
- ❑ Check electrical wiring—ensure that all wire gauges are as recommended—service disconnect switch should be used—verify that fusing or circuit breakers are adequate for load use.
- ❑ Check polarity—verify that line voltage exists between black L1 wire and earth ground.
- ❑ If installation elevation is >6,000 feet (>1,830 meters), replace pressure switch in accordance with **Pressure Switch Replacement** section.

Startup

Start up the heater as follows:

1. Turn OFF all electric power to appliance.

NOTE: This appliance is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.

2. Open control compartment (see **Figure 4**) access panel screwlock door.
3. Turn gas valve ON/OFF switch to OFF (see **Figure 18**).

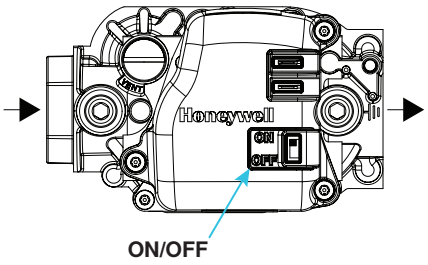


Figure 18. Gas Valve ON/OFF Switch

4. Wait 5 minutes to clear out any gas and then smell for gas (including near floor).
   a. If you smell gas, STOP! and follow steps in DANGER message listed above or on heater operating label.
   b. If you do not smell gas, proceed to step 6.
5. Turn gas valve ON/OFF switch to ON.
6. Close control compartment access panel screwlock door.
7. Turn ON electric power to unit—green status indicator light on rear bottom of fan cabinet is illuminated.
8. To heat cold trailer, run unit in heating and fan mode:
   a. Press HEAT ON pushbutton—green pushbutton is illuminated.
   b. Fan is energized, air proving pressure switch closes, and pressure switch closes, which fires unit.
   c. Burner flame is sensed and in 30 seconds after combination gas valve is energized, fan motor is energized.
   d. If flame is extinguished during main burner operation, integrated control system closes main valve and must be reset by interrupting power to control circuit (refer to lighting instructions provided with heater).
9. To circulate air in hot trailer, run unit in fan mode:
   a. Press FAN ONLY pushbutton—green pushbutton is illuminated.
   b. Fan is energized and remains energized until FAN ONLY pushbutton is pressed again.
10. TO TURN OFF GAS TO APPLIANCE:
   a. Set thermostat to lowest setting.
   b. If service is to be performed, turn OFF all electric power to appliance.
   c. Open control compartment (see **Figure 4**) access panel screwlock door.
   d. Turn gas valve ON/OFF switch to OFF.
   e. Close control compartment access panel screwlock door.

Vent System Testing

For each heater or utility heater connected to the venting system and placed in operation while any other appliance(s) connected to the venting system(s) is not in operation, test the vent system as follows:

1. Seal unused openings(s) in vent system.
2. Inspect vent system for proper size and horizontal pitch as required in *National Flue Gas Code* (ANSI Z223.1/NFPA 54) or *Natural Gas and Propane Installation Code* (CSA B149.1) and in venting instructions.
3. Verify that there is no blockage or restriction, leakage, corrosion, and/or other deficiencies that could cause any unsafe condition.
4. In so far as is practical, close all doors, windows, and other open spaces within building and all doors between space in which appliance(s) is connected and space where vent system is located.
5. Close any fireplace dampers.
6. Turn on clothes dryers and any exhaust fans (such as range hoods and bathroom exhausts) so that they operate at maximum speed. Do not operate a summer exhaust fan.
7. Following lighting instructions provided with heater, place heater being inspected in operation. Adjust thermostat so that heater will operate continuously.
8. After it has been determined that each heater connected to vent system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous condition of use.
9. If improper venting is observed during above tests, vent system must be corrected.

Post-Startup Checklist

Check the following ***after*** startup:

- ❑ Ensure that vent system has been tested in accordance with **Vent System Testing** section.
- ❑ With unit in operation, measure manifold (outlet) gas pressure in accordance with **Measure and Adjust Manifold (Outlet) Gas Pressure** section.
- ❑ Turn unit OFF and ON, pausing 2 minutes between each cycle; observe for smooth ignition.
- ❑ Place literature bag that contains Limited Warranty, this manual, and any control or optional information in accessible location near heater.

⚠ DANGER ⚠

- **The gas burner in this gas-fired equipment is designed and equipped to provide safe controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion, which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of indirect-fired gas burning equipment requires a properly operating vent system that vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**
- **Always comply with the combustion air requirements listed in the installation codes and in this manual. Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. Heaters installed in a confined space must be supplied with air for combustion as required by code and the requirements listed in this manual. MAINTAIN THE VENT OR VENT/COMBUSTION AIR SYSTEM IN STRUCTURALLY SOUND AND PROPER OPERATING CONDITION.**

ADJUSTMENTS

If the gas that fires the unit is propane, the burner orifice must be replaced (refer to **Burner Orifice Replacement** section) and the unit must be converted in accordance with the **Gas Conversion** section ***before*** startup. If the heater is being installed at an elevation of >6,000 feet (>1,830 meters), the pressure switch must be replaced in accordance with the **Pressure Switch Replacement** section ***before*** the gas pressure is adjusted. ***After*** startup, the combination gas valve outlet pressure must be measured and adjusted if necessary in accordance with the **Measure and Adjust Manifold (Outlet) Gas Pressure** section.

Burner Orifice Replacement

Replace the burner orifice as follows:

⚠ CAUTION ⚠

When removing or replacing a burner orifice, use two wrenches and take care not to damage the Venturi tube and/or the bracket.

1. Unthread existing burner orifice.

⚠ DANGER ⚠

- **DO NOT use pipe tape or sealant (pipe dope or joint compound) on orifice threads because the hole in the orifice may become blocked and may cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.**
- **DO NOT attempt to drill out orifices in the field. Use only factory-supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury, or death.**

2. Thread replacement burner orifice into place—to prevent cross-threading, hand-tighten orifice until snug and then tighten one-and-one-half to two turns using wrench.

Gas Conversion

NOTE: A factory-authorized gas conversion kit for converting the unit from natural gas to propane is provided with the unit. This kit MUST BE used for gas conversion.

⚠ DANGER ⚠

All gas conversion must be done by a qualified service person in accordance with these instructions and in compliance with all codes and requirements. In Canada, gas conversion shall be carried out in accordance with the requirements of the Provincial Authorities having jurisdiction and in accordance with the requirements of the CAN/CGA-B149.1 and CAN/CGA-B149.2 installation code.

Install the conversion kit as follows:

Table 8. Natural Gas to Propane Conversion Kit Components

Component	PN
Conversion tape	064391
Propane disk	037752
Propane burner orifice	661084
Spring kit	098720

Gas Conversion—Continued

1. Remove gas supply and electrical power:
   a. Turn OFF gas supply at shutoff valve outside of heater.
   b. Turn OFF electrical power.
   c. Open control compartment (see **Figure 4**) access panel screwlock door.
2. Install regulator spring kit in accordance with gas valve manufacturer's instructions (included with regulator spring kit).

⚠ CAUTION ⚠

After a new regulator spring kit is installed, it is necessary to adjust the spring by adjusting the manifold pressure. This adjustment can be made only after the heater is in operation (refer to step 7).

3. Replace burner orifice in accordance with **Burner Orifice Replacement** section.

⚠ CAUTION ⚠

If the heater will be operated at an elevation >6,000 feet (>1,830 meters), a high-elevation pressure switch must be installed.

NOTES:

- **If the installation elevation is >6,000 feet (>1,830 meters), verify that the elevation on the rating plate or high-elevation label is >6,000 feet (>1,830 meters). If the rating plate or label does not indicate an elevation of >6,000 feet (>1,830 meters), order and install the appropriate high pressure switch kit.**
- **If the heater is equipped for installation at an elevation of >6,000 feet (>1,830 meters) and is being installed at a lower elevation, order and install the appropriate switch.**
- **Contact your distributor (refer to replacement parts manual) to select the factory-authorized replacement part.**

4. For installations at elevations >6,000 feet (>1,830 meters), replace pressure switch in accordance with **Pressure Switch Replacement** section.
5. Restore electrical power and gas supply:
   a. Turn ON electrical power.
   b. Turn ON gas supply and relight heater, following instructions on heater.
6. Perform leak test:
   a. Check all connections for gas leaks using commercial leak-detecting fluid or rich soap and water solution. Leaks are indicated by presence of bubbles.
   b. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).

NOTE: Conversion of a unit using these kits does not alter the input rate. Refer to the rating plate on the heater for the input rate and other appropriate information. If adjusted for high-elevation operation, the input rate will be affected.

7. Adjust manifold (outlet) gas pressure in accordance with **Measure and Adjust Manifold (Outlet) Gas Pressure** section.
8. Close control compartment access panel screwlock door.

Pressure Switch Replacement

NOTE: For installations at elevations >6,000 feet (>1,830 meters), the pressure switch must always be replaced before the heater is operated. The switch is shipped separately for field-installation if the unit Is ordered with high-elevation option DJ20.

1. Locate pressure switch in control compartment (see **Figure 16**) and mark and disconnect two switch wires.
2. Mark and disconnect sensing tube(s) from pressure switch.
3. Remove two screws that secure mounting bracket and remove bracket and pressure switch. Save bracket and screws for reuse.
4. Install replacement pressure switch (refer to replacement parts manual found at **www.reznorhvac.com** for PN) using mounting bracket and two screws. Reconnect sensing tube(s) and wires.

Measure and Adjust Manifold (Outlet) Gas Pressure

When the heater leaves the factory, the combination gas valve is set so that the valve outlet gas pressure is regulated to 3.5 IN WC. Inlet supply pressure to the valve for natural gas must be a minimum of 5 IN WC or as noted on the rating plate and a maximum of 14 IN WC. For a unit converted to propane, valve outlet gas pressure is regulated to 10 IN WC. Inlet supply pressure to the valve for propane must be a minimum of 11 IN WC and a maximum of 14 IN WC. During normal operation at sea level, adjustment to the factory-setting should not be necessary. Measuring outlet pressure cannot be done until the heater is in operation. Measure and adjust the manifold (outlet) gas pressure as follows:

⚠ WARNING ⚠

Valve outlet gas pressure must never exceed 3.5 IN WC for natural gas or 10 IN WC for propane. The maximum inlet supply pressure for natural gas or propane is 14 IN WC. Maximum gas pressure can never be exceded either during operation or when unit is static (with lock-up regulator).

⚠ CAUTION ⚠

Before attempting to measure or adjust valve outlet gas pressure, the inlet supply pressure must be within the specified range, both when the heater is in operation and when it is on standby. Incorrect inlet pressure could cause excessive valve outlet gas pressure immediately or at some future time. If natural gas supply pressure is too high, install a regulator in the supply line before it reaches the heater. If natural gas supply pressure is too low, contact your gas supplier.

NOTE: The inputs and capacity of the heater varies depending on elevation. For installation at elevations above 2,000 feet (610 meters), the heater shall be derated 4% for each 1,000 feet (305 meters) of elevation above sea level. If unsure of elevation, contact local gas supplier.

1. If installation is at elevation >6,000 feet (>1,830 meters), replace pressure switch in accordance with **Pressure Switch Replacement** section.
2. Determine correct outlet pressure (refer to **Table 9**) for elevation of installation. If installation is at elevation >2,000 feet (>610 meters), derate the heater 4% for each 1,000 feet (305 meters) of elevation above sea level.
3. Turn gas valve switch to OFF to prevent flow to combination gas valve.

NOTE: Use a water column manometer that is readable to the nearest tenth of an inch.

4. Connect manometer to output pressure tap on valve (see **Figure 19**).

Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

Table 9. Required Manifold (Outlet) Gas Pressure

Installation Location	Elevation (Feet (Meters))	Natural Gas	Propane
		Manifold Pressure (IN WC)	
US, Canada	0–2000 (0–610)	3.5	10.0
US	2001–3000 (611–915)	3.1	8.8
Canada	2001–4500 (611–1373)	2.8	8.1
US	3001–4000 (916–1220)	3.0	8.5
	4001- 5000 (1221–1525)	2.8	8.1
	5001–6000 (1526–1830)	2.7	7.7
	6001–7000 (1831–2135)	2.6	7.4
	7001–8000 (2136–2440)	2.5	7.1
	8001–9000 (2441–2745)	2.4	6.7
	9001–10,000 (2746–3045)	2.2	6.4

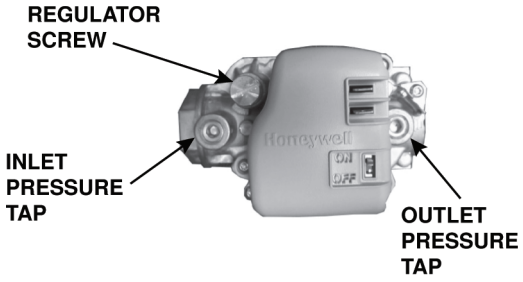


Figure 19. Combination Gas Valve

5. Turn gas valve ON/OFF switch to ON.

⚠ CAUTION ⚠

DO NOT bottom out the gas valve regulator screw. This can result in excessive overfire and heat exchanger failure due to unregulated manifold pressure.

6. Remove cap from regulator screw (see **Figure 19**) and adjust pressure in accordance with **Table 9** by turning regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure.
7. Turn up thermostat and cycle burner once or twice to properly seat adjustment spring in valve and recheck outlet pressure. When pressure corresponds to **Table 9**, disconnect manometer and install cap on regulator screw.
8. Check for leakage at outlet pressure tap fitting. Correct as necessary.
9. Connect manometer to inlet pressure tap (see **Figure 19**). While heater is operating, measure inlet pressure, which should be between 5 and 14 IN WC for natural gas or between 11 and 14 IN WC for propane.
10. If inlet pressure is not between 5 and 14 IN WC for natural gas or between 11 and 14 IN WC for propane, inlet pressure must be corrected by adjusting manifold (outlet) pressure in accordance with steps 3 through 6.
11. Use permanent marker to fill in appropriate input and capacity values on high-elevation adjustment label from literature bag provided with unit. Select location for label on outside of heater access panel that will be conspicuous to anyone operating or servicing unit. Ensure that surface is clean and dry and affix label.
12. Observe heater operation for at least one complete cycle to check for safe and proper operation.

MAINTENANCE

⚠ WARNING ⚠

- **If you turn OFF the electrical power supply, turn OFF the gas.**
- **Eye protection is recommended when cleaning unit.**

⚠ CAUTION ⚠

- **When re-lighting, always follow the lighting instructions on the heater.**
- **If any of the original wire supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 220°F (105°C), except for limit control, flame rollout, and sensor lead wires, which must be rated at 302°F (150°C).**

NOTE: To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

The unit is designed to operate with a minimum of maintenance. However, to ensure long life and satisfactory performance, routine service is recommended. When servicing, follow standard safety procedures and those specific instructions and warnings in this manual. The following is designed to aid a qualified service person in maintaining and servicing this equipment.

Service Checklist

At a minimum, perform the following annually (see **Figure 16** for component locations):

- ❑ Inspect burner/control compartment annually to determine if cleaning is necessary.
- ❑ Clean all dirt, lint, and grease from combustion air opening and venter assembly.
- ❑ Clean all dirt, lint, and grease from fan blade, fan guard, and motor.
- ❑ Check heat exchanger both internally and externally.
- ❑ Check burner for scale, dust, or lint accumulation and clean if needed.
- ❑ Check gas valve to ensure that gas flow is being shut off completely.
- ❑ Check vent or vent/combustion air system for soundness and clean openings.
- ❑ Replace any parts that do not appear sound.
- ❑ Check for any damaged wiring and replace as necessary.

Maintenance Procedures

⚠ CAUTION ⚠

When any service is completed, ensure that the unit is reassembled correctly so that no unsafe conditions are created. If replacement parts are required, use only factory-authorized parts.

High Temperature Limit Control Maintenance

If it is determined that the high temperature limit control (see **Figure 16**) needs replacing, use only a factory-authorized replacement part that is designed for the size of heater.

Maintenance Procedures—Continued

Transformer Maintenance

Use a voltmeter to verify that there are 24V output from the transformer (see **Figure 16**). If the transformer is not functioning, it must be replaced. Use a replacement transformer identical to the factory-installed model.

Fan and Motor Assembly Maintenance

Inspect and clean the motor, fan guard, and blades. Remove any dirt and grease. Take care when cleaning the fan blades so as not to cause misalignment or imbalance. Check to ensure that there are no signs of damage or excessive wear to the fan and motor assembly. If necessary, replace the assembly as follows:

1. Turn OFF gas and electric power.
2. Remove and save screws that secure fan guard to top of fan cabinet (see **Figure 4**) and remove fan guard.
3. Remove fan access door from back of fan cabinet and disconnect existing fan motor wires and ground screw wire .
4. Remove and save screws that secure existing fan and motor assembly to top of fan cabinet and remove fan and motor assembly.
5. Install replacement fan and motor assembly in opening in top of fan cabinet and connect fan motor wires and ground screw wire in accordance with wiring diagram provided with unit.
6. Secure replacement fan and motor assembly to top of fan cabinet using existing screws.
7. Re-install fan access door.
8. Turn ON electric power and gas, start up unit, and check for proper operation.

Burner Orifice Maintenance

The burner orifice usually needs to be replaced only when installing a gas conversion kit. When ordering a replacement orifice only, provide BTUh content and specific gravity of gas as well as the model and serial number of the unit. Replace the burner orifice in accordance with the **Burner Orifice Replacement** section.

Burner Maintenance

Visually inspect the burner compartment (see **Figure 20**). If there is an accumulation of dirt, dust, and/or lint, clean the compartment and remove and clean the burner as follows:

1. Remove gas and electric supply:
   a. Shut OFF gas supply ahead of union at manual shutoff valve outside cabinet.
   b. Turn OFF electric supply.
   c. Disconnect gas supply at union outside of cabinet.
2. Remove burner assembly (see **Figure 20**):
   a. Open control compartment (see **Figure 4**) access panel screwlock door.
   b. Disconnect gas train.
   c. Mark and disconnect wires at combination gas valve, ignitor, and flame sensor.

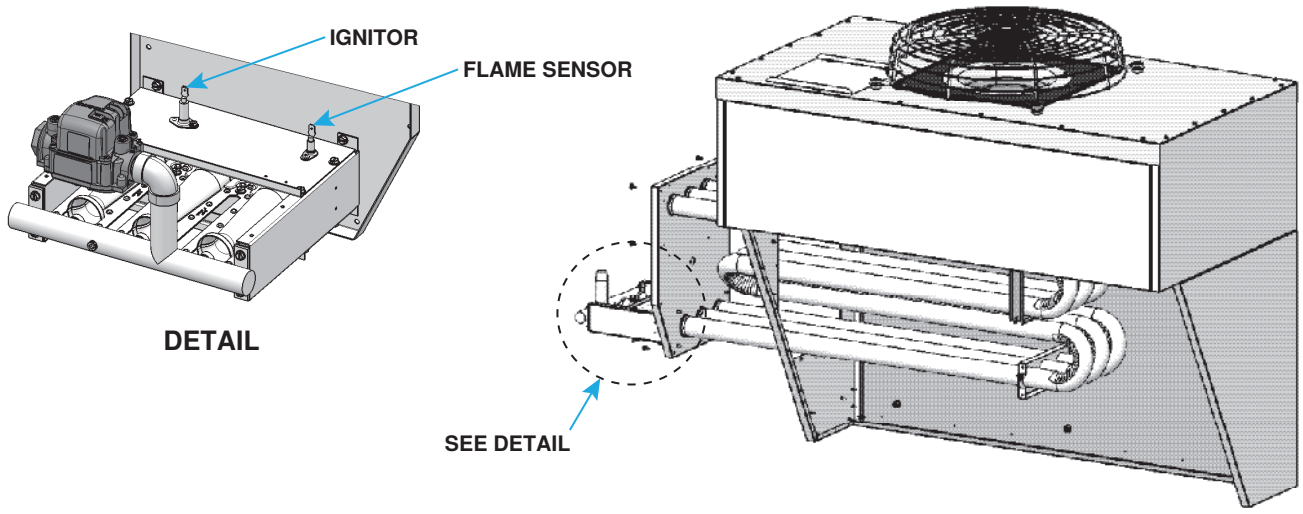


Figure 20. Heat Cabinet

⚠ CAUTION ⚠

Take care not to damage the ignitor while removing or cleaning the burner assembly.

3. Remove screws that secure gas manifold to burner box and carefully remove burner assembly.

NOTE: If, upon inspection, any burner components are damaged or deteriorated, replace the burner assembly.

4. Shine flashlight on burners and use compressed air or vacuum cleaner to loosen and remove any accumulated dust or debris.
5. Re-install burner assembly (see **Figure 20**):
   a. Install burner assembly and gas manifold and secure gas manifold to burner box using screws removed in step 3.
   b. Reconnect wires to combination gas valve, ignitor, and flame sensor.
   c. Reconnect gas train.
   d. Close control compartment access panel screwlock door.
   e. Reconnect gas supply at union outside of cabinet.
   f. Leak test connection using leak detecting solution. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).
6. Turn ON electric power and gas, start up unit, and check for proper operation.

Heat Exchanger Maintenance

1. Remove burner in accordance with **Burner Maintenance** section.
2. Remove any external dirt or dust accumulation.
3. Visually inspect heat exchanger for cracks and holes.
4. If crack or hole is found, replace heat exchanger.
5. Install burner in accordance with **Burner Maintenance** section.

Maintenance Procedures—Continued

Ignition System Maintenance

- The circuit board (DSI control module, see **Figure 10**) monitors the operation of the heater including ignition. The only replaceable component is the 3-amp Type ATC or ATO fuse (color code: violet, PN 201685). If the fuse is blown, the problem is most likely an external overload. Correct the problem and replace the fuse.
- Do not attempt to disassemble the control module. However, check the lead wires each heating season for insulation deterioration and good connections.
- For the flame sensor (see **Figure 20**), disconnect the wire and remove the screw and the flame sensor. Clean flame sensor with an emery cloth before reinstalling.
- Proper operation of the direct spark ignition system requires a minimum flame signal of 1.0 microamps as measured by a microampmeter.

⚠ CAUTION ⚠

When reassembling, the brown ground wire must remain attached to the ignitor for unit sizes 55, 85, and 110.

- For the ignitor (see **Figure 20**), disconnect the wire and remove the screw and ignitor. Clean the ignitor assembly with an emery cloth before reinstalling.

⚠ WARNING ⚠

Due to high voltage on the spark wire and electrode, do not touch when energized.

- The spark gap (see **Figure 21**) must be maintained to 1/8 inch.

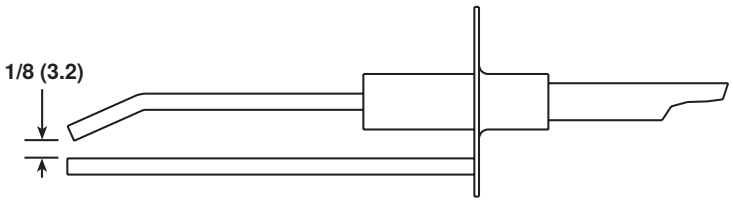


Figure 21. Ignitor Spark Gap

Combination Gas Valve Maintenance

⚠ WARNING ⚠

The combination gas valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting them to the unit to ensure positive closure.

Inspect the combination gas valve (see **Figure 16** for location), carefully remove any external dirt accumulation, and check wiring connections. Check the valve annually to ensure that the valve is shutting off gas flow completely as follows:

1. Close manual shutoff valve to prevent flow to combination gas valve.

NOTE: Use a water column manometer that is readable to the nearest tenth of an inch.

2. Connect manometer to outlet pressure tap on combination gas valve (see **Figure 19**).
3. Open manual shutoff and combination gas valves.
4. Use finger to fully block main burner orifice for several seconds.
5. Observe manometer with orifice blocked. If ***any*** pressure is indicated, combination gas valve is leaking and must be replaced before heater is restored to operation.

Pressure Switch Maintenance

If it is determined that the pressure switch (see **Figure 16**) needs replacing, use only the factory-authorized replacement part that is designed for the model and size of heater being serviced. Replace the switch in accordance with the **Pressure Switch Replacement** section.

NOTE: A unit operating above 6,000 feet (1,830 meters) in elevation requires a high-elevation pressure switch (refer to Pressure Switch Replacement section).

Venter Motor and Wheel Assembly Maintenance

NOTE: Venter motor bearings are permanently lubricated. Keep all hardware removed to be used in reassembling and installing the replacement parts.

Remove dirt and grease from the motor casing, venter housing, and venter wheel (see **Figure 16**). Replace the venter motor and wheel assembly as follows:

1. Turn OFF gas and electric power.
2. Open control compartment (see **Figure 4**) access panel screwlock door.
3. Disconnect venter motor wires from circuit board and ground screw.
4. While holding venter motor, remove six screws that secure venter motor mounting plate to venter housing. Remove motor and wheel assembly from heater.
5. Reassemble replacement venter motor and wheel assembly (see **Figure 22**).
6. Reconnect venter wires in accordance with wiring diagram provided with unit.
7. Close control compartment access panel screwlock door.
8. Turn ON electric power and gas, start up unit, and check for proper operation.

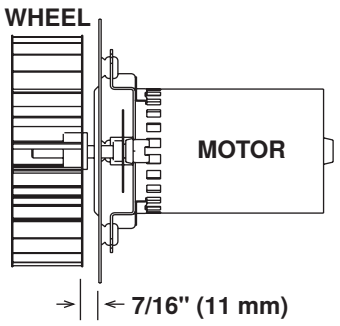


Figure 22. Venter Motor and Wheel Assembly

Vent System Maintenance

Check the complete system at least once a year. Inspection should include all joints, seams, inlet air guard, and the vent terminal cap. Clean all openings and replace any defective parts.

TROUBLESHOOTING

General Troubleshooting

Table 10. General Troubleshooting

Symptom	Probable Cause	Remedy
A. Venter motor will not start	1. No power to unit	Turn ON power and check supply fuses or circuit breaker
	2. No 24V power to integrated circuit board	Turn up thermostat
		Check control transformer output
	3. Integrated circuit board fuse blown	Correct cause and replace fuse (3A, type ATC or ATO, 32VDC)
	4. No power to venter motor	Tighten connections at circuit board and/or motor terminals
	5. Integrated circuit board defective	Replace integrated circuit board
	6. Defective venter motor	Replace venter motor (refer to **Venter Motor and Wheel Assembly Maintenance** section)
B. Burner will not light	1. Manual valve not open	Open manual valve
	2. Air in gas line	Bleed gas line (initial startup only)
	3. Gas pressure too high or too low	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	4. No spark	Perform following:
	a. Loose wire connections	Ensure that all wire connections are solid
	b. Transformer failure	Ensure that 24V power is available
	c. Incorrect spark gap	Maintain spark gap at 1/8 inch
	d. Spark cable shorted to ground	Replace worn or grounded spark cable
	e. Spark electrode shorted to ground	Replace ceramic spark electrode if it is cracked or grounded
	f. Burner not grounded	Ensure that integrated circuit board is grounded (terminals P1–9)
	g. Circuit board not grounded	Ensure that integrated circuit board is grounded to furnace chassis
	h. Unit not properly grounded	Ensure that unit is properly field grounded to earth ground and properly phased (L1 to hot lead L2 to neutral)
	i. Integrated circuit board fuse blown	Correct cause and replace fuse (3A, type ATC or ATO, 32VDC)
	j. Faulty integrated circuit board	If 24V power is available to integrated circuit board and all other causes have been eliminated, replace board
	5. Lockout device interrupting control circuit by above causes	Reset lockout by interrupting control at thermostat or main power
	6. Interlock door switch open	Close access door or replace switch
	7. Pressure switch not closing	Perform following:
		Ensure that unit is properly vented
		Remove obstruction(s) from vent
		Replace faulty tubing to pressure switch
	8. Faulty pressure switch	Replace pressure switch
	9. Main valve not operating	Perform following:
	a) Defective valve	If 24V power is measured at valve connections and valve remains closed, replace valve
	b) Loose wire connections	Check and tighten all wiring connections
	10. Integrated circuit board does not power main valve	Perform following:
	a) Loose wire connections	Ensure that all wire connections are solid
	b) Flame sensor grounded	Ensure that flame sensor lead is not grounded or that sensor insulation or ceramic is not cracked—replace as required
	c) Incorrect gas pressure	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	d) Cracked ceramic at sensor	Replace sensor

Table 10. General Troubleshooting—Continued		
Symptom	**Probable Cause**	**Remedy**
C. Burner cycles ON and OFF	1. Gas pressure too high or too low	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	2. Burner not grounded	Ensure that integrated circuit board is grounded (terminals P1–9)
	3. Circuit board not grounded	Ensure that integrated circuit board is grounded to furnace chassis
	4. Faulty integrated circuit board	If 24V power is available to integrated circuit board and all other causes have been eliminated, replace board
	5. Pressure switch not closing	Perform following:
		Ensure that unit is properly vented
		Remove obstruction(s) from vent
		Replace faulty tubing to pressure switch
	6. Faulty pressure switch	Replace pressure switch
	7. Flame sensor grounded	Ensure that flame sensor lead is not grounded or that sensor insulation or ceramic is not cracked—replace as required
	8. Cracked ceramic at sensor	Replace sensor
	9. Incorrect polarity	Reverse line volt leads to integrated circuit board
	10. Pin terminal loose on wire harness	Replace wire harness
D. No heat (heater operating)	1. Incorrect valve outlet pressure or orifice	Check valve outlet pressure (refer to unit rating plate for manifold pressure)
	2. Cycling on limit control	Check air throughput
	3. Improper thermostat location or adjustment	Refer to thermostat manufacturer's instructions
E. Fan or venter motor will not run	1. Circuit open	Check wiring and connections
	2. Defective integrated circuit board	Replace board
	3. Defective motor	Replace motor
F. Fan or venter motor turns ON and OFF while burner is operating	1. Motor overload device cycling ON and OFF	Check motor load against motor rating plate—replace motor if needed
G. Fan or venter motor cuts out on overload	1. Low or high voltage supply	Correct electric supply
	2. Defective motor	Replace motor
	3. Poor airflow	Clean motor, fan, and fan guard

Unit Troubleshooting Using DSI Control Module

NOTE: IMPORTANT: When using a multimeter to troubleshoot the 24V circuit, place the multimeter's test leads into the connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings caused by the control module's fault mode monitoring circuits.

The SSD on the DSI control module (refer to **Circuit Board (DSI Control Module)** section) may be used to troubleshoot the unit. The control module monitors the operation of the heater, and the display indicates normal operation and various abnormal conditions. If the heater fails to operate properly, check this display (refer to **Table 11**) to determine the cause and/or to eliminate certain causes. Remove and reapply power to the control module to view the last five fault codes stored in its memory—the most recent to least recent fault codes will be displayed. See **Figure 23** for a flowchart for troubleshooting the unit using the DSI control module.If troubleshooting indicates that repair of the DSI control module is required, note that its only replaceable part is the fuse, which is a type ATC or ATO 3A fuse, color code violet (PN 201685).Remove and reapply power to the control module to view the last five fault codes stored in its memory. The most recent to least recent fault codes will be displayed.

Table 11. Circuit Board (DSI Control Module) Display Codes

Display Code Status	Display Code	Indication
Steady	—	Normal operation—no call for heat
	0	Ignition sequence active
	H	Normal operation—call for heat (strong flame)
Flashing	2	Normal operation—call for heat (weak flame)
	L	Lockout from failed ignition or flame loss
	3	Pressure switch is not closed within 30 seconds of venter motor energizing
	4	Pressure switch is closed before venter motor is energized
	5	Limit switch or rollout open
	6	Undesired flame
	7	Polarity reversed
Steady	Off	Internal fault/power failure

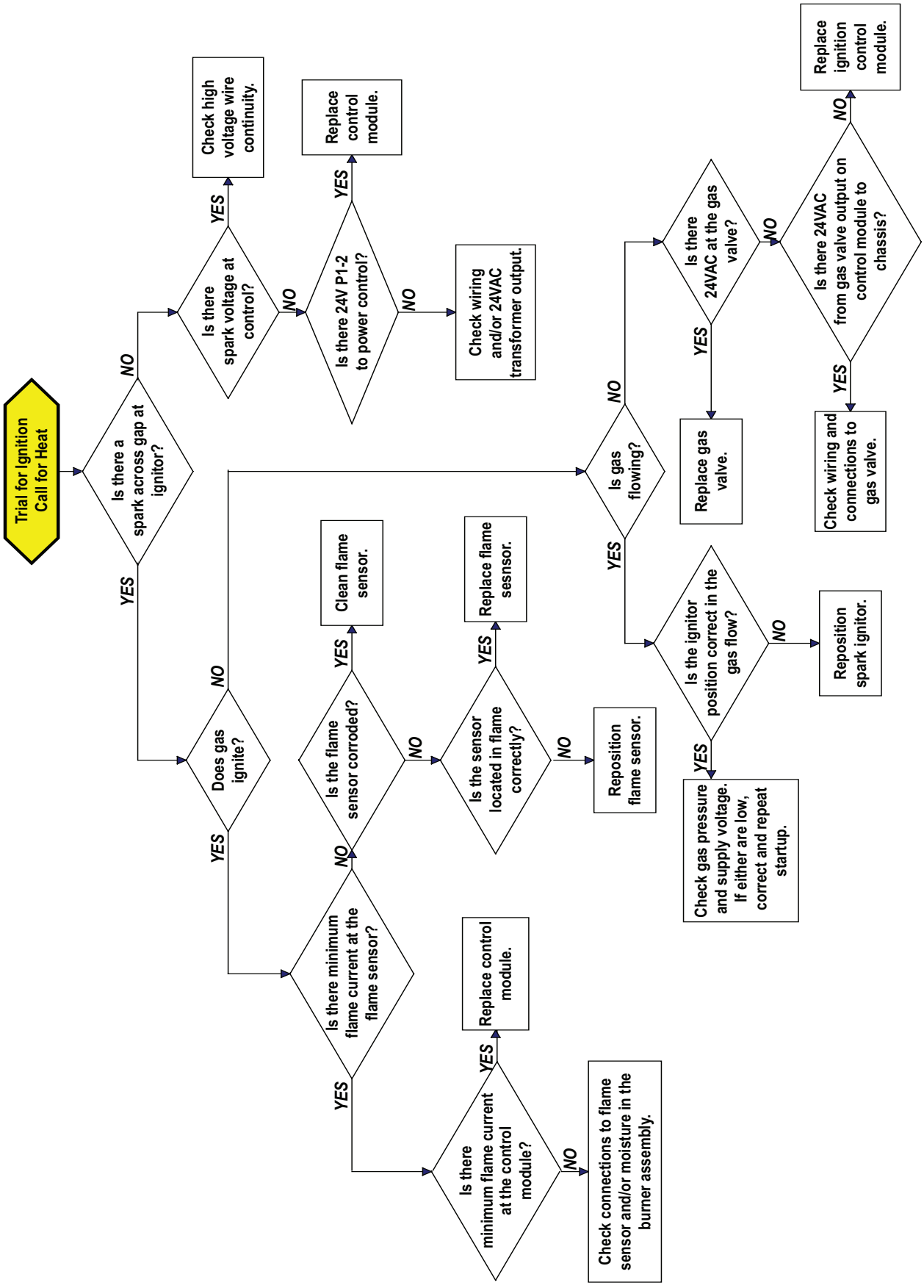


Figure 23. DSI Control Module Troubleshooting Flowchart

INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

Model	Serial No.	Date of Installation	Notes
	Installer	Distributor	
Name			
Company			
Address			
Phone No.			

For more information on Reznor HVAC products:

- **Contact your local Reznor representative at 1-800-695-1901**
- **Refer to the technical specifications, manuals, and consumer materials found at www.reznorhvac.com**

Intertek

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